THE PREDICTION OF TAKEOVER TARGETS IN U.K

A Thesis submitted for the degree of Doctor of Philosophy

by

Stelios Komis

Department of Economics, Brunel University

April 1995

ABSTRACT

The aim of this thesis is to identify the financial characteristics of takeover targets in UK for the period 1982-1990. An examination of the financial characteristics of the target firms may bring about an immediate recognition of the motives of takeover activity. The present study attempts to identify the financial characteristics of takeover target firms both at an economy wide level and at an industrial level.

The thesis has been motivated primarily by the fact that there is no comprehensive study examining mergers and acquisitions in the UK in the 1980s and particularly within an industrial classification framework.

The present thesis provides a comprehensive study of merger and acquisition activity for the UK over the period 1982-1990 . The sample selected includes an initial population of: 314 target firms, 603 bidder firms and a sample of 236 non- target firms matched by industry with the target firms. The basic methodology is logit analysis.

The novelty of the economy wide study of mergers and acquisitions is as follows: the use of multivariate logit for a study of the UK, the separation of the data into distinct estimation (1982-1985) and validation (1986-1990) periods and the binomial choice problem is differentiated into bidders versus targets and non targets versus targets.

The industry by industry study examines the following sectors: chemicals, construction, food, electrical and electronics engineering and mechanical engineering. The present thesis suggests that the financial characteristics of target firms vary between different industries.

ACKNOWLEDGEMENTS

I would like to express my deepest appreciation to my supervisor Professor Antonios Antoniou who was constantly encouraging me throughout the whole period of the research and who was giving me the right guidelines in the preparation of the present thesis.

I am pleased to take the opportunity to thank Dr. John Hunter for the advice and help given to me in the empirical part of the present thesis.

Also, I would like to express my gratitude for the advise given to me at various stages of the research to Professor Len Skeratt.

CONTENTS

CHAPTER 3 : METHODOLOGY

CHAPTER 4 : DESCRIPTION OF DATA

CHAPTER 5 : THE ECONOMY WIDE MODELS

CHAPTER 6 : THE INDUSTRY SPECIFIC MODELS

CHAPTER 7 : CONCLUSION - SUGGESTIONS FOR FURTHER RESEARCH

APPENDICES

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Stanley B. Block (1969)
believes that merger candidates may be identified, to some extent, through intensive industry analysis.

What the existing finance literature has failed to identify is whether the behaviour of mergers and acquisitions depends on a characteristic of the industry or a characteristic of the economy. The present thesis attempts to identify the financial characteristics of takeover target firms both at an economy wide level and at an industrial level. An examination of the financial characteristics of the target firms may bring about an immediate recognition of the motives of takeover activity. In order to get a better understanding of the reasons and motives[1] of the takeover activity there is a need to identify the financial characteristics of the takeover target firms, in other words to derive the financial profile of potential takeover candidates. Moreover, Robert J. Monroe (1973) argues that the successful identification and classification of merged firms by financial characteristics alone could be of interest for regulators of antitrust policy where they should be interested in the financial profile of merged firms in their attempt to identify the overall economic impact of antitrust policy as it affects mergers.

The existing finance literature has examined mergers and acquisitions under two basic areas, the efficient markets framework and the examination of the financial characteristics of the acquired firms. Within the efficient markets framework the market model and the capital asset pricing model were the major tools of the researchers. The major objective of the different studies under this framework was to examine the movement of abnormal returns to the acquiring and acquired firms' shareholders[2]. The second area of research is the

---

[1] The most common motives described and suggested in the existing literature are: economies of scale, growth, diversification, market power, avoidance of bankruptcy, an ambition of some firms to limit competition or achieve monopoly profits, a desire of some firms to achieve sufficient size to have efficient access to capital markets, a desire of the shareholders to replace an existing management, a desire of managers to manage an over- growing set of subordinates.

[2] Thomas Hogarty (1970), James Ellert (1976), M. Firth (1979), Peter Dodd (1980), Paul H. Malatesta (1983), Michael C. Jensen and Richard S. Ruback (1983), Paul Asquith (1983), Robert F. Bruner and David W. Mullins (1983), T. Boone Pickens Jr (1985), Richard H. Pettway and Takeshi Yamada (1986), Gregg A. Jarrell and Annette B. Poulsen (1989).

examination of the financial characteristics of acquired firms based on accounting data (through financial ratio analysis). MDA[3] (Multiple Discriminant Analysis) was used as a major tool for the analysis of the financial characteristics of the firms under examination. MDA[4] has been used to estimate a discriminant function relating some financial performance measures for a sample of non-acquired and acquired firms or acquiring and acquired firms in an effort to classify firms as acquisition candidates.

The contribution of the thesis is as follows:

i) it provides a **comprehensive study of M&A**[5] activity for the **UK** over the **period 1982-1990.**

ii) the **sample selected** which is drawn from the EXSTAT database and includes:

a) a population of **target** firms.

b) a population of **bidder** firms.

c) a sample of **non- acquired** firms[6] matched by industry with the target firms.

iii) the **novelty of the** economy wide study **of M&A** is:

a) the use of **multivariate logit**[7] for a study of the UK.

b) the **separation of the data** into distinct **estimation** (1982-1985) and **validation** periods (1986-1990)[8].

c) the use of stepwise regression to specify the final model.

d) the binomial choice problem is differentiated into bidders versus targets and non

---

[3] Simkowitz and Monroe (1971), Tzoannos and Samuels (1972), D. Stevens (1973), Belkaoui (1978), Wansley and Lane (1983), P. Rege (1984), P. Barnes (1989).

[4] Robert A. Eisenbeis (1977) explains that MDA has several methodological problems which are analysed in chapter 3 of the present thesis.

[5] M&A= merger and acquisition.

[6] Non- acquired firms are not involved in mergers or acquisitions for the period under examination.

[7] Logit and probit are methodologies where very limited research appears to exist in the finance literature. Dietrich and Sorensen (1984), Joel Hasbrouck (1985), K. Palepu (1986), Ronnie J. Clayton and M. Andrew Fields (1991). Probit analysis is developed but the models derived with probit analysis have the same significant variables as the logit ones, therefore the results are not presented in the thesis.

[8] In a theoretical paper G. Kemp (1995) justifies this approach.

G. Kemp (1995), *Structural Stability in Duration Models*, Department of Economics, University of Essex.

targets[9] versus targets. Singh (1971) has divided his sample into three groups as well but he focuses his study on a univariate and discriminant analysis.

iv) **the industry by industry study**[10] of M&A activity for the full sample period (1982-1990). The thesis develops industry specific models for the following industrial classifications:chemical, construction, food, electrical and electronics engineering and mechanical engineering. The industry specific models provide information about the financial profiles of takeover targets by industry.

The outline of the present thesis can be described as follows.

Chapter 1 investigates the different theories of mergers and acquisitions with related empirical evidence. Initially, there is an analysis for the theories that are actually tested in the present thesis namely: profitability theory, inefficient management theory, leverage theory and liquidity theory. All these theories are financial in nature. Then, there is a discussion of the most important economic and other financial theories: avoidance of bankruptcy as a motive for merger, monopoly theory (market power), economies of scale, growth, diversification, tax loss carry forward and synergy. Moreover, another section is discussing the theories that are directly related to the stock market (increase in market value per share, payout theory and the P/E ratio and the undervaluation of the assets). Finally, in this chapter there is an overview of the merger activity in an attempt to identify the motives of mergers and acquisitions through time and identify what theories are related to each of these merger waves. Moreover the different merger waves will give an indication as to which industries participated in each wave. The contribution of chapter 1 is to identify the existing theories concerning mergers and acquisitions so as to provide the theoretical basis for the formulation of the hypotheses that are developed in chapter 2. Moreover, chapter 1 provides the rationale for the choice of the industries under examination through the overview of merger waves.

---

[9] A non target firm is a firm which is neither a bidder nor a target firm for the period under examination.

[10] Dietrich and Sorensen (1984) suggest that the sample choice and variable definitions account for the different effects of industry variation on measures of firm characteristics, which can vary substantially across industries.

Chapter 2 reviews the existing literature behind the topic of predicting takeover targets and analyses the various limitations of the previous studies. Moreover, chapter 2 analyses the different postulates or hypotheses that have been put forward to be examined by the present thesis. The hypotheses under examination are the following: profitability, inefficient management, financial leverage, corporate liquidity and research and development. The hypotheses are examined individually under two parts : the discrimination between " target " firms against " bidder " firms and the discrimination of the financial characteristics of " target " firms against "non-acquired[11] " firms. The overall contribution of chapter 2 is to identify the limitations of previous studies and to describe the different hypotheses that are tested in the present thesis.

Chapter 3 describes the methodologies adopted in the present thesis. Initially, there is a discussion of the limitations of discriminant analysis. Then, there is an analysis of the techniques employed in the present thesis, logit analysis and probit analysis. In addition, the chapter describes the 38 financial accounting ratios that are employed in the present thesis. These ratios belong into the following groups of ratios: profitability, efficiency, liquidity, leverage and capital expenditure. An appendix which is important for the present thesis and it is directly related to chapter 3 is Appendix II which describes factor analysis and stepwise regression analysis. These two techniques have been employed in the present thesis in an attempt to reduce the number of the variables under investigation without losing the complete set of information[12]. Stepwise regression analysis proved to be a satisfactory technique in selecting the significant variables for the empirical analysis. Factor analysis was not fundamentally useful as it was replaced by stepwise regression analysis. However, many of the variables selected were quite important in the factor analysis. In addition, factor analysis did provide some information of the relative importance of the different dimensions under investigation. The major contribution of chapter 3 is to provide the rationale for the choice of logit analysis as an appropriate statistical method for the present thesis.

[11] Non bidder / non target firms.

[12] The 38 ratios used are highly collinear which means that they could not all be used in the logit and probit to discriminate either between bidders and targets or between non targets and targets.

Chapter 4 describes the data that has been employed in the present thesis. The sample consists of firms from the chemical, construction, food, electrical and electronics engineering and mechanical engineering sectors. The data is associated with potential bidder firms and potential target firms as well as firms that were not involved in the takeover activity during the period 1982-1990 (non targets/ non bidders) within the U. K. . Graphical mean analysis is provided both at the economy wide level as well as by industry. This provides a justification of the industry analysis considered in the chapter 6, though the limitations of descriptive analysis are recognised. The contribution of chapter 4 is to identify at a preliminary stage the financial characteristics of the groups under examination at the economy wide level as well as by industry through graphical mean analysis.

Chapter 5 presents and discusses the multivariate models on the **economy wide sample**[13] when the groups under investigation are firstly bidders against targets and secondly non targets against targets. The contribution of the chapter is to isolate the financial characteristics of target firms at the economy wide sample.

Chapter 6 presents and discusses the multivariate models **by industry** when the groups under investigation are firstly bidders against targets and secondly non targets against targets. The contribution of the chapter is to isolate the financial characteristics of target firms by industry.

Chapter 7 concludes the thesis and also provides suggestions for further research.

---

[13] The economy wide sample for the present thesis includes firms from the following industries: chemical, construction, food, electrical and electronics engineering and mechanical engineering.

CHAPTER 1

REVIEW OF THEORIES OF MERGERS

"The various motives for takeovers suggest a variety of financial characteristics possessed by the ideal target firm. Hypothesised motivations for takeovers include increased market power, reduced costs through economies of scale, acquisition of undervalued assets, acquisition of liquid assets, the resolution of an imbalance between the target firm's investment opportunities and its financial resources, diversification resulting in lower risk of failure, significant modification of capital structure, and a variety of managerial motives. These motivations are not independent of one another which makes the testing of alternative theories problematic. Thus, it is not surprising that the empirical evidence simultaneously supports many differing theories of takeovers."
Jon W. Bartley and Calvin M. Boardman, (1990).

1.1 Introduction

The objectives of this chapter are to analyse and investigate the different theories of mergers and acquisitions with related empirical evidence and to investigate the merger waves so as to give an insight as to what were the key factors that motivated these waves. It seems from the statement provided by Jon W. Bartley and Calvin M. Boardman (1990) that a lot of theories have been put forward to explain the phenomenon of mergers and acquisitions but the finance literature faces a problem. The problem is to identify and justify a theoretical framework for mergers and acquisitions. The reason is that the three basic decisions (investment, financing and dividend decision) of finance are linked with mergers and acquisitions.

The present chapter describes the theories of mergers and acquisitions under three different sections. The first section describes the financial theories of mergers and acquisitions namely: profitability theory, the inefficient management theory, the leverage theory and the liquidity theory. All of these theories provide the basis for the empirical modelling for the present thesis. The second section describes the basic economic theories together with other financial theories of mergers and acquisitions namely: avoidance of bankruptcy as a motive for merger, monopoly theory (market power), economies of scale theory, growth, diversification, tax loss carry forward, synergy. The third section provides a brief analysis of the theories of mergers associated with the stock market.

Finally, the chapter gives an overview of the different merger waves that appeared in the present finance literature. The analysis of the different merger waves will give an indication about the fundamental motives that caused these mergers and the industries that participated in these waves.

1.2 The Financial theories of Mergers and Acquisitions

1.2.1 Profitability Theory

Thomas Hogarty (1970) and Ajit Singh (1992) suggest that mergers have a neutral impact on profitability. Ajit Singh (Jan. 1992) argues that there is empirical evidence that despite the big merger waves of the early 1970s and of the 1980s, both for US and UK research shows that mergers either have a negative or neutral effect on profitability. Steven (1973) and Kuehn (1975) found that U.K acquired firms had low profitability. Moreover, M. Firth (1979) carried out a research on the profitability of takeovers and mergers in U.K. He supports that maximising management utility in the form of growth and size is perhaps a more important influence in many firms than the alternative theory of profit maximisation.

1.2.2 Inefficient Management Theory - The Market for Corporate Control

The theory of the "market for corporate control" considers take-overs as a controlling mechanism for managers who operate their firms in ways that do not maximise profits and it is a mechanism that promotes economic efficiency by reallocating the targets assets to better managed firms where assets will be utilised more efficiently. The market for corporate control seems to be a very important issue for mergers and acquisitions. Henry G. Manne

(1965), Michael C. Jensen and Richard S. Ruback (1983), Paul Asquith (1983), G. D. Hancock and M. Mougoue (1991) and Ajit Singh (Jan. 1992) support that the "market for corporate control" through takeovers is a mechanism for disciplining managers who operate their firms in ways that do not maximise profits. Henry G. Manne (1965) supports that if a firm has inefficient management the market price of the shares is lower when compared to the market price of the shares of other firms in the same industry or relative to the whole market. The lower the share price, relative to what it could be with more efficient management, the more attractive the takeover becomes to the efficient management team of the potential bidder. In addition, Henry G. Manne (1965) advocates that the market for corporate control implies a number of important advantages such as lessening the wasteful bankruptcy proceedings, more efficient management of corporations and generally a more efficient allocation of resources. Within the context of the market for corporate control and mergers Henry G. Manne (1965) believes that mergers may be a valuable asset which is independent of any interest in either economies of scale or monopoly profits and that many mergers are probably the result of this market. Ajit Singh (January 1992) discusses the market for corporate control and supports that large corporations in a modern economy suffer from an acute 'agency' problem. This arises because of incomplete contracts, asymmetric information between shareholders and managers, and the organisational requirements for the efficient functioning of the modern corporation, the managers inevitably have a great deal of discretion. This discretion can, and often is, used by managers to pursue their own ends (e.g. perks, empire building) to the detriment of their shareholders. The market for corporate control provides the only means by which inefficient managers or those who do not promote shareholders interest can be disciplined. Therefore, the free operation of the takeover mechanism can benefit society through two distinct channels: firstly the threat of take-overs can discipline inefficient management and reduce 'agency costs' and secondly even if the firms were working efficiently, take-overs may lead to a reorganisation of their productive resources and thereby enhance shareholder value. In addition, Griffin James M. et. al. (1992) support that firms which are under financial restructuring, emphasise that takeovers basically address agency concerns. P. H. Malatesta (1983) supports that under the improved- management hypothesis a period of inefficient management is a prerequisite for merger. When investors realise that inefficient policies are being pursued, they will also realise that the firm is an acquisition candidate.

1.2.2.1 Management acting for their own interest against shareholder interest[1] .

Managers are acting for their own interest against their shareholder interest when they will decide if their firm will takeover another firm. Margotta D. G. (1989) advocates that some researchers warned that the separation of ownership from control might enable controlling managers to increase their own wealth at the expense of shareholders.

Empirical evidence concerning the notion that managers act for their own benefit and to the detriment of their shareholders' is conflicting. Some researchers believe that mergers are planned and executed by managers who thereby maximise their own utility [T. Boone Pickens Jr. (1985), Fridrich Trautwein (1990), H. Nejat Seyhum (1990)] instead of their shareholders' value and that some managers do not consider takeovers as a mean of enhancing shareholder value but sometimes they view them as a threat to their personal benefits (e.g. salaries and perquisites). Beside this, Victor Pastena and William Ruland (1986) found that distressed firms with high ownership concentration (or owner control) show an increase tendency to merge rather than to declare bankruptcy and believe that the self-interest of managers, rather than just the interests of shareholders and creditors, seems to help motivate the merger/ bankruptcy choice. The results are consistent with the hypothesis that the self-interest of managers seems to be at least partly responsible for the merger/ bankruptcy choice. On the other hand, there are some studies that support that managers act rationally [Yakov Amihud et. al. (1986), Ronald M. Giammarino and Robert L. Heinkel (1986)] when they will decide about a potential merger and that they do not act against their shareholders' interest and sometimes managers approve some merger proposals because they want to reduce the firm's risk.

Richard Roll (1986) develops the so called "Hubris Hypothesis" where under this hypothesis decision makers in bidder firms pay too much for their targets on average in the samples under examination. Richard Roll supports that potential bids are abandoned whenever the bidder firm's valuation of the target turns up with a figure below the current market price and that bids are rendered when the valuation exceeds the price. If there are no gains in takeovers, hubris is necessary to explain why managers do not abandon these bids also since reflection would suggest that such bids are likely to represent positive errors in valuation. Richard Roll (1986) then says that hubris hypothesis might seem to imply that managers act consciously against shareholders interest by issuing bids founded on mistaken

[1] The present thesis will treat this issue in isolation and under the umbrella of the market for corporate control.

estimates of target firm value. Regarding this issue, H. Nejat Seyhum (1990) examines the conflict-of-interest hypothesis which predicts that bidder managers will knowingly overpay for target firms and engage in activities that benefit them personally even if they reduce share prices and subsequently shareholders' wealth. The findings of H. Nejat Seyhum's (1990) research were that share price evidence regarding the wealth effects of takeover activity for bidder firms is mixed and does not provide a clear answer to whether the bidder managers undertake takeover activity for their own benefit. Moreover, Yakov Amihud et. al. (1986) suggest that mergers are motivated by the manager's desire to reduce the firm's risk.

1.2.3 Leverage Theory

According to Jack O. Vance (1969), Ronald E. Shrieves and Mary M. Pashley (1984) acquisition candidates are characterised by excess debt capacity which means that a merger produces debt capacity for the post-merger firm which exceeds the firms combined premerger debt capacities. Stevens[2] (1973) found that leverage was important in explaining takeovers and that acquired firms are characterised by low leverage. Ronald E. Shrieves and Mary M. Pashley (1984) in examining the increased debt capacity incentive state that merger may result in a decrease in the likelihood of default at premerger debt levels, thus creating debt capacity for the post-merger firm which exceeds the firms combined premerger debt capacities. These findings are consistent with the existence of merger-related incentives to increase financial leverage for a significant subset of merging firms. There is a potential for increased debt capacity and/ or wealth shifting by the management of acquiring firms. The terms of purchase of the acquired firm were consistent with an immediate increase in leverage in the merging entities.

1.2.4 Liquidity Theory

Firms which have excess cash and do not have profitable investment opportunities to invest are easy targets for takeover. On the other hand, firms in need of funds that want to finance their working capital requirements are likely to be takeover targets because the bidder is

[2] The financial leverage measure in Steven's study (1973) study was the most significant indicator in both the univariate and multivariate models.

expected to bring additional funds to improve the liquidity position of the target firm. Jack O. Vance (1969), Simkowitz and Monroe (1971), Stevens (1973) and Rege[3] (1984) support that target firms have a very good liquidity position when compared to then non-acquired firms. H. Kent Baker et. al. (1981) had as one of their objectives to examine the opinions of corporate executives involved in mergers and acquisitions regarding specific issues about business combinations. Some of the executives believed that business combinations provide an effective means of investing surplus cash.

1.3 The Economic Theories of Mergers and Acquisitions - Other Financial Theories

1.3.1 Avoidance of Bankruptcy as a motive for Merger

Companies that face liquidity problems and may declare bankruptcy sometimes prefer to merge. This is the so called, theory of bankruptcy avoidance as rationale for mergers. Robert A. Haugen and Terence C. Langetieg (1975) believe that a merger may raise the profitability of a depressed firm in poor financial condition and significantly reduce the risk of bankruptcy. In addition, Ronald E. Shrieves and Donald L. Stevens (1979) examine financial data for samples of acquired and non- acquired firms and established that the data was consistent with the theory of bankruptcy avoidance as a rationale for mergers. They found that many cases of severe financial crisis among large firms are resolved through the merger process. Therefore, this process contributes to the efficiency with which resources are reallocated to more productive ends and this process serves a valuable function in the economy. Furthermore, Ronald E. Shrieves and Donald L. Stevens (1979) set forth a number of possible reasons for preferring merger over bankruptcy. These include avoidance of bankruptcy legal and administrative costs[4] and the fact that on a going concern (in a merger) the value of the firm is greater than liquidation value if the bankruptcy progresses. Moreover, Victor Pastena and William Ruland (1986) found that distressed firms that merge have lower financial leverage and are larger than firms that enter bankruptcy.

[3] Rege (1984) believes that very liquid firms will be attractive takeover candidates at low valuation ratios.

[4] Henry G. Manne (1965) suggests that the market for corporate control among other things implies the advantage of lessening the wasteful bankruptcy proceedings.

1.3.2 Monopoly Theory - Market Power

Monopoly theory basically promotes market power. The desire to create substantial market power is a significant motivation for a merger. A firm is a potential takeover candidate if that firm has a dominant market position in an attractive growth sector of the economy. Market power gives firms the ability to determine the prices of their products, usually above the competitive equilibrium level. Industrial organisation typically considers market power within the context of the horizontal[5], vertical[6] or conglomerate[7] mergers. Evidence in favour of market power within the context of M&A[8] *activity has been presented by Ajit* Singh (Jan. 1992) and Severin Borenstein (1990). Severin Borenstein (1990) examined airline mergers and found that these mergers have created substantial market power for the acquiring firm. Additionally, Ajit Singh (Jan. 1992) argues that mergers can increase market power even if there were few or no mergers, purely as a result of the normal growth process of firms. Moreover, Ajit Singh supports that if there is a high incidence of mergers, this does not necessarily indicate any increase in industrial concentration or monopoly power. This is because changes in concentration are a function of a number of variables other than just mergers or variations in the normal growth rates of firms. According to Ajit Singh this point is particularly significant for merger policy in the most recent period since there is empirical evidence that despite the big merger waves of the early 1970s and of the 1980s, there has been little increase in industrial concentration either in the US or in the UK during the last two decades. Ajit Singh explains that many industrial organisation economists have argued in favour of much tighter policy on mergers because since mergers can lead to increased market power, and since they do not on average seem to produce a greater efficiency in the utilisation of resources, they should be subject to strict regulation. Evidence against market power within the context of M&A activity has been presented by Michael C. Jensen and Richard S. Ruback (1983) where they support that the gains created by corporate takeovers do not appear to come from the creation of market power. Moreover, B. Espen Eckbo (1983) when examining horizontal mergers has found no significant evidence that proposed horizontal mergers are expected to produce a significant

[5] Two firms which operate in the same line of business merge.

[6] Two firms which operate in different levels of production merge together.

[7] Two firms which operate in unrelated business activities merge together.

[8] M&A= Merger and Acquisition.

expansion of the merging firm's share of the market along with an increase in industry rate of output.

1.3.3 Economies of Scale Theory

Economies of scale is one of the most prevailing motives for mergers and occur in a specific firm when the average cost declines with increases in volume. An alternative explanation of economies of scale could be that due to an increase in the size of the firm, total costs decrease and long-run average costs fall. Within the context of M&A activity economies of scale can be achieved with a merger of two firms because economies of scale is associated with the increase in size of the firm. Economies of scale can perhaps best be realised with a horizontal merger as it eliminates duplicate facilities. Hunter W. C. and Wall L. D. (1989) support that banks that acquire other banks are sometimes motivated by the fact that they want to achieve economies of scale in the production of financial services.

1.3.4 Growth

Growth is another legitimate motive for mergers and acquisitions. A firm may acquire assets of another firm at low cost and may avoid the risk which is associated with the development of a new product through acquisition of a firm, that has already developed a specific product. It is usually quicker to acquire new products and facilities through mergers than through internal development. External growth may take the form of the acquisition of research capabilities of another firm. M. Firth (1971) advocated the view that takeovers and mergers can be viewed as a major reason for the growth of the firms in the environment of the modern business life. Before describing the motive of growth the following question can be raised.

"What is the better way to achieve growth, through internal expansion or external expansion (e.g. merger activity) ?

> **"A firm may not be able to grow at a fast or balanced enough rate by internal expansion and may find that its only way of achieving a desired growth rate is by acquiring other firms". James C. Van Horne (1983 pp 603-628)**

The acquiring firm may be unable to achieve growth or develop such prerequisites for growth on its own. Therefore, the acquiring firm is likely to acquire another firm. Besides this, the acquiring firm may be motivated to acquire another firm because the target firm holds basic patents and only for that reason the target firm is valuable. In certain cases, growth in sales, assets, and total earnings appears to have substituted maximisation of shareholder wealth as the primary goal of the firm. Under such circumstances, mergers obviously are attractive, because in most cases growth can be achieved more easily through external acquisitions than it can be, through internal development. Douglas Kuehn (1975) believes that it is anticipated that the firm's growth rate of net assets will negatively influence the probability that it is acquired. That is, the past growth record of a firm is expected to affect the probability that the firm is acquired through its influence on the valuation ratio[9]. Thus the historical record of earnings and growth rate of a firm should provide different sorts of indicators of the past performance of the firm and hence a basis for the market to assess its value. Furthermore Douglas Kuehn (1975) says that Marris[10] (1964) has noted the possibility that firms attempting to maximise their growth rate may become takeover candidates because of the choice of an "excessive" growth target caused loss of control and consequently failure to meet the profits constraint imposed through the valuation ratio. Marris has argued that survival is dependent upon adopting a growth maximising policy and that firms which do otherwise will be those which fail to survive.

Evidence in favour of the growth motive within the context of M&A activity has been presented by H. Kent Baker et. al. (1981) where they had examined the opinions of corporate executives involved in mergers and acquisitions regarding specific issues about business combinations. One of the two important merger motives that they had identified was to affect a more rapid growth. Mergers and acquisitions provide a faster means of growth and it was preferred to the growth that is generated through internal expansion.

Sometimes growth by acquisition can be achieved with less money than achieving internal growth through internal expansion.

> **" Internal expansion takes longer and is often more expensive; and the penalty for mistakes would be higher since firms could only liquidate their mistakes by selling off individual assets piecemeal rather than as a part of a going concern ". Edith Penrose (1980 pp. 179-180)**

---

[9] Marris (1964) , *The Economic Theory of Managerial Capitalism* defines the valuation ratio as stock- market value of a firm's equity capital over the book value of its net equity assets.

[10] Marris (1964), *The Economic Theory of Managerial Capitalism.*

Howard I. Bernstein (1988) analyses mergers and acquisitions in the food processing industry and when he asked the president of Curtice- Burns Foods Inc., a firm that specialises in buying businesses, the president of the firm Mr. McDonald answered that the three most important reasons one firm buys another are: firstly acquiring a going concern may produce an immediate increase in income from sales to an established customer group and may also allow for elimination of expenses. Secondly buying is cheaper than making. If you want to own a supermarket operation 1,000 miles from your firm headquarters, it may be cheaper, faster, and easier to buy an existing chain than to burn up mileage, money, and time in site selection, construction, and introductory promotion. Finally, an undiscovered bargain. That is many times there is a business that is been doing well for years, but no one has ever approached the owner with a purchase offer. Therefore, putting it all together, an acquisition or merger produces faster growth, both in gaining new geographical sales territory and in reaching the stage where an expanding firm becomes important to major suppliers and simultaneously obtains additional customer segments and new distribution channels.

1.3.5 Diversification

Diversification is the primary motive for conglomerate mergers. By acquiring a firm in a different line of business, a firm may be able to minimise uncertainty in its profits. The main problem with diversification is that diversification is easier and cheaper to be achieved for the shareholders rather than the corporation. The shareholder can achieve diversification by buying more shares of different firms.

But how can the firm achieve diversification?

> **" In the case of conglomerate mergers, however where economies were not so evident, diversification seems to be more important motive. Firms would use acquisitions to divert assets from their own industry, which they perceived to be without much potential for growth and attempt to branch into others ".**
> **Baruch Lev [11]**

Yakov Amihud et. al. (1986) in an examination of conglomerate mergers suggested that such mergers are motivated by the manager's desire to reduce the firm's risk. On the other hand, Richard H. Pettway and Takeshi Yamada (1986) in an examination of mergers in

[11] Joel M. Stern and Donald H. Chew, Jr. (1987), *The Revolution in Corporate Finance*, Basil Blackwell.(p.361).

Japan found little support for the view that mergers reduce either systematic or unsystematic risks of the acquiring firms.

1.3.6 Tax Loss Carry Forward

Baruch Lev [12] and Van Horne James C. (1983) support that many times a firm may have cumulative tax losses and may not have prospect of earning enough in the future in order to utilise fully its tax loss carry forward. Therefore, if this firm merges with a profitable firm, it may be possible for the surviving firm to utilise fully the tax loss carry forward. This can be considered as an economic gain for the surviving firm, which gain is made at the expense of the government that cannot be realised by either firm separately. Tax loss carry forward can provide a tax shield for the acquiring firm.

1.3.7 Synergy

Synergy may form part of the " Efficiency " theory. Efficiency theory views mergers as the mean to accomplish synergy. The value of the combined firm $V_{(bidder+ target)}$ exceeds the value of the individual firms ($V_{bidder} + V_{target}$) brought together by the merger. Therefore with synergy $V_{(bidder+ target)} > V_{bidder} + V_{target}$. Merger synergy implies that the post-merger benefits will exceed the sum of the separate operations of the merging firms. These benefits may occur immediately or develop over time. This explanation is often used by the acquiring firm managers to justify acquisition payments (or premium payments) which exceed the premerger market values of the target firms.

Synergy is evident [Robert A. Haugen and Terence C. Langetieg (1975), Hunter W. C. and Wall L. D. (1989)] in some mergers because it makes possible the entry of some firms into new product lines which change the level of the firm's profitability and improve efficiency as well. Elazar Berkovitch and M. P. Narayanan (1990) develop an asymmetric-information model and they found that the fraction of synergy captured by the target decreases with the level of total synergy. Moreover, the higher the cash component, the lower the fraction of synergy captured by the target. Furthermore, Chatterjee Sayan's (1992) study proposes that

---

[12] Joel M. Stern and Donald H. Chew, Jr. (1987), *The Revolution in Corporate Finance*, Basil Blackwell.(pp. 359-360).

value from takeovers can be created by synergy or restructuring, suggesting that only if the synergy element is prevailing, then the target firm must accept the offer. Evidence against synergy within the context of M&A activity has been experienced by B. Espen Eckbo (1983) when examining horizontal mergers found no significant evidence that the 'synergy' effect is expected to produce a significant expansion of the merging firm's share of the market along with an increase in industry rate of output. Besides this, William J. Best and Ron E. Seger (1989) analyse the synergy benefits in distribution systems and support the view that although mergers and acquisitions are executed to generate synergistic benefits from the amalgamation of distribution systems, the results are often unsatisfactory.

Synergy may be classified as financial or operational or managerial.

According to Fridrich Trautwein (1990) financial synergies result in lower costs of capital. Fridrich Trautwein suggested that the different ways to achieve this is by lowering the systematic risk of a firm's investment portfolio by investing in unrelated businesses, increasing the firm's size, which may give it access to cheaper capital or establishing an internal capital market which may operate on superior information and therefore allocate capital more efficiently.

Synergy may be operational (e.g. production economies). A vertical combination of firms can create operating economies. Specifically operating economies can arise when the activities of one firm in a way supplements the activities of the other firm. Therefore, with operating economies duplicate facilities can be eliminated at a great extent. In other words, firms' operations can be consolidated. In an airline merger, the principal objective is to realise economies of operation through elimination of duplicate facilities and flights.
Nicholas A. H. Stacey (1970) supports that technical research and development can be viewed as major causes of many mergers, since technical research and development are associated with rising costs. When a number of firms are researching towards identical product objectives, resources of manpower and finance can be saved by avoiding duplication of activities. This is one of the most significant reasons why research and development expenditure, as well as administration costs can be successfully minimised with horizontal mergers. Therefore, a proposed merger will carry out a specific research and development programme more efficiently and with low costs.

Fridrich Trautwein (1990) supports that operational synergies may lower the cost of the involved business units or may enable the firm to offer unique products and services. These potential advantages have to be weighted against the cost of combining or transferring assets. Moreover, Sullivan M.J. et. al. (1990) advocated that takeover gains arise apparently from the realisation of operating synergies or management related efficiencies. They suggest that the acquiring firm would pay a premium to obtain an interest in the firm sufficient to obtain operating control but would not pay premiums to obtain ownership beyond this level of control. Another study developed by Stephen A. Rhoades (1993) found that horizontal bank mergers during 1981-1986 did not generally result in efficiency gains.

Managerial synergies[13] are realised when the management team of the acquiring firm is superior when compared with the management team of the acquired firm. It is true that many firms employ inefficient management. When a firm is badly managed then its assets may not be fully utilised. Therefore, when a firm has inefficient management then it should seek to replace its management. Takeovers can be the control mechanism where a firm faces the problem of inefficient management[14]. For example, the managers of firm "B"(this firm employs efficient managers) will persuade the shareholders of firm "T" (this firm employs inefficient managers) that if they managed the assets of firm "T" then the results of shareholders will be greater than at present.

[13] Michael J. S et. al. (1990) advocated that takeover gains arise apparently from the realisation of management related efficiencies.

[14] The inefficient management theory has been discussed extensively before.

