BANKRUPTCY AND BUSINESS FAILURE IN THE CONSTRUCTION INDUSTRY

A Special Research Problem

Presented To

The Faculty of the School of Civil Engineering

by

Eric C. Milner

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Civil Engineering

Georgia Institute of Technology

August, 1987

GEORGIA INSTITUTE OF TECHNOLOGY
A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA
SCHOOL OF CIVIL ENGINEERING
ATLANTA, GEORGIA 30332

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CHAPTER 1

INTRODUCTION, OBJECTIVES, AND PROCEDURE

Introduction

Competition is the key to a free enterprise business system. Competition breeds improvement; a company must constantly strive to better its competitors or face the consequences. With tight market conditions some businesses will ultimately not succeed or continue operations.

The prospect of business failure is not a topic most businesses care to acknowledge. In construction however, failure is a real possibility and the possibility, as will be shown, has increased tremendously in the recent past.

The conditions which result in company failure and the economic conditions which increase the likelihood of failure are therefore legitimate areas of study. Understanding the mechanism of failure is key to attempting to avoid failure. Corrective action can not be taken if trouble is not acknowledged or foreseen.

To many failure in business equates to bankruptcy. Bankruptcy can be viewed as society's means of acknowledging the inevitability of failure and of the need to equitably handle all concerns involved in the failure. Creditors must be paid in an equitable manner, and the fate of the debtor must be handled equitably. Above all bankruptcy is a legal process with clear

and distinct guidelines established in law. The terms bankruptcy and bankrupt should only apply to firms which have, either voluntarily or involuntarily, entered their fate into the bankruptcy court system.

The term failure in the business world can also be used in a sense which does not equate with bankruptcy. Failure can be viewed as the lack of success. In this case failure would mean the inability of a company to realize returns on investments equal to or greater than returns which could have been obtained from other sources. For this paper failure will be viewed in the bankruptcy sense or as ceasing to continue and being unable to fully pay all creditors.

A term with is essential when discussing bankruptcy and failure is insolvency. Insolvency occurs when liabilities exceed assets. This can be a temporary condition as when current assets do not meet current liabilities. Technical insolvency is the term used for this situation. A more serious condition is when total liabilities exceed the fair value of total assets. (Altman 1971) Under this insolvency the company is unable to satisfy all debts. This is certainly the main trigger for bankruptcy.

Business bankruptcy has lost some of the stigma once attached to it. Perhaps this is because of the increased number of business who use this route to exit the business world. It may also be due to a realization that in competitive changing marketplaces failure will occur. Understanding and studying bankruptcy and failure in the construction industry however, may

assist construction companies from being forced to take that route.

Background

Unlike the study of how to succeed in business, the study of business bankruptcy has not been given much attention. This is particularly true for the construction industry in the United States. No comprehensive study into the causes of bankruptcy for construction companies or of bankruptcy in the construction industry has been completed.

The study of bankruptcy in other areas has been performed. Models to predict the bankruptcy tendency of companies have been developed for other industries and for various company sizes. This procedure has not been applied to U.S. construction companies however.

Statistics on bankruptcies are maintained by the U.S. Bankruptcy Court system however the statistics are not broken down into areas like construction. The largest source of information on failures in the construction industry is Dun and Bradstreet Corp. Dun and Bradstreet is a private corporation which maintain a database on various aspects of the business world. It publishes some of this database in various forms including failures in the construction industry.

Objectives

The purpose of this paper is to explore a unique aspect of the construction business environment, bankruptcy and business failure. The increasing number of business failures in construction makes the understanding of this issues critical. This paper is designed to give the reader an overview of the legal aspects of bankruptcy. A brief history of the laws pertaining to bankruptcy is provided to give the reader an understanding of the changes which have occurred in the benefits of bankruptcy.

The reasons why a company may become placed in a situation of possible failure are presented to give insight into the actions which are necessary to minimize the risk of failure. The paper studies the prediction of business failure from both the standpoint of macro-economic factors as well as from economic factors of individual companies. Ten years of applicable data is used to analyze the prediction of business failure probability in the construction industry. The goal is to establish a means for defining the impact external factors have on construction failures so companies can monitor the factors and hopefully avoid failures by realizing the impact of the changes have on failure risk.

Procedures

This paper presents the fluctuation of the probability of failure for construction companies over the period 1978-1986. The possible causes of the changes which have occurred in this item are presented and analyzed. Empirical relationships between variables which possibly cause changes in failure probability are made.

Mathematical modeling techniques are used to verify empirical findings and to obtain a method to predict future changes in the rate of failure for construction companies. The limitations of the model are explored including the possible effects of bankruptcy law changes.

The applicability to construction companies of models developed to predict failure prospects of individual companies is investigated. These models were developed for companies unrelated to construction. Within the limitations of data availability the model are tested using information from construction related firms.

CHAPTER 2

HISTORY AND LEGAL ASPECTS OF BANKRUPTCY

Philosophy

Businesses exist in an ever-changing environment, an environment whose conditions can rapidly change from favorable to unfavorable. The business world is one with inherent risks and dangers. Businesses are constantly challenged by its competitors and its operating economy. Each business approaches similar conditions differently and with varying results. Each however must meet changing conditions to maintain profitability and succeed in the business world. However not all businesses can succeed. (Nelson 1981)

In business competition new businesses continue to be formed and some businesses will ultimately cease to exist. A business can end for a number of reasons, however, a greater and greater number of businesses are stopping operation through the legal means of bankruptcy.

With the inevitability of business failure it is essential that a standardized means of dissolving or handling the failed business be established. Bankruptcy serves this purpose. Bankruptcy is society's means of minimizing the costs and effects of business failure. Ultimately bankruptcy is a legal process which must equitably satisfy the needs of a companies creditors as well as the companies owners. It must clearly establish the

rules for determining which creditors will get what and determine the fate of the debtor. (Altman 1971)

The failure of a business without set guidelines to orderly disestablish the business would lead to a chaotic economic system. The rights of all interested parties would not be known nor necessarily be protected.

In its attempt to be equitable, bankruptcy law allows for two separate means of handling unproductive establishments. The law provides for the orderly liquidation of business assets or when applicable provides guidelines for giving a debtor business time and direction to become productive again. The theory behind reorganization is that if the business's economic value is greater in a new reorganized capacity then the value of its liquidated assets, the company should not be liquidated. Alternatively if the company's prospects in any reorganized state are not positive then it is better for society to require liquidation. Part of the bankruptcy process is to make this determination.

Bankruptcy may be entered in one of two manners: either voluntarily or involuntarily. As the names suggest voluntary bankruptcy is with the approval of the debtor company. In some cases however the debtor is reluctant to enter bankruptcy but because of its financial condition should. In these cases creditors of the debtor can enter an involuntary bankruptcy in an attempt to minimize their losses. Both the liquidation vs. reorganization and voluntary vs. involuntary issues are clarified

in bankruptcy law. It is important to have a general knowledge of bankruptcy law to fully understand bankruptcy's impact and significance.

History and Overview of Bankruptcy Law

It has been shown that bankruptcy fulfills a great purpose in the economic system of a society. It allow for the orderly and equitable handling of a business unable to cope with its debts. The need for bankruptcy provisions in a society are well established. In the United States the Constitution specifically empowers the Congress with enacting bankruptcy laws. (Stanley and Girth 1971)

The focus of bankruptcy law has changed substantially over time. The theory of debtor's prisons and holding individuals criminally accountable for unpaid debts no longer holds. The philosophical change can be viewed as a realization that economic conditions vary and in order to promote growth risks must be encouraged. Consequently businesses are not necessarily grossly incompetent for going bankrupt. They may have existed in an unfavorable environment which lead to their demise. In addition if penalties for assuming business risks are too great, businesses will not take the risks necessary to make an economy flourish.

The first substantial and lasting bankruptcy law enacted by Congress was the Bankruptcy Act of 1893. This act clearly focused on the disestablishment of businesses through liquida-

tion. The act did not formally acknowledge reorganization. A company however, could attempt to remain in existence through an equity receivership. Equity receiverships were developed to prevent harmful seizures of property by unsatisfied creditors through liens. This was done by having court appointed receivers manage corporate assets. They proved however, to be time consuming, costly, and susceptible to unjust settlements. (Altman 1983)

The first major amendment of the 1893 act was the Chandler Act of 1938. In addition to being more comprehensive, this act clearly established the philosophy of business reorganization as an alternative to full liquidation. The act consisted of 14 chapters of which both Chapters X and XI dealt with business reorganization. Chapter X was for publicly held corporations and those with secured creditors. A Chapter X case could be filed voluntarily or involuntarily by creditors with total claims exceeding $5,000. Chapter XI dealt with smaller firms with no secured creditors and could only be entered into voluntarily. Chapter X cases automatically resulted in the appointment of an independent trustee to control the company during reorganization. Under a Chapter XI filing the owners of the bankrupt firm usually remained in control during reorganization proceedings.

Both Chapter X and Chapter XI cases required the formulation of a reorganization plan. This plan developed by input from owners, creditors, and trustees would outline the steps to be taken to turn the bankrupt business into a successful one.

The reorganization plan had to be approved by the court and by a percentage of the creditors. Once ratified the plan became binding on all creditors.

Liquidation under the 1938 act was termed straight bankruptcy. The act established clear guidelines for the priority of payment to creditors. Under the act all creditors in a certain category had to be paid in full before the next lower category of creditors could be paid anything. (Altman 1983)

The most recent bankruptcy law is the Bankruptcy Reform Act of 1978. The new act mainly revises the administrative procedures behind bankruptcy allowing them to better fit the character of the increased number of filings being experienced. A large change under the new act is the combining of all reorganization (including old Chapter X and XI filings) into one chapter, Chapter 11. Under Chapter 11 automatic appointment of a trustee no longer exists. A trustee for the period of reorganization is mainly reserved for cases in which fraud or some other illegal activity is suspected. This change may dishearten creditors who have little faith in existing management but is designed to speed up the process of bankruptcy.

Chapter 11 also allows involuntary filings in cases which would have not been allow under the old Chapter XI. This change is included to help eliminate the prospect of a company attempting to stay alive while it is only causing further economic damage. Creditors can now file the bankruptcy charges before their loses become unmanageable.

Chapter 11 holds intact the concept of filing a reorganization plan intact. Under the new act however, creditors are given more input. Under the old Chapter XI only debtors could file a plan. Now creditors can file their own plan for the troubled company after a specified period of time. (Nelson 1981)

The new code also clarifies the rights of and protections for the debtor. Basically it stops all collective efforts of creditors and forces all debts owed into the bankruptcy proceedings. The term used for this action is automatic stay. An automatic stay gives the debtor the time to formulate a reorganization or repayment plan without fear of harassment or foreclosure. Ultimately automatic stays may lead to a relieving of the financial debts that forced the bankruptcy depending on the outcome of the reorganization plan. (Altman 1983)

Priority of payment is another concept which remains under the 1978 act. Some changes were made to the hierarchy of priority however. To assist in the probability of passing a reorganization plan by creditors, a reorganization plan may call for some payment to a lower level creditor before the higher creditor is paid in full. This procedure speeds up the bankruptcy process and possibly ends in a more equitable solution. The priority of claims in the new law are:

1) Administrative expenses of the bankruptcy, such as legal, accounting fees and trustee fees.

2) Unsecured claims occurring after commencement of bankruptcy case.

3) Unsecured claims for wages, salaries or benefits earned within 90 days before filing.

4) Unsecured claims to individuals up to $900 arising from the deposit of money before bankruptcy in connection with the future use of goods or services of the debtor.

5) Unsecured claims of governmental units including all taxes.

6) Secured debts, that is debts having specific assets as collateral, have priority on the funds received from the liquidation of that asset and priority over remaining unsecured debts.

7) Senior debts spelled out in loan agreements.

8) Remaining unsecured claims.

9) Equity holders in the firm i.e. preferred and common stock holders in that order. These individuals should not receive any payment or securities in the new firm if the value of the firm's asset is less than the claims. (Altman 1983)

Liquidations follow these priorities more rigorously since there is no reorganization plan. Under the new act business liquidations are no longer termed straight bankruptcies. They are rather referred to by the chapter which covers them, Chapter 7.

As can be seen from this overview of bankruptcy law there are some scenarios where it is advantageous for a troubled company to seek bankruptcy protections. The company can obtain relief from debt through liquidation or can even possibly

reorganize and emerge from bankruptcy a stronger, more prosperous entity. Under reorganization debts are handled under a court approved reorganization plan which may also contain some relief from burdensome debt.

Protections granted under the new Chapter 11 are significant. The priciple of automatic stay guarantees a debtor freedom from individual collection effort by various creditors. Lumping all debts into bankruptcy hearings allows the debtor the possibility of complete freedom from all debts and continued operation if the court agrees to reorganization. The fact that trustees are no longer routinely appointed for Chapter 11 filings is also a benefit to the bankrupt company. Greater latitude in the direction the company will take is maintained by company management.

It can be seen that the laws governing Chapter 11 reorganizations are more advantageous to the bankrupt company than the provisions which governed the old Chapter X or X1 cases. There is a greater prospect that the company requesting reorganization will not only get relief from debt but also reemerge in a form that is more competitive. In fact construction companies are using this route to void labor agreements which management feels are hampering their ability to make profits. By declaring bankruptcy and requesting reorganization labor agreements may be nullified under reorganization plans. (ENR 1983)

This helps explain why a company may seek bankruptcy. The

reasons for the need to study bankruptcy and specifically bankruptcy in the construction industry are derived from other issues.

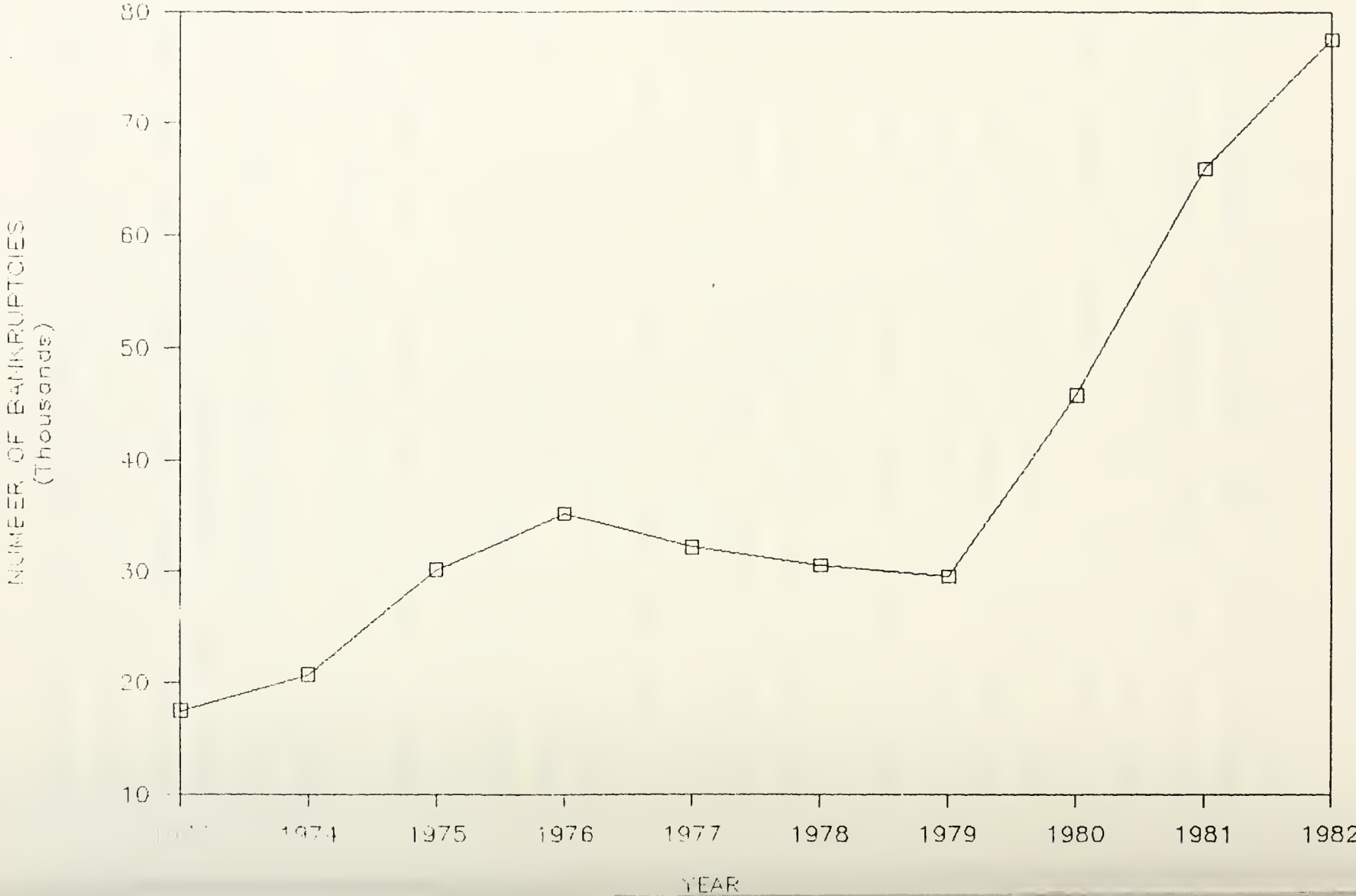
Why Study Bankruptcy in the Construction Industry

Although sometimes a topic which most businesses would rather not think about, the study of bankruptcy especially in recent times is an essential topic. For reasons which will be explored later in this paper the number of business bankruptcies has soared in the recent past. Figure 2.1 gives an indication of the growth in the number of business bankruptcies according to the U.S. Bankruptcy Courts, Administrative Office of the President, Table of Bankruptcy Statistics, 1980. It is important to note that the court system does not segregate statistics by specific industries. Therefore data specifically on construction bankruptcies is not available. The trend of total business bankruptcies however approximate construction bankruptcy trends.

A second source of information concerning business failures is through Dun and Bradstreet Corporation. Dun and Bradstreet (D&B) is a private corporation which keeps statistics on numerous aspects of American and worldwide business. One aspect which D&B keeps statistics on is business failure. It must be kept in mind however that D&B's definition of a business failure does not necessarily equate to bankruptcy. A business failure is defined as: "a business that ceased operation following

BUSINESS BANKRUPTCIES

U.S. Administrative Bankruptcy Courts



assignment or bankruptcy; ceased operation with losses to creditors after such actions as foreclosure or attachment; voluntarily withdrew leaving unpaid debts; were involved in court actions such as receivership, reorganization of arrangement; or voluntarily compromised with creditors." (D&B Business Failure Record 1986)

Failures according to D&B by definition will not equal either the number of bankruptcies nor the number of businesses which cease operation. A failure will not be assessed to a company which decides to close its doors but is able to pay its creditors in full. In addition a failure may be assessed even if a formal court proceeding is not entered into.

D&B' total number of failures will not compare to court statistics for another reason. D&B does not keep statistics on all forms of business. Specifically railroads, financial institutions, real estate companies and some small service firms are not included in D&B's statistics. D&B however does keep specific track of various categories of business including construction. D&B's statistics will therefore be used throughout this paper as the indicator of failures in the construction world. Included in D&B's construction section are subsections for general contractors and operative builders, construction other than buildings, and special trade contractors. Figure 2-2 shows the total number of failures in construction related fields according to D&B. This figure clearly supports the notion that bankruptcy and business failure in the construction industry is a

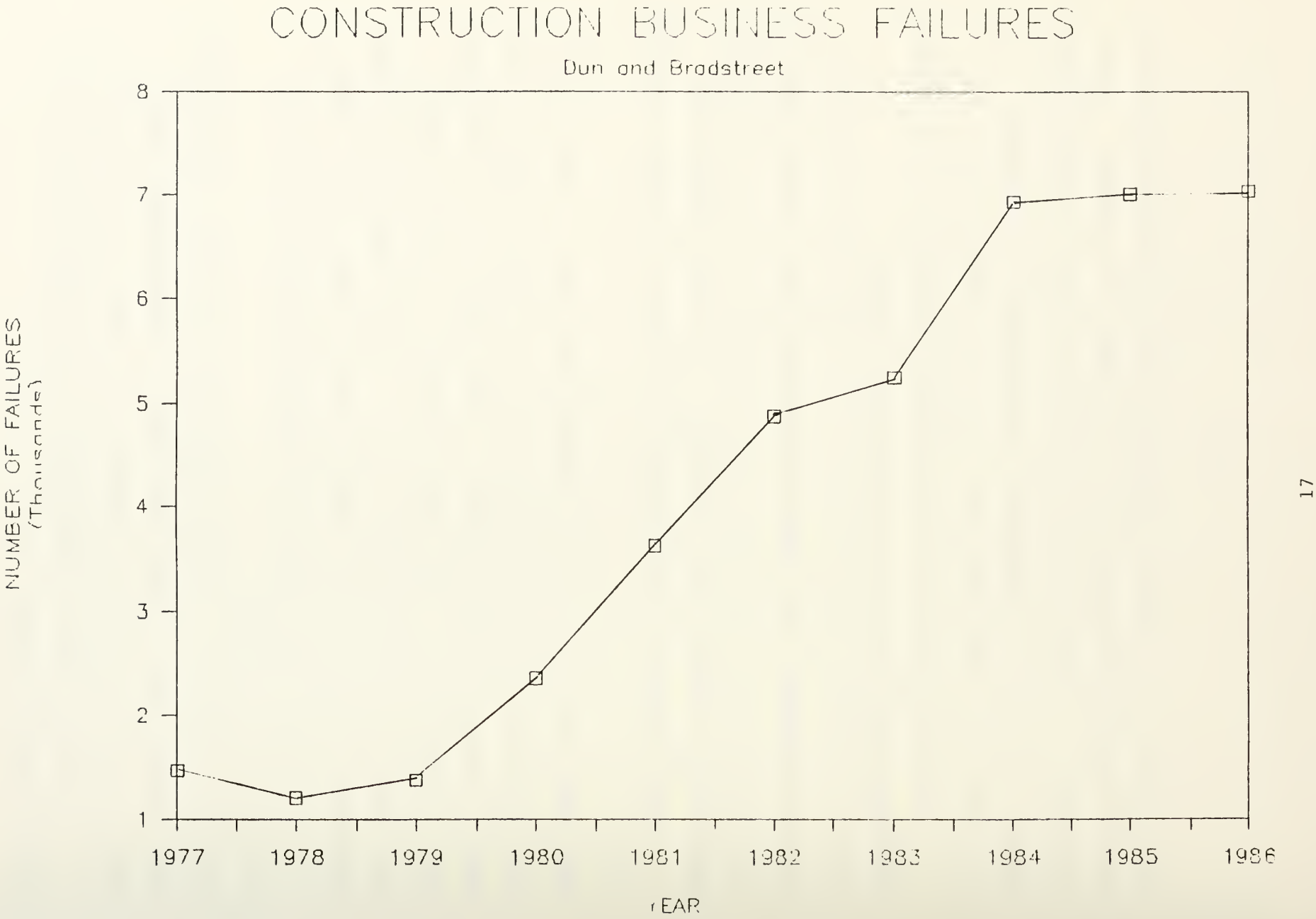

CONSTRUCTION BUSINESS FAILURES
Dun and Bradstreet
NUMBER OF FAILURES
(Thousands)
8
7
6
5
4
3
2
1
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR

Fig. 2.2

critical area of study.

