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AN EMPIRICAL INVESTIGATION OF THE IMPACT OF TROUBLED DEBT RESTRUCTURING ON FIRMS IN FINANCIAL DISTRESS

Texas A&M University   PH.D.   1984

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AN EMPIRICAL INVESTIGATION OF THE IMPACT OF

TROUBLED DEBT RESTRUCTURING ON FIRMS IN

FINANCIAL DISTRESS

A Dissertation

by

JOHN GWENFFRUD HAMER

Submitted to the Graduate College of
Texas A&M University
in partial fulfillment of the requirement for the degree of

DOCTOR OF PHILOSOPHY

May 1984

Major Subject: Accounting
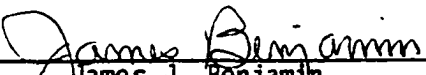
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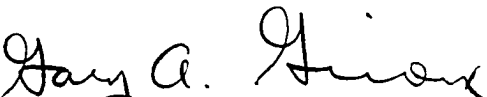IMPACT OF TROUBLED DEBT RESTRUCTURING

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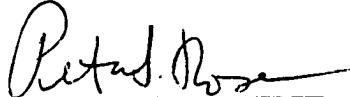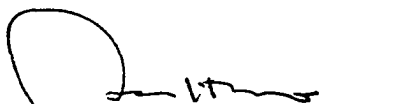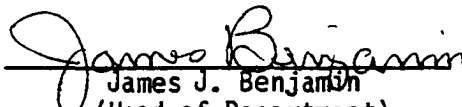
A Dissertation

by

JOHN GWENFFRUD HAMER

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May 1984

ABSTRACT

An Empirical Investigation of the Impact

of Troubled Debt Restructuring

on Firms in Financial Distress. (May 1984)

John Gwenffrud Hamer, B.S., University of Lowell;

M.B.A., Texas A&M University

Chairman of Advisory Committee: Dr. James Benjamin

The purposes of this study were to extend the body of research relating to the use of multiple discriminant analysis in bankruptcy prediction models, the relationship between bankruptcy and troubled debt restructuring, and the nature of troubled debt restructured (TDR) firms. Also, the effects of troubled debt restructurings on firms in financial distress were examined in detail.

A descriptive analysis of a sample of sixty troubled debt restructured (TDR) firms was performed. The types of TDR's each firm employed was looked at. Also, specific ratios and financial statement items were compared with those of bankrupt and nonbankrupt firms.

In general, the TDR firms were found to be financially better off than the bankrupt firms and financially worse off than the nonbankrupt firms. This result is what might be expected.

However, a couple of interesting results occurred which might not be expected. First, there were thirteen firms in the TDR sample which appear to be financially strong. These firms may be

experiencing cash flow problems which is a common event.

Second, when working capital was analyzed, it was found that the TDR sample had the lowest working capital of all three samples. Even the bankrupt sample had higher working capital. In fact, the TDR firms experienced negative working capital while both the bankrupt and nonbankrupt samples had positive working capital. This result is important and may indicate that working capital or some measure of funds flow is a key factor in TDR research.

A sample of both bankrupt and nonbankrupt firms was used to develop a bankruptcy prediction model. Those firms entering bankruptcy from 1972 to 1981 were matched with nonbankrupt firms on the basis of size, industry type, and year of bankruptcy. The TDR firms were then analyzed through this model.

In conclusion, this research project examined sixty TDR firms. Several of them undertook more than one type of restructuring. Both before and after TDR, the TDR firms fell into a bimodal distribution with roughly half of them classifying as bankrupt in each year and the other half classifying as nonbankrupt. From statistical testing, it was shown that these firms were becoming financially weaker prior to TDR. But, after TDR, it can only be concluded that these firms did not continue to worsen financially.

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CHAPTER I

INTRODUCTION

Purpose of this Research Effort

For several years, bankruptcy has been a topic of interest to researchers in the areas of both accounting and finance.[1] When a firm is in financial difficulty, its only recourse may be to file for bankruptcy under the National Bankruptcy Act. Under this Act, the firm may be able to reorganize and become a going concern again or may be forced into liquidation. Bankruptcy is the last resort for financially troubled firms.

Since bankruptcy is such an important event, most studies have attempted to detect firms which would eventually file for bankruptcy. Two views have been suggested to explain bankruptcy. One view states that the onset to bankruptcy may be very quick so that no indicators can predict bankruptcy before it actually occurs. The other view considers bankruptcy to be a long-term process. In the latter case, there may be indicators which predict the bankruptcy of a given firm at some point in the future.

It is from this latter view that several bankruptcy models have been developed in an effort to predict the future status of firms as either bankrupt or nonbankrupt. In most of these studies, the

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variables chosen to distinguish a sample of firms as bankrupt or nonbankrupt have been financial ratios. In other words, troubled firms should have significantly different financial ratios than healthy firms.

Before a firm reaches the point of bankruptcy, it may have several alternatives to reverse its troubled position and possible bankruptcy. One alternative may be to enter into a troubled debt restructuring (TDR) where, if the creditors agree, the firm may be able to either reduce or extend its debt, or both. In this research, several aspects of TDR's are studied. Using a sample of TDR firms, tests will first be conducted to determine if TDR firms are classified as bankrupt or nonbankrupt prior to debt restructuring. A discriminant bankruptcy model will be developed similar to ones developed by others [Altman 1977, Rose and Giroux, 1980]. Second, the TDR sample will be tested after restructuring to determine if, in fact, they reverse from their troubled positions and become profitable. Since this is the first empirical study pertaining to TDR's, the results should prove quite useful for future research.

The research problem studied here, then, focuses on TDR firms. The characteristics of these firms will be analyzed to determine whether or not the firms are progressing through a process which usually results in bankruptcy. If not, the restructuring may have occurred with no indications of future financial problems.

The topic of troubled debt restructuring has never been empirically studied in either the accounting or finance areas as far

as this author has been able to determine. Therefore, an empirical study of troubled debt restructuring and how it relates to bankruptcy is unique to the literature.

When a firm becomes unable to pay its debts, the TDR alternative may result in two events. First, the TDR may make it possible for the firm to pay its debts and continue to function as a going concern. Alternatively, the TDR may have no effect on reversing the failure process; therefore, the firm soon faces loan default, bankruptcy, and possible liquidation. This study will determine if the majority of the TDR firms show signs of financial difficulty before the TDR event takes place. Also, after TDR, the financial direction that these firms take will be observed. These firms can either strengthen, remain the same, or worsen.

The research questions may be stated as follows:
Is there evidence that the onset of a TDR is part of the failure process? In other words, prior to restructuring, do TDR firms possess the characteristics of bankrupt or nonbankrupt firms? Also, has TDR aided troubled firms in reversing their progression through the failure process? In other words, after restructuring, do the characteristics of the TDR firms differ from what they were before restructuring? Or do they maintain the same characteristics as before? And were these characteristics similar to either bankrupt or nonbankrupt firms? Are these firms able to settle their debt? Finally, are these firms able to continue to function as going concerns? The results of this study will try to provide some evidence

relevant to these questions pertaining to TDR firms.

The following hypotheses will be tested to answer the above questions:

    (One-sided)

1. Ho: The difference in mean Z scores before TDR from one year to the next for the TDR firms is less than or equal to zero

    H1: The difference in mean Z scores before TDR from one year to the next for the TDR firms is greater than zero

    (Two-sided)

2. Ho: The difference in mean Z scores after TDR from one year to the next for the TDR firms is zero

    H1: The difference in mean Z scores after TDR from one year to the next for the TDR firms is not zero

The firms' Z score is a score computed by the discriminant function to determine the financial position of each firm. High positive Z scores represent profitable firms while negative Z scores represent unprofitable ones. In the first hypothesis, if Z scores are decreasing prior to TDR, then the difference in Z scores for each firm over a one year period should be positive. In the second hypothesis, if Z scores are changing (either positively or negatively), then the difference between Z scores for each firm over a one year period should not be equal to zero. If the firms' financial condition continues to worsen, the differences in Z scores should be positive. If the firms' financial condition, in fact, becomes stronger, the

differences in Z scores should be negative.

Next, we wish to test the null hypothesis that the proportion of TDR firms classified as bankrupt or nonbankrupt remains the same for each year prior to TDR and each year after TDR. We let p1 be the proportion of TDR firms which are classified as bankrupt in one year and p2 be the proportion of TDR firms which are classified as bankrupt in the next year. We may state the null and alternative hypotheses symbolically as follows [Daniel, 1978]:

3. Ho: p1=p2 or p1-p2=0, H1: p1≠p2 or p1-p2≠0

4. Ho: M=Mo, H1: M≠Mo where M is the firm's mean scores

   and Mo is the hypothesized median of Z scores.

These hypotheses will be tested for several years. First, they will be tested for each year up to three years prior to TDR. Then they will be tested for each year up to three years after the TDR.

5. Ho: The distribution of Z scores of the TDR firms is homo-

   geneous.

   H1: The distribution of Z scores of TDR firms is not homo-

   geneous.

The above hypothesis should indicate whether the sample of TDR firms is homogeneous in their bankrupt or nonbankrupt characteristics or if a dichotomy within the sample exists. This is important for a couple of reasons. First, prior to TDR, testing of this hypothesis will indicate if the TDR firms are similar to bankrupt firms. After TDR, testing of this hypothesis will indicate whether or not these firms retain the same status or whether their financial positions

change so that they are similar to nonbankrupt firms.

In this study, multiple discriminant analysis (MDA) will be used to develop a bankruptcy prediction model. The discriminant model developed will be similar to those developed in the past and will use those variables found to be the most predictive. A sample of bankrupt and nonbankrupt firms were used to develop this model. Next, a sample of TDR firms will be evaluated using the bankruptcy model before they entered into TDR. If the firms were having financial difficulties prior to TDR, the model may classify them as being bankrupt firms. If not, they will be classified as nonbankrupt firms. After the TDR, these same firms (where data is available) will be evaluated again using this same model. If TDR has been effective in turning these firms around, the model may then classify a significant number of these bankrupt and nonbankrupt firms as non-bankrupt firms.

If the results of the study indicate that TDR has been effective for firms trying to reverse their unsuccessful positions, future research can develop this study further. Chapter VI presents several ideas for future research in the TDR area.

Economic Conditions of the United States

The economic conditions of the nation have a major effect on the operations of a business. There have been major efforts by government to reduce inflation and unemployment while achieving economic growth. Because business failures have more than tripled in the past three years, it is useful to look at some of the economic statistics which have occurred over that time period [Annual Report Federal Reserve

Bank of New York, 1982]. The increase in business failures may vary inversely with economic conditions. As inflation, interest rates, and unemployment rise, the number of business failures rises [Annual Report, Federal Reserve Bank of New York, 1982].

After the oil crisis in 1973, the country entered into a recessionary period. Throughout the mid 1970's, the rate of inflation and unemployment decreased. The following illustrates economic data for the United States from 1972 to 1981:

Year	1972	1973	1974	1975	1976
GNP (Billions)	$1185.9	$1326.4	$1434.2	$1549.2	$1718.0
Unemployment Rate	4.9	4.4	5.2	7.9	5.9
Discount Rate	4.5	7.5	7.75	6.0	5.25
Inflation Rate	6.12	8.46	11.24	6.53	4.56

Year	1977	1978	1979	1980	1981
GNP (Billions)	$1918.3	$2163.9	$2417.8	$2633.1	$2937.7
Unemployment Rate	7.0	6.2	6.1	7.6	8.3
Discount Rate	6.0	9.5	12.0	12.87	13.41
Inflation Rate	6.16	8.45	12.31	10.81	8.06

In the late 1970's, the rate of economic growth increased. Also, unemployment dropped significantly to less than six percent in 1976. However, inflation increased in the late 1970's. The major cause of increased inflation was a shortage of raw materials which caused poor

productivity in the nation's industry [Economic Report of the President, 1980].

In 1979, oil prices more than doubled. Inflation was still on the rise at 12.31% while the unemployment rate remained at 6%. The Federal Reserve's discount rate was rising at this time. Investment decreased during this period. The discount rate reached a new high of 13.41% in 1981.

The Carter Administration ended in 1980 with an inflation rate of 10.81%. While government spending reduced unemployment during this period, individuals and businesses were suffering from high inflation and interest rates.

Plans for economic recovery began in 1981 with a decrease in government spending, a decrease in the federal income tax rates, and regulatory decontrol. It is hoped that this plan will reduce inflation, interest rates, and unemployment, while stimulating business investment and productivity.

As of December 1982, inflation had been substantially reduced to 5%. The discount rate at this time has dropped to 11.02%. However, the GNP had not shown evidence that the business segment had increased investment. Unemployment had risen to 10.7%.

The economic recovery plans in the 1980's have been considered partially successful by some people. Interest rates have declined, which enables firms to borrow funds more cheaply. This is hoped to increase business investment and production which will lead to reduced unemployment and economic growth. However, the new concerns and fears

of the people are related to unemployment, which has reached the
highest rate in 1982 of 10.7%.

In summary, the economy in the United States from 1972 to 1982
has experienced several adverse changes. In general, interest rates
and unemployment have increased over this ten year period. The
discount rate reached its peak in 1979 and has begun to decline since
then. This economic turmoil, although not solely responsible, had a
major effect on the increasing rate of bankruptcies in the United
States over the past several years. In 1979, there were 7757 business
failures in which companies filed for bankruptcy. This number
increased each year to 25,346 in 1982 [Annual Report Federal Reserve
Bank of New York, 1982].

The state of the general economy and the probability of
bankruptcy vary inversely. As firms are subject to an economic
turndown, they tend to become less profitable and financially worse
off, often resulting in bankruptcy. As a result, interest in TDR's
rose, which led to the issuance of FASB Statement No. 15 in 1977
[Kolins, 1977]. The decline in the economy caused an increased
interest in business failures and troubled debt restructurings.

Relevance of the Study

No empirical studies thus far have attempted to determine the
effects of TDR on troubled firms. Studies in the TDR area have been
limited to summaries of, and how to apply, a troubled debt
restructuring. A possible explanation could be that, since a debt
restructuring may not be a common occurrence, data may have been

difficult to obtain. Ideally, with four years of data now available (since disclosure has been required) under FASB Statement No. 15, sufficient information may be obtained for this study. Therefore, the first step was to determine how many firms have implemented TDR in order to determine if an acceptable sample size can be obtained. A sample of sixty TDR firms was obtained.

Research in the bankruptcy area has resulted in empirical models to predict and classify bankruptcy before the fact. These models are well-known and widely accepted [Altman et al, 1977, Rose and Giroux, 1980]. While these models consider factors such as liquidity, profitability, leverage, and other factors, they do not reflect the TDR event, which may be a step in the failure process.

There have also been theoretical models which try to predict the probability of failure [Scott, 1979], though only a few have appeared to date. These studies have attempted to explain the results obtained from the empirical studies. Scott [1981] has found many factors in common between the theoretical and empirical models. The factors or ratios in common are EBIT (earnings before interest and taxes)/total interest payments, EBIT/TA (total assets), and common equity/total capital.

All of the empirical bankruptcy studies performed in the past have been ex-post in nature. In other words, the prediction models were developed from firms which had already filed for bankruptcy. A TDR is a pre-bankruptcy event. In this study, the TDR sample will be evaluated using a discriminant model which is ex-post in nature. The

results of the TDR firms may be useful in future research in the development of an ex-ante (before bankruptcy) bankruptcy model.

Therefore, the idea of tying these two concepts together is pertinent to research in this area. Since debt restructuring chronologically precedes bankruptcy in the failure process, they are closely related. So, an analysis of the relationship between bankruptcy and TDR would add to the overall body of knowledge in this area. The results of this study may also play an important role in building a bankruptcy theory. The more knowledge that is learned concerning bankruptcy, the steps leading to bankruptcy, and their interrelationships, the closer researchers will come to developing a useful bankruptcy theory. Scott [1981] has attempted to tie together the empirical bankruptcy studies with the theoretical ones. He found that these studies differ somewhat, but have used several of the same variables.

The results of the study could prove useful to debtors, creditors, and investors. Although each firm is different, the general conclusions drawn from this study could influence the decision-making process concerning TDR's. If TDR's are shown to have helped troubled firms, future troubled firms may be more hopeful in trying to implement a TDR. Creditors could become more flexible in granting TDR's or more lenient in establishing the terms of a TDR.

Conversely, if TDR's have not proven to be successful, troubled firms may not view the TDR as a "way out of the tunnel." These firms may just proceed to the next step, bankruptcy, or they might choose

another alternative, such as a merger. Creditors may become more strict in granting TDR's if they have been unsuccessful in the past. Also, creditors may become more conservative in establishing the terms of a TDR.

The conclusions presented in this study may not be strong enough to provide evidence that TDR's may or may not be a favorable alternative. Much additional research is needed in this area which may support or not support the implementation of TDR's.

For the past several years, economic conditions in the United States have experienced some adverse changes. Interest rates and the unemployment rate have risen considerably. A decline in the economy can financially weaken firms. Therefore, due to current economic conditions, there may be an increasing trend toward troubled, failed, and bankrupt firms [Argenti, 1976]. Below is a summary showing the number of business failures in the United States over the past ten years:

Year	Number of Business Failures	Percent Change
1973	9,571	-
1974	10,046	4.96%
1975	11,629	15.76%
1976	9,851	-18.05%
1977	7,988	-18.91%
1978	6,720	-15.87%
1979	7,757	15.43%
1980	11,782	51.89%

1981	17,217	46.13%
1982	25,346	47.21%

[Adapted from the Annual Report, Federal Reserve Bank of New York, 1982].

Since business failures have more than tripled during this three year period (from 1979 to 1981), the importance of this topic cannot be overemphasized. With this increasing trend in business failures, it is likely that we would observe an increase in TDR's as a method to avoid default and bankruptcy. Troubled firms may find this alternative to be a possible solution to a recurring problem.

In conclusion, empirical studies of TDR are relevant to the accounting literature. Since no prior empirical studies have dealt with TDR, any results obtained will be novel to the accounting literature. With an economy which has experienced several adverse changes during this period, bankruptcies have increased significantly. Because more firms face bankruptcy, there may be an increasing trend toward TDR's. Therefore, the importance of TDR research is evident for two reasons. First, research needs to address the TDR firms specifically. Second, TDR research may be helpful in building a bankruptcy theory.

Limitations

There are several limitations to this study. The main limitation may be that factors other than debt restructuring may have an impact on the restructured firm. For example, the state of the economy may affect a particular firm's position. If a firm has restructured its

debt and economic conditions for the firm's industry subsequently improve, what explanation could be given for the firm's recovery? By using a sample of firms in different industries, some of these factors may be reduced. However, it is impossible to totally isolate debt restructuring as a single factor.

There are limitations when using MDA (Multiple Discriminant Analysis). Ohlson cites a few [Ohlson, 1980]:

1. There are certain statistical requirements imposed on the distributional properties of the predictors. For example, the variance-covariance matrices of the predictors should be the same for both groups (failed and non-failed firms); moreover, a requirement of normally distributed predictors certainly mitigates against the use of dummy independent variables. A violation of these conditions, it could perhaps be argued, is unimportant (or simply irrelevant) if the only purpose of the model is to develop a discriminating device.

MDA has been found to be a powerful test, even when these requirements are violated. Tests will determine the equality of the variance-covariance matrices and the normality of the predictors. The statistical package, MULDIS, computes the variance-covariance matrices.

2. The output of the application of an MDA model is a score which has little intuitive interpretation, since it is basically an ordinal ranking (discriminatory) device. For decision problems such that a misclassification structure is an inadequate description of the payoff partition, the score

is not directly relevant. If, however, prior probabilities
of the two groups are specified, then it is possible to
derive posterior probabilities of failure. But, this
Bayesian revision process will be invalid or lead to poor
approximations unless the assumptions of normality, etc. are
satisfied.

3. There are also certain problems related to the "matching"
    procedures which have typically been used in MDA. Failed and
    non-failed firms are matched according to criteria such as
    size and industry, and these tend to be somewhat arbitrary.
    It is by no means obvious what is really gained or lost by
    different matching procedures, including no matching at all.
    At the very least, it would seem to be more fruitful actually
    to include variables as predictors rather than to use them
    for matching purposes.

The TDR firms in this study will not be matched with any other
firms. The firms will be compared with both the bankrupt and
nonbankrupt samples do determine any similarities or dissimilarities.
It is unknown at this point whether the TDR sample is a separate
discrete group from these two samples. The discriminant model will be
developed by matching a sample of bankrupt and nonbankrupt firms.
From this model, the TDR firms will be analyzed by their computed Z
scores. The changes in these Z scores will detect the effects of TDR
of these firms. Since this is essentially a comparison of Z scores
within firms from one year to the next, any changes should reflect the

firms' financial condition. When analyzed through the model, the dissimilarities between these firms and the bankrupt firms for which the model was developed may bias the results. Therefore, the predictive ability of the independent variables could differ between the original samples of failed and non-failed firms and the TDR firms. In other words, the model may not be the best model to analyze TDR firms.

The types of firms used to develop the discriminant model will be industrial firms. The COMPUSTAT Industrial File will facilitate the data gathering process. The TDR firms will be all those found by DISCLOSURE, Inc. So not all of the selected firms may be industrial firms. Some of these firms have been eliminated from the TDR sample. For example, commercial banks were deleted from the sample because the TDR's these banks reported were their customers' TDR's, not their own. Since the sample is not a random sample but an entire population, the possibility exists that the results may be biased. The industries comprising the TDR sample are similar to those of the COMPUSTAT firms. However, since DISCLOSURE, Inc. is the best source for the sample, it was used in this study.

Debt restructuring may prove effective for certain types of firms or firms experiencing similar difficulties. The model does not differentiate why a firm is in financial difficulty, only that it is. An idea for future research could investigate why a firm becomes a troubled firm. Also, the leniency of terms of the TDR may affect on the financial outcome of the companies.

A final limitation of the study is the source of the TDR sample. As was mentioned above, this sample was compiled from DISCLOSURE, Inc. This service listed all publicly traded firms who reported debt restructuring in their published financial statements in 1982. Some of these firms, however, restructured their debt several years ago. However, as noted in Table 2 (p.52), eight of these firms have never entered into a TDR. Therefore, DISCLOSURE, Inc. is not without its pitfalls. However, at this time, it provides the most complete and reliable sample available.

Summary of the Study

In Chapter II, a review of the literature is presented. The first section of this chapter summarizes the literature pertaining to troubled debt restructurings. This section is brief, reflecting the need for additional empirical TDR studies. The last section reviews the bankruptcy literature since it is closely related to TDR.

Chapter III introduces the methodology used in the study. It starts from sample selection all the way through the specific statistical tests used for data analysis.

Chapter IV presents the descriptive and comparative analysis of the TDR firms.

Chapter V presents the results of the statistical tests employed. Also, nonparametric statistical tests will be employed to analyze the TDR firms.

Finally, Chapter VI presents conclusions drawn and recommendations made from the study.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter is divided into two parts. First, a review of the limited literature pertaining to TDR appears. Finally, the chapter concludes with a summary and description of the bankruptcy literature.

Troubled Debt Restructuring

In June, 1977, the Financial Accounting Standards Board (FASB) issued FASB Statement No. 15, "Accounting by Debtors and Creditors for Troubled Debt Restructurings." A troubled debt restructuring occurs, "if the creditor for economic or legal reasons related to the debtor's financial difficulties grants a concession that it would not otherwise consider" [FASB, 1978]. These arrangements are thought to keep the debtor from going into bankruptcy.

According to the FASB, a troubled debt restructuring may include, but is not limited to, one or any combination of the following:

a. Transfer from debtor to the creditor of receivables from third parties, real estate, or other assets to satisfy fully or partially a debt (including a transfer resulting from foreclosure or repossession).

b. Issuance or other granting of an equity interest to the creditor by the debtor to satisfy fully or partially a debt, unless the equity interest is granted pursuant to existing terms for converting the debt into an equity interest.

c. Modification of terms of a debt, such as one or a combination of:

    1. Reduction (absolute or contingent) of the stated interest rate for the remaining original life of the debt.

    2. Extension of the maturity date or dates at a stated interest rate lower than the current market rate

for new debt with similar risk.

3. Reduction (absolute or contingent) of the face amount or maturity amount of the debt as stated in the instrument or other agreement.

4. Reduction (absolute or contingent) of accrued interest.

Troubled debt restructurings may result in a gain for the debtor if the amount to be repaid under the restructuring is less than the carrying value of the debt. However, if the debtor must repay more than the carrying value of the debt, no gain or loss is recognized.

Information about any troubled debt restructuring must be disclosed in the body of the financial statements or in the footnotes. Disclosure must be made for the period of restructuring and any subsequent periods in which amounts contingently payable are included in the carrying amount of the restructured debt. Prior to this statement, no disclosure concerning TDR was necessary.

Although the study will be concerned with TDR in general, all of the firms in the sample will be ones which have implemented FASB Statement No. 15. Since no disclosure was required prior to the statement, the data needed for analysis were impossible to find for firms which did not disclose TDR's. The sample will consist of all those publicly traded firms which disclosed a TDR in their 1981 financial statements. Some of these TDR's will go back several years while others will be current.