1.4 Theories of mergers and the stock market

One of the important merger motives directly linked to the stock market is to increase the market value per share[15] of the firm. H. Kent Baker et. al. (1981) found that an important merger motive was to increase the market value of the firm. In addition, it is generally held that a firm with low P/E ratio will be more prone to a bid. Thus a low P/E ratio implies a low future growth rate, and hence takeover bids could arise from bidders who believe they could improve performance. There is strong evidence (Jack O. Vance (1969), Simkowitz and Monroe (1971), Tzoannos and Samuels (1972), Harris et al (1982) and Wansley and Lane (1983)) that the most common short term financial strategy was the use of acquisition as a tool to boost EPS by acquiring firms with lower P/E ratios[16] because for a high P/E ratio in the acquired firm means that the acquiring firm would be paying a high price for the current earnings. Finally, according to Tzoannos and Samuels (1972), Marris[17] found that acquired firms are those that are undervalued by the market. Furthermore Tzoannos and Samuels (1972) state that the undervaluation of assets was explored by Gort (1969)[18] who found that the level of takeover activity varied according to the degree of share undervaluation in the market.

[15] We know that the share price can be expressed as:

$$P_o = \Sigma \frac{D_t}{(1+K_e)^t}$$

Dt: dividend expected at the end of period t.
Ke: the required rate of return of investors in a stock of the risk involved.
The case for a higher valuation after a merger than before must be based upon raising the level of expected future dividends per share in the numerator, lowering the required rate of return Ke, in the denominator, or some combination of the two. The first primarily involves increasing earnings per share over what they would otherwise be; the second involves reducing the risk to investors.

[16] This P/E ratio is determined by dividing the market price of the share over the earnings per share of the firm.

[17] Marris (1964), *The Economic Theory of Managerial Capitalism.*

[18] Gort, M. (1969), *An Economic Disturbance Theory of Mergers*, Quarterly Journal of Economics .

1.5 Historical overview of merger activity

The first merger wave (See Table 1.5-1) took place between 1895-1904 and during this period the greatest merger activity occurred. This trend was constituted primarily by horizontal mergers and resulted in high concentration in many industries. The industries participating in that wave were metals and metal products, fabricated metal products, food and food products, non-electrical machinery, transportation equipment, tobacco, chemicals, petroleum products, machinery and bituminous coal. The major motives behind that wave were economies of scale in production, distribution, administration and marketing. In addition, another characteristic of that period is that of the creation of monopoly in the market. Patrick A. Gaugham (1991) advocates that financial factors forced the end of the first merger wave: i) the shipbuilding trust collapse in the early 1900s brought to the force the dangers of fraudulent financing, ii) the stock market crash of 1904, iii) the Banking Panic of 1907 which closed many of the nation's banks.

Author	Alexandra M. Post (1994)	Patrick A. Gaugham (1991)	J. Fred Weston, Kwang S. Chunk and Susan E. Hoag (1990)	Conclusion
Merger Wave I				
• Duration	• 1898-1902/4	• 1897-1904	• 1895-1904	• 1895-1904
• Merger Structure/Character.	• Horizontal.	• Horizontal.	• Horizontal	• Horizontal
• Industries participating.	• Metals. • Metal products. • Food. • Non-electrical machinery. • Transportation equipment. • Tobacco. • Chemicals.	• Metals. • Food products. • Petroleum products. • Chemicals. • Transportation equipment. • Fabricated metal products. • Machinery. • Bituminous coal.		• Metals. • Metal products. • Fabricated metal products. • Food. • Food products. • Non-electrical machinery. • Transportation equipment. • Tobacco. • Chemicals. • Petroleum products. • Machinery. • Bituminous coal.
• Motives.	• Economies of Scale. • Specialisation.	• Economies of Scale in production and distribution. • Creation of monopoly in the market.	• Economies of Scale in production, administration and marketing. distribution.	• Economies of Scale in production , distribution, administration and marketing. • Creation of monopoly in the market.

Table 1.5-1 Merger Wave I

The second merger wave (See Table 1.5-2) took place between 1916-1929. The structure of the mergers were vertical. The industries participating in that wave were public utilities, banking, food processing, retailing, chemicals, mining manufacturing, primary metals, petroleum products and transportation equipment. The major motives behind that wave were product extension and efficiencies, marketing refinement and extension, creation of national sales and marketing teams. In addition, another characteristic of that period is that of merging for oligopoly and achieving technological economies. J. Fred Weston et. al. (1990) support that the second wave of mergers ended with the onset of a severe economic slowdown in 1929. Patrick A. Gaugham (1991), advocates that rather than monopolies, the result was often an oligopolistic industry structure.

Author	Alexandra M. Post (1994)	Patrick A. Gaugham (1991)	J. Fred Weston, Kwang S. Chunk and Susan E. Hoag (1990)	Conclusion
Merger Wave II • Duration	• 1919/22-1929	• 1916-1929	• 1922-1929	• 1916 /(19)/(22)-1929.
• Merger Structure/Character.	• Vertical.	• Vertical.	• Vertical.	• Vertical.
• Industries participating.	• Public utilities. • Banking Industry. • Food Processing. • Retailing. • Chemicals. • Mining .	• Manufacturing. • Mining. • Public utilities. • Banking. • Primary metals. • Petroleum products. • Food products. • Chemicals. • Transportation equipment.	• Public utilities. • Banking. • Food Processing • Chemicals. • Mining Sectors.	• Public utilities. • Banking . • Food Processing. • Retailing. • Chemicals. • Mining . • Manufacturing. • Primary metals. • Petroleum products. • Transportation equipment.
• Motives.	• Production efficiencies. • Marketing refinement. • Creation of national sales and marketing teams.	• Merging for oligopoly.	• Product extension. • Market extension. • Technological economies.	• Product extension and efficiencies. • Marketing refinement and extension. • Creation of national sales and marketing teams. • Merging for oligopoly. • Technological economies.

Table 1.5-2 Merger Wave II

The third merger wave (See Table 1.5-3) took place between 1940-1947. This is the post-war growth development with an economic environment where there was a strong regulatory impetus. The industries participating in that wave were electricals which emerged as a merger-intensive industry. The major motives behind that wave were efforts to avoid government wartime price controls and other regulations as well as income and estate taxes compared to relatively low capital gains taxes. Also, larger firms acquired smaller, privately held firms for motives of tax relief and product extensions reasons. Patrick A. Gaugham (1991) supports the view that this merger wave did not feature any major technological changes or dramatic development in the nation's infrastructure.

Author	Alexandra M. Post (1994)	Patrick A. Gaugham (1991)	J. Fred Weston, Kwang S. Chunk and Susan E. Hoag (1990)	Conclusion
Merger Wave III • Duration	• 1940-1947	• 1940s	• 1940-1947	• 1940-1947.
• Merger Structure/Character.	• Post-war growth. • Regulatory impetus.	• The author does not give any particular information	• Rapid growth of the economy and an upsurge in merger activity.	• Post-war growth. • Regulatory impetus.
• Industries participating.	• Electricals.	• The author does not give any particular information	• The author does not give any particular information	• Electricals.
• Motives.	• Efforts to avoid government wartime price controls and other regulations as well as income and estate taxes compared to relatively low capital gains taxes.	• Larger firms acquired smaller, privately held firms for motives of tax relief.	• Government regulation and tax policies. • Product extension.	• Efforts to avoid government wartime price controls and other regulations as well as income and estate taxes compared to relatively low capital gains taxes. • Larger firms acquired smaller, privately held firms for motives of tax relief. • Government regulation and tax policies. • Product extension.

Table 1.5-3 Merger Wave III

The fourth merger wave (See Table 1.5-4) took place between 1960-1969. J. Fred Weston et. al. (1990) support that merger activity reached its historically highest level during the three year period of 1967 through 1969 (booming period for the economy). The number of mergers declined sharply as the general economic activity slowed down after 1969. Moreover, they support that during this wave a number of firms sought to diversify in the attempt to acquire access to the new technologies that had developed after World War II. Patrick A. Gaugham (1991) supports that in this merger wave smaller firms targeted larger firms for acquisition. Besides this, Patrick A. Gaugham (1991) supports that this period was characterised by the rapid growth of management science which developed methodologies that facilitate organisational management and that could theoretically be applied to a wide variety of organisations, something that accelerated the conglomerate movement. This has accelerated the conglomerate movement because managers reasonably believed that they could manage a corporate organisation that spanned several industry categories. The belief that the conglomerate could become a manageable and successful corporate entity started to become reality. Potential bidders soon learned that acquisitions, financed by stocks, could be an excellent way to raise earnings per share without incurring tax liabilities. The changing regulatory atmosphere at the end of the 1960s set the stage for a slowdown in this merger wave. When the stock market fell in 1969, the P/E game could no longer be played. Indeed, many analysts felt that the conglomerate mergers helped collapse this market in as much as when securities attain values far in excess of the underlying economic basis for their valuation, a collapse is sure to follow. This would be one lesson of the stock market crash of October 1987. The structure of the mergers were conglomerate. The industries participating in that wave were defense and aerospace, petroleum, coal products, paper products, industrial chemicals, industrial machinery, communication equipment. The major motives behind that wave were product extension, diversification into other industries, P/E incentive, accounting manipulations, defensive or positive diversification in terms of research, manufacturing and marketing and tax considerations.

Author	Alexandra M. Post (1994)	Patrick A. Gaugham (1991)	J. Fred Weston, Kwang S. Chunk and Susan E. Hoag (1990)	Conclusion
Merger Wave IV • Duration	• 1960-1968.	• 1965-1969.	• 1960s.	• 1960-1969.
• Merger Structure/Character.	• Conglomerate.	• Conglomerate.	• Conglomerate.	• Conglomerate.
• Industries participating.	• Defense and aerospace. • Petroleum. • Coal Products. • Paper Products. • Industrial Chemicals. • Industrial Machinery. • Communication Equipment.	• The author does not give any particular information	• Aerospace industry.	• Defense and aerospace. • Petroleum. • Coal Products. • Paper Products. • Industrial Chemicals. • Industrial Machinery. • Communication Equipment.
• Motives.	• Product extension. • Diversification into other industries.	• P/E Incentive. • Accounting manipulations.	• Defensive or positive diversification in terms of research, manufacturing and marketing. • Tax considerations.	• Product extension. • Diversification into other industries. • P/E Incentive. • Accounting manipulations. • Defensive or positive diversification in terms of research, manufacturing and marketing. • Tax considerations

Table 1.5-4 Merger Wave IV

The fifth merger wave (See Table 1.5-5) took place between 1970-1989. The structure of the mergers were horizontal. J. Fred Weston et. al. (1990) support that following the recession in 1974-1975, the US economy entered a long period of expansion, during which M&As trended upward. Alexandra M. Post (1994) supports that this is the latest wave which took place for strategic reasons in the USA starting in the second half of the 1970s and the 1980s. An analogous wave occurred in the United Kingdom from 1985-1987.

The industries participating in this wave were oil and gas extraction, electronic equipment, industrial machinery, transportation equipment, food, cement, airlines, chemicals, commercial and investment banking, insurance, broadcasting, health and care and natural resources. The major motives behind that wave were diversification, acquiring new production technologies, economies of scale in data processing, lending and financing and operational efficiency.

Author	Alexandra M. Post (1994)	Patrick A. Gaugham (1991)	J. Fred Weston, Kwang S. Chunk and Susan E. Hoag (1990)	Conclusion
Merger Wave V • Duration	• 1975-1989.	• 1970s	• 1976-	• 1970-1989.
• Merger Structure/Character.	• Horizontal.	• Hostile takeovers.	• Vertical.	• Horizontal.
• Industries participating.	• Oil and gas extraction. • Electronic equipment. • Industrial machinery. • Transportation equipment. • Food. • Cement. • Banking. • Airlines. • Chemicals.	• Investment Banking.	• Commercial and Investment Banking. • Insurance. • Broadcasting. • Health and care. • Natural resources.	• Oil and gas extraction. • Electronic equipment. • Industrial machinery. • Transportation equipment. • Food. • Cement. • Airlines. • Chemicals. • Commercial and Investment Banking. • Insurance. • Broadcasting. • Health and care. • Natural resources.
• Motives.	• Diversification. • Acquire new production technologies.		• Economies of scale in data processing. • Lending and financing. • Operational efficiency.	• Diversification. • Acquire new production technologies. • Economies of scale in data processing. • Lending and financing. • Operational efficiency.

Table 1.5-5 Merger Wave V

1.6 Conclusion

The market for corporate control is an important issue for mergers and acquisitions. There is sufficient empirical evidence[19] to suggest that the "market for corporate control" through takeovers is a control mechanism for disciplining managers who operate their firms in ways that do not maximise profits and also when a firm faces the problem of inefficient management. The market for corporate control implies a number of important advantages such as decreasing the wasteful bankruptcy proceedings, more efficient management of firms and generally a more efficient allocation of resources. Another important issue within the M&A framework is the one that deals with the notion that managers act for their own benefit and to the detriment of their shareholders'. Empirical evidence concerning this issue is conflicting. Some researchers believe that mergers are planned and executed by managers who thereby maximise their own utility[20]. On the other hand, there are some studies that support the idea that managers act rationally[21] when they decide about a potential merger and that they do not act against their shareholders' interest. In addition to that, sometimes managers approve some merger proposals because they want to reduce the firm's risk.

Thomas Hogarty (1970) and Ajit Singh (1992) suggest that mergers have a neutral impact on profitability. On the other hand, Kuehn (1975) found that U.K acquired firms had low profitability. Moreover, M. Firth (1979) supports that maximising management utility in the form of growth and size has more impact in many firms than the alternative theory of profit maximisation.

Another important theory developed and tested within the M&A framework is that of leverage or increased debt capacity[22]. Acquisition candidates are characterised by excess capacity which means that a merger produces debt capacity for the post-merger firm which exceeds the firms combined premerger debt capacities.

---

[19] Henry G. Manne (1965), Michael C. Jensen and Richard S. Ruback (1983), Ajit Singh (Jan. 1992).

[20] Fridrich Trautwein (1990), H. Nejat Seyhum (1990), T. Boone Pickens Jr. (1985).

[21] Yakov Amihud et. al. (1986), Ronald M. Giammarino and Robert L. Heinkel (1986).

[22] Jack O. Vance (1969), Ronald E. Shrieves and Mary M. Pashley (1984).

Liquidity theory has been developed and well documented for mergers and acquisitions and this theory supports the notion that target firms have a very good liquidity position[23] when compared to the non-acquired firms.

Market power is a motive where the acquiring firm want to acquire a firm so as to enhance its market power. Evidence in favour of market power within the context of M&A activity has been presented by Ajit Singh (Jan. 1992) and Severin Borenstein (1990). Evidence against market power within the context of M&A activity has been presented by Michael C. Jensen and Richard S. Ruback (1983) where they support that the gains created by corporate takeovers do not appear to come from the creation of market power. Moreover, B. Espen Eckbo (1983) when examining horizontal mergers has found no significant evidence that proposed horizontal mergers are expected to produce a significant expansion of the merging firm's market share.

Economies of scale is another prevailing motive for mergers. Economies of scale can perhaps best be realised with a horizontal merger. Hunter W. C. and Wall L. D. (1989) claim that banks that acquire other banks are sometimes motivated by the fact that they want to achieve economies of scale in the production of financial services.

Growth is another legitimate motive for mergers and acquisitions. Evidence in favour of growth motive within the context of M&A activity has been presented by H. Kent Baker et. al. (1981). Moreover, Howard I. Bernstein (1988) analyses mergers and acquisitions in the food processing industry and found that an acquisition or merger produces faster growth, both in gaining new geographical sales areas and new distribution channels.

Diversification is the primary motive for conglomerate mergers. By acquiring a firm in a different line of business, a firm may be able to achieve stability in its earnings. Yakov Amihud et. al. (1986) in an examination of conglomerate mergers suggested that such mergers are motivated by the manager's desire to reduce the firm's risk. On the other hand, Richard H. Pettway and Takeshi Yamada (1986) in an examination of mergers in Japan

---

[23] Jack O. Vance (1969), Simkowitz and Monroe (1971), Stevens (1973), Rege (1984).

found little support for the view that mergers reduce either systematic or unsystematic risks of the acquiring firms.

Synergy is evident[24] in some mergers because it makes possible the entry of some firms into new product lines which change the level of the firm's profitability and improve efficiency as well. Evidence against synergy has been presented by William J.Best and Ron E. Seger (1989) where they analyse the synergy benefits in distribution systems and found that synergistic benefits from the combination of distribution systems are usually discouraging.

Financial synergies result in lower costs of capital. This can be achieved[25] either by lowering the systematic risk of a firm's investment portfolio, by investing in unrelated businesses or by increasing the firm's size, which may give it access to cheaper capital. Synergy may produce operating economies where duplicate facilities can be eliminated at a great extent and may lower the operating costs of the involved business departments. Managerial synergies[26] are realised when the bidder firm has better management team than the target firm. When a firm is badly managed then its assets may not be fully utilised. Therefore, when a firm has inefficient management then it should seek to replace its management.

There is evidence that a merger increases the market value per share of the firm. H. Kent Baker et. al. (1981) found that an important merger motive was to increase the market value of the firm. There is strong evidence that the most common short term financial strategy was the use of acquisition as a tool to boost EPS by acquiring firms with lower P/E ratios[27] because for a high P/E ratio in the acquired firm means that the acquiring firm would be paying a high price for the current earnings.

---

[24] Hunter W. C. and Wall L. D. (1989).

[25] Fridrich Trautwein (1990).

[26] Michael J. S et. al. (1990) advocated that takeover gains arise apparently from the realisation of management related efficiencies.

[27] Jack O. Vance (1969), Simkowitz and Monroe (1971), Tzoannos and Samuels (1972), Harris et al (1982) and Wansley and Lane (1983).

This chapter has also described historically the different merger waves.

The first merger wave took place between 1895-1904 and the structure of the mergers were horizontal. The major motives behind that wave were economies of scale in production, distribution, administration and marketing. In addition, another characteristic of that period is that of the creation of monopoly in the market.

The second merger wave took place between 1916-1929 and the structure of the mergers were vertical. The major motives behind that wave were product extension and efficiencies, marketing refinement and extension, creation of national sales and marketing teams. In addition, another characteristic of that period is that of merging for oligopoly and achieving technological economies.

The third merger wave took place between 1940-1947 and this is the post-war growth development with an economic environment where there was a strong regulatory impetus. The major motives behind that wave were efforts to avoid government wartime price controls and other regulations, for tax relief purposes and product extensions reasons.

The fourth merger wave took place between 1960-1969. The structure of the mergers were conglomerate. The major motives behind that wave were product extension, diversification into other industries, P/E incentive, accounting manipulations, defensive or positive diversification in terms of research, manufacturing and marketing and tax considerations.

The fifth merger wave took place between 1970-1989 and the structure of the mergers were horizontal. The major motives behind that wave were diversification, acquiring new production technologies, economies of scale in data processing, lending and financing and operational efficiency.

The industries that participated in almost all the waves are: chemicals, food, electricals, petroleum, machinery, financial services. The present thesis examines the following sectors: chemical, construction, food, electrical and electronics engineering and mechanical engineering.

CHAPTER 2

REVIEW OF THE PREDICTION OF TARGETS

HYPOTHESIS DEVELOPMENT

2.1 Introduction

The aims of the chapter are to explore the previous studies in predicting takeover targets and identify the limitations of these studies. In addition, the chapter describes the different hypotheses that are examined in the present thesis.

The chapter reviews the studies on the prediction of takeover targets. There is a discussion of the limitations of the previous studies and also an attempt to identify the key variables of these studies. Beside this, the present chapter analyses the hypotheses that have been developed for examination by the present thesis. The hypotheses that are described are the following: profitability, inefficient management, financial leverage, corporate liquidity and research and development. These hypotheses are tested in the empirical chapters 5 and 6.

2.2 A Review of the Studies on the Prediction of Targets

Simkowitz and Monroe (1971) study is one of the earliest studies using MDA[1] in an attempt to specify the financial profile of firms that are acquired by conglomerate firms for the period April 1 to December 31, 1968. They used stepwise MDA so as to classify firms as acquired or non-acquired. Four groups of firms were used in their study. The estimation sample consisted of 25 non-acquired firms and 23 acquired firms which are used to

[1] MDA= Multiple Discriminant Analysis.

construct the discriminant function. The validation sample[2] was drawn consisting of a group of 64 non-acquired firms and 23 acquired firms. A total of 24 variables were selected to provide measurements on seven different aspects of a firm's financial condition. Seven ratios entered MDA as significant (See Appendix I - Table 1). These variables denote a firm's: growth, size, profitability, leverage, dividend policy, liquidity and a seventh group of variables was also selected to provide information regarding the characteristics of the market for the firm's stock. Simkowitz and Monroe (1971) found that the most significant ratios which give the greatest efficiency on standardise coefficients of the discriminant function were four: i) P/E ratios: the acquired firms tended to seek out firms whose P/E ratios are lower than their own. ii) Lower dividend payout rates: the acquired firms tended to be low dividend payers and ceteris paribus would be firms whose shareholders would be more keen to abandon their position. iii) Lower growth in equity: this variable indicates that acquired firms were relatively unable to build the equity base needed and finally acquired firms were smaller in size[3]. The estimation sample provided an overall accuracy rate of 77 percent. This model could correctly classified 82.6 percent of the acquired firms. The predictive power of the model was also tested by using the validation sample of acquired and non-acquired firms. The validation sample provided an overall accuracy rate of 63.2 percent and the model can correctly classified 64 percent of the acquired firms.

Singh (1971) is the first UK study of M&A activity. Singh[4] attempts to discriminate between the acquired and the surviving firms, between the acquiring and the acquired firms and between the acquiring and the non-acquiring firms. The period under examination is 1954-1960. Singh matched each acquired firm with the non- acquired firm nearest to it in size, in the same industry at the last accounting date before the takeover. Singh used univariate and discriminant analysis to complete his study. The detailed statistical analysis of the data was related to takeovers in five industries: food, non-electrical engineering, electrical engineering, clothing and footwear and drink. The sample consists of 847 firms when all industries were combined, 132 firms from the food industry, 176 firms from the drink industry, 96 firms from the clothing industry, 319 firms from the non- electrical engineering industry, 124 firms from the electrical engineering industry. Data differing in

[2] The validation sample is used as a basis for testing the discriminant function determined from the analysis sample.

[3] Size was measured by the sales volume.

[4] Singh (1971) has divided his sample into three groups as the present study does but he focus his study on a univariate and discriminant analysis.

age was used to compute the variables: the short-term (one to two years prior to merger) records and long term (three to six years prior to merger) records. The study used ten ratios (See Appendix I - Table 2) which nine (except X8, Net Assets) of them have been employed for the multivariate analysis. For multivariate analysis three industries have been considered : electrical engineering, non-electrical engineering and food industry. When short-term records were used the misclassification rate was 35.6 percent. On the other hand, when long term records were used the misclassification rate was 36.8 percent. When comparing between the acquiring and the acquired firms acquiring firms appear to have higher rate of growth, much larger size and more profitable. Beside this, acquiring firms have a higher retention ratio, higher gearing ratio and less liquidity. Moreover, the acquiring firm is significantly more profitable than the average acquired firm, but not than the average non-acquiring firm. Singh found that acquired firms have low profitability, low growth, and low valuation ratios when compared against non-taken over firms.

Tzoannos and Samuels (1972) investigate the distinguishing financial characteristics of both the bidder firms and the target firms using a discriminant analysis approach. The time period of the study is July 1967 to the end of March 1968. Thirty six mergers were selected at random from those which took place over this period, and thirty two firms selected randomly from the firms that were not the subject of takeover bids. The variables under examination represent the dimensions of capital structure, profitability, liquidity, investment and dividend policy. The model they used consisted from variables listed in Appendix I - Table 3. Tzoannos and Samuels concluded that the characteristics possessed by those firms that were acquired, which differentiated them from the firms not acquired were a higher absolute level of capital , a higher rate of increase in the capital gearing, a slower increase in profits, a lower P/E , a slower rate of increase in dividends and a greater variation over time in the rate of dividends. The characteristics of the bidder firms were an above average downward trend in capital gearing, a lower absolute level of capital , a higher than average increase in profits to capital employed and a higher than average increase in the trend of dividends.

Stevens (1973) analyses the financial characteristics of acquired firms and develop a multivariate model to determine which financial characteristics best distinguished firms acquired in mergers from similar firms not acquired. The Stevens' sample consisted of 80 firms (40 acquired and 40 non acquired firms). Financial ratios[5] were calculated for each of the firms (See Appendix I - Table 4). Stevens matched merged and non-merged firms by size of the assets. Estimation sample contained mergers occurred in 1966 (80 firms[6]) , and validation sample 1967-1968 (40 firms[7]). In the validation sample, 70 percent accuracy was achieved. In order to avoid the problem of multicollinearity, Stevens uses factor analysis. The original set of ratios was factored into six distinct and orthogonal factors, with each factor being a linear combination of the original 20 ratios (See Appendix I - Table 4 under the column variables and heading factor analysis- variables). The different variables chosen from factor analysis accounted for 82.49 percent of the total variance. The MDA model was derived with four of the six ratios entering the equation (See Appendix I - Table 4). These four ratios were :

i)EBIT[8] / Sales : This ratio ranked second in contribution to the MDA model, the univariate test indicated no group differences. ii)Net Working Capital/Total Assets: This characteristic was least important in group discrimination. iii)Sales/Total Assets: This overall measure of activity and turnover indicated very little group difference but still contributed to the multivariate profile that differentiated the groups. iv)Long Term Liability/Total Assets: This financial leverage measure was the most significant indicator in both the univariate tests and the MDA model which implies that capital structure considerations are important in merger decisions and that acquired firms have systematically lower levels of leverage. According to the author this is consistent with the Lintner (1971)[9] and Lewellen (1971)[10] arguments. The model demonstrated a classification accuracy of 70 percent in the estimation sample and 67.5 percent in the validation sample. The study of the discriminant coefficients showed that acquired firms experienced: lower EBIT/ Sales, lower Sales/ Total Assets, lower Long - Term Liability/ Total Assets than their matched non-acquired firms. Steven argues that,

[5] The ratios were estimated after financial statement data from the two prior reporting periods was collected.

[6] 40 acquired firms and 40 non-acquired firms.

[7] 20 acquired firms and 20 non-acquired firms.

[8] EBIT= Earnings before interest and tax.

[9] Lintner John (May 1971), *Expectations, Mergers and Equilibrium in Purely Competitive Securities Markets*, American Economic Review, Vol. 61, no. 2, pp. 101-111.

[10] Lewellen, Wilbur G. (May 1971), *A Pure Financial Rationale for the Conglomerate Merger*, Journal of Finance, vol. 26 , pp. 521-537.

regardless of the stated motive for merger, financial characteristics either are specific decision variables or directly reflect non-financial reasons for acquisition. In addition, the firms' capital structure appears as an especially important variable, both by itself and in a profile with variables measuring liquidity, profitability and activity.

Kuehn (1975) seeks to discriminate between merged and non-merged firms. The sample size of this study consists from U.K. mergers that took place between 1957-1969 and the methodologies adopted were linear probability models and probit analysis. Six financial variables were chosen to represent the six financial dimensions which Kuehn believed were important in the determination of the probability of a merger. The variables under investigation are described in Appendix I - Table 5 together with the respective dimensions that they represent. Kuehn found that acquired firms had low valuation ratios, low profitability and low growth. Besides this, he found that acquired firms had low liquidity and the dividend payout policy appeared to have no impact. Kuehn found that the valuation ratio was the major variable in determining the likelihood of a takeover. He found that acquiring firms are growth maximisers tended to have lower profitability than in the industry average, higher growth in net assets than in the industry average, and higher valuation ratios than in the industry average. The major limitation of Kuehn's study was that he had not developed multivariate probit analysis.

Belkaoui (1978) attempted to distinguish between acquired Canadian firms from non-acquired on the basis of accounting ratios using multiple discriminant analysis. Both univariate analysis and multivariate analysis, of financial ratios, are conducted. The non-acquired firms were matched with the acquired firms by industry and size. Four groups of accounting ratios[11] were considered (See Appendix I - Table 6). Twenty-five firms were randomly selected from a population of firms which were the subject of takeovers in the years 1960 to 1968 and were matched with twenty five firms that were not acquired. Therefore, for 50 firms [25 acquired and 25 non-acquired] the annual reports were examined for 5 years prior to the takeover date. Sixteen potential predictor ratios were collected for examination (See Appendix I - Table 6). The groups of the ratios are divided

[11] The major assumption of Belkaoui's study is that most of the chosen ratios in this study indicate a low value to predict takeovers. In other words, a firm may be acquired because it has lower than average profitability ,liquidity and asset turnover. An opposite prediction rule is used for the long term debt + preferred stock /total assets. This complies with the theory that the acquired firms have already used their borrowing potentials and that they will allow the acquiring firm to access to new loan funds.

into liquid and non-liquid financial ratios. The use of the dichotomous test showed the superiority of the nonliquid ratios in predicting takeovers apart from the fact that the net income/net worth and the cash flow/net worth ratios have a lower percentage error[12] than all fourteen remaining liquid and nonliquid ratios. The notable exception is the performance of the working capital/ total assets ratio in the second year prior to takeover. The superiority in the predictive power of the nonliquid ratios is more notable in the short-term, particularly in years one, two and three, than in the long term. The classification accuracy has been tested with a validation sample consisting of 22 firms (11 acquired and 11 non-acquired firms). The table below describes the classification accuracy from year one to year five prior to the merger for both the estimation and validation period.

Years prior to the merger	Classification accuracy. Estimation Period	Classification accuracy. Validation Period
1	72%	70%
2	80%	76%
3	84%	85%
4	78%	76%
5	80%	75%

The best classification accuracy Belkaoui achieved was when he used the data of three years prior to merger. (85%).

Harris et al. (1982) examines the financial characteristics of acquired firms by means of probit analysis for the period (1974-1977) and to determine if such characteristics differ considerably from the characteristics of non-acquired firms and to detect if such characteristics might be useful in predicting which firms will be acquired. The sample used consists of 106 acquired firms and approximately 1,200 non-acquired firms. For a detailed analysis of the sample and final variables under examination (See Appendix I - Table 7). Harris et al. used both two year and five year data in their study, but the results were similar. They also normalised the variables by industry averages, but found that only one

[12] The number of misclassifications obtained by the use of the optimal cut-off ratios in each of the five years is used to compute the percentage error rate of classification. The percentage error rate that is found through this test denotes a predictive ability in the sense that the lower the error, the greater the predictive power. Similarly, a cross sectional analysis was used over all industries. Belkaoui adopted Altman's (1968) z method to distinguish mergers from nonmergers. A firm was classified as a firm candidate for acquisition if its z-score exceeded the cutoff point.

such variable, total liabilities/total assets was useful for the prediction. This suggests that normalisation of variables for industrial effects was not important. No classification or prediction accuracy was reported in their study. The major conclusions of the study are that: In sample design, it is important to keep the ratio of acquired to non-acquired firms approximately equal to the ratio found in the firm population. Moreover, the estimated probit models are statistically significant but are not very powerful in explaining the determinants of the acquisition activity and that a focus on characteristics of only the acquired firms may miss important phenomena that involve specific matching of acquired and acquiring firms.

Wansley and Lane (1983) investigate the financial characteristics of firms acquired in the late 1970's by using linear discriminant analysis in an attempt to develop a model that best distinguished the acquired group from the non-acquired group. Firms selected for use in this study were merged in 1975-1977. There are 83 such firms. Of this total, 16 were merged in 1975, 28 in 1976 and 39 in 1977. The model was developed based upon the estimation sample of the 1975-1976 where the examination consisted of 44 acquired firms and 44 firms that remain non-merged whose fiscal year end matched that of the merged firms. Non-acquired firms were selected randomly from the Compustat Industrial file and matched by fiscal year-end to ensure that data came from the same reporting period. The validation sample consists of 39 firms merged in 1977 which were withheld to test for the predictive power of the model. In this study initially 20 variables measuring 10 aspects of the firm's profile were employed (See Appendix I - Table 8). The final model constructed through stepwise discriminant procedures showed that 5 of the original 20 variables were useful in prediction (See Appendix I - Table 8). The estimation sample provided an overall accuracy rate of 75 percent for a sample of 44 firms merged during 1975 and 1976 and an equal number of randomly selected non-merged firms matched for fiscal year-end. This model could correctly classified 78.6 percent of the acquired firms. The predictive power of the model was also tested by using the validation sample of merged and non-merged firms. The validation sample provided an overall accuracy rate of 69.2 percent and the model can correctly classified 76 percent of the acquired firms. These findings suggest that the acquired firms may be successfully identified from non-acquired firms based solely upon their financial characteristics. Five variables were significant: price/earnings, lnsales, market value/book value, compound growth in sales, long term debt/total assets.

Rege (1984) examines if financial ratios based on historical accounting information can differentiate between firms which are likely to be acquired and those which are not. The information obtained concerned 116 foreign and 167 domestic acquired firms. Sixty five non-acquired firms were found to match the sixty five foreign acquired firms. These firms were compared to the domestic acquired firms and out of the sample of 167 only 55 domestic acquired firms could be obtained which matched 55 foreign acquired firms and 55 non-acquired firms according to the three criteria[13]. Therefore the total sample size was 165 for the present study. Multiple discriminant analysis was employed with 44 firms chosen from each group at random so as to derive the coefficients. Rege used the remaining i.e. cases from each sample which were included in the third group for finding the possibility of misclassification. Five accounting ratios were selected (See Appendix I - Table 9) based upon the findings of previous studies. After the variables were computed from the data of one year prior to takeover, tests of the group location difference were conducted. The results failed to reject the null hypotheses of no difference in group means. As a result, the classification was not successful, and thus, no classification result was reported in the study. The results indicate that financial characteristics of the acquired firm considered in this study neither distinguish between domestic and non-acquired, foreign and non-acquired, non foreign and domestic acquired firms based on published accounting information. This finding suggests that historical cost information might not have sufficient discriminatory power in merger prediction, if the predictor variables are not carefully selected. It also implies that non- historical cost information might be useful for the prediction. Their ranking in the multivariate setting puts the payout variable first followed by activity, liquidity, leverage and profitability in that order.