The great impact of bankruptcy or business failure on all facets of the construction industry increases the importance of this area of study. While the impact on the business having financial trouble is obvious, the impact on owners, subcontractors, is just as critical.

An owner's objectives in a construction project can be summarized by his desire to obtain quality work for an inexpensive price in a timely manner. All of these areas are affected when a contractor is faced with bankruptcy. The most obvious impact is the increased urgency of cost issues to the contractor. The need to save money can first show in cutting corners in the performance of a job. Quality becomes secondary to minimizing costs.

The likelihood of additional and perhaps frivolous claims or change order requests also increases. The disincentives of confrontation with the owner can be outweighed by the desperation of the contractor. The need to maintain a good rapport with the owner and possible legal battles do not seem as important to a troubled contractor as to a financially fit one.

Another manifestation of impending bankruptcy is the desire to overbill for work completed. While the incentive for this always exists, it is compounded in the case of a troubled contractor. Not only is the contractor's need for money greater but the possible implications to the owner are greater. Since the prospect of a troubled contractor not completing contractual

obligations is greater than normal, an owner who has paid the contractor more than the value of work completed may very likely be left with uncompleted work and insufficient funds to complete the work.

Bankruptcy does not only affect the financial aspects of a project but it also affects the timeliness of the project as well. Delays can be caused to the project even if the contractor has not entered into the lengthy process of bankruptcy. A contractor in difficulty and unable to keep pace with incoming bills will lose his credit standing with his suppliers and subcontractors. The troubled contractor will become unable to obtain necessary material and equipment unless these items can be paid for in cash.

The possible implication of a troubled contractor to an owner are severe. An informed owner however can minimize these possible effects with a properly worded contract. Bankruptcy law limits the right of the owner to terminate a contract solely on the basis of bankruptcy. (ABA 1983) A carefully worded clause in a contract's General Provisions stating the owners right to terminate the contract based on nonperformance will give the owner the flexibility to terminate the contract if it is not progressing in a timely manner. In association with a termination clause must be a clause allowing the owner the right to complete unfinished work using means other than the original contractor.

A second area in which the owner must protect himself is

concerning payments. A clause requiring the contractor to certify there are no liens against him before progress payments are made will perform a couple of functions. First it indicates the contractor is not in severe financial trouble and it also helps ensure funds are flowing to his subcontractors and suppliers.

Two final areas which can be utilized by an owner are the use of bonds and retention. Payment and performance bonds can be essential in guarding against problems from bankruptcy. Not only do they assist the owner if bankruptcy occurs, they also guard against getting a contractor who is financially troubled. A financially troubled contractor most likely will be unable to secure the required bonds. Holding funds in retention as well as bonds can help ensure a project will be completed if bankruptcy occurs. Retention will guard against overpayment and will build a fund capable of getting a new contractor to complete the job if the initial contractor fails. A severe retention policy however can cause a borderline contractor to cross the line into bankruptcy.

Not only does bankruptcy affect owners but it also impacts all tiers of subcontractors and suppliers. The main difficulty encountered by subs and suppliers is obtaining payment for past performance. The difficulty is rooted in the concept of automatic stay described earlier. Basically the request for payment becomes entangled in the whole set of debts owed by the bankrupt contractor. The payment therefore will not be settled until

court hearings are concluded. Even then the creditor may not obtain full payment because of the rules governing allocation of assets.

The subcontractor or supplier does have some remedies to the situation. Bankruptcy law does allow the subcontractor or supplier to refuse to perform for a contractor once he is insolvent. In addition goods delivered after insolvency may be recovered. (ABA 1983) If the goods are delivered prior to filing for bankruptcy they are covered under automatic stay rules.

Payment for services can be attempted to be collected under another means. This would be through the use of a mechanic's lien against the owner. A move of this nature may have uncertain results. An owner can argue that the use of the mechanic's lien is an act to collect against a debt prior to bankruptcy and therefore it should be covered under automatic stay provisions even though the action is against the owner. (ABA 1983)

It can be seen that the possibility of bankruptcy has severe implications to owners, subcontractors and suppliers. A trouble contractor can use the threat of bankruptcy to his advantage. Bankruptcy is viewed by owners as an act which will cause great delays, and lead to uncertain project results. Concessions can be sought by the contractor form the owner to avert possible bankruptcy. Lax contract interpretation and more favorable payment schedules are two areas which could greatly help a troubled contractor. The contractor may also seek more favorable payment schedules for financial institutions, subcontractors, and

suppliers since their fate is also entangled with the fate of the contractor.

CHAPTER 3

CAUSES OF BUSINESS FAILURES IN THE CONSTRUCTION INDUSTRY

The Difficulty in Assigning a Cause

In Chapter 2 it was shown that business bankruptcies and construction industry business failures are on the rise. The study of this trend relies on the factors which cause a business to fail. What causes some businesses to thrive in a given environment while others fail? What are the underlying mechanisms which can be used to explain this trend? This chapter will explore these issues.

To study the causes of business failures it is important to clearly understand a business's working environment. A business's environment can be viewed as a product of external factors (its marketplace, its competitors, the prevailing economic conditions) and internal forces (its management philosophy, its financial condition, and its workers). These forces are of course not mutually exclusive. What occurs outside of the business will cause change in the business itself and to some extent the actions of the business will effect some of its external environment.

Both the company's external and internal environments play key roles in the success or failure of that company. A company with a strong financial and managerial base can possibly overcome

difficult economic and market conditions. Conversely a weak company can prosper in a growing market and a good economy. A company's condition can therefore be viewed as a combination of industry conditions and the financial condition of the company. (Platt 1985)

It is important to recognize the interrelationship which exists between these factors. Extended periods of poor market and economic conditions can turn a financially fit business into a weak one. Even within the category of internal forces interrelationship exists. Poor management may lead to poor sales and poor sales may lead to poor liquidity. The process of assigning a reason to a given failure is therefore a difficult one. Since so many factors are related how do you determine the actual cause?

Even with this problem Dun and Bradstreet maintains statistics on the causes of business failures they track. The cause for a failure is determined by the opinion of informed creditors and information in Dun and Bradstreet (D&B) reports. The publication which lists reasons for business failures is the Business Failure Record. The most recent publication (1986) segregates the causes of failures into 10 main areas:

1) neglect	6) sales
2) disaster	7) expenses
3) fraud	8) customer
4) economic factors	9) assets
5) experience	10) capital

Figure 3.1 shows the relative weights of the 10 causes with some of the lessor causes combined for ease of presentation. Clearly the most significant failure cause according to the D&B statistics is economic factors. Within the economic factors category are five subcategories:

1) bad profits
2) high interest rates
3) loss of market
4) no customer spending
5) no future

Of these five subcategories only one is significant: bad profits. Bad profits accounts for 74.2% of the failures in the economic factors category. Since economic factors account for 69.8% of all failures, alternatively it can be said that bad profits account for slightly over half of all failures.

Bad profits however is a vague, extremely encompassing term. Problems in the other three major categories: experience, sales, and expenses can ultimately lead to bad profits. Classifying a failure as the result of bad profits therefore may not give a good indication of underlying problems which caused the profit problem. D&B's statistics reflect, to a degree, the interaction between failure causes. The sum of the percentages of all categories exceeds 100% since some failures are attributed to more than one cause. The total sum of causes is approximately 110%. The fact that the sum is close to 100% however is an indication that all the underlying problems contributing to

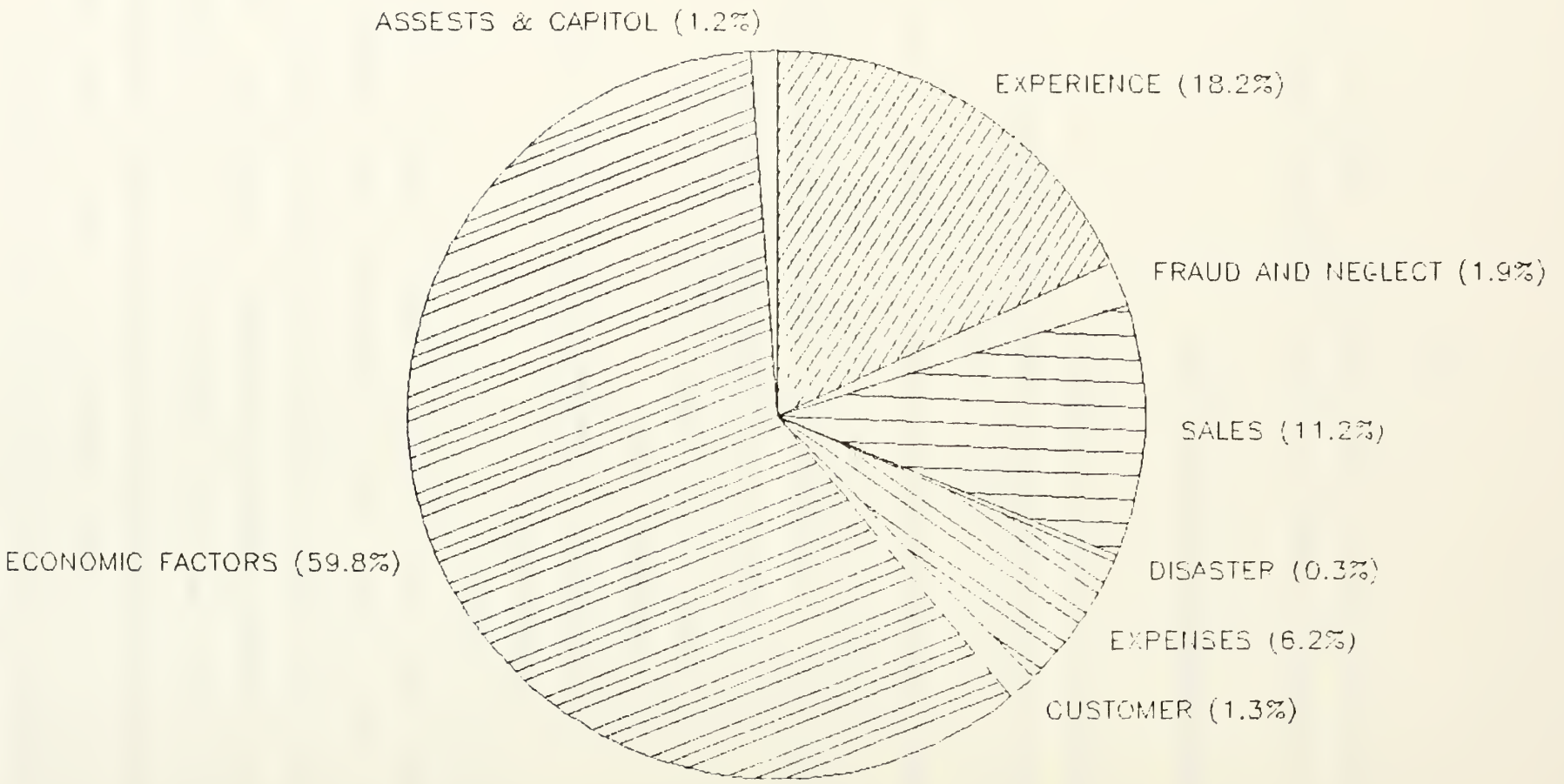

CAUSES OF BUSINESS FAILURES
Dun and Bradstreet 1986
ASSESTS & CAPITOL (1.2%)
EXPERIENCE (18.2%)
FRAUD AND NEGLECT (1.9%)
SALES (11.2%)
DISASTER (0.3%)
EXPENSES (6.2%)
CUSTOMER (1.3%)
ECONOMIC FACTORS (59.8%)

Fig. 3.1

failure are not listed.

Although the D&B listings may not be completely comprehensive, it is an indication of some of the causes affecting business failure in the construction industry. It should be noted that D&B's listing does not give credit, in most cases, to external factors as reasons for failure. Rather it lists how those market conditions manifest themselves in the company which failed. D&B's information does suggest the following areas are important causes to business failure in the construction industry:

1) bad profits
2) management incompetence and lack of experience
3) inadequate sales
4) loss of market and economic decline
5) difficulty collecting from customers.

Again this list is intertwined. The difference between belonging in one as opposed to another is slim. Also it is almost exclusively tied to company issues not overall economic conditions. Overall economic issues do however influence a companies financial stability and these factors will be investigated in the next section.

Market and Macro-Economic Factors

The economic system in which a business exists can do much to determine the fate of that business. Whether it is the market

competition which the business faces, the cost to borrow money, or the increase in the cost of goods and services, a business can not control the overall framework in which it must operate. Perhaps the most significant item in this category is the interest rates which a business must pay to borrow money.

The importance of interest rates is derived not only because of its possible impact on a business but also because of their variability. Indeed if interest rates remained constant with time, costs associated with borrowing money would be inconsequential. Businesses could easily factor the cost into their cost of doing business and no problems would occur. It is because interest rates fluctuate that businesses must assume risk due to borrowing money.

Companies forced to borrow money at a higher rate than those who had borrowed money at a different time are at a distinct disadvantage in competition with the other firm. Companies must therefore be adept at foreseeing market changes. Insight into when to borrow money is a prime advantage.

Although construction related firms do not have the capital investment of other industries like manufacturing, the concept of borrowing money cheaply is critical to construction companies. Most projects require a substantial amount of capital before the project can be started. Materials, land , and equipment must be procured in most cases before any funds are received from an owner or client. Due to retention the money received from an owner generally will not equal the money expended on a project

until late in that project. This of course requires contractor funds (in most cases borrowed) to compensate for the difference. The ability to borrow money at a low rate may make the difference between not only making money but also getting the job in the first place.

The whole issue of when to borrow money, and for how long to borrow it, bring a substantial amount of risk into a project. Businesses are faced with the decision of borrowing money over a short period or a long period. Predicting whether the rates will rise at the end of a short period is key to determining the correct length of the loan. Failing to guess correctly may result in having to borrow money later at a higher rate which can ruin expected profits.

A related issue to interest rates is inflation. Inflation is important for two reasons. First it is a key indicator of interest rates. As inflation increases interest rates will follow. Second it can cause direct losses to a business if the business does not account for it properly. In a fixed price situation, a contractor can be responsible for price increases which could substantially erode profits. The possibility of this situation is minimized however, by the policy of getting firm fixed price quotes before bidding.

Another key external force which could determine the success or failure of a company is reacting to market conditions. A business must always be aware of who its potential customers are, what type of business activity can be expected in that market,

and whether a shift in market potential is expected.

Needs for services and goods constantly change. For a business to survive it must anticipate these changes and react to them before its too late. What is popular and in need today may not be tomorrow.

A prime example of this in the construction world can be seen in heavy/horizontal construction. In the recent past new highways were being built at an astonishing rate. Largely due to federal funding, the need for new road construction caused the prospect for work in that area to be great. The trend however had to peak and decline. Now the emphasis is clearly on road maintenance, repair, and rehabilitation. Companies which can foresee these changes, monitor applicable trends, and react to new trends are at a great advantage.

A final aspect of external forces on a company is related to the market competition which it faces. A method of viewing this issue is by examining the number of businesses in a given field. Certainly for a given volume of work if the number of businesses in that area increases, competition for the work increases. In addition the prospect of failure increases. Companies must lower their profit expectations just to stay in the market.

New businesses entering a market not only increase the likelihood of failure through competition, but also their very nature increases the possibility of failure. New businesses are very unstable. They don't possess some of the characteristics

that allow established businesses to weather financial hardships. New businesses in general do not have equity built to a point where if a problem occurs they can take losses and still survive. On the contrary, due to their riskiness, new businesses are less likely to secure loans capable of sustaining them through the hardship.

In addition to financial instability, new businesses lack the experience of older firms. Referring back to figure 3.1 it is clear that lack of experience is a key cause of business failure. Experience problems can be tied to different areas. In construction the company must not only be technically competent but also financially competent. A business which understands the trade of construction well but does not understand how to manage money will experience difficulty and vice versa.

Internal Factors Which Can Cause Failure

The external forces mentioned in the previous section will ultimately manifest themselves in some internal aspect of a business. Profits, current assets, and total revenues are some of the areas which can be affected by those issues. However in addition to forces external to a company, there are items over which the company has control which can produce effects which determine whether or not that company survives. These can be viewed as internal forces.

Prime among this category is having a poor cash-flow cycle.

This area relates to the issue of interest rates mentioned previously. A company however should have some control over when it receives a certain payment for work completed. Keeping a handle on accounts receivable, making sure invoices are submitted promptly and paid promptly can clearly reduce interest payments on borrowed money. If necessary, front-end loading a project's payment schedule can be done to minimize the difference between money expended and money owed.

It should be realized that a business does not have complete control over this matter. Late payment by an owner is not something done by the efforts of the contractor. MOnitoring and managing the cash-flow cycle however can be done. In fact if it isn't done an no attempt is made to minimize the time between work performance and payment, the contractor can clearly be losing possible profits.

A second area which is under the control of the business, is properly using assets. This area has two extremes, both of which are potentially damaging.

Placing all resources of a company in assets which are not liquid can accelerate the growth of the company but can also lead to the dramatic failure of the company. The money made by the company can be put into materials for another project, equipment, or office space all of which can help the company grow. However if money is needed quickly it would not be available until the assets could be liquidated. A technical insolvency where current assets do not meet current liabilities could result. On the

other hand failure to use assets to revitalize and stimulate the company can cause stagnation and loss of future prospective work. Company management must weigh the advantages of growth against the prospect of technical insolvency to determine the proper balance of asset usage.

Businesses must also make decisions on how to raise the funds necessary to preform its operations. The choice must be made between going into debt or increasing equity. Of the two increasing debt is more risky. Debt has the corresponding interest payments associated with it. Revenues must be substantially high as to adequately cover the repayment schedule. Failure to have sufficient revenue from the debt incurred will ultimately lead to bankruptcy.

Increasing equity either by increasing owner's equity or selling stock gives a company more flexibility in repayment. Choosing this course of action however may decrease owner's profits and control since they have to be spread over a wider base.

The costs required to produce the outcome of a business are perhaps the ultimate area of concern. While construction is associated with low fixed costs of doing business, operating leverage or the costs relative to profit for a project are of concern. Except for the case of heavy construction, equipment and other fixed costs are low. Most costs are associated with a specific project. Material, labor, and even equipment rental costs fluctuate from job to job and are not present if that job

is not active.

Cost control for a job is therefore of prime importance. Sufficient and timely cost control reports defining budgeted vs. actual costs are essential for ensuring profitability for a job. The ability to foresee cost overruns before they become unmanageable should be the goal of cost control reporting.

Since contractors rely on the same material suppliers and the same rental companies, the cost of labor and the method of operation are sometimes the only differences between the costs of contractors. Labor productivity and efficient techniques therefore are two areas which could mean the difference between success or failure. If a given contractor can do a job quicker because of better labor productivity or better methods that contractor will be well employed and profitable.

This chapter has listed several factors involved in determining whether or not a business will fail. However all of the areas whether they are external or internal ultimately show in the company's financial statement. Plain and simple, a company will succeed if it can make money. The data collected by Dun and Bradstreet showing poor profits as the prime reason for failure bears this out.

It is the company's managerial policies and decisions within the context of its external environment which will cause the company to make or lose money. Emery Toncre states "The major difference between a business that survives and one that fails depends upon how well the business owner has used management

tools" (Toncre 1984) Perhaps this statement should be generalized to how well a business owner makes financial decisions. Dun and Bradstreet's data shows that about 80% of all failures are attributed to financial causes.

A company which does not adequately manage its finances will ultimately fail economically. This failure may only be opportunity losses i.e. not meeting profit expectations or expectations of non-risk investments. The failure may also be negative profits and ultimately a negative net worth of the company which is business failure and bankruptcy.

CHAPTER 4

ANALYSIS OF BUSINESS FAILURE RATE FOR CONSTRUCTION

Introduction to Construction Failure Rate

Chapter 3 investigated some of the causes of business failure in the construction industry. For the study of the causes to be significant they must ultimately effect the pattern of business failure. This chapter will analyze the relationship of various causes of business failure and failure statistics. Chapter 5 will then take this process one step further and investigate the applicability of modeling business failure based on relationships discussed in this chapter.