Since there have been no empirical TDR studies to date, the only TDR literature published is descriptive in nature. Although these are not research studies as such, a brief review of what has been published

in the TDR area is presented below for completeness.

Norby [1976] cited large loan losses of banks and market losses on New York City bonds as stimulating interest in TDR's. As TDR's became more important, the AICPA showed interest in TDR accounting by banks. In 1975, the FASB issued an exposure draft dealing with TDR's and later withdrew it.

Hauge [1976] recognizes that the concern over TDR's in the 1970's had been the greatest since the 1930's. A discussion memorandum issued by the FASB in 1976 suggests the use of current value accounting, market values, and present value techniques in accounting for TDR's.

Hauge says that users and preparers of financial statements do not understand present value techniques, which were implemented in the discussion memorandum prior to the issuance of FASB Statement No. 15. Therefore the discussion memorandum should be questioned. In the past, TDR's did not affect the financial statements. But a new accounting method may be detrimental to business, since required disclosure can affect investors and creditors perceptions and even stock prices.

New methods of accounting for TDR's could change the manner in which creditors extend credit. Also, using present value techniques, earnings of banks may become distorted. For example, if banks do not like the new methods of accounting for TDR's, they may be more hesitant to grant them. Creditors could become more stringent in granting credit. As a result, small and marginal businesses may find

a reduction of credit availability.

Phillips [1977] discusses TDR's and real estate investment trusts. He noted that several types of TDR's have been used prior to FASB Statement No. 15. Many of these types are presented in the description of FASB Statement No. 15. He concludes by describing the 1976 exposure draft issued by the FASB and acknowledges its leniency in accounting for TDR's. The exposure draft essentially allows the creditor to structure the TDR as he wishes.

The relevant literature pertaining to FASB Statement No. 15 has been mostly descriptive in nature. Beresford and Neary [1977] state that in most cases no gain or loss will be recognized by debtors and creditors in a debt restructuring. However, in a situation where the future cash flows of interest and principal to be repaid by the debtor are less than the carrying amount of the debt before the restructuring, the debtor will recognize a gain and the creditor will recognize a loss.

Hiltner and Oien [1978] define a troubled debt restructuring and list the possible forms a debt restructuring may take as defined in FASB Statement No. 15 (see p. 18). Also, they present two flowcharts for debt restructuring; these show what courses of action are available to creditors and debtors. These flowcharts follow the order of accounting operations necessary when implementing FASB Statement No. 15. They start with loan default, the alternative choices allowed under a TDR, and the results that may occur. There is no guarantee that a TDR will enable a firm to operate profitably again.

Kolins [1977] discusses the guidelines for debt restructuring, as outlined in FASB Statement No. 15, and provides a brief numerical example. He also points out that any gain to be recognized by the debtor, if material, should be classified as an extraordinary gain.

Ratcliffe and Raiborn [1981] outline FASB Statement No. 15 for debtors, including the appropriate disclosure requirements. Ratcliffe and Munter [1980] outline FASB Statement No. 15 for creditors, including the appropriate disclosure requirements.

For debtors, the disclosure requirements include a description of the change(s), any gain to be recognized (with tax effect), per-share amount of gain (net of tax), aggregate gain or loss recognized during the period attributable to asset transfers, and the extent to which any contingent payments are included in the carrying amount of restructured payables [Ratcliffe and Raiborn, 1981].

For creditors, the disclosure requirements include outstanding receivables whose terms have been modified by major category, the aggregate recorded investment, the gross interest income forgone during the period through restructuring the receivable, and the amount of interest income on those receivables included in income for the period. Also, the amount of any commitments to lend additional funds to troubled debtors whose restructured receivables have not been satisfied must be disclosed [Ratcliffe and Munter, 1980].

Bankruptcy

Business failure has been a topic of great interest over the past fifteen years. If early-warning signs of business failure can be

pinpointed, it is possible that the number of future business failures may be substantially reduced. If a troubled firm can be made aware of its impending failure, it may be able to take some appropriate steps to reverse its troubled situation. Several types of variables (which indicate failure) have already been studied.

Defining business failure is not a simple task. Previous studies have chosen different definitions of business failure. Examples include operating results below expectations, net loss and nonpayment of dividends, net loss and negative cash flows, deteriorating results year after year, loan default, Chapter X or Chapter XI Bankruptcy, and liquidation [Rose and Giroux, 1980]. A firm may experience negative cash flows for a few years but manage to recover. Also, a firm may file bankruptcy under Chapter XI of the Bankruptcy Code. However, if the firm (debtor) can work out a suitable arrangement with its creditors, it may recover and continue as a profitable firm. Therefore, it is difficult to determine the best definition of business failure.

Bankruptcy Continuum

Giroux and Wiggins [1983] developed a bankruptcy continuum presented in Table 1 (p. 24). In this model, a pattern is developed beginning with the first signs of trouble for a firm all the way through liquidation. The first three indicators - poor operating results, net loss/nonpayment of dividends, and negative cash flows - are the early symptoms of potential distress. Poor operating results are trouble spots which occur when a firm can no longer carry out its

Table 1

SPECTRUM OF BUSINESS FAILURE EVENTS

Minor/
Temporary   Major/
Permanent

Operating Results Below Expectations	Nonpayment of Dividends	Net Loss and Negative Cash Flow Trends	Lowered Bond Rating	Deteriorating Operating Results Year After Year	Debt Accomodation	Loan Default	Bank-ruptcy	Liquid-ation

Alternatives Available
to the Failing Firm   Troubled Debt ———— Bankruptcy ———— Cease
                                                          Restructuring   Petition   Operations

           ————— Policy Changes —————
                Operating Reorganizations

                                        Major —————————
                                             Reorganization

                        —————— Discontinued Operations ——————————

                    ——————— Merger With ———————————
                           Solvent Corporation

Alternatives Available
to Creditors   —————— Receipt of Cash Under ——————
                                                   Judicial Provisions

       —————— Careful Analysis of Financial Performance ——————
           of Failing Firm

                                         Debt Accomodation ——————————
                                     Exchange of Debt for Equity Position

[Adapted from Giroux and Wiggins, 1983]

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goals due to its financial position (e.g., net loss, nonpayment of dividends). However, if operating results deteriorate year after year, the final outcome is likely to be loan default and/or bankruptcy. If reorganization under the bankruptcy law is ineffective, the firm may have to liquidate.

Some specific events which may occur indicating future bankruptcy have been suggested by Giroux and Wiggins Table 1 (p. 24). Under this bankruptcy continuum, net loss, nonpayment of dividends, negative cash flows, deteriorating results, and loan default are all part of this long-term process. In the past, variables such as financial ratios have been used to measure this process in prediction models. Different variables have been used in an attempt to predict bankruptcy. Generally, there has been overall agreement that variables exist which predict bankruptcy. However, there has not been full agreement as to which specific variables should be used in an attempt to predict bankruptcy.

When a firm experiences deteriorating results year after year, there are several alternatives available. Deteriorating results can be defined as lower levels of income year after year or increases in losses from year to year. First, a firm may be able to turn itself around and become profitable again due to better management or better economic conditions. Secondly, a firm may enter into a merger with a profitable firm in order to avoid loan default and possible bankruptcy. Third, it may enter into a troubled debt restructuring (TDR) in an effort to reduce or delay its debt.

Fourth, if a firm has defaulted on a loan, it may then attempt to enter into a TDR in order to turn its position around again. Finally, the firm may reorganize under the National Bankruptcy Act in order to become a going concern again. While none of these alternatives will ensure a troubled firm relief, they are attempts which, if taken, may help the firm to avoid being forced into liquidation.

When a firm is unable to pay its debts, it may enter into an agreement with its creditors to change the terms of its debt. However, the creditors of the firm must agree to a TDR in order for it to be implemented. Therefore, it is not always possible for a troubled firm to enter into a TDR, even though the firm may be in default. Although the creditors always make the final decisions, the terms of the TDR must be mutually agreed upon between the debtors and creditors. Also, these terms must follow the guidelines of FASB Statement No. 15.

The firm may want to enter into this TDR in order to avoid default and possible bankruptcy. As a result of the TDR, the firm may turn around and become a profitable concern again or it may still head toward bankruptcy. It is the hope of the firm that the TDR will result in settlement of debts and long-run profitability and liquidity.

Likewise, when a creditor agrees to a TDR, the creditor wants the troubled firm to meet its obligation under the TDR. If this occurs, the creditor will receive at least a portion of what the firm

owes. This is a much more favorable result than the chance of losing everything should liquidation take place. So, the creditor compromises on the obligation in order to avoid a total loss. However, the TDR does not guarantee payment of debt but merely makes it easier for the debtor to meet the obligation. A TDR may result in a situation where the debtor firm still cannot satisfy its obligations. If this occurs, the firm may be forced to file for bankruptcy and possible liquidation.

It is important for a firm to be able to pinpoint these trouble spots and also to know how to correct them. A firm that has realized that operating results are deteriorating can take steps to improve its condition. The firm must first determine why its operating results are declining. Once the cause is known, the proper actions can be taken. For example, a firm's selling price may be higher than its competition's, thus reducing the firm's sales. A proper response might be to increase advertising or reduce the selling price of the product.

When a firm does not identify and correct its early trouble spots and thus experiences deteriorating results for several years, its possible alternatives include loan default, merger, or a troubled debt restructuring. If the firm wants to continue to be an independent going concern, a troubled debt restructuring may be its best alternative. With the agreement of the creditors, the payment of debt can be prolonged or reduced, allowing the firm to reverse its deteriorating position. Again, it is emphasized that the creditors

must consent to a TDR. It is hoped that the firm will again become profitable and settle its debts with its creditors within the TDR time frame. If this is not possible, or the creditors will not allow a restructuring, the firm may wish to merge with another firm and, therefore, continue to operate. Otherwise, loan default is imminent and this often leads to bankruptcy, and possibly liquidation.

Argenti, in his book Corporate Collapse; the Causes and Symptoms, discusses the topic of early identification of failure and its prevention. He presents reasons for the increase in bankruptcy, such as economic downturn and the growing size of firms in recent years. Firms that rapidly increase their growth sometimes have more demands for management than they can find. Good management requires experienced people with good training. When a firm has a demand for management, sometimes these factors are ignored. He recognizes the need to develop a framework for failure. If and when the causes of business failure can be determined, action can be taken to prevent those events from occurring which cause failure.

Argenti quotes several authors concerning their views about the causes of failure. He cites a few of these causes to be top management, accounting information, change, accounting manipulations, rapid expansion, and the economic cycle. Another chapter is devoted to the classic Altman [1968] study, which is discussed later in this section.

Following an analysis of the Rolls-Royce and Penn Central collapses, Argenti presents his opinions pertaining to the causes and

symptoms of failure he presented earlier. He defines three types of failure. The first type occurs in newly formed, smaller companies, which never grow to be successful in their short lives. The second type of failure also occurs with very young firms, who grow fast in their initial years to be profitable firms. However, in the last few years of their life they literally collapse. The third type of failure occurs with long-lived, previously successful firms, whose demise takes several years of deteriorating conditions.

Argenti ends his book with ideas for the prevention and cure of failure. He includes suggestions for what government, banks, and shareholders can do to help. Although Argenti did not develop a theory of business failure, he made an initial step by analyzing the characteristics of failed firms.

Most studies in the bankruptcy area have attempted to classify firms as being either failed or non-failed from one to several years prior to business failure. The purpose of classifying failed and non-failed firms into their proper categories is to develop some type of model that can predict which firms in a group of nonbankrupt firms will experience bankruptcy in the future. The results of the classification models have been good. These models have classified over ninety percent of their given samples accurately. However, when used as prediction models, the results have been poor. Classification accuracy drops significantly when these models are used to analyze other samples of firms. Research in this area indicates that good classification results are roughly ninety percent

or better for one year prior to bankruptcy, eighty percent or better for two years prior to bankruptcy, and seventy percent or better for three or more years prior to bankruptcy. [e.g. see Altman, 1968 or Beaver, 1966].

Most studies in the area have been ex-post, classifying firms as failed or non-failed after the failed group has filed for bankruptcy. Their ex-post nature has been considered to be a weakness since these models have classified these firms well but do not predict well in an ex-ante framework. However, it is believed that these ex-post studies will develop into ex-ante studies which can predict bankruptcy with better accuracy. The research in the bankruptcy area has not reached this point thus far.

The most common types of firms studied have been large industrial firms. Data from these firms can be more easily obtained (e.g., 10-K reports, Moody's Manuals, and the COMPUSTAT Industrial Research File). Cther types of firms studied have been railroads [Altman, 1973], savings and loan associations [Altman, 1977], small businesses [Edmister, 1972], banks [Sinkey, 1975], and retail firms [Altman, Haldeman, and Narayanan, 1977].

Financial ratios have been the most commonly used variables in the classification models. However, other variables such as price-level statements [Norton And Smith, 1979 and Mensah, 1983] and market price data [Beaver, 1973] have also been studied. The hypothesis is that various financial ratios will be significantly different for failed versus non-failed firms. The basic categories

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of ratios studied have been based on: liquidity; profitability; coverage; and other earnings, relative to leverage measures, capitalization, and earnings variability [Rose and Giroux, 1980]. Overall, the various studies have found different specific ratios to be the most significant. However, there has been a lot of overlapping since different studies have used some of the same ratios.

The methodologies employed have also varied. Univariate methods have been used, which consider the effect of one variable at a time. These methods do not reflect the interactions of the variables being studied so they are considered to be inferior. Yet a significant variable for predicting bankruptcy can be pinpointed. For example, Beaver [1966] found that cash flow was an important predictor variable.

Multivariate methods do consider the interactions for the variables involved. The most widely used method up to this point has been multiple discriminant analysis (MDA) [Altman et. al., 1977]. One of the assumptions of MDA is that there are at least two discrete and known groups. In this study there are two discrete groups; bankrupt and nonbankrupt firms. Each bankrupt firm is matched with a non-bankrupt firm. Although matching is not required, it has been done in the finance literature in an attempt to assure similarity between samples except for the bankrupt-nonbankrupt status [Rose and Giroux, 1980]. In this study, the samples were matched by firm size, type of firm, and other factors so that each two firms matched together are as similar as possible, with the exception of the

bankruptcy status.

MDA selects the best variables for classification and combines them into a predictive model. Then it classifies observations into either bankrupt or nonbankrupt categories using the individual firms' predictive ratios into the MDA model.

· Other multivariate methods which have been used are linear regression and LOGIT [Ohlson, 1980]. These methods have not performed as well as MDA, so they will not be discussed here. They have resulted in good classification accuracy, but not as good as MDA. Neither achieved ninety percent accuracy one year prior to bankruptcy.

Beaver [1966, 1968, 1973] was one of the first to attempt to classify firms into failed and non-failed categories. He defined failure as the inability to pay obligations as they mature. He used seventy-nine pairs of large industrial firms. Data was obtained from Moody's Manuals. He compared financial ratios and market prices as predictors using univariate techniques and found that two ratios, cash flow/total debt and net income/total assets, were the most successful in classifying firms up to three years prior to failure.

Wilcox [1971] developed a theoretical model to explain Beaver's results since there has been no theory of bankruptcy to date. He derived a model to determine the probability of ultimate failure and found that the components of his model were similar to Beaver's best ratios (cash flow). He suggests that additional research into the variance of cash inflows, cash outflows, and the covariance of cash

inflows and outflows may result in a better predictive bankruptcy model.

Wilcox's theoretical model did not go without criticism. Benishay [1973] found Wilcox's model unappealing and unrealistic. The theoretical model is not a predictive model, but an "autopsy analysis" of failed firms. Again, this is a common criticism of all the empirical studies to date. Kinney [1973] noted that Beaver's model [1966] produced comparable results using less data and computation. However, Wilcox's attempt at a theoretical model to explain bankruptcy may have been a necessary step to bankruptcy theory which is so badly needed.

Wilcox [1973], in a later study, developed a cash flow model to predict bankruptcy. His study tests his previously developed statistic derived from the binomial expansion. This model classified well up to five years prior to bankruptcy.

Deakin [1972] used the fourteen ratios employed in Beaver's study along with MDA to determine if MDA would give Beaver's model better predictive accuracy. These ratios were as follows: cash flow/total debt, net income/total assets, total debt/total assets, current assets/total assets, quick assets/total assets, working capital/total assets, cash/total assets, current assets/current liabilities, quick assets/current liabilities, cash/current liabilities, current assets/sales, quick assets/sales, working capital/sales, and cash/sales. The failed firms in Deakin's study were companies which experienced bankrupcty, insolvency, or

liquidation. The failed firms tended to expand through debt and preferred stock in the third and fourth years prior to failure. The MDA model had very good results for up to three years prior to bankruptcy. When Deakin applied the model to an independent sample, the second and third year prior to failure had good results but not the first year prior to failure. Deakin could not explain this result.

Altman [1968] used sixty-six manufacturing companies to assess the quality of ratio analysis. This was a landmark study in the bankruptcy literature. The failed firm group was legally bankrupt firms under the Chapter X or Chapter XI of the National Bankruptcy Act. He used MDA to test his five best ratios; working capital/total assets, retained earnings/total assets, earnings before interest and taxes/total assets, market value of equity/book value of debt, and sales/total assets.

Altman was the first to employ MDA for the classification of failed and non-failed firms. The model had classification accuracy of ninety-four percent for one year prior to bankruptcy and seventy-two percent for two years prior to bankruptcy [Altman, 1968]. Since Altman had better results using MDA as opposed to previous studies (e.g., Beaver), several studies thereafter have used MDA. Different variables have been analyzed in an attempt to improve classification accuracy.

Moyer [1977] tested a new sample of firms using Altman's classic model [1968] and got very poor results. He then re-estimated

Altman's parameters using stepwise MDA and found the model had better classification accuracy by omitting two of the five variables. Those variables were market value of equity/book value of debt and sales/total assets. Two possible explanations were offered:

1. The significance of the variables is sensitive to the sample data examined.

2. Discriminant analysis is not valid to test the significance of the variables, as earlier criticized by Joy and Tollefson.

Moyer also found that, when compared to Beaver's model, the Altman model stands up well. So again, MDA proved to be more accurate than previously used univariate methods.

Altman, Haldeman, and Narayanan [1977] constructed a new bankruptcy classification model called ZETA. ZETA classifies very accurately up to five years prior to bankruptcy. In addition to manufacturing firms, the sample in this study also contained retail firms. The authors cite several reasons for developing a new model when other older models proved to be accurate. They are:

1. The change in size, and financial profile, of business failures in recent years warranted new research.

2. The data being used is from a newer time period (1970's).

3. Retail firms are included.

4. The data and footnotes have been analyzed to include most recent changes in financial reporting standards and accepted accounting practices.

5. Several advances and controversial aspects of MDA not previously addressed were tested here.

A seven-variable model was developed and tested using both linear

and quadratic MDA. These variables dealt with return on assets, stability of earnings, debt service, cumulative profitability, liquidity, capitalization, and size. If the variance-covariance matrices of the two groups of failed and non-failed firms are identical, linear MDA is appropriate. If not, quadratic MDA should be used. It was determined that quadratic MDA was appropriate for testing the model. However, when linear MDA was used, bankruptcy classification was more accurate.

The ZETA model was compared with Altman's [1968] old model in three ways. First the old model was tested for five years. This resulted in poor prediction accuracy after the second year. Second, the sample from the ZETA model was used in Altman's old model. Finally, new parameters were calculated for the new sample based on the variables in the prior Altman model. The ZETA model proved superior in each comparison.

Finally, the efficiency of the ZETA model was tested by comparing it to two naive strategies where all firms are classified as nonbankrupt and a proportional chance strategy based on observed error rates equalling a prior probability. ZETA was found to be almost six times as efficient as the two naive strategies.

Rose and Giroux [1980], in a later study, used MDA to develop their own bankruptcy classification model. In this study, firms were used which had filed petitions under Chapter X or Chapter XI of the National Bankruptcy Act between 1970 and 1978. The data was obtained from the COMPUSTAT Industrial Research File, the largest data base

available. The authors tested 130 variables for their predictive significance. A quadratic MDA model was then developed using the best eighteen predictive ratios. Some of the ratios examined here were pretax profit margin, current assets/total assets, operating profit margin after depreciation, and the current ratio. This model resulted in good classification accuracy up to seven years prior to bankruptcy.

It is suggested that, with further research, an "early warning system" can be developed to find trouble spots for companies which could help them avoid failure. The failed firms experienced similar characteristics:

1. An expense problem, especially selling, general, and administrative

2. A smaller cash flow margin

3. More rapid turnover of receivables and inventories

4. Lower earnings

5. High financial leverage

6. Low liquidity

7. Reduced dividend yields

Rose and Giroux found that linear MDA was more successful when classifying firms as failed or non-failed than quadratic MDA but was also more erratic over time. The success of their model over previous studies is due to the use of the COMPUSTAT Industrial File and the MULDIS MDA package, an efficient approach to utilizing the COMPUSTAT data.

Several other studies have been conducted which give similar

results. Blum's [1974] Failing Company Model was developed to predict failure for 115 pairs of industrial firms. His variables incorporate changes over time which other models do not. Some of his variables were net quick assets/inventory, cash flow/total liabilities, standard deviation of net income over a period, and net worth at book value/total liabilities. Firms were considered failed when they were unable to pay debts as they came due, entered into bankruptcy proceedings, or entered into debt restructuring to reduce debt with creditors. He used financial ratios and discriminant analysis and achieved classification accuracy up to five years prior to failure.

Dambolena and Khoury [1980] used financial ratios and MDA to classify failed and non-failed firms. They noted that ratios for failed firms become more unstable than non-failed firms as the firms approach bankruptcy. So, their analysis included the stability of the ratios. Their model was accurate for up to five years prior to bankruptcy. The ratios they used were as follows; net profit/sales, net profit/net worth, net profit/net working capital, net profit/fixed assets, net profit/total assets, sales/net worth, sales/net working capital, sales/inventory, cost of sales/inventory, current ratio, acid test ratio, inventory/net working capital, current debt/inventory, fixed assets/net worth, current debt/net worth, total debt/net worth, times interest earned, funded debt/net working capital, and total debt/total assets.

Collins [1980] compares two Altman studies [1968, 1977] with one done by Meyer and Pifer for banks [1970]. Meyer and Pifer regressed

each of their financial ratios on time and determined the time trend, coefficient of variation, and shift away from the trend in the period prior to failure. Collins found that the Altman methodology classifies just as well as the Meyer and Pifer methodology.

Norton and Smith [1979] used industrial firms to compare historical cost ratios with general price level adjusted ratios. They found no significant differences in the classification accuracy between historical cost ratios and general price level adjusted ratios.

In the most current bankruptcy study to date, Mensah [1983] developed a discriminant model similar to those developed in the past. He used the same financial ratios which have been used before, but applied price-level techniques to these variables. He also implemented LOGIT analysis. His results were insignificant as neither of his models achieved better classification accuracy than previous ones. This would indicate that price-level changes have no effect on the bankruptcy prediction models.

Ohlson [1980] performed a study using financial ratios to predict bankruptcy using LOGIT. He gathered data from 10-K reports in order to obtain the data at the time it was released to the public, because he considered the timing of when information is made available to be very important. He also considered data obtained from Moody's Manuals can be difficult to extract since it is very condensed. He found four significant factors affecting the probability of failure within one year:

    1. Company size

2. Measure(s) of financial structure

3. Measure(s) of performance

4. Measure(s) of current liquidity

The ratios employed dealt with these factors. For example to

measure size, Ohlson used the log (total assets/GNP price-level

index). Net income/total assets was used as a measure of

performance. Working capital/total assets was used as a liquidity

measure. Total liabilities/total assets was used to measure financial

structure. He chose not to use MDA because of some of the problems

associated with it:

1. There are certain statistical requirements imposed on the distributional properties of the predictors. (e.g., the variance-covariance matrices should be identical for the failed and non-failed groups). A normal distribution is required.

2. The output of an MDA model is a score in which the observation is classified based on an ordinal ranking device, leaving little intuitive interpretation.

3. The matching of failed and non-failed firms is somewhat arbitrary.

Ohlson's methodology, LOGIT Analysis, avoids these problems.

LOGIT Analysis is an econometric model which determines the

probability that the firm fails within some specified time period

given that it belongs to a certain population.

The sample of failed firms must have filed for bankruptcy under

Chapter X or Chapter XI of the National Bankruptcy Act. The

non-failed firms were taken from the COMPUSTAT Industrial Research

File. All firms had to be traded on some stock exchange or

over-the-counter market and had to be industrial firms.

The results indicate that LOGIT Analysis predicts bankruptcy accruately within one year, within two years given the company did not fail in the first year, and within one or two years. Ohlson concludes that with more research, LOGIT Analysis may be a powerful predictive tool.

Scott [1981] reviews several previously derived empirical bankruptcy models. These models were derived by other researchers. From these models, he concludes that bankruptcy prediction may be possible due to low misclassification rates. He notes that earnings or cash flow and debt appear in all of the models analyzed. Another important variable in bankruptcy prediction is a firm's stock price.