Dietrich and Sorensen (1984) employ logit estimation in predicting the probability that a given firm will be a merger target. They viewed mergers as external investments and they employ a net present value framework in selecting their discriminant variables. The main assumption of the study is that the factors tending to increase the net present value of cash flows of a potential target are expected to increase the attractiveness of a particular merger candidate while factors increasing the cash outflows associated with a merger tend to reduce its attractiveness. The variables were measured by the percentage deviation from

---

[13] Rege (1984) used three criteria to select the non-acquired firms: industry, year of takeover and asset size.

industry averages. To account for industry variations in measures affecting performance and cash flows they gathered data on merged and nonmerged firms in four industries namely food and beverages, chemicals, electronics and transportation. Data were obtained for 46 firms in the above industries merged in the years 1969 to 1973. (A matched sample of 60 firms distributed equally in the same four industries). Then they transformed the above variables to relative deviations from industry averages. Five-year-old data was used for the nonmerged group (stated as a five-year average departure from the mean value for all nonmerged firms in the sample from the same industry over the same period), while one-year-old data was used for the merged firms (the merger occurred in one of the years 1969 to 1973). The probability of a firm being merged was said to be a function of the financial variables that are shown in Appendix I - Table 10. The logit model correctly classified 92.54% of the estimation sample. When the variables were reduced to five the accuracy in classification of the estimation sample fell to 85.55% . The "predictive" power of the model was 91% for the validation sample, which consisted of only six merged and 16 nonmerged firms. The probability that a firm is a merger target increases as payout, turnover, size and leverage decrease; the probability that a firm is a merger target increases as volume increases. The results indicate that firms make attractive merger targets when management is deficient in producing sales rather than deficient in maintaining profit margins. Additionally, the significance of size and volume probably points to the relative ease of acquiring smaller firms with high trading volume. The results indicate that a firm with average or above average turnover has a very low probability of being a merger candidate, ceteris paribus. But if a firm has a high-turnover with compensating characteristics of low leverage, low payout, or high trading volume, the model assigns nearly a zero value to the probability of merger. The conclusion of the study is that factors tending to increase the NPV of a potential target are expected to increase the attractiveness of a particular merger candidate while increasing the cash outflows associated with a merger tend to reduce its attractiveness. Moreover low turnover must be accompanied by any or a combination of low payout, low financial leverage, high trading volume, and smallness in aggregate market value in order to produce a high probability of merger. The power of the model to predict was 90 percent accuracy. Therefore, one can use logit results to estimate the probability that a given firm will become a merger target.

Joel Hasbrouck (1985) attempts to assess differences in the financial characteristics of target and non-target firms using logit analysis. A sample of firms that were takeover targets in the 1977-1982 period was gathered. Each acquired firm was matched by industry with two control (non-acquired) firms. Financial data was collected for all firms and an analysis was made of the systematic differences between target and control groups. The control variables considered in the study were three[14]. The variables under investigation are described in Appendix I - Table 11 together with the respective dimensions that they represent. The results indicated that target firms are characterised by low q ratios (market/replacement values) and to a lesser extent high current financial liquidity (high level of liquid assets). There is an apparent importance of the q ratio (both equity and assets). The relative magnitude implies that low q firms are more likely to be targets, and that the effects are of similar size for both industry-and size-matched control groups. Measures of financial leverage were not found to be significant. Based on the t-statistics, the most important determinant is LSIZE[15], the logarithm of the market value of equity. The presence of a q effect in both analyses suggests that for a firm-specific mechanism, while the similarity in significance associated with QEQU[16] and QASSET[17], this is an indication of the irrelevance of capital structure as a determinant of takeover likelihood. The debt ratio differences suggest that target firms are more highly levered than the control firms. The role of q must be seen as a firm-specific signal of managerial incompetence. The financial liquidity effect is somewhat more problematic, however, suggesting an industry-related causal mechanism. Measures of financial leverage were found to be significant only insofar as they were indicative of an induced q effect. The role of q (market/replacement value) is perhaps the most interesting and complex and several explanations for its relationship to takeover likelihood may be advanced. It may be said that q is indicative of managerial performance, a role consistent with the value maximisation hypothesis. Such a relationship would lead to a greater likelihood of takeover for a firm with q low relative to other firms, a firm specific characteristic.

---

[14] Joel Hasbrouck (1985) used three control variable: time, size(market value of equity) and industry. Among the three, time is perhaps the most safe control variable. Firm size is likely to be a firm-specific (negative) determinant of acquisition likelihood. It was introduced into the analysis in two ways. In the non-industry-matched analysis, size was used as a control variable in constructing the control group. In the industry-matched analysis, size was included as an additional explanatory variable. The population of available firms was too small to permit control matching by size and industry simultaneously.

[15] LSIZE=log(market value of equity).

[16] QEQU=q measure for common equity, defined as (market value of equity)/(replacement value of assets-market value of liabilities).

[17] QASSET= q measure for the entire firm, defined as (market value of equity+ market value of liabilities)/(replacement value of assets).

Victor Pastena and William Ruland (1986) examine the joint ability of the independent variables to explain the merger/ bankruptcy choice using both probit analysis and multiple discriminant analysis. A probit analysis was used to test the importance of three firm-related variables- revenues, financial leverage, and the magnitude of tax carryforwards in explaining the merger/ bankruptcy decision. They have also examined the association of ownership concentration with the merger/ bankruptcy choice. A sample of troubled firms was obtained for the 14-year period beginning in 1970 and ending in 1983. The sample of firms was obtained from the 1983 Compustat Annual Industrial Research Tape. This tape shows all firms deleted from Compustat with financial data up to one or two years prior to the year of deletion. The sample of distressed firms was selected using the model developed by Altman (1968). They restricted the sample to manufacturing firms since the Altman model was not developed for banks, insurance firms, or other nonmanufacturing businesses. The Research Tape contains 531 manufacturing firms that merged during the study period. The Altman model was then run on each firm for the last year of data availability. The z-scores suggest that 83 manufacturing firms were distressed. There were some problems with the data of some of the firms and a sample of 68 distressed manufacturing firms that merged remained for study. The Compustat research tape includes 95 bankrupt firms, of which 56 are manufacturing firms. Fourteen firms were deleted for data availability reasons, and 42 firms remained in the study. The final sample contains 110 distressed firms that either merged or entered bankruptcy. The ownership concentration and tax carryforward data were obtained from Standard and Poor's Corporate Records using information for the reporting period just prior to the announcement of bankruptcy or merger. All other financial data were taken from Compustat using the most recent financial information available on the bankruptcy or merger announcement date. The form of the classification model is :

$$M_J = a + b_1 * CON_j + b_2 * LEV + b_3 * TAX_J + b_4 * SIZE_j + e_j$$

(See Appendix I - Table 12)

The intercept a and the terms b_1 through b_4 are coefficients obtained by fitting the model, and e_j is the unexplained error term. The examination shows that the distressed firms that merge have lower financial leverage and are larger than firms that enter bankruptcy. Tax carryforwards are not important in the model. Another finding from the study was that the tests reveal that distressed firms with high ownership concentration (or owner control) show an increase tendency to merge rather than to declare bankruptcy. The results suggest that the self-interest of managers, rather than just the interests of shareholders and creditors, seems to help motivate the merger/ bankruptcy choice. The probit model correctly classifies 73.6 percent of the cases. The authors conducted multiple discriminant analysis to test the predictive power of the variables considered in the merger/ bankruptcy choice. The results are consistent with the hypothesis that the self-interest of managers seems to be at least partly responsible for the merger/ bankruptcy choice.

Krishna G. Palepu (1986) undertakes a methodological and empirical analysis of takeover prediction so as to analyse methodological problems associated with the development of binary state prediction models when the distribution of the two states of interest is skewed. In addition, Palepu examines if it is possible to predict targets with a high degree of accuracy after correcting the methodological flaws of the earlier studies. Palepu has isolated three disadvantages[18] which make the reported prediction accuracies of the previous studies unreliable. A total of 277 targets were initially identified. Of these, 163 were included in the estimation sample after screening for data requirements. The population of 2054 firms, which were not taken over as of 1979 and satisfied the criteria for inclusion in the sample as non-targets, was first arranged in alphabetical order. Every sixth firm was selected from this list to generate a random group of 343 non-targets. Of these, 256 firms met the data requirements and were included in the sample. To test the predictive ability of the estimated model, a separate group of firms is used. This includes all the targets from the year 1980 and all the non-targets, other than those used in the estimation sample, listed on the COMPUSTAT tape in 1980. After screening for the criteria for inclusion in the study listed earlier, and the data requirements, this group consists of 30 targets and 1087 non-targets. Notice that the targets form only about 2.6% of this group. This is a more realistic group to test the true predictive ability of the model than the type of hold-out samples used by the earlier studies. The methodology of the binomial logit model is employed with 9 independent variables. (See Appendix I - Table 13).

[18] The first disadvantage is the use of non-random equal share samples in the model estimation, without appropriate modification to the estimators, leads to inconsistent and biased estimates of the model parameters and the acquisition probabilities. Therefore, this overstate model's ability to predict targets. The second disadvantage is the use of equal-share samples in prediction tests leads to error rate estimates that fail to represent the model's predictive ability in the population. Finally, the use of arbitrary cutoff probabilities in prediction tests without specifying a decision context (the state-payoff matrix and the prior state probabilities).

The variables to be included in the acquisition likelihood model are specified on the basis of six hypotheses[19], frequently stated on the determinants of a firm's acquisition probability. The magnitudes of the acquisition probabilities are in general very small. When the model is tested on a group of 1117 firms, 24 of the 30 (80%) actual targets and 486 of the 1087 (45%) actual non-targets are correctly classified. The strategy of investing in the 625 firms identified by the model to be potential targets is found to result in statistically insignificant excess returns. Hence, the estimated model's ability to predict targets is not superior to that of the stock market. Since the market does not seem to identify targets very accurately long before the takeover announcements, it is concluded that the model also does not predict targets accurately.

Paul Barnes (1989) examines if takeovers can be predicted using historical financial data in the form of accounting ratios. The statistical technique of multiple discriminant analysis (MDA) has been used in order to estimate a linear model which best discriminates between the two population groups (acquired and non-acquired) in terms of their distinguishing financial characteristics. The discriminating model is then used to predict group membership, i.e. failure and nonfailure. Data concerning 92 successful takeover bids of UK quoted firms during the years 1986-87 were obtained (mergers announced prior to the October 1987 crash). Each firm was matched with a non-acquired listed firm within the same industrial sector whose market capitalisation immediately prior to the merger was the nearest. Industrial classification was that used by datastream. Nine basic financial ratios for each firm two years prior to the merger were obtained. The ratios under investigation are described in Appendix I - Table 14 together with the respective dimensions that they represent. The ratio between it and the relevant sector average, the industry relative ratio was used for the analysis. Nine variables in the initial data set and the use of factor analysis in only 9 variables raises some doubts about the validity of factor analysis. MDA also is a technique which has a lot of limitations. The model in the estimation period can correctly

[19] -*Inefficient management hypothesis*: Firms with inefficient managements are likely targets.
-*Growth-resource mismatch hypothesis*: Firms with a mismatch between their growth and the financial resources at their disposal are likely targets.
-*Industry disturbance hypothesis*: Firms that are in an industry subjected to "economic disturbances" are likely acquisition targets.
-*Size hypothesis*: The likelihood of acquisition decreases with the size of the firm.
-*Market-to-book hypothesis*: Firms whose market values are low compared to their book values are likely acquisition targets.
-*Price-Earnings hypothesis*: Firms with low P/E ratios are likely acquisition targets.

classified 68.48 per cent of the acquired firms. The model in the validation period (37 acquired firms and 37 matched non-acquired firms) can correctly classified 74.3 per cent of the acquired firms. The use of industry relative ratio was advocated and was illustrated by means of some UK data giving a reasonably high prediction success rate.

Jon W. Bartley and Calvin M. Boardman (1990) examines whether CC[20] and CD[21] financial data (in conjunction with HC[22] data) have the potential to improve the predictive ability of models that classify firms as takeover targets. The two most frequently used research methodologies for comparing inflation adjusted data to HC data are the examination of the security price reaction to inflation adjusted disclosures and the relationship between inflation adjusted data security returns. These methodologies are indirect tests of usefulness because they test whether or not investors behave as if the disclosures have information content rather than demonstrating the actual use of the data. A second avenue of research provides more direct tests usefulness. The performance of inflation adjusted data is compared to that of HC data in mathematical models that are useful to investors. The research methodology of the study is MDA (Multiple Discriminant Analysis). The independent variables were grouped into the general categories of performance, earning power, long-term solvency, short term solvency, and other characteristics. The variables and the results of the models are summarised in Appendix I - Table 15. The objective of this study was to determine if inflation adjusted accounting data have incremental usefulness in the context of predicting takeover targets. Classificatory models were developed that have direct implications for predictions of large investments and takeovers, and the results indicate that models combining CC and CD data with HC data are more accurate than simple HC models. The usefulness of CC and CD data for identifying takeover targets is not surprising. It is widely recognised that many acquiring firms contemplate the restructuring and /or sale of some portion of the target firm's operations. Inflation adjusted values of specific assets as well as inflation adjusted measures of performance and capital structure should be more useful than HC measures in evaluating a firm's restructured value. The authors believe that their analysis of the takeover prediction

---

[20] CC= Current Cost.

[21] CD= Constant Dollar.

[22] HC= Historical Cost.

models provides a pragmatic comparison of the usefulness of alternative accounting disclosures and facilitates a better understanding of the economic phenomena of takeovers.

Ronnie J. Clayton and M. Andrew Fields (1991) assess the relative performance of logit, probit, and discriminant analysis models developed from selected financial variables and applied to the prediction of acquisition candidates. The time period selected for this study was the four-year period, 1976 to 1979. The first two years are used for model development (estimation period) while the second two years are used to inter-temporally test each model's predictive capabilities (validation period). During 1976-77, 71 acquisitions were completed for which data were available in the Compustat Industrial Files. For modelling purposes a random sample of 71 other firms was selected also. In order to provide an appropriate prediction sample, a total population of 1967 firms with complete data, including 171 acquisitions, was identified during the 1978-79 period. This data is used to develop, test, and compare the logit, probit and discriminant analysis models. The ratios (See Appendix I - Table 16) represent nine distinct groupings including common measures of liquidity, leverage, coverage and profitability. Measures of firm size, growth, dividend policy and variability are also included. The final category includes market factors that are likely to be important in the determination of acquisition candidates. In addition, the relationship between basic ratios and attractive acquisition candidates may be distorted by industry influence. Of the 47 ratios, 15 are basic variables normalised by industry averages to adjust for this possible distortion . The results of the study are summarised in Appendix I - Table 16. The variables included in the models provide insight into the characteristics shared in common by acquisition targets:

<u>Size</u>: The net working capital variable is a proxy for size. Although this variable often is considered to be a measure of liquidity, it actually is highly correlated to the other size variables. Size is a factor common to all studies of acquisition targets since are smaller in general. Acquisition costs and the ease of acquisition are directly related to size; however the average size of acquired firms has risen during the last ten years.

<u>Leverage</u>: Acquired firms use less leverage. This factor is reported to be significant by most other studies. Unused debt capacity is attractive to the bidder.

<u>Return on Assets</u>: All three models provide a measure of return on assets (ROA or CFTA). Buying firms prefer targets with a higher return on assets. This would indicate a stronger financial position particularly with respect to future cash flows.

Dividends: Acquired firms pay lower dividends. These firms are retaining relatively more earnings, which may indicate a higher growth potential. Alternatively, it could indicate that the buying firm has an interest in utilising this business as a potential source of cash flow. This variable appears in the logit and probit models.

Price to cash Flow: Numerous studies, including Harris et al (1982), Simkowitz and Monroe (1971). and Wansley and Lane (1983), have reported that acquired firms have lower price-earnings ratios. This study finds no significant relationship, a result reported by Dietrich and Sorensen (1984) and Palepu (1986). However, the logit and probit models indicate a significant positive relationship when measuring market price to cash flow per share instead of earnings per share. Buying firms prefer targets with a higher PCF. This tends to indicate a desire to purchase a firm with a higher expected growth rate in cash flow.

Net Profit Margin: The discriminant model includes the adjusted net profit margin. Acquired firms have relatively lower industry adjusted NPM's. This would reflect an area of possible improvement in earnings available to buying firms.

Coverage: The times interest earned ratio is the final variable in the discriminant model and indicates that coverage is higher for acquired firms. Unlike the other variables it is not significant.

P. Holl and J. F. Pickering (1991) examine the effects of takeovers and other variables on corporate performance reported. The methodology used is logit analysis. Their sample of 972 establishments is taken from the Workplace Industrial Relations Survey, 1984, in which the plant is the unit of investigation and the assessment of performance is made by managers. The different variables employed by the study are described in Appendix I - Table 17 . Using logit analysis the authors found that the main determinants of relative financial performance are avoidance of takeover and strength of market position. The main determinants of growth of sales are profitability, change of ownership, smaller size and lack of market dominance.

Stephen A. Rhoades (1993) conducts tests to determine whether banks involved in horizontal mergers achieve efficiency improvements relative to other firms. The analysis covers 898 bank mergers from 1981 to 1986. The overall sample is composed of banks engaged in horizontal mergers and all 'other' banks, for each of the years 1981- 1986. The sample of banks engaged in horizontal mergers is based on a listing of all bank mergers and acquisitions during each of the years 1981-1986. The models and the variables of the study are described in Appendix I - Table 18. The results of this study indicate consistently that horizontal bank mergers during 1981-1986 did not generally result in efficiency gains.

2.3 A critical overview of the previous studies

The examination of existing literature on the topic of the prediction of takeover targets as described in <u>section 2.2</u> and <u>Appendix I</u> has revealed some methodological problems which need to be examined very carefully and if possible to make an effort to rectify them.

The **first problem** that has been identified after the examination of the previous studies on the prediction of takeover targets is that **industry classification was not considered**[23].

> **" There is another factor to the stability assumption. This is that the model is also <u>stable across all industries</u>. This is most unlikely to be the case, especially as industry average financial ratios, of course, vary across industries ".**
> **Paul Barnes (1989) (p.77)**

Paul Barnes (1989) mentioned the problem of the stability of the existing models and and then he put forward some suggestions.

> **" There are a number of ways around this problem. <u>One is to estimate industry specific models</u>. Another is to adjust for industry specific aifferences in the general model. Probably the best and easiest way, again, is to use industry- relative ratios ".**
> **Paul Barnes (1989) (p.77)**

Stevens (1973) was criticised by Monroe (1973) in a comment paper for not taking the industry effect into account. Dietrich and Sorensen (1984) support that the sample choice and variable definitions account for the different effects of industry variation on measures of firm characteristics, which can vary substantially across industries.

[23] Simkowitz and Monroe (1971), Stevens (1973), Belkaoui (1978), Wansley and Lane (1983), Rege (1983).

Simkowitz and Monroe (1971), Wansley and Lane (1983) analysed financial characteristics of acquired firms and have not considered industry classification. Platt and Platt[24] (1990) suggested that the problem with the financial ratios may be solved if we use industry relative ratios (i.e. firm's ratio/ industry's average ratio). But, Paul Barnes (1982) proved that industry relative ratios are associated with skewness and non-normality. Furthermore, Jon W. Bartley and Calvin M. Boardman (1990) suggested that matching on industry may be an appropriate control mechanism when the research objective is to examine the statistical significance of individual causal variables.

The present thesis advocates a solution around the problem, **which is to develop industry specific models for the chemical industry, construction industry, food industry, electrical and electronics industry and mechanical engineering industry.** Given the inter-industry differences, an examination by industry, may adjust any specific factors creating major changes in economic environment and in takeover activity in the years under examination.

The **second problem** is that **validation samples** (hold- out samples) **were chosen from the same time period as the estimation samples**[25]. Paul Barnes (1989) supports that the predictive application of the model must have stability over time. Therefore, there is a need to test the model derived in the estimation sample in a totally different period for the validation sample with a totally new set of firms. This approach has been justified by Gordon Kemp (1995) in his paper *"Structural Stability in Duration Models"*. The contribution of the present thesis is the fact that it employs validation samples that are chosen from a different time period from that of the estimation samples. The estimation period is the period 1982-1985 and the validation period is the period 1986-1990.

The **third problem** is the **analysis of financial characteristics of acquired firms shortly preceding to an acquisition**[26]. Most of the previous studies have identified firms that were takeover targets during a single year and then obtained financial data from the financial

---

[24] Platt, H. D. and M. B. Platt (1990), *Development of a Class of Stable Predictive Variables: The Case of Bankruptcy Prediction*, Journal of Business Finance and Accounting (Spring 1990), pp. 31-51.

[25] Simkowitz and Monroe (1971) , Stevens (1973), Belkaoui (1978), Rege (1983), Dietrich and Sorensen (1984).

[26] Simkowitz and Monroe (1971), Tzoannos and Samuels (1972), Wansley and Lane (1983), Rege (1983).

statements immediately preceding the year of the takeover. Simkowitz and Monroe (1971) analysed financial characteristics of acquired firms immediately prior to an acquisition. Tzoannos and Samuels (1972) have used the estimating function with the parameters of one period to forecast events in the next period with the same set of firms. Dietrich and Sorensen's (1984) major limitation is that one year old data was used for the merged firms but five year old data was used for the nonmerged firms. The present thesis employs 6 year old data for target, bidder and non- acquired firms (non bidder and non targets firms) so as to capture the financial performance of the firms well before the acquisition attempt.

The **fourth problem** is that many studies used **MDA[27] analysis** which employs many problems such as multicollinearity, classification problems, time series problems, the definition of groups, the distribution of the variables etc.)[28]. Wansley and Lane (1983) accept the fact that since linear discriminant algorithm employs averages, some information relevant to particular mergers is lost in the discriminant function. Thus although no liquidity, profitability or activity variable enters the model as significant the authors do admit that these are important attributes in particular mergers. Simkowitz and Monroe (1971) used MDA which was selected as the appropriate statistical tool for their study but the high probability that several of the original variables possessed a high degree of multicollinearity made necessary the exclusion of those variables which did not add to the power of the model (e.g. the discriminant function includes no direct measure of profitability, debt policy or liquidity while one or more measures of each of these were included in the original set of variables). Therefore, the technique employed with highly correlated input data raises some doubts as to which financial characteristics were significant. Jon W. Bartley and Calvin M. Boardman (1990) have identified multicolinearity in their study which led the authors to remove in subsequent steps of the stepwise procedure for some variables that initially entered the models. The present thesis employs logit and probit approaches in an attempt to avoid the methodological problems of MDA.

Another problem is the **use of small sample sizes** which makes the findings more general[29]. Dietrich and Sorensen (1984) study use small sample sizes, especially the validation sample,

---

[27] Simkowitz and Monroe (1971), Singh (1971), Tzoannos and Samuels (1972), Stevens (1973), Rege (1983), Wansley and Lane (1983), Paul Barnes (1989), Jon W.Bartley and Calvin M.Boardman (1990).

[28] More discussion of these problems is provided in chapter 3.

[29] Belkaoui (1978), Dietrich and Sorensen (1984), Stevens (1973), Wansley and Lane (1983).

which consisted of only 6 merged and 16 nonmerged firms. Belkaoui's (1978) results are based on a relatively small population of acquired firms (50 and 22 firms in the estimation and validation samples, respectively). The sample size for the present study is described in chapter 4 and it is large enough to justify the empirical findings. Finally some studies employ **limited number of variables** in their empirical models [Rege (1984), P. Barnes (1989)]. The present thesis employs 38 variables explaining five different dimensions.

Moreover, the following key variables were used in the final models in the above studies: Return on Capital Employed, Acid Test Ratio, Current Assets/ Total Assets, Long Term Liabilities/ Total Assets, Sales/ Total Assets, Net Working Capital/ Total Assets, Total Liabilities/ Total Assets, Natural Log of Total Assets, EBIT- Depreciation\ Total Assets, Net Profit/ Total Assets, Capital Expenditure\ Total Assets, EBIT/ Sales, Natural Log of Sales, EBIT\ Interest Payment, Quick Assets\ Current Liabilities, Current Assets\ Current Liabilities, Log of Net Working Capital, Net Profit Margin, Payout ratio and P/E ratio. Consequently, the intention is to use these variables as the basis of the present study. From this list it was found that the most common financial characteristics of takeover targets are: low P/E ratios[30], low dividend payout[31], low growth[32], smaller in size[33], low profitability[34], low valuation ratios[35], low efficiency[36], low leverage[37] and high liquidity[38].

30 Simkowitz and Monroe (1971), Tzoannos and Samuels (1971), Wansley and Lane (1983).

31 Simkowitz and Monroe (1971), Dietrich and Sorensen (1984), Ronnie J.Clayton and M.Andrew Fields (1991).

32 Simkowitz and Monroe (1971), Singh (1971), Kuehn (1975).

33 Simkowitz and Monroe (1971), Wansley and Lane (1983), Dietrich and Sorensen (1984), Palepu (1986), Ronnie J.Clayton and M.Andrew Fields (1991).

34 Singh (1971), Tzoannos and Samuels (1971), Stevens (1973), Kuehn (1975).

35 Singh (1971), Kuehn (1975).

36 Stevens (1973), Dietrich and Sorensen (1984).

37 Stevens (1973), Wansley and Lane (1983), Victor Pastena and William Ruland (1986), Ronnie J.Clayton and M.Andrew Fields (1991).

38 Joel Hasbrouck (1985).

2.4 Hypotheses

In the light of the above studies there is an attempt to test the following thesis which in the main depend on the variables isolated as being significant before.

2.4.1 Hypothesis 1 : " Profitability Hypothesis "

It is often supposed in finance literature that the acquired firms are less profitable than the acquiring firms. Tzoannos and Samuels (1972) vouch that a merger is therefore seen as part of a healthy process of rationalising the industrial structure. If this hypothesis is correct it should be possible to discriminate those firms that are likely to be acquired from those firms that will do the purchasing. Thomas Hogarty (1970) and Ajit Singh (Jan. 1992) support that corporate mergers have a neutral impact on profitability. This hypothesis has been tested by the following studies: Singh (1971), Tzoannos and Samuels (1972), Stevens (1973), Kuehn (1975), Harris et. al. (1982), Wansley and Lane (1983), Rege (1984), Dietrich and Sorensen (1984), Paul Barnes (1989) and Ronnie J. Clayton and M. Andrew Fields (1991).

- **Potential bidders and potential targets should show different financial performance in terms of profitability.**

The issue being explored is whether a firm will become the target of a takeover bid, because of its relatively poor financial performance in terms of profitability. Under the null hypothesis, bidders are able to escape takeover due to their superior financial performance in terms of profitability as compared with that of the potential targets which show poor financial performance in terms of profitability.

- **Non-acquired firms and potential targets should show different financial performance in terms of profitability.**

The issue being explored is whether a firm will become the target of a takeover bid, because of its relatively poor financial performance in terms of profitability. Under the null hypothesis, non-acquired firms are able to escape takeover due to their superior financial performance in terms of profitability as compared with that of the potential targets which show poor financial performance in terms of profitability.

2.4.2 <u>Hypothesis 2</u> : "Inefficient Management Hypothesis"

Many firms employ inefficient or incompetent management. The existing finance literature suggest that an indication of inefficient management is when the assets of a firm are not fully utilised. Therefore, when a firm has inefficient management then it should seek to replace its management. Takeovers can be an indirect control mechanism by which managers of a firm who fail to maximise the efficiency of the assets of the firm and subsequently of the market value of the firm are replaced. In the present thesis ratios under the efficiency group are used as a proxy for management performance. This hypothesis is related to Manne's (1965) concept of a market for corporate control. Under this hypothesis corporate mergers shift control of an acquired firm's assets from a relatively inefficient management to the superior managers of the acquiring firm. Moreover, Seymour Tim (1986) says that poor performance in relation to industry benchmarks is often viewed as a presence of ineffective management, and predators may believe such firms offer opportunities to substantially increase returns. This hypothesis has been tested by Krishna G. Palepu (1986) and some other studies (e.g. Stevens (1973), Harris et. al. (1982), Wansley and Lane (1983)) have used some activity ratios to measure the efficiency of the firm without testing directly the above hypothesis.

- **Potential bidders and potential targets should show different financial performance in terms of efficiency.**

The issue being explored is whether a firm will become the target of a takeover bid, because of its relatively poor financial performance in terms of efficiency. Under the null hypothesis, potential bidders are able to escape the actual takeover due to their superior financial performance in terms of efficiency as compared with that of the potential targets which show poor financial performance in terms of efficiency.

- **Non-acquired and potential targets should show different financial performance in terms of efficiency.**

The issue being explored is whether a firm will become the target of a takeover bid, because of its relatively poor financial performance in terms of efficiency. Under the null hypothesis, non-acquired firms are able to escape the actual takeover due to their superior financial performance in terms of efficiency as compared with that of the potential target firms which show poor financial performance in terms of efficiency.

2.4.3 Hypothesis 3: "Financial Leverage Hypothesis"

The purpose of this hypothesis is to examine the differences of potential takeover targets and non-acquired firms in terms of financial leverage measures as well as the differences of potential takeover targets and bidder firms in terms of financial leverage. The proxy for this hypothesis are the ratios under the leverage group. Jack O. Vance (1969) when analysed the financial characteristics of target firms he found that excess debt capacity was one of them. This hypothesis has been tested by the following studies: Singh (1971), Tzoannos and Samuels (1972), Stevens (1973), Harris et. al. (1982), Wansley and Lane (1983), Rege (1984), Dietrich and Sorensen (1984), Joel Hasbrouk (1985), Victor Pastena and William Ruland (1986), Paul Barnes (1989) and Ronnie J. Clayton and M. Andrew Fields (1991).

- **Potential target firms use less financial leverage than bidder firms.**

The issue of being explored is whether a firm will become the target of a takeover bid, because of its relatively poor leverage position compared to bidder firms.

- **Potential target firms use less financial leverage than non-acquired firms.**

The issue being explored is whether a firm will become the target of a takeover bid, because of its relatively poor leverage position compared to the non-acquired firms.

2.4.4 Hypothesis 4: "Corporate Liquidity Hypothesis".

As it was discussed in chapter 1, firms which have excess cash and do not have profitable investment opportunities to invest in are deemed to be targets for takeover. The general perception is that target firms have good liquidity position. On the other hand, there are firms in need of funds that want to finance their working capital requirements. If this is the case, then, these firms are likely to be takeover targets because the bidder is expected to bring additional funds into the target firm so as to improve its liquidity. Jack O. Vance (1969) analyses the financial characteristics of target firms and among these financial signals is a firm with excess liquidity. According to Rege (1984) and Joel Hasbrouck (1985) very liquid firms will be attractive takeover candidates. This hypothesis has been tested by the following studies: Singh (1971), Tzoannos and Samuels (1972), Stevens (1973), Kuehn (1975), Belkaoui (1978), Harris et. al. (1982), Wansley and Lane (1983), Rege (1984), Dietrich and Sorensen (1984), Joel Hasbrouk (1985), Paul Barnes (1989) and Ronnie J. Clayton and M. Andrew Fields (1991).

- **Potential bidders and potential targets should show different financial performance in terms of liquidity.**

The issue being explored is whether a firm will become the target of a takeover bid, because of its very good liquidity position compared to the bidder firms.

- **Non-acquired firms and potential targets should show different financial performance in terms of liquidity.**

The issue being explored is whether a firm will become the target of a takeover bid, because of its very good liquidity position compared to the non-acquired firms.

2.4.5 Hypothesis 5 : " Research and Development Hypothesis ".

SSAP[39] 13 defines three terms: pure (or basic) research[40], applied research[41] and development[42]. An acquisition candidate may be characterised from good research and

[39] SSAP= Statement of Standard Accounting Practice. SSAP 13 was issued by the ASC (Accounting Standards Committee) in December 1977 and it was revised in January 1989.

[40] Pure (or basic) research: i) original investigation undertaken in order to gain new scientific or technical knowledge and understanding and ii) not primarily directed towards any specific practical aim or application.

[41] Applied Research: i) original investigation undertaken in order to gain new scientific or technical knowledge and ii) directed towards a specific practical aim or objective.

[42] Development: i) the use of scientific or technical knowledge in order to produce new or substantially improved materials, devices, products, processes, systems or services prior to the commencement of commercial production.

development capabilities. The proxy for this hypothesis will be the following set of financial ratios: Capital Expenditure[43] to Total Assets and Capital Expenditure to Sales.

The hypothesis is formulated as follows:

- **Potential bidders and potential targets should show different financial performance in terms of the size of research and development.**

The issue being explored is whether a firm will become the target of a takeover bid, because it can generate research capabilities from its total assets or sales when compared to the potential bidder firms.

- **Non-acquired firms and potential targets should show different financial performance in terms of the size of research and development.**

The issue being explored is whether a firm will become the target of a takeover bid, because it can generate research capabilities from its total assets or sales when compared to the non-acquired firms.

[43] R. H. Parker (1992) ("Macmillan dictionary of accounting") defines capital expenditure as expenditure on fixed assets. In the U.K, there must be disclosed, were practicable, in the notes to the accounts the aggregate or estimated amount of contracts for capital expenditure insofar as not provided for, and the aggregate or estimated amount of capital expenditure authorised by the directors but not contracted for. For the present thesis capital expenditure is assumed to measure the research and development intessiveness.

2.5 Conclusion

The present chapter identifies the major limitations of the previous studies which are: industry classification was not considered, estimation samples and validation samples were chosen from the same time period, analysis of financial characteristics of acquired firms shortly preceding to an acquisition, the use of MDA analysis, limited number of variables under consideration and the use of small sample sizes for both the estimation and validation periods. In addition, the present chapter identifies the key variables that are employed in the final models of the previous studies. Moreover, it describes the most common financial characteristics of takeover targets as identified by the previous studies which are: low P/E ratios[44], low dividend payout[45], low growth[46], smaller in size[47], low profitability[48], low valuation ratios[49], low efficiency[50], low leverage[51] and high liquidity[52]. The findings of this chapter are valuable so as to decide on the financial variables to be employed and provide a benchmark for the comparison of the results of the present thesis to the results of the previous studies. Moreover, the present chapter describes the different hypotheses under investigation namely profitability, inefficient management, financial leverage, corporate liquidity and research and development. The above hypotheses have been chosen because all of them are purely financial in nature and therefore they satisfy the requirements of the data that has been collected. In addition these hypotheses are representatives of the respective theories of mergers that are described in chapter 1 under section 1.2. It is beyond the scope of the present thesis to test all the theories outlined in chapter 1. It is clear that due to the nature of the data some economic theories can not be tested (e.g. monopoly theory, economies of scale theory, growth, diversification etc.).

---

44 Simkowitz and Monroe (1971), Tzoannos and Samuels (1971), Wansley and Lane (1983).

45 Simkowitz and Monroe (1971), Dietrich and Sorensen (1984), Ronnie J.Clayton and M.Andrew Fields (1991).

46 Simkowitz and Monroe (1971), Singh (1971), Kuehn (1975).

47 Simkowitz and Monroe (1971), Wansley and Lane (1983), Dietrich and Sorensen (1984), Palepu (1986), Ronnie J.Clayton and M.Andrew Fields (1991).

48 Singh (1971), Tzoannos and Samuels (1971), Stevens (1973), Kuehn (1975).

49 Singh (1971), Kuehn (1975).

50 Stevens (1973), Dietrich and Sorensen (1984).

51 Stevens (1973), Wansley and Lane (1983), Victor Pastena and William Ruland (1986), Ronnie J.Clayton and M.Andrew Fields (1991).