The key indicator of business failure activity discussed so far has been Dun and Bradstreet's listing of total yearly failures in the construction industry. Figure 2.2 showed the change in this indicator over the period 1977-1986. The use of this statistic to define and analyze the state of business failure in the construction industry may be inaccurate. Since the measurement is only of the number of failures, the statistic does not take into account the size of the pool from which the number of failures is taken.

This may be misleading for the following reason. If the number of active construction companies increases significantly over time, the number of companies failing may also increase over the same period although the condition of the construction

industry may be stable or even better. Looking at the total number of failures without relating it to the number of possible failures therefore does not give a complete indication of the status of the construction industry and the possibility of failure for construction companies.

A more accurate indicator of the relative health of the construction industry and of failure tendency is the business failure rate. Dun and Bradstreet has routinely published failure rates for the cumulative total of the businesses it lists. The failure rate strictly for construction has only been published starting in 1984. Due to the importance of how this statistic has changed over time it is essential to find a method of calculating it.

Dun and Bradstreet in addition to maintaining failure statistics also maintains a listing of the number of active firms in different industrial categories for the previous year. These figures are published in Dun and Bradstreet's "Census of American Business". The complete pool of businesses analyzed to obtain the number of yearly failures is given in the section listing number of firms by sales volume.

The total number of firms for which construction was their primary business was obtained from this source. This in conjunction with the total number of failures was used to calculate a business failure rate for construction companies. In accordance with Dun and Bradstreet convention this statistic is displayed as the number of failures per 10,000 possible firms.

Figure 4.1 shows the change of business failure rate for construction companies over the period 1978-1986. Figure 4.2 is a comparison of the change of total number of failures and the change in failure rate over the same period. Figure 4.2 uses an index of 1978=100 to equally compare the two items.

On its own the change in business failure rate for construction companies demonstrates some interesting characteristics. Most significantly is the period 1979-1984. In this five year period the rate of failure soared from 20 per 10,000 (or 0.2%) to 112 per 10,000 (or 1.12%) an increase of 460%. With the exception of 1982-1983 the increase in failure rate was fairly constant. The period of drastic increase was preceeded and followed by slight decreases. The decrease from 1984-1986 however, did little to compensate for the previous increases and the failure rate in 1986 was still over 100 per 10,000 at 107.

Figure 4.2 demonstrates the importance of using failure rate as an indicator of industry tendency vice total failures. Although the graph of both statistics are similar in style, the growth of the failure rate index has not kept pace with the failure index. This corresponds to the fact that the number of companies in the construction industry has grown over the period 1978-1986. This growth therefore explains some of the growth in the number of failures per year. Specifically there were approximately 544,000 construction related businesses in 1978 and 658,000 in 1986 according to Dun and Bradstreet records.

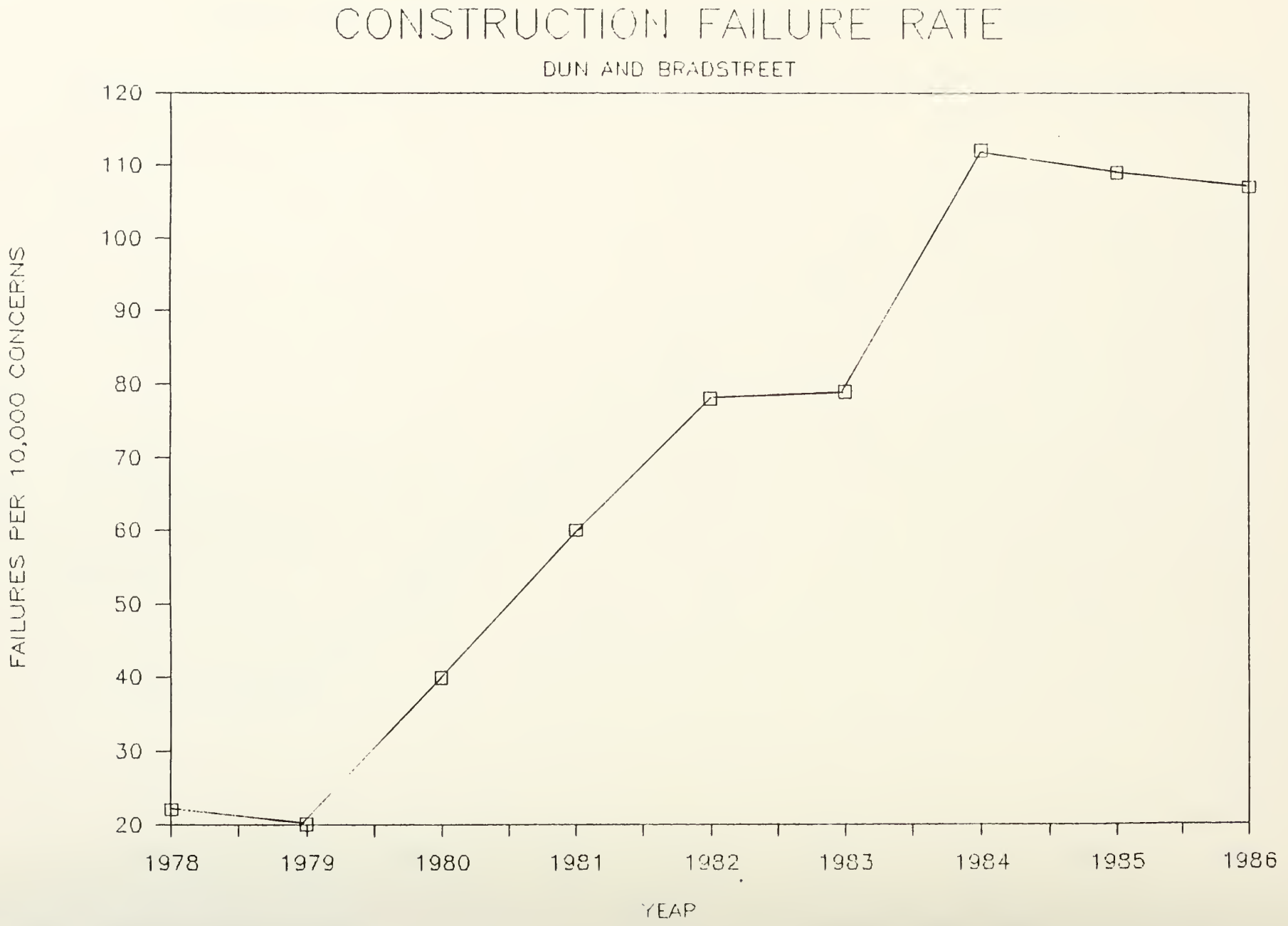

CONSTRUCTION FAILURE RATE
DUN AND BRADSTREET
FAILURES PER 10,000 CONCERNS
120
110
100
90
80
70
60
50
40
30
20
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR

Fig. 4.1

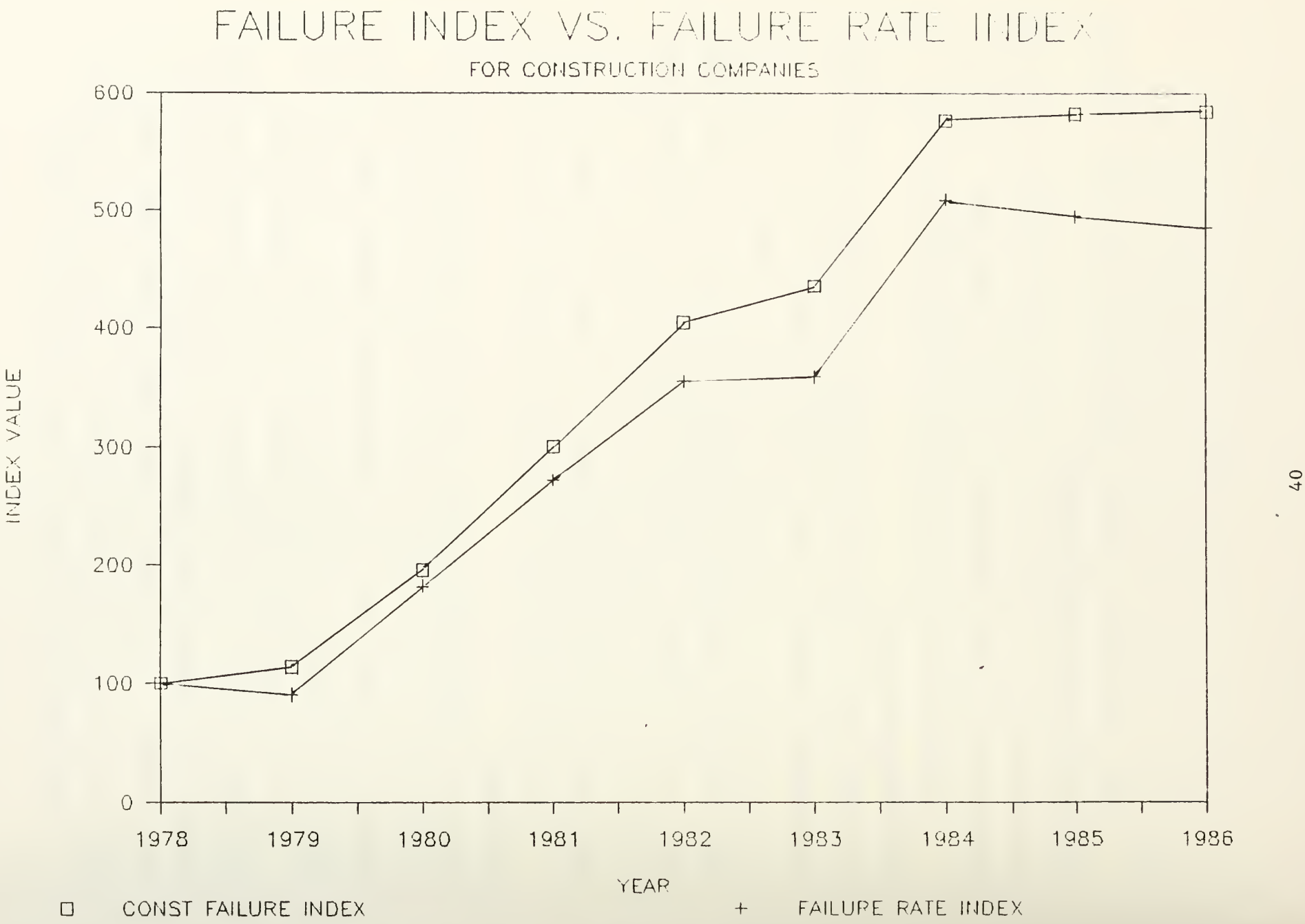

FAILURE INDEX VS. FAILURE RATE INDEX
FOR CONSTRUCTION COMPANIES
INDEX VALUE
600
500
400
300
200
100
0
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
CONST FAILURE INDEX
FAILURE RATE INDEX

Fig. 4.2

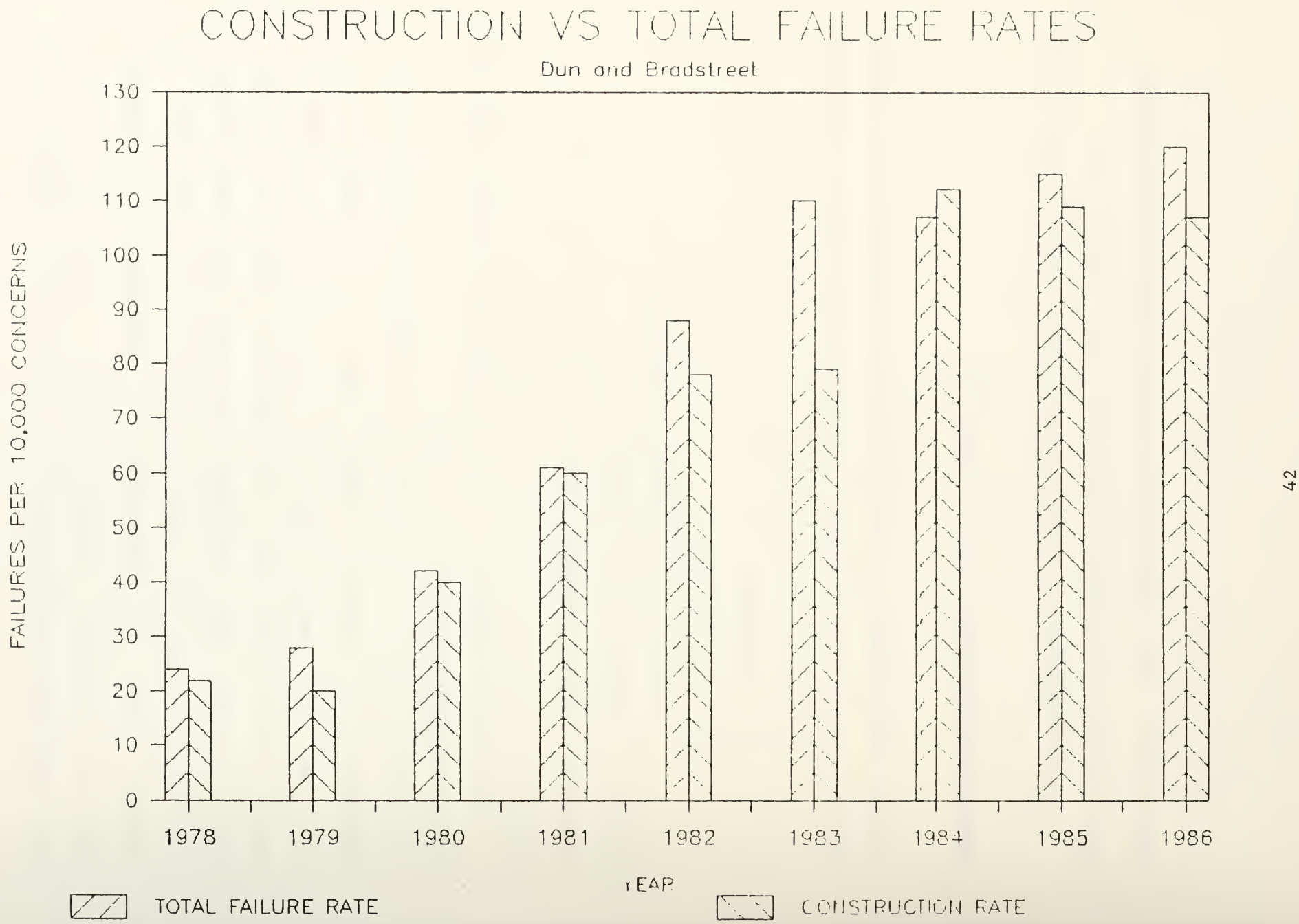
The tendency for failure in the construction industry therefore has not increased as much as plain failure statistics would suggest. The growth in the number of failures however has exceeded the growth in the number of companies. This explains the overall growth of the failure rate over the period of study.

It can be seen that the failure rate for construction companies was highly volatile during the period 1978-1986. An interesting comparison to the construction failure rate is the failure rate for all business tracked by Dun and Bradstreet. Figure 4.3 compares the failure rates for construction and all businesses.

The failure rate for construction is fairly consistent with the failure rate for all businesses. In fact the rate for construction has in general been slightly less than the total rate for all concerns. The failure rate for all businesses had seen a similar jump during the period 1979-1984 as had the rate for construction. In addition a leveling off period following the increase occurred. The 1986 rate of failure for all businesses was 120 per 10,000, a significant amount higher than the construction rate.

Construction firms therefore are no more susceptible to business failure than businesses in other industries. In fact the probability of failure for a construction company in 1986 was 12% less than the average company.

Still the rates of failure experienced in the last couple of years are the highest since the Great Depression. That fact


CONSTRUCTION VS TOTAL FAILURE RATES
Dun and Bradstreet
FAILURES PER 10,000 CONCERNS
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
TOTAL FAILURE RATE
CONSTRUCTION RATE

alone signifies the need of study in this area. However in raw terms the probability of failure for the average construction company is low. 100 firms per 10,000 equates to a 1% chance of failing in a given year. The realization that a firm must live with the chance over its entire life adds to the significance of rises in the failure rate. In addition the rate is not equal for all firms. Well established firms intuitively have a much lower probability of failure than newer firms. This reasoning will be investigated later in the chapter and leads to significance of new businesses to the failure rate.

The erratic behavior of the construction failure rate shown in Figure 4.1 can be related to industry forces which also vary over time. These industry forces were tied to the causes of failure in chapter 3 and include:

1) amount of construction activity
2) interest rates
3) inflation
4) new business activity

The changes in these forces, in various forms, can be compared to failure rate changes to determine their significance and impact.

Construction Activity and Failure Rate

The relationship between construction activity and failure rate can best be conceptualized through the theory of competition. When construction activity competition between

existing businesses increases. Lower profit margins, higher risk factors, and greater likelihood of negative profits result.

Continued decreases or stagnation in construction activity should ultimately result in increases in business failure. Figure 4.4 shows one measure of construction activity, the construction contract valuation index by F. W. Dodge. The index with 1977 equal to 100 was obtained from the Department of Commerce's Survey of Current Business.

The graph shows a clear decline in construction activity from the period 1979-1982. Following 1982 a steady rise in activity occurred with the rate of rise gradually decreasing from 1982-1986.

The comparison between the valuation index and construction failure rate can be made by placing both graphs in index form with both having 1978=100. Figure 4.5 gives this presentation.

From Figure 4.5 it can be seen that the drop in construction activity noted during the period 1979-1982 correlates to the largest rate of increase in the construction failure rate. The rise in contract value index from 1982-1983 has a corresponding leveling off in the failure rate. All of this is consistent with the general relationship that decreases in construction activity result in failure increases.

The period following 1983 however, is not consistent with the general relationship. The index for contract value is increasing from 1983-1986 however the index value for failure rate also increases. This relationship implies the need for

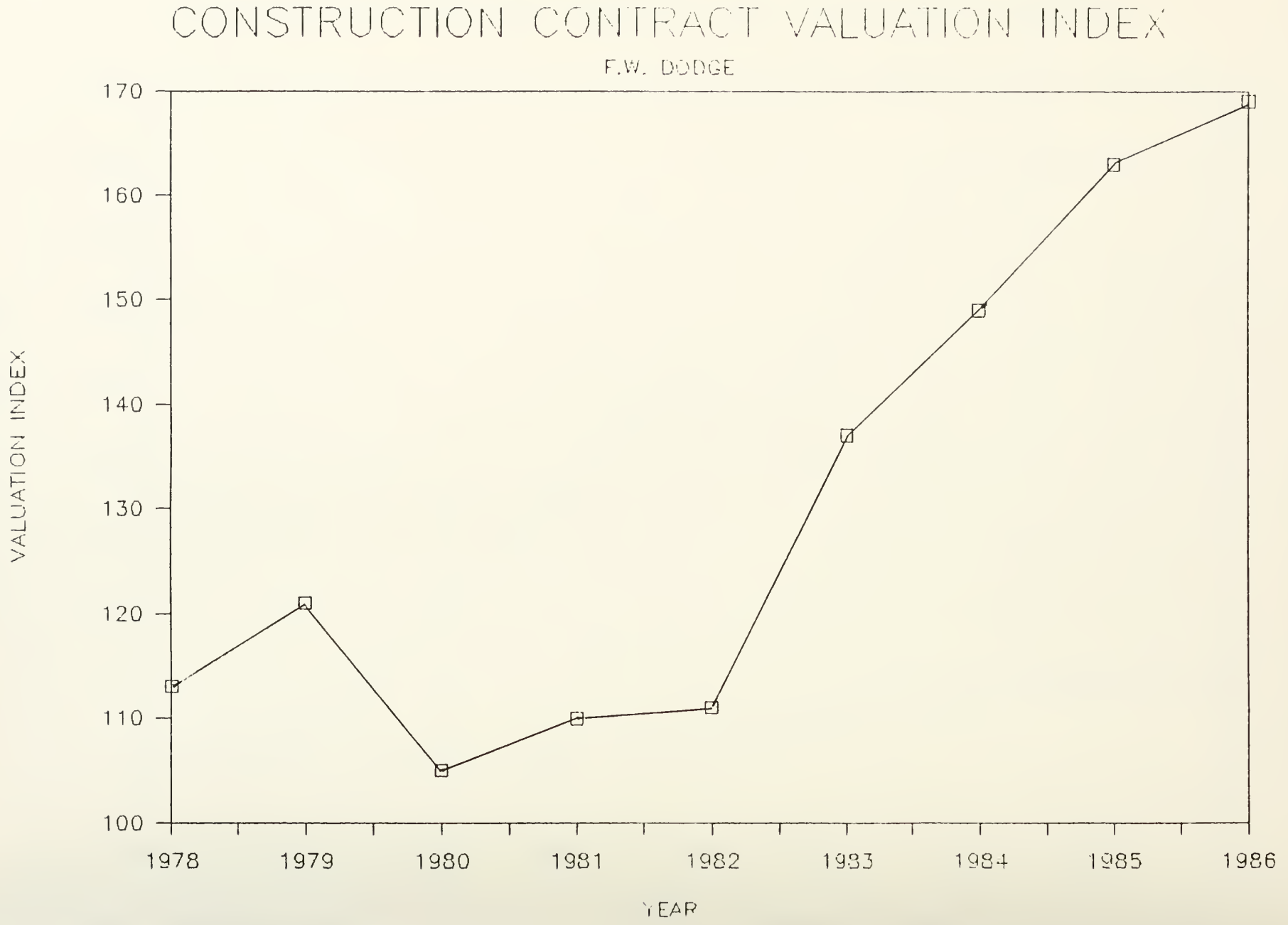
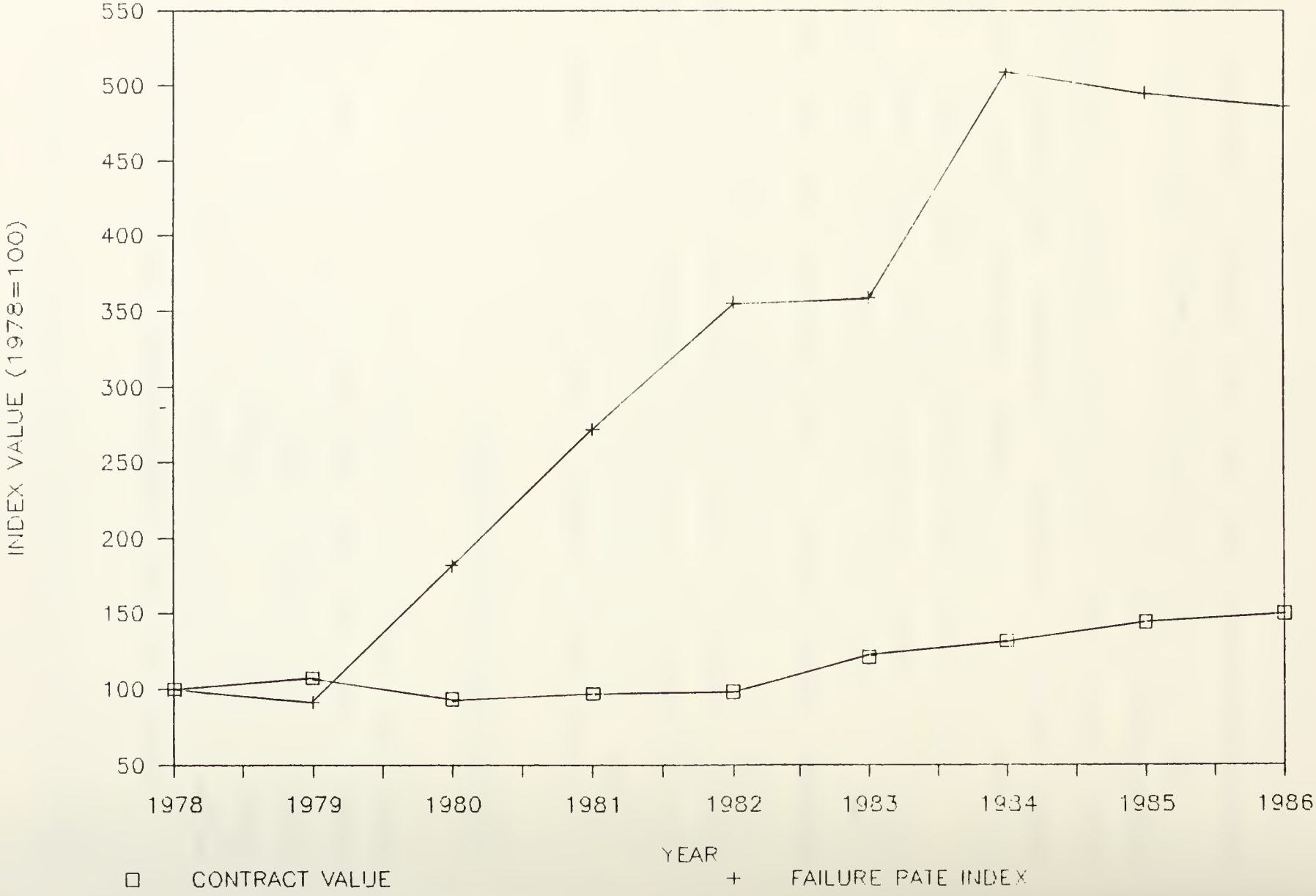