Scott presents the results of the empirical models developed by Beaver [1966], Altman [1968,1977], Ohlson [1980], and others. He notes that several ratios used in these studies were similar. Next is a review of the models based on the gambler's ruin theory. Wilcox [1971] was a pioneer with these models in which the firm is considered a gambler which is classified as nonbankrupt when its net worth is positive. When the firm's net worth drops to zero, the firm is then classified as bankrupt. However, these models have not had any empirical support.

In the simple case, the firm lasts for two periods. The firm is considered bankrupt if its liabilities exceed the liquidation value of the firm. These models, then, are different from the empirical models so they cannot explain the successful results of those models. Based

on his theoretical model, Scott transforms Wilcox's [1971] gambler's ruin model and Altman's [1977] model so they contain the same stock and flow variables. Although Altman's [1977] ZETA model contains more variables, the stock and flow variables are explained theoretically.

Next, Scott develops a theoretical model based on the value of the firm and the debt it owes its creditors. His model incorporates firms which have imperfect access to capital. As measures of financial failure, he uses debt, income, retained earnings, and market value and book value of equity. He concludes that there is an overlap between the empirical and theoretical models as there are many similarities between them.

Scott concludes by discussing the similarities and dissimilarities between the empirical and theoretical models. The overlap between these models is imperfect. As an explanation for this, he concludes that the theoretical models are too simple and have not been developed enough thus far to explain the empirical models.

As these models become more developed in the future, it may be possible to predict TDR's in this process. Also, these models may be able to detect which types of firms should implement TDR's. The research in this area has not yet reached this point.

Hamer [1982], in an unpublished working paper derived from her dissertation, compares the Altman [1968], Deakin [1972], and Blum [1974] studies with a new model she developed. Her results were similar to each of the individual studies' results. Up to five years prior to bankruptcy, prediction accuracy was good. Beyond five years

prior to bankruptcy classification, accuracy was below seventy percent in all models.

In her discriminant model, she found linear MDA to classify better than quadratic MDA. She also notes that other methods that relax the assumptions of a normal distribution, namely LOGIT, have not resulted in better classification accuracy. This result is also substantiated by Ohlson [1980] which supports the continued use of MDA in these types of studies.

Hamer's study is relevant to this research for several reasons. Bankruptcy is defined in both studies as filing a petition under the National Bankruptcy Act. She used MDA, which this study does. She also used the MULDIS package, as was used here. Finally, both models used the COMPUSTAT files for data gathering. All of these similarities should result in similar results pertaining to the bankruptcy prediction model developed for the bankrupt and nonbankrupt firms.

The conclusions from most of the empirical bankruptcy studies have agreed that financial ratios and other variables analyzed have predictive ability. Because these studies have analyzed different variables and ratios, they disagree somewhat on which ratios are the best predictors, their percent of classification accuracy, and the length of time for which each model is accurate. However, there is a great deal of overlap among these studies. For example, they agree that liquidity ratios are important. But while one study uses cash flows [e.g. Beaver, 1968], another may consider working capital more

significant [e.g. Altman, 1968].

Because these models differ in the ratios employed in them, each model classifies differently. Altman [1977] had good classification results for up to five years while Beaver's [1968] model classified well for only two years over time. The models which have evolved have achieved better classification results.

All these studies have used ratios pertaining to: liquidity, profitability, coverage, and other earnings relative to leverage measures, capitalization, and earnings variability [Rose and Giroux, 1980]. It is the specific ratios in these areas that have differed. For example, Beaver [1966] used cash flows while Altman [1968] found working capital to be a better measure of funds.

The few theoretical models which have been developed also overlap with the empirical ones. Scott [1981] compared several of these models as was previously mentioned.

The conflicting results are due to the specific differences in the studies performed. Most of them have been mentioned, but a brief list is provided here:

1. Variations in time period covered by the data (up to 10 years)

2. Variations in size of companies

3. Variations in ratios used

4. Variations in methodologies employed

5. Variations in the industries used

6. Variations in the definition of failure.

These variations may be responsible for the differences between

the bankruptcy models. In general, though, it is agreed that failure
can be predicted from events occurring several years prior to
failure. There is also agreement about which types of ratios (e.g.
liquidity, coverage, etc.) are the best predictors. In conclusion,
these studies support the failure process theory which is an
underlying assumption of this study.

CHAPTER III

METHODOLOGY

Introduction

In this chapter, a description of the methodology employed in this study will be presented. First, selection procedures for the three samples used are discussed. Next, the statistical design used is discussed in detail. Variable selection procedures and validation testing are presented. Finally, the hypotheses to be tested in order to analyze the TDR firms are presented.

Sample Selection

It will first be necessary to draw three samples for this study. In order to develop a bankruptcy model using MDA, a sample of industrial bankrupt firms filing petitions under Chapter X or Chapter XI of the National Bankruptcy Act was found.[2] The Wall Street Journal Index is the source from which the bankrupt firms were chosen. Each of these firms will be cross-referenced through Moody's

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2. Under the National Bankruptcy Act, creditors may file an Involuntary Petition in Bankruptcy or debtors may file a voluntary petition under Chapter XI of the Bankruptcy Code. Here, the debtor firm attempts to work out an agreement with its creditors so it may become a going concern again and hence avoid liquidation. The Bankruptcy Tax Act of 1980 provides for several tax advantages for the bankrupt firm, including a new type of reorganization qualifying for tax-free treatment.

Investor Manuals and SEC 10-K reports to determine their specific
filing dates for bankruptcy. The bankrupt firms will be selected for
a ten year period, 1972-1981. Since variables which may predict
bankruptcy may change over time, a ten year time span was selected.
Rose and Giroux [1980], for example, used a ten year time period. A
time period of this length makes it possible to obtain a good sample
size from using the COMPUSTAT Industrial File. Altman [1968] used a
twenty year time period. In choosing a time period for analysis, the
economic cycles must be taken into consideration. The ten year period
from 1972 to 1981 was a period of both inflation and recession in
which business failures increased; therefore, for these reasons, this
time period was chosen for analysis.

When using MDA, large samples increase predictive ability
[Eisenbeis and Avery, 1972]. Previous studies [Altman, 1968, Rose and
Giroux, 1930] have used sample sizes of between thirty and
thirty-five. Therefore, a sample size of at least thirty should be
appropriate here [Tatsuoka, 1971]. Large samples increase the
likelihood that the hypothesis of the equality of group means and
dispersions will be rejected [Eisenbeis and Avery, 1972]. Using a
normal multivariate technique, a sample size of around twenty-five is
considered adequate. Another factor which will influence the sample
size is the MULDIS package being used. In order for MULDIS to compute
a discriminant function, the number of variables tested must be less
than the sample size used. In this study, twenty-five variables were
tested which means that the sample size must be significantly greater

than twenty-five. Since the sample size was only thirty-five, the twelve variables selected by MULDIS were retested by themselves. MULDIS selected all twelve of these variables for the discriminant function. Next, the COMPUSTAT Industrial Research File will be examined to determine how many of these firms it includes. This file provides a large data base from which the model can be developed. Firms listed on the COMPUSTAT Industrial File are all publicly traded companies. It has been used in past studies because of the vast amount of data it contains. Only failed firms appearing on the COMPUSTAT Industrial Research Tape will be used for analysis. Therefore, all the bankrupt firms used in the analysis will be publicly traded firms. There should be a sufficient number of failed firms since this sampling method has been previously used [Rose and Giroux, 1980]. See Appendix 1 for a list of these firms and the year each one filed for bankruptcy.

Next, a sample of industrial nonbankrupt firms was chosen from the COMPUSTAT Industrial File. These firms were matched with the bankrupt firms by type and size. When using MDA, two or more discrete groups are needed for analysis; in this case, the two groups are the bankrupt and nonbankrupt firms. Since the prediction of bankruptcy is desired, the two groups will be matched so that they are as similar as possible with the exception of their bankruptcy or nonbankruptcy status. These samples include both industrial and retail firms.

As part of the matching process, each nonbankrupt firm will be in the same industry as its bankrupt counterpart. In other words, the Standard and Poor's industry codes will be the same for each matched

pair. Also, total assets and sales between matched firms should not differ more than ten percent, because differences greater than ten percent are generally considered significantly different [Tatsuoka, 1971]. Therefore, only firms differing within ten percent will be matched.

Finally, a sample of debt restructured firms was obtained using DISCLOSURE, Inc. No known index exists which provides a complete listing of debt restructured firms. However, DISCLOSURE, Inc. provides a listing of all publicly traded firms. Firms can be selected according to the specific disclosures they made in their financial statements. DISCLOSURE, Inc. is a computerized service which scans all publicly traded companies for specific disclosures. Approximately nine thousand firms comprise the DISCLOSURE population; these firms are listed on the New York Stock Exchange, American Stock Exchange, and Over the Counter Exchange. In this particular study, firms were selected from a total of seventy-six firms which made disclosure of debt restructuring in the past year. This is the most complete sample available of TDR firms. The sample was used in the analysis after eliminating those firms which either had not restructured their debt or were true creditors, not debtors, of a TDR. From this particular sample, banks, bank holding companies, and real estate companies were omitted from analysis, since they were the creditors of TDR's. Again, each of these firms will be cross referenced with Moody's investor service manuals and SEC 10-K reports to determine the specific dates of debt restructuring.

The sample of TDR firms consists of both industrial and retail firms. This is consistent with the bankrupt and nonbankrupt samples. Several of the TDR firms have the same SIC industry code as some of the bankrupt and nonbankrupt firms.

The size of the TDR firms in relation to the bankrupt and nonbankrupt firms is also an important factor. The bankrupt and nonbankrupt firms are all large firms with assets over one million dollars, since they are all listed on the COMPUSTAT Industrial File. Therefore, the TDR firms also should be large firms so that they can be more comparable with the bankrupt and nonbankrupt firms.

The mean asset size of the bankrupt firms was $122.32 million and the mean asset size of the nonbankrupt firms was $109.88 million. Both samples had large variances since assets ranged from $1.2 million to well over one billion dollars. The TDR sample had a mean asset size of $285.98 million, which is substantially larger than the other samples. Most of the firms fell in the same range as the bankrupt and nonbankrupt samples, except for three. Two had assets under one million dollars while one had assets over two billion dollars. Therefore, the size of the TDR firms is fairly comparable to the bankrupt and nonbankrupt samples. When these firms were not included, the mean asset size of the TDR firms was $119.41 million. Therefore, the majority of firms in the TDR sample had a mean asset size between the bankrupt and nonbankrupt firms. The variances for all three samples were extremely large.

Of the seventy-six firms selected for analysis, it was found that

eight actually did not enter into a TDR nor intended to do so. Thus, these eight firms were eliminated from further analysis. This might indicate that the DISCLOSURE data base is not totally reliable; however, it is the only data base currently available, so it will still be used in this study. Another eight firms were composed of banks, bank holding companies and real estate companies. Their disclosure of TDR's was their customers debt restructurings where they were the creditors. Therefore, these firms were also dropped from the sample. As a result, a total of sixty TDR firms are left for analysis. For a breakdown of the TDR sample, see Table 2.

Selected variables were chosen from the bankrupt sample for one, two, and three years prior to bankruptcy. Classification accuracy beyond three years prior to bankruptcy may not be reliable [Altman, 1968]. The results of the various studies have been mixed. The same variables will be chosen for each matched nonbankrupt firm for the same years as their bankrupt counterparts. Finally, the selected variables will be chosen for the TDR sample for one, two, and three years prior to bankruptcy.

The three samples of firms will be mutually exclusive. In this manner, there will be no interaction of data between firms. The bankrupt sample is comprised of thirty-five firms filing bankruptcy within the last ten years and listed on the COMPUSTAT Industrial File. The matched nonbankrupt sample also contains thirty-five firms. Finally, the TDR sample contains sixty firms. For a list of firms in all three samples, see Appendix 1.

Table 2

COMPILATION OF TDR SAMPLE

Number of firms selected by DISCLOSURE, Inc.   76

Less:

Number of firms with no TDR	8	
Banks	6	
Bank Holding Companies	1	
Real Estate Companies	<u>1</u>	
		<u>16</u>

Debtor TDR firms Left for Analysis   60

The reason for using three samples is first to compute a bankruptcy prediction model. In order to determine if the TDR sample follows the failure process, these firms will be analyzed through the bankruptcy model. In this manner, it can be seen whether the TDR firms become closer to the bankrupt firms prior to TDR. If the bankruptcy continuum holds, this result should occur.

Statistical Design

Using multiple discriminant analysis (MDA), a prediction model was developed similar to the Rose and Giroux model [1980]. Discriminant analysis is a multivariate statistical technique which classifies observations into two or more qualitative categories by using two or more quantitative variables. The following assumptions are necessary in order for discriminant analysis to be valid [Eisenbeis and Avery, 1972]:

1) there are two or more discrete and known groups

2) each observation in each group has a set of at least two characteristics (variables) and,

3) the groups (populations) have multivariate normal distributions with common covariance matrices.

The purposes of discriminant analysis are as follows [Eisenbeis and Avery, 1972]:

1) to test for mean group differences and to describe the overlaps among groups and

2) to construct classification schemes based upon the set of m variables in order to assign previously unclassified observations to the appropriate groups.

The techniques used in discriminant analysis are multivariate extensions of univariate analysis of variance. In the application of

discriminant analysis, the goal is to assign the observations to the most similar groups while trying to minimize misclassifications.

Discriminant analysis determines the direction of group differences by finding a linear combination of the original predictor variables that shows large differences in group means. First, a criterion must be chosen to measure group-mean differences. The F-ratio is used for testing the significance of the overall difference among several group means on a single variable. The F-ratio is computed as follows:

$$F = \frac{SSb}{SSw} \Big/ \frac{N-K}{K-1}$$

Where K is the number of groups, N is the number of observations, SSb is the between sum-of squares and SSw is the within sum-of squares.

The linear discriminant function can then be written as follows:

$$Z = v1X1 + v2X2 + \ldots + vpXp$$

Here there are p predictor variables denoted as X. In this equation, Z is the computed discriminant score and the v's are the coefficients or weights for the predictor variables.

The optimal discriminant function occurs when SSb is maximized. At that point, the coefficients are determined. Matrices and vectors can be used when the number of coefficients needed becomes large.

In discriminant analysis, the equation using the number of variables which best discriminate between two or more groups is selected. The number of discriminant variables necessary to describe all between-group variation is the minimum of the between-group degrees of freedom and the number of variates.

There are three general types of hypothesis tests used in discriminant analysis. The first one tests for the usefulness of the entire discriminant function. The second test determines whether a hypothetical discriminant function is in agreement with the discriminant function computed from the data. Finally, the third test determines whether a given variable should be included or excluded from the function.

In this study, the variables used for analysis will be financial ratios. These have been used in prior studies and are considered to have good classification accuracy [Altman, 1968,1977].

The development of the discriminant function entails several statistical computations. Because this becomes very complex, computers are necessary in the construction of the discriminant function. Today, there are several software packages available which perform discriminant analysis.

In a two group case, which is used here, these multivariate tests can be reduced to a univariate test by creating a linear function of the observation vectors. The vector B is used to transform the variable y so that the ratio of the between-groups variance of y is at a maximum [Eisenbeis and Avery, 1972].

A good classification procedure minimizes the probability of misclassification. Eisenbeis and Avery [1972] give the following function to be minimized:

$$M=P(1|2) \ \Pi_2 \ 2+P(2|1) \ \Pi_1$$

where P(g|h) is the probability of assigning an observation into group

g, given that it arose fom group h. In this case, h is the a priori
probability of an observation being drawn from group h.

The function M above is then minimized as follows:

Assign to group 1 if

$$\frac{f1\ (x)}{f2\ (x)} \geq \frac{\Pi_2}{\Pi_1}$$

Assign to group 2 otherwise [Eisenbeis and Avery, 1972]. An
observation that is incorrectly assigned to group 1 is called a Type I
error. And an observation that is incorrectly assigned to group 2 is
called a Type II error.

The computer-package, MULDIS, will be used to develop a
bankruptcy prediction model. This package will select the most
significant financial ratios of firms for the ratios which best
predict bankruptcy. The model will be developed from these ratios.
The purpose of MDA is to take a given set of variables, in this case
financial ratios, and compute a linear and/or quadratic equation from
those variables which best discriminates between the two populations.
The equation developed may use from one up to all of the variables
tested. Each variable selected in the equation will have a
coefficient assigned to it. This equation has the least
classification errors.

Linear classification may be used when the population dispersions
are equal. However, when they are unequal, quadratic classification
procedures should be used [Eisenbeis and Avery, 1972]. Previous
studies have shown that linear classification actually performed
better than quadratic even when the population dispersions are unequal

[Rose and Giroux, 1980, McCall and Eisenbeis, 1970]. MULDIS determined that the variance-covariance matrices were not equal. Also, MULDiS computes both linear and quadratic DISCRIMINANT functions. It was found that the linear model had better classification accuracy and therefore was used in this study. As mentioned in the limitations section in Chapter I, linear MDA has been shown to be powerful even when the assumption of equal population dispersions is violated.

Each firm will then be assigned a Z score based on its own financial ratios and the discriminant function. A critical value (Zc) will also be determined where any Z values above Zc will be classified as nonbankrupt and any Z values below Zc will be classified as bankrupt.

The MULDIS package was chosen for this study. It is considered to be one of the best packages available and has been used for over ten years [Rose and Giroux, 1980]. Also, it has been successfully implemented in previous bankruptcy studies [See Rose and Giroux, 1980, or Hamer, 1982]. Therefore, it should be appropriate for this analysis.

The MULDIS package has many statistical options available. They are as follows [Eisenbeis and Avery, 1972]:

1. the calculation of discriminant functions and related significance tests;

2. the use of classification rules to assign new observations to the appropriate groups;

3. the calculation of discriminant functions and related tests and reduced space means and dispersions matrices;

4. the calculation of discriminant functions and related tests, and the use of classification rules to assign new observations to the appropriate groups (test space classification only);

5. the calculation of the discriminant functions and related tests, the calculation of reduced space means and dispersion matrices, and the use of classification rules to assign new observations to the appropriate groups.

In addition, a wide range of secondary options are available, including:

1. the Box test of group dispersion equality;

2. complete, forward, and backward stepwise selection procedures;

3. test space or reduced space linear or quadratic classification procedures;

4. the Lachenbruch holdout classification method;

5. printouts of the actual classification equations and rules;

6. graphs of the original and classified observations in linear reduced space;

7. various print, labeling, and punched output.

It should be noted here that the Lachenbruch holdout classification method was used. When this method is used, the graph option listed above cannot be used. However, of main importance in this study are the calculation of discriminant functions, forward and backward stepwise procedures, and the Lachenbruch holdout classification method. The MULDIS tape is able to achieve these statistical functions. The Lachenbruch holdout classification method is explained after the next section.

Selection of Variables

The two dependent variables of interest here are the failed and nonfailed groups. The independent variables consisted of selected

financial ratios. Those ratios chosen best classified the

bankrupt-nonbankrupt status of each firm through the MDA function.

The ratios analyzed were those most commonly employed in earlier

studies. The discriminant function will attempt to maximize

classification accuracy in the selection of these ratios.

The financial ratios chosen for analysis came from the Altman

studies [1968, 1977]. As of 1980, these models were recognized as

being the most accurate in the literature [Dambolena and Khoury,

1980]. See Appendix II for the specific ratios analyzed. The ratios

found to have significant discriminating power were used to develop

the discriminant function. Forward stepwise procedures will eliminate

those ratios which do not have significant predictive ability. These

ratios are also listed in Appendix II.

Over the past several years, hundreds of ratios have been tested

for their classification accuracy. Altman was a pioneer in

implementing MDA. His models have had good classification accuracy in

comparison to other models. Classification results are considered to

be good when there is ninety percent correct classification accuracy

for one year prior to bankruptcy [Rose and Giroux, 1980]. Therefore,

the financial statement items used in his study were used here to

compute twenty-five ratios from these data. The F-statistic

calculated for the twelve variable set selected from this set of

twenty-five was 14.64867, which is significant at a level of .0001.

The percent of classification accuracy of each variable is shown in

Appendix II. Next, stepwise forward selection MDA will be used to

select those variables with the greatest discriminating power. The MULDIS package will perform this function. The stepwise procedures perform discriminant functions on different sets of variables. One variable is eliminated at a time. The set of variables which best classifies the discrete samples is then selected. The best set of variables will be determined when Wilks' lambda is minimized. Wilks' lambda is an inverse measure of the discriminating power of the ratios [Eisenbeis and Avery, 1972].

Validation Testing

Validation testing of the discriminant function is necessary, since the specific model employed may only accurately classify firms for the sample of firms for which it was developed. In other words, a discriminant function is developed using a given sample of firms. When testing the classification accuracy for the function, the same sample of firms tested will produce the minimum classification errors, since this was the sample from which the sample was developed. In other words, the MDA model is sample specific. Another sample of firms with different ratios may not achieve the same classification success, which would indicate that the discriminant model is accurate only for the sample from which it was developed. This should not be the case, since the function should discriminate accurately for any given sample within the same underlying population. Therefore, the model should not be validated using the original sample [Joy and Tollefson, 1975].

A common technique for validation testing used in earlier studies

was to split the firms into a specified proportion. The model was
developed on one portion, while the other portion was used for
validation. Altman [1968] used this procedure in his original classic
study.

Scott [1979] criticized the use of a hold-out sample where scarce
or small samples exist, because this technique can lead to poor
estimates and incorrect conclusions about the error rates of the
discriminant functions.

Another validation technique developed by Lachenbruch [1975]
results in an almost unbiased estimate of error rates for all sample
observations. It is an iterative technique where each observation is
held out from the sample. The Lachenbruch method combines the
features of using the original sample and holdout sample for
validation testing. After each observation is held out from the
sample, it is then reclassified. The proportion of misclassified
observations is then used to determine the classification accuracy of
the discriminant function. The discriminant function is then
estimated using all remaining observations. Scott [1979] concludes
that this technique of validation is clearly superior.

Rose and Giroux [1980] implemented the Lachenbruch technique in
their study. They achieved results superior to previous bankruptcy
studies in that their model classified firms as failed and non-failed
up to seven years prior to bankruptcy. The best previous model
[Altman, 1977] accurately classified firms up to five years prior to
bankruptcy. Therefore, the Lachenbruch technique for validation

testing will be employed in this study, since the samples involved will be relatively small. The MULDIS computer package used in the study includes the Lachenbruch validation technique.

The model will be developed using the sample of paired bankrupt and nonbankrupt firms. Any firms classified as nonbankrupt which are actually bankrupt will be considered a Type I error. Any firms classified as bankrupt which are actually nonbankrupt will be considered a Type II error. The results can be condensed into a table, illustrated by Table 3. From these results, the percent classified correctly can be easily obtained. This is important to ensure good classification accuracy. A model without good classification accuracy cannot be expected to predict or classify well when applied to other firms.

After the model has been developed and tested for its accuracy, the TDR firms will be tested. The TDR firms were tested for one, two, and three years prior to restructuring to determine if these firms would classify as failed or non-failed. If the TDR firms are aiming toward bankruptcy, then prior to TDR, a larger percent of these firms may classify as bankrupt. This result might be expected if the failure process holds. However, it may be too soon for these firms to classify as bankrupt. If the failure process does not hold, or TDR may or may not be part of this process, then the TDR firms may not classify as bankrupt before debt restructuring. If not, they may continue to fall in the failed category.

A Z score distribution will be developed for the TDR sample as

Table 3

MDA Results Table

Actual	Predicted	Bankrupt	Nonbankrupt
Bankrupt		H	M_1
Nonbankrupt		M_2	H

H - correct classifications (HITS)

M_1 - Type I error

M_2 - Type II error

Adapted from Altman, 1968.

well as for the bankrupt and nonbankrupt samples. In this manner, it can be determined if the Z score distribution for the TDR sample approximates either the bankrupt or nonbankrupt samples, or if it has a unique distribution.

For those firms which restructured their debt more than one year ago, further analysis will be done to determine the effects of the TDR. In other words, if the TDR has helped the firms, they should change their status from failed to non-failed after the TDR.

Comparison of TDR Firms

The sample of TDR firms selected for analysis will be examined for the present and/or absence of several characteristics. An effort will be made to determine if any similarities, such as industry type, firm size, or specific financial ratios, exist within the population of TDR firms. Specific characteristics pertaining to TDR firms have never been clearly defined. Therefore, this information could be useful to firms as an "early-warning" system of financial difficulty.

The TDR firms will be analyzed for several years prior to TDR. Trends within each firm will be determined (e.g., increasing debt, poor operating results). Trends which differentiate these TDR firms from other firms will also be analyzed.

This analysis will be descriptive in nature. Since no analysis of TDR firms has been done prior to this analysis, this information may be useful to future research in this area.

Hypotheses to be Tested

In order to test for changes in Z scores from year to year, the

TDR firms will be tested for differences in each of their Z scores

from three years prior to TDR through three years after TDR.

Therefore, if Z scores are getting either better or worse from year to

year for a particular firm, this change can be pinpointed.