52 Joel Hasbrouck (1985).

CHAPTER 3

METHODOLOGY

3.1 Introduction

The classification methodologies that appear in the existing finance literature are LPM[1], MDA[2], Logit analysis and Probit analysis which are employed many times with financial ratios to predict group membership and especially in the prediction of bankruptcy and the prediction of takeover targets.

The aims of the chapter are to review the different methodologies adopted in the present thesis and to describe the covariates employed in the thesis.

Initially, the present chapter makes an overview of discriminant analysis, a technique that has been used widely in the area of the prediction of takeover targets but it employs some statistical problems. Then, there is a description of the methodologies that have been employed in the present thesis namely logit analysis and probit analysis. Moreover, there is a description of the covariates (financial accounting ratios[3]) that are used in the present thesis.

The major contribution of chapter 3 is that it provides the rationale for the choice of logit analysis and probit analysis as appropriate methodological techniques for the present thesis.

---

[1] LPM= Linear Probability Models.

[2] MDA= Multiple Discriminant Analysis.

[3] The variables used in the present thesis are all financial. The variables are financial ratios which have been calculated based on the financial statements of the firms under analysis. Thirty-eight variables have been calculated which explain five different dimensions namely profitability, efficiency, liquidity, leverage and research and development. An extensive analysis of the data is provided in chapter 4.

3.2 Multiple Discriminant Analysis (MDA)

3.2.1 Discriminant Analysis - An Overview

William R. Klecka (1980) describes discriminant analysis as a powerful technique for examining differences between two or more groups of objects with respect to several variables simultaneously and it has been applied in a wide range in the social science studies[4] field. Donald Stevens (1973) argues that MDA is well suited to many finance problems where the dependent variable is nonmetric (acquired and non acquired, bankrupt or not bankrupt) and is further suited to finance applications because as a multivariate technique, it treats a profile of variables rather than one variable at a time. Furthermore, James W. Wansley (1984) identifies the different areas where MDA has gained wide acceptance in applied business research. Within the area of finance, MDA has been used to identify problems with banks[5], analyse industrial bond ratings[6], predict corporate bankruptcy and small business failures[7],determine the capital adequacy of commercial banks[8]. In the area of mergers and acquisitions, MDA has been used to analyse the financial characteristics of acquired firms[9]. Discriminant analysis enables the significance of a number of variables to be considered at the same time. This is a methodology whereby an observation is classified into one of several groups based on the profile of its characteristics. MDA reduces the multi- dimensional variable space into a single dimension called the discriminant function (Z). Z is a linear combination of the various discriminating variables used in the model. Using the two samples i.e. the firms that were acquired and those that were not subject to a takeover bid, discriminant analysis takes the form of estimating a linear probability function. This function can be used to give an estimate of the probability of a firm taken over in response to various financial variables. The method consists of using as the dependent variable a dummy that takes the values of 1 if the firm belonged to the first sample (those taken over) and 0 if it belonged to the second (those not subject to takeover bids or bidder firms). Then this variable is

---

[4] Personnel placement testing, psychological testing of the children, the effects of medical treatments, economic differences between geographic regions, predicting voting behaviour etc.

[5] Sinkey, J. F. (1975), *A Multivariate Statistical Analysis of the Characteristics of Problem Banks*, Journal of Finance, March, pp. 21-36.

[6] Pinches, G. E. (1973), *A Multivariate Analysis of Industrial Bond Ratings*, Journal of Finance , March, pp. 1-8.

[7] Altman E. I (1968), *Financial Ratios ,Discriminant Analysis and the Prediction of Corporate Bankruptcy*, Journal of Finance, September, Vol. XXIII, No 4, pp. 589-609.

[8] Dince, R. R. and Fortson, J. C. (1972), *The Use of Discriminant Analysis to Predict The Capital Adequacy of Commercial Banks*, Journal of Bank Research, Spring, pp. 54-62.

[9] Simkowitz and Monroe (1971), Tzoannos and Samuels (1972), D. Stevens (1973), Belkaoui (1978), Wansley and Lane (1983), P. Rege (1984), P. Barnes (1989).

regressed against the various explanatory variables which are the financial characteristics that the theory suggests will influence one firm in its decisions to take over another firm. If the independent variables are normally distributed, the discriminant analysis estimator is the true maximum-likelihood estimator. However, if the independent variables are not normal, the discriminant analysis estimator is not even consistent, whereas the logit maximum likelihood estimator is consistent and therefore more robust.

3.2.1.1 Discriminant Analysis - Properties and Limitations.

Discriminant analysis has been widely used to two -category (dichotomous) classification problems in empirical financial research. What has not been analysed in depth was the fact that the difficulties associated with discriminant analysis have not been analysed by the various researchers properly. O. Maurise Joy and John O. Tollefson (1975) support that the conclusions and generalisations that can be drawn from such studies are frequently groundless and questionable. Moreover, O. Maurise Joy and John O. Tollefson (1975) and William R. Klecka (1980) discuss the limits on the statistical properties[10] of the discriminating variables. According to Robert A. Eisenbeis (1977) most discriminant analysis papers that have appeared in the business finance and economics literature have suffered from methodological or statistical problems that have limited the practical usefulness of the results. The major limitations that will be discussed in this section are the following: multicollinearity, classification problems, the distribution of the variables, group dispersion (variance-covariance) matrices and the relative importance of individual variables. Hence, the conclusions from studies employed discriminant analysis are disputable.

[10] Firstly, *no variable may be a linear combination of other discriminating variables*. Secondly, *each group is drawn from a population which has a multivariate normal distribution*. This permits the precise computation of tests of significance and probabilities of group membership. When this assumption is violated, the computed probabilities are not exact. Finally, the *population covariance matrices are equal for each group*. This allows a simplification of the formulas used to calculate the discriminant function and certain tests of significance.

Multicollinearity is a common problem when MDA is used with ratios in most empirical studies in finance. Donald Stevens (1973) discusses the problem of multicollinearity[11]. Altman (1968) reported high multicollinearity in the ratio set from which he derived his discriminant model. He emphasised the need to choose the variables for the model very carefully, and his selection was achieved through a large number of trial computer runs. In addition, Simkowitz and Monroe (1971) experienced similar problems, and no ratios measuring leverage, liquidity or profitability enter the final discriminant function. They explained that the multicollinearity they observed in the data was the reason why leverage was omitted because they were not important discriminators. Similar multicollinearity problems were experienced in the study developed by Stevens (1973) which employed a large set of ratio data. In an attempt to reduce high correlations among the variables entering the MDA phase, the data were first subjected to a factor analysis[12].

O. Maurise Joy and John O. Tollefson (1975) support that discriminant analysis faces **classification problems**. The problem is the classification of entities into a priori categories, where each entity may be characterised by a number of characteristics. Robert A. Eisenbeis (1977) advocated that if one of the main purposes in conducting a discriminant analysis is to construct a classification scheme, then a central problem involves assessing the performance of the estimated rules. Reclassification of the original sample used in constructing the classification rules as a means to estimate expected error rates leads to a biased and overly optimistic prediction of how well rules perform in the population.

The **distribution of the variables** is another problem that faces the standard discriminant analysis. Robert A. Eisenbeis (1977) believes that procedures assume that the variables used to describe or characterise the members of the groups being investigated are multivariate normally distributed. Violations of the normality assumptions may bias the tests of significance and estimated error rates. It is very important to note that if the normality hypothesis is rejected, one

---

[11] Donald Stevens (1973) supports the view that the shortcomings of the MDA approach are significant whenever more than one variable interacts to produce differences. An assumption of most statistical techniques derived from the general linear model is that the independent variables are mutually uncorrelated. If there are moderate departures from this do not significantly damage the results. But if the variables are highly collinear, the weights in the resulting model are highly unstable and the model tends to be highly sample sensitive and subsequently the interpretation becomes very difficult.

[12] See Appendix II for a discussion of factor analysis.

is then faced with the practically impossible task of deriving the appropriate alternative joint probability density functions.

Robert A. Eisenbeis (1977) goes on and discusses another critical assumption of classical linear discriminant analysis which says that the **group dispersion (variance-covariance) matrices** are equal across all groups. Relaxation of this assumption affects only the significance test for the differences in group means.

Furthermore, Robert A. Eisenbeis (1977) believes that one of the misunderstood aspects of discriminant analysis relates to the problem of determining the **relative importance of individual variables**. The discriminant function coefficients are not unique; only their ratios are. Therefore it is not possible *nor does it make any sense to test, as is the case with regression* analysis, whether a particular discriminant function coefficient is equal to zero or any other value. That is, there is no test for the absolute value of a particular variable. It is this aspect of discriminant analysis that may be more upsetting to economists than to others. It seems to be the nature of the behavioural hypotheses generated in economics and finance that they require that the influence of specific variables be isolated and quantified in a fundamental sense. Regression analysis seems particularly well suited for such problems, since it does allow one to test, ceteris paribus, whether specific coefficients are significantly different from a particular value.

3.2.1.2 THE LINEAR PROBABILITY MODEL

In the LPM[13], the coefficient indicates the marginal change in the probability associated with a unit change in the explanatory variable.

A **linear probability model**[14] is the linear relationship of the coefficients in equation which are used to explain a dummy dependent variable:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \varepsilon_i \qquad (1)$$

[13] Robert S. Harris, John F. Stewart ,and Willard T. Carleton (1982), *Financial Characteristics of Acquired Firms* (Mergers and Acquisitions: Michael Keenan and Lawrence J. White-Lexington Books) pp. 223-241.

[14] A. H. Studenmund (1992), *Using Econometrics: A Practical Guide*, Harper Collins Publishers.

where

Y_i = dummy variable

X_s = independent variables,

β_s = regression coefficients,

and

ε_i = the error term.

The covariates variables for the present research are the financial ratios under investigation. The term linear probability model comes from the fact that the right-hand side of the equation is linear, while the expected value of the left hand side is a probability.

For the purpose of the present thesis suppose Y_i as a dummy variable is equal to 0 if a firm is a non-acquired firm and is 1 if the firm is an acquisition candidate, a potential takeover target. (See chapters 5+6). Moreover, the present thesis also investigates another area where Y_i will serve as a dummy variable and it is equal to 0 if a firm is a potential bidder firm and it is equal to 1 if the firm is an acquisition candidate, a potential takeover target. (See chapters 5+6)

Models, such[15] as (1), which express the dichotomous Y_i as a linear function of the explanatory variable(s) $X_{i(s)}$, are called linear probability models (LPM) since $E(Y_i / X_i)$, the conditional expectation of Y_i given X_i, can be interpreted as the conditional probability that the event will occur given X_i. The justification of the name LPM models like (1) can be described as follows:

Assuming $E(e_i)$=0, as usual (to obtain unbiased estimators), we obtain:

$$Y_i / X_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} \qquad (2)$$

Now if[14] P_i= probability that Y_i= 1(that is, that the event occurs) and 1-P_i= probability that Y_i= 0 (that is, that the event does not occur), the variable Y_i has the distribution outlined in (3). Equation (1) measures a probability because it can be shown that the expected value of

[15] Damodar N. Gujarati (1988), *Basic Econometrics*, McGraw-Hill International Editions, Second Edition.

Y_i equals the probability that Y_i will equal one. The proof of the above point can be described as follows:

If P_i = the probability that Y_i will equal to one, then the probability that Y_i will equal zero is $(1-P_i)$, since Y_i can take only two values.

Thus, the expected value of $Y_i = 1P_i + (1-P_i)0 = P_i$, (3)

the probability that Yi equals one.

Therefore, by the definition of mathematical expectation, we obtain

$$E(Y_i) = 0(1-P_i) + 1(P_i) = P_i \qquad (4)$$

Comparing (2) and (4), we can equate:

$$E(Y_i / X_i) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} = P_i \qquad (5)$$

that is, the conditional expectation of the model (1) can be interpreted as the conditional probability of Y_i. Since the probability P_i must lie between 0 and 1, we have the restriction:

$$0 \leq E(Y_i / X_i) \leq 1 \qquad (6)$$

that is, the conditional expectation, or conditional probability, must lie between 0 and 1.

3.2.1.2.1 Problems with the Linear Probability Model

Caudill- Sb (1988) mentions that criticisms of the linear probability model are discussed by Maddala (1983); the disturbances in the LPM are heteroscedastic, therefore least squares is not efficient, the disturbances are not distributed normally, so there exist nonlinear procedures more efficient than least squares, and predicted probabilities from the LPM can lie outside the 0-1 interval. The criticism of the linear probability model (LPM) has led to increased use of logit analysis and probit analysis.

"LPM has frequently been used in econometric applications, especially in the early years, because of its computational simplicity. Though I do not recommend its use in the final stage of a study, it may be used for the purpose of obtaining quick estimates in a preliminary stage." Amemiya[16] (1981)

Summarising, the use[14] of OLS to estimate the coefficients of an equation with a dummy dependent variable encounters some problems which eventually are problems of LPM:

- ***The error term is not normally distributed.*** Because the dependent variable takes on only two values, the error term approaches the normal distribution only for large samples but not for small samples. The absence of normally distributed errors affects the statistical inference of equation (5).
- ***The error term is inherently heteroskedastic.*** The variance of ε_i equals $P_i(1-P_i)$, where P_i is the probability that Y_i equals 1. Since P_i can vary from observation to observation, so too can the variance ε_i . Thus the variance of ε_i is not constant, and the classical assumption of OLS that the error term has a constant variance is violated.
- The expected value of Y_i is not bounded by 0 and 1. Since the expected value of Y_i is a probability, we would expect the expected value of Y_i to be limited to a range of 0 to 1.

Meador J. W. et. al. (1986) assessed the advantages of several multivariate models and found that the logit technique is an appropriate method for estimating the probability of acquisition because the logit model measures the probability of merger using maximum likelihood estimates derived from a comparison of the financial characteristics identified to the conditional probability of merger. Therefore, there is a valid justification for using logit as a methodology for predicting takeover targets.

[16] Amemiya, Takeshi (1981), *Qualitative Response Models: A Survey,* Journal of Economic Literature, Vol. 19, pp. 1483-1536.

3.2.1.3 THE BINOMIAL LOGIT MODEL

The use of the logit does not depend on the assumption that independent variables are distributed multivariate normal and enables direct interpretation of the various explanatory variable coefficient estimates. In the logit model[17], the coefficient is the change in the log of the odds associated with a unit change in the explanatory variable. Dietrich and Sorensen (1984) support the view that when logit analysis is used to estimate the probability of a merger instead of MDA, it makes the interpretation of the estimation results more direct and imposes less restrictive assumptions on the statistical properties of the data. Moreover, they support that specifically in the area of prediction of target firms logit estimation allows a comparison of the relative importance of the explanatory variables in determining the likelihood of merger.

The binomial logit model[14] is an estimation technique that uses the cumulative logistic function:

$$\ln\left(\frac{Y_i}{[1-Y_i]}\right) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \varepsilon_i \qquad (1)$$

where Y_i is a dummy variable. For the purpose of the present thesis suppose Y_i as a dummy variable is equal to 0 if a firm is a non-acquired firm and is 1 if the firm is a potential takeover target. (See chapters 5+6). In addition, the present research also carries out another examination where Y_i will serve as a dummy variable and it is equal to 0 if a firm is a potential bidder firm and it is equal to 1 if the firm is a potential takeover target. (See chapters 5+6).

The expected value of $\boldsymbol{Y_i}$ continues to be $\boldsymbol{P_i}$, the probability.

Therefore based on the LPM we can re-write (1) above as:

$$P_i = E(Y = 1 / X_i) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} \qquad (2)$$

where $X_{i(s)}$ are the financial characteristics (different financial ratios) of the firms and Y=1 means that a firm is a potential acquisition candidate.

Equation (1) can be thought of as the log of the odds. Odds[14] refers to the ratio of the number of times a choice will be made divided by the number of times it will not.

---

[17] Robert S. Harris, John F. Stewart ,and Willard T. Carleton (1982), *Financial Characteristics of Acquired Firms* (Mergers and Acquisitions: Michael Keenan and Lawrence J. White-Lexington Books) pp. 223-241.

Now, there is a discussion of how the logit model[14] avoids the unboundedness problem of the linear probability model because both sides of Equation (1) are unbounded.

If Y_i=1, then the left-side of Equation (1) becomes:

$$\ln\left(\frac{Y_i}{[1-Y_i]}\right)=\ln\left(\frac{1}{0}\right)=\infty \qquad (3)$$

Similarly, if Y_i=0 :

$$\ln\left(\frac{Y_i}{[1-Y_i]}\right)=\ln\left(\frac{0}{1}\right)=-\infty \qquad (4)$$

The $\hat{Y}_{is}$ produced by a logit now is limited by zero and one. To prove that we need to solve Equation (1) for Y_i.

It can be shown that Equation (1) is equivalent to :

$$Y_i=\frac{1}{1+e^{-(\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\beta_3 X_{3i})}} \qquad (5)$$

Combining (2) and (5) we can write:

$$P_i=E(Y=1/X_i)=\frac{1}{1+e^{-(\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\beta_3 X_{3i})}} \qquad (6)$$

where e is the familiar base of the natural logarithm. For ease of exposition, we can write

$$P_i=\frac{1}{1+e^{-Z_i}} \qquad (7)$$

where $Z_i=\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\beta_3 X_{3i}$.

Equation (7) represents what is known as the **(cumulative) logistic distribution function.**

If we examine equation (5) the largest $\hat{Y}_i$ that we can have given

$\hat{\beta}_0+\hat{\beta}_1 X_{1i}+\hat{\beta}_2 X_{2i}+\hat{\beta}_3 X_{3i}=\infty$ is

$$\hat{Y}_i=\frac{1}{1+e^{-\infty}}=\frac{1}{1}=1 \qquad (8)$$

The smallest $\hat{Y}_i$ that we can have given

$\hat{\beta}_0+\hat{\beta}_1 X_{1i}+\hat{\beta}_2 X_{2i}+\hat{\beta}_3 X_{3i}=-\infty$ is

$$\hat{Y}_i=\frac{1}{1+e^{\infty}}=\frac{1}{\infty}=0 \qquad (9)$$

Thus, $\hat{Y}_i$ is bounded by one and zero.

We can estimate a binomial logit using a maximum likelihood method.

If P_i , the probability of a firm be a potential takeover target , is given by (7), then (1-P_i), the probability of not being a potential takeover target, then:

$$1-P_i=\frac{1}{1+e^{Z_i}} \qquad (10)$$

Therefore, we can write

$$\frac{P_i}{1-P_i}=\frac{1+e^{Z_i}}{1+e^{-Z_i}}=e^{Z_i} \qquad (11)$$

Now $P_i/(1-P_i)$ is simply the odds ratio in favour of a firm being a takeover target- the ratio of the probability that a firm will become a takeover target to the probability that a firm will not become a takeover target. Thus, if P_i= 0.8, it means that odds are 4 to 1 in favour of the firm being a takeover target.

Now if we take the natural log of (11), we obtain a very interesting result, namely:

$$L_i=\ln\left(\frac{P_i}{1-P_i}\right)=Z_i=\beta_0+\beta_1X_{1i}+\beta_2X_{2i}+\beta_3X_{3i} \qquad (12)$$

that is, L, the log of the odds ratio, is not only linear in X, but (from the estimation viewpoint) linear in the parameters also. L is called the logit, and hence the name logit model for models like (12). The statistical significance of the above model (12) can be tested with the likelihood ratio test[18].

3.2.1.4 THE BINOMIAL PROBIT MODEL

In the probit[19] model the coefficient is the change in the standard deviations of the normally distributed variable. Probit provides means for estimating the probability that a firm will be acquired as well as the contribution of a particular financial characteristic to that probability. Probit assumes that potential acquiring firms will judge the attractiveness of all potential

[18] The likelihood ratio test examines whether the logit or probit equation are statistically significant. According to Leonard Lardaro (1993)(p.418) the test statistic for the null hypothesis is **LR= -2 [log of likelihood function (Restricted) - log of likelihood function (Unrestricted)]** which follows the chi- square distribution with k degrees of freedom, where k is the number of coefficients whose values are restricted to 0 in the null hypothesis. If the value of this test statistic exceeds the critical chi-square value with k degrees of freedom at the selected level of significance, we reject H_o, that the set of partial slope coefficients does not influence the dependent variable. Like the situation with a "large" equation F statistic, we then conclude that the logit or probit equation is statistically significant.

[19] Robert S. Harris, John F. Stewart ,and Willard T. Carleton (1982), *Financial Characteristics of Acquired Firms* (Mergers and Acquisitions: Michael Keenan and Lawrence J. White-Lexington Books) pp. 223-241.

targets. Probit estimates the coefficients by maximum likelihood techniques, given the pattern of the events observed in the sample. These coefficients then can be used to estimate the probability that a particular firm given its financial characteristics will be acquired. Coefficients have the statistical properties of consistency and an asymptotically normal distribution. The statistical significance of the probit model is tested in a similar way to that of logit[18]. An advantage of Probit over multiple discriminant analysis is that it provides significance tests for the individual independent variables as well as for the overall classification.

The binomial probit model[14] is an estimation technique for equations with dummy dependent variables that avoids the unboundedness problem of the linear probability model by using a variant of the cumulative normal distribution:

$$P_i = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z_i} e^{-s^2/2}\, ds \qquad (1)$$

where : P_i= the probability that the dummy variable Y_i= 1.

$$Z_i = \hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \hat{\beta}_2 X_{2i} + \hat{\beta}_3 X_{3i} + \varepsilon_i \qquad (2)$$

s= a standard normal variable

We can rewrite the probit so as to look familiar to the logit models.

$$Z_i = F^{-1}(P_i) = \hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \hat{\beta}_2 X_{2i} + \hat{\beta}_3 X_{3i} + \varepsilon_i \qquad (3)$$

where F^{1} is the inverse of the normal cumulative distribution function.
Probit models typically are estimated by applying maximum likelihood techniques to the model in the form of Equation (3), but the results often are presented in the format of Equation (4).

$$Z_i = F^{-1}(P_i) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} \qquad (4)$$

For the present thesis the statistical package of LIMDEP is employed to carry out LPM models, logit models and probit models. Following the discussion in the present chapter binomial logit has been selected to estimate the models presented in the thesis as it is preferred to MDA and as conclusions drawn from probit are not materially different.

3.3 Financial Ratio Analysis - The design of covariates.

Financial ratios are the covariates for the present thesis. The aim of section 3.3 is to make an overview of financial ratio analysis and describe its properties. In addition, there is a description of the covariates selected to be used by the present thesis.

3.3.1 Financial Ratio Analysis - An overview

Financial ratios are mainly divided into two main categories concerning their treatment from the analytical point of view: i) the time series analysis which is concerned with the behaviour of a given ratio over time and ii) the cross sectional analysis which involves comparisons between the investigated firm's ratios and also the examination of the characteristics of different firms within an industry or across industries. The most widely discussed cross-sectional technique is a comparison of ratios across firms. Numerous individual ratios have been proposed in the literature. The principal value of ratio analysis is that it identifies matters which need further investigation. Financial ratios may be regarded as a convenient way to summarise large quantities of financial data and allow comparisons in the firms' performance. Traditionally, ratio analysis has been the major tool used in interpretation and evaluation of financial statements. Financial statements analysis then may be regarded as part of a larger information- processing system on which informed decisions can be derived. Ratios based on historical accounting information[20] are often considered as yardsticks for evaluating the financial condition and performance of the firm. Horigan[21] (1967) used them to determine the long-term credit standing of the firm. Beaver[22] (1967) and Altman[23] (1968) used them for predicting corporate failures. O'Connor[24] (1973) studied the usefulness of financial ratios to investors in common stock. Elam[25] (1975) considered the effect of lease data on the predictive ability of financial ratios. All these studies found that the information input obtained from the ratios is useful for making rational financial

---

[20] Udayan P. Rege (Autumn 1984), *Accounting Ratios to Locate Takeover Targets*, Journal of Business Finance and Accounting, pp. 301-311.

[21] Horigan, J. O. (1967), *The Determination of Long Term Credit Standing with Financial Ratios*, Supplement to the Journal of Accounting Research (1967, pp. 44-62).

[22] Beaver, W. H. (1967), *Financial Ratios as Predictors of Failure*, Supplement to the Journal of Accounting Research (1967), pp 71-111.

[23] Altman, E. I. (1968), Financial Ratios, *Discriminant Analysis and the Prediction of Failure*, The Journal of Finance (September 1968), pp 589-609.

[24] O' Connor, M. C. (1973), *On the Usefulness of Financial Ratios to Investors in Common Stock*, The Accounting Review (VOL. XLVIII, No. 2, April 1973), pp 339-352.

[25] Elam, R. (1975), *The Effect of Lease Data on the Predictive Ability of Financial Ratios*, The Accounting Review (VOL. XLX, No. 1, January 1975), pp. 25-43.

decisions. Therefore, there is a valid justification to employ financial accounting ratios to investigate the financial characteristics of target firms.

3.3.1.1 Properties of financial ratio analysis.

The rationale for research into the distribution of financial ratios can be explained by two main principles. The first principle is the control for the effect of size and the second one is normal distribution can be used to describe much of the analysis of the distribution of financial ratios. The most vital reason for using ratio analysis is to control for the effect of size on the financial ratios being examined. This assumption highlights proportionality. Proportionality, implies that a proportionate relationship exists or ought to exist between the two variables of the ratio. Strict proportionality implies that size is only properly controlled when two financial variables (x and y where x is a measure of size and where x and y are strictly proportional). Therefore $y_i = bx_i$ and the ratio $y_i / x_i = b$ (This is a good measure of the statistical relationship between the two variables under consideration. Strict proportionality, is assumed in both cross sectional analysis, in which the ratio is evaluated in relation to a representative ratio of either firms in the same industry for the same time period, and in time series analysis in which the historical behaviour of the ratio is examined for a specific firm. The strict proportionality assumption is violated under the following circumstances: (i) if there is an intercept term, a and $a \neq 0$. In this case the ratio does not satisfactorily control for size as $y/x = b + a/x$ and (ii) where there is an error term u, in which case $y_i = a + bx_i + u$. In this case the control of size is heavily depended on the behaviour of the error term u.

Significant empirical studies were carried out concerning the vital aspect of proportionality of ratio analysis and especially are concerned with its violation. Whittington (1980) and Barnes (1982) identified the nature and likelihood of misinformation arising from the fact that there is an intercept term a and $a \neq 0$ in the proportionality function. What they suggested as a solution was that a regression analysis should be used. That is for the functional relationship to be properly estimated it is necessary for the intercept to be estimated. Beside this, Barnes (1982) carried out empirical studies concerning the cross sectional distribution of financial ratios which proved skewness as evidence for non zero-intercept. A second approach to checking visually for proportionality is to plot values of the ratio for alternative values of the denominator. Proportionality implies that the value of this ratio across alternative values of the denominator would be similar and therefore the line linking values of the ratio would be parallel to the horizontal axis. Now, if the analyst is facing the problem of choosing upon proper size measures then a practical way that can be carried out by him is to plot the numerator against alternative size measures and then he can select the measure that best satisfies the strict proportionality. However, where the proportionality assumption is not descriptive (i.e. fails to collect, summarise and present data), using statistical tools like linear or non-linear regression analysis is the best option for helping us to analyse data. Now, we will examine how normal distribution can be used to describe the analysis of the distribution of financial ratios. The normal distribution has a bell-shaped curve symmetrical about the mean. The normal distribution has the advantage of that if we know the mean and the standard deviation of a ratio (standard deviation is the square root of the variance), that statistical significance of deviations from the mean can be determined if the distribution of that ratio is normally distributed. Despite, the advantages of examining normally distributed variables evidence suggests that ratios are not normally distributed mainly for two reasons. Firstly, some financial ratios have technical limits that prevent normal distribution. In this case, the actual distributions of financial ratios tend to be asymmetric and are generally skewed to the right. The main reason for the right- skewness is that most ratios have a lower limit of zero but an indefinite upper limit. Secondly, some financial ratios have economic limits that may result in fewer observations in either the lower or upper end of the distribution than the normal *distribution.*

Various empirical studies show an effort to attempt to impose normality. The extent of departure from symmetry may sometimes be reduced by transformation of the original variables (logarithmic transformation). Deakin (1976) concluded that the normality assumption was not able to be held for eleven well known ratios, except for the debt to total asset ratio and he found out that square root and logarithmic transformation sometimes produced normality but no general guidelines could be extracted. Frecka and Hopwood (1983) used Deakin's original ratios and found out that by deleting outliers (an outlier is an observation which appears to be inconsistent with the remainder set of data) normality could be achieved for most ratios using a population of manufacturing firms and specific industry groupings. This also greatly reduced variances and increased their stability over time. The attempt to impose normality by deleting observations that deviate most from normality is called trimming the sample. Moreover, an attempt to impose normality can be achieved by resetting extreme observations to less extreme values. This is called winsorizing the data. In other words, changing an outlier's value to that of the closest non-outlier, and then attempting to fit the distribution on with a known one.

Watson (1990) examined the multivariate distributional properties, multivariate outliers, and modified power transformations to determine whether multivariate normality could be approximated for cross-sectional samples of financial ratios. The results indicated that the joint distribution of the financial ratios differed significantly from multivariate normality and that the financial ratio data contained multivariate outliers. By deleting multivariate outliers and applying modified power transformations to the ratios, approximate multivariate normality was obtained. Watson (1990) concludes that using multivariate outlier detection and transformation methods in accounting research would enhance statistical conclusion validity.

3.3.2 The covariates selected

In attempting to analyse the hypotheses under examination it is my reasoning to find proper measures of the theoretical concepts that are tested. To some extent accounting theory provides good definition of variables. However, in many cases the accounting definition is at variance with economic and financial theory. In selecting the ratios the present thesis group variables by their relationship to the relevant hypotheses. In addition, the financial ratios have been selected based on the availability of data.

3.3.2.1 Profitability Group

> **" Every business in the private sector of the economy must, in the long run, be profitable if it is to survive. Profitability is necessary if investors and lenders are to continue to support the business."**
>
> **(Michael F. Morley)[26]**

Profitability refers to the ability of a firm to generate revenues in excess of expenses. Profitability ratios are designed for the evaluation of the firm's operational performance. Thomas Hogarty (1970) in an attempt to examine the profitability of corporate mergers he suggests that mergers have a neutral impact on profitability and that mergers are a risky form of investment. In addition, Hisham Fadel (1977) examines the predictive power of financial

[26] Michael F. Morley, *Ratio Analysis*, Published for The Institute of Chartered Accountants of Scotland, by Gee & Co (Publishers) Limited.

ratios in the British construction industry. The study investigates the impact of both size and profitability on financial ratios and suggests models for prediction for different sizes and levels of profitability. The findings of the study carried out by Hisham Fadel (1977) suggest that both the level of profitability and the size of the firm, measured by sales turnover, have a definite impact on some of the financial ratios with the level of profitability having the greater effect. Table 3.3-1 describes the covariates under the profitability group.

Table 3.3-1: PROFITABILITY GROUP

Ratio	Formula
Return on Capital Employed (X1)	$\frac{\text{Profit before tax}}{\text{Total Assets}} X\, 100$
Profit to Sales (X2)	$\frac{\text{Profit after tax}}{\text{Sales}} X\, 100$
Profit to Total Asset (X3)	$\frac{\text{Profit after tax}}{\text{Total Assets}} X\, 100$
EBIT to Sales (X4)	$\frac{\text{Profit before tax}}{\text{Sales}} X100$

<u>Return on Capital Employed</u> is a ratio where in the present thesis examines the relationship of profit before tax to the capital employed which is described as being the total assets which is found by adding the value of fixed assets to that of current assets. The return on capital employed may show that the firm is using its assets efficiently due to a lower expenditure on fixed assets or it may be the case that the firm is using assets over a long period of time. This ratio is a good measure on the profitability of the firm. The higher the rate, the better for the shareholders, in other words the more dividend they will get. Singh (1971) has employed this ratio in his analysis. Tzoannos and Samuels (1972) suggest that it is possible that a firm is taken over because it has a higher than average rate of profit to capital employed (See Appendix I - Table 3), and so is an attractive purchase to the shareholders of the buying firm . On the other hand, because their rate of profit is lower than average, the shareholders of the selling firm may be keen on a takeover hoping that new management will improve matters. Rege (1984) has seen this ratio as a proxy of profitability (See Appendix I - Table 9) because this ratio is not influenced by the financing, tax and size implications. (EBIT- depreciation expense/total assets.)

Profit to Sales will measure what amount of profit after tax is generated from sales and subsequently distributed to the shareholders.

Profit to Total Assets will measure what amount of profit after tax is generated from total assets.

EBIT[27] to Sales measures the profitability of the firm and indicates the relative efficiency of the firm before interest and taxes paid. This ratio has been employed by Stevens (1973) and was a proxy of the profitability dimension (See Appendix I - Table 4) and his final discriminant model suggested that acquired firms experienced a lower EBIT/ Sales ratio. Dietrich and Sorensen (1984) used this ratio as a proxy for profit margin (See Appendix I - Table 10).

3.3.2.2 Efficiency Group

Traditional financial accounting statements do not tell us how efficiently the resources of a firm are managed. In other words, financial accounting statements do not say anything about efficiency. Efficiency means how successful the management of a firm is in using the resources of the firm. In other words, efficiency ratios measure the operational efficiency of the firm. Within the merger context a rigorous definition of efficiency is lacking and it has to be differentiated from the pareto efficiency as defined in micro- economics. For the purpose of the present thesis, if a firm has operational inefficiency then this is a signal that may employ inefficient managers, therefore this firm is a takeover target. Table 3.3-2 describes the covariates under the efficiency group.

[27] EBIT= Earnings before interest and tax.

Table 3.3-2: EFFICIENCY GROUP

Ratio	Formula
Sales to Shareholders' Funds (X5)	$\frac{\text{Sales}}{\text{Shareholders' Funds}}$
Sales to Total Assets (X6)	$\frac{\text{Sales}}{\text{Total Assets}}$
Annual Sales (X7)	Natural Log of Sales
Sales to Fixed Assets (X8)	$\frac{\text{Sales}}{\text{Total Net Tangible Assets (See note 1)}}$
Sales to Current Assets (X9)	$\frac{\text{Sales}}{\text{Total Current Assets}}$
Annual Equity and Capital Reserves (X10)	Natural Log of Equity and Capital Reserves
Annual amount of Total Assets (X11)	Natural Log of Total Assets
Average Debtor Collection Period (X12)	$\frac{\text{Debtors}}{\text{Sales}} X365$
Debtors Turnover (X13)	$\frac{\text{Sales}}{\text{Debtors}}$

Note 1 : Total net tangible assets, excludes leased assets and assets under construction.

Sales to Shareholders' Funds indicates what amount of sales is generated from shareholders' funds.