CONSTRUCTION CONTRACT VALUATION INDEX
F.W. DODGE
VALUATION INDEX
170
160
150
140
130
120
110
100
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR

Fig 4.4

CONTRACT VALUE INDEX VS. FAILURE RATE



additional factors to explain the activity of construction failure rate.

Another key point should be made about the relationship between the contract value index and the failure rate index as shown in Figure 4.5. The change in failure rate is clearly more dramatic and substantial than the change in contract value index. This indicates that small variations in the value index can have substantial effects on the failure rate.

Interest Rates and Failure Rate

As mentioned in chapter 3 the implication of changes in the interest rate which companies borrow money at can severely effect the profitability of construction companies. The need to borrow money to commence a project is almost always a fact of life in construction. Borrowing money cheaply with lower interest payments reduces the risk of negative profit on a job. The impact of project delays, and late payments which hurt the cash-flow cycle becomes less acute with lower interest rates.

Interest rates vary according to location, length of loan, and credit risk. It is difficult therefore to state a definitive rate charged to a construction business. The changes in interest rates however should follow a similar pattern no matter what the loan characteristics are.

For this paper the measure of interest rates is the federal intermediate credit bank loan rate. Figure 4.6 shows the changes


FED. INTER. CREDIT BANK LOANS
INTEREST RATE (%)
15
14
13
12
11
10
9
8
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR

Fig. 4.6

of this loan rate during the period 1978-1986. The substantial increase of over 80% from the period 1978-1981 is perhaps the most significant portion of the graph. The implications of this quick and significant change in the borrowing rate should be great.

After 1981 a gradual decrease in interest rates occurred with the exception of a slight increase from 1983 to 1984. The rate in 1986 however is still 20% higher than the rate in 1978.

To compare the effect of interest rates on construction failure rate the two values were indexed at 1978=100 so changes can be viewed on similar scales. Figure 4.7 shows this comparison

It would be expected that increases in loan rates would result in corresponding increases in failure rate. This relationship is evident during the period 1979-1981. However before that period the relationship does not hold.

This can possibly be due to a time lag between the rise in loan rates and the rise in failure rate. If the loan rate curve is shifted one year so that 1987 would be 1979, the relationship hold for the period 1979-1982.

After 1982 however the lag between the curves does not seem to hold. Specifically, the period 1984-1986 shows both curves on slight declines. The prospect of a time lag between changes in loan rate and changes in failure rate therefore seems uncertain. While it is logical that it would take a certain period of time for the new interest rates to effect company performance, the

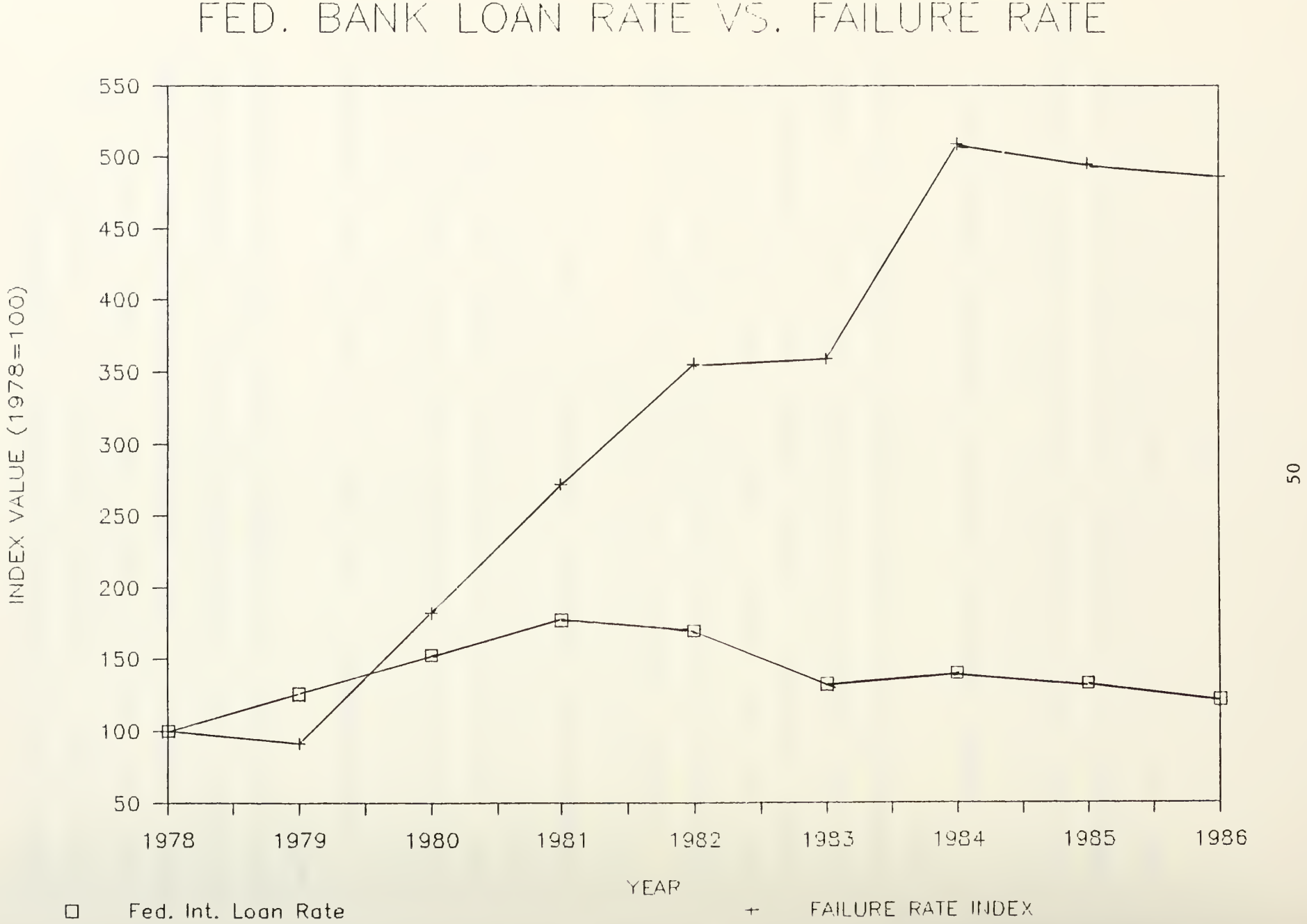

FED. BANK LOAN RATE VS. FAILURE RATE
INDEX VALUE (1978=100)
550
500
450
400
350
300
250
200
150
100
50
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
Fed. Int. Loan Rate
FAILURE RATE INDEX

Fig. 4.7

graph of the two variables is unclear in determining the relationship. A possible relationship that increases in loan rate take a period of time to cause increases in failure rate while decreases in loan rate almost immediately cause decreases in failure rate is suggested by the graph. A conclusion about the relationship would appear to require additional information however.

The decreases in loan rate from 1984-1986 had corresponding slight decreases in failure rate. The increases in loan rate on the other hand had corresponding significant increases in failure rate. This relationship would seem to suggest the need to additional forces to explain this lack of decrease in 1984-1986. In addition the substantial increase of failure rate from 1983-1984 is unexplained from just loan rates.

Another comparison with failure rate related to interest rates can be made using mortgage rates. Mortgage rates are applicable for a couple of reasons. First while they are not directly involved in interest payment made by contractors, they are a good indicator of loan interest rate activity. Changes in mortgage rates are extremely similar to changes in loan interest rates.

Secondly mortgage rates are an excellent indicator of residential construction activity. Rises in mortgage rates inevitably reduce residential construction activity. Residential construction is a significant portion of work to many of the companies tracked by Dun and Bradstreet under the heading of

construction. Therefore changes in residential activity should effect construction business failures.

Figure 4.8 is a graph of new home, first, conventional, mortgage rates. As expected the graph is similar to the graph of loan rates. Significant rises occurred in 1978-1981. Rates were fairly stable from 1981-1982 and then decreased thereafter to a point slightly above the rate in 1978.

Figure 4.9 showing mortgage rate vs. failure rate indices again indicates the possibility of a time lag particularly during the period 1979-1982. Mortgage rates do not explain the rise in failure rate from 1983-1984 but do suggest the downward trend from 1984-1986. However again it would be expected that the downward trend in mortgage rates would result in a larger decrease in failure rate.

Construction Cost and Failure Rate

Severe rises in construction cost and overall inflation related to construction can have an effect on contractor profitability. Failure to anticipate cost changes and guard against incurring additional costs can limit chances for success. Large increases in construction cost could affect construction failure rates.

As a measure of construction cost, the Department of Commerce's cost index with 1977=100 was used. Figure 4.10 shows the change over time. The largest increases can be seen to have

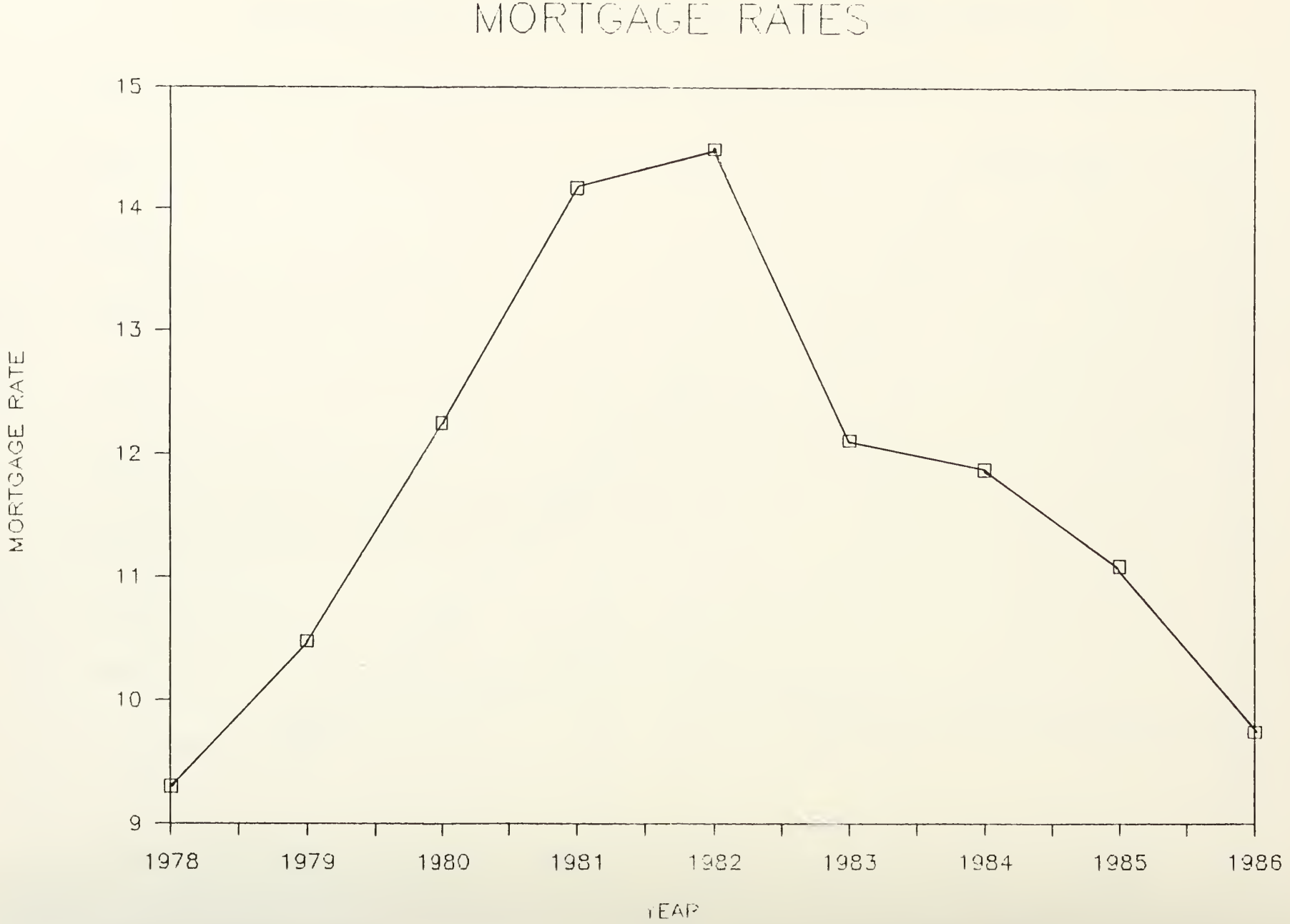

MORTGAGE RATES
MORTGAGE RATE
15
14
13
12
11
10
9
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR

Fig. 4.8

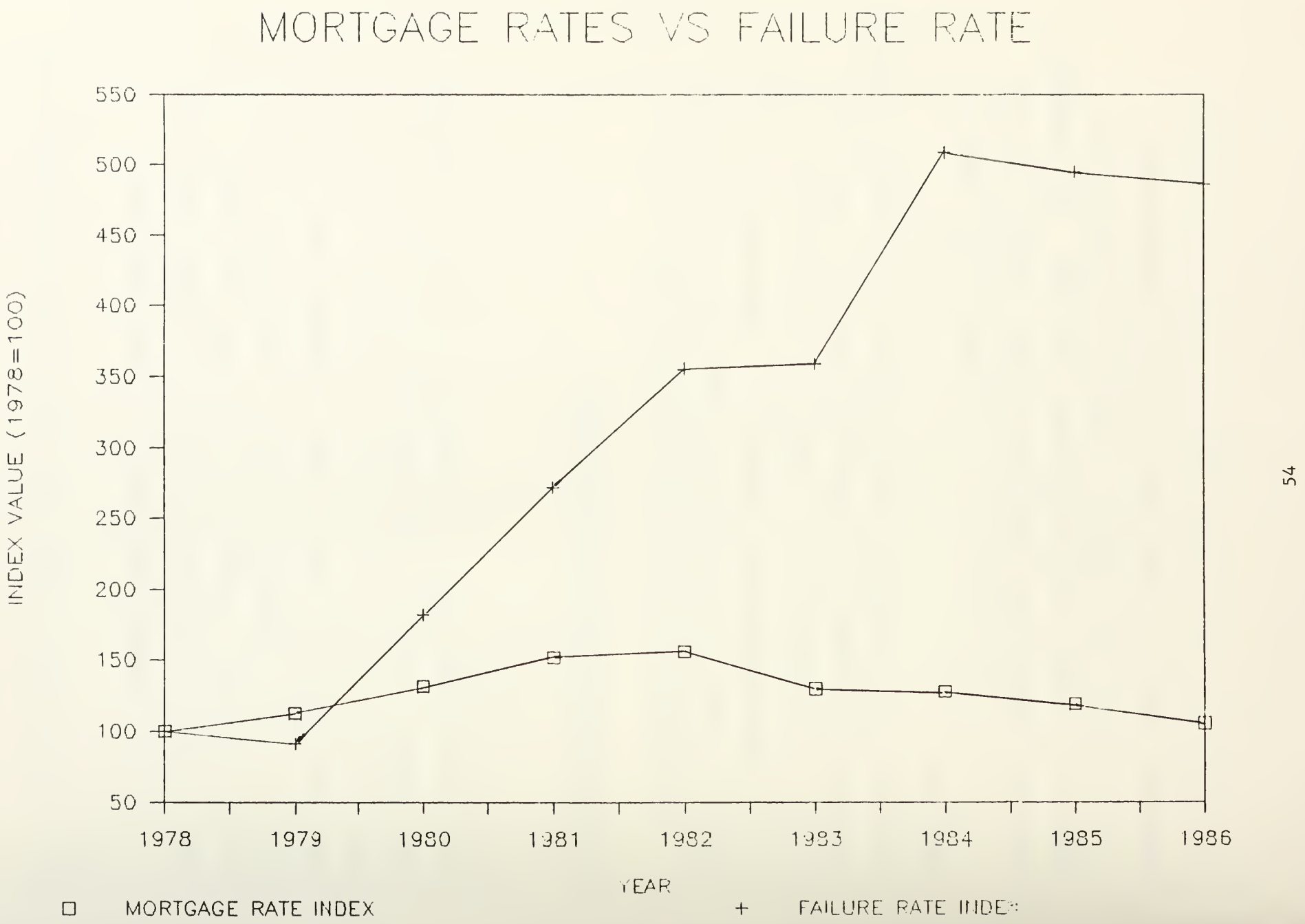

MORTGAGE RATES VS FAILURE RATE
INDEX VALUE (1978=100)
550
500
450
400
350
300
250
200
150
100
50
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
MORTGAGE RATE INDEX
FAILURE RATE INDEX

Fig. 4.9

been from 1978-1980. After 1980 the rise was fairly stable and moderate.

Again to measure the effect on failure rates the construction cost index with 1978=100 was graphed against the failure rate index. Figure 4.11 shows this relationship. From Figure 4.11 it is difficult to see any clear pattern between the cost index and failure rate. Some correlation exists with high cost increases and the high increase in failure rate from 1979-1981, however a general relationship does not seem to exist. The use of construction cost as a predictor of failure rate would seem to be limited.

New Business Activity and Failure Rate

The prospect of failure for a business just starting operation should be significantly higher than the prospect of failure for an established business. As explained in chapter 3 the lack of experience and of financial reserves places a new construction business in a precarious position. The lack of a reputation and of standard customers adds to the already unstable condition.