The following hypotheses will be tested:

(One-sided)

Ho: The difference in mean Z scores before TDR from one year to
the next for the TDR firms is less than or equal to zero

H1: The difference in mean Z scores before TDR from one year to
the next for the TDR firms is greater than zero

(Two-sided)

Ho: The difference in mean Z scores after TDR from one year to
the next for the TDR firms is zero

H1: The difference in mean Z scores after TDR from one year to
the next for the TDR firms is not zero

In the first hypothesis, if the differences in Z scores is

greater than zero, Z scores are getting worse as the firms approach

the TDR date. Likewise, in the second hypothesis, if the differences

in Z scores is not equal to zero, then the Z scores are either getting

better or worse as the firms approach TDR. If the differences in Z

scores are greater than zero, the firms are getting worse, since the Z

scores are declining. Conversely, if the differences in Z scores are

less than zero, the firms are becoming stronger, as the values of Z

scores were increasing.

The hypotheses will be tested using data for a one year period

for each comparison. First, the two samples will contain the Z scores for three and two years prior to TDR. Next, Z scores for two and one years prior to TDR will be compared followed by one year prior to TDR and year of TDR. Z scores will also be tested for the year of TDR and one year after TDR, one year after TDR and two years after TDR, and finally for two and three years after TDR.

Rejection of the first null hypothesis will lead to the conclusion that Z scores of the TDR firms are getting worse as time progresses, indicating weakening firms. Rejection of the second null hypothesis will lead to the conclusion that the Z scores are getting better as time progresses, indicating strengthening firms. So the financial condition of the TDR sample can be followed for several years.

In order to carry out this test, a nonparametric statistical technique will be used. It is unclear whether or not normality will be found in the Z score distributions. Therefore, nonparametric tests will be used, since they are robust enough to use even under normality. As previously mentioned in the limitations sections, MDA assumes multivariate normality. However, MDA has been found to be a powerful test, even when this requirement is violated. Eisenbeis and Avery cite several studies where this has occurred [Eisenbeis and Avery, 1972]. Also, to date there is no nonparametric counterpart for MDA. So, for the discriminant function, the only tool available was a parametric test.

The Wilcoxin matched-pairs, signed-ranks test was used to test

for these population differences. This test uses two related samples when the relative magnitudes of differences are known. The differences are then ranked, and these rankings are then used to test for differences between the related samples. In this study, two years of data will be used for the same sample. Therefore, any progression toward or away from bankruptcy can be noticed.

The assumptions of the Wilcoxin matched-pairs signed-ranks test are as follows [Daniel, 1978]:

A. The data for analysis consist of n values of the difference $D_i = Y_i - X_i$. Each pair pf measurements (X_i, Y_i) is taken on the same subject or on subjects that have been paired with respect to one or more variables. The sample of (X_i, Y_i) pairs is random.

B. The differences represent observations on a continuous random variable.

C. The distribution of the population of differences is symmetric.

D. The differences are independent.

E. The differences are measured on at least an interval scale.

This test, therefore, will indicate if in fact Z scores for the TDR sample worsen before the TDR date. Also, the test will indicate if Z scores for these firms get better after TDR and it will measure significant changes in Z scores before and after TDR (see Table 4). In a situation where a bi-modal distribution exists, the Wilcoxin matched-pairs, signed-ranks test will still test for differences in Z scores for each TDR firm.

If TDR has helped firms to avoid bankruptcy and become profitable concerns again, then, after restructuring, a significantly larger

number of firms should be classified as nonbankrupt. Some firms may become bankrupt after debt restructuring; therefore, these firms should be classified as bankrupt. Finally, since it may take a long period of time for a firm to turn itself around, it is possible for more and more of the TDR firms to become classified as nonbankrupt further into the future (e.g., year 3 after TDR may contain more nonbankrupt TDR firms than year 1 after TDR).

Next, the TDR sample was tested using frequencies. Again using two years of data at a time for analysis, a frequency table shown in Table 4 can be set up as follows:

Table 4

Frequency Table

2nd Year Z Scores

		Bankrupt	Nonbankrupt	Total
1st year	Bankrupt	A	B	A&B
Z scores	Nonbankrupt	C	D	C&D
Total		A&C	B&D	N

The null hypothesis to be tested here is as follows: the proportion of TDR firms being classified as bankrupt is the same under two years. We let p1 be the proportion of TDR firms classified as bankrupt in one year, and p2, the proportion of TDR firms classified as bankrupt in the next year. We may state the null and alternative hypotheses symbolically as follows:

Ho: $p1 = p2$ or $p1 - p2 = 0$

H1: $p1 = p2$ or $p1 - p2 = 0$ [Daniel, 1978].

In this manner, the frequency of firms changing their bankruptcy status from year to year can be analyzed. For years prior to TDR, if firms are weakening, there will be more firms falling into box C. After TDR, if firms are beginning to turn around, there should be more firms falling into box B.

To test for these frequencies, the McNemar test for related samples will be used. The assumptions of the McNemar test are as follows:

A. The data consist of N subjects (or items) or pairs of subjects, depending on whether subjects act as their own controls or whether experimental subjects are paired with a matched control. The data available for analysis may be displayed in a table similar to the table above.

B. The measurement scale is nominal, with four categories. Using the notation of the table above, the four categories are bankrupt-bankrupt, bankrupt-nonbankrupt, nonbankrupt-bankrupt, and nonbankrupt-nonbankrupt.

C. When subjects are their own controls, they are independent of each other. Of course, the two observations made on the same subject are related, since they are made on the same individual. When matched pairs are used the pairs are independent, but observations within a given pair are related.

Rejection of the null hypothesis would indicate that the firms are changing with respect to their bankruptcy status from year to year. This test was carried out using two years of data beginning three years prior to TDR through three years after TDR. Therefore, any changes occurring in a particular year will be noticed.

To test for differences before and after restructuring within the TDR firms, the Wilcoxin signed rank test was used. This procedure uses the magnitude of median differences in one sample when testing for differences between the observed values and the hypothesized

median. This test has an efficiency of 95.5% of the parametric t - test. The assumptions of this test are as follows: [Daniel, 1978]

A. The sample available for analysis is a random sample of size n from a population with unknown median M.

B. The variable of interest in continuous.

C. The sampled population is symmetric.

D. The scale of measurement is at least interval.

E. The observations are independent.

The hypothesis to be tested here is as follows:

$$Ho: \quad M = Mo \qquad H1: \quad M \neq Mo$$

In this test, M is the firms' mean Z scores and Mo is the hypothesized median of Z scores. This analysis should evaluate restructuring of the TDR firms without using the bankrupt firms for comparison. The results should prove similar to those obtained from the above hypotheses. If there has been a trend of increasing Z scores after TDR, the Wilcoxin signed-rank test will verify this trend. Otherwise, no significant trend in Z scores after TDR will be found.

The next hypothesis to be tested here will determine if a dichotomy exists for TDR firms after TDR. It is reasonable to assume that some TDR firms will turn around and become profitable while others will go into default, and ultimately bankruptcy. A chi-square test for homogeneity is appropriate here. The hypothesis to be tested is as follows:

Ho: The distribution of Z scores to TDR firms is homogeneous.

H1: The distribution of Z scores of TDR firms is not homogeneous.

Again, this test was carried out for TDR firms for one, two, and three years before and after TDR. This test determined if the TDR firms possess similar characteristics or if there are no similarities within the TDR sample.

The assumptions of the chi-square test for homogeneity are as follows: [Daniel, 1978]

A. The samples are independent.

B. The samples are random.

C. Each subject in the population may be classified into one of two mutually exclusive categories, according to whether it has or does not have the characteristic of interest.

If TDR has helped firms avoid bankruptcy, nonhomogeneity should be observed. If the trend of Z scores has increased after TDR, it is expected that one group of TDR firms will fall into the failed category and another group into the nonfailed category. This result indicates nonhomogeneity. If there has been no significant trend in Z scores, the majority of firms should fall into one group, the failed category. This result indicates a homogeneous sample. Again, the results here should be consistent with those of the prior tests.

Summary

In this study, several things will be analyzed. First, MDA will be used to develop a bankruptcy prediction model. Using this model, the TDR sample will be analyzed in order to determine the discriminant scores of the sample firms. The TDR firms will then be tested to determine if they follow any particular trends of the bankrupt or nonbankrupt firms. Also, an analysis will try to see if the TDR firms

change after restructuring.

The following is a summary of the nonparametric tests which will be employed:

Hypothesis	Test
1)	The Wilcoxin matched-pairs signed-ranks test (one-sided) will determine if the TDR firms classify as bankrupt as the TDR date approaches.
2)	The Wilcoxin matched-pairs signed-ranks test (two-sided) will determine whether the TDR firms classify as bankrupt or nonbankrupt after TDR.
3)	The McNemar test for related samples will determine if the proportion of TDR firms classifying as bankrupt or nonbankrupt changes over the time period used for analysis.
4)	The Wilcoxin signed-rank test will determine if the Hypothesis Test number of TDR firms with positive and negative Z scores changes significantly before and after TDR.
5)	The Chi square test for homogeneity will determine if the TDR sample is homogeneous to either the bankrupt or nonbankrupt samples before and after TDR.

CHAPTER IV

THE NATURE OF TDR FIRMS

Introduction

The purpose of this chapter is to examine the nature of TDR firms in detail. Since no prior studies have specifically examined TDR firms, a descriptive analysis of these firms should be useful. After analysis of the specific characteristics of these firms, some generalizations can be made about TDR firms.

A troubled debt restructuring (TDR) occurs when a firm becomes unable to pay its debt when this becomes due. As previously mentioned, with the creditor's approval a TDR may take a number of different forms. The debtor may transfer real estate or other assets to the creditor to satisfy his debt. An equity interest in the firm may be issued to the creditor in order to convert the outstanding debt into equity. Finally, a modification of the terms of the debt may consist of one, or any combination of the following: a reduction of the stated interest rate; extension of the maturity date; reduction of the face value of the debt, and a reduction of accrued interest.

TDR's have been linked to the failure process (Table 1, p. 24). The increase in business failures has more than tripled in the past four years [Annual Report, Federal Reserve Bank of New York, 1982]. Giroux and Wiggins state that more bankruptcies have occurred during 1980 and 1981 than during the post-depression period [1982]. Because of this significant increase, bankruptcy research is important and relevant to the accounting literature. If TDR's are linked to

business failures as part of the failure process, then TDR research also becomes important.

To date, no one has empirically studied TDR firms. The literature which exists consists of descriptions of FASB Statement No. 15. In this chapter, an overall analysis will be conducted to determine the types of TDR's that were used in the sample. Also, specific analysis of selected financial statement items and ratios will compare the TDR firms with the bankrupt and nonbankrupt samples. Next, two of the TDR firms will be analyzed before and after their TDR. The reasons for the selection of these firms are presented in a later section of this chapter. At this point, however, it is important to understand that these firms, while characterizing the TDR sample, took different directions after TDR. First, prior to TDR, characteristics of the firms will be analyzed to compare the financial situations of the two companies. They will again be compared after the TDR to see what direction they will take. One firm may become profitable, while simultaneously, the other firm may file for bankruptcy under Chapter XI of the National Bankruptcy Act.

An interesting aspect of TDR's is the many different forms they may take. For example, one firm may issue common stock in exchange for debt while another may reduce its principal, while still another firm may issue common stock and reduce its principal simultaneously. There are many combinations of terms available to the troubled firm. In the next section, the TDR sample will be given a closer look to see exactly the types of restructuring these firms have undergone.

Types of Troubled Debt Restructurings

The TDR sample contains sixty firms. Of these sixty firms, three of them indicated intentions of debt restructuring in 1982 but had not yet entered into a TDR. Thirty-one (54.39%) of the remaining fifty-seven TDR firms restructured their debt with just a single type of restructuring or modification, while the remaining twenty-six firms (45.61%) used more than one combination of terms. Six firms in this latter category did not specify their terms of restructuring. Therefore, fifty-one firms will be reviewed to determine the specific terms of debt restructuring they underwent.

There were six basic types of TDR's encountered in the sample. They were: a reduction in principal, issuance of common stock for debt, issuance of preferred stock for debt, extension of maturity date, reduction in the interest rate, and reduction in accrued interest. See Appendix 3 for a breakdown of the types of restructuring each firm used.

Two banks were interviewed to determine what steps they take when implementing a TDR. The first bank interviewed said in almost all cases they prefer to defer the interest. In this manner, they will still get the full amount of principal and interest. If this fails, they then consider more lenient terms. However, at this point, they analyze each debtor firm individually so there is no step by step process.

The second bank gave several factors influencing a TDR. The most important factor is that the bank must be reasonably certain that the

firm can increase its cash flow or working capital as a result of the TDR. Given that this event takes place, the type of TDR is dependent upon the size of the loan, the type of business involved, the debtor's honesty and the debtor's past history with its creditors.

If the business has influence in the community, the bank is more flexible in granting a TDR. The bank would be more willing to grant a reduction in principal or accrued interest in this case. If the firm produces a product with no demand, the bank might allow the firm to extend its maturity date which is a much stricter form of TDR.

Communication between the bank and its customer is also an important factor. Big city banks and smaller community banks tend to differ. According to one banker, as long as there is a good line of communication, the community bank tends to be more flexible than the big city banks in granting TDR's. A community bank tends to feel more responsible to the needs of local business. So the type of bank involved is a major factor also. It appears, then, that different banks use different methods in granting TDR's. Also the debtor firm's relationship with the bank is important.

A few items are worth noting. First, twenty-five of the fifty-one firms (49.02%) implemented a reduction in principal either solely or with some other modification. Twenty-four firms (47.06%) issued either common or preferred stock in settlement of debt. Seventeen firms (33.33%) extended their maturity date. Finally, only five firms (9.8%) lowered their interest rate and six firms (11.77%) had their accrued interest reduced.

At this point it is worth looking for any relationships between the TDR firms' type of restructuring and their working capital positions. Working capital is analyzed in a later section of this chapter. But, for now, it is important to understand that working capital has been found to be a critical factor distinguishing the TDR firms from the bankrupt and nonbankrupt samples.

Before TDR, forty firms experienced decreasing working capital. Of these forty firms, twenty implemented a reduction in principal while eighteen issued either common or preferred stock. Only two of the firms with decreasing working capital prior to TDR entered into another type of restructuring. This is an indication that the financially worse-off firms with decreasing working capital had entered into the more lenient forms of TDR's.

After TDR, thirteen firms reported decreasing working capital. Of these firms, six of them had reduced their principal while five had issued either common or preferred stock. So, after TDR, most of the firms with decreasing working capital were the ones implementing the lenient TDR's.

Thirty firms had experienced negative working capital prior to TDR. Of these firms, fourteen had reduced their principal while thirteen had issued either common or preferred stock. Only three had implemented another type of TDR.

After TDR, there remained thirteen firms with negative working capital. Of these firms six had reduced their principal and three had issued either common or preferred stock.

There is evidence here to conclude that most of the firms which had reduced their principal or issued stock had decreasing and/or negative working capital. These firms, in general, were more financially worse off than the other TDR firms studied. After TDR,the majority of firms experiencing decreasing and/or negative working capital were still these financially weak firms, although less in number. Therefore, the firms with the worst funds flow problems entered into the more lenient terms of TDR's.

In summary, the most common types of debt restructurings occurring were either reductions in principal or issuance of common or preferred stock. Some of the firms implemented a TDR consisting of more than one modification. For that reason, the total number of firms listed above exceeds sixty. It is unclear whether the type of TDR is related to the firms' financial positions. This relationship is addressed in a later section of this chapter.

When a firm encounters financial difficulty, a reduction in principal may be advantageous for the debtor firm. In this manner, a substantial amount of debt can be forgiven, making funds available for other purposes. However, the creditor must first agree to excuse some of the principal owed. In situations where a reduction in principal was not part of the TDR, perhaps the creditors would not allow it. The creditor wants to maximize its cash inflows. So, if the creditor believed that the principal could in fact be completely paid off, it may not agree to a reduction in principal.

Even though a reduction in principal may eliminate some of the

firm's debt, the firm itself must become profitable if it intends to continue as a going-concern. In a poorly managed company, a reduction in principal may only serve to prolong failure. So, the TDR itself is one step a troubled firm takes when trying to turn itself around.

The issuance of common and preferred stock is a common event to the sample firms. By issuing shares of stock to its creditors, the TDR firm can relinquish its debt. At the same time, the creditors may receive this stock in full value of the outstanding debt. However, whether or not the stock stays at this value is unknown. If the debtor firm is facing bankruptcy, the possibility is good that the stock's price may drop substantially. If the creditor agrees to this type of restructuring, he assumes the risk while holding the stock, but if the TDR firm turns around and the stock price remains the same or increases, the creditor ultimately will do well. The creditor can sell the stock at an amount equal to or greater than the amount of restructured debt.

An extension of the maturity date, a reduction in the interest rate, and a reduction in accrued interest are used to a much lesser extent by the sample firms. These types of restructurings may probably not have as much impact on a troubled firm's financial position. In these cases, the dollar amounts involved will probably be much less. These terms can substantially reduce the firm's cash outflows and expenses; therefore, the firm may have a stronger cash flow and working capital as a result of TDR. Also, income would increase since interest expense would be decreasing. Therefore, they

are probably implemented if the creditor will not agree to a reduction in principal or issuance of stock. So, in many cases, these types of restructurings may be used as alternative choices for the debtor firms.

However, these modifications of terms may be what the debtor firm wants. For example, a firm may take out a long-term loan when the interest rate is eighteen percent. Subsequently, if the interest rate falls to eight percent and the firm becomes unable to make the loan payments, a reduction in the interest rate may help.

Why does a firm choose a particular type of modification of terms in a TDR? A number of factors could be involved here. First, the TDR firm's management must decide upon which type of TDR it wishes to undertake. Since management may not agree, some negotiation may be involved within the firm. But secondly, and more important, the creditor firm must agree to the specific terms of the TDR. This process will involve negotiation between the debtor and creditor firms. So, the type of restructuring implemented may in fact be the result of the bargaining involved.

A topic of future research could be to use this same sample of TDR firms and ask each one how the terms of the TDR came about. Possibly, creditors of the more troubled firms were more willing to give up some of the principal in an effort to avoid a total loss. A study could compare levels of financial distress of TDR firms with types of TDR's.

Another topic left for future research would be to determine if certain types of restructurings help a given firm recover more than

others. In some instances, a reduction in principal should be the
most advantageous for the debtor. However, if the above paragraph
proves to be true, then only the worst financially stricken firms
would use a reduction in principal. These firms would have a higher
probability of facing bankruptcy than a firm in a financially stronger
situation which may be using an extension of the maturity date.

Characteristics of TDR Firms

In this section, descriptive information pertaining to the TDR
firms is presented. More specifically, financial variables used are
analyzed for the TDR firms in order to compare and contrast these
firms with the bankrupt and nonbankrupt samples.

For years prior to TDR, three financial statement items will be
analyzed. They are earnings before interest and taxes (EBIT),
retained earnings (RE), and total capital (TC). These items were
chosen because they tend to differ the most between bankrupt and
nonbankrupt firms. Income is an important factor in the failure
process. Also, looking at a firm's retained earnings and total
capital balances can determine if these firms have been ailing over
time. So, by studying these items, it can be seen whether the TDR
firms resemble bankrupt or nonbankrupt firms.

Also analyzed in this chapter are four financial ratios. They
are earnings before interest and taxes/interest expense (EBIT/INT),
working capital/total assets (WC/TA), current portion of long-term
debt/total assets (CLTD/TA), and long-term debt/total liabilities
(LTD/TL). These ratios are associated with the general areas of

predictive ability in bankruptcy studies. They deal with liquidity, profitability, coverage, and other earnings relative to leverage measures, capitalization and earnings variability. Therefore these ratios may also be key factors in studying TDR firms.

It should be noted at this point that the Z scores computed for the TDR firms resulted in a bimodal distribution which will be addressed further in Chapter V. For now, it is necessary to understand that roughly half of the TDR sample were classified as bankrupt prior to TDR. These firms had negative Z scores. The other half of the sample classified as bankrupt with positive Z scores. So, when looking at financial statement items and ratios, the TDR sample was divided into two groups to determine if there are any differences between the two groups. If dichotomies exist between the two groups, it may be useful to treat them as two distinct groups. However, as can be seen from the results presented, there appear to be no differences between the two groups. Therefore, the entire sample of TDR firms can be analyzed as one group.

The first item observed was EBIT. Intuitively, a healthy firm earns income annually while a troubled firm incurs losses. Since the TDR firms are having problems paying their debt, it might be expected that some of these firms are incurring losses. Below is a summary of the results for the sixty TDR firms for one, two, and three years prior to TDR.

	Positive EBIT	Sporadic EBIT	Negative EBIT	Total
Classified as Nonbankrupt	4	9	13	26
Classified as Bankrupt	9	16	9	34
Total	13	25	22	60

Overall, one might expect positive EBIT to be associated with positive Z scores and negative EBIT to be associated with negative Z scores; however, this was not the case. Of the thirteen firms having positive EBIT, 69.23% of them had negative Z scores. And of the twenty-two firms with negative EBIT, 59.09% of them had positive Z scores.

This result indicates several things. First, analysis of TDR firms in general becomes difficult because, even though these firms are considered troubled, several of them did not report a negative EBIT for three years prior to TDR. This could mean that some of these firms are profitable firms which may just be experiencing a cash flow problem at the TDR date.

Secondly, forty-seven out of the sixty TDR firms reported sporadic or negative EBIT for three years prior to TDR. This, then, is strong evidence that these firms are in financial trouble. However, only thirty-three firms had negative Z scores prior to TDR. Why did the model not classify at least forty-seven firms as bankrupt? Possibly, some of these firms with sporadic EBIT were not really troubled firms. Or, perhaps the MDA model computed is not totally reliable or is sample specific. It is for this reason that emphasis should be placed on both the descriptive data of these firms

and the statistical testing of Z scores.

Because of these differences, further analysis of both the descriptive data and the statistical testing is warranted. Perhaps more descriptive analysis or different statistical tests may explain the differences found. However, a comparison of the MDA results and descriptive results presented later supports general reliability of the MDA model.

Another explanation could be that the MDA model produces more conservative results than what the raw data appear to say. It may be too early in the failure process for the model to detect.

Finally, the failure process may include TDR's but perhaps all TDR's are not part of the failure process. In other words, a firm which is in the failure process may implement a TDR. However, any given firm which implements a TDR may not be part of this failure process.

Examining the twenty-six firms with positive Z scores, four (15.39%) had positive EBIT prior to TDR. This fact in itself is an indication that these firms are not doing well, despite their respective Z scores. Thirteen (50%) of them incurred losses in each year for three years prior to TDR. Finally, nine (35.61%) of these experienced losses in at least one year for three years prior to TDR.

Of the firms with negative Z scores, nine (26.47%) had positive EBIT and nine (26.47%) had negative EBIT for each of the three years prior to TDR. Sixteen (47.06%) firms incurred losses in at least one of the three years prior to TDR. From these results, there does not

appear to be any substantial differences between the firms with positive Z scores and those with negative Z scores.

In total, then, forty-seven (78.33%) of these firms incurred losses in at least one year. This is fairly strong evidence that these are troubled firms starting through the failure process. Only thirteen (21.67%) firms reported positive EBIT. That fact alone, though, does not mean that these are healthy firms.

Since thirteen firms reported positive EBIT for three years prior to TDR, further analysis was conducted to determine which types of TDR's were implemented. The results are interesting and are summarized below:

Type of TDR	Number of Firms
Reduction in Principal	1
Reduction in Principal Interest	1
Extension of Maturity Date	3
Issuance of Preferred Stock	3
Issuance of Common Stock	5
Total	13

Most importantly, notice that the least common type of TDR was a reduction in principal and a reduction in principal plus accured interest. But when observing the entire sixty firms (Appendix III), reduction in principal was the most common type of TDR. It appears that the creditors realized that eleven of these thirteen firms were capable of repaying their debt so they did not consider a reduction in principal. This was not true of the more troubled firms.

The other three types of TDR's implemented here puts the creditor at less risk. Unless the stock price drops rapidly, the creditors will assume the full value of the outstanding debt. The creditors must have believed that these firms would continue to operate.

There is an explanation here for why these firms needed a TDR. It appears that these firms could be experiencing cash flow problems. Eight of these firms experienced negative working capital prior to TDR. This observation supports the idea of a funds flow problem. This could be company specific or common to their entire industries. This factor appears to be the probable reason for these firms' TDR's which will be discussed in more detail later.

When looking at specific ratios for the bankrupt, nonbankrupt and TDR samples, an assumption can be made that the nonbankrupt firms have the strongest ratios and the bankrupt firms have the weakest. The TDR firms' ratios might be assumed to be between the bankrupt and nonbankrupt firms. This was the case with all of the ratios analyzed except for that of working capital/total assets (WC/TA).

This ratio was lowest for the TDR sample. In fact, WC/TA was negative for the TDR firms and was positive for both the bankrupt and nonbankrupt firms. This is an indication that the TDR firms have a serious funds flow problem which results in these firms not being able to pay their debt. The bankrupt firms may have a higher WC/TA ratio since after filing for bankruptcy. The bankruptcy court in many cases forgives large amounts of debt in order to help these firms.