Sales to Total Assets indicates how many times annual sales cover total assets. Stevens (1973) found that this ratio though activity indicated very little group difference, it participated to the multivariate profile of his model and represented the activity dimension (See Appendix I - Table

4) and this ratio suggests that acquired firms have a lower Sales/ Total Assets ratio. Moreover, Harris et al.(1982) employed this ratio as a proxy for the activity dimension (See Appendix I - Table 7) as well as Rege (1984) (See Appendix I - Table 9). Dietrich and Sorensen (1984) used this ratio as a proxy for asset turnover (See Appendix I - Table 10).

Annual Sales will determine the level of total sales and it seems to be a legitimate measure of the activity of the firm. A similar variable has been employed by Simkowitz and Monroe (1971) (See Appendix I - Table 1) which was the annual sales and represented the sales volume dimension. This variable has entered the final model of Wansley and Lane (1983) and it was a proxy for size (See Appendix I - Table 8). Moreover, this ratio was employed by Ronnie J. Clayton and M. Andrew Fields (1991) as a proxy of the firm size but has not been successful to enter the final model (See Appendix I - Table 16).

Sales to Fixed Assets represents the efficiency dimension as well. It is the sales to fixed assets ratio. Fixed assets (such as plant and machinery) enable the business to function more efficiently. Therefore, this ratio indicates how efficient is the use of fixed assets in generating sales.

Sales to Current Assets will determine the level of sales which is yield from the current assets of the firm.

Annual Equity and Capital Reserves determine the equity and capital reserves that is maintained in the firm. In other words this is what belongs to the ordinary shareholders. A similar variable has been employed by Simkowitz and Monroe (1971) (See Appendix I - Table 1) which was the three year percentage change in equity and represented the growth dimension. Simkowitz and Monroe (1971) found that among the most significant ratios which give the greatest efficiency on standardise coefficients of the discriminant function was the growth rates in equity which was a lower growth in equity for acquired firms. This variable indicates that acquired firms were relatively unable to build the equity base needed. Joel Hasbrouk (1985) employed this ratio as a measure of size (See Appendix I - Table 11).

Annual amount of Total Assets will indicate the total amount of assets employed by the firm. This ratio has been employed by Harris et al.(1982) which acts as a proxy for the size dimension (See Appendix I - Table 7).

Average Debtor Collection Period shows how frequently debtors pay their debts. A company can increase sales by either reducing the price of the product or offering more generous credit terms. If this ratio increase then that may imply that we will have liquidity problems. Therefore, if the debtors do not pay at the specific time limits set up by the firm then the firm may find that it has run into cash flow problems. There is no optimum number in this ratio. It depends on the type of the business. If the trend of this ratio is upwards, then it might suggest that the firm's credit control was beginning to weaken. Most firms turn over their debtors somewhere between one month to two months.

Debtors Turnover . If the annual turnover of a firm is divided by the average debtors figure the resulting ratio shows the number of times debtors are turned over in a year. The ratio is an indication of the efficiency of the firm's credit control.

3.3.2.3 Liquidity Group

Liquidity ratios measure the extent to which assets can be quickly turned into cash. In other words, they try to assess how much cash the entity has available in the short term (one financial accounting year - 12 months) so as to see if it can meet its immediate financial obligations and thus avoid the possibility of insolvency. Joel Hasbrouck (1985) has examined the role of financial liquidity in takeover behaviour and he believes that this is somewhat problematic because firms may hold financial assets in excess of normal transactions requirements for a number of reasons. The events that give rise to excess liquid assets, and in consequence the relationship to takeover likelihood, may be either firm-or industry-specific. Table 3.3-3 describes the covariates under the liquidity group.

Table 3.3-3: LIQUIDITY GROUP

Ratio	Formula
Current Ratio or Working Capital Ratio (X14)	$\frac{\text{Total Current Assets}}{\text{Total Current Liabilities}}$
Acid Test or Liquid Asset or Quick Asset Ratio (X15)	$\frac{\text{Total Current Assets - Stock of Finished Goods}}{\text{Total Current Liabilities}}$
Asset Cover (X16)	$\frac{\text{Total Assets}}{\text{Total Liabilities - Total Current Liabilities}}$
Cash Position No.1 (X17)	$\frac{\text{Cash \& Equivalent + Interest Received}}{\text{Total Current Liabilities}} X100$
Cash Position No.2 (X18)	$\frac{\text{Cash \& Equivalent + Interest Received}}{\text{Sales}} X100$
Cash Position No.3 (X19)	$\frac{\text{Cash \& Equivalent + Interest Received}}{\text{Total Assets}} X100$
Working Capital to Sales (X20)	$\frac{\text{Total Current Assets - Total Current Liabilities}}{\text{Sales}}$
Working Capital to Total Assets (X21)	$\frac{\text{Total Current Assets - Total Current Liabilities}}{\text{Total Assets}}$
Cash to Total Assets (X22)	$\frac{\text{Cash \& Equivalent}}{\text{Total Assets}}$
Cash to Current Liabilities (X23)	$\frac{\text{Cash \& Equivalent}}{\text{Total Current Liabilities}}$
Quick Assets to Total Assets (X24)	$\frac{\text{Total Current Assets - Stock of Finished Goods}}{\text{Total Assets}}$
Quick Assets to Sales (X25)	$\frac{\text{Total Current Assets - Stock of Finished Goods}}{\text{Sales}}$
Current Assets to Total Assets (X28)	$\frac{\text{Total Current Assets}}{\text{Total Assets}}$

Current Assets to Sales (X29)	$\frac{\text{Total Current Assets}}{\text{Sales}}$

Current Ratio assumes that current assets could be converted into cash to meet current liabilities. In most cases we expect that current assets will be more than current liabilities. The current assets ratio will then be at least 1:1. If this is not the case, the entity may not have sufficient liquid resources available to meet its immediate financial commitments. If the current assets consist of a very high proportion of stocks, then the acid test ratio (See X15) may be a better indicator for the liquidity position of the firm.

A high current ratio[28] may suggests that the firm has excessive levels of current assets. The firm may hold excessive stocks or cash balances or of failing to collect its debts quickly, thus maintaining high levels of debtors in the current assets. In addition, production management may keep high levels of raw materials constantly so that production is never delayed. The explanation of a high ratio could be that the firm keeps high stock levels so as to provide a better service to customers. The numerical value of the current ratio helps the ratio user towards asking the right questions, but additional information is needed to answer properly these questions.

This ratio has been employed by Belkaoui (1978)[29] and it was one of the proxies for the liquid asset to current debt group (See Appendix I - Table 5). Moreover, Paul Barnes (1989) used the ratio in the final MDA model (See Appendix I - Table 14). This ratio was employed by Ronnie J. Clayton and M. Andrew Fields (1991) as a proxy of the liquidity dimension but has not been successful to enter the final model (See Appendix I - Table 16).

The **acid test ratio** is probably a better measure of the entity's liquidity position than the current assets ratio because it excludes stocks, as they are not always sold. Therefore, the ratio is current assets less stock divided by the current liabilities.

---

[28] Michael F. Morley, *Ratio Analysis*, Published for The Institute of Chartered Accountants of Scotland, by Gee & Co (Publishers) Limited.

[29] This ratio had the following percentage error in classification for years one to five before the takeover: 44%, 52%, 40%, 50% and 50%.

The acid test ratio[30] compares the assets which are already liquid (cash) together with those which should very soon be liquid (debtors) with liabilities due for payment in the short term. The popular rule of thump is that the ratio should not be less than unity. Therefore, if the acid test ratio is less than 1:1 then we should investigate the make up of the current assets and current liabilities. An acid test ratio less than 1:1 may not necessarily imply that the firm has a serious liquidity problem now but the firm will have financial difficulties in the near future. This rule is basically sensible in that one does expect immediately available liquid resources to exceed immediate liabilities, but it is too rigid to be applied to all firms.

The acid test ratio has been employed by Belkaoui (1978)[31] and it was one of the proxies for the liquid asset to current debt group (See Appendix I - Table 6). In addition, this ratio has been utilised by Tzoannos and Samuels (1972) and it was a proxy for the liquidity (See Appendix I - Table 3). Moreover, Paul Barnes (1989) employed this ratio in his analysis and has entered the final discriminant model (See Appendix I - Table 14).

<u>**Asset Cover**</u> will explain the relationship between total assets against long-term liabilities. This will determine how many times the total assets cover the long-term liabilities.

For the <u>**Cash Position No.1**</u> and <u>**Cash Position No.2**</u> and <u>**Cash Position No.3**</u>[32] the higher these ratios, the higher the cash resources available to the firm.

<u>**Working Capital to Sales**</u> ratio has been employed by Belkaoui (1978)[33] and it was one of the proxies for the liquid asset turnover group. (See Appendix I - Table 6).

<u>**Working Capital to Total Assets**</u> ratio was used by Singh (1971) (See Appendix I - Table 2) and his results rank liquidity third in a group of five variables when he tried to discriminate acquired from non- acquired firms. Stevens (1973) found that the acquired

---

[30] Michael F. Morley, *Ratio Analysis*, <u>Published for The Institute of Chartered Accountants of Scotland,</u> by Gee & Co (Publishers) Limited.

[31] This ratio had the following percentage error in classification for years one to five before the takeover: 34%, 50%, 36%, 34% and 44%.

[32] This ratio was employed by Ronnie J. Clayton and M. Andrew Fields (1991) as a proxy of the liquidity dimension but has not been successful to enter the final model (See Appendix I - Table 16).

[33] This ratio had the following percentage error in classification for years one to five before the takeover: 50%, 46%, 44%, 54% and 44%.

firms were more liquid by utilising this ratio which ratio contributed to its multivariate profile (See Appendix I - Table 4). Belkaoui (1978) has used this ratio[34] which has shown superiority compared to the other ratios under investigation. Harris et al. (1982) employed this ratio which was a proxy for the corporate liquidity dimension (See Appendix I - Table 7). Rege (1984) has seen this ratio as a proxy of liquidity because the numerator stands for working capital representing the availability of short term assets and the denominator represents total assets which normalises the size effect of the numerator (See Appendix I - Table 9).

__Cash to Total Assets__ ratio will indicate the amount of cash that is generated from the total assets. This ratio has been examined in the study carried out by Belkaoui (1978)[35] and it was one of the ratios under the liquid assets to total asset group (See Appendix I - Table 6).

__Cash to Current Liabilities__ ratio will indicate the amount of cash that is generated from the current liabilities. This ratio has been employed by Belkaoui (1978)[36] and it was one of the proxies for the liquid asset to current debt group (See Appendix I - Table 6).

__Quick Assets to Total Assets__ ratio will indicate the amount of the current assets except the stock of finished goods that are generated from the total assets. This ratio has been examined in the study carried out by Belkaoui (1978)[37] and it was one of the ratios under the liquid assets to total asset group (See Appendix I - Table 6).

__Quick Assets to Sales__ ratio has been employed by Belkaoui (1978)[38] and it was one of the proxies for the liquid asset turnover group. (See Appendix I - Table 6).

---

[34] This ratio had the following percentage error in classification for years one to five before the takeover: 34%, 20%, 42%, 32% and 52%.

[35] This ratio had the following percentage error in classification for years one to five before the takeover: 48%, 44%, 42%, 42% and 36%.

[36] This ratio had the following percentage error in classification for years one to five before the takeover: 44%, 48%, 42%, 48% and 46%.

[37] This ratio had the following percentage error in classification for years one to five before the takeover: 42%, 32%, 40%, 36% and 28%.

[38] This ratio had the following percentage error in classification for years one to five before the takeover: 34%, 36%, 40%, 42% and 48%.

Current Assets to Total Assets ratio shows the amount of current assets that it has been generated from total assets and generally establishes the input of the current assets to the overall total assets of the firm. This ratio has been employed by Singh (1971) and represented the liquidity dimension in his study (See Appendix I - Table 2). In addition, this ratio has been examined in the study carried out by Belkaoui (1978)[39] and it was one of the ratios under the liquid assets to total asset group (See Appendix I - Table 6). Moreover, this ratio was employed by Ronnie J. Clayton and M. Andrew Fields (1991) as a proxy of the liquidity dimension but has not been successful to enter the final model (See Appendix I - Table 16).

Current Assets to Sales ratio has been employed by Belkaoui (1978)[40] and it was one of the proxies for the liquid asset turnover group. (See Appendix I - Table 6).

3.3.2.4 Leverage Group

Leverage ratios describe the firm's financial structure and evaluates the risk implied by the capital structure of the firm. Leverage ratios examine the relationship between the funds invested by shareholders and the funds invested by creditors. Joel Hasbrouck (1985) when discussing the financial leverage and its relationship to the takeover activity he supports that a practitioner would suggest that unused debt capacity may be considered attractive. In the modern academic view, existing capital structures are considered consequences of tax rules and agency costs. Moreover, Joel Hasbrouck (1985) discusses a point raised by Jensen and Meckling (1976) , that manager's claim on the firm has some of the characteristics of debt, particularly with respect to the consequences of bankruptcy, and managers inclined to minimise the risk of bankruptcy have incentive to underlever the firm. If low leverage is viewed as a signal of managerial incompetence, this will lead to a firm-specific relationship between this variable and takeover likelihood. This line of reasoning, consistent with value maximising behaviour, suggests that takeover targets, will have lower pre-existing levels of debt, a relationship also likely to be firm specific. Table 3.3-4 describes the covariates under the leverage group.

[39] This ratio had the following percentage error in classification for years one to five before the takeover: 48%, 38%, 38%, 34% and 38%.

[40] This ratio had the following percentage error in classification for years one to five before the takeover: 44%, 42%, 32%, 32% and 40%.

Table 3.3-4: LEVERAGE GROUP

Ratio	Formula
Long Term Liabilities to Shareholders' Equity (X26)	$\frac{\text{Total Liabilities} - \text{Total Current Liabilities}}{\text{Shareholders' Funds}}$
Total Liabilities to Shareholders' Equity (X27)	$\frac{\text{Total Liabilities}}{\text{Shareholders' Funds}}$
Preference and Loan Capital to Equity and Reserves (X30)	$\frac{\text{Preference Capital} + (\text{Total Liabilities} - \text{Total Current Liabilities})}{\text{Shareholders' Funds}}$
Loan Capital and Preference Capital to Total Assets (X31)	$\frac{(\text{Total Liabilities} - \text{Total Current Liabilities}) + \text{Preference Capital}}{\text{Total Assets}}$
Interest Paid to Loan Capital (X32)	$\frac{\text{Total Interest}}{(\text{Total Liabilities} - \text{Total Current Liabilities})}$
Total Profit to Interest Paid (X33)	$\frac{\text{Profit after Tax}}{\text{Total Interest}}$
Gearing Ratio (X34)	$\frac{\text{Total Liabilities} + \text{Preference Capital}}{\text{Shareholders' Funds} + \text{Minority Interest} + \text{Total Liabilities}}$
Debt to Equity Ratio (X35)	$\frac{\text{Total Liabilities} + \text{Preference Capital}}{\text{Shareholders' Funds} + \text{Minority Interest}}$
Interest Cover (X36)	$\frac{\text{Profit before Interest \& Tax}}{\text{Total Interest}}$

Long Term Liabilities to Shareholders' Equity. Joel Hasbrouk (1985) employed this ratio as a measure of long-term financial leverage (See Appendix I - Table 11).

Total Liabilities to Shareholders' Equity . A similar ratio is employed by Victor Pastena and William Ruland (1986) as a proxy of leverage. (See Appendix I - Table 11).

Preference and Loan Capital to Equity and Reserves ratio is defined in Table 3.3-4 above.

Loan Capital and Preference Capital to Total Assets ratio is employed by Stevens (1973) in the final discriminant model and represents the leverage dimension of the study (See Appendix I - Table 4) and suggests that acquired firms have a lower Long- Term Liability/ Total Assets ratio. Moreover, Harris et. al.(1982) employed this ratio which was a proxy for the financial leverage dimension (See Appendix I - Table 7). Besides this, this variable has entered the final LDA model of Wansley and Lane (1983) and it was a proxy for leverage (See Appendix I - Table 8). Dietrich and Sorensen (1984) used this ratio as a proxy for leverage (See Appendix I - Table 10).

Interest Paid to Loan Capital ratio shows the relationship between interest payments and loan capital.

Total Profit to Interest Paid ratio shows the relationship between total profit and interest payments.

Gearing Ratio is an indicator of the financial risk of the firm. In the present thesis, the gearing ratio is formulated as follows: If the total debt (total liabilities) and preference share capital is divided by total debt (total liabilities) plus shareholders' funds and minority interest, the resulting ratio shows the gearing or the leverage ratio because high gearing describes a financial structure which is heavy with debt.

The gearing ratio[41] is a measure that describes the financial structure of the firm. The basic rule for lenders to the business is that a high gearing ratio is more risky than a low one and is seen as

[41] Michael F. Morley, *Ratio Analysis*, Published for The Institute of Chartered Accountants of Scotland, by Gee & Co (Publishers) Limited.

a warning sign. A low gearing ratio is an indication of stability and safety for long-term creditors, since any fall in operating earnings or firm asset values would then have to be very substantial before the creditors would be exposed to the risk of non-payment of their interest or capital on the due dates, or of insufficient firm assets to repay their loans in the event of a winding up. A moderate amount of gearing involves borrowing at a level which presents little risk to the lenders, therefore long term creditors should look at the interest cover ratio as well.

Debt to Equity Ratio. The numerator of this ratio consists of short-term as well as long-term liabilities and preference shares while the denominator consists of shareholders' funds and minority interest. This measure of solvency is based on the notion that the larger the ratio of debt to equity, the lower the protection of the lenders.

Interest cover [41] measures the firm's debt-servicing capacity and provides a warning if there is some doubt as to whether the firm can pay future interest on what it has borrowed. The ratio is constructed by dividing the annual profit before interest and tax which is available to pay interest commitments by the interest due. The numerator is therefore the net profit before tax and before interest payable. Pre-tax profit, rather than post-tax profit, is used in the numerator because tax is only payable on profits after interest, which is another way of saying that interest takes precedence over tax in the ranking of claims on operating earnings. The ratio measures the cover or safety margin for interest claims. A low cover figure warns creditors that there is a greater risk of non-payment of interest should there be any future fall in operating earnings.

3.3.2.5 Research and development Group

Table 3.3-5 describes the covariates under the capital expenditure/ R&D group.

Table 3.3-5: CAPITAL EXPENDITURE RATIOS

Ratio	Formula
Capital Expenditure to Total Assets (X37)	$\frac{\text{Capital Expenditure Contracted}}{\text{Total Assets}}$
Capital Expenditure to Total Sales (X38)	$\frac{\text{Capital Expenditure Contracted}}{\text{Total Sales}}$

Capital Expenditure to Total Assets ratio will determine the amount of capital expenditure that is generated from total assets. Dietrich and Sorensen (1984) used this ratio as a proxy for investment (See Appendix I - Table 10).

Capital Expenditure to Total Sales ratio is defined in Table 3.3-5 above. This ratio will determine the amount of capital expenditure that is generated from total sales.

3.4 Conclusion

The present chapter describes the methodologies adopted in the present thesis which are LPM, Logit analysis and Probit analysis. Following the discussion in the present chapter binomial logit has been selected to estimate the models presented in the thesis as it is preferred to MDA and as conclusions drawn from probit are not materially different. Finally, the ratios under investigation are analysed together with the rationale of their inclusion in the study. The major contribution of chapter 3 was to provide the rationale for the choice of logit analysis and probit analysis as appropriate methodological techniques for the present thesis. Moreover, the fact that financial accounting ratios have been used widely in the existing finance literature in the prediction of certain events, this justifies their utilisation in the present thesis. The major limitation of using financial characteristics to test alternative merger hypotheses is the fact that one cannot test any economic theories like economies of scale, growth, monopoly theory (market power) etc. This limitation has been discussed before and I do recognise that with financial accounting ratios the dimensions that can be tested are only financial in nature and in the final model some other economic factors are not captured.

CHAPTER 4 - DESCRIPTION OF DATA

4.1 Introduction

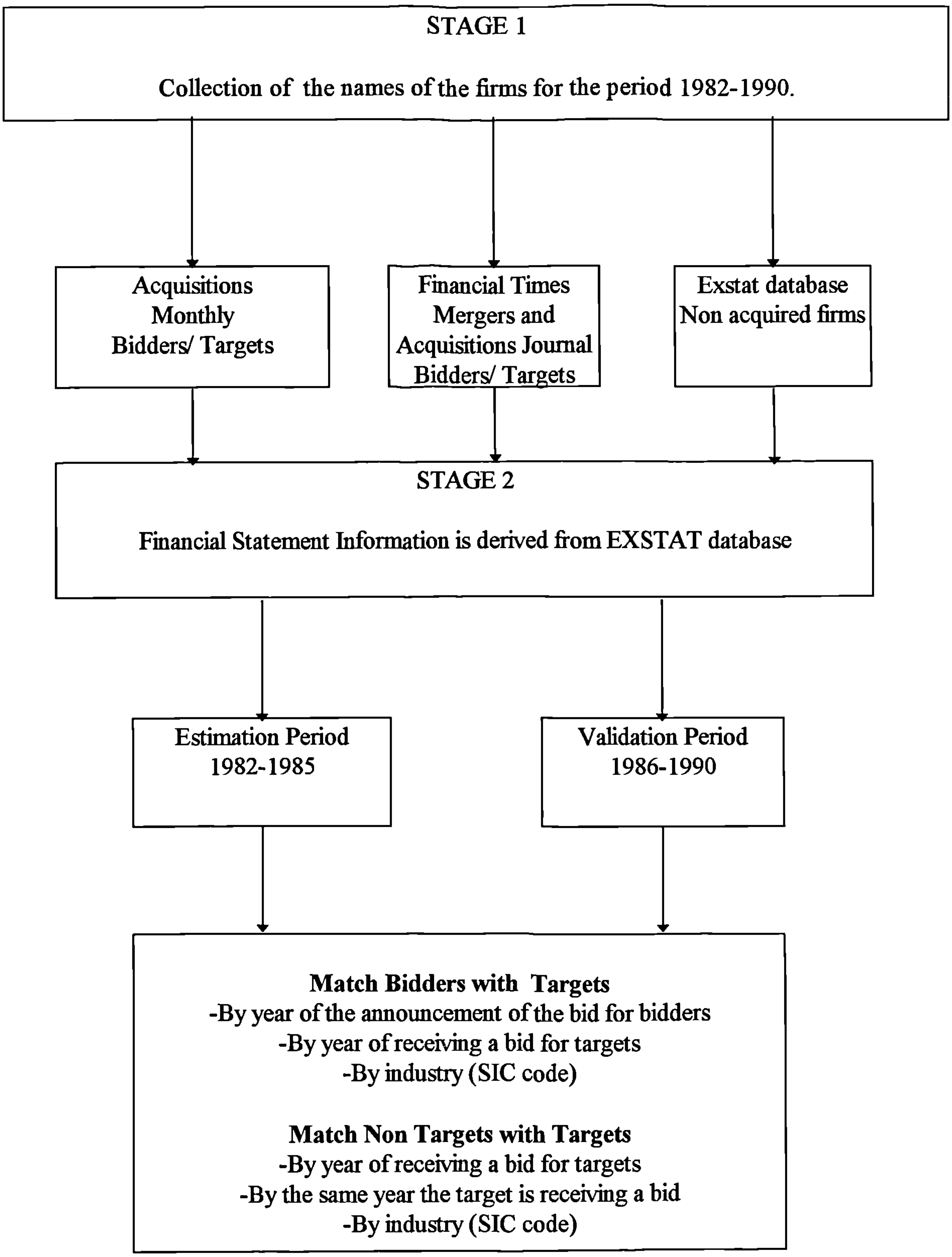
The present chapter has three sections. In the first section, the data is described in terms of the population from which the companies are drawn, the sampling methods, the nature of the data and the time periods examined and their separation into sub samples for estimation and validation. In the second section graphical analysis of the means of the ratios of the economy wide sample[1] is developed and finally in the third section, graphical analysis of the means of the ratios by industry is outlined.

The data is associated with potential bidder firms and potential target firms as well as firms that were not involved in the takeover activity, non-target firms for the period 1982-1990.

The collection of a substantial financial database on M&A activity for this period is a major contribution of the present thesis. A major part of this work has been the collection of financial statement information on acquisitions differentiated by industrial classification.

[1] The economy wide sample includes the firms from all the industries under investigation.

4.2 Description of Data



The time period selected for the present thesis is 1982 to 1990. The first four years (1982-1985) are used for the model development while the second five years (1986-1990) are used to test each model's parametric structure.

A bidder is defined as a firm that has announced an attempt to takeover another firm. I have define the year this offer is announced as the "announcement year" (See Appendix III). A target is defined as a firm that has received a bid by another firm. I have define the year this offer is received as the "announcement year" (See Appendix III). A non target is defined as a firm that has neither received a bid by another firm nor has attempted to takeover another firm but the year of announcement for that group is the year a target firm received the bid (See Appendix III).

4.2.1 The population

Initially, information about the names of bidder and target firms has been collected. The names of bidders and targets by sector were extracted from the *Acquisitions Monthly Journal*[2] which is available at the London Business School and the *Financial Times -Mergers and Acquisitions Journal*[3] which is available at the Science and Reference Library (British Library). The next step was to identify the names of the firms that were not involved in a takeover activity namely the "non-targets/non-bidders" or the "non-target" firms. Exstat database has been extremely effective to identify the non-target firms. Exstat database was located at Bath University. The names of the "non-acquired" firms were identified after personal and careful examination. The "non-acquired" firms are firms that have not been recorded either as bidders or targets during the period 1982-1990 either in the 'Acquisitions Monthly' or 'Financial Times- Mergers and Acquisitions Journal'. The data employed in this study consists of a sample of firms selected from the chemical, construction, food, electrical and electronics engineering and mechanical engineering sectors. The initial sample size of the present research initially consisted of a selection of 603 bidder firms, 314 target firms and 236 non-targets/non-bidders (non-target group).

---

2 The 'Acquisitions monthly 'gives information regarding the announcement date of the take-over, the names, and industrial classification of both bidder and target firms as well as the price of the bid.

3 'Financial Times -Mergers and Acquisitions Journal' gives information regarding the announcement date of the take-over, the names, and industrial classification of both bidder and target firms as well as the price of the bid.

4.2.2 Method of sampling

As outlined before, the initial sample size of the present research consisted of a selection of 603 bidder firms, 314 target firms and 236 non-targets/non-bidders (non-target group). Therefore, the initial total number of firms was 1,153.

From the initial sample size, I have selected 427 companies from this population of available firms for potential inclusion in the sample. The selection criteria for the final sample size were: the firm should have a comprehensive set of financial statement information for the six years before the announcement year as defined before for each group and the financial statement information about the firm could be extracted from EXSTAT database. My final sample includes 96 bidders (22.5% of the total final sample size), 161 targets (37.50% of the total final sample size) and 170 non targets (39.8% of the total final sample size). The percentage of the firms selected by year in the final sample from each group is described in Table 4.2-1. For example 27.08% of the total number of bidders in my final sample is selected from year 1982, 10.56% of the total number of targets in my final sample is selected from year 1982 and 12.35% of the total non targets is selected from year 1982.

Group / Year	Bidders		Targets		Non Targets	
	Number	Percent	Number	Percent	Number	Percent
1982	26	27.08%	17	10.56%	21	12.35%
1983	0	0%	0	0%	0	0%
1984	11	11.46%	17	10.56%	16	9.41%
1985	12	12.5%	19	11.80%	23	13.53%
1986	21	21.88%	24	14.91%	25	14.71%
1987	11	11.46%	37	22.98%	38	22.35%
1988	8	8.33%	23	14.29%	26	15.30%
1989	6	6.25%	13	8.07%	10	5.88%
1990	1	1.04%	11	6.83%	11	6.47%
Total	96		161		170	

Table 4.2-1

As it is shown in Table 4.2-1 , 22.5% of the total final sample size is bidder firms, 37.7% target firms and 39.8% non target firms.

For all **bidder firms**, I collect relevant, financial statement information for the last six years from the announcement year when the bidder decides to initiate a takeover attempt. I therefore assign as my information date the year end that is at least 6 years before the bid date.

For all **target firms**, I collect relevant, financial statement information for the last six years from the announcement year when the target receives a bid. I therefore assign as my information date the year end that is at least 6 years before the bid date.

For all **non target firms**, I collect relevant, financial statement information for the last six years from the announcement year when the target receives a bid. I therefore assign as my information date the year end that is at least 6 years before the bid date.

Industrial classification of the firms included in the present thesis was based on the SIC[4] code. (See Table 4.2-2).

[4] SIC= Standard Industrial Classification.

- **Chemicals (SIC CODE 2500)**:
  * Chemicals and Plastics.
  * Pharmaceuticals.
  * Inorganic Chemicals, Fertilisers.

- **Construction (SIC CODE 5000)**:
  * Building and Construction.
  * General Demolition and Construction Work.
  * Building Materials.
  * Building Products.
  * Building Contractors.

- **Food (SIC CODE 4100)**
  * Food & Drink.
  * Food Manufacturing.
  * Processed Foods.
  * Meat.
  * Fish Processing.
  * Cakes, Pies & Pastries.
  * Coffee, Tea, Snack Foods & Pasta.
  * Processing of Fruit & Vegetables.
  * Bread, Biscuits & Flour Confectionery.
  * Ice-cream, Cocoa, Chocolate & Sweets.
  * Miscellaneous Foods.
  * Brewing, Beers, Wines & Spirits.
  * Sugar & Sugar by Products.

- **Electronics & Electrical Engineering (SIC CODE 3400):**
  * Electrical.
  * Electronics.
  * Basic Electrical Equipment.
  * Electrical Equipment for Industrial Use.
  * Telecommunications & Electronic Equipment.

- **Mechanical Engineering.(SIC CODE 3200)**

Table 4.2-2

4.2.3 Nature of the data

The models developed in the present thesis utilise the 38 financial ratios and variables presented in chapter 3, all of which are basic financial relationships that may represent important characteristics of acquisition candidates. The ratios represent five dimensions: profitability, leverage, efficiency, liquidity and capital expenditure. Initially, financial statement information of the various firms has been extracted from datastream database which is located at Brunel University. But, information about the "non-acquired" group of firms was not available from datastream. Datastream could provide sufficient information for the group of the bidder firms but not a satisfactory number of target firms.(See Table 4.2-4). Exstat database was the database which actually was used to extract all the relevant financial statement information about the firms that are under investigation in the present thesis. Therefore financial statement information for bidders, targets and non-targets or non-acquired firms was extracted from EXSTAT database (See Table 4.2-3) which was located at Bath University. Exstat database is the ideal database for the present research because it provides information for all three groups under investigation (See Table 4.2-4). Information was extracted for the following items:

Item Number (as listed in EXSTAT)	Description
CB3	INTEREST RECEIVED
C23	CAPITAL EXPENDITURE-CONTRACTED
C31	SALES/TURNOVER
C34	PROFIT BEFORE TAX
C43	PROFIT AFTER TAX
C44	MINORITY INTERESTS- PROFIT AND LOSS
C47	COST OF PREFERENCE DIVIDENDS
C49	RETAINED PROFIT
C52	DEPRECIATION AND AMORTISATION
C57	TOTAL INTEREST/TOTAL INTEREST AND FINANCIAL EXPENSES.
C61	COST OF GOODS SOLD
C65	RESEARCH AND DEVELOPMENT
C91	TOTAL NET TANGIBLE ASSETS
C103	STOCK-FINISHED GOODS
C104	WORK-IN-PROGRESS
C106	DEBTORS
C111	CASH AND EQUIVALENT
C114	TOTAL CURRENT ASSETS
C115	TOTAL ASSETS
C122	PREFERRED CAPITAL
C123	ORDINARY CAPITAL
C132	SHAREHOLDERS' FUNDS
C133	MINORITY INTEREST - BALANCE SHEET
C151	CREDITORS
C157	TOTAL CURRENT LIABILITIES
C158	TOTAL LIABILITIES

Table 4.2-3

INDUSTRY	BIDDERS	TARGETS	NON-TARGETS/ NON-BIDDERS
Chemicals	75 Firms Datastream 62 Exstat 65	28 Firms Datastream 14 Exstat 26	36 Firms Exstat 36
Electrical and Electronics Engineering	133 Firms Datastream 117 Exstat 105	58 Firms Datastream 27 Exstat 48	23 Firms Exstat 23
Food	112 Firms Datastream 91 Exstat 98	49 Firms Datastream 24 Exstat 48	49 Firms Exstat 49
Mechanical	84 Firms Datastream 74 Exstat 74	51 Firms Datastream 25 Exstat 42	44 Firms Exstat 44
Construction	84 Firms Datastream 74 Exstat 70	68 Firms Datastream 32 Exstat 61	55 Firms Exstat 55

Table 4.2-4

4.2.4 The Examination Period.

The whole period under examination is 1982-1990. For examination purposes the time period is divided into the estimation and the validation period[5]. From 1982-1985 is the estimation period under examination and from 1986-1990 is the validation period under examination. Table 4.2-5 and Table 4.2-6 provide a description of the final number of firms that are used under the estimation period and validation period by sector and at the economy wide level.

By examining Table 4.2-5 (Bidders against targets) the estimation sample consists from 101 firms and the validation sample consists from 148 firms. The industry with the highest sample size in the estimation period comes from the food sector and in the validation period from the construction sector.

By examining Table 4.2-6 (Non targets against targets) the estimation sample consists from 111 firms and the validation sample consists from 212 firms. The industry with the highest sample size in the estimation period comes from the food sector and in the validation period from the construction sector.

[5] The rationale for this has been discussed in chapter 2.