Dun and Bradstreet maintains statistics on the number of businesses entering the construction field. Figure 4.12 is a graph of the number of new businesses over time. The definition of a new business was changed in 1985 so the values of new businesses starting in that year can not be compared with

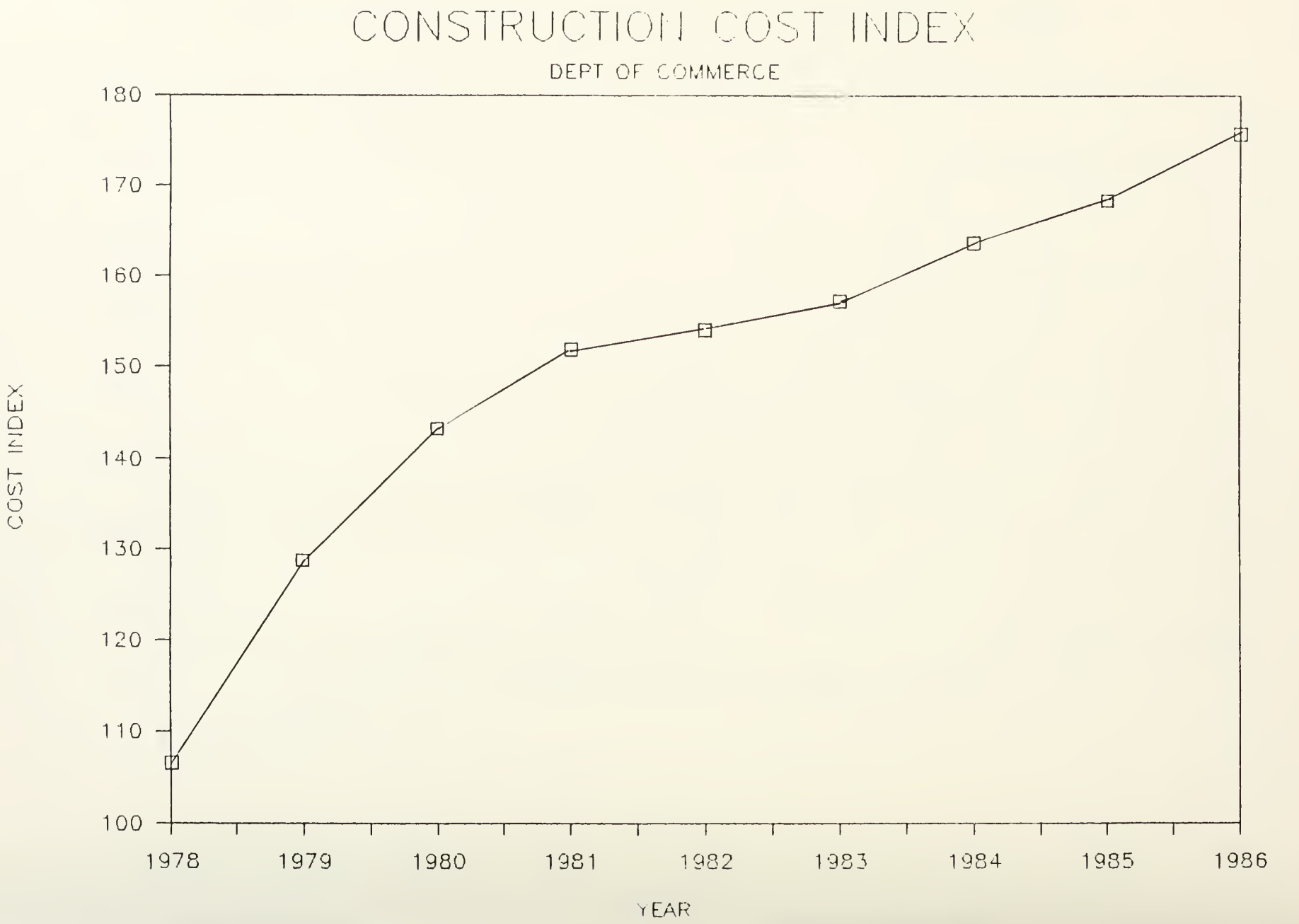
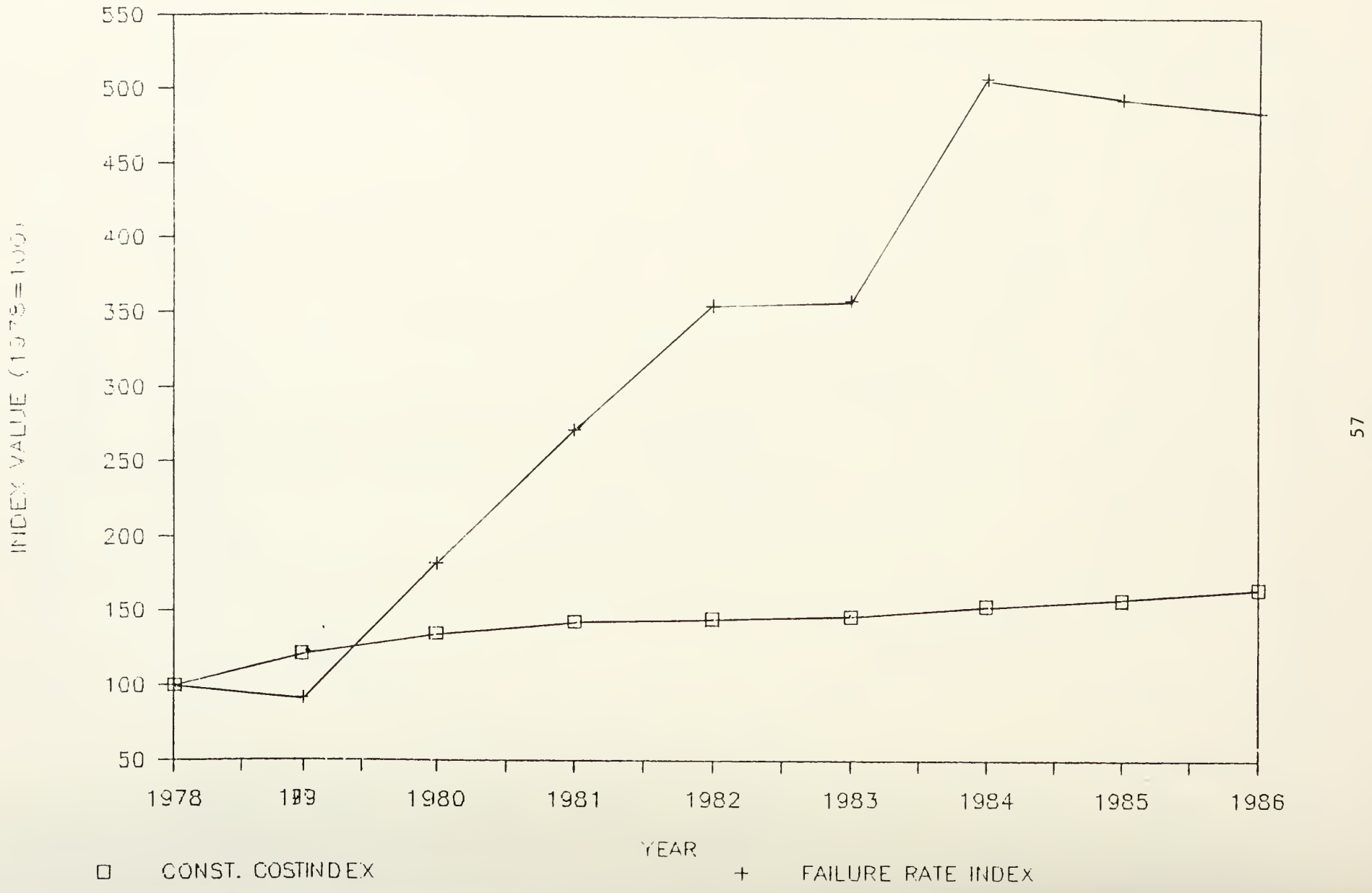

CONSTRUCTION COST INDEX
DEPT OF COMMERCE
COST INDEX
180
170
160
150
140
130
120
110
100
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR

Fig. 4.10


CONSTRUCTION COST VS FAILURE RATE
550
500
450
400
350
300
250
200
150
100
50
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
CONST. COSTINDEX
FAILURE RATE INDEX

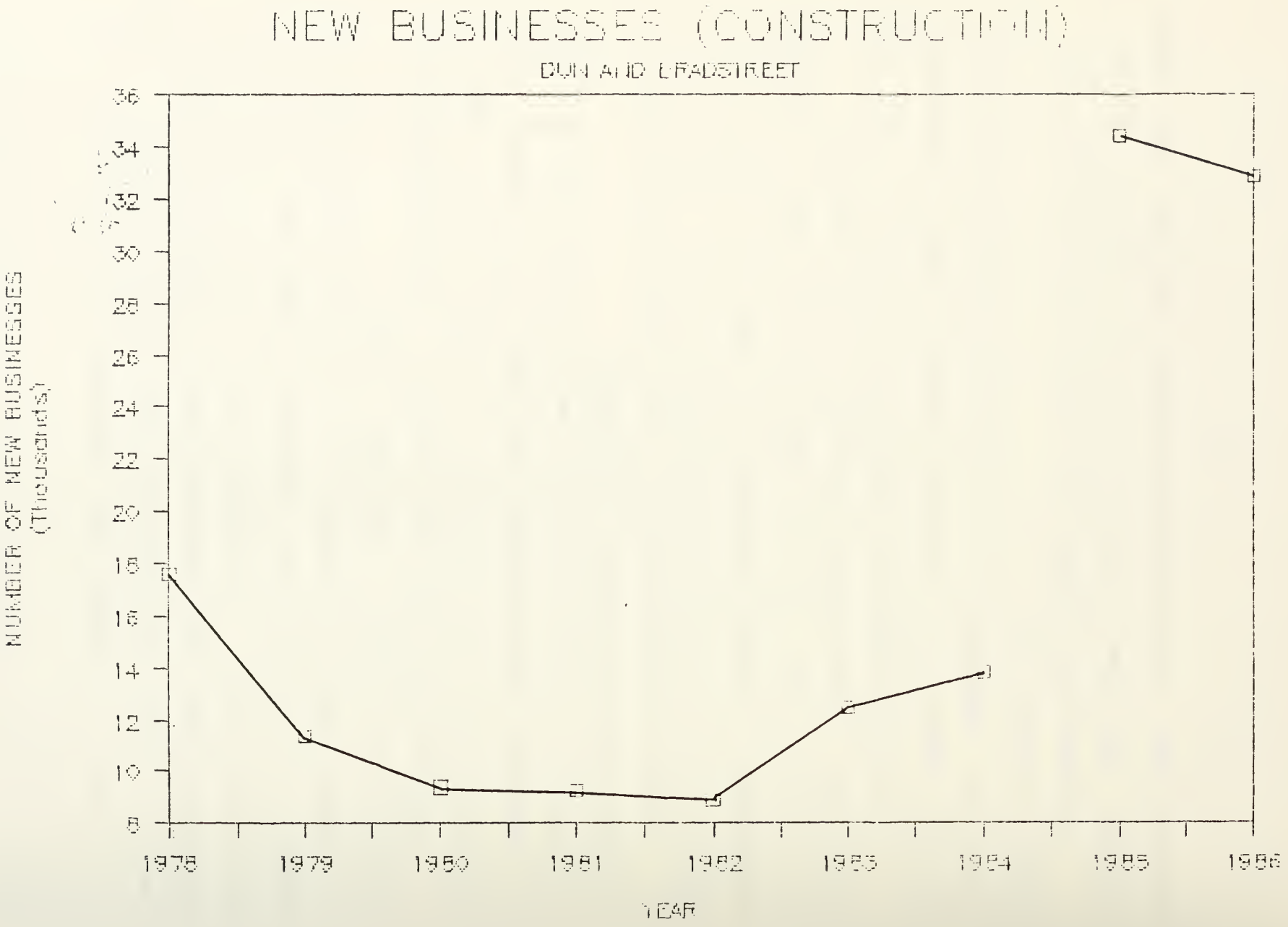

NEW BUSINESSES (CONSTRUCTION)
DUN AND BRADSTREET
NUMBER OF NEW BUSINESSES
(Thousands)
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR

Fig. 4.12

previous years. The trend of the curve however is still valid and important.

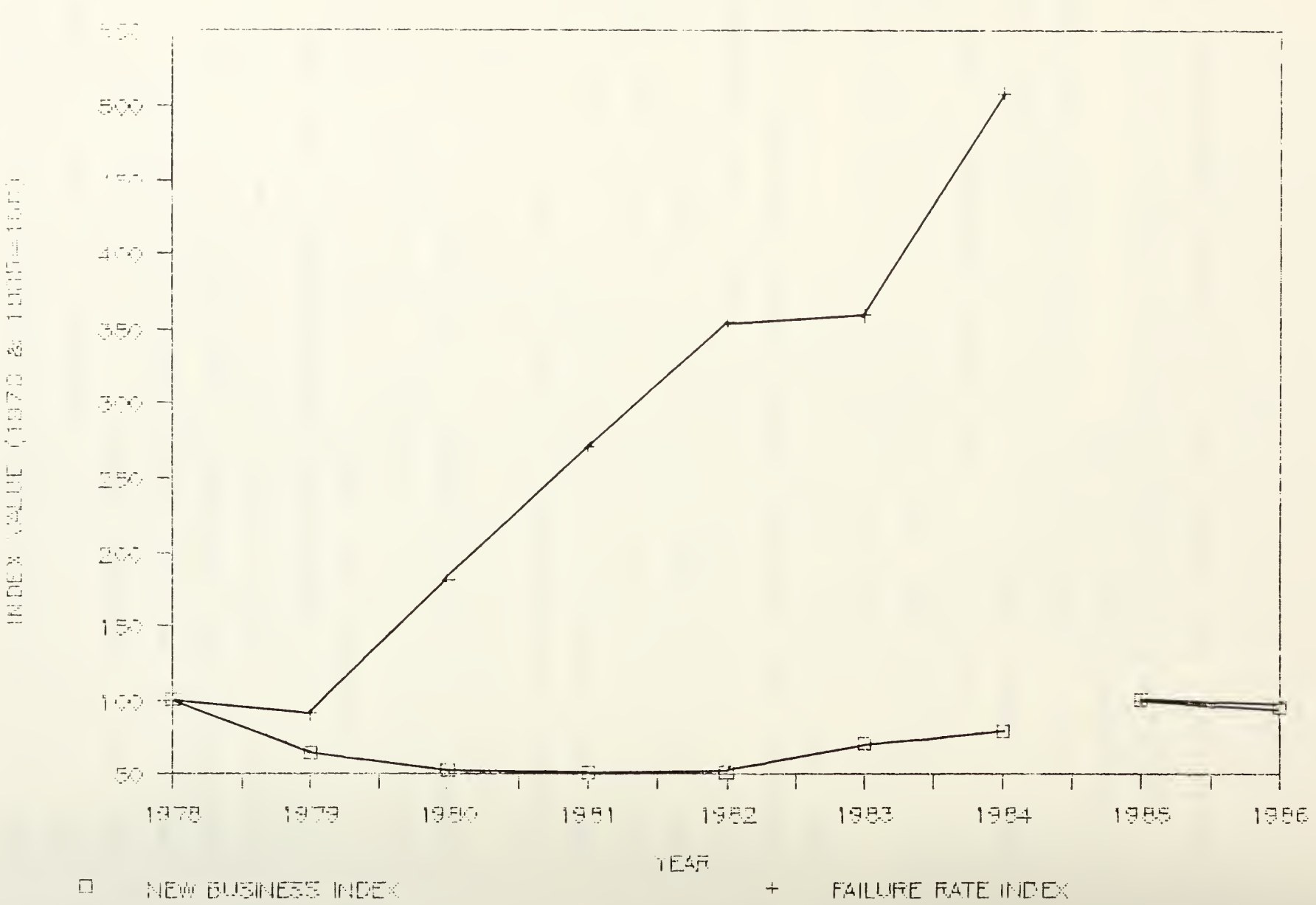
Figure 4.12 reveals some interesting characteristics. The general downward trend from 1978-1982 should be expected. It was previously shown that during this period construction activity was on the decline. In addition interest rates were high and in general the status of the construction industry was not good. It is logical that new businesses would be less likely to enter the construction industry at that point in time.

Following 1982 the trend reversed. New businesses again started entering into construction in larger numbers. Again this is consistent with the overall condition of the industry. The prospects for success with more construction activity and lower interest rates would seem to be greater.

Comparing indexed values of new business activity and failure rate also shows some interesting points. This presentation is shown in Figure 4.13. Both 1978 and 1985 have bee indexed at 100. The 1985 value of 100 was used to eliminate the effects of the revised definition of a new business.

If logical tendencies prevailed the two curves should rise and fall together.This obviously is not the case for the period 1979-1982. Reductions in new businesses were associated with rises in failure rate.

Following 1982 however, the trends of the two curves are similar. The rises in new businesses have corresponding rises in failure rate. In fact since construction activity, loan interest


NEW BUSINESSES VS FAILURE RATE
INDEX VALUE (1978 = 100)
500
400
300
200
150
100
50
1978
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
NEW BUSINESS INDEX
FAILURE RATE INDEX

60

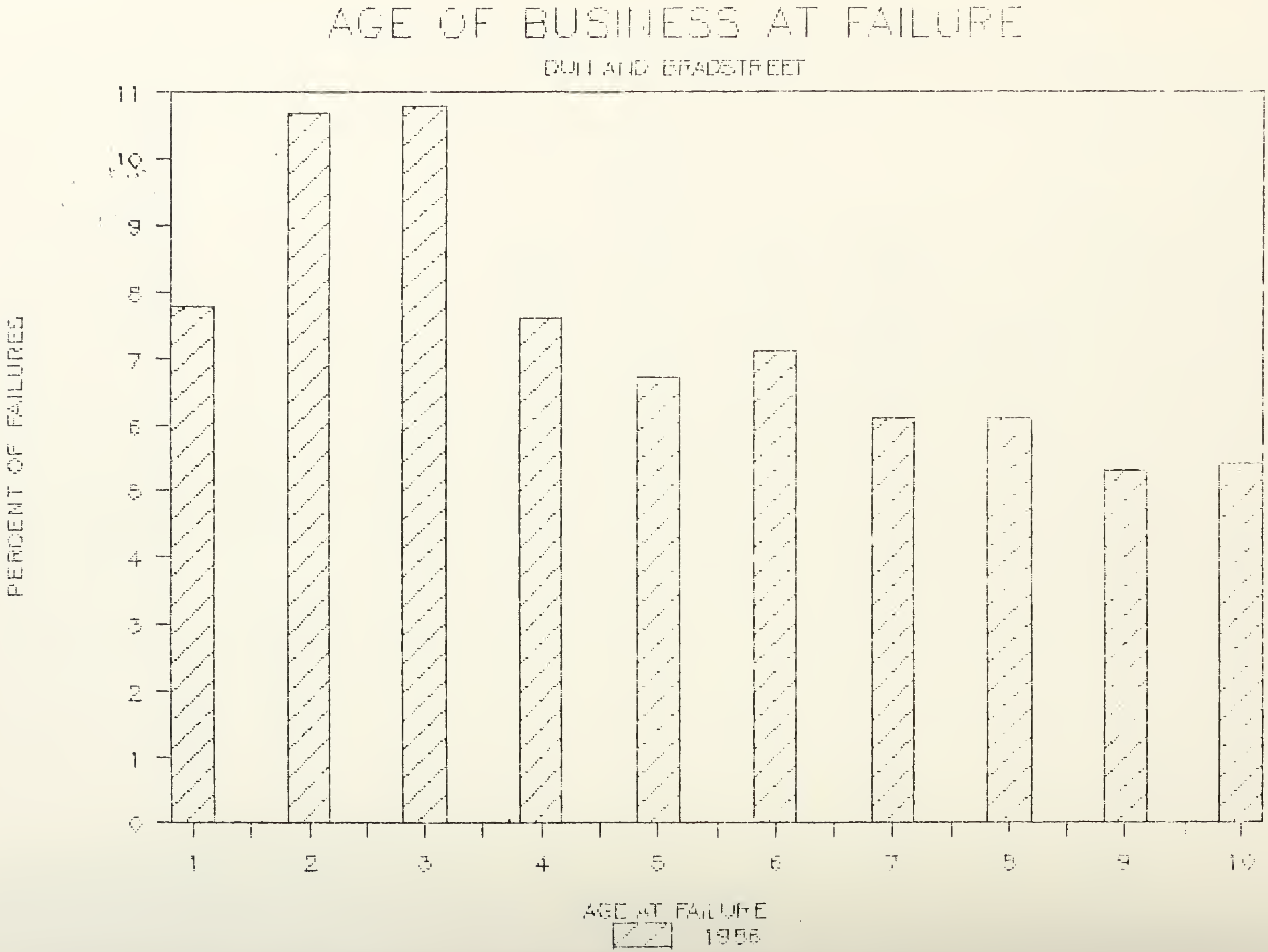
rates and construction cost can't explain the rises in failure rate from 1982-1984, and its continued high values, it appears that only new business activity can explain these trends. Therefore the fact that the failure rate has not fallen dramatically after increases in construction activity and decreases in interest rates, implies new business activity and failure of new businesses may be maintaining the high rate.

To investigate this possibility another statistic kept by Dun and Bradstreet can be introduced. This statistic is the percent of failures attributable to businesses of a given age.