The next item for analysis is RE. A firm which was once healthy

and reports a deficit in retained earnings is likely to be
experiencing losses over a period of years. However, a new firm
reporting a deficit may have incurred a loss in only one year since it
would not have had the opportunity to accumulate retained earnings
over a period of years. Nevertheless, a deficit in retained earnings
is a clear indication of a financially troubled firm. Below is a
summary of the results of the TDR firms' retained earnings.

	Positive RE	Negative RE	Total
Classified as Nonbankrupt	6	20	26
Classified as Bankrupt	10	24	34
Total	16	44	60

Again, it should be noted that there does not appear to be any
difference in proportions between the firms possessing positive Z
scores and those possessing negative Z scores. Therefore, only the
totals will be discussed.

Sixteen (26.67%) of the firms reported positive retained earnings
prior to TDR; however, this does not mean that these firms are
healthy. The only conclusion here is that these firms have had
sufficient income to offset any accumulated losses incurred and
dividends paid over their lives.

Forty-four (73.33%) reported deficits in retained earnings prior
to TDR. A deficit in retained earnings means that over the life of
the firm, the losses incurred have been greater than any income
earned. This again is a clear indication that these are troubled
firms. Some are experiencing losses year after year following through

the failure process. It should be noted here that, for three years prior to TDR, some of these firms shifted from positive retained earnings to negative retained earnings. However, no firm shifted in the opposite direction.

After TDR, three firms did shift from negative retained earnings to positive retained earnings, indicating the firms had become profitable again. Since there were just a few firms involved here, no conclusions can be drawn.

Next, TC (total capital) will be analyzed in the same manner as RE. When TC becomes negative, the firm is definitely in trouble, since its liabilities exceed its assets. Below is a summary of the results of the TDR firms' total capital.

	Positive TC	Negative TC	Total
Classified as Nonbankrupt	20	6	26
Classified as Bankrupt	18	16	34
Total	38	22	60

In this case, there is a difference between the positive and negative Z scores so each will be analyzed separately. For the firms with positive Z scores, twenty (76.92%) reported positive TC while six (23.08%) reported negative TC. So most of these firms, even though they might be in financial distress, still have greater assets than liabilities.

For the firms with negative Z scores, eighteen (52.94%) reported positive TC while sixteen (47.06%) of them reported negative TC. It is evident that, in general, the firms with positive Z scores are

somewhat healthier than the firms with negative Z scores. So, even though many of the firms with positive Z scores appear to be in financial trouble, the MDA model did not pick it up. This is a weakness to the bankruptcy prediction model which will be discussed in Chapter V.

Next, four financial ratios were analyzed for the TDR, bankrupt, and nonbankrupt samples in order to determine if any similarities or dissimilarities exist. Since most firms in the TDR sample were experiencing financial difficulties prior to TDR (as evidenced above), the TDR sample will not be split in two for analysis here.

Four financial ratios will be analyzed. These ratios were chosen for analysis because of their predictive power in this and other bankruptcy models. The ratios studied here are earnings before interest and taxes/interest expense (EBIT/INT), working capital/total assets (WC/TA), current portion of long-term debt/total assets (CLTD/TA), and long-term debt/total liabilities (LTD/TL). The earnings, debt, and working capital of a firm can be distinguishing factors between healthy and troubled firms.

The failure process begins with operating results below expectations. Later the firm in the failure process experiences deteriorating operating results year after year. Therefore, earnings is an important variable to be analyzed here.

Also appearing in the beginning of the failure process are nonpayment of dividends and net loss and negative cash flow trends. Again, there is support for an earnings variable to be analyzed.

Also, analysis of a funds flow variable is warranted. In this study working capital was selected as a funds flow variable. Altman [1977] found working capital to be a better predictor than cash.

Later in the failure process are lowered bond ratings, debt accomodation, and loan default. These events support the analysis of both current and long-term debt. These items are analyzed separately since different results may occur.

These ratios were chosen for analysis because of the various financial data composing them. In the first ratio, income and interest expense is compared. Typically, a troubled firm would be earning lower profits, and thus net income. This could also cause a cash flow problem. Also interest expense might be higher for those firms in default. Therefore, EBIT/INT should be smaller.

The second ratio analyzes working capital. Since working capital represents funds in a business, it might be expected that this ratio gets smaller as a firm's financial position worsens.

The third ratio is a measure of the firm's current portion of long-term debt to total assets. This ratio is important, since the current portion of long-term debt could change significantly as the result of a TDR. For example, if the TDR results in the long-term debt becoming currently due, this ratio may increase sharply. In a few cases, the TDR firms' long-term debt became currently due as a result of their TDR's.

The last ratio is a measure of the firm's long-term debt to total liabilities. This ratio may also be distinguishing between samples,

since long-term debt can be substantially reduced as the result of a TDR. These last two ratios are important here, since the purpose of a TDR is to modify that debt in some way.

Below is a summary of the means of each of these ratios for each of the three samples studied. The period of analysis was one year prior to TDR for the TDR firms and one year prior to bankruptcy for the bankrupt and matched nonbankrupt firms.

Ratio	Bankrupt Sample	TDR Sample	Nonbankrupt Sample
EBIT/INT	-.7673	.7478	7.5927
WC/TA	.2377	-.3061	.3531
CLTD/TA	.1775	.1299	.0627
LTD/TL	.5006	.4369	.6216

The results of the first ratio, EBIT/INT, is what might be expected. The TDR sample fell between the bankrupt and nonbankrupt samples, coming out higher than the bankrupt firms and worse than the nonbankrupt firms. It should be noted here, though, that the TDR firms' EBIT/INT was much closer to the bankrupt firms ratio, indicating that the TDR firms may have financial difficulty.

Since EBIT was previously analyzed, special attention should be focused on interest expense at this point. It might be expected that a firm entering into a TDR would have a considerably higher interest expense than an otherwise healthy firm. When a firm goes into default, interest still accrues on the debt. So, average interest/total debt expense was computed for the bankrupt-

nonbankrupt, and TDR samples. The following results were obtained:

Sample	Average Interest Expense/Total Debt
Nonbankrupt	.0555
TDR	.1527
Bankrupt	.1824

This ratio was computed for one year prior to bankruptcy for the bankrupt and for the TDR sample. The results are interesting. The TDR sample had average interest expense/total debt higher than the nonbankrupt sample. But, the TDR firms' interest expense/total debt was lower than the bankrupt sample. This ratio, when computed for the TDR sample, was very close to the bankrupt sample as opposed to the nonbankrupt sample. This is a clear indication that the TDR firms were experiencing an interest expense problem prior to TDR. Since these firms are experiencing deteriorating results and this interest expense problem prior to TDR, there is evidence that these firms have entered the failure state.

The next ratio, WC/TA, is not as expected. The nonbankrupt sample had a higher WC/TA than the other samples. The bankrupt firms had the second highest WC/TA ratio, while the TDR firms had the lowest WC/TA and on average had negative working capital.

As was mentioned previously, since the TDR firms cannot pay their debt, it is obvious that they should be experiencing a severe funds flow problem. But the bankrupt firms may have previously entered into TDR's giving them temporary funds flow relief. Also the bankruptcy court in many cases relinquishes the bankrupt firms from their

obligation to repay their debt. In this manner the bankrupt firms are able to start over and try to become going-concerns again.

In order to analyze working capital further, two approaches were taken. First, working capital before and after TDR was examined to determine whether working capital was increasing or decreasing during these periods. Also, the firms with positive Z scores were segregated from those with negative Z scores to determine if any differences exist between the two groups. The following results were obtained:

		WC Before TDR	WC After TDR	Total
Decreasing	Z-	21	9	30
WC	Z+	19	4	23
Sub Total		40	13	53
Increasing	Z-	11	12	23
WC	Z+	7	12	19
Sub Total		18	24	42
No Data Available		2	23	25
Total		60	60	120

As might be expected, most firms had decreasing WC before TDR. Of the firms examined, 68.97% had decreasing WC. Therefore, there is evidence of a cash flow or funds problem prior to TDR. There appears to be no difference between the firms with positive Z scores and those with negative Z scores.

After TDR, 64.86% of the firms available for analysis experienced increasing working capital. Although many firms were lost after TDR because of lack of data, there is a definite change in working capital trend after TDR. It appears that working capital may be a key factor in the development of TDR research.

Since the WC/TA ratio was negative on the average, the second
approach determines the number of firms with positive and negative
working capital before and after TDR. Again, the firms with positive
Z scores are reported separately than those with negative Z scores to
determine if any differences exist. The following results were
obtained:

		WC Before TDR		WC After TDR		Total	
Negative	Z-	12		8		20	
WC	Z+	18		5		23	
Sub Total			30		13		43
Positive	Z-	20		13		33	
WC	Z+	8		11		19	
Sub Total			28		24		52
No Data Available		2		23		25	
Total		60		60		120	

These results again prove interesting. First, prior to TDR,
51.72% of the TDR sample had negative WC. After TDR, 35.14% of the
firms analyzed had negative WC. Although no firm conclusions can be
drawn because of the loss of firms, it appears that there is a drastic
reduction of firms having negative WC after TDR. This result could
possibly mean that the TDR's did help these firms. Again, there does
not appear to be any substantial difference between the firms with
positive Z scores and the firms with negative Z scores.

Looking at the firms with positive WC, 48.28% had positive WC
before TDR while 64.86% had positive WC after TDR; so, there appears
to be an increase in positive WC here also.

One other item is worth noting. For firms with positive Z scores, eight had positive WC before TDR and eleven had positive WC after TDR. Since twenty-one firms were lost after TDR, the increase in the number of firms having positive WC is seventeen percent higher. One explanation could be that these firms were initially healthy so there is a higher probability that these firms will achieve positive WC faster than other firms. These firms had positive Z scores computed from the MDA model. The model classified them as nonbankrupt. Since they appear to be, in fact, healthy, the MDA model is somewhat supported.

The third ratio, CLTD/TA, measures the proportion of long-term debt currently due. As might be expected again, the bankrupt firms had the highest CLTD/TA, followed by the TDR firms, and finally the nonbankrupt firms. This can be explained by the fact that as a firm becomes troubled and cannot pay off its debt, the portion currently due becomes larger over time.

Finally, the last ratio, LTD/TL is a measure of the portion of a firm's total debt that is long-term. It can be expected that the nonbankrupt firms had the highest value here since their creditors are not as concerned with their ability to settle this debt. When a firm gets into financial difficulties, fewer creditors will be willing to lend to it on a long-term basis. This may occur from the banks' own financial analysis or lowered bond ratings. However it is uncertain why the TDR firms had a smaller value than the bankrupt firms.

An explanation for this result could be that, as a TDR firm goes

into default, more and more of its long-term debt becomes currently due which would significantly reduce the LTD/TL ratio. This occurred with several of the firms in the TDR sample. The bankrupt ratio is possibly higher because when the bankruptcy court eliminates the firms' long-term debt, total debt also decreases which may not change the LTD/TL ratio significantly. Again, as mentioned earlier, this effect would tend to increase funds flow. Finally, the nonbankrupt firms are likely to have higher credit ratings which would enable them to use much more leverage.

In this analysis, the firms' 10-K reports will be used to examine key financial statement items indicating financial strengths or weaknesses. The notes to the financial statements will be perused to get an overall view of the company.

Two firms will be used in this analysis. They are the John F. Lawhon Furniture Company and Lexicon Corporation. The first company entered into a TDR in 1981 and subsequently filed for Chapter XI Bankruptcy later that year. The second company entered into its TDR in 1979, but still continues to operate as a going-concern.

These two firms are part of the sixty firms comprising the TDR sample. This sample was obtained from DISCLOSURE, Inc. All publicly-traded firms disclosing a TDR are included in the sample. Unfortunately, the reliability of the sample is not without queston. Theoretically, the idea behind DISCLOSURE, Inc. is unique. However, it requires human manpower to scan every publicly-traded financial statement to segregate each disclosure. As was mentioned in the

limitations section, a few firms initially appeared in the sample which never entered into or disclosed a TDR. Likewise, it is probable that several TDR firms never appeared in the sample, especially since disclosure of TDR's may appear in various places in a firm's financial statements.

John F. Lawhon Furniture Company

At this point, after having analyzed the TDR firms in general, specific analysis will be done on two of the TDR firms. One firm, the John F. Lawhon Furniture Company, entered into a TDR and later filed for bankruptcy. The other firm, the Lexicon Corporation, entered into a TDR and still continues as a going-concern.

These firms were chosen for further analysis for several reasons. First, they are representative of several of the firms in the TDR sample, but in different ways. For example, one firm later filed for bankruptcy as several other firms in the sample did, while the other did not. Each firm entered into a different form of TDR, but each of these terms was common to several of the firms in the sample. One firm is an established firm, while the other one was a young unestablished firm. The TDR sample contained several young, unestablished companies as well as established ones. The John F. Lawhon Furniture Company experienced negative Z scores right up to bankruptcy while the Lexicon Corporation experienced declining positive Z scores prior to TDR. Since the distribution of firms was bimodal, each of these firms fell into a different group; therefore, each is representative of several of the firms in their respective

groups.

The John F. Lawhon Furniture Company (JFLF) is a retail furniture and bedding outlet. The company sells nationally advertised brands of furniture at discount prices. Composed of ten facilities within seven states, the company caters to customers in the low and middle income brackets.

Since merchandise is sold at discount prices, the customers either assume the responsibility of picking up the furniture themselves or pay additional delivery charge fees. This delivery revenue is insignificant for the company. Another form of insignificant revenue is the company's subsidiary, which sells damaged and repossessed inventory. Therefore, the major revenues earned from the JFLF company is that of new furniture sales.

In order to offer discount prices, the company purchases inventory in large quantities, usually in railroad or truckload lots. Because of this purchase strategy, customers are able to receive around ninety percent of their purchased merchandise immediately. However, the company must maintain high levels of merchandise inventory, which ties up cash normally available for other purposes.

The retail furniture industry is highly competitive. Competitors include other retail furniture outlets along with department and discount stores. The JFLF company recognized that some of its competitors have greater resources, either financial or other, which puts the JFLF company at a disadvantage. Other factors affecting operations are high interest rates, credit restrictions, inflation,

and a decline in economic conditions.

Results of Operations

In 1976, the company suffered a net loss but had sales of over twenty million dollars. In 1977, revenues rose by six million dollars and the company earned a profit. The increase in profits continued into 1978, where net income almost doubled from 1977. In these three years cost of goods sold and selling and administrative expenses increased with revenues. However, interest expense declined four percent in 1977 and two percent in 1978.

In 1979, revenues increased by fifty-six percent. This substantial increase was due to several new store openings. Cost of goods sold, which remained around sixty percent of sales for 1976, 1977, and 1978, was reduced only slightly in 1979 to fifty-nine percent. Selling expenses as a percentage of sales increased by three percent in 1979 to thirty-eight percent. Again, the new store openings were primarily responsible for this increase.

Interestingly, the company's interest expense, which was on a downward trend, jumped by thirty percent in 1979. This substantial increase was caused by both an increase in interest rates and an increase in outstanding debt.

As a result of these factors, the company reported a net loss in 1979. The costs of new store openings in that year had a major impact on these results.

In 1980, there were no new store openings. Revenues increased only slightly while, at the same time, the nation experienced a

decline in the general economy. Cost of goods sold as a percentage of sales dropped by two percent, but selling and administrative costs as a percentage of sales increased by one percent. Again in 1980, interest expense increased by eighty-two percent from 1979. This severe increase was again due to an increase in interest rates and an increase in outstanding debt. Despite this unfavorable increase, the company reported positive net income in 1980.

As the TDR date approaches, a few things are noticeable. First, revenues, cost of goods sold, and selling and administrative expenses tend to be changing only slightly. As revenues increase, so do the expenses, but they remain fairly constant as a percentage of those revenues. This is similar to those activities of a healthy firm. Secondly, interest expense in the past two years has increased dramatically, more than doubling each year. This may indicate a debt problem for the company. Finally, net income and loss reported each year seems to sway back and forth with no trend. Although there is no downward trend here, it certainly is not the sign of a healthy company.

At the end of fiscal 1981 the company entered into a TDR where it extended the 1981 maturities of its long-term debt over the next five year period. No mention was made about how this TDR was negotiated with the creditors, so it is impossible to determine how long the TDR negotiation took and how different the TDR terms were from what the company had initially wanted.

Earlier in fiscal 1981, the company suffered from the same problem it had before a decline in the economy and record high

interest rates. A serious cash-flow problem caused action to be taken in implementing the TDR. Also, the company began to close some of its unprofitable stores in that year.

The company reported its highest net loss ever in fiscal 1981, over six million dollars. Revenues and costs decreased as a result of the store closings. However, interest expense remained constant.

In the beginning of fiscal 1982, the JFLF company filed for bankruptcy under Chapter XI of the National Bankruptcy Act. At this point the firm went under reorganization. Therefore, the TDR became irrelevant.

During fiscal 1982, the company continued closing unprofitable stores. As a result, revenues decreased in 1982, as did expenses. Interest expense dropped by sixty percent as a result of the reorganization. Finally, the firm reported income before extraordinary items and an extraordinary gain from debt restructuring under bankruptcy reorganization. It appears at this point that the company may again become a going-concern and avoid liquidation.

A few other items should be examined for this company during this period. From 1979 to 1982, total assets decreased as a result of poor operations and store closings. Current liabilities remained fairly constant until 1982, when they were substantially reduced. Long-term debt again was reduced. The retained earnings deficit was substantially reduced as a result of the bankruptcy proceedings. Finally, in each year prior to 1982, the company showed a decrease in working capital. But, as a result of the reorganization, the company

experienced an increase in working capital for fiscal 1982 of almost six million dollars.

Summary

At this point, a natural question arises: Why was the TDR not effective for JFLF Company? There may be several factors contributing to the answer, a few of which seem readily apparent.

The period of time between the TDR and bankruptcy was less than one year, so it may have been too late for the company to restructure its debt at that point. If, back in 1976 the company had undertaken a TDR when it first experienced a loss, it may have been successful. Why then, was it not? Perhaps management did not feel it was necessary. Perhaps the creditors would not agree. In general, though, an earlier TDR date may have been evident and perhaps earlier implementation could have avoided bankruptcy.

Another question which arises follows: Could implementation of a more lenient TDR have avoided bankruptcy? Although it is impossible to determine at this point, the company appears to be turning around into a profitable concern again after bankruptcy. Could a TDR have accomplished the same result? The JFLF company's TDR was for an extension of its maturity date only. Suppose, for example, that the TDR called for a substantial reduction in principal. Would that type of TDR have avoided bankruptcy for the firm? Although the answer to that question is unknown, it appears that a reduction in principal may have been more helpful than an extension of maturity date.

Why, then, did the company not implement a reduction in

management did not feel the company was in as bad a position as it was. They may have felt a reduction in principal was not necessary.These are all unanswered but interesting questions in which future research studies may try to find the answers.

In conclusion, the unsuccessful TDR implemented by the JFLF company may have been avoided by a timing factor or a type of TDR factor. Or, the TDR could have been an inevitable failure. It is unfortunate that time cannot be reversed. The only way to determine the answer here is to go back and change the timing and type of TDR. But since the restructuring from the bankruptcy reorganization appears to be successful, perhaps a different type of TDR implemented earlier could have also been successful.

The Lexicon Corporation

The Lexicon Corporation is a manufacturer of an electronic hand-held language translator. The company was incorporated in 1976 and remained in the development stages until November, 1978. At that time, the company began sales of its product. In October, 1979, the company entered into a TDR which essentially was a reduction in principal.

In August 1979, the company contracted with a private manufacturer and granted the manufacturer the exclusive worldwide license to manufacture, assemble, and market the company's products. The manufacturer agreed to attempt to sell all of the company's

inventories.

In 1981, the company again entered into a TDR. This TDR also called for a reduction in principal. It should be noted that the company still had not achieved profitability as of December 1981.

In 1982, the company was producing two major products - the LEX-21 computer terminal and the LEX-31 personal communications computer. During the first six months of 1982, sales of these products increased significantly. Also in 1982, Bytec Management Corporation purchased a large portion of Lexicon's stock, making more capital available. The company planned to finance any additional expenditures through the issuance of equity securities.

It is interesting to note here that, until 1982, a significant portion of the company's financing was accomplished through the use of long-term debt. It was not until 1982 that the undercapitalized firm began to issue additional stock to obtain needed capital. Lexicon may have been restricted by its outstanding creditors.

Results of Operations

For the first six months of fiscal 1982, product sales of Lexicon increased fifty-three percent over the first six months of fiscal 1981. Although the company is still having financial problems, its substantial increase in revenues indicates that the company has good growth potential. This factor surely must have been recognized by the firms creditors when granting the TDR's.

From the start of operations in 1976, total assets of the company have increased in each year except 1980. However, in 1981, total

assets reached a new peak. They were three-hundred twenty-seven percent over 1980 and seventy-three percent over 1979. For the first time in the history of its operations, the retained earnings deficit did not increase significantly. This was due to the $7000 net loss reported in 1981, the lowest loss in history.

Long-term debt reached its highest point in 1979 and began to substantially decrease thereafter. Likewise, interest expense followed the same pattern. In fact, long-term debt decreased by fifty-four percent in 1981 and interest expense by eighty-three percent.

Selling expenses increased significantly in 1982 due to advertising costs for the LEX-21 and LEX-31. Also, the marketing group increased its staff. These costs are aimed at increasing sales for 1982 and future years.

General and administrative expenses increased by thirty-five percent in 1982. This increase was due to settlement of a lawsuit, higher costs of stock tradings, higher allowance for uncollectible accounts, and increases in professional fees.

Overall, Lexicon Corporation is making progress through its increased sales. The expenses related to these sales have also increased; but, the company has specifically traced and indicated the reasons for the increased expenses, which seem to be reasonable. It appears that the company is keeping a very close watch over its operations. Creditors would find this to be a very positive factor when considering whether or not to grant a TDR.

Finally, the company predicts a promising year in fiscal 1983. It forecasts increased sales of the LEX-21 and LEX-31 for 1983. Also, there may be an opportunity for the company to become involved with government research and development which would lead to a significant increase from government sales.

Summary

Lexicon Corporation is a fairly new company not without the financial problems encountered by almost all new companies. In 1979, its creditors granted the company a reduction in principal. The question arises then: Did the TDR help the firm?

To answer this question, earnings before interest and taxes (EBIT) need to be examined. EBIT for 1977 was -$108,000 and in 1978 was -$286,000. By 1979, the company reached its highest net loss ever which amounted to -$2,014,000. After the TDR in 1979, EBIT went to -$265,000 in 1980, much better than 1979. However, the firm was still operating at a loss. So then, perhaps the TDR in 1979 helped the company to turn in the right direction by reducing its annual losses.

Unfortunately, other factors may have contributed to this reversal. At that point, sales increased, which would contribute to the reduction in losses. This is not unusual for a new company.

Evidently, though, the 1979 TDR was not sufficient, since the company again entered into a TDR in 1981, when the creditors granted the company another reduction in principal. Has this TDR helped Lexicon Corporation?

By 1981, Lexicon was marketing the LEX-21 and began to increase

its sales significantly. EBIT for 1981 was only -$7000, a substantial decrease from prior years. Fiscal 1982 operations were promising, although a loss was still reported in the quarterly statements. There are so many unknown factors here that it is impossible to answer the questions. However, the fact that the company has remained in operation is an indication that the TDR has helped.

By reducing the principal of its long-term debt, the company has been able to meet the obligations of its creditors. If there were no TDR, there would have been a great probability of Lexicon Corporation going into default and Chapter XI bankruptcy. However, only time will tell.

From the creditors point of view, why did they agree to a second TDR when the first one apparently was not successful? The creditors must have believed that the company has good potential for becoming successful. Therefore, they were willing to bend a lot more than with a firm they believe could not become profitable.

Finally, why did the creditors allow a reduction in principal both times? If the creditors were confident of future success, certainly an extension of maturity date would be more beneficial to them. Once again, the answer to this question is unknown. However, they must have felt that the principal amount of debt was too much of a financial burden for the company. Therefore, they agreed both times to the more liberal type of TDR, a reduction in principal.

In conclusion, future research can try to find the answers to these questions. A questionnaire-type study could be conducted which

would ask each of the TDR firms these unanswered questions.

Hopefully, future research will find some of the answers.

Comparison

The two firms analyzed in this chapter, the John F. Lawhon

Furniture Company and the Lexicon Corporation, are examples of two

totally different firms. However, they have one thing in common -

they both have restructured their debt.

The JFLF Company was a profitable operation at one time which

later entered into Chapter XI bankruptcy. The Lexicon Corporation is

a new company still trying to get off the ground. Each of the firms

used a different type of TDR. One used an extension of maturity date

while the other used a reduction in principal. Finally, the TDR

appears to be unsuccessful for the JFLF Company while Lexicon's might

prove to be successful.

The possible explanations underlying the success and failure of

these TDR's are so numerous that it is impossible to pinpoint the

exact reasons. The firms themselves are very different; their

creditors are different and the type of TDR's they used are

different. Future research can address itself to these problems.

Summary

In this chapter several aspects of TDR firms were analyzed.