Chemicals Bidders Vs Targets Estimation Sample	*No.*	*Construction Bidders Vs Targets Estimation Sample*	*No.*	*Electronics Bidders Vs Targets Estimation Sample*	*No.*	*Food Bidders Vs Targets Estimation Sample*	*No.*	*Mechanical Bidders Vs Targets Estimation Sample*	*No.*	*All the Sectors Bidders Vs Targets Estimation Sample*	*No.*
Bidders	*10*	*Bidders*	*12*	*Bidders*	*6*	*Bidders*	*14*	*Bidders*	*7*	*Bidders*	*49*
Targets	*8*	*Targets*	*16*	*Targets*	*7*	*Targets*	*16*	*Targets*	*5*	*Targets*	*52*
Total	*18*		*28*		*13*		*30*		*12*		*101*
Chemicals Bidders Vs Targets Validation Sample		*Construction Bidders Vs Targets Validation Sample*		*Electronics Bidders Vs Targets Validation Sample*		*Food Bidders Vs Targets Validation Sample*		*Mechanical Bidders Vs Targets Validation Sample*		*All the Sectors Bidders Vs Targets Validation Sample*	
Bidders	*5*	*Bidders*	*5*	*Bidders*	*11*	*Bidders*	*12*	*Bidders*	*14*	*Bidders*	*47*
Targets	*15*	*Targets*	*29*	*Targets*	*21*	*Targets*	*18*	*Targets*	*18*	*Targets*	*101*
Total	*20*		*34*		*32*		*30*		*32*		*148*

Table 4.2-5

Chemicals Non - Targets Vs Targets Estimation Sample		*Construction Non-Targets Vs Targets Estimation Sample*		*Electronics Non-Targets Vs Targets Estimation Sample*		*Food Non-Targets Vs Targets Estimation Sample*		*Mechanical Non-Targets Vs Targets Estimation Sample*		*All the Sectors Non-Targets Vs Targets Estimation Sample*	
Non-Targets	*11*	*Non-Targets*	*16*	*Non-Targets*	*4*	*Non-Targets*	*19*	*Non-Targets*	*9*	*Non-Targets*	*59*
Targets	*8*	*Targets*	*16*	*Targets*	*7*	*Targets*	*16*	*Targets*	*5*	*Targets*	*52*
	19		*32*		*11*		*35*		*14*		*111*
Chemicals Non - Targets Vs Targets Validation Sample		*Construction Non-Targets Vs Targets Validation Sample*		*Electronics Non-Targets Vs Targets Validation Sample*		*Food Non-Targets Vs Targets Validation Sample*		*Mechanical Non-Targets Vs Targets Validation Sample*		*All the Sectors Non-Targets Vs Targets Validation Sample*	
Non-Targets	*17*	*Non-Targets*	*28*	*Non-Targets*	*13*	*Non-Targets*	*24*	*Non-Targets*	*29*	*Non-Targets*	*111*
Targets	*15*	*Targets*	*29*	*Targets*	*21*	*Targets*	*18*	*Targets*	*18*	*Targets*	*101*
	32		*57*		*34*		*42*		*47*		*212*

Table 4.2-6

4.3 Limitations of the present study

The limitations of the present thesis can be described as follows:
For the sample of firms selected no consideration has been taken of the foreign ownership or the ownership by firms of overseas subsidiaries. However, by their very nature overseas of UK firms has been excluded from this data set. Further no repeated acquisitions or repeated bids have been included.

What follows is a descriptive analysis of the data as such it might be viewed as an analysis of simple correlations. However, it gives the reader a compact way of reviewing the data analysed in this study. Clearly, conclusions drawn from this analysis must be treated with some caution, but as the conclusion emphasises there are instances when this analysis presage the results of multivariate analysis.

4.4 Analysis of Sample Means - Economy wide sample and Industrial Classification Analysis

The objective of section 4.5 and section 4.6 is to provide an initial investigation of the financial characteristics of the groups under investigation. These two sections show graphically the mean behaviour of the ratios under investigation for the three different groups. The findings of these two sections will enhance the contribution of the present thesis which examines mergers and acquisitions at the economy wide level and by industry. It seems that an industry classification analysis in the topic of mergers and acquisitions will give an insight into what are the real industrial financial characteristics of the target firms.

4.5 Analysis of Sample Means - The Economy wide sample

This aim of this section is to provide some preliminary findings for the behaviour of the mean of the ratios of the economy wide sample. For each financial ratio there is a graph that shows its mean value for the last six years including the year of the announcement. The findings of this section will enhance the analysis of the empirical findings that are provided in chapter 5.

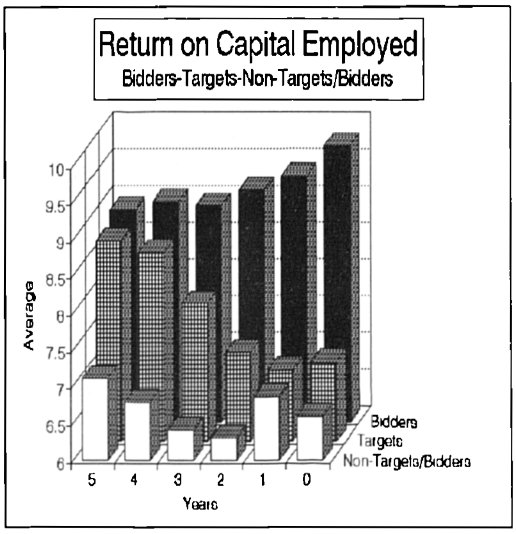


Figure 4.5-1

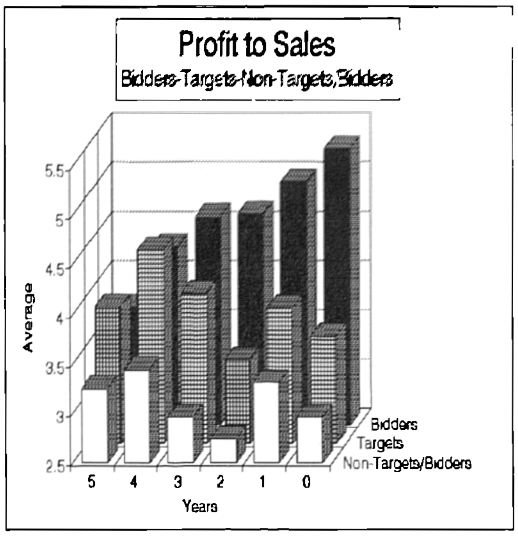


Figure 4.5-2

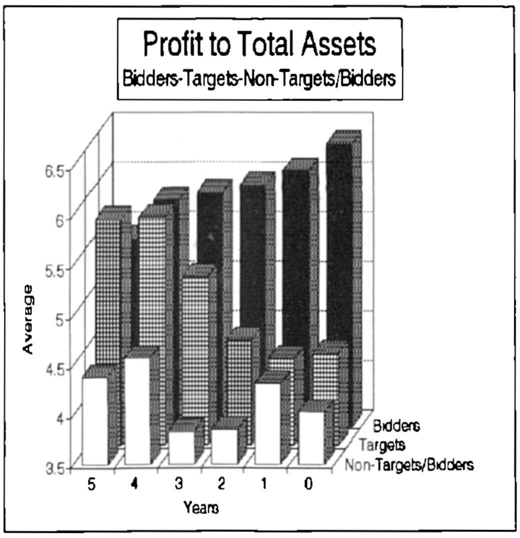


Figure 4.5-3

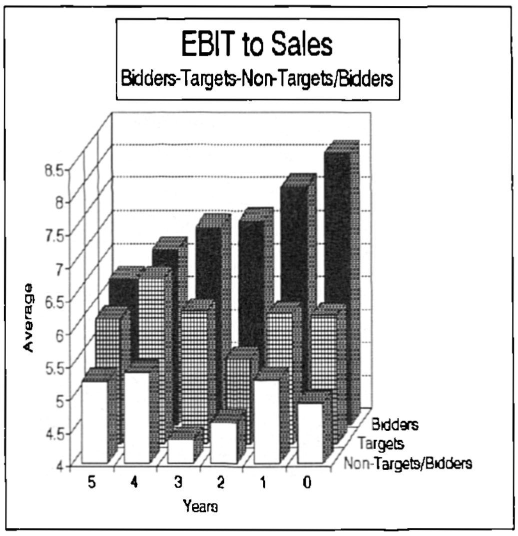


Figure 4.5-4

Figures (4.5-1, 4.5-2, 4.5-3 and 4.5-4) clearly show that the performance of the bidders in terms of the profitability ratios under investigation are superior compared to the performance of the target and non-target group. This superiority is more significant in the year of the announcement (Year 0). This may denote that bidders on average are profitable firms and in their attempt to expand their activities bidders acquire other companies. From figures (4.5-1, 4.5-2, 4.5-3 and 4.5-4) when comparing bidders with targets, target firms have low profitability but when comparing target firms with non target firms this is not the case[6].

[6] The performance of the non target firms is the worst in terms of profitability. It could be said that this group of firms may be vulnerable to a takeover at a later stage. The fact that the non target firms have very low profitability will have to be analysed further in chapter 6 and see whether non target firms are characterised with low profitabilit when compared to target firms.

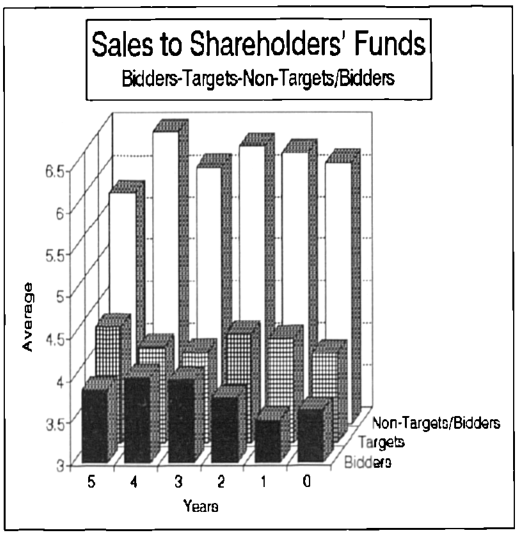


Figure 4.5-5

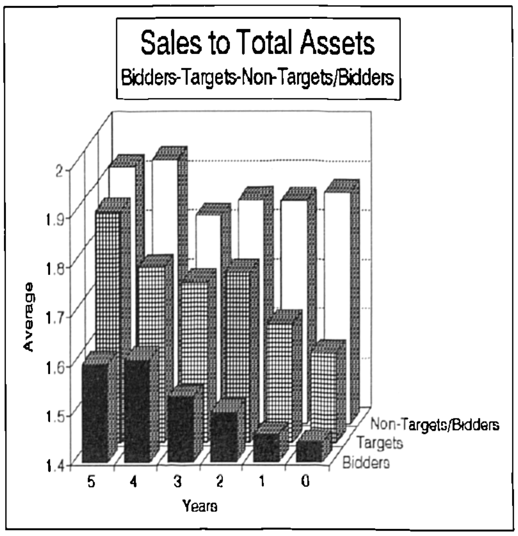


Figure 4.5-6

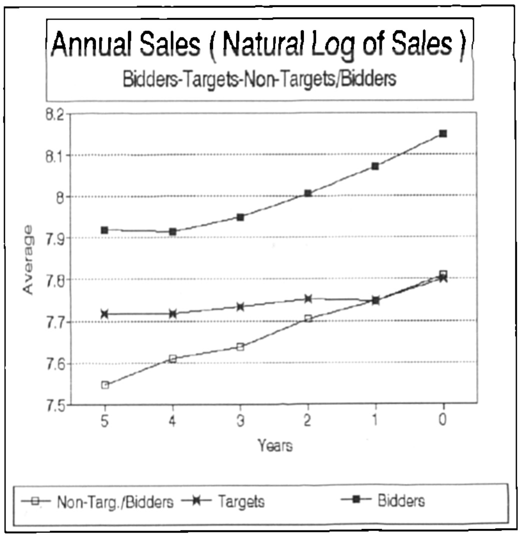


Figure 4.5-7

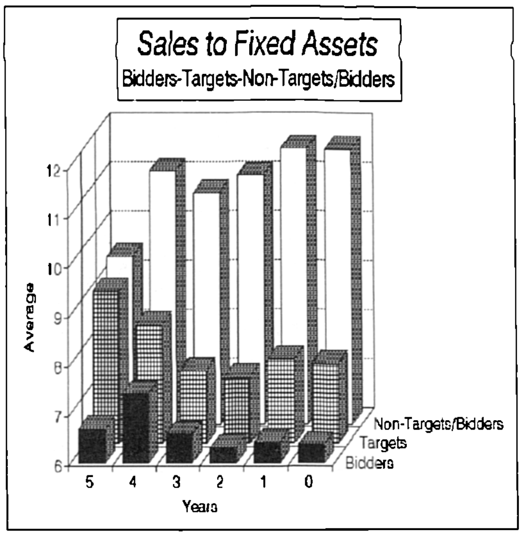


Figure 4.5-8

Figures (4.5-5, 4.5-6, 4.5-7 and 4.5-8) clearly show that the performance of the non-target firms in terms of the efficiency ratios under investigation is superior compared to the performance of the target and bidder group. This could be the answer to the question that has been raised before. The non-target firms are very efficient firms in generating sales . Since these firms are efficient and usually small in size they may raise profitability in the long-term. Bidder firms seem not utilising their fixed assets efficiently (See Fig. 4.5-8). Target firms are clearly more efficient than bidders[7] (See Fig. 4.5-6, 4.5-8).

[7] This finding is not theory consistent with the finance literature which says that target firms are inefficient.

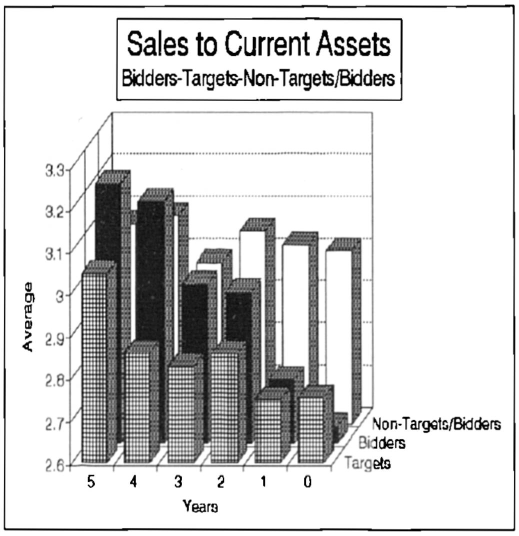


Figure 4.5-9

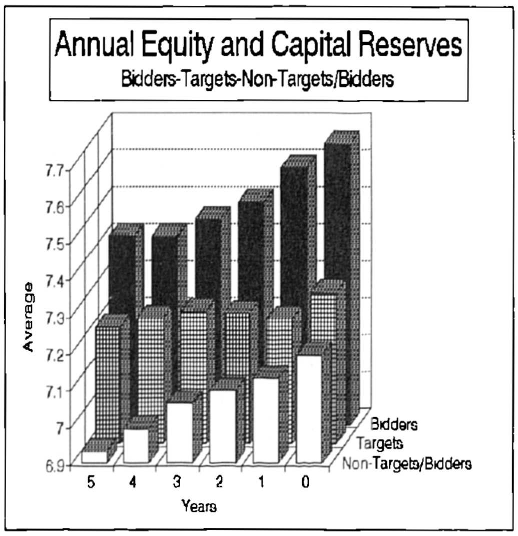


Figure 4.5-10

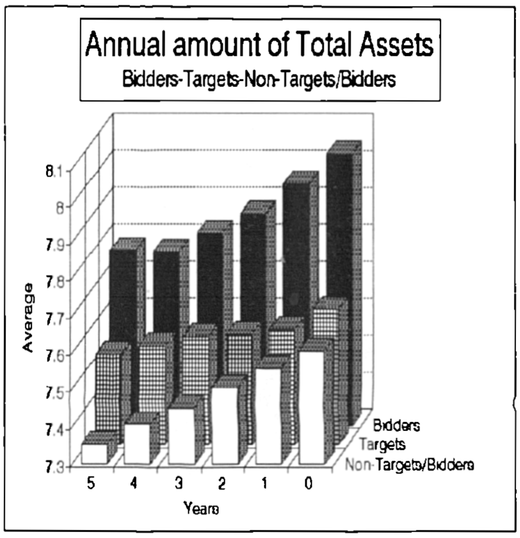


Figure 4.5-11

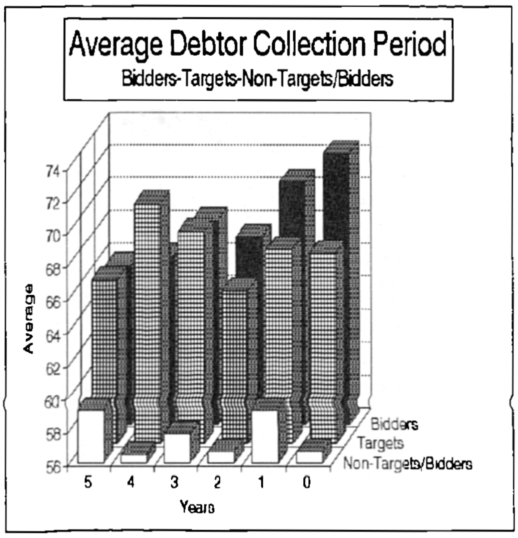


Figure 4.5-12

Figures (4.5-9, 4.5-10, 4.5-11 and 4.5-12) are measures of efficiency. In terms of total assets (See Fig.4.5-11) the bidder group performs better than the other groups. This is consistent with the finance literature which says that bidder firms are bigger in size compared to the target firms who seem to have lower size. The non-target group is even smaller than target firms which clearly shows that these firms are small firms. Bidder firms can attract investors (See Fig. 4.5-10) and can raise funds through the issue of ordinary shares. Another finding is that, non-target firms seem to impose very strict credit limits to their debtors (See Fig. 4.5-12) compared to the other groups. Both bidders and targets seem to face a problem for collecting their debts (See Fig. 4.5-12).

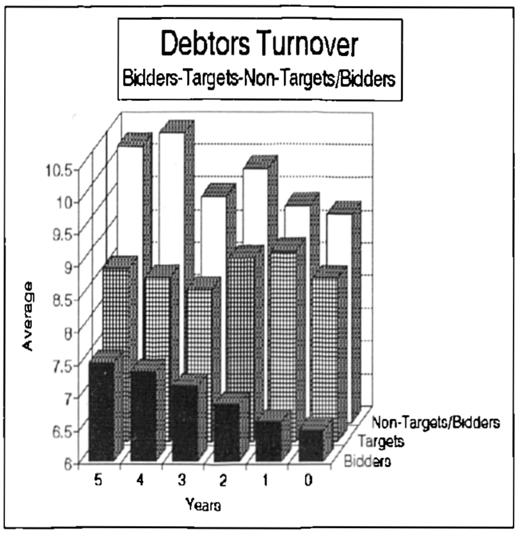


Figure 4.5-13

Debtors turnover ratio (Fig. 4.5-13) as outlined in chapter 3 is a reflection of the combination of trade practice and the effectiveness of the firm's credit control. Again the non-target group seem to show an effective performance in terms of the credit policy that is executed in this group of firms when compared to the other two groups.

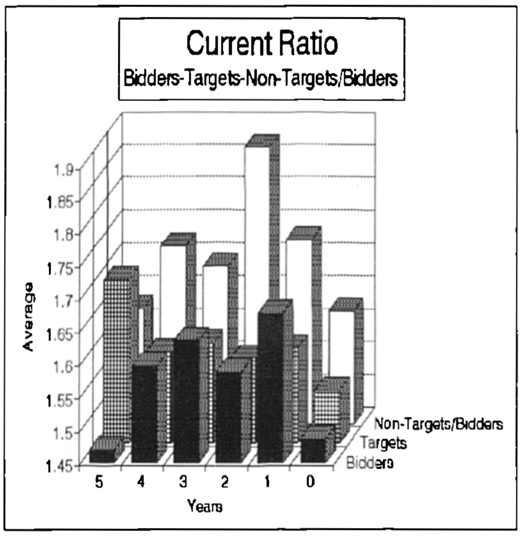


Figure 4.5-14

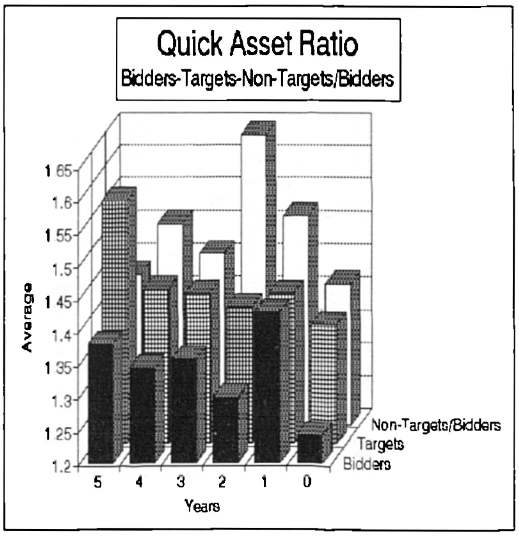


Figure 4.5-15

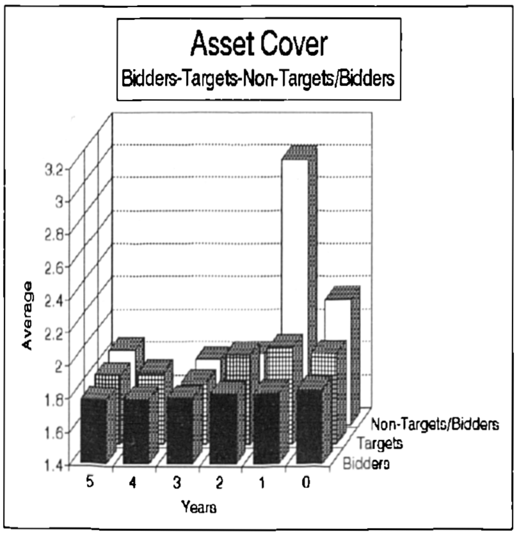


Figure 4.5-16

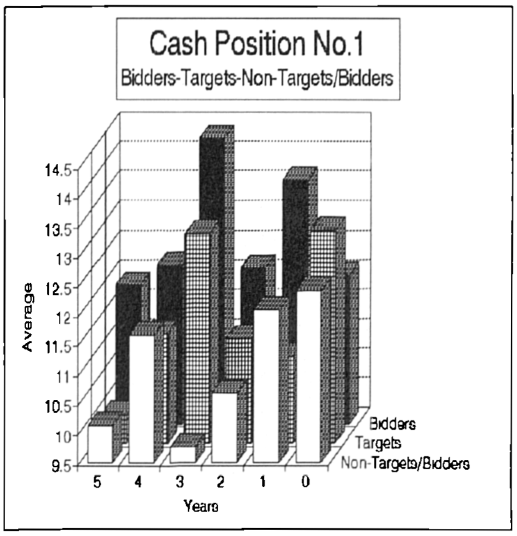


Figure 4.5-17

Figures (4.5-14, 4.5-15, 4.5-16 and 4.5-17) are financial ratios associated with the liquidity position of the firm. The liquidity position of the non-target group seems to be superior (See Fig.4.5-14 and Fig.4.5-15) to the liquidity position of the target and bidder firms. The quick asset ratio as advocated in chapter 3 is a very good measure of the liquidity position of the firm. Figure 4.5-15 shows clearly that bidder firms face liquidity problems and that target firms do have a better liquidity position than that of the bidder firms. The liquidity position of the target firms is better when compared to that of the bidder firms. This is theoretically consistent with the finance literature which says that target firms are likely to be acquired because of their good liquidity position.

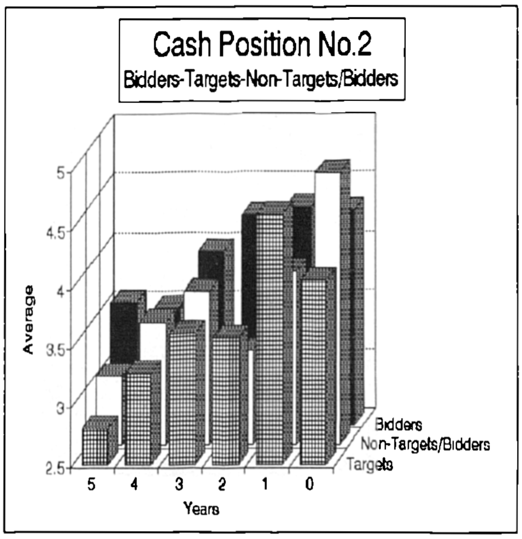


Figure 4.5-18

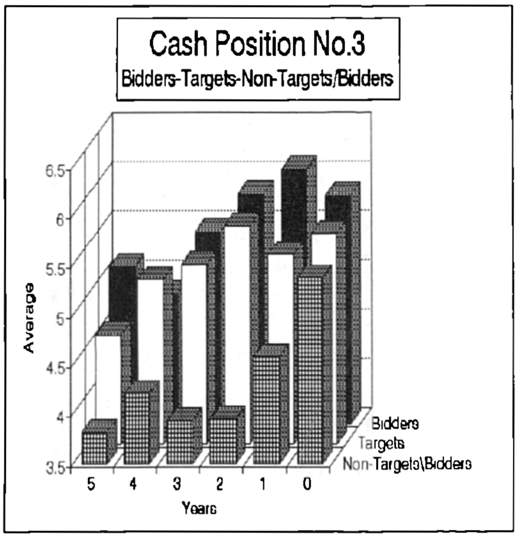


Figure 4.5-19

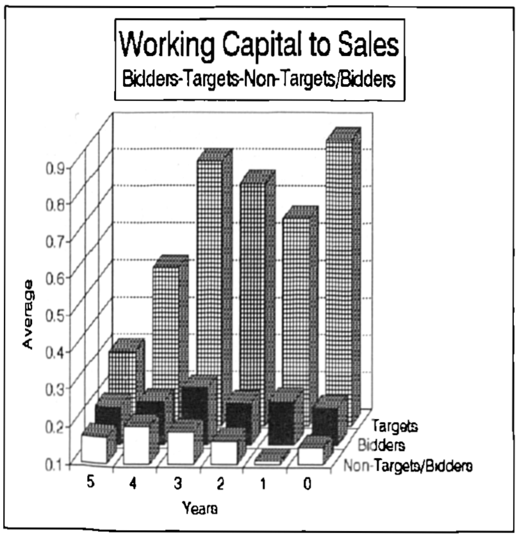


Figure 4.5-20

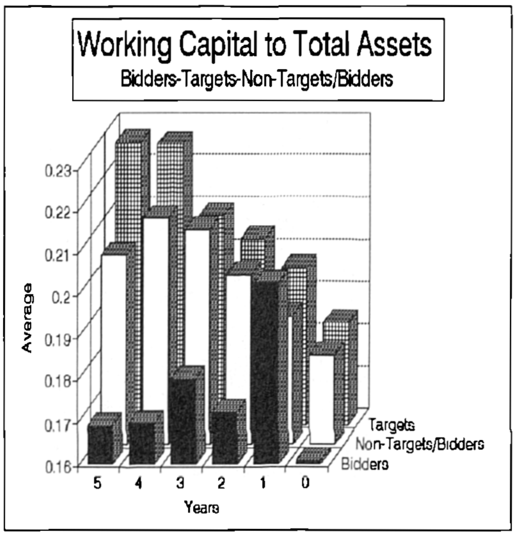


Figure 4.5-21

Figures (4.5-18, 4.5-19, 4.5-20 and 4.5-21) are financial ratios associated with the liquidity position of the firm. The interesting figures are the two figures which explain the working capital position of the firm. The working capital is the difference between current assets and current liabilities. Then the working capital has been divided by the sales (See Fig.4.5-20) and by the total assets (See Fig.4.5-21). The working capital of the target firms is superior than that of the other two groups under examination, especially this is clearly evident in Fig.4.5-20. Target firms generate more current assets from their sales (See Fig.4.5-20). Target firms are more liquid than the other two groups of firms (See Fig.4.5-20 and 4.5-21) and this finding is theory consistent with the finance literature which says that target firms have a very good liquidity position when compared to the non- target firms.

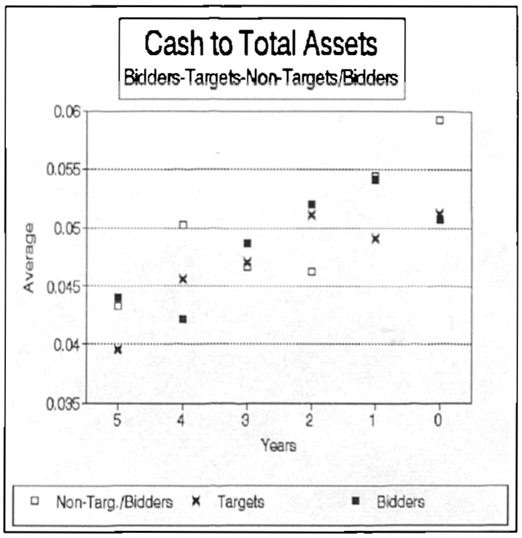


Figure 4.5-22

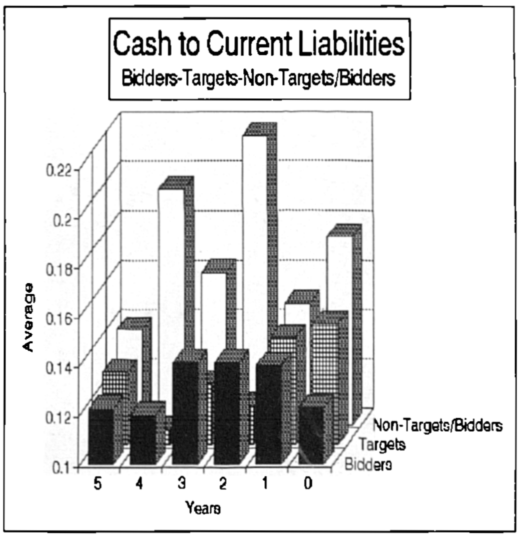


Figure 4.5-23

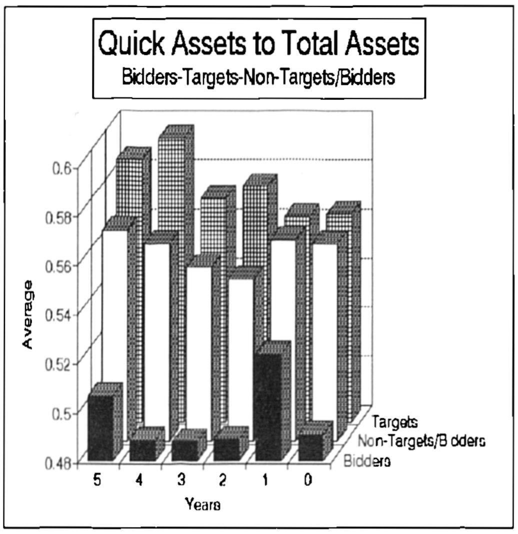


Figure 4.5-24

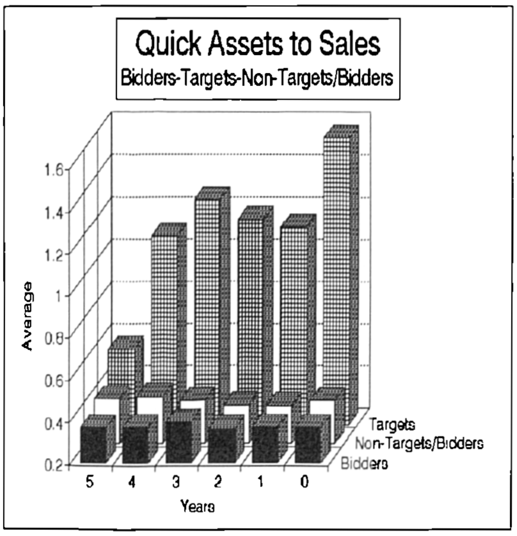


Figure 4.5-25

In addition, the liquidity dimension is examined through the financial ratios in Figures (4.5-22, 4.5-23, 4.5-24 and 4.5-25). The target and the non-target group seem to perform and generate significant amount of their quick assets (total current assets-stock of finished goods)(See Fig.4.5-24) from their total assets. On the contrary, this is not the case of bidder firms. The next interesting finding is that target firms do generate a lot of their quick assets from their sales (See Fig.4.5-25) but this is not the case of the other two groups. Empirical findings from the Figures 4.5-24 and 4.5-25 do support the notion that target firms are potential takeover targets due to their healthy liquidity position.

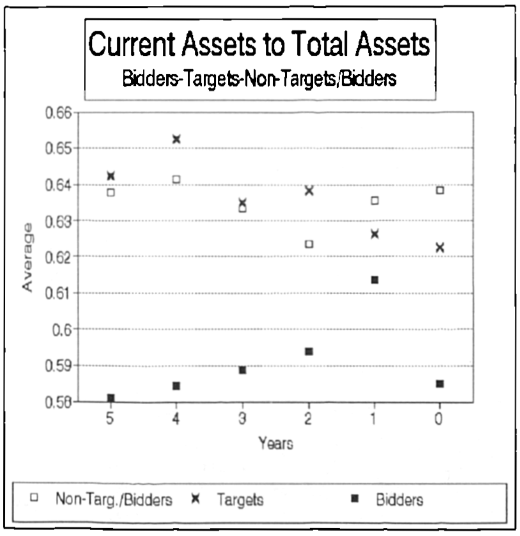


Figure 4.5-26

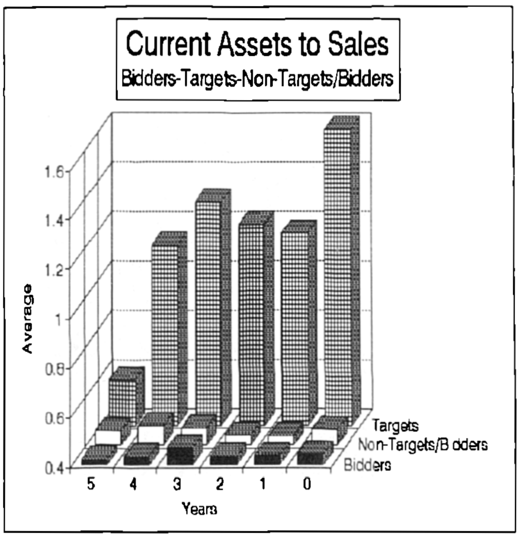


Figure 4.5-27

Figures (4.5-26, 4.5-27) are another two financial ratios from the liquidity dimension. The significant finding is the performance of the target group (See Fig. 4.5-27) where it shows that target firms do really generate their current assets from the utilisation of their sales. The evidence is theoretically consistent with the existing finance literature whereby target firms do appear to be more liquid than bidder firms or non-target firms.