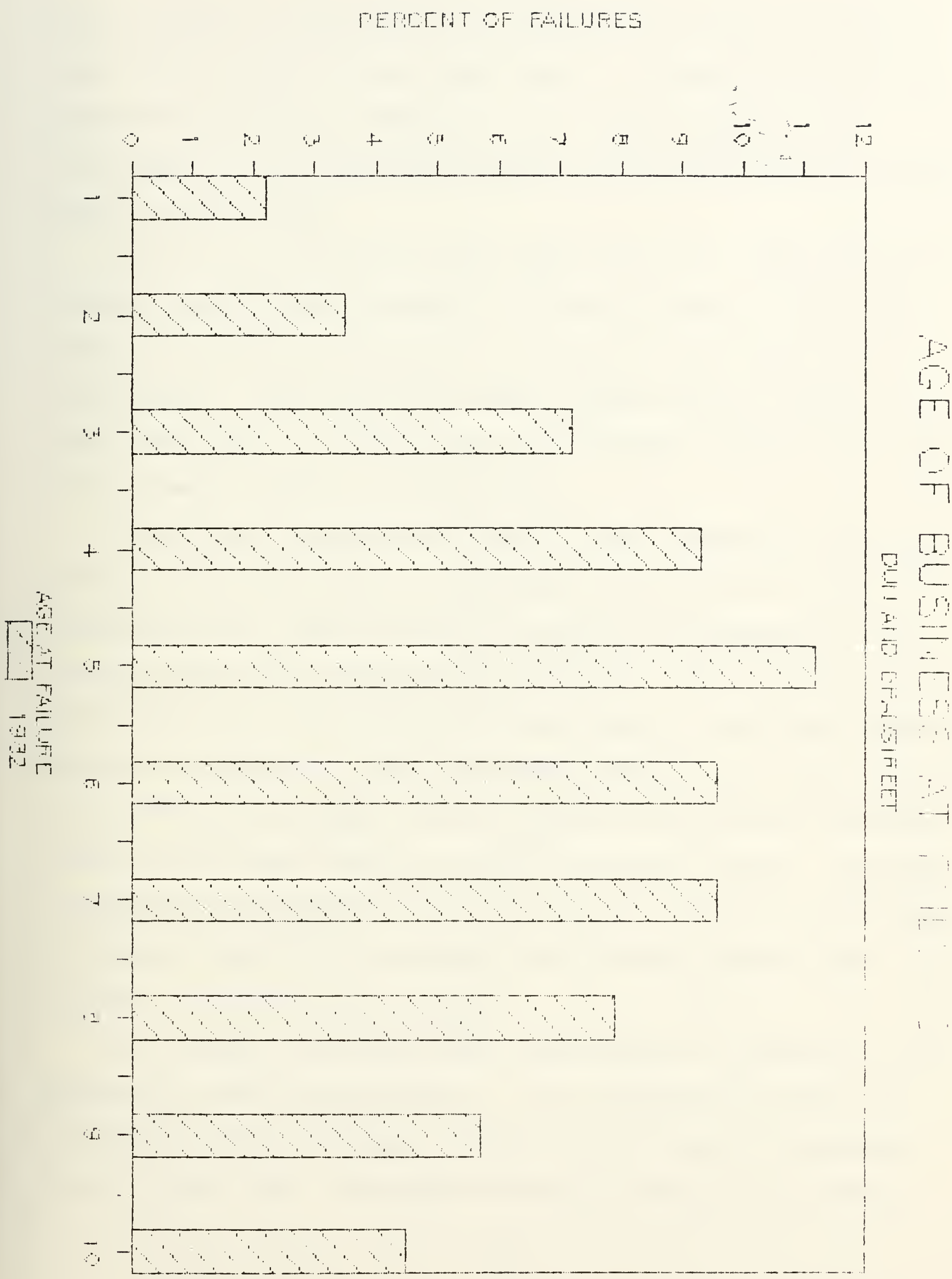
Three different years are to be compared to show the influence of new businesses in maintaining the high failure rate. These years correspond to critical periods in the change of new business activity over 1978-1986. 1978 was chosen since after that year new businesses started to fall dramatically. 1982 was the year which had almost the lowest number of new businesses and marked the point when new business activity increased. 1986 shows the most recent status of activity.

Figure 4.14 shows the percent failing for ages from 1 year to 10 years for 1986. This figure shows the influence of recent new businesses activity to the failures experienced in 1986. About 1/3 of all failure are accounted for in businesses 3 years old or less. In addition over 7.5% of the failures were caused by businesses in their 1st year.

Figure 4.15 as a contrast shows the percent of failures per age for 1982. The average age of failure was significantly older



AGE OF BUSINESS AT FAILURE
DUN AND BRADSTREET
PERCENT OF FAILURES
0
1
2
3
4
5
6
7
8
9
10
11
AGE AT FAILURE

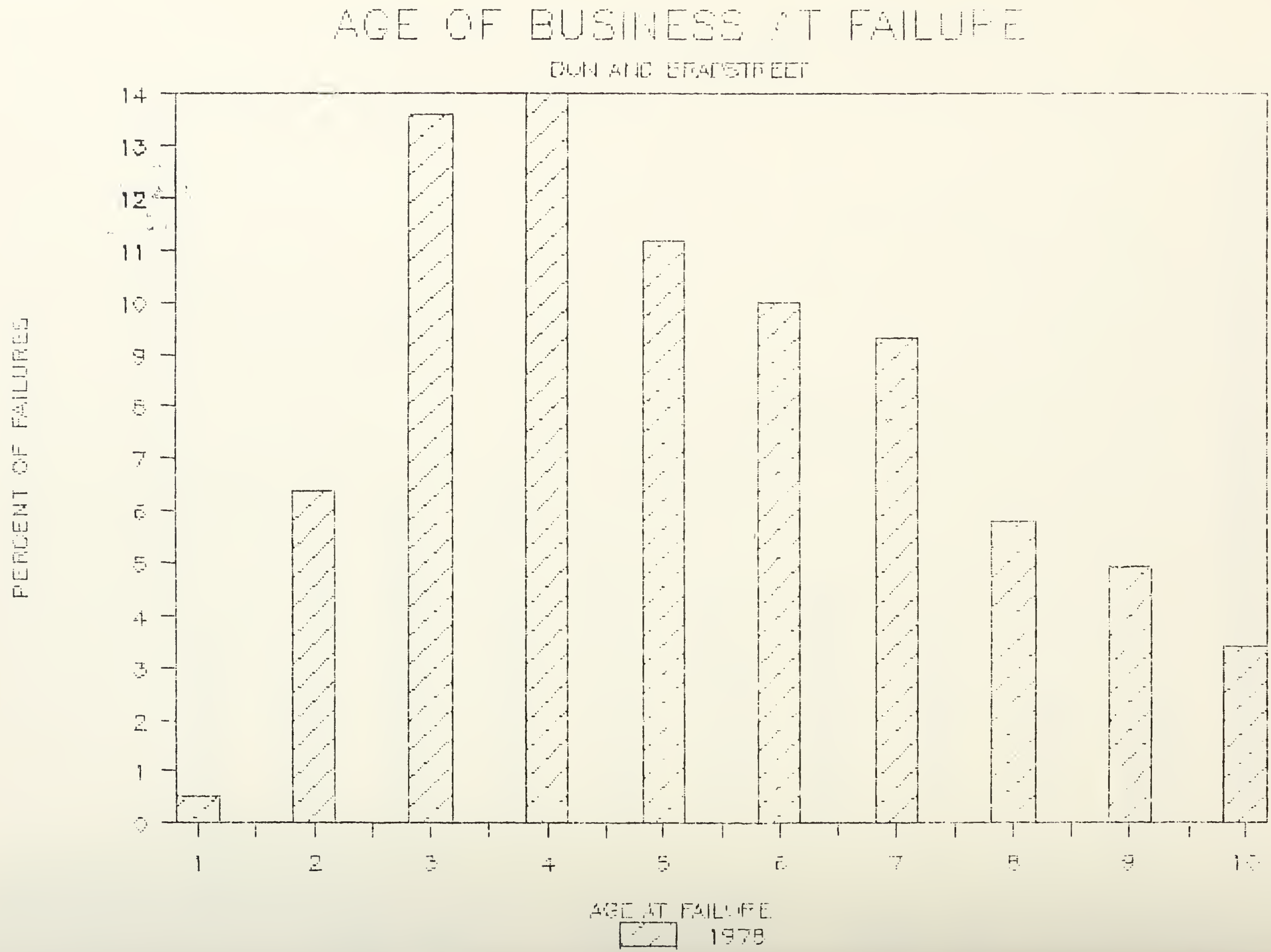

PERCENT OF FAILURES
AGE OF BUSINESS AT
DUN AND BRADSTREET
AGE AT FAILURE
1982
0
1
2
3
4
5
6
7
8
9
10
11
12
1
2
3
4
5
6
7
8
9
10

than for 1986. Only 2.2% of the failures were from companies less than one year old and less than 15% of failures were from companies less than 3 years old. The significance of new businesses on the failure rate during this period clearly is not what is was in 1986.

Figure 4.16 shows the same graph for 1978. Even though new business activity was as great in 1978 as it was in 1986, the impact of the new businesses on failures in 1978 was not as significant. Less than 1% of the failures were by companies in their first year. The failures in the second, third, and fourth years however picked up tremendously.

A possible explanation of this is that companies were less anxious to go the route of bankruptcy and failure in 1978. Companies would rather continue unproductive businesses for another year before succumbing to failure. The advantages of bankruptcy due to the latest laws were not in effect so companies were not as anxious to have the courts settle their fate. As the laws have been slackened and the stigma of bankruptcy has waned companies are more likely to enter bankruptcy earlier. This is one possible explanation of why the age of failure in 1978 would be greater than 1986 even though new business activity and economic conditions were similar.

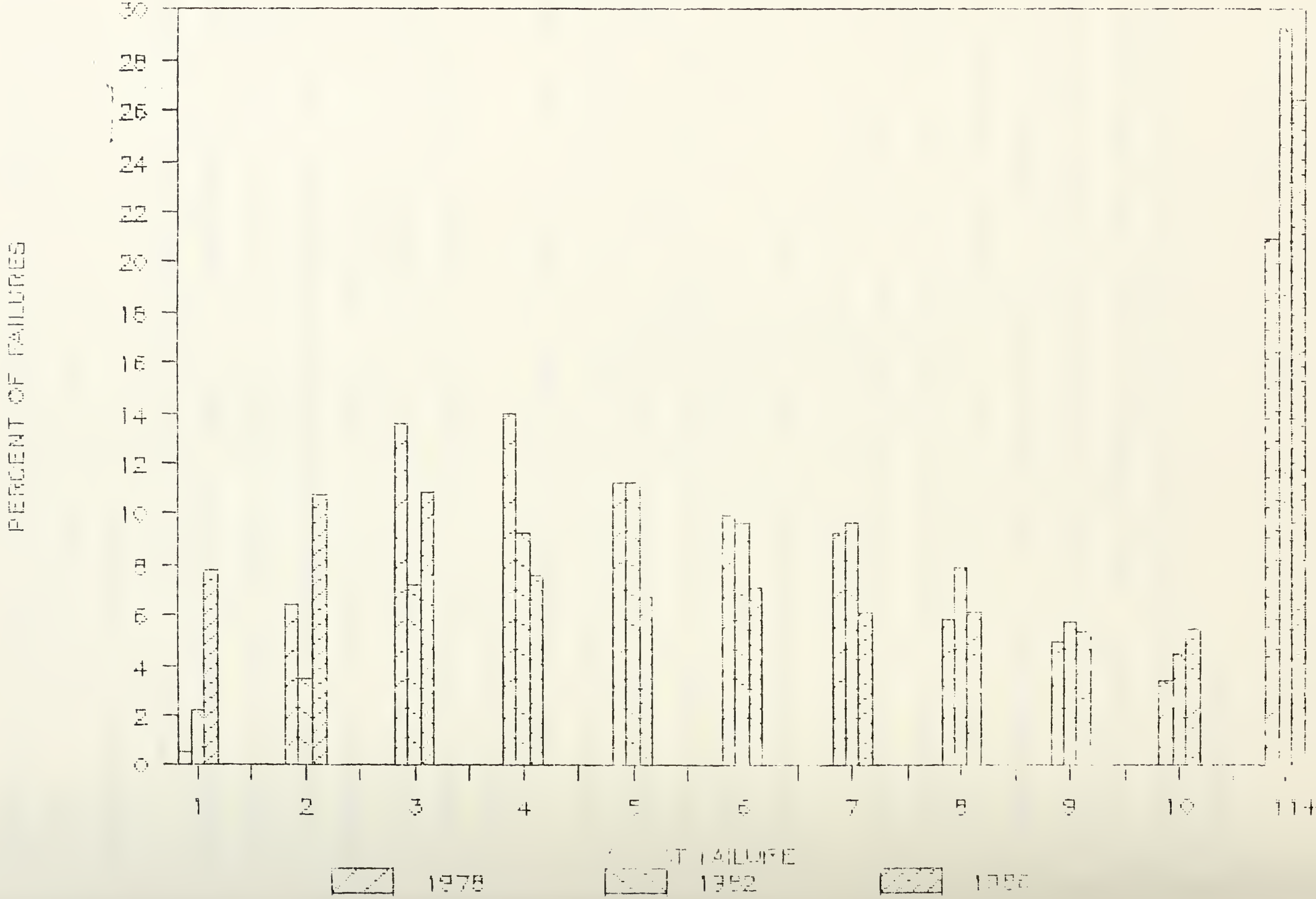
For clarity the three years are combined on Figure 4.17 to demonstrate their relationship. It is important to note that 1982 had by far the largest percent of failures for companies over 10 years old. In general the age of failure was greater



AGE OF BUSINESS AT FAILURE
DUN AND BRADSTREET
PERCENT OF FAILURES
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
AGE AT FAILURE
1978

AGE OF BUSINESS AT FAILURE

DUN AND BRADSTREET



during that period. This can partially be explained by the fewer number of new businesses entering at that time, but another explanation is relevant.

That period was the end of a long spell of low construction activity and high interest rates. It demonstrates the impact continuing poor economic conditions can have on established businesses. Although established businesses can handle some adversity, continued poor economic conditions will cause failure in weak established businesses. As a contrast, relatively good economic conditions in 1986 result in failures occurring in much younger businesses.

Since the percent of failures for 1986 for young companies was extraordinarily high, the impact of new businesses on the failure rate is even more significant in this period. Not only did the number of new businesses increase from 1982-1986 but the likelihood of them failing increased also. Their impact on maintaining a high failure rate is the result.

Another significant way of looking at this issue is to view the rate of failure for young businesses. In 1982 the greatest likelihood of failure may not have been until that company was five years old. In 1986 by far the greatest likelihood is in the first three years. The failure rate for a construction company three years old or less is substantially greater than the 107 per 10,000 average. Once a company is older than three years however, its prospects for avoiding failure start increasing dramatically.

Summary

The characteristics of the failure rate over the period 1978-1986 are complex. it is clear that no one factor can account for the variations experienced. Rather it would appear that construction failure rate is a function of several factors.

The failure rate curve had several interesting periods. The dramatic rise from 1979-1982 is certainly one. This rise can be attributed to extremely low construction activity, high interest rates, high mortgage rates, and possibly high inflation.

The slight increase from 1982-1983 and the dramatic increase from 1983-1984 can not be explained with the same variables. The increase in construction activity and decrease in interest rates would suggest a reduction in failure rate. The increase can be explained by the increase in new businesses entering the construction industry.

The continued high rate of failure, although slightly declining from 1984-1986, also is contrary to what indicators would suggest. Interest rates continued to fall and construction activity increased although at a slower pace than previous years. The lack of fall in the failure rate can be explained by the relatively high rate at which new businesses are entering construction and the high percentage of failure in these new businesses. The overall trend of a lower age at failure is indicative of the impact that new businesses are having on the high failure rate.

Another issue which must be stated is the possible impact of looser bankruptcy laws on the failure rate in general. While it is not possible to obtain concrete evidence on the impact of the realization among companies that bankruptcy has new advantages, it is suspected that the new laws have increased the speed at which companies declare bankruptcy and probably the amount that seek bankruptcy also. It is also suspected that this reasoning can not explain the entire growth of the failure rate in construction nor its continued high value.

CHAPTER 5

MODELING OF BUSINESS FAILURE RATE AND BANKRUPTCY IN THE CONSTRUCTION INDUSTRY

Introduction

The past influence of various economic factors on the construction business failure rate was investigated in Chapter 4. These factors can not only be used to explain past performance but also to predict future tendencies and changes. The use and development of a mathematical model to predict future failure rates will be explored based on factors previously presented.

Modeling of bankruptcy tendency can also be applied to individual companies rather than the industry as a whole. This chapter will also explore the applicability of models in determining the prospect of failure for construction companies. The analysis will introduce and use existing models developed outside the construction industry and analyze their usefulness in determining failure probability for construction companies.

Macro-Economic Modeling

Methodology

To model the overall prospect of failure in the construction industry the overall external factors in which construction

companies exist must be used. The model to be presented will employ as variables the industry indicators developed in Chapter 4. They include:

1) as a measure of interest rates: the Federal Intermediate Credit Bank Loan Rate
2) as a measure of construction activity: the Construction Contract Valuation Index by F.W. Dodge
3) as a measure of interest rates and residential construction activity: the new first home conventional mortgage rate
4) as a measure of inflation: the Department of Commerce's construction cost index
5) as a measure of new business activity: the number of yearly businesses starts from Dun and Bradstreet.

These variables have a significant range in values. To eliminate the effect of variable range, the change in variable was used for modeling. The overall form of the model was therefore:

$$\Delta \text{failure rate}_{ij} = C_1 \Delta X_{1ij} + C_2 \Delta X_{2ij} + \ldots + C_n \Delta X_{nij} + C_{n+1}$$

where: $\Delta \text{failure rate}_{ij}$ = the change in failure rate from year i to year j,

C_n = a modeling coefficient,

ΔX_{nij} = the change in variable X from year i to year j with the variable being the five listed above.

The objective of the model can be thought of as determining which variables contribute to the change in failure rate and to what degree they contribute. To perform the analysis of the model and determine coefficients, multiple linear regression was used. Multiple regression analysis is a process which finds the best fit coefficients for a series of independent variables set equal to one dependant variable. As a by-product of multiple regression analysis the significance of the combination of variable as well as the significance of individual variables can be determined.

Using this processes therefore the five variable thought to have a possible influence on failure rate can be used in various combinations to determine the best combination. The relative coefficients will be determined as well as the influence of individual variables on failure rate.

The multiple regression analysis for this model was performed on a Macintosh computer. In particular the program Statview was used. This allowed the rapid analysis of various combinations of variables.

There are two significance tests for multiple linear regression. The first is a test for the significance of regression. This test determines if there is a relationship using the combination of variables employed and the dependant variable. The test also determines the significance of the relationship so that different alternatives can be compared to determined which provides a better modeling of the dependant

variable. The test for significance of regression uses the hypotheses:

Ho: all coefficient are zero and

H1: at least one coefficient is not zero.

The test is made using an F statistic calculated by dividing the mean square of regression by the mean square of error. The hypothesis that all coefficients are zero can be rejected if:

$$F_o > F_{\alpha,k,n-k-1}$$

where: alpha is a measure of the significance of the relationship,

k = degrees of freedom of regression,

n-k-1 = degrees of freedom of error.

If Ho is rejected at least one of the independent variables contributes significantly to the model. The larger Fo is the greater the significance of the model is.

The second test for significance is on individual variables. This test is to determine the usefulness of individual variables on the whole model. The hypotheses for the test are:

Ho: the coefficient for the variable is zero

H1: the coefficient is not zero.

If Ho is rejected the variable contributes significantly to the model. Ho can be rejected if:

$$t_o > t_{\alpha/2,n-k-1}$$

where: alpha defines the significance,

n-k-1 = the degrees of freedom of error.

The values of percent change for the variables applied to

the model are listed in Appendix B. The values for changes between 1984 and 1985 had to be omitted since the change of new construction businesses can not be calculated. The definition of a new business was changed in 1985 so the 1985 value can not be compared with 1984's value. The changes between the remaining years from 1978-1986 were used to develop the model. All values used were percents.

Analysis of Results

The multiple regression analysis performed generated the following model as the best predictor of change in construction business failure rate:

change in failure rate = 2.1(change in new business) + 1.8(change in Fed. Int. Bank Loan Rate) - 3.9 (change in contract value index) + 44.8

Figure 5.1 shows the output for the regression analysis for these three variables. Figure 5.1 is separated into three parts. The first part shows the significance for the three variables in combination and the degrees of freedom for the test. The second part shows the actual values calculated by the regression analysis and also the t values used to determine if individual variables are significant. The third section shows variable values for different confidence intervals. The significance test

Multiple Regression Y_1 :FAILURES 3 X variables

DF.	R.	R-squared.	Adj. R-squared.	Std. Error.
6	.994	.987	.975	6.102

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	3	8692.203	2897.401	77.82
RESIDUAL	3	111.697	37.232	p = .0024
TOTAL	6	8803.9		

No Residual Statistics Computed

Note: 1 case deleted with missing values.

1

Multiple Regression Y_1 :FAILURES 3 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	44.844				
NEW BUSINESSES	2.108	.201	1.292	10.488	.0019
CONTRACTS V...	-3.91	.316	-1.109	12.385	.0011
FED. INTER. CR...	1.801	.248	.82	7.258	.0054

2

Multiple Regression Y_1 :FAILURES 3 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
NEW BUSINESSES	1.468	2.747	1.635	2.58	109.99
CONTRACTS V...	-4.914	-2.905	-4.653	-3.167	153.397
FED. INTER. CR...	1.011	2.591	1.217	2.385	52.676

3

Fig. 5.1

for the three variables in combination results in:

$F_o = 77.82$

$F_o > F_{\alpha,k,n-k-1}$ for alpha = 0.1 $F_{0.1,3,3} = 29.46$

The significance tests for individual variables:

for contract value index, t = 12.385

for new businesses, t = 10.488

for fed. int. loan rate, t = 7.258

for alpha = 0.01, $t_{\alpha/2,n-k-1} = 5.841$

Therefore all three variables are significant and their combination is significant.

Not only does the model make sense statistically it also makes sense logically. The negative coefficient for contract value index indicates decreases in construction activity increase failure rate. Both of the other variables have positive coefficients so increases in loan interest rates and new businesses increase failure rate.

Since contracts value index had the largest coefficient, this model indicates that changes in that variable effect failure rate the most. Both new business activity and loan rate change are about equal in their influence.