Several important items are summarized here. Thirty-one out of sixty

TDR firms used only one type of restructuring while the others used

more than one type. Twenty-five firms entered into a reduction

principal, twenty-four firms issued either common or preferred stock,

seventeen firms extended their maturity date, five firms lowered their interest rate and six firms reduced their accrued interest. The financially worse off firms (with decreasing and negative working capital) tended to use the more lenient forms of TDR's such as a reduction in principal and issuance of stock. There were thirteen firms which appeared to be healthy firms. These firms tended to use the strictest forms of TDR's such as extension of maturity date.

EBIT, RE and TC were analyzed before TDR. It was found that most firms were experiencing losses in at least one year prior to TDR. This result supports the failure process. Also, several firms had negative RE and TC which indicates recurring losses from year to year. Again, this gives further support for the failure process.

Four financial ratios were analyzed. As might be expected, the nonbankrupt firms had the strongest ratios while the bankrupt firms had the lowest. The one exception was WC/TA where the TDR sample had the lowest. This result indicates a serious funds flow problem for the TDR firms. The bankrupt firms had a higher WC/TA, probably from either previous TDR's or bankruptcy reorganization.

There was a trend for TDR firms with decreasing working capital prior to TDR to shift toward increasing working capital after TDR. There was also a trend for these firms to shift from negative working capital prior to TDR to positive working capital after TDR.

Finally, two TDR firms were analyzed. The JFLF Company extended its maturity date and later filed for bankruptcy. The Lexicon Corporation reduced its principal and still continues to operate as a

going concern. These firms' operating results were analyzed

separately.

CHAPTER V

EMPIRICAL RESULTS OF THE MODEL

Sample Selection

The sample of bankrupt firms consisted of thirty-five firms which filed for Chapter X or XI of the National Bankruptcy Act between 1972 and 1981. In addition to this characteristic, the firms in this sample are also listed on the COMPUSTAT Industrial Research File in order to facilitate the data gathering process. Selected data were extracted for one, two, and three years prior to bankruptcy in order to develop the discriminant bankruptcy model. Data for three years prior to bankruptcy were available for all thirty-five firms. However, data were only available for thirty-two and twenty-seven firms for two years and one year prior to bankruptcy, respectively. The missing data illustrates a major weakness of the COMPUSTAT tapes.

The firms comprising the nonbankrupt sample were matched by industry and size of total assets and revenues to each of their bankrupt counterparts. In this manner, each matched pair were as similar as possible, with the exception of their bankruptcy status. Also, each firm in the nonbankrupt sample is listed on the COMPUSTAT Industrial File. Selected data were extracted for each of these thirty-five firms in order to develop the discriminant bankruptcy model.

The debt restructured sample consisted of sixty firms which disclosed some form of TDR in their 1981 financial statements. Variables were computed for each of these firms in order to evaluate

them with the discriminant model. The variables selected for analysis were the twelve discriminating variables derived from the MDA bankruptcy model which will be discussed later in this chapter. The variables were computed for one, two, and three years prior to restructuring. In addition, ratios were computed for the year of restructuring and for each year after restructuring. Therefore, the firms in the TDR sample can be evaluated both before and after their troubled debt restructuring.

Variable Selection

Selected financial ratios were chosen for discriminating variables. Using financial statement items considered to be significant by the Altman Zeta model (1977), twenty-five financial ratios were derived. These ratios appear in Appendix II. These twenty-five ratios were computed for each firm in the bankrupt and nonbankrupt samples for one, two, and three years prior to bankruptcy. The ratios were then analyzed by the multiple discriminant analysis package, MULDIS, to determine those ratios which have the most predictive power.

Multiple Discriminant Analysis

In this study, a bankruptcy prediction model was developed using MDA. The two qualitative discrete groups are the sample of bankrupt and the sample of nonbankrupt firms. The characteristics or variables are the twenty-five financial ratios selected for analysis.

It is not clear that the variables selected for the MDA model do not arise from multivariate normal populations and, accordingly, this

factor was cited in the limitations section in Chapter I. However, MDA has been found to be a robust test, even when the normality requirement is violated [Eisenbeis and Avery, 1972]. From the discriminant function computed, it was found that the variance-covariance matrices were not equal and that variables did not have a normal distribution. Linear MDA was found to classify with the best accuracy so will be used for this study. MDA has been found to have very good classification accuracy in similar studies [Altman, 1977, Rose and Giroux, 1980].

MDA selects the most significant financial ratios of the matched firms which best classify the firms in their respective groups. In this study, MULDIS selected the ratios which best classified the bankrupt and nonbankrupt firms into their bankrupt and nonbankrupt categories. Of the twenty-five variables used for selection, MULDIS selected twelve of them which best classified the two groups. Appendix II lists all twenty-five variables used and the best twelve selected for the discriminant model. For the twelve variables selected, their F-statistics and percent of discriminating power are also shown in Appendix II.

MULDIS selects the best set of discriminating variables where Wilkes Lambda is minimized. Wilkes Lambda was at a minimum at the best twelve variable set, equal to .1891203. Of the variables selected, six deal with liquidity and income items. The remaining six variables deal with either current or long-term debt. This result should make intuitive sense, since bankrupt firms are generally

distinguished due to net losses and liquidity problems.

Available for variable selection, MULDIS has several options available. They include complete, forward, and backward stepwise selection procedures. All three options were tested for completeness. Using each of the three options available, the same twelve variables were selected. However, slightly different coefficients and percent of discriminating power were computed for each variable. But, the equation developed under each option classified the same number of firms correctly, implying there are no significant differences between the three options using this data.

Multiple Discriminant Analysis Results

Four different MDA functions were computed. One function was computed for the samples one year prior to bankruptcy, another was computed for two years prior to bankruptcy, and a third one was computed for three years prior to bankruptcy. Finally, an MDA function was computed for all three years prior to bankruptcy combined together.

The best classification results of these four functions was for one year prior to bankruptcy. This result should make intuitive sense, since the closer to bankruptcy a firm becomes, the more discriminating its predictor variables should be, because the financial position of these firms was worsening. This result is consistent with previous studies [Altman, 1977, Rose and Giroux, 1980]. Therefore, the MDA function computed for one year prior to bankruptcy will be used to evaluate the TDR firms.

The ratios selected for the MDA model and their discriminating power are listed in Table 5. The first ratio, as mentioned earlier, is a measure of working capital or funds. Therefore, this should be an important ratio for a TDR firm, since the TDR firms are lacking funds to settle their debt.

The next three ratios and the seventh one are measures of income. Income before extraordinary items includes interest expense and income taxes expense. However, earnings before interest and taxes (EBIT) does not consider these expenses. One of these ratios measures EBIT as a percent of interest expense. Interest expense is also an important item, since a TDR deals directly with debt and interest.

The fifth and sixth ratios selected analyze the firms' current assets and current liabilities, respectively. These ratios, as a percent of total assets, measure the proportion of the firms' balance sheet that is current. Although similar to working capital, these ratios analyze current assets and current liabilities individually.

The eight and ninth ratios are measures of the firms' current portion of long-term debt, while the last three ratios measure the firms' long-term debt. As was mentioned previously, long-term debt is very significant as it relates to TDR's. This can be seen directly, as the discriminating power of these last three ratios is 60.98%. The current portion of long-term debt is also important, since this is the portion of the firms' debt that they cannot pay. The discriminating power of these two ratios is 11.49%.

The results of this discriminant function can be condensed into a

Table 5

Ratios Selected for the Discriminant Function

Ratio	Percent of Discriminating Power
1. Working Capital/Total Assets	10.07343%
2. Income Before Extraordinary Items/Total Assets	3.322073%
3. Earnings Before Interest and Taxes/Total Assets	.3233316%
4. Earnings Before Interest and Taxes/Interest Expense	4.523617%
5. Current Assets/Total Assets	7.076948%
6. Current Liabilities/Total Assets	.2482795%
7. Earnings Before Taxes/Total Assets	1.964262%
8. Current Long-term Debt/Total Assets	5.217768%
9. Current Long-term Debt/Current Assets	6.265601%
10. Long-term Debt/Total Capital	16.36950%
11. Long-term Debt/Common Equity	27.07425%
12. Long-term Debt/Total Liabilities	17.54093%
Total	99.99999%

* rounding error

table shown in Table 3 (p. 63). This table indicates the correctly and incorrectly classified firms. A bankrupt firm which classified as nonbankrupt is called a Type I error while a nonbankrupt firm which classified as bankrupt is called a Type II error. Table 6 shows the results of the discriminant function by number of firms and percent of total.

The linear function classified 92.593% of the bankrupt firms correctly and 96.296% of the nonbankrupt firms correctly. The quadratic function classified 96.296% of the bankrupt firms correctly but only 85.185% of the nonbankrupt firms correctly. Other studies have also shown that linear MDA performs better than quadratic MDA in bankruptcy studies [Rose and Giroux, 1980, Altman et al, 1977].

Table 6 shows the results of both functions one year prior to bankruptcy. Table 7 shows the results of the other three functions computed but not used here. In these years, the percent of classification accuracy varied from a high of 81.25% to a low of 45.714% while 81.25% is much better than chance, 45.714% would give a very poor classification accuracy.

The percent of correctly classified firms drops significantly for two years and three years prior to bankruptcy. Due to this fact, these functions were not used here. It might be argued that since a TDR occurs prior to bankruptcy, these models might be more reliable for analyzing the TDR firms. However, since this study investigates the relationship between TDR firms and bankrupt firms, the model just prior to bankruptcy is used, since it best characterizes the bankrupt firms.

Table 6

MDA Results - One year Prior to Bankruptcy
Linear Classification
(Lanchenbruch Hold Out Method)

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	25	2	27
Nonbankrupt	1	26	27
Column Total	26	28	54

Percent Table of Linear Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	92.593%	7.407%	100%
Nonbankrupt	3.704%	96.296%	100%
Column Average	48.148%	51.852%	100%

Quadratic Classification -One Year Prior to Bankruptcy

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	26	1	27
Nonbankrupt	4	23	27
Column Total	30	24	54

Percent Table of Quadratic Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	96.296%	3.704%	100%
Nonbankrupt	14.815%	85.185%	100%
Column Average	55.556%	44.444%	100%

Table 7

MDA Results - Several Years Prior to Bankruptcy
Three Years Prior to Bankruptcy
Linear Classification
(Lachenbruch Hold Out Method)

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	18	17	35
Nonbankrupt	11	24	35
Column Total	29	41	70

Percent Table of Linear Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	51.429%	48.571%	100%
Nonbankrupt	31.429%	68.571%	100%
Column Average	41.429%	58.571%	100%

Quadratic Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	27	8	35
Nonbankrupt	19	16	35
Column Total	46	24	70

Percent Table of Quadratic Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	77.143%	22.857%	100%
Nonbankrupt	54.286%	45.714%	100%
Column Average	65.714%	34.286%	100%

Table 7 (Cont.)

Two Years Prior to Bankruptcy
Linear Classification
(Lachenbruch Hold Out Method)

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	21	11	32
Nonbankrupt	8	24	32
Column Total	29	35	64

Percent Table of Linear Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	65.625%	34.375%	100%
Nonbankrupt	25 %	75 %	100%
Column Average	45.313%	54.688%	100%

Quadratic Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	26	6	32
Nonbankrupt	10	22	32
Column Total	36	28	64

Percent Table of Quadratic Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	81.25 %	18.75 %	100%
Nonbankrupt	31.25 %	68.75 %	100%
Column Average	56.25 %	43.75 %	100%

Table 7 (Cont.)
One, Two, and Three Years Prior to Bankrupt Combined
Linear Classification
(Lachenbruch Holdout Method)

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	67	20	87
Nonbankrupt	21	66	87
Column Total	88	86	174

Percent Table of Linear Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	77.011%	22.989%	100%
Nonbankrupt	24.138%	75.862%	100%
Column Average	50.575%	49.425%	100%

Quadratic Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	64	23	87
Nonbankrupt	18	69	87
Column Total	82	92	174

Percent Table of Quadratic Classification

Predicted

Actual	Bankrupt	Nonbankrupt	Total
Bankrupt	73.563%	26.437%	100%
Nonbankrupt	20.69 %	79.31 %	100%
Column Average	47.126%	52.874%	100%

The linear function better classified both groups, so it will be used to evaluate the TDR firms. The MDA function computes a Z score for each observation. This score is a result of multiplying the given observations ratios by the MDA functions coefficients and then summing. A critical Z score (Zc) is determined where Z scores falling above Zc are classified as non- bankrupt while Z scores falling below Zc are classified as bankrupt. The Zc score used in the MULDIS package is zero. Table 8 shows how each of the TDR firms classified before and after TDR based upon their Z scores in those years.

The TDR sample consists of large firms with total assets over $1 million. All of the bankrupt and nonbankrupt firms also had total assets over $1 million. The TDR firms are all industrial and retail firms which are similar in industry codes to the bankrupt and nonbankrupt samples. There are several different industries comprising each sample, so the model should not be industry specific. The location of each firm in all three samples is scattered throughout the United States. Therefore, there are similarities among all three samples.

The centroid for the nonbankrupt group is very close to zero. This might be an indication that either the nonbankrupt sample may not contain healthy firms or there could be a few nonbankrupt firms which are not strong, so the nonbankrupt centroid is close to the bankrupt centroid. Nevertheless, the function classified significantly better than chance for one year prior to bankruptcy.

Table 8

MDA Results of TDR Firms

Classification	Bankrupt	%	Nonbankrupt	%	Total	%
Three years prior to TDR	29	55.77	23	44.23	52	100
Two years prior to TDR	23	40.35	34	59.65	57	100
One year prior to TDR	30	50.00	30	50.00	60	100
Year of TDR	33	56.90	25	43.10	58	100
One year after TDR	25	58.14	18	41.86	43	100
Two years after TDR	9	36.00	16	64.00	25	100
Three years after TDR	4	44.44	5	55.56	9	100

The header row "Classification   Results of the TDR Firms" spans the table.

A major factor to be considered here is which MDA model is appropriate for evaluation of the TDR firms. It could be argued that since the TDR event occurs prior to the bankruptcy event, one of the discriminant functions prior to bankruptcy would be appropriate.

In this particular study, the MDA model for one year prior to bankruptcy had good classification results, but those models beyond one year prior to bankruptcy had very poor classification results. See Table 7 (p. 119) for a breakdown of results for each model. For example, for two years prior to bankruptcy, the linear function classified 65.625% of the bankrupt firms correctly and 75% of the nonbankrupt firms correctly. The quadratic function classified 81.25% and 68.75% of these firms correctly, respectively. The best classification result for three years prior to bankruptcy was in the quadratic function. This function classified 77.143% of the bankrupt firms correctly and only 45.714% of the nonbankrupt firms correctly. Using all three years prior to bankruptcy, correct classification results ranged from 73% to 79%.

In this study, then, the model for one year prior to bankruptcy will be used to evaluate the TDR firms. Another reason for using this discriminant function is because it best discriminates between the bankrupt and nonbankrupt firms just before bankruptcy and, since part of the study compares the bankrupt and TDR firms, this model would be the best to distinguish the two samples.

Z scores were computed for each of the TDR firms. Non-parametric statistical tests will be performed from these Z scores in order to

evaluate the TDR firms. This methodology has been used to measure the firms' systematic risk based on Z scores [Altman and Brenner, 1981]. As a firm's Z score changes from nonbankrupt to bankrupt, the systematic risk in its stock price might be expected to rise.

Altman and Brenner performed a study of the effect of stock prices due to newly reported financial data. Previous studies in this area (which are referred to as efficient market hypothesis studies) and have concluded that newly reported financial data is already incorporated into the stock price so that an investor cannot earn excessive profits from this new information.

Previous studies used the capital asset pricing model to measure a given stock's rate of return. In their study, Altman and Brenner incorporate the newly reported financial data into Altman's [1968] MDA bankruptcy prediction model to create new information. They computed Z scores for each firm and used firms which had shifted Z scores between the bankrupt and nonbankrupt categories. Finally, they computed the firms' systematic risk before and after the change in Z scores. So, the change in Z scores was used to determine if there were changes in the stock prices due to new information.

They had some evidence to conclude that the change in Z scores did not affect the stock price. In other words, this new information (the change in Z scores) is already incorporated into the stock price.

In this study, also, the Z scores of the TDR firms are used for analysis of the firms' financial positions. This use of Z scores is not common in the literature, but has been used successfully by Altman

and Brenner [1981].

The results of the nonparametric statistical tests are presented later in this chapter. The variables used for evaluation are those which best discriminated between bankrupt and nonbankrupt firms one year prior to bankruptcy. Since TDR is assumed to be a pre-bankruptcy event as part of the failure process, these variables are appropriate for evaluation of the TDR firms.

The linear discriminant function had good classification accuracy for one year prior to bankruptcy (Table 6, p. 118). It classified 92.593% of the bankrupt firms correctly, resulting in a 7.407% Type I error. Nonbankrupt firms were classified with 96.296% accuracy, resulting in a 3.704% Type II error. Therefore, this linear equation is the one used to evaluate the TDR firms.

Analysis of TDR Firms

Using the linear discriminant function derived from MULDIS, Z scores were computed for each of the sixty TDR firms. Where data was available, a Z score was computed for each firm for three, two, and one year prior to TDR, the year of TDR, and one, two, and three years after TDR. A Z score above zero places the firm into the nonbankrupt category while a Z score below zero places the firm into the bankrupt category. Table 8 (p. 123) shows the classification results of the TDR firms for each year.

For the firms classifying as nonbankrupt in each year, about two-thirds of these firms had Z scores greater than ten, which indicates these firms are profitable or similar to the nonbankrupt firms. The

highest Z scores are an indication of the healthiest firms. The Z score distribution is an ordinal ranking which merely classifies firms from lowest to highest Z scores. The lowest scores are the financially worse firms while the highest scores are the healthiest firms. Firms with Z scores close to Zc are considered to be in an overlap area, not very healthy and not very unhealthy. Therefore, very large Z scores result for strong firms. Only five of these firms had Z scores between zero and four. These few firms, although classifying as nonbankrupt, are close to the cutoff point. Therefore, these firms may, in fact, be troubled.

Of the firms classified as bankrupt in each year, about half of them had Z scores less than negative ten, which is an indication that these firms are in financially vulnerable positions. Conversely, from the above paragraph, very low Z scores are an indication of very troubled firms. Only a few firms had Z scores between negative four and zero, which would fall into the overlap area. Most of these firms had Z scores between negative four and negative ten. These Z scores result in a bimodal distribution, since the majority of firms classified as nonbankrupt fall at one end of the continuum while the majority of firms classified as bankrupt lie at the opposite end of the continuum.

Prior to TDR, about half of the firms were classified as bankrupt. This bimodal distribution indicates that all of the firms may not be following through the failure process, although those firms classifying as bankrupt appear to be following through the process.

Those firms classifying as nonbankrupt may not be in the failure process at all. Or, they may be deteriorating as part of the failure process but their financial positions may not be weak enough to classify them as bankrupt. After TDR, there appears to be no shift of firms from the bankrupt to nonbankrupt category; however, a more detailed analysis of how each individual firm changes from year to year will indicate if the TDR has had any effect on the firms' financial position. Statistical testing of the Z score results can achieve this need. Even though half of these firms had positive Z scores, a significant decline in Z scores for each year prior to TDR may be an indication that those firms are in fact following the failure process.

Although only about half of the firms classified as bankrupt prior to TDR, fifty-two of them (86.67%) experienced net losses in one or more years prior to TDR. Twenty-two of the sixty TDR firms reported deficit balances for total equity prior to restructuring. Of these twenty-two firms, sixteen had negative Z scores, while six had positive Z scores. These results indicate that, in general, these firms were having financial difficulties prior to TDR.

It is also interesting to note that forty-four firms in the TDR sample reported deficit balances in retained earnings prior to restructuring. These negative trends are an indication that these firms' financial positions were deteriorating before the TDR date. Most of them had deficits in retained earnings, while some reported deficits for total equity. Therefore, these firms in general seem to

be following through the failure process. The fact that about half of these firms had positive Z scores for three years prior to TDR might indicate that the bankruptcy prediction model is not reliable for a distant time period before TDR in the failure process. From the detailed analysis of these firms presented in Chapter IV, there appears to be some support for the MDA model computed.

In Chapter IV, it was found that funds flow was a critical factor distinguishing the TDR firms. The ratios selected in the MDA model which contain working capital items account for 28.88203% of its discriminating power. So in both cases, working capital was a significant distinguishing item.

Results of Statistical Testing

The results of Z scores of the TDR firms fell into a bimodal distribution. That distribution can be shown as follows:

Year of TDR

Bimodal
Distribution

$\bar{Z}-$	$\bar{Z}$	Zc	$\bar{Z}+$

Z scores   -11.95   -.40   o   16.64
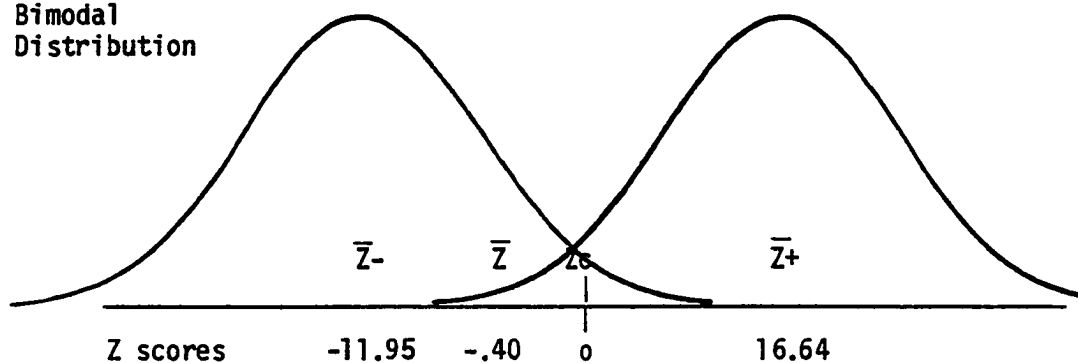
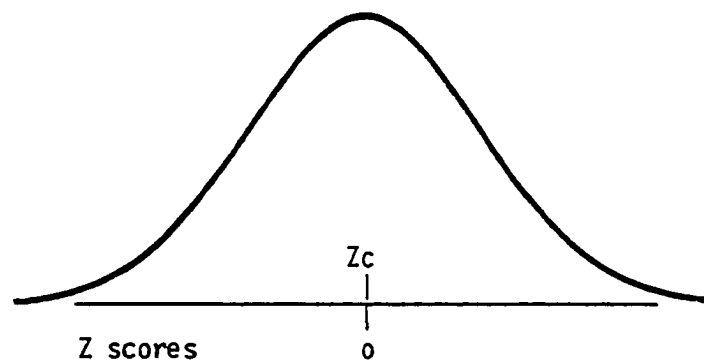Had the Z scores resulted in a normal distribution, parametric statistical

tests would have been appropriate. A normal distribution would have looked

like the following:

Normal
Distribution

Zc

Z scores   o

In the first figure above, the overlap area in the center

represents a range of Z scores for which it is uncertain whether the

firms should be classified as bankrupt or nonbankrupt. The Z score

distribution is a continuum, with zero being an arbitrary cutoff point. However, for firms with Z scores very close to zero, it becomes difficult to classify these firms except in an arbitrary manner. In other words, they are not healthy firms with a positive Z score over ten. And they are not very sick firms with a negative Z score less than negative ten. Although these firms could be dropped from the analysis, it will be interesting to see in which direction they might move.

The bankrupt sample had mean Z score of -7.99 and a standard deviation of .03337927, the nonbankrupt sample a mean Z score of 9.18 and a standard deviation of .0230832, and the TDR sample a mean Z score of -.3322 and a standard deviation of 19.961155.

Table 9 illustrates the results of Z scores for the TDR sample for three years prior to TDR and two years ater TDR. In this scale, $\overline{Z}-$ is the average for all firms classified as bankrupt each year while $\overline{Z}+$ is the average for all firms classified as nonbankrupt each year. Zc is the cutoff point where firms above Zc are considered nonbankrupt and firms below Zc are considered bankrupt. Finally, $\overline{Z}$ is the average Z score for all firms in the TDR sample for each year.