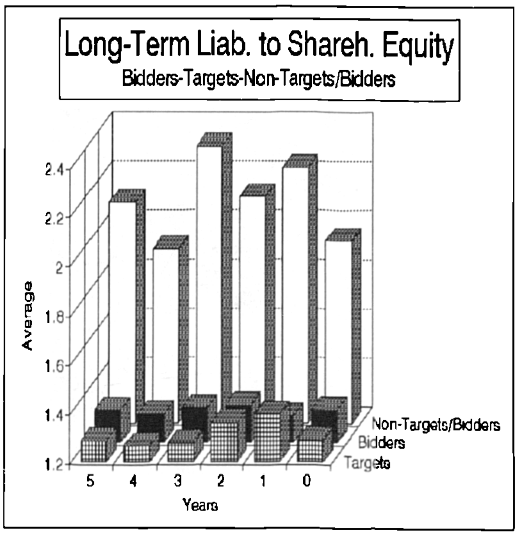


Figure 4.5-28

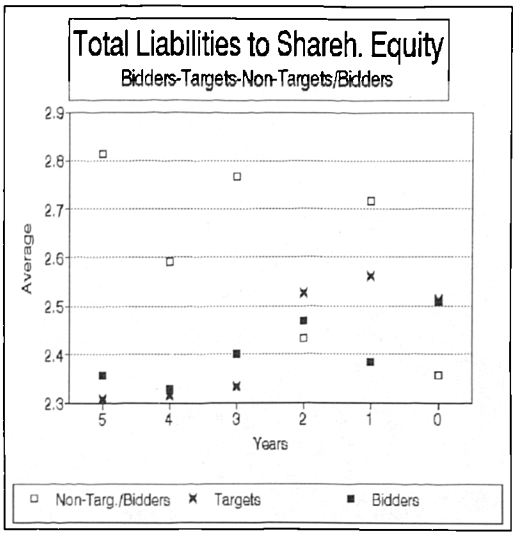


Figure 4.5-29

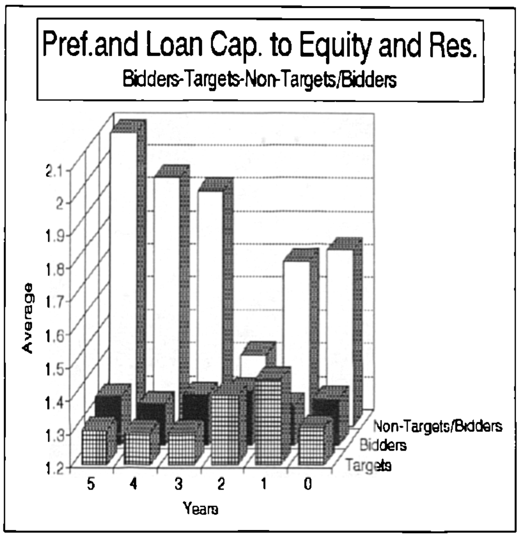


Figure 4.5-30

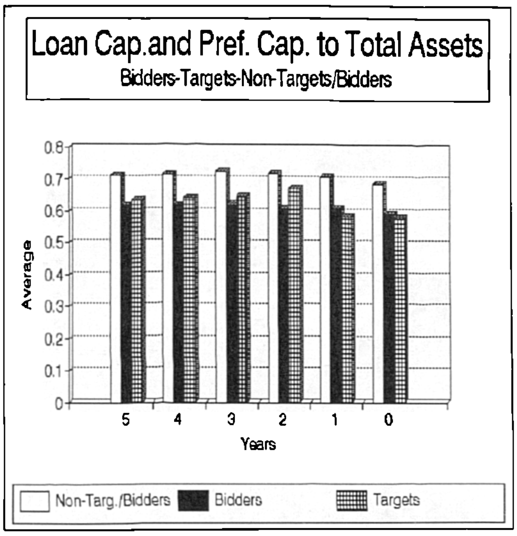


Figure 4.5-31

The leverage dimension is another interesting dimension which shows the position of a firm in terms of its borrowings. From the Figures (4.5-28, 4.5-29, 4.5-30 and 4.5-31) the interesting findings are shown in Figures (4.5-28, 4.5-30) where the non-target group seems to rely heavily on debt in order to finance its activities. The fact that non target firms can finance their activities through borrowings could be an explanation why they are not vulnerable to any takeover proposal.

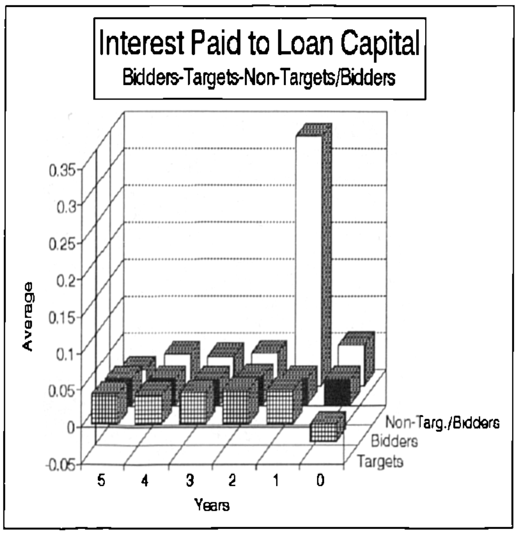


Figure 4.5-32

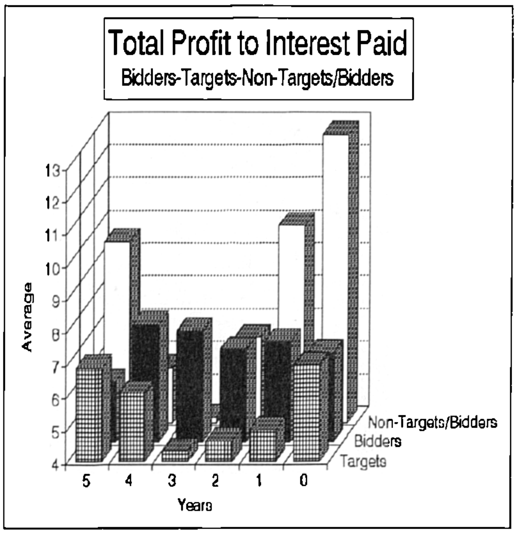


Figure 4.5-33

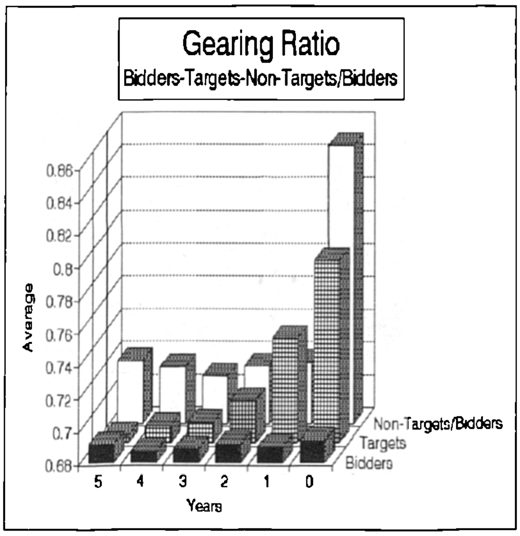


Figure 4.5-34

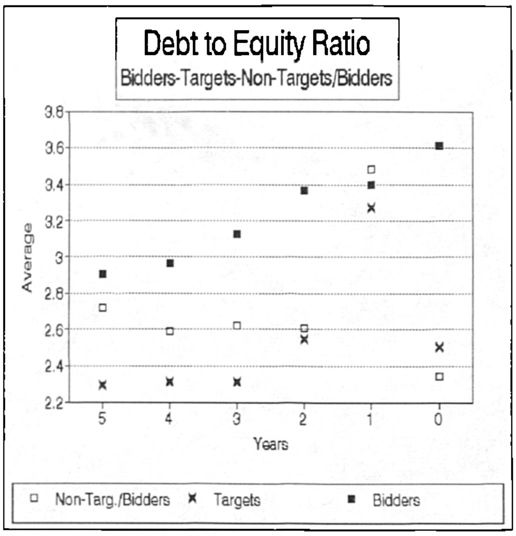


Figure 4.5-35

The leverage dimension is shown again from the Figures (4.5-32, 4.5-33, 4.5-34 and 4.5-35). The gearing ratio (See Fig.4.5-34) is a ratio which shows that around the year of the announcement of a takeover the target firm is experiencing a high debt capacity in its capital structure which may denote that in order to sustain their position in the market and avoid any takeover proposal they borrow money so as to survive. Another interesting finding is shown in Figure 4.5-35 where the debt to equity ratio for bidder firms is significantly higher than the other groups and it is increasingly steadily from year 5 preceding the announcement of the bid to year 0 (year of the announcement of the bid) which gives evidence that a lot of bidders in order to acquire some other firms they do increase their debt in their capital structure so as to acquire their victim.

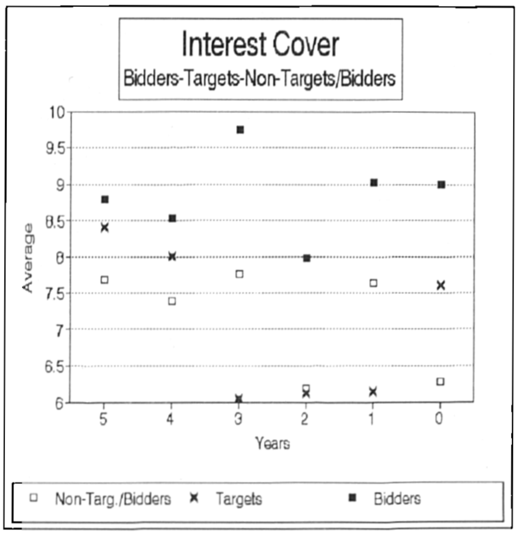


Figure 4.5-36

The interest cover (Fig. 4.5-36) measures the firm's debt-servicing capacity and provides a warning if there is some doubt as to whether the firm can pay future interest on what it has borrowed. Figure 4.5-36 shows that bidder firms face a problem to pay the interest payments for their borrowings. This may be the reason that bidder firms want to acquire firms which have very good liquidity position so as to pay the interest for their borrowings.

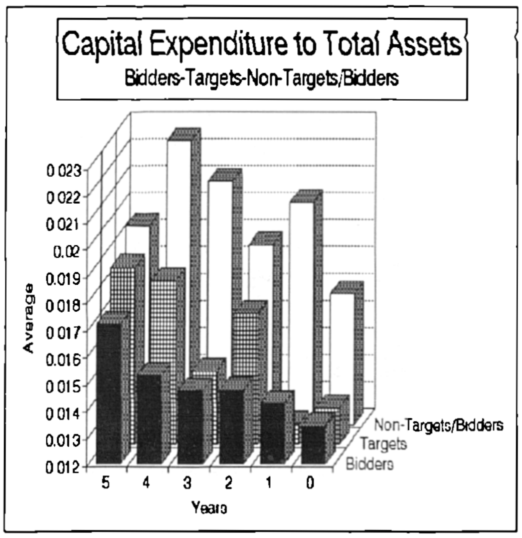


Figure 4.5-37

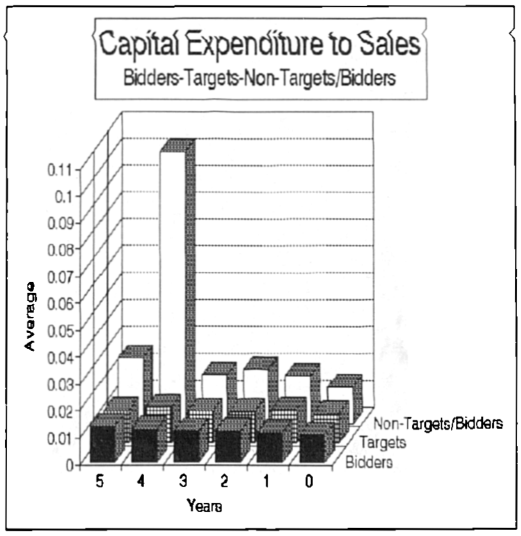


Figure 4.5-38

The ratios that are associated with capital expenditure are the proxy for the money that firms spend in research and development programs. None of the groups generate significant capital expenditure from their sales (See Fig.4.5-38) whereas there is a significant impact of the capital expenditure for the non-target group as shown in Figure 4.5-37. The non-targets group seems to invest a substantial amount of money to improve their asset position which may denote that they have good research and development capabilities as well.

4.6 Analysis of Sample Means - By Industry

The aim of this section is to provide some preliminary findings for the behaviour of the mean of the ratios by industry. For each financial ratio there is a graph that shows the mean value (six year average) of each industry individually . The findings of this section will enhance the analysis of the empirical findings that are provided in chapter 6. The purpose of the industrial mean analysis is to examine the financial characteristics of the different industries across the three different groups.

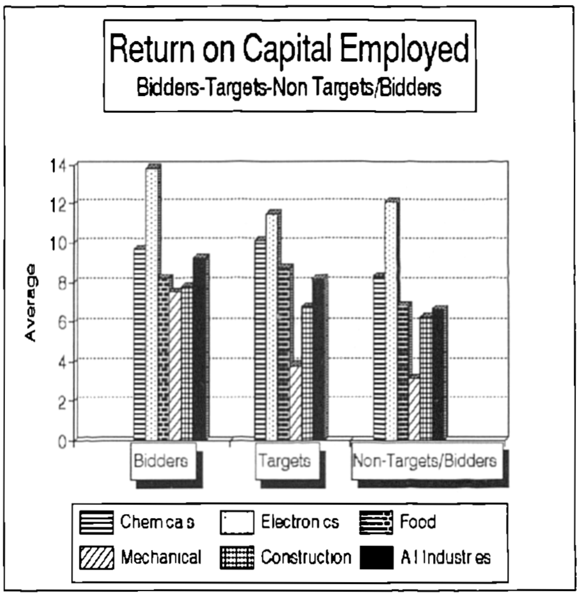


Figure 4.6-1

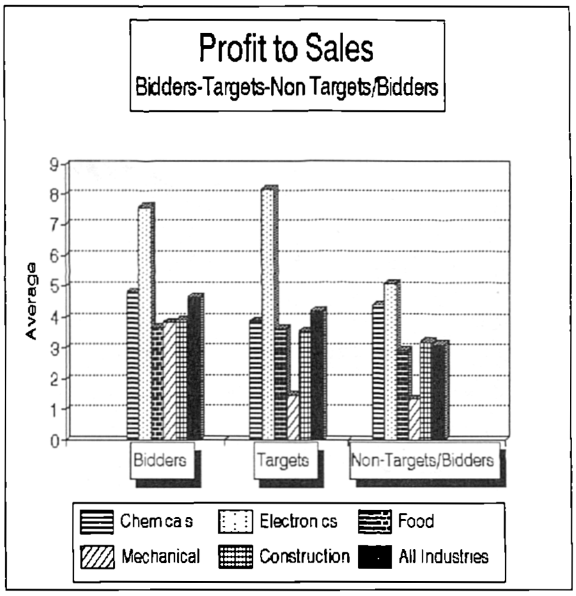
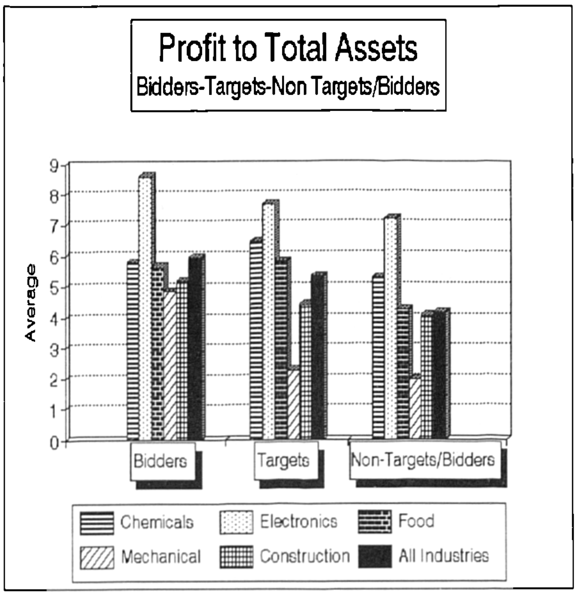


Figure 4.6-2



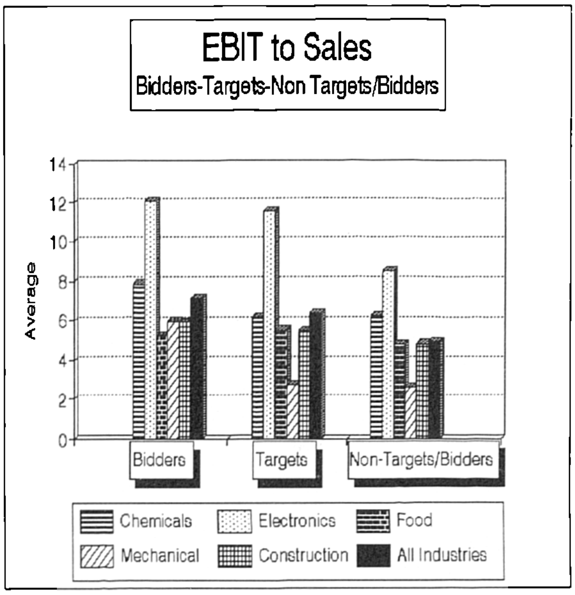
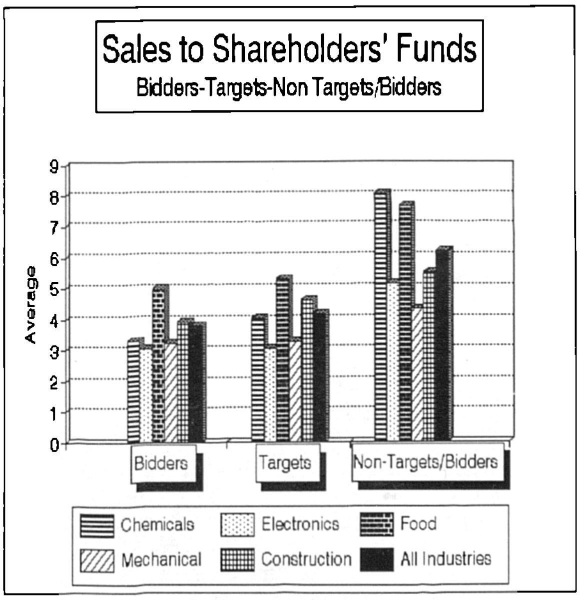


Figure 4.6-3 *Figure 4.6-4*

The characteristics of the various industries in terms of profitability are different. The industry with the higher profitability ratios across the three groups is the electronics industry. By examining all figures (4.6-1, 4.6-2, 4.6-3, 4.6-4) the target firms of the mechanical industry show very low profitability compared to the target firms of the other sectors and also the non-target group of the same sector shows very low profitability similar to that of the target firms which one can say that these firms could be seen as future takeover candidates.



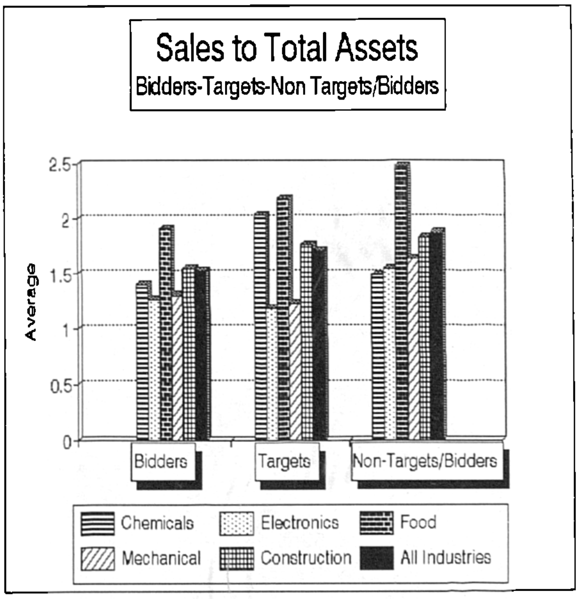


Figure 4.6-5 *Figure 4.6-6*

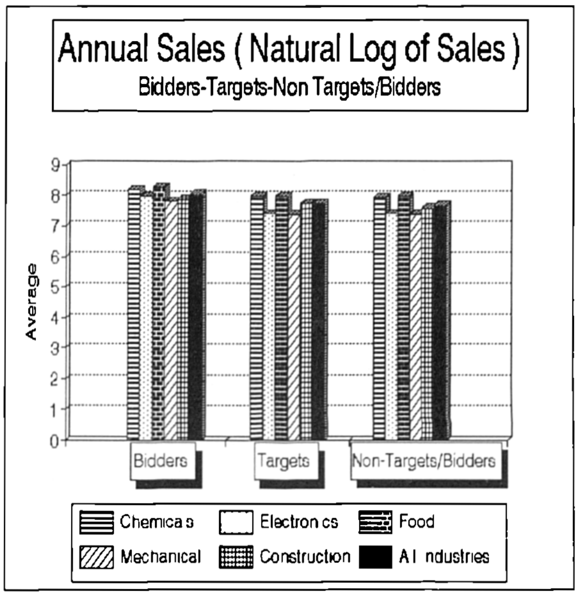


Figure 4.6-7

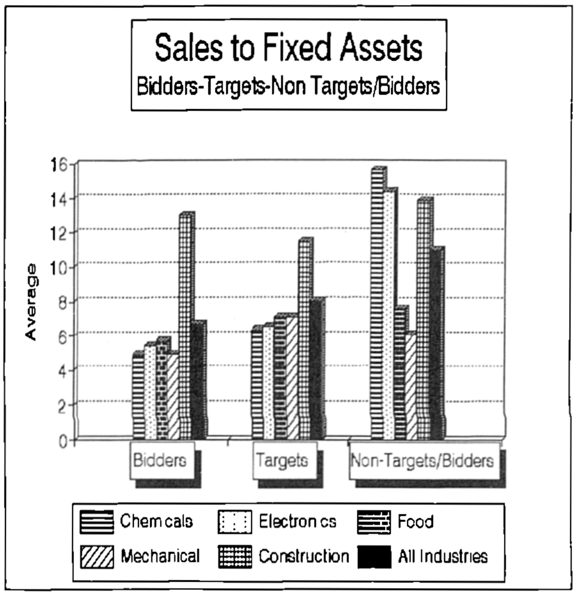


Figure 4.6-8

Figures (4.6-5, 4.6-6, 4.6-8) explain the industrial efficiency dimension for the non-target group and shows very good efficiency compared to the bidder group and the target group. The non-target group of the food industry (See Fig.4.6-5) generates a lot of its efficiency from its total assets which is above the industry average. The bidder firms and the target firms of the construction industry have the best performance of the sales to fixed assets ratio compared to the other industries (See Fig. 4.6-8) *which means that the more times that the fixed assets are* covered by the sales revenue, the greater the recovery of the investment in fixed assets for that sector. The non-targets of the chemical sector show the best performance for the sales to fixed assets ratio compared to the other sectors not only in that group, but also across the groups (See Fig. 4.6-8).

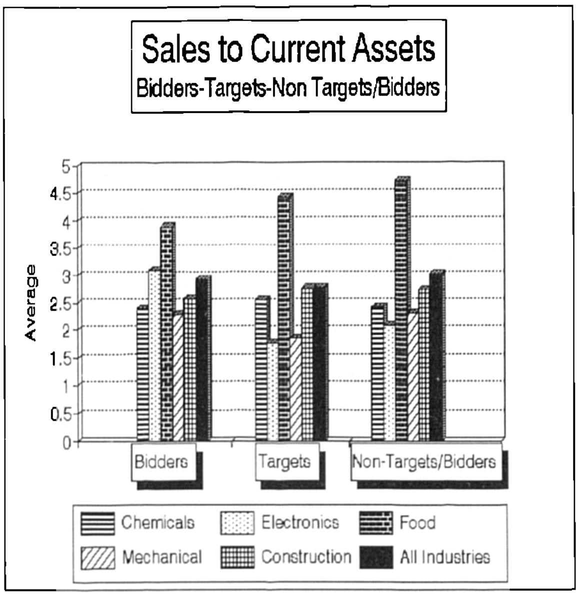


Figure 4.6-9

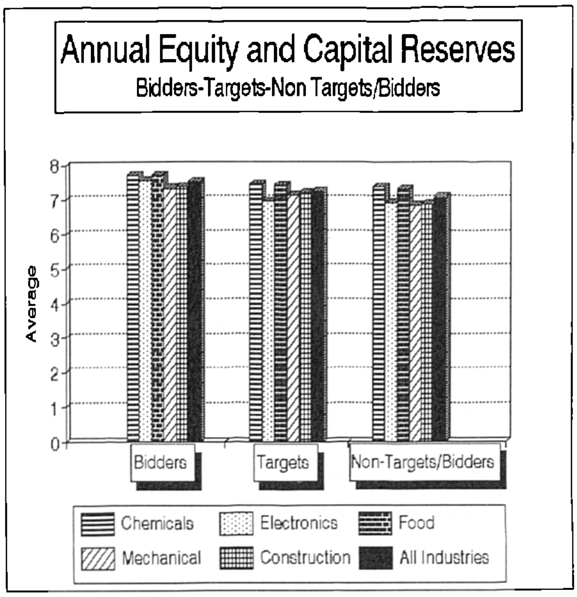


Figure 4.6-10

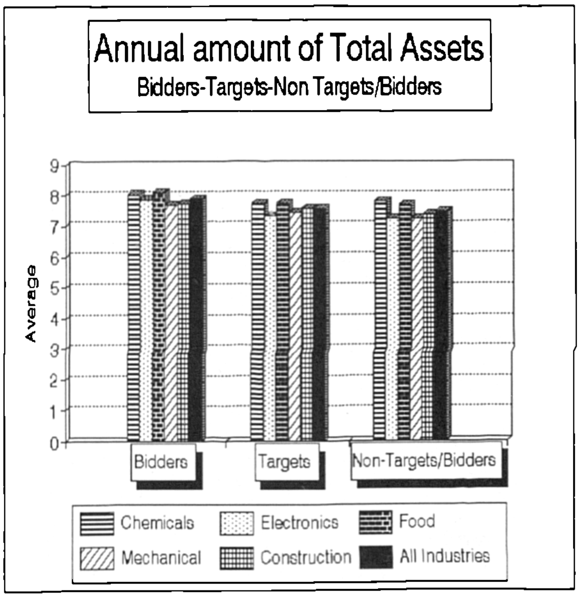


Figure 4.6-11

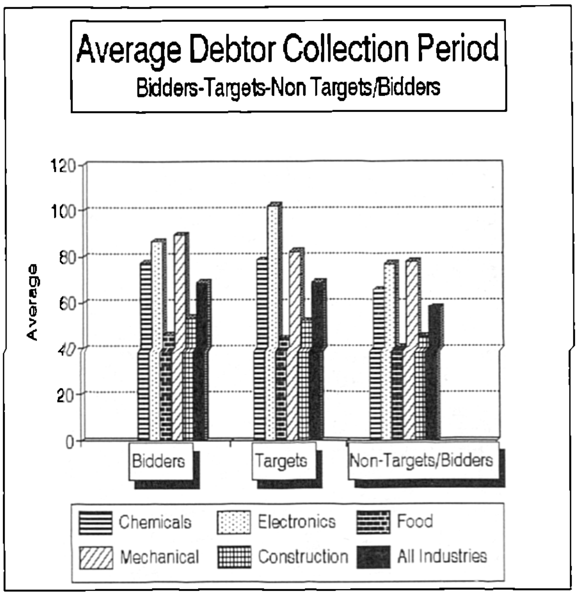


Figure 4.6-12

The two ratios that need to be investigated when examining figures (4.6-9, 4.6-10, 4.6-11 and 4.6-12) are the sales to current assets (Fig. 4.6-9) and the average debtor collection period (Fig. 4.6-12). The sector which seems that it takes advantage from its current assets is the food sector and the finding applies to all the groups (See Fig. 4.6-9). The bidder firms of the electronics sector seem to perform slightly above the industry average ratio for the sales to current assets ratio but this is not the case for the target and non-target groups for that sector (See Fig. 4.6-9). Another interesting finding is shown from the average debtors collection period which shows how frequently debtors pay their debts.

By examining Figure 4.6-12 the average debtor collection period of the electronics sector is very high across all the three groups. The low average collection period for the food sector across the three groups is expected due to the nature of its activities. The results of the mechanical sector for all the three groups are quite high across all the three groups but the contrary applies for the construction sector (See Fig.4.6-12).

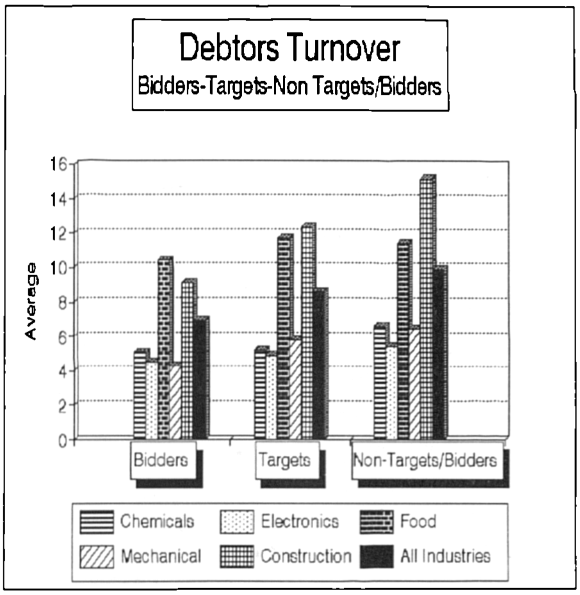


Figure 4.6-13

Figure 4.6-13 reveals the number of times debtors are turned over in a year. The ratio is therefore a reflection of the effectiveness of the firm's credit control. The sectors that seem to change their debtors a lot of times which is an indication of efficiency are the food and construction sectors throughout all their groups.

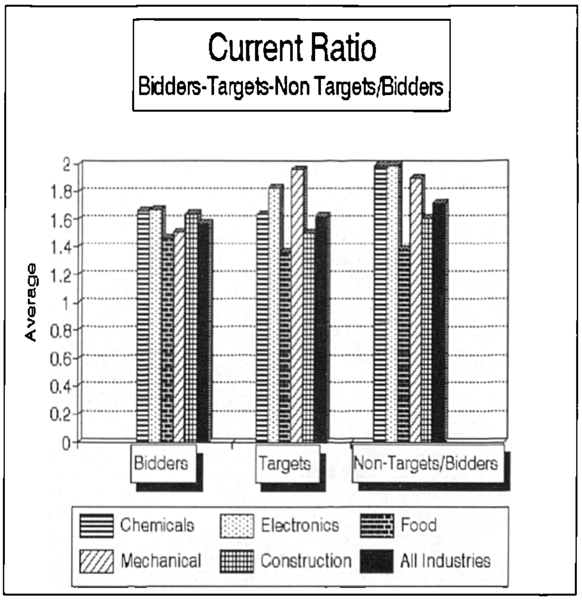


Figure 4.6-14

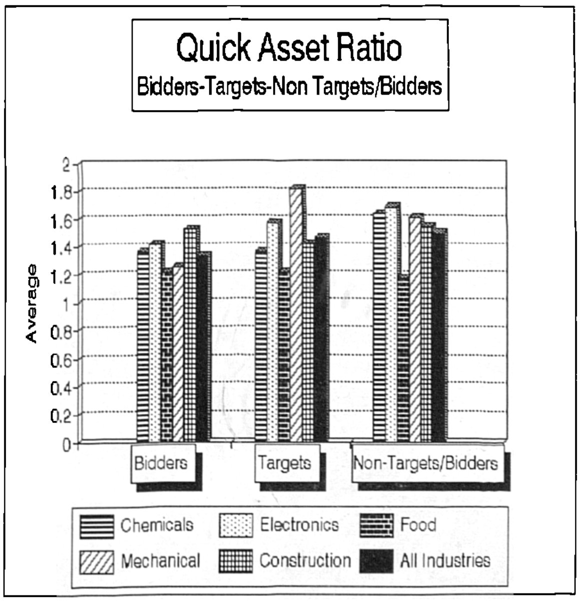


Figure 4.6-15

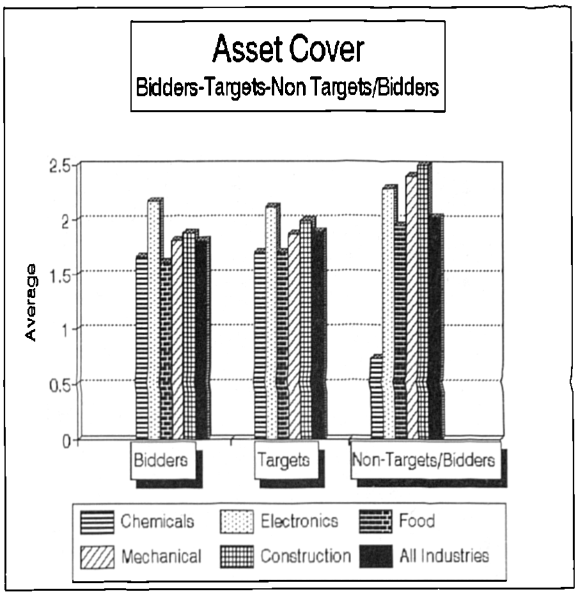


Figure 4.6-16

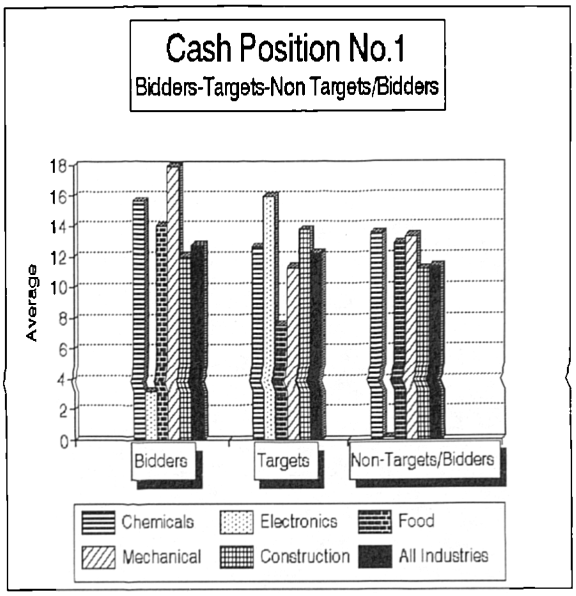


Figure 4.6-17

Joel Hasbrouck (1985) has examined the role of financial liquidity in takeover behaviour and he believes that the events that give rise to excess liquid assets, and in consequence the relationship to takeover likelihood, may be either firm-or industry-specific. Liquidity ratios measure the extent to which assets can be quickly turned into cash. In other words, they try to assess how much cash the entity has available in the short term. The liquidity position of the target group is better than the bidder group (See Fig. 4.6-15) and especially for the electronics and mechanical sector. The current ratio (Fig. 4.6-14) and the quick asset ratio (Fig. 4.6-15) show the liquidity performance by industry in the three groups under examination. These graphs reveal that the target firms of the construction sector are less liquid than the bidder firms of the same sector (See Fig. 4.6-15). For the current ratio as mentioned in chapter 3 (See section 3.3.2.3), this ratio assumes that current assets could be converted into cash to meet current liabilities but as explained in that section there is no general rule for this ratio which may vary from industry to industry (See Figures 4.6-14, 4.6-15, 4.6-16 and 4.6-17). The quick asset ratio of the food industry is the lowest across all groups (See Fig. 4.6-15) and this is due to the nature of the activities of that sector. The reason for this may be the fact that in the numerator of that ratio we do not take into account stock. The asset cover ratio explains the relationship between total assets against long-term liabilities. This will determine how many times the total assets cover the long-term liabilities. The non-targets have on the overall higher asset cover (See Fig. 4.6-16). The only sector which has very low asset cover ratio in that group is the chemical sector. Cash position no.1 (Fig. 4.6-17) shows a better performance for the bidder group when compared to the other two groups apart from two sectors, the electronics and construction sector.