The printouts of the other regression analyses performed using different combinations of variables are contained in Appendix B. From the other runs performed it is clear that the variables in the final model are by far the best predictors of

construction failure rate change.

First it is clear that two variables alone can not predict failure rate change. All runs with two variables had F test values less than seven which means a low significance of prediction. Even the analysis of mortgage rates (which to some extent measures both interest rates and residential construction activity) and new business activity resulted in an F test value of less than three.

From the sequence of different analyses it is also clear that change in construction cost is not an indicator of change in failure rate. This confirms what was suspected in Chapter 4 with the graph of both failure rate and construction cost using a similar index value. All runs with construction cost resulted in lower F test values than if construction cost was omitted. In addition the t values for construction cost always indicated construction cost was not a significant predictor of failure rate.

The change in federal intermediate credit bank loan rate turned out to be a better predictor of failure rate than mortgage rates. This should be expected since it should more closely indicate the loan rate being paid by construction companies.

A final point about the collection of analyses run on the variables is that there was no evidence of a time lag between the variables and failure rate change. One year time lags for the variable loan rate, mortgage rate, and new businesses were attempted but they all resulted in very low F values. From this

it should not be concluded that no time lag exists between variable changes and failure rate changes, rather it only appears that the time lag is not one year.

Additional research into the possibility of lags that are represented by months not years is needed. This research can be conducted similarly to the analysis for this paper only monthly changes in variables should be used. Another possibility that is suggested by the information in Chapter 4 is that time lags only occur in changes which increase failure rate. In other words it takes a period of time for negative influences to manifest themselves in failure rate increases. If conditions improve however, failure rate may fall with little or no time difference. Again additional research is needed to analyze this possibility.

Model Limitations

The model should not be taken as an absolute indicator of changes in construction failure rate. The statistical analysis shows, as would be expected, there is not a complete correlation. In addition to the possibility of some time lag other factors may be effecting the model.

The possible impact of the new bankruptcy law certainly is not accounted for in the model. The possibility of more companies seeking bankruptcy protection due to legal advantages and the possibility of a stronger company after reorganization can not be quantified. Therefore the possibility can not be

modeled.

Another impact on the model was the lack of knowledge of new business activity from 1984-1985. Since Dun and Bradstreet revised their definition of a new business in 1985 the change in new businesses from 1984-1985 as well as change in all other variables had to be omitted. The model therefore does not reflect changes between 1984-1985.

The most significant limitation of the model is that the model is only for a given period of time. It is uncertain how the model would perform in other periods. The model should be analyzed with future values to determine its adequacy and to update its coefficients.

Modeling of Company Bankruptcy Tendency

A distinct and different modeling technique from that presented so far can be applied to characteristics of individual companies to determine their likelihood of bankruptcy. Modeling of this nature has been performed on different company groupings but never strictly for construction companies in the United States. A model was developed in Great Britain for construction companies. Mr. Franco Abbinante discussed the applicability of that model to U.S. construction firms in his Special Research paper. (Abbinante 1987)

Modeling of bankruptcy tendency for companies uses traditional financial ratio analysis. The values of these

financial ratios for a group of companies which have gone bankrupt and a group which have not are gathered. A statistical analysis is performed on these ratios to determine which are relevant to the fact that certain companies went bankrupt while others did not. A model describing the tendency of these companies toward bankruptcy is then developed.

Traditional financial ratios take items from company balance sheets and income statements. These ratios allow the company to be compared against other similar companies. Also a company's progress can be tracked by looking at the change in these ratios over time.

Financial ratios can be separated into four categories:

1) liquidity ratios are a measurement of current asset to current liabilities which can also be viewed as a likelihood of technical insolvency

2) leverage ratios are a measurement of the debt of a company compared to other aspects of the company

3) activity ratios are a measurement of the revenues generated by the company for given assets or other aspects of the company

4) profitability ratios are a measurement of profit to other company characteristics like assets or revenues. (Halpin 1985)

Financial ratios cover all aspects of a company's condition. The proper use of financial ratios can therefore give a good indication of the strength of a company and consequently its

probability of failure.

Altman's Z-Score Model

A pioneer in the field of predicting business bankruptcy is Edward Altman. In the late 1960's he developed a model for predicting bankruptcy tendency using a sample of 66 manufacturing companies. Half fo these companies had gone bankrupt. By analyzing different financial ratios of the 66 firms he developed a model which would fairly well distinguish between which of the 66 went bankrupt and which did not. He called this model the z-score model and its form was:

$$Z = 0.012A + 0.014B + 0.033C + 0.006D + 0.999E$$

Where: A = working capital/total assets

B = retained earnings/total assets

C = earnings before interest and taxes/total assets

D = market value of equity/book value of total liabilities

E = sales/total assets

Note the financial ratios that comprise the model cover all aspects of the company:

A measures the liquidity of the company

B measures the financial reserves of the company and to some degree indicates that younger firms without time to build high retained earnings will be more likely to fail

C measures the productivity of the company's assets

D is an indirect measurement of how much a firm's assets can decline in value before liabilities exceed assets and insolvency occurs.

E is an activity ratio or a capital turnover ratio indicating the firm's sales generating capability for given assets. (Altman 1983)

When presented this model was shown to be a good indicator of bankruptcy tendency within 2 or 3 years from the time for analysis. Using the model if the z-score calculated was less than 1.81 this meant the company was going to go bankrupt. Z-Scores greater than 2.99 meant the company was not going to go bankrupt. If the z-score was between 1.81 and 2.99, the bankruptcy tendency of the company was unclear.

Z-Score Modeling and Construction Companies

The z-score model was developed from companies which were not involved with construction. The group of companies used to develop the model were fairly consistent in size. No firm with assets lower than $1 million was used and no firm with assets greater than $25 million was used. In addition as the ratios chosen suggest, all companies were public.

The applicability of this model to construction companies is therefore unclear. To analyze how this model perform with construction companies, seven companies who are involved with

construction were chosen. These companies were:

1) Blount Inter.
2) Turner Corp.
3) Halliburton Co.
4) Morrison Knudsen
5) Flour Corp.
6) Perini Corp.
7) Dravo Co.

These firms are not solely involved in construction. At worst however, they have subsidiaries who are some of the largest construction companies in the U.S. The construction portion of all of these companies is significant to the total business of that firm. All of the firms however exceed the upper limit on assets used when the z-score model was developed.

The primary reason these companies were chosen is that the data required for using the z-score model was readily available through Moody' Industrial Manual. All of the data used was from 1985 balance sheets and income statements.

A computer program in BASIC was developed to calculate the z-score for companies. That program as well as the printouts of runs calculating the z-score of the seven companies is contained in Appendix C. A summery of the z-scores is shown in Figure 5.2.

From Figure 5.2 it is clear that the z-score model predicts bankruptcy for Turner Corp. and Flour Corp. sometime before 1988. The bankruptcy prospects for Blount Inter, and Dravo are unclear. Only Halliburton, Morrison Knudsen and Perini are clearly not

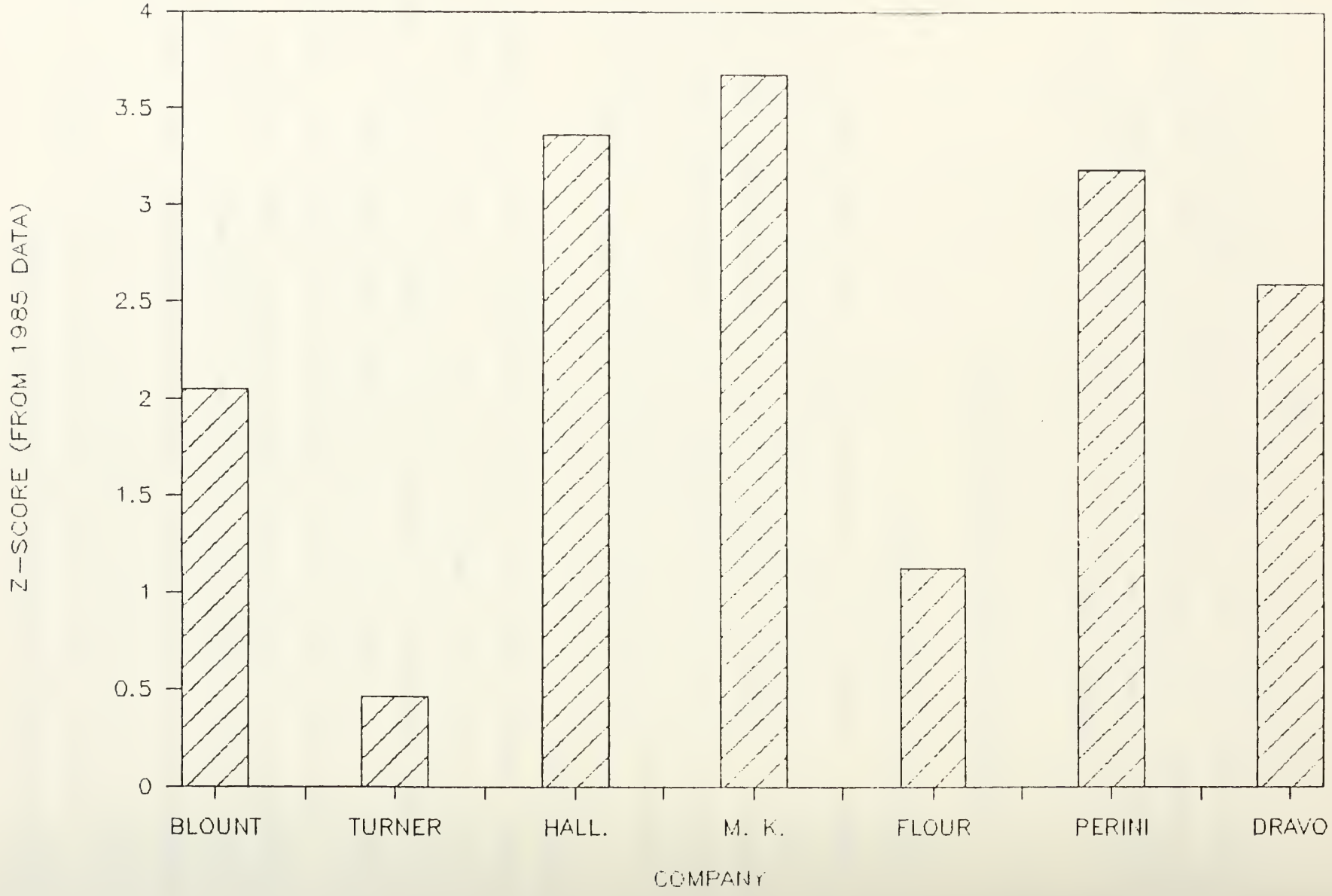

Z-SCORE FOR CONSTRUCTION COMPANIES
Z-SCORE (FROM 1985 DATA)
4
3.5
3
2.5
2
1.5
1
0.5
0
BLOUNT
TURNER
HALL.
M. K.
FLOUR
PERINI
DRAVO
COMPANY

Fig. 5.2

facing possible bankruptcy in the near future.

Based on these results the applicability of Altman's z-score modeling for construction related firms is suspect. All of these companies have significant financial reserves and are leaders in their field. Predicting only three of the seven are secure from bankruptcy in the very near future does not seem accurate.

The model may be more applicable to construction firms with assets in the range for which the model was developed. Obtaining the data necessary to conduct this analysis is difficult. Not only are there few companies who would fit into this category, their balance sheets and income statements are not in general published.

The fact this model is strictly for public companies and larger established firms indicates it may not be appropriate for analyzing and avoiding problems in the construction industry anyway. As noted in Chapter 4 the most significant class of failures in construction is small, extremely young companies. Altman's z-score by its very nature is not applicable to companies in that category.

Edmister's Small Business Model

R. Edmister applied the technique of financial ratio modeling to determine the failure probability in small businesses. The population for Edmister's study was exclusively firms with loans from the Small Business Administration. Using

zero-one linear regression Edmister developed the following model:

$$Z = 0.951 - 0.423A - 0.293B - 0.482C + 0.277D - 0.452E - 0.352F - 0.924G$$

where: A is the ratio of annual funds flow to current liabilities. It equals one if the ratio is less then 0.05, zero otherwise,

B is the ratio of equity to sales. It equals one if the ratio is less then .07, zero otherwise,

C is the ratio of net working capital to sales divided by the corresponding Robert Morris Assoc. (RMA) average ratio. It equals one if the ratio is less than -0.02, zero otherwise,

D is the ratio of current liabilities to equity divided by the corresponding RMA average ratio. It equals one if less than 0.48, zero otherwise,

E is the ratio of inventory to sales divided by the corresponding RMA industry average. It equals one if the ratio has shown an upward trend, zero otherwise,

F is the quick ratio divided by the trend in RMA quick ratio. It equals one if the trend is downward and the level prior to receiving the SBA loan is less than 0.34, zero otherwise,

G is the quick ratio divided by RMA quick ratio. It equals one if the ratio has shown an upward trend, zero otherwise.

Using the failure criteria, if $Z > 0.53$ the company would not fail and if $Z < 0.53$ failure occurs, the model predicted all of the failures and 86% of the non-failures. (Altman 1983)

Again the applicability of Edmister's model to small construction companies can not be analyzed due to the lack of financial information from small construction companies. A model designed for small businesses is inherently more applicable to construction since the vast majority of companies and companies

that fail fall into that category.

Edmister's model does give some insight into what is important to determining failure in small businesses. Four of the seven variables in his model deal with current liabilities either by itself our as part of the quick ratio. Maintaining a good control over the extent of current liabilities and insuring sufficient liquid assets are on hand to cover the liabilities seems to be the most important factor. Note that this contrasts with Altman's model for larger public companies where current liabilities are only a part of one of the five variables he uses.

The ideal analysis for determining what is important for small construction companies would be to develop a model strictly for small construction company failures. This model would require accurate financial statements from a large group of bankrupt and non-bankrupt construction companies. Obtaining this information is not simple and would require the support of a lending institution or bonding company. The result of the study would determine which financial ratios are significant to small construction companies. It can not be accurately stated that all of the ratios in Edmister's model especially inventory to sales are the most significant to construction companies.

The use of Edmister's model is a starting point however. The use of it rather than the z-score model developed by Altman would apply to the vast majority of construction companies and could assist them in staying away from failure.

CHAPTER 6

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Bankruptcy and business failure is an extremely disruptive force in the construction industry. A project encountering a bankrupt contractor will suffer in completion time, quality and cost.

To avoid this possibility an owner must adequately screen possible contractors. Bonding must be used to minimize the possible effects of a bankrupt contractor.

Construction companies themselves must always be cognizant of the possibility of business failure. Constant monitoring of their financial condition through the use of financial ratios is key. Overall industry indicators must also be monitored and trends analyzed to determine swings in failure probabilities.

It is clear that the chance of failure for a construction company has increased significantly over the past ten years. A possible factor in the increase is bankruptcy laws have become more lenient. Consequently the protection afforded debtors by law may be very appealing. A contractor who once may have attempted to cancel debts without the use of bankruptcy is more likely to choose the bankruptcy route now.

The prospect of reorganization through bankruptcy courts certainly has its advantages for companies burdened with large

unmanageable debts. Bankruptcy can be a way of sheading the debt while leaving behind the main causes of the debt through reorganization. Alleviation from unwanted union agreements and of poor management are two key areas when the reorganization route is considered.

Although precise causes of bankruptcy and failure are hard to define, most are related to financial management problems. Construction's reliance on a cash-flow cycle for each project with negative cash-flows occurring at the start of most projects makes financial management a prime concern. Construction companies capable of properly managing money and keeping close tabs on cost control are at an advantage. Companies must constantly strive to do things quicker and more efficiently since overall labor cost is a prime difference between individual contractors.

From a macro-economic standpoint the rate of failure in construction is related to the amount of construction activity, loan interest rates, and the number of new businesses entering construction. It appears that construction has reached its saturation point as far as number of companies goes. New business activity has been relatively high in the recent past however it is primarily the new businesses which have been failing.

A company desiring to enter the construction field now must be very certain that a market exists for his business. In addition to be technically competent, he must have a fair amount

of business savvy. Insuring the growth of the company does not exceed the company's capacity is of prime importance. Small business failure models indicate high current liabilities relative to current assets is the one key indicator of failure. A new business must be cautious of its first 3-5 years of operation. Failure rate in that time is by far the greatest.

A company must also be aware that avoiding failure does not ensure success. It is suspected that many more companies exit the construction field due to lack of success than because of failure. To succeed, a company must not only avoid failure by remaining solvent it must earn enough profit to help the company expand, meet all debts, and exceed the rate of other investment opportunities.

Conclusions

From this research the following has been concluded:

1) The number of yearly failures in the construction industry according to Dun and Bradstreet have risen 484% from 1978-1986. A more accurate portrayal of the status of the construction industry is through the use of failure rate. This statistic has risen from 22 per 10,000 to 107 per 10,000 or an increase of 386% from 1978-1986.

2) The sharp rise in failure rate from 1979-1982 can be attributed to low construction activity and high interest rates. With construction activity increasing and interest rates falling

between 1982 and 1986, the construction failure rate has remained high due to new businesses.

3) In the last five years the average age of a construction company at failure has been declining. The higher age at failure five years ago is indicative of the effect bad economic times have on all companies even established firms. Older firms can weather some adversity but continued slow activity and high interest rates ultimately have their effect. As a contrast, recently the age at failure has been declining which indicates the companies which are failing are in general small, unexperienced companies who are unable to get a foot hold in a tight competitive construction industry. The most difficult time for a new company is now the first three years. After that time the probability of failure starts to drop.

4) Although the failure rate for construction companies is extremely high when compared with the last forty years, it is below the failure rate for all businesses. Construction is by no means alone in problems with company failures.

5) Using data from the past ten years and multiple regression a mathematical model to predict changes in construction failure rate was made. The expression which by far was the best predictor of failure rate change was:

change in failure rate = 2.1(change in new businesses) + 1.8(
change in Fed. Inter. Credit Bank Loan
Rate) - 3.9(change in contract value
index) + 44.8

For this model, construction cost changes were not a good indicator of failure rate changes suggesting inflation may only be important for its effects on other industry indicators like interest rates. The model could not incorporate possible effects new laws have on bankruptcy and failure rate. The modeling process gave no indication of time lags between variable changes and failure rate changes. Since all changes were in yearly increments the only conclusion is that time lags of one year do not exist. This model can assist companies in determining when failure rates will be high so management decisions can be made which will lower a businesses chance of failure. This model also demonstrates the impact new businesses have on failure rate. At first glance it would appear that 1986 would be a good year for a company to enter into the construction field; construction activity is high and interest rates are low. Due to the relatively high number of companies entering construction however the rate of failure is extremely high because of the high amount of competition especially for younger companies. Prosective business owners must be aware of the possibility of failure and realize the factors which affect its change. The model presented will assist in that effort.

6) The applicability of models which use financial ratios to predict future failure prospects for individual companies, to construction companies is suspect. The models have been developed from companies unrelated to construction and have specific target groups. Altman's z-score model appears to be

overly pessimistic when it applied to seven large, public, construction related firms. The suspected lack of applicability may be due to the companies tested being larger than the companies used to develop the model or may be due to the fact that the companies are construction not manufacturing related.

Recommendations for Further Research

Further research is needed in the following areas:

1) The model which was developed to determine changes in failure rate for construction based on industry indicators should be updated and tested for accuracy in the coming years. With only the changes in variables for eight years of data available the model should be fine turned and the coefficients updated when additional information is available.

2) The model should also be broken down into monthly increments. This will indicate whether or not time lags between variable changes and failure rate change of less than one year are present. This will also result in a more accurate model.

3) Further investigation into the applicability of models which predict bankruptcy tendency for individual companies is needed. This is particularly true for models based on small businesses. Since the majority of construction failures are small businesses this will result in the most benefit to the industry. To perform this analysis accurate information on small private companies is needed. This is certainly the most

difficult step in the process.

4) If it is found that existing models are not good predictors of bankruptcy for small construction companies, a model specifically for construction companies should be developed. The difficulty making this model is similar to testing existing models only more acute. Not only does financial information from existing companies have to be obtained but also financial information from similar companies who have recently gone bankrupt is needed. Under existing procedures of bankruptcy courts this step is nearly impossible. The entire project would require the assistance of organizations like the Small Businesses Administration, private lending institutions, bonding companies and Bankruptcy Courts.