It is interesting to note that, prior to TDR, average Z scores $(\overline{Z})$ are slightly increasing. However, at the inception of TDR and one year after TDR, $\overline{Z}$ decreases. Strangely, two years after TDR $\overline{Z}$ increases to 8.64. No generalizations can be made here for two reasons. First, $\overline{Z}$ is an average so it can be influenced by a very high or very low Z score. Secondly, several firms were lost after

Table 9
Results of Z Score Distribution

Three Years Prior to TDR

$\bar{Z}-$ $\bar{Z}$ Z_c $\bar{Z}+$

-.91

-11.82   o   13.12

Two Years Prior to TDR

$\bar{Z}-$ Z_c $\bar{Z}$ $\bar{Z}+$

-8.09   o   -.91   10.84

One Year Prior to TDR

$\bar{Z}-$ Z_c $\bar{Z}$ $\bar{Z}+$

-10.08   o   3.60   18.86
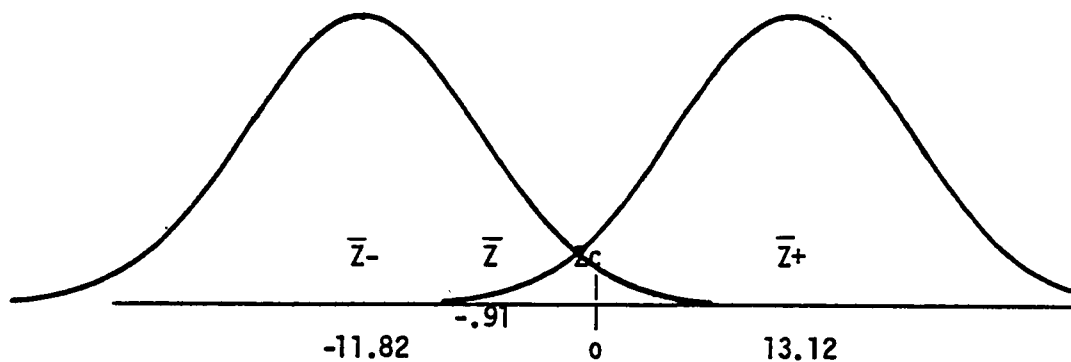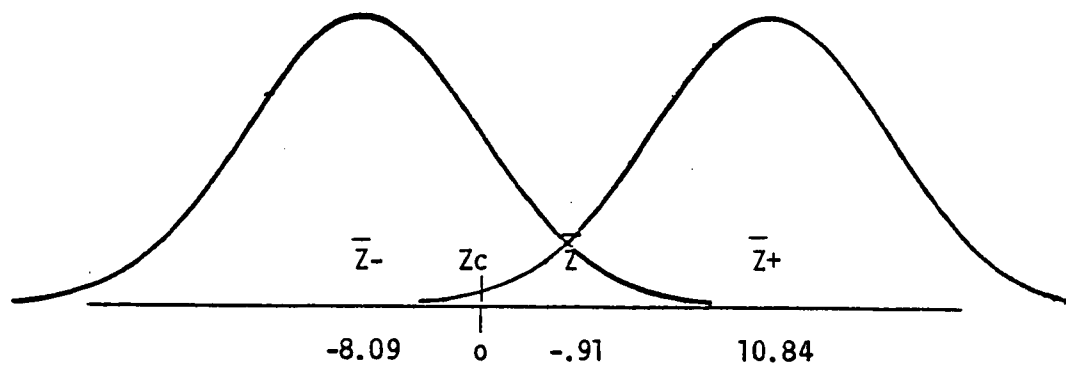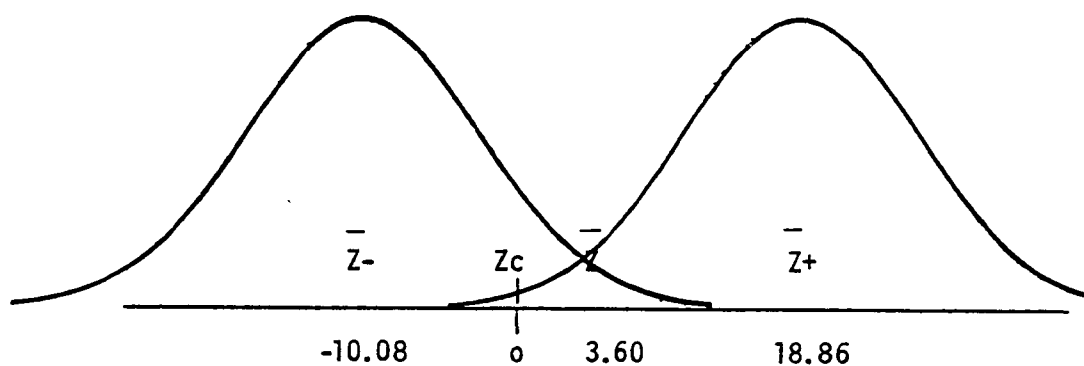
Table 9 (con't.)

One Year After TDR

Z-	Z	Zc	Z+
-11.51	-2.74	o	14.81

Two Years After TDR

Z-	Zc	Z	Z+
-12.15	o	8.64	23.89
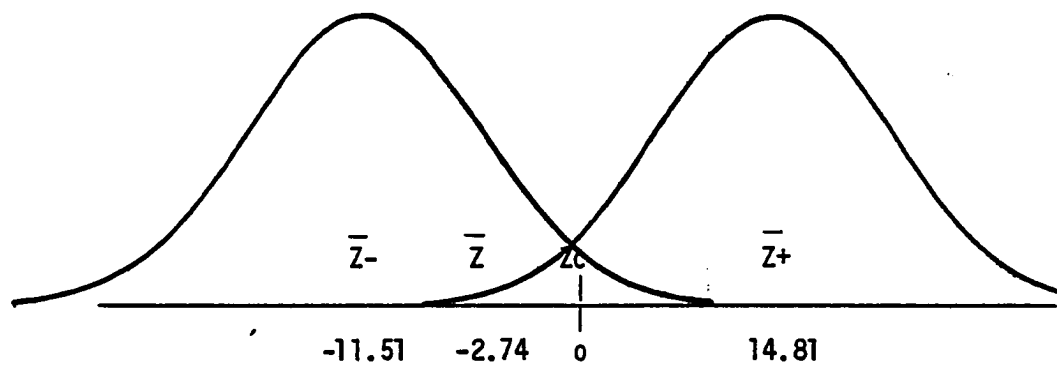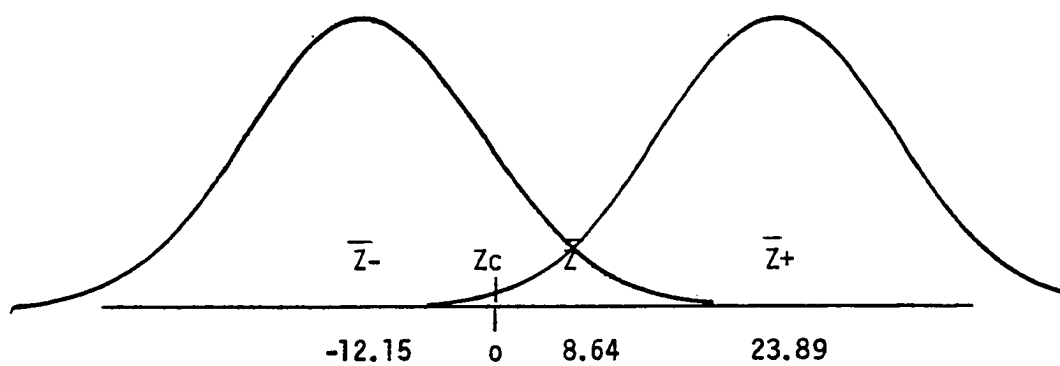
TDR, since no data was available.

A few items should be noted here. First, the mean Z score is far different than either the bankrupt or nonbankrupt samples. Next, the large standard deviation of the TDR sample is due to the bimodal distribution, some classifying as bankrupt and some as nonbankrupt. If this sample is divided into two categories, one with positive Z scores and one with negative Z scores, then the mean Z scores for each group would be more similar to the bankrupt and nonbankrupt samples, as noted above. Also, the standard deviations for each Z score group would be much smaller.

It becomes apparent that some of the firms in the TDR sample seem to be following through the failure process. However, it is uncertain whether or not the firms classifying as nonbankrupt are, in fact, following through the failure process. There are two possible explanations. First, these firms may not be headed toward failure before the TDR event. They may be normal, healthy firms which are just experiencing a cash flow problem at a particular point in time. There is evidence that thirteen of the TDR firms may be in that position. These firms were analyzed in Chapter IV. In this case, their creditors may have no objection to a TDR, since they would feel secure that the firm would continue as a going-concern. Secondly, the predition model may not be able to classify these firms accurately, since the TDR date may come long before failure. For several years prior to failure, bankruptcy prediction models lose accuracy. So, even though these firms may in fact be heading toward the failure

process at this point, the model might not be able identify these firms. It appears that both of these situations exist in the TDR sample. Most of these firms had declining Z scores prior to TDR; however, very few had constant or increasing scores, which indicates healthy firms.

Since the Z scores did not lie in a normal distribution, nonparametric statistical testing is appropriate. There is common criticism of using nonparametric statistical tests, because the Z scores were computed using multiple discriminant analysis, a parametric statistical technique. First, to date, there has been no nonparametric procedures developed which perform the functions of MDA. Second, as was mentioned in the limitations section of Chapter I, MDA has proven to be a powerful technique even when the assumption of normality is relaxed. It has also been used successfully in other bankruptcy studies [Altman, 1977, Rose and Giroux, 1980]. Third, nonparametric statistical techniques will be used for further testing of the Z score results because the distribution is not normal. The reason for choosing nonparametric tests over parametric tests is because their results are more conservative. The bimodal distribution was more severe in MDA than with the nonparametric tests.

The first hypothesis to be tested will try to determine if the changes in Z scores approaching the TDR date are moving in the bankrupt direction. The hypothesis to be tested is as follows:

Ho: The difference in mean Z scores before TDR from one year to the next for the TDR firms is less than or equal to zero.

H1: The difference in mean Z scores before TDR from one year to

the next for the TDR firms is greater than zero.

The Wilcoxin matched-pairs, signed-ranks test was used here to test two years of Z scores at a time. This hypothesis was tested three times. The first test was to compare Z scores for three and two years prior to TDR. The second test compared Z scores for two and one year prior to TDR. Finally, the third test compared Z scores for one year prior to TDR and the year of TDR. If the null hypothesis is false, then it can be concluded that the firms Z scores are decreasing from year to year approaching the TDR date.

Using the large sample approximation for these tests, the following results were obtained:

Time Periods	Test Statistic Z
Three and two years prior to TDR	2.09
Two and one years prior to TDR	-4.15*
One year prior and year of TDR	-3.99*

*significant at the .05 α level.

At two years and one year prior to TDR, it can be concluded that the mean Z scores are worsening for the firms at the 95% confidence level. However, for three years prior to TDR, no conclusions can be made. So, there is some indication that the firms' financial positions were getting worse as they approached their TDR's.

Since, on the average, Z scores are worsening two years and one year prior to TDR, something can be said about the TDR firms in

general. Since the variables are heavily based on income and debt, it could be assumed that either the TDR firms' income was worsening or their losses were getting larger. This, in fact, was the case for most firms prior to TDR. Long-term debt soared during this period while more and more firms experienced net losses in these years.

The next hypothesis to be tested is to determine in what direction the Z scores take after TDR. The following hypothesis was tested:

Ho: The difference in mean Z scores after TDR from one year to the next for the TDR firms is zero.

H1: The difference in mean Z scores after TDR from one year to the next for the TDR firms is not zero.

The same Wilcoxin matched-pairs signed-ranks test was used here, but in this case the two-sided hypothesis is appropriate, since it is not known in which direction the firms' Z scores will go. This hypothesis was also tested three times. For one year after TDR, the large sample approximation formula was used, while for two and three years after TDR, the T statistic for this test was computed, since the data available in these years diminished. The following results were obtained:

Time Period	Test	Statistic
	Z	T
Year of TDR and one year after TDR	-.56	
One and two years after TDR		57
Two and three years after TDR		3

As can be seen from the above table, none of these test statistics was found to be significant. The firms' individual ratios did not change to any great extent from year to year. Rejection of the null hypothesis would have indicated that mean Z scores were significantly changing for years after TDR. However, in each situation above, the null hypothesis cannot be rejected. Therefore, it cannot be concluded at the 95% confidence level that the firms' mean Z scores or financial positions changed significantly after TDR.

Although there were no significant results here, a few things can be noticed. In the first year after TDR, the Z score of -.56 indicates that on average the Z scores have continued to decrease, but not significantly. The confidence level here is only 57.54%. The T score for two years after TDR indicates that Z scores increased, but below the 89.6% confidence level. Finally, in the third year after TDR, the T score indicates rising Z scores above the 92.2% confidence level but below the 96.9% confidence level.

For two years prior to TDR, the firm's financial positions were weakening as their Z scores decreased. During the first year after TDR, Z scores still decreased, but not significantly. At this point, then, the firms appear to be stabilizing, that is, getting neither worse nor better. For two and three years after TDR, Z scores improved, but again not significantly. But, at least the firms were no worse off after TDR than before TDR.

Observing the firms' financial statement items after TDR, there was a general upward trend for income of 66.67%. Some firms still

experienced net losses in these years, but usually smaller net losses than they suffered prior to TDR.

Long-term debt was reduced for most firms after TDR as a result of the debt restructuring. However, in many cases, the current portion of long-term debt rose. In these cases, the restructuring terms called for reduced principal but a substantial amount currently due. So, even though the firms had reduced their principal, they had to settle a substantial amount of their long-term debt currently. This might explain why the Z scores did not increase significantly.

The third hypothesis tested will try to determine the same results as before, but in a slightly different manner. The McNemar test for related samples will be used. This test uses the results of the Z scores and will determine if a significant number of firms changed their bankrupt or nonbankrupt status for three years prior to and three years after TDR.

The following hypothesis was tested:

Ho: p1=p2 or p1-p2=0

H1: p1≠p2 or p1-p2≠0

where p1 is the proportion of TDR firms classified as bankrupt in one year and p2 is the proportion of TDR firms classified as bankrupt in the next year.

A two by two MATRIX can be formed as follows:

Time Period 2

		Bankrupt	Nonbankrupt	Total
Time	Bankrupt	A	B	A&B
Period 1	Nonbankrupt	C	D	C&D
	Total	A&C	B&D	N

By using a sequence of two time periods, the table can be set up as follows:

A. Firms which classified as bankrupt in periods one and two.

B. Firms which classified as bankrupt in period one and non-bankrupt in period two.

C. Firms which classified as nonbankrupt in periods one and two.

D. Firms which classified as nonbankrupt in period one and bankrupt in period two.

Instead of measuring for differences in mean Z scores, changes in the frequencies of classification will be measured. Each one year time period was tested between three years prior to TDR to three years after TDR. The following results were obtained:

Time Period	.	Test Statistic Z
three and two years prior to TDR		2.50*
two and one year prior to TDR		-1.15
one year prior and year of TDR		- .77
year of TDR and one year after TDR		0.00
one and two years after TDR		-
two and three years after TDR		-

*significant at the .05 α level

The first time period tested has a result which is not expected. A significant number of firms at the 95% confidence level changed their bankrupt-nonbankrupt status. This result is strange, because the shift was from bankrupt to nonbankrupt, not from nonbankrupt to bankrupt as might be expected. Or, for several years prior to TDR, most of the TDR firms experienced sporadic net losses. One year they would report profits while in the next they would report losses. The further back prior to TDR, the more inconsistent trends appeared. Although this indicates instability, it may also explain the shift in the opposite direction. Perhaps three years prior to TDR is too far off to analyze these firms with a bankruptcy model. In this case, the descriptive analysis in Chapter IV may be more reliable.

The descriptive data analyzed was EBIT, RE, TC, EBIT/INT, WC/TA, CLTD/TA, and LTD/TL. For most of these items the nonbankrupt firms had the strongest results while the bankrupt firms had the weakest results. However, the most important item was WC/TA since the TDR sample had negative WC/TA while the other two samples had positive WC/TA. This result indicates a severe funds flow problem for the TDR firms.

The results of the next two time periods is not unexpected. There is a shift toward bankruptcy status, but not significantly so. The Z score shifts were significant for these periods, but evidently the shifts in Z scores were not large enough to cause the firms' bankrupt-nonbankrupt status to change significantly.

The Z statistic of 0.00 for the first year after TDR indicates

that there were an equal amount of shifts to nonbankrupt status as there were away from it. So, overall, there is no significant change in the firms' financial positions in one direction or the other for one year after TDR.

Again, observing the raw data for this period, most firms income and working capital have increased, but not to a great extent. An explanation could be that not enough time has passed in order for the TDR firms to strengthen their financial positions. Analysis of these firms several years into the future will ultimately determine whether or not TDR has been successful.

In Chapter IV, specific attention was given to working capital (WC) and earnings before interest and taxes (EBIT). A general trend of decreasing WC before TDR and increasing WC after TDR was found. This indicates that the TDR firms' funds flow problem was worsening prior to TDR. But, after TDR the funds flow problem began to improve. Working capital appears to be the most critical factor in the study of TDR firms. EBIT for most firms was negative or sporadic before TDR, but it was higher than the bankrupt firms on average. This result is consistent with the failure process. The TDR firms' losses are not yet as severe as the bankrupt firms.

The last two time periods could not be tested. To implement the McNemar test, the total number of status shifts has to be at least ten. For two and three years after TDR, the number of shifts in classification was less than ten. Therefore, no conclusions can be made for these time periods.

The next hypothesis to be tested will try to determine whether a significant number of firms fall into either the bankrupt or nonbankrupt categories. This test will be carried out for each year from three years prior to TDR to three years after TDR. Rejection of the null hypothesis will lead to the conclusion that the Z scores fall into either the bankrupt or nonbankrupt categories. From the classification results obtained in Table 8 (p. 123), it appears that the null hypothesis will not be rejected because of the bimodal distribution.

The following hypothesis was tested:

Ho: M=Mo

H1: M≠Mo

In this hypothesis, M is the Z mean score computed for each firm, while Mo is the median of Z scores. Testing of this hypothesis will determine if most of the TDR firms classify as either bankrupt or nonbankrupt for each year under analysis. The results are as follows:

Time Period	Test Statistic T
three years prior to TDR	- .67
two years prior to TDR	-1.32
one year prior to TDR	0.00
year of TDR	- .91
one year after TDR	- .92
two years after TDR	-1.20
three years after TDR	- .50

As is expected, there were no significant results for any year under analysis. Therefore, it cannot be concluded that a significant number of firms classified as either bankrupt or nonbankrupt at any point in time. This result supports the bimodal distribution discussed earlier.

The final hypothesis to be tested will try to determine if the TDR population is homogeneous with respect to the bankrupt and/or nonbankrupt populations used to derive the discriminant model. The chi-square test for homogeneity can achieve this result. The hypothesis to be tested may be stated as follows:

Ho: The sampled populations of TDR firms are homogeneous

Hl: The sampled populations of TDR firms are not homogeneous

Rejection of the null hypothesis will lead to the conclusion that a dichotomy exists between the TDR and bankrupt sample or the TDR and nonbankrupt sample based on each of the samples' classification results. Again, each year will be tested from three years prior to TDR to three years after TDR.

A two by two contingency table can be formed shown in Table 10:

Table 10

Chi-Square Contingency Table

1.	Bankrupt	Nonbankrupt	Total
TDR Sample			
Non Bankrupt			
Total			

2.	Bankrupt	Nonbankrupt	Total

TDR Sample

Bankrupt
Sample

Total

For each year prior to TDR, the actual results will be used for the bankrupt and nonbankrupt firms shown in Table 7 (p. 119). For the year of TDR and subsequent years, the results used for the MDA model (one year prior to bankruptcy) will be used. These results are shown in Table 6 (p. 118). For the TDR sample, actual results will be for each year which are shown in Table 8 (p. 123).

The results of the Chi-Square test for homogeneity are as follows:

Time period	Nonbankrupt Sample Test Statistic x^2	Bankrupt Sample Test Statistic x^2
three years prior to TDR	4.9900*	.1587
two years prior to TDR	2.1276	5.2372*
one year prior to TDR	.0713	.3882
year of TDR	21.7204*	10.8308*
one year after TDR	21.0511*	9.6469*
two years after TDR	8.7169*	18.3685*
three years after TDR	9.3677*	9.9901*

*significant at the .05 α level

For three years prior to TDR, a dichotomy existed between the TDR and nonbankrupt samples, indicating that the TDR sample and nonbankrupt sample are not homogeneous. For two years prior to TDR, a

dichotomy existed between the TDR and bankrupt samples, while for one year prior to TDR, no dichotomies existed. There is no indication here, then, that the TDR sample is significantly different than either of the bankrupt or nonbankrupt samples for each year prior to TDR.

Four explanations can be offered here. One possible explanation for these conflicting results might be that these firms actually changed their financial positions in the given directions each year. Another explanation might be that, the greater the time period is away from the TDR date that is analyzed, the MDA function and thus the Z scores become less reliable. Third, there may exist more than two discrete groups in the MDA model. If this were the case, the Z scores computed would become less reliable, resulting in inconsistent findings. Finally, if prior to TDR, the firms were implementing accounting changes to mask their financial positions, then the computed Z scores would be based on these masked financial data which make some firms appear to be healthy firms when, in fact, they are not.

There is evidence to conclude that the TDR sample may, in fact, be distinct and separate from both the bankrupt and nonbankrupt samples. A discriminant function computed using three groups should result in Z scores clustering around three points instead of two. If the TDR sample had Z scores which clustered around its own point, then there would be support for this explanation. This could also explain the bimodal distribution of Z scores computed earlier for the TDR firms.

Again, focusing on the raw data prior to TDR, it was previously observed that reported income and losses were erratic over time.

Since the discriminant function was largely based on income factors, the erratic behavior of the firm could, in fact, cause this shift in homogeneity. Again, a possible conclusion here may be that three years prior to TDR is too distant from the bankrupt event to be evaluated properly from a bankruptcy prediction model. Finally, those results may be due to the fact that the TDR firms follow a bi-modal distribution. The positive and negative Z scores combined together may affect the results.

However, the results for the year of TDR and subsequent years are more meaningful. In each of these years, a dichotomous relationship existed between the TDR and bankrupt samples and also between the TDR and nonbankrupt samples, which is consistent with the bimodal distribution obtained.

The homogeneous relationships observed in years prior to TDR have resulted because of the bankrupt and nonbankrupt data used. The classification results for the TDR sample were based on the MDA function for one year prior to bankruptcy. Therefore, there is an indication that the TDR sample had similar classification results to the bankrupt and nonbankrupt samples. This is evident in the periods where the homogeneous relationships occurred.

After TDR, nine of the firms filed for bankruptcy under the National Bankruptcy Act. Also, several of them still continue to operate as of 1982. Only a few firms actually have gone out of existence, and only three have merged with other firms.

In a few cases the TDR has failed. In an attempt to stay alive,

some of these firms have filed for bankruptcy or merged with other companies. So even though the TDR itself failed, these firms appear to be following through the failure process. They are now taking the next available course of action available to them.

In several cases, though, the firms still continue to operate. This result provides evidence that in some cases, a TDR may be successful. If a firm can implement a successful TDR, it may be able to remove itself from the failure process. This appears to be true in some cases.

Summary

An MDA model was computed using MULDIS. The model computed was a twelve-variable linear function derived from the bankrupt and nonbankrupt samples. The TDR firms were then analyzed through this model from three years prior to TDR up through three years after TDR.

Next, several nonparametric statistical tests were performed to determine any similarities or dissimilarities between the TDR sample and the bankrupt and nonbankrupt samples. These tests were also designed to determine whether the TDR firms' financial positions were worsening or improving prior to TDR and after TDR.

In summary, these statistical tests have indicated that TDR firms become financially weaker approaching the TDR date, based on their respective Z scores. After the TDR date, there is no indication that the firms turn around and become healthy firms. However, there is no indication that these firms worsen further after TDR. At most then, they may stabilize for up to three years after TDR. As mentioned

earlier, analysis into future years will ultimately determine the success or failure of the TDR.

The descriptive analysis presented in Chapter IV provided stronger evidence that the TDR firms were becoming financially worse off prior to TDR based on earnings and working capital. After TDR, the firms did begin to improve.

CHAPTER VI

CONCLUSIONS

For several years, firms have entered into troubled debt restructurings with their creditors. These TDR's have been informal agreements between debtor and creditor firms. Because no financial reporting requirements were required prior to 1977, most firms did not disclose their TDR's in their financial statements. Therefore, data was virtually impossible to obtain in order to perform empirical research. Today, with five years of data available, empirical studies in this area have become possible.

In past studies, TDR's have been tied to the failure process. Before a firm faces bankruptcy and/or liquidation, it may experience operating results below expectations, nonpayment of dividends, net losses and negative cash flow trends, lowered bond ratings, and deteriorating results year after year. At this point in time, the firm may face loan default. A viable alternative may be a TDR, which may help the firm avoid bankruptcy. With the approval of the creditors, and, if successful, this TDR may help the firm to turn around and become profitable again.

Two very important questions that have never been addressed up to this point are as follows: Do firms that restructure their debt possess characteristics of bankrupt firms prior to restructuring? And do these firms, after restructuring, manage to turn themselves around and become profitable concerns again? These questions were studied in this analysis.

In the past, several bankruptcy prediction models have been developed. The most common predictor variables used have been financial ratios. In this study, another bankrupcy prediction model was developed using financial ratios as predictor variables. Variables were computed using the same financial statement items that Altman used [1977]. Multiple discriminant analysis was used to develop the model, since it is considered to be the technique which has had the best classification accuracy thus far [Hamer, 1982]. Next, in an attempt to answer the above questions, a sample of TDR firms was analyzed using the bankruptcy prediction model.

Summary of Results

Three samples of firms were obtained for analysis. First, a sample of bankrupt firms was constructed covering a ten-year period. These firms were all listed on the COMPUSTAT Industrial Research File, which makes data easy to obtain. Next, a sample of nonbankrupt firms was matched by industry type and size with the bankrupt sample. These firms were also all listed on the COMPUSTAT Industrial File as well. Finally, a sample of TDR firms was obtained by DISCLOSURE, Inc. These firms disclosed TDR's in their 1981 financial statements. DISCLOSURE selects all of the firms reporting a specific item, e.g. TDR, in their latest financial statements. The procedure does not go back to past financial statements; however, the firms must report a TDR in each year while it exists, so many of the TDR's reported in this study occurred prior to 1981.