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APPENDIX A

DATA USED IN ANALYSIS OF FAILURE RATE

	CONSTRUCTION FAILURES			TOTAL FAILURES	NEW ESTABLISHED CONSTRUCTION		CONSTRUCTION COST		MORTGAGE RATE CON. NEW HOME		CONSTR. CONTRACTS VALUATION		FED. INTER CREDIT LOAN RATE	
EAR	NUMBER	RATE	% CHANGE	RATE	NUMBER	% CHANGE	INDEX	% CHANGE	RATE	% CHANGE	INDEX	% CHANGE	VALUE	% CHANGE
1977	1,463			46			100.0		8.99		100.0			
1978	1,204	22		44	17,614		109.5	9.50%	9.30	5.63%	112.0	12.00%	8.01	
1979	1,278	20	-9.05%	39	11,365	-35.51%	132.7	20.85%	10.48	12.69%	101.0	-9.82%	10.09	25.97%
1980	2,288	40	100.00%	42	5,411	-17.19%	147.3	11.34%	12.25	16.89%	105.0	-17.22%	12.12	20.11%
1981	3,614	60	50.00%	61	9,305	-1.17%	151.9	6.30%	14.17	15.67%	110.0	4.76%	14.2	16.17%
1982	4,872	78	30.00%	88	8,902	-4.33%	154.1	1.48%	14.45	2.26%	111.1	0.91%	12.86	-4.51%
1983	5,047	79	1.28%	110	12,479	40.18%	157.3	2.08%	12.11	-16.47%	137.0	23.42%	10.6	-21.07%
1984	6,936	112	41.77%	107	12,859	10.90%	162.7	4.07%	11.85	-1.90%	145.1	6.76%	11.2	5.66%
1985	7,005	109	-2.68%	115	34,417		166.3	2.91%	11.09	-6.65%	167.0	5.42%	10.64	-5.01%
1986	7,037	107	-1.83%	120	32,892	-4.42%	175.7	4.40%	9.74	-10.17%	169.0	0.65%	9.7	-8.83

DISTRIBUTION FAILURE INDEX	FAILURE RATE INDEX	ACCIDENT VALUE INDEX	FED. INTER LOANS INDEX	MORTGAGE RATE INDEX	CREDIT COST INDEX	NEW BUSINESS INDEX
100	100	100	100	100	100	100
114	91	107	126	117	121	84
196	183	93	157	131	133	92
311	271	97	177	152	147	92
405	355	98	169	156	145	91
436	399	121	132	130	147	71
576	509	132	141	129	154	79
552	100	144	135	119	153	100
584	98	150	121	105	165	96

APPENDIX B

DATA USED IN MODELING FAILURE RATE AND PRINTOUTS OF STATISTICAL ANALYSES

FAILURES Y_1	NEW BUSINESSES	MORTGAGE RATE	CONST. COST INDEX
-9.09	-35.51	12.69	20.85
100.00	-17.19	16.89	11.34
50.00	-1.13	15.67	6.00
30.00	-4.33	2.26	1.45
1.28	40.18	-16.43	2.08
41.77	10.90	-1.90	4.07
.	.	.	.
-1.83	-4.42	-12.17	4.40
.	.	.	.

CONTRACTS VALUATION INDEX	FED. INTER. CREDIT BANK LOANS
7.08	25.97
-13.22	21.11
4.76	16.20
.91	-4.51
23.42	-21.83
8.76	5.66
.	.
3.68	-8.83
.	.

WITH LOAN RATE SHIFTED ONE YEAR

Multiple Regression Y_1:FAILURES 3 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
5	.958	.917	.793	17.732

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	3	6970.304	2323.435	7.389
RESIDUAL	2	628.882	314.441	p = .1215
TOTAL	5	7599.186		

No Residual Statistics Computed

1

Note: 3 cases deleted with missing values.

Multiple Regression Y_1:FAILURES 3 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	61.221				
CONTRACTS V	-4.326	.985	-1.319	4.393	.0481
NEW BUSINESSES	1.04	.446	.686	2.331	.145
FED. INTER. CR	-.168	.598	-.079	.281	.8054

2

Multiple Regression Y_1:FAILURES 3 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
CONTRACTS V	-8.563	-.089	-7.202	-1.451	19.301
NEW BUSINESSES	-.88	2.96	-.263	2.343	5.436
FED. INTER. CR	-2.742	2.406	-1.915	1.579	.079

3

Multiple Regression Y_1:FAILURES 4 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
6	.996	.992	.975	6.094

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	4	8729.639	2182.41	58.776
RESIDUAL	2	74.261	37.131	p = .0168
TOTAL	6	8803.9		

No Residual Statistics Computed

1

Note: 2 cases deleted with missing values.

Multiple Regression Y_1:FAILURES 4 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	44.488				
CONTRACTS V	-3.729	.363	-1.058	10.265	.0094
NEW BUSINESSES	2.027	.216	1.243	9.378	.0112
FED. INTER. CR	1.362	.503	.62	2.708	.1136
MORTGAGE RATE	.587	.585	.205	1.004	.4211

2

Multiple Regression Y_1:FAILURES 4 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
CONTRACTS V	-5.291	-2.166	-4.789	-2.668	105.38
NEW BUSINESSES	1.097	2.957	1.396	2.658	87.938
FED. INTER. CR	-.802	3.525	-.107	2.83	7.334
MORTGAGE RATE	-1.929	3.104	-1.121	2.295	1.008

3

WITH MORTGAGE RATE, NEW BUS., CONTRACT VALUE

Multiple Regression Y_1:FAILURES 3 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
6	.98	.961	.921	10.748

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	3	8457.315	2819.105	24.402
RESIDUAL	3	346.585	115.528	p = .0131
TOTAL	6	8803.9		

No Residual Statistics Computed

1

Note: 2 cases deleted with missing values.

Multiple Regression Y_1:FAILURES 3 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	45.185				
CONTRACTS V	-3.351	.592	-.95	5.664	.0109
NEW BUSINESSES	1.652	.293	1.013	5.639	.011
MORTGAGE RATE	1.965	.508	.688	3.866	.0306

2

Multiple Regression Y_1:FAILURES 3 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
CONTRACTS V	-5.234	-1.468	-4.743	-1.959	32.085
NEW BUSINESSES	.72	2.585	.963	2.342	31.803
MORTGAGE RATE	.347	3.584	.769	3.162	14.943

3

WITH MORTGAGE RATE SHIFTED ONE YEAR

Multiple Regression Y_1:FAILURES 3 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
5	.961	.923	.808	17.086

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	3	7015.323	2338.441	8.01
RESIDUAL	2	583.863	291.932	p = .113
TOTAL	5	7599.186		

No Residual Statistics Computed

1

Note: 3 cases deleted with missing values.

Multiple Regression Y_1:FAILURES 3 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	61.948				
CONTRACTS V	-4.349	.916	-1.326	4.746	.0416
NEW BUSINESSES	1.066	.408	.702	2.614	.1205
MORTGAGE RATE	-.334	.683	-.106	.489	.6733

2

Multiple Regression Y_1:FAILURES 3 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
CONTRACTS V	-8.292	-.406	-7.025	-1.673	22.523
NEW BUSINESSES	-.688	2.819	-.125	2.256	6.834
MORTGAGE RATE	-3.27	2.603	-2.327	1.659	.239

3

WITH NEW BUS. SHIFTED ONE YEAR, LOAN RATE . CONTRACT VALUE

Multiple Regression Y_1:FAILURES 3 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
4	.962	.926	.703	19.657

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	3	4809.697	1603.232	4.149
RESIDUAL	1	386.414	386.414	p = .3429
TOTAL	4	5196.111		

No Residual Statistics Computed

1

Note: 4 cases deleted with missing values.

Multiple Regression Y_1:FAILURES 3 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	47.125				
CONTRACTS V	-1.289	1.426	-.474	.904	.5321
NEW BUSINESSES	-.121	.407	-.094	.297	.8162
FED. INTER. CR	1.022	1.017	.488	1.006	.4982

2

Multiple Regression Y_1:FAILURES 3 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
CONTRACTS V	-19.411	16.833	-10.294	7.716	.817
NEW BUSINESSES	-5.296	5.054	-2.693	2.451	.088
FED. INTER. CR	-11.896	13.941	-5.397	7.442	1.011

3

WITH COST INDEX NEW BUS., CONTRACT VALUE. LOAN RATE

Multiple Regression Y_1:FAILURES 4 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
6	.994	.988	.963	7.345

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	4	8695.994	2173.999	40.294
RESIDUAL	2	107.906	53.953	p = .0244
TOTAL	6	8803.9		

No Residual Statistics Computed

1

Note: 2 cases deleted with missing values.

Multiple Regression Y_1:FAILURES 4 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	43.679				
CONTRACTS V	-4.002	.516	-1.135	7.763	.0162
NEW BUSINESSES	2.166	.326	1.328	6.641	.0219
FED. INTER. CR	1.743	.371	.794	4.699	.0424
CONST. COST I	.28	1.057	.05	.265	.8158

2

Multiple Regression Y_1:FAILURES 4 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
CONTRACTS V	-6.22	-1.784	-5.507	-2.497	60.262
NEW BUSINESSES	.763	3.568	1.213	3.118	44.106
FED. INTER. CR	.147	3.339	.66	2.826	22.085
CONST. COST I	-4.266	4.826	-2.805	3.365	.07

3

WITH NEW BUS. AND . CONTRACT VALUE

Multiple Regression Y_1 :FAILURES 2 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
6	.874	.765	.647	22.765

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	2	6730.953	3365.476	6.494
RESIDUAL	4	2072.948	518.237	p = .0554
TOTAL	6	8803.9		

No Residual Statistics Computed

1

Note: 2 cases deleted with missing values.

Multiple Regression Y_1 :FAILURES 2 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	53.182				
CONTRACTS V	-4.168	1.17	-1.182	3.562	.0235
NEW BUSINESSES	1.098	.541	.674	2.029	.1123

2

Multiple Regression Y_1 :FAILURES 2 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
CONTRACTS V	-7.418	-.919	-6.663	-1.673	12.687
NEW BUSINESSES	-.405	2.601	-.056	2.252	4.118

3

WITH LOAN RATE AND . CONTRACT VALUE

Multiple Regression Y_1:FAILURES 2 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
6	.723	.522	.283	32.43

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	2	4597.03	2298.515	2.185
RESIDUAL	4	4206.87	1051.718	p = .2283
TOTAL	6	8803.9		

No Residual Statistics Computed

1

Note: 2 cases deleted with missing values.

Multiple Regression Y_1:FAILURES 2 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	43.182				
CONTRACTS V	-2.547	1.529	-.723	1.666	.1711
FED. INTER. CR	3.073E-4	.952	1.400E-4	3.228E-4	.9998

2

Multiple Regression Y_1:FAILURES 2 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
CONTRACTS V	-6.794	1.699	-5.808	.713	2.775
FED. INTER. CR	-2.644	2.645	-2.03	2.031	1.042E-7

3

WITH LOAN RATE AND NEW BUSINESSES

Multiple Regression Y_1:FAILURES 2 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
6	.582	.339	.008	38.153

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	2	2981.255	1490.628	1.024
RESIDUAL	4	5822.645	1455.661	p = .4374
TOTAL	6	8803.9		

No Residual Statistics Computed

1

Note: 2 cases deleted with missing values.

Multiple Regression Y_1:FAILURES 2 X variables

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	21.723				
FED. INTER. CR	2.148	1.542	.978	1.393	.236
NEW BUSINESSES	1.083	1.145	.664	.946	.3977

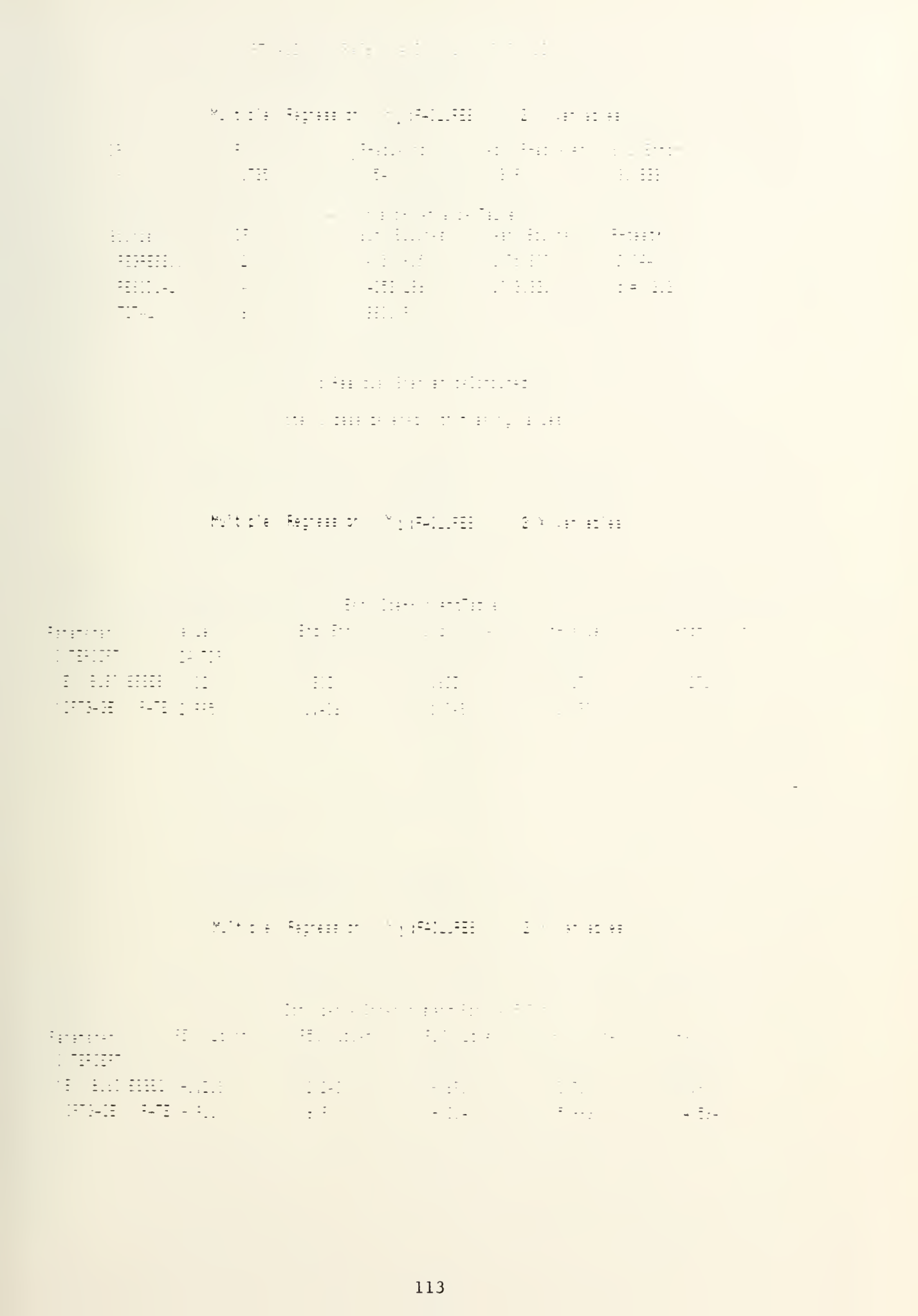
2

Multiple Regression Y_1:FAILURES 2 X variables

Confidence Intervals and Partial F Table

Parameter:	95% Lower:	95% Upper:	90 % Lower:	90 % Upper:	Partial F:
INTERCEPT					
FED. INTER. CR	-2.134	6.429	-1.139	5.435	1.941
NEW BUSINESSES	-2.097	4.264	-1.358	3.525	.895

3



Multiple Regression Y1:FAILURES 3 X variables

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	[illegible]	[illegible]	[illegible]	[illegible]
RESIDUAL	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	[illegible]	[illegible]		

No Residual Statistics Computed

Note: [illegible] cases deleted with missing values.

Multiple Regression Y1:FAILURES 3 X variables

Beta Coefficient Table

Parameters:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	[illegible]				
NEW BUSINESSES	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CONTRACTS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FED. INTER. RATE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Multiple Regression Y1:FAILURES 3 X variables

Confidence Intervals and Partial F Table

Parameters:	95% Lower	95% Upper	90% Lower	90% Upper	Partial F:
INTERCEPT					
NEW BUSINESSES	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CONTRACTS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FED. INTER. RATE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

APPENDIX C

PRINTOUTS OF ANALYSIS OF APPLICABILITY OF BANKRUPTCY MODELS FOR CONSTRUCTION COMPANIES

```
INPUT "THE NAME OF                                    ";NAME$
INPUT "THE COMPANY'S TOTAL ASSETS ARE                 ";ASSET
INPUT "THE COMPANY'S WORKING CAPITAL IS               ";WC
INPUT "THE COMPANY'S RETAINED EARNINGS BEFORE INTEREST AND TAXES ARE";EBIT
INPUT "THE COMPANY'S EARNINGS BEFORE INTEREST AND TAXES ARE";EBIT
INPUT "THE COMPANY'S MARKET VALUE OF EQUITY IS        ";MVE
INPUT "THE COMPANY'S BOOK VALUE OF TOTAL LIABILITIES IS";TL
INPUT "THE COMPANY'S SALES ARE                        ";SALES
X1=WC/ASSET
X2=RE/ASSET
X3=EBIT/ASSET
X4=MVE/TL
X5=SALES/ASSET
Z=1.2*X1+1.4*X2+3.3*X3+.6*X4+.99*X5
IF Z >= 2.99 GOTO 340
IF Z <= 1.81 GOTO 360
B$="'S BANKRUPTCY TENDENCY IS UNCLEAR"
GOTO 370
B$=" SHOWS NO SIGNS OF BANKRUPTCY IN THE NEXT THREE YEARS"
GOTO 370
B$=" HAS A VERY HIGH CHANCE OF BANKRUPTCY"
LPRINT "**********
LPRINT "*
LPRINT "*
LPRINT "*
LPRINT "**********
LPRINT " "
LPRINT " "
LPRINT "    ALL VALUES ARE IN    OF DOLLARS"
LPRINT " "
LPRINT "    TOTAL ASSETS ARE";ASSET
LPRINT " "
LPRINT "    WORKING CAPITAL IS";WC
LPRINT " "
LPRINT "    EARNINGS BEFORE INTEREST AND TAXES ARE";EBIT
LPRINT " "
LPRINT "    RETAINED EARNINGS ARE";RE
LPRINT " "
LPRINT "    BOOK VALUE OF TOTAL LIABILITIES IS";TL
LPRINT " "
LPRINT "    TOTAL SALES ARE";SALES
LPRINT " "
LPRINT " "
LPRINT " "
LPRINT "    THE COMPANY'S Z-SCORE IS";Z
LPRINT " "
LPRINT " "
LPRINT "    THEREFORE ";N$;B$
IF Z <= 1.81 GOTO 500
LPRINT
LPRINT
LPRINT " THE REASONS FOR THE COMPANY'S HIGH BANKRUPTCY
LPRINT
LPRINT
IF X1 > .1 GOTO 520
LPRINT "    LOW WORKING CAPITAL"
```

****

BLOUNT

****

L VALUES ARE IN THOUSANDS

TAL ASSESTS ARE [illegible]1724

RKING CAPITAL IS [illegible]19

RNINGS BEFORE INTEREST AND TAXES ARE [illegible]

TAINED EARNINGS ARE 110824

OK VALUE OF TOTAL LIABILITIES IS 564514

RKET VALUE OF EQUITY IS 189734

TAL SALES ARE [illegible]

E COMPANY'S Z-SCORE IS [illegible]

EREFORE BLOUNT'S BANKRUPTCY TENDANCY IS [illegible]

TURNER

L VALUES ARE IN THOUSANDS

TAL ASSETS ARE 752135

RKING CAPITAL IS 41547

RNINGS BEFORE INTEREST AND TAXES ARE 19532

TAINED EARNINGS ARE 67129

OK VALUE OF TOTAL LIABILITIES IS 68619

RKET VALUE OF EQUITY IS 106455

TAL SALES ARE 87657

E COMPANY'S Z-SCORE IS .4600747

EFORE TURNER HAS A VERY HIGH CHANCE OF BANKRUPTCY

REASONS FOR THE COMPANY'S HIGH BANKRUPTCY TENDANCY ARE

WORKING CAPITAL
RETAINED EARNINGS
EARNINGS BEFORE INTEREST AND TAXES
MARKET VALUE OF EQUITY
SALES

LL VALUES ARE IN THOUSANDS

OTAL ASSETS ARE [illegible]

ORKING CAPITAL IS 1200469

ARNINGS BEFORE INTEREST AND [illegible]

ETAINED EARNINGS ARE 1754705

OOK VALUE OF TOTAL LIABILITIES IS 157[illegible]

ARKET VALUE OF EQUITY IS 3093929

OTAL SALES ARE 4779445

HE COMPANY'S Z-SCORE IS [illegible]

HEREFORE [illegible] SHOWS [illegible] SIGNS [illegible]

FLOUR

L VALUES ARE IN THOUSANDS

OTAL ASSETS ARE 279.264

ORKING CAPITAL IS 36.535

ARNINGS BEFORE INTEREST AND TAXES ARE 61.514

TAINED EARNINGS ARE 47.870

OOK VALUE OF TOTAL LIABILITIES IS 17.624.0

ARKET VALUE OF EQUITY IS 944.720

TAL SALES ARE 71.2.444

E COMPANY'S Z-SCORE IS 1.1341%

REFORE FLOUR HAS A VERY HIGH CHANCE OF BANKRUPTCY.

REASONS FOR THE COMPANY'S HIGH BANKRUPTCY PROBABILITY ARE

W WORKING CAPITAL
W RETAINED EARNINGS
W EARNINGS BEFORE INTEREST AND TAXES

****

PERINI

****

LL VALUES ARE IN THOUSANDS

OTAL ASSESTS ARE 322599

ORKING CAPITAL IS 43805

ARNINGS BEFORE INTEREST AND TAXES ARE-9877

ETAINED EARNINGS ARE 90351

OOK VALUE OF TOTAL LIABILITIES IS 240419

ARKET VALUE OF EQUITY IS 87183

OTAL SALES ARE 810072

HE COMPANY'S Z-SCORE IS 1.182491

EFORE PERINI SHOWS NO SIGNS OF BANKRUPTCY IN THE NEXT THREE YEARS

****

DRAVO

****

L VALUES ARE IN THOUSANDS

TAL ASSESTS ARE 542084

RKING CAPITAL IS 87370

RNINGS BEFORE INTEREST AND TAXES ARE 7670

TAINED EARNINGS ARE 134814

OK VALUE OF TOTAL LIABILITIES IS 343053

RKET VALUE OF EQUITY IS 196275

TAL SALES ARE 822738

E COMPANY'S Z-SCORE IS 2.578423

REFORE DRAVO'S BANKRUPTCY TENDANCY IS UNCLEAR

Thesis
M59722 Milner
c.1 Bankruptcy and business failure in the construction industry.