First, a descriptive analysis was performed on the TDR firms. A

summary of the types of TDR's implemented was presented. A history of two of the TDR firms was presented, one which came out of its troubled position and one which subsequently filed for bankruptcy. Possible reasons for these firms' positions after the TDR were suggested.

First the types of TDR's were examined. It was found that most firms either implemented a reduction in principal or issued common or preferred stock in settlement of debt. Fewer firms extended maturity dates, lowered interest rates or reduced accrued interest.

Next, the characteristics of TDR firms were presented and discussed. It was found that 78.33% of the TDR firms experienced negative EBIT in at least one year prior to TDR indicating financial difficulties. Prior to TDR, 77.33% of the TDR firms had a deficit in retained earnings which may indicate net losses year after year. Finally 36.67% of the firms had deficit capital balances. In conclusion, the majority of these firms were having financial difficulties prior to TDR.

Analysis of four financial ratios between the bankrupt, nonbankrupt and TDR samples was expected except for WC/TA. WC/TA was found to be the lowest for the TDR firms. Also, WC/TA on average was found to be negative for the TDR firms. This result provides strong evidence that these firms are experiencing cash flow problems which makes it impossible for them to make payments on their debt. Further analysis of working capital and other funds flow measures is needed. This critical factor has been previously emphasized and may prove to be a key factor in the study of TDR firms.

For the other ratios analyzed, the nonbankrupt firms had results which indicated they were in the strongest financial position. The bankrupt samples results indicated that they were in the most financially worst position. The TDR firms were stronger than the bankrupt firms and weaker than the nonbankrupt firms.

The following observations can be made from this analysis:

1) The TDR firms, overall, were experiencing negative EBIT, some of them year after year.

2) The TDR firms reported interest expense very close to the bankrupt sample.

3) Prior to TDR, most·of the firms had negative and decreasing WC.

4) After TDR, most of the firms had positive and increasing WC.

5) Thirteen firms never showed negative EBIT and did not deteriorate prior to TDR.

Next, using the samples of bankrupt and nonbankrupt firms, an MDA bankruptcy model was developed and a twelve-variable linear model was derived from using financial ratios. The ratios selected for analysis were those found to have predictive power in previous studies. The MULDIS package used forward stepwise selection procedures in order to eliminate any ratios found to be unpredictive.

Once the MDA model was developed, it was used to analyze TDR firms. Data for the TDR firms were obtained from the firms' 10-K reports and Z scores were computed for each firm in the sample. The period of analysis was from three years prior to the TDR date through

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three years after the TDR date.

It was found that prior to TDR, only half of the firms were classified as bankrupt, resulting in a bimodal distribution. The question of why the majority of these firms did not classify as bankrupt before TDR remains unanswered. Three reasons can be offered. First, prior to TDR, income was erratic over time. This could explain the bimodal distribution. The erratic results during these periods might indicate that prior to TDR, that although the firms were not doing well in general, the MDA model did not classify them as bankrupt.

Another possible explanation could be that the MDA model was either too conservative or was not able to discriminate TDR firms well. This leads to the third explanation. There may exist three discrete groups for the discriminant function. The TDR sample may be separate and distinct from the bankrupt and nonbankrupt groups. This should also explain the bimodal distribution. There is evidence to support this third explanation since working capital was significantly different for the TDR firms. Some measure of funds flow may be the critical variable to distinguish the TDR sample from the other two.

Next, through nonparametric statistical testing, it was found that for one and two years prior to TDR, the firms' Z scores declined, indicating weakening financial positions. However, the decline is not significant enough to change the bankrupt-nonbankrupt status of the TDR firms classifying as nonbankrupt. During the first year following the TDR, the Z scores continued to decline, but not significantly so.

Again, it cannot be concluded that these firms' financial positions were weakening.

For two and three years following the TDR, the firms' Z scores improved somewhat, but not significantly so. None of these changes occurring after the TDR were strong enough to cause a shift in the bankrupt-nonbankrupt status of the firms classifying as bankrupt.

One conclusion that can be made here is that since the firms' Z scores worsened prior to TDR, their financial positions were weakening. After TDR, since the Z scores did not change significantly, the financial positions of the TDR firms stabilized. Although there is no indication that these firms turned themselves around as a result of the TDR, at least they seem to have held their positions at a stable level.

As mentioned earlier, from observation of the raw data, the firms' liquidity, operating, and debt ratios seemed to improve slightly after TDR, but apparently not significantly so. An extension of the current study into future periods may find these firms strengthening to a greater degree.

Finally, it was found that for all years following the TDR a dichotomy existed between the TDR and bankrupt firms and also between the TDR and nonbankrupt firms. Therefore, it may be concluded that after TDR, the TDR firms are not homogeneous with either the bankrupt or nonbankrupt firms with respect to their classification results.

There are two possible explanations for this result. First, the TDR firms, after TDR, may still be somewhere between the bankrupt and

nonbankrupt firms on the bankruptcy continuum. Therefore, they would not be homogeneous to either group. Secondly, as mentioned earlier, it is possible that there are more than two discrete groups in the MDA model. There are possibly three groups that are distinguishable - bankrupt, nonbankrupt, and TDR firms. If this were true, the TDR firms would not be homogeneous to either of the two other samples.

Two TDR firms were analyzed in detail. The JFLF Company is an established furniture company which has suffered from losses in the past few years. The Lexicon Corporation is a newly formed computer company.

The JFLF Company extended its maturity date while the Lexicon Corporation reduced its principal twice. The JFLF Company filed for bankruptcy subsequent to its TDR. Three possible explanations are offered for the JFLF Company's unseccussful TDR.

First, a TDR may have been too late for the JFLF Company. Second, the terms of the TDR may have been too strict. Perhaps a reduction in principal may have been better. Third, the company may have been in such a financially bad position that nothing would have avoided the failure process and bankruptcy.

The Lexicon Corporation continues to operate. Even though it is still incurring losses each year, the losses have been substantially reduced. Because the bank allowed the company to reduce its principal twice, it must have believed that this young growth company had a marketable product which would soon make the firm profitable. As of 1982, it appears that the TDR has helped put the Lexicon Corporation

on the right track. Hopefully, future research can address these topics in more detail, as more knowledge pertaining to TDR's evolves.

Conclusions

Several conclusions can be drawn from this study. First, the conclusions drawn from the descriptive study performed in Chapter IV are presented. Finally the conclusions drawn from the statistical testing performed in Chapter V are presented.

Conclusions from the Descriptive Study

First the types of TDR's were examined. It was found that most firms either implemented a reduction in principal or issued common or preferred stock in settlement of debt. Fewer firms extended maturity dates, lowered interest rates, or reduced accrued interest.

Next, the characteristics of TDR firms were presented and discussed. It was found that 78.33% of the TDR firms experienced negative EBIT in at least one year prior to TDR indicating financial difficulties. Prior to TDR, 77.33% of the TDR firms had a deficit in retained earnings which may indicate net losses year after year. Finally 36.67% of the firms had deficit capital balances. In conclusion, the majority of these firms were having financial difficulties prior to TDR.

Analysis of four financial ratios between the bankrupt, nonbankrupt, and TDR samples was expected. The TDR sample was between the bankrupt and nonbankrupt samples, but closer to the bankrupt sample. Long-term debt/total liabilities was the lowest for the TDR sample. And the working capital ratio for the TDR sample was

negative, the lowest for the three samples.

The following observations can be made from this analysis:

1) The TDR firms, overall, were experiencing negative EBIT.
    Some of them year after year.

2) The TDR firms reported interest expense very close to the
    bankurpt sample.

3) Prior to TDR, most of the firms had negative and decreasing
    WC.

4) After TDR, most of the firms had positive and increasing WC.

5) Thirteen firms never showed negative EBIT adn did not appear
    to have deteriorating operating results prior to TDR.

It can be concluded that all but thirteen firms entered the
failure process prior to TDR. They experienced operating results
below expectations, net loss and negative funds flow trends and
deteriorating results year after year. After TDR, there appears to be
a reversal in these trends for some firms, but complete data was not
available to make an overall conclusions.

Thirteen of the sixty TDR firms do not appear to be following the
failure process. A conclusion here could be that these firms may in
fact be healthy firms with a cash or funds flow problem at a
particular point in time. Only two of these firms implemented a
reduction in principal indicating the probability that eleven of these
firms could repay their debt.

The negative WC/TA ratio observed for the TDR firms supports the
fact that these firms have a severe funds flow problem. So even

though these thirteen firms appear to be healthy, a severe cash or funds flow problem could force them into a TDR. This appears to be true with these firms.

Finally, descriptive analysis was performed on two TDR firms. One firm was a well established firm, implemented an extension of maturity date on a loan and later filed for bankruptcy. The firm is still in existence today. The second firm was a newly developed firm, which implemented a reduction in principal on a loan and has so far avoided bankruptcy. These firms were compared because they were fairly representative of the entire TDR sample.

From this analysis it was concluded that the JFLF Company, a well established firm, made one of two errors when implementing its TDR. First, which may have been out of its control, the firm should have implemented a more lenient TDR such as a reduction in principal or issuance of stock. The extension of maturity date did not prove to be effective. Second, it appears that by the time the JFLF Company implemented its TDR, it was already too far along the failure process to reverse itself. Perhaps wiser management would have seen the need for a TDR a few years earlier. Earlier implementation might have saved the firm.

The Lexicon Corporation, a newly formed company, has already implemented two reductions in principal. Although the company continues to operate at a loss, the amounts of these losses have been drastically reduced. This is common with many new companies. It appears, then, that the Lexicon Corporation may become profitable soon.

The firms themselves cannot be totally responsible for the results. The banks have the final say when implementing a TDR. They may make their decision on the financial position of the firm, the relationship it shares with the firm, or the type of industry in which the firms operated.

Although nothing can be concluded from these two factors, the last one may be important. The bank could have been influenced by the fact that the JFLF Company is in the furniture industry. This industry has significantly weakened in the past several years. Also, the bank could also have been influenced by the fact that the Lexicon Corporation is in the computer industry. This industry has been growing fast in the past few years.

Conclusions from Statistical Testing

It was concluded that for two years, and one year prior to TDR, the firms' Z scores were worsening. This supports the descriptive analysis earnings and working capital data. However, after TDR, no significant changes in Z scores were found. This means that the financial positions of the TDR firms did not change significantly. Although the approach of statistically testing Z scores may be questioned, it has been used by Altman and Brenner to test for stock market reactions [1981]. They reported similar results achieved by the Efficient Markets Hypothesis research. So there is support for this analysis.

When testing for homogeneity, the results were inconsistent. While several possible explanations are possible, one seems to warrant

the most support. The TDR sample may be distinct from the bankrupt and nonbankrupt samples. In this case an MDA model could be computed using three goups where the TDR goup would not be homogeneous to either the bankrupt or nonbankrupt groups. The critical factor supporting this conclusion is the TDR group's negative WC/TA ratio. This is significantly different from the other groups, and could be a key discriminating factor among all three groups.

In general, it appears that the TDR firms are in financial difficulty and have started the failure process. All but thirteen firms were having financial problems prior to TDR. The thirteen firms, which appeared healthy, still encountered a funds flow problem. This is not an uncommon event for a healthy firm. Earnings and working capital provide the strongest support for these firms' deteriorating positions. The MDA model also supports their deteriorating positions.

After TDR, there is some evidence that working capital data help to support this statement. However, statistical testing of the Z scores from the MDA model after TDR provides no conclusions.

Suggestions for Future Research

Throughout the text of this study, some mention has been made of suggested ideas for future research. First, an extension of the current study can c rry this analysis of TDR firms into future years. It may, in fact, take several years after a TDR for a firm to turn around. Along the same lines as in this study, MDA could be used to predict a TDR instead of using a bankruptcy model to analyze TDR

firms. In other words, a TDR sample could be matched with a sample of firms with no TDR. Then, a discriminant function could be developed in an attempt to predict a TDR similar to many of the bankruptcy studies.

One of the more interesting ideas presented for future research would be to determine if a particular type of TDR proves to be more successful than other types. There are so many factors influencing a TDR that this topic, although important to research, would be very difficult to pursue.

An interesting topic mentioned earlier is to follow these firms further into the future to see what their outcomes are. Some of these firms may merge or some may become bankrupt. The direction that these firms take could be analyzed. Also, factors could be examined which help to explain why some firms can continue as going concerns and why some firms face bankruptcy and liquidation.

Another topic would be to interview top management of the TDR firms and find out how each TDR came about. It would be interesting to actually know how much bargaining is involved between debtor and creditor firms when implementing a TDR. Since the bank or other lender must first agree to the specific terms of a TDR, the debtor firm does not always end up with the type of TDR it prefers. The debtor firm may want a very lenient TDR while the bank or other lender might not agree. The bank may think that the debtor does not need as lenient a TDR as it wishes or that there is too much risk involved.

Along these lines, another interesting research project would be

to interview the creditors of the TDR firms to see how TDR has affected them. For example, would they be willing to agree to a TDR again with the same firm or another firm? A TDR's impact on its creditors may prove to be a very fruitful study. Other creditors may benefit from these results. This topic could be carried further into the banking industry.

A topic as an extension of this study would be to perform a discriminant function with three groups. The bankrupt, nonbankrupt, and TDR samples could be treated as a separate and distinct group. Because of the interesting result found in this study using working capital data, this idea could prove interesting.

Another important topic along these lines is to analyze working capital in detail for the TDR firms. It was shown that working capital decreased before TDR and increased after TDR. An analysis of the changes in the components of working capital for these firms may provide other key factors in distinguishing and understanding TDR firms.

An interesting study left for future research would be to determine if specific terms of TDR are more effective than others in aiding firms to avoid bankruptcy. A nonparametric test, the Friedman test, may test for differences between these factors. This test is the nonparametric counterpart of analysis of variance. Such factors or treatments may consist of:

a) reduction of interest rate

b) extension of maturity date

c) reduction of principal

d) reduction of accrued interest

e) issuing of equity

f) transfer of receivables.

Some of these may be combined if it is found that they occur

simultaneously.

Limitations

Several limitations have been discussed earlier. First, it may

be impossible to isolate a TDR so it can be analyzed by itself. This

is a problem cited in many studies. However, because other factors,

such as economic conditions, are common to all firms, these different

factors can be eliminated to a certain extent.

There are several limitations of using MDA which were presented

in Chapter I. The variance-covariance matrices of the predictors

(financial ratios) should be the same for both groups (bankrupt and

nonbankrupt firms). The variables should follow a normal

distribution. However, when these requirements are violated, MDA has

still proven to be a powerful tool. The Z scores computed from the

model have little intuitive interpretation. Also, the matching

procedures involved are somewhat arbitrary.

This study has some other limitations which should also be

addressed. First the TDR firms were not matched so that they could be

compared with the bankrupt and nonbankrupt firms to determine if they

follow the failure process. As was mentioned earlier, if a TDR firm

is in the failure process, its Z score should decline as it approaches

the TDR date. This could be a problem, since the bankrupt and nonbankrupt samples were matched by industry and size. Z scores were computed for these firms. Then, it was these Z scores which were statistically analyzed. Therefore, the Z scores are related to all three samples. However, the parameters of the MDA model were derived from the bankrupt and nonbankrupt samples. Since the nonparametric statistical tests analyzed Z scores within firms from year to year, the changes in those Z scores should be meaningful.

Since the TDR sample was not random, the possibility exists that the results may be biased. However, since DISCLOSURE, Inc. is the best source available, it was used here. The bankrupt and nonbankrupt samples were also nonrandom samples. This problem, however, has been cited as common in the literature and is not considered detrimental to the results [Eisenbeis and Avery, 1972].

Finally, the nonparametric statistical tests examined the TDR firms' Z scores. The importance of these Z scores may have been overemphasized. However, for each test performed, the raw data for these firms were examined in Chapter IV in order to support or dispute the conclusions of the statistical tests. In all cases, the conclusions from the statistical testing could be supported. The analysis of the raw data indicated that the TDR firms were weakening prior to TDR.

Another limitation was with the source of the TDR sample. It was found that DISCLOSURE, Inc. had made some errors in listing the TDR firms. Eight firms listed in the DISCLOSURE Inc. TDR sample had never

implemented or disclosed a TDR. Since the process of identifying specific disclosures in financial statements requires individuals to examine these financial statements in detail, the reported disclosures are subject to human error. Although every effort was made to minimize these weaknesses, they cannot be totally eliminated. Hopefully, any weaknesses present in the study are not strong enough to significantly bias the results.

Another limitation again lies in the TDR sample. As mentioned earlier, DISCLOSURE only selected firms which reported a TDR in their 1981 financial statements. In some cases, the TDR went back several years and still exists. However, in many cases, the TDR is at most one year old. Some of the older TDR's may have been settled, or some of these firms may have gone out of existence. But, it remains the best source for a TDR sample.

Finally, because many of the TDR's are current, the analysis of TDR firms involves a period of five years. However, the MDA model was developed using a ten year period to obtain an acceptable sample size. Although this may have no effect on the results, there still exists the possibility of a bias.

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APPENDIX I

Samples	Year of TDR
A. Restructured Firms	
1. Aeronica, Inc.	79
2. AES Tech	80
3. Allied Equities Corp.	78,79
4. American Agrifuels	80
5. Americare Corp.	80
6. Associated Food Stores, Inc. NY	79
7. Avatar Holdings, Inc.	80
8. Birtcher Corp.	80
9. Brush Wellman, Inc.	80
10. Chef's International, Inc.	80
11. Chicago Milwaukee Corp.	80
12. Chicken Unlimited Enterprises	76,78
13. China Trade Corp.	82
14. City Stores Co.	81
15. Colt Oil Inc.	80
16. Continental Airlines	80
17. Continental Copper & Steel	81
18. Crowley Foods, Inc.	80
19. Deltona Corp.	80
20. E.C. Ernst	80
21. Engineering Measurements	82
22. F & M Schaefer Corp.	80
23. Fine Products Co., Inc.	80
24. First National Realty	79
25. GF Business Equipment, Inc.	80
26. Hydroculture, Inc.	80
27. Icot Corp.	80
28. Itel Corp.	80
29. IU International Corp.	81
30. John F. Lawhon Furniture	81
31. King James Corps.	81
32. Lexicon Corp.	79,81
33. Lloyd S. Electronics	81
34. Love Oil Co., Inc.	80
35. Mayfair Supermarkets	81
36. Medco Jewelry Corp.	80
37. Mego International	80
38. Morton Shoe Co., Inc.	81
39. NCC Industries, Inc.	77
40. North American Biologicals, Inc.	81
41. Pacesetter Industries	79,82
42. Pantry Pride	81

43.	Pathcom, Inc.	78
44.	Pfizer, Inc.	81
45.	Quality Care	82
46.	REM Metals Corp.	81
47.	Russell, Burdsall, & Ward	80
48.	Safeguard Business Systems	80
49.	Scan Data Corp.	80
50.	Scanfax Systems	77,78
51.	Sea Pines iCo.	78
52.	Superscope Inc.	80
53.	Tiffany Industries	78,81
54.	Topps & Trowsers	81
55.	Twin Fair Inc.	82
56.	Universal Container	79
57.	Wells Benrus Corp.	79
58.	White Motor Corp.	79
59.	Willcox & Gibbs, Inc.	80
60.	Xonics, Inc.	81

B. Bankrupt Firms	Year of Bankruptcy	Nonbankrupt Firms
1. Electronic Computer Programming Inst. Inc.	75	AAR Corporation
2. General Alloys Co.	73	Shaer Shoe Corp.
3. TMA Company	73	Fluke Manufacturing, Inc.
4. Westates Petroleum Co.	76	Cooper Laboratories
5. Gray Manufacturing Co.	75	Keystone Industries
6. National Bellas Hess, Inc.	74	Pittsburgh Brewing Co.
7. DCA Development Corp.	73	Coleco Industries, Inc.
8. Electrospace	74	Global Marine, Inc.
9. American Book-Stratford Press	73	Ennis Business Forms, Inc.
10. Potter Instrument Co., Inc.	75	Altec Corp.
11. American Recreation Group,	73	HMW Industries, Inc.
12. Harvard Industries, Inc.	73	Altamil Corp.
13. Waltham Industries Corp.	72	Interphoto, Inc.
14. Botany Industries	72	Russ Togs, Inc.
15. Mammoth Mart, Inc.	74	Caldor, Inc.
16. Arlan's Dept. Stores, Inc.	74	Dillard's Dept. Stores Inc
17. Bohack Corp.	77	Alterman Foods, Inc.
18. Penn Fruit Co., Inc.	75	Foodarama Supermarkets
19. W.T. Grant Co.	75	Gamble-Skogmo, Inc.
20. Allied Artists Industries, Inc.	79	Riblet Products Corp.
21. Allied Supermarkets, Inc.	78	National Tea Co.
22. Combustion Equipment Assoc. Inc.	80	Twin Disc Inc.
23. FDI Inc.	78	Tokheim Corp.
24. Garland Corp.	80	Barco of CA
25. Lynnwear Corp.	81	Barco of CA
26. Mansfield Tire & Rubber Co.	79	Mohawk Rubber Co.
27. Metropolitan Greetings, Inc.	79	Williamhouse Regency Inc.
28. Penn Dixie Industries, Inc.	80	Ceco Corp.
29. Piedmont Industries, Inc.	79	Barco of CA
30. Poloron Products, Inc.	81	Oakwood Homes
31. Richton International Corp.	80	Swank, Inc.
32. Vendo Co.	77	Wurlitzer Co.
33. West Chemical Prod., Inc.	79	Oakite Prod.
34. Whippany Paper Board Co.	80	American Israeli Paper Mills
35. Spatrain Lines, Inc.	81	Moore McCormack Resources, Inc.

APPENDIX II

Ratios used in analysis

		Percentage of Discriminating Power Accounted for by Each Variables
1.	Working capital/total assets*	10.07343%
2.	Retained earnings/total assets	
3.	Income before extraordinary items /total assets*	3.322073%
4.	Earnings before interest and taxes/total assets*	.3233316%
5.	Book value of equity/book value of debt	
6.	Earnings before interest and taxes/interest expense*	4.523617%
7.	Current assets/current liabilities	
8.	Common equity/total capital	
9.	Current assets/total assets*	7.076948%
10.	Current liabilities/total assets*	.2482795%
11.	Earnings before taxes/total assets*	1.964262%
12.	Long-term debt/total assets	
13.	Current long-term debt/total assets*	5.217768%
14.	Current long-term debt/current assets*	6.265601%
15.	Current long-term debt/current liabilities	
16.	Current long-term debt/total capital	
17.	Current long-term debt/common equity	
18.	Long-term debt/total capital*	16.36950%
19.	Long-term debt/common equity*	27.07425%
20.	Long-term debt/total liabilities*	17.54093%
21.	Total assets/total liabilities	
22.	Total liabilities/total capital	
23.	Interest expense/total liabilities	
24.	Common equity/total liabilities	
25.	Interest expense/earnings before interest and taxes	
		99.99999%**

*found to be significant by Muldis
**rounding error

APPENDIX III

Type of Restructuring

	Number of Firms	Number of Firms Using One Type of Restructuring
Reduction In Principal	25	12
Issuance Of Common Stock	13	5
Issuance Of Preferred Stock	11	6
Extension Of Of Maturity Rate	17	5
Reduction In Interest Rate	5	1
Reduction In Accrued Interest	6	2

Combination Of Terms

	Type	Number of Firms
Reduction In Principal +	Issuance Of Common Stock	3
Reduction In Principal +	Extension Of Maturity Rate	4
Reduction In Principal +	Reduction In Accrued Interest	1

Reduction In Principal	+	Issuance Of Common Stock	+	Extension Of Maturity Rate	1
Reduction In Principal	+	Issuance Of Common Stock	+	Reduction In Accrued Interest	1
Reduction In Principal	+	Issuance Of Common Stock	+	Issuance Of Preferred Stock	1
Reduction In Principal	+	Issuance Of Preferred Stock			1
Reduction In Principal	+	Extension Of Maturity Rate	+	Reduction In Interest Rate	1
Issuance Of Common Stock	+	Extension Of Maturity Rate			2
Issuance Of Common Stock	+	Extension Of Maturity Rate	+	Reduction In Accrued Interest	1
Issuance Of Preferred Stock	+	Extension Of Maturity Rate	+	Reduction In Interest Rate	1
Issuance Of Preferred Stock	+	Extension Of Maturity Rate	+	Reduction In Interest Rate + Reduction In Accrued Interest	1
Extension Of Maturity Rate	+	Reduction In Interest Rate			1

VITA

John Gwenffrud Hamer was born in Lowell, Massachusetts to Mr. and Mrs. Gwenffrud L. Hamer. After graduating from Westford Academy in Westford, Massachusetts, Mr. Hamer received his Bachelor's Degree in Accounting in 1979 from the University of Lowell in Lowell, Massachusetts.

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The typist for this dissertation was Jacqueline Kozlowski.