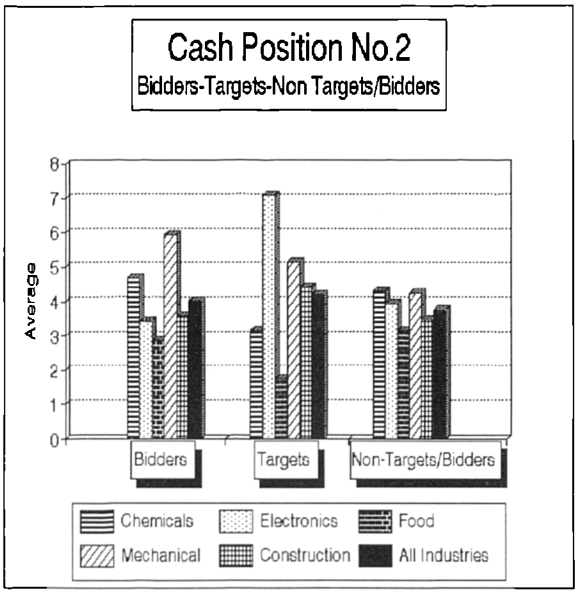


Figure 4.6-18

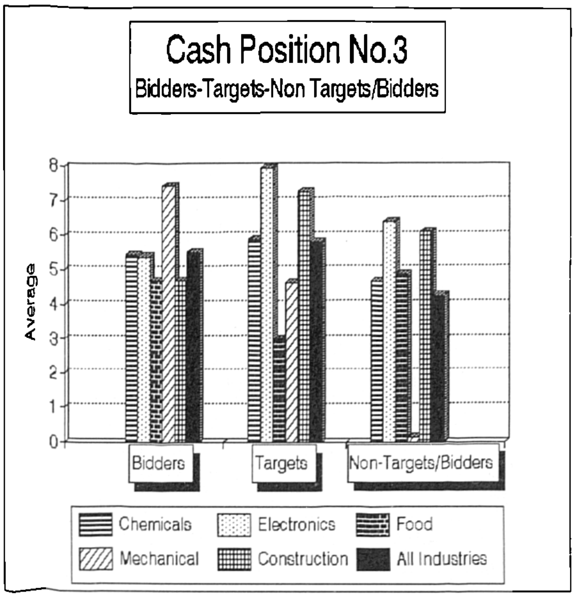


Figure 4.6-19

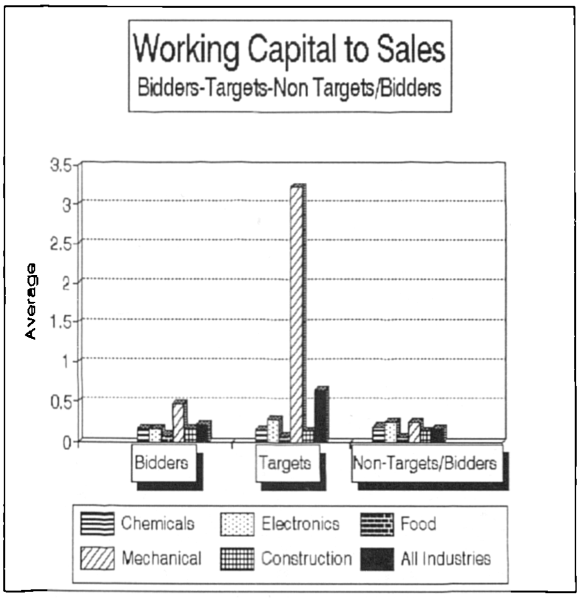


Figure 4.6-20

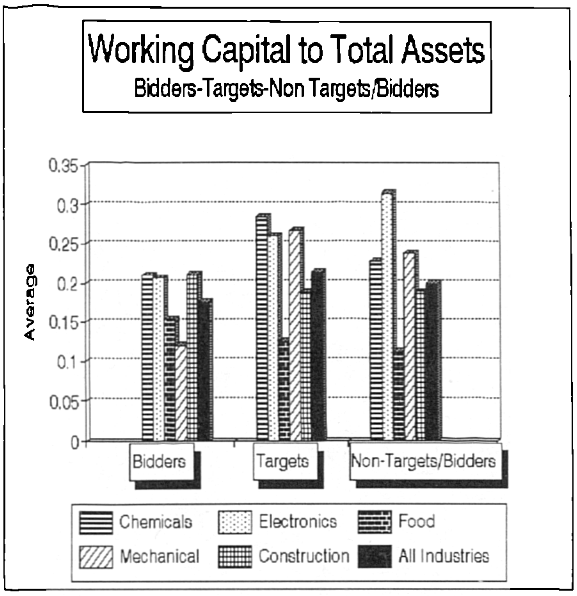


Figure 4.6-21

The notable figure from the graphs above is Fig. 4.6-20 [8]. The working capital to sales ratio for the target firms of the mechanical sector is higher when compared to the other sectors. This is very important because if we go back and examine Fig. 4.5-20 which is the same ratio at the economy wide level the target group has a higher working capital ratio when compared to the other groups. The performance of the target firms of the mechanical sector affects the economy wide sample of target firms. Therefore, this is a very good example which suggests that we need to discriminate between different groups by industry.

[8] There has been an examination for possible outliers. The performance of two target firms from the mechanical sector has an effect to the total sample of the mechanical target firms for the Working Capital to Sales ratio. The names of the two companies are: ALLEN (EDGAR) BALFOUR LTD and GILTSPUR LTD.

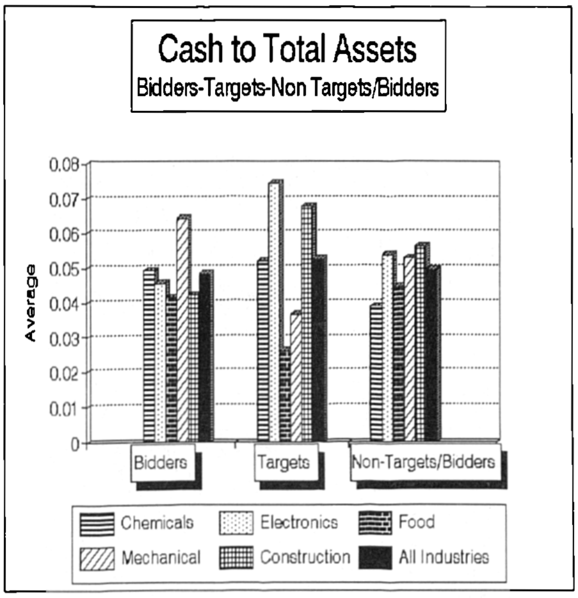


Figure 4.6-22

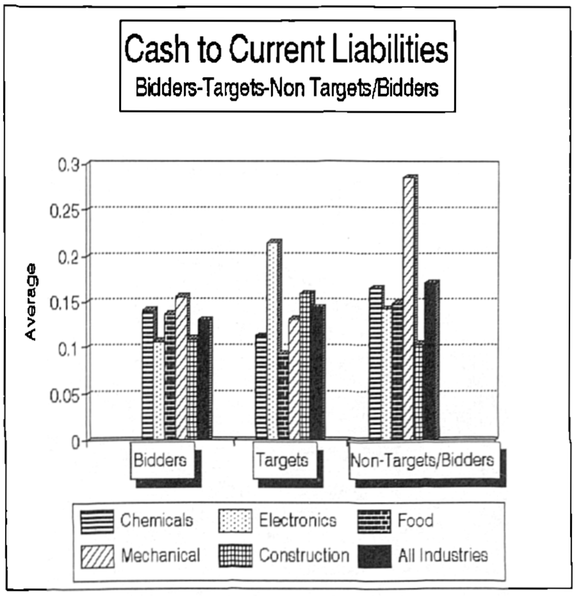


Figure 4.6-23

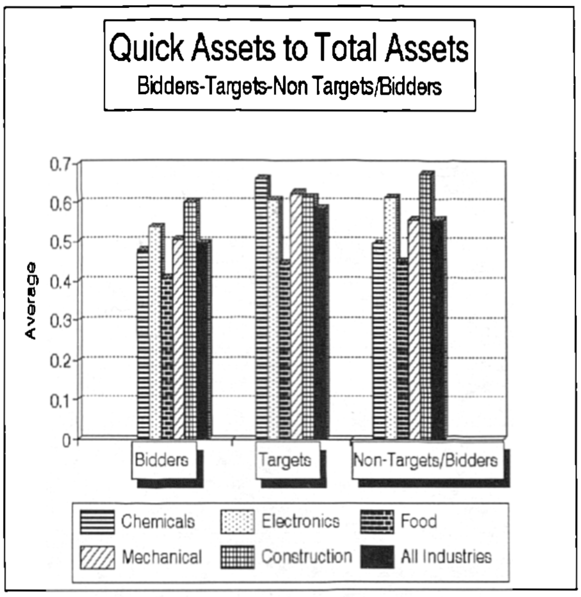


Figure 4.6-24

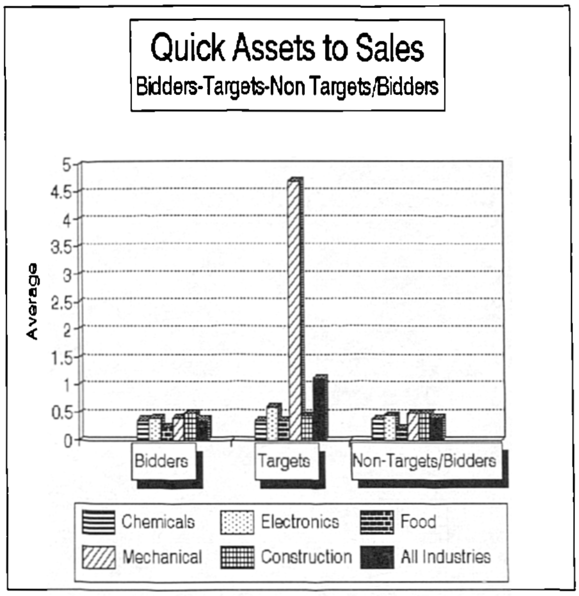


Figure 4.6-25

The cash to total assets ratio (See Fig. 4.6-22) indicates the amount of cash that is generated from the total assets. The target firms of the electronics industry seems to show the best performance for that ratio and the worst performance comes from the target firms of the food sector. The quick assets to sales for the mechanical sector (See Fig.4.6-25 [9]) has similar implications to that explained before for the working capital to sales ratio (Fig.4.6-20).

[9] There has been an examination for possible outliers. The performance of two target firms from the mechanical sector has an effect to the total sample of mechanical target firms for the Working Capital to Sales ratio. The names of the two companies are: ALLEN (EDGAR) BALFOUR LTD and GILTSPUR LTD.

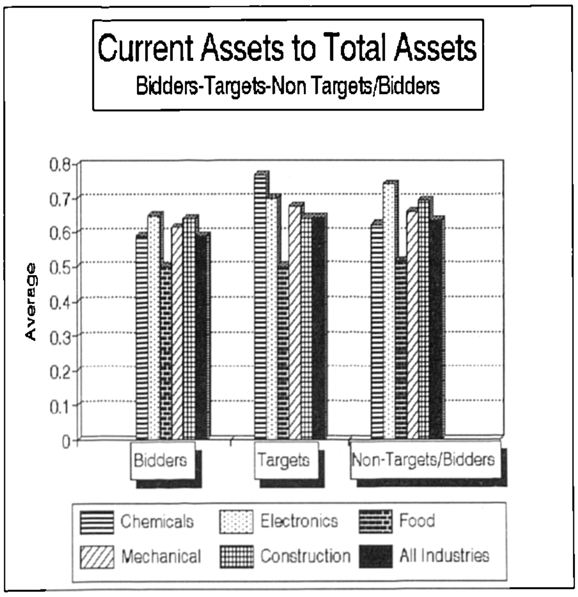


Figure 4.6-26

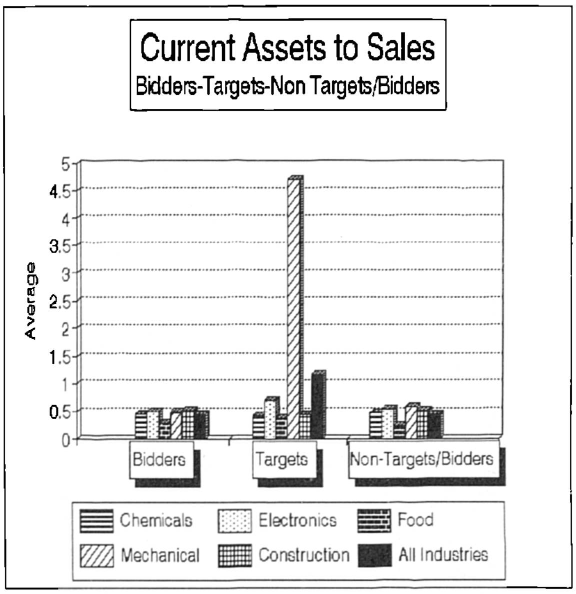


Figure 4.6-27

The current assets to total assets ratio shows the amount of current assets that it has been generated from total assets and generally establishes the input of the current assets to the overall total assets of the firm. This ratio shows that the target firms of the chemical sector has the best performance when compared to the other groups across all the industries under examination. Beside this, the current assets to sales ratio for the mechanical sector (See Fig. 4.6-27 [10]) has similar implications to that explained before for the working capital to sales ratio (Fig.4.6-20) and quick assets to sales ratio (Fig.4.6-25).

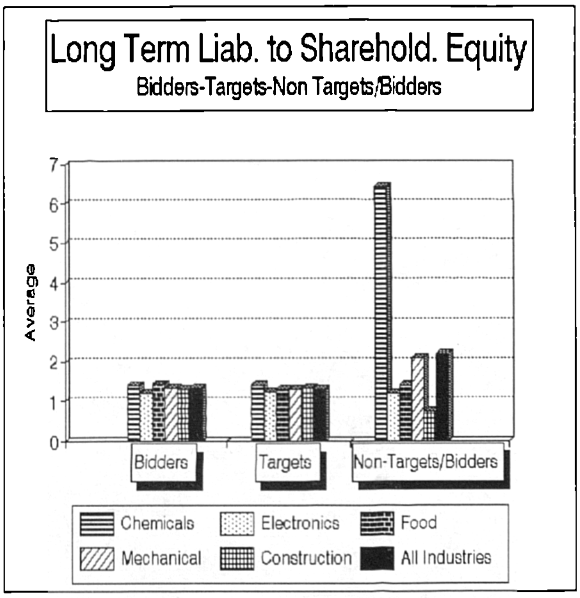


Figure 4.6-28

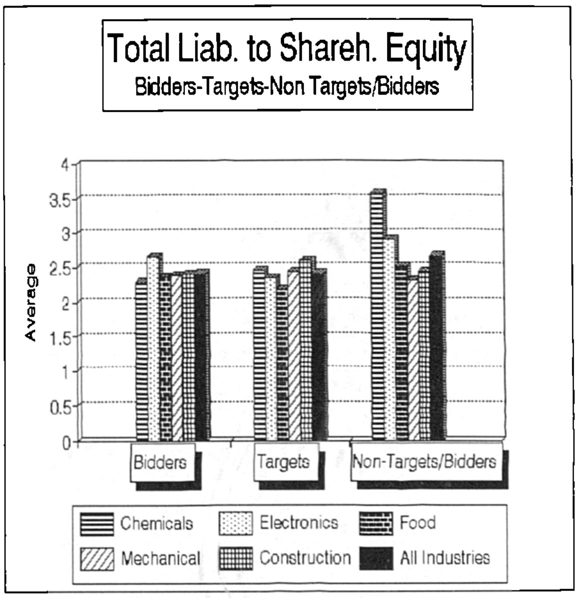


Figure 4.6-29

[10] There has been an examination for possible outliers for the Current Assets to Sales ratio. No particular target firms from the mechanical sector seem to influence the total sample size of the mechanical target firms under examination for the Current Assets to Sales ratio.

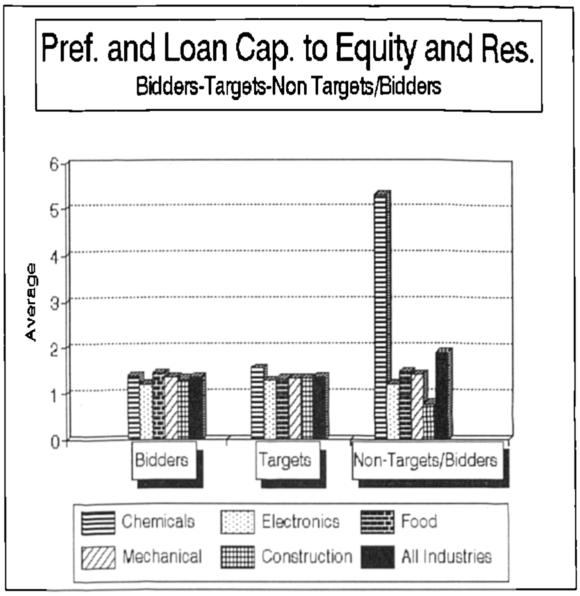


Figure 4.6-30

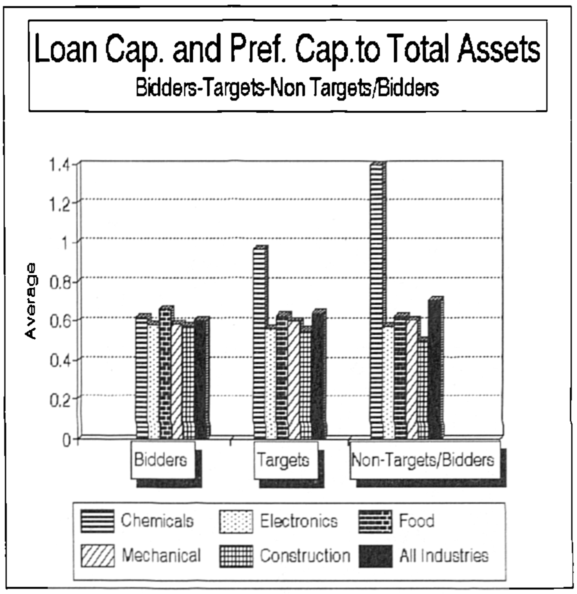


Figure 4.6-31

Leverage ratios describe the firm's financial structure and measures the long-term risk implied by that structure. The leverage position of the chemical sector is the striking finding of the non-target group (See Fig.4.6-28 [11], 4.6-29, 4.6-30 [12], 4.6-31 [13]). This may denote that non-target chemical firms rely on debt financing so as not to be acquired. This is an outstanding finding because when examining the same figures that explain the economy wide level performance of the different groups (See Fig.4.5-28, 4.5-29, 4.5-30, 4.5-31) it seems that the non-target group shows a high leverage position. But this overall impact of the leverage position of the non-target group at the economy wide level is clearly affected from the non-target firms of the chemical sector.

[11] There has been an examination for possible outliers for the Long term Liabilities to Shareholders Equity ratio. No particular non target firms from the chemical sector seem to influence the total sample size of the chemical non target firms under examination for the Long term Liabilities to Shareholders Equity ratio .

[12] There has been an examination for possible outliers. The performance of two non target firms from the chemical sector has an effect to the total sample of the chemical non target firms for the Preference and Loan Capital to Equity and Reserves ratio. The names of the two companies are: ENIMONT HOLDINGS UK LTD and ATOCHEM UK HOLDINGS LTD.

[13] There has been an examination for possible outliers for the Loan Capital and Preference Capital to Total Assets ratio. No particular non target firms from the chemical sector seem to influence the total sample size of the chemical non target firms under examination for the Loan Capital and Preference Capital to Total Assets ratio.

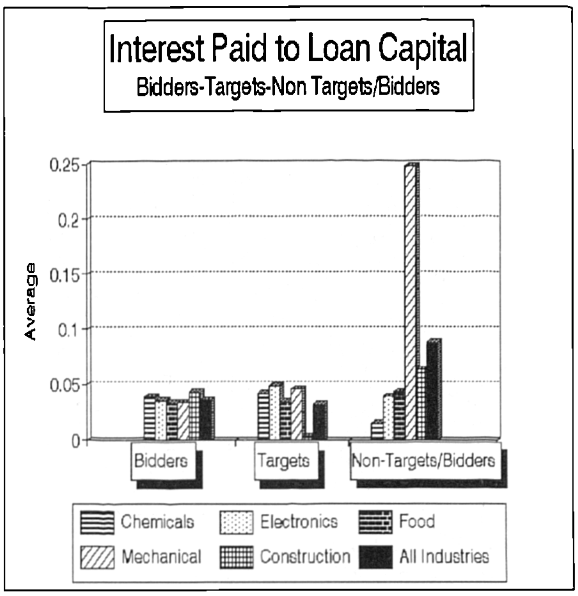


Figure 4.6-32

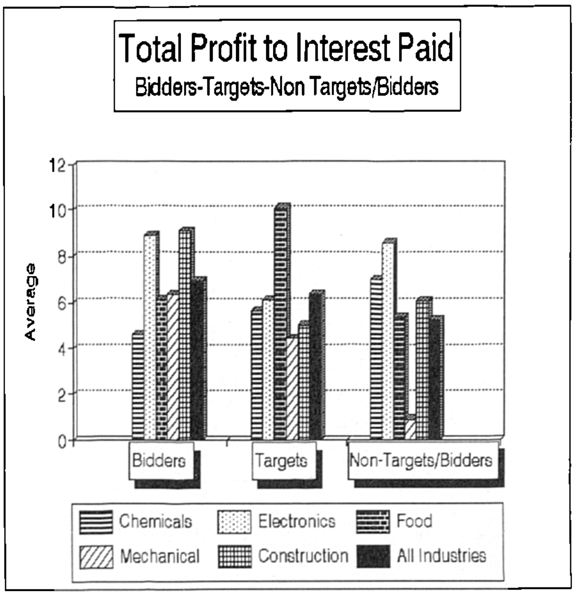


Figure 4.6-33

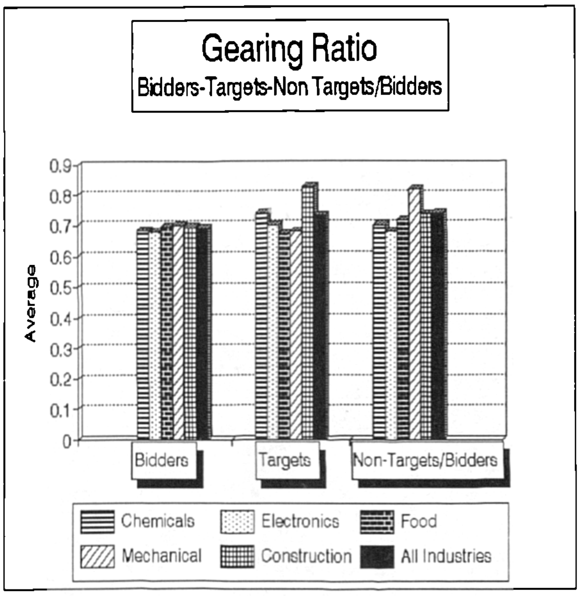


Figure 4.6-34

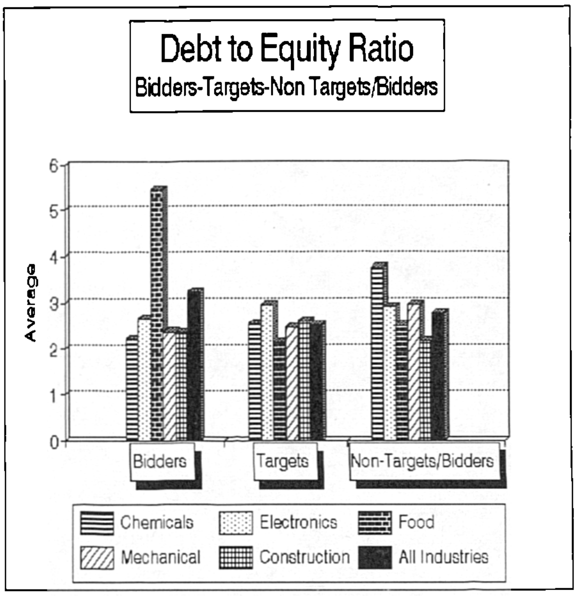


Figure 4.6-35

When examining Figures (4.6-32, 4.6-33, 4.6-34, 4.6-35) the striking findings is the performance of the interest paid to loan capital for non-targets/bidder group of the mechanical sector (See Fig. 4.6-32 [14]) which has again affected the economy wide sample under investigation for that particular ratio (See Fig.4.5-32). In addition, the debt to equity ratio of the bidder firms of the food sector (See Fig.4.6-35) seems to be high which denotes that these firms rely on debt financing.

[14] There has been an examination for possible outliers. The performance of one non target firm from the mechanical sector has an effect to the total sample of the mechanical non target firms for the Interest paid to Loan Capital ratio. The name of the company is H.M. HOLDINGS PLC.

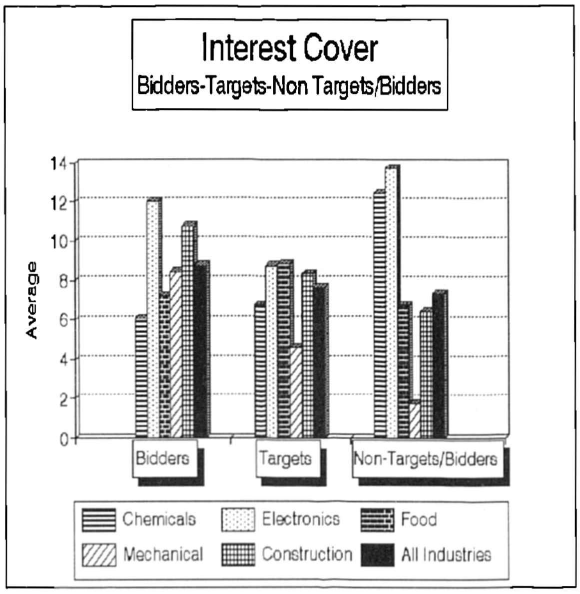


Figure 4.6-36

Interest cover measures the firm's debt-servicing capacity and provides a warning if there is some doubt as to whether the firm can pay future interest on what it has borrowed. The literature suggests that the cover should be over 4 for safety. A low cover figure warns creditors that there is a greater risk of non-payment of interest should there be any future decrease in operating earnings. By examining Fig. (4.6-36) the target firms and the non-target firms of the mechanical sector seem to show bad performance concerning the interest cover ratio.

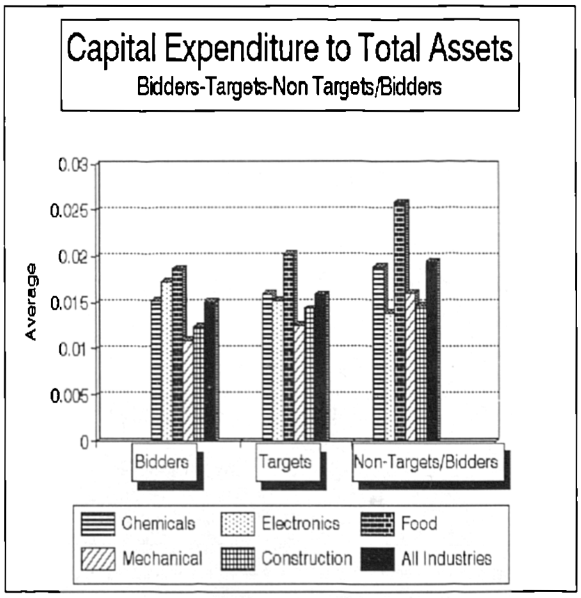


Figure 4.6-37

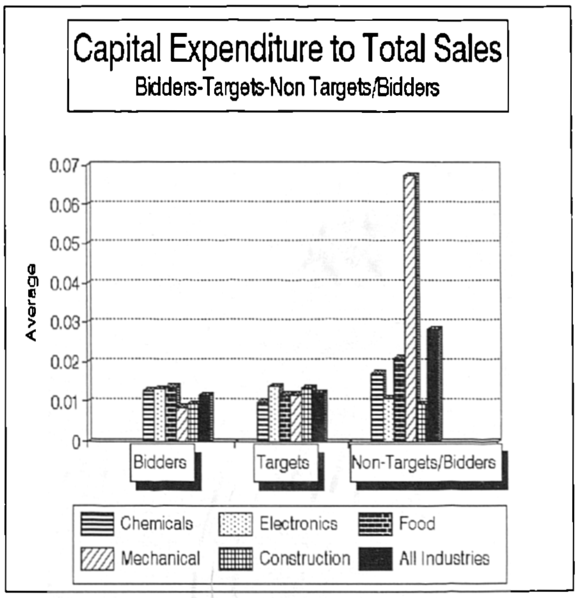


Figure 4.6-38

The non-target group of the mechanical sector seems to spent more money for capital expenditure and generates more sales compared to the other industries (See Fig.4.6-38 [15]). This may be an indication of good research and development output for the non-target group of the mechanical sector, which output ultimately generates sufficient sales to sustain competitive advantage in the market.

[15] There has been an examination for possible outliers. The performance of one non target firm from the mechanical sector has an effect to the total sample of the mechanical non target firms for the Capital Expenditure to Total Sales ratio. The name of the company is FERRUM HOLDINGS.

4.7 Conclusion

The present thesis analyses mergers and acquisitions within the UK economy for the period 1982-1990. For the purpose of the analysis the sample size is divided into the estimation period (1982-1985) and the validation period (1986-1990). The firms under investigation belong to the following sectors of the economy: chemical, construction, food, electrical and electronics engineering and mechanical engineering. The contribution of the present chapter is demonstrated through graphical mean analysis of the financial ratios for both the economy wide sample and by industry for the three groups of firms under investigation. The rationale for industry classification is justified because firm characteristics vary substantially across industries and across the three groups under investigation. Moreover, the financial characteristics of the groups under investigation by industry are different from the financial characteristics of the groups at the economy wide sample. In addition, there are specific industry characteristics that affect the economy wide sample. It is obvious that by disaggregating the sectors of the economy a lot of interesting findings are produced. Industry classification models will give an insight into what are the real financial characteristics of the target firms. The analysis of the mean of the ratios under the analysis for the economy wide sample and then within an industrial classification framework clearly supports the proposition that there is a need i) to discriminate between a) Bidders b) Targets c) Non-Targets (Non-targets\ Bidders or Non-acquired firms) and ii) between industries. The major findings of the graphical mean analysis are described as follows:

The performance of bidders in terms of the **profitability** ratios under investigation is superior to that of the target and non-target group, and it is more significant in the year of the announcement of the bid. This suggests that that bidders on average are profitable firms and in their attempt to expand their activities bidders acquire other firms. Target firms tend to have low profitability compared with bidders but not when compared with non target firms' case. It might be argued that this low profitability makes non target[16] firms vulnerable to takeover. The question is why and how non-target firms may escape from being takeover targets. The characteristics of the various industries in terms of **profitability** are different. The industry with the higher profitability ratios across the three groups is the electronics industry. The target firms of the mechanical industry show very low profitability compared to the target firms of the other sectors.

[16] The fact that non target firms are very small in size may be a reason that protect these firms for being takeover targets.

The performance of the non-target firms in terms of the **efficiency** ratios[17] under investigation is superior to the performance of the target and bidder group. In terms of total assets the bidder group performs better than the other groups. This is consistent with the finance literature which says that bidder firms are bigger in size compared to the target firms. The non-target group is even smaller than target firms. Another finding is that, non-target firms are efficient in collecting their debts . On the other hand, both bidders and targets are inefficient in collecting their debts . The non-target group of the food industry generates a lot of its **efficiency** from its total assets which is above the industry average. The bidder firms and the target firms of the construction industry seem to utilise their fixed assets efficiently compared to the other industries. The non-targets of the chemical sector show the best performance for the sales to fixed assets ratio compared to the other sectors not only in that group but also across the other groups as well. The sector which seems that it takes advantage from its current assets is the food sector and the finding applies to all the groups of that sector . The electronics sector faces problems of collecting their debts throughout the three groups. The sectors that seem to change their debtors a lot of times are the food and construction sectors throughout all their groups.

The **leverage** dimension is another interesting dimension which shows the position of a firm in terms of its borrowings. The non-target group seems to be very highly levered and this group may not be vulnerable to any takeover proposal because it can finance its activities through borrowings. The gearing ratio shows that around the year of the announcement of a takeover the target firm is experiencing a high debt capacity in its capital structure which may denote that in order to sustain their position in the market and avoid any takeover proposal they borrow money so as to survive. Another interesting finding is shown with the debt to equity ratio for bidder firms which is significantly higher than the other groups and may suggest that a lot of bidders do increase their debt in their capital structure so as to acquire their victim. The high leverage position of the non-target firms of the chemical sector is an interesting finding. This may denote that non-target chemical firms rely on debt financing so as not to be acquired. This is an **outstanding finding** because when examining the same ratio in the economy wide sample it seems that the non-target group shows a high

[17] Efficiency ratios measure the operational efficiency of the firm. Within the merger context a rigorous definition of efficiency is lacking and it has to be differentiated from the pareto efficiency as defined in micro- economics. If a firm has operational inefficiency then this is a signal that may employ inefficient managers, therefore this firm is a takeover target.

leverage position. It is obvious, that this overall impact of the leverage position of the non-target group at the economy wide level is clearly affected from the non-target firms of the chemical sector. When examining the interest paid to loan capital for the non-target group of the mechanical sector it seems that this sector has affected the economy wide sample under investigation for that particular ratio. In addition, the debt to equity ratio of the bidder firms of the food sector seems to be high which denotes that these firms rely on debt financing. The interest cover ratio of the mechanical target and non target firms suggest that these firms may face problems to pay future interest on what they have borrowed.

The liquidity position of the non-target group seems to be superior to the **liquidity** position of the target and bidder firms. The working capital of the target firms is superior to that of the other two groups under examination. Target firms are able to utilise their sales to generate more current assets. The target and the non-target group seem to perform and generate significant amount of their quick assets from their total assets. On the contrary, this is not the case of bidder firms. The next interesting finding is that target firms do generate a lot of quick assets from their sales but this is not the case for the other two groups. Empirical findings from the graphical mean analysis do support the notion that target firms are potential takeover targets due to their healthy liquidity position. The liquidity position of the target group is better than the bidder group and especially for the electronics and mechanical sector. From the current ratio and the quick asset ratio the target firms of the construction sector are less liquid than the bidder firms of the same sector . The quick asset ratio of the food industry is the lowest across all groups and this is due to the nature of the activities of that sector. The reason for this may be the fact that in the numerator of that ratio we do not take into account stock. The working capital to sales ratio for the target firms of the mechanical sector is higher when compared to the other sectors. This is very important because by examining the same ratio at the economy wide level the target group has a higher working capital ratio when compared to the other groups. The performance of the target firms of the mechanical sector for the working capital ratio affects the performance of the target firms of the economy wide sample. In addition, the quick assets to sales and the current assets to sales ratio for the mechanical sector have similar implications to what has just been explained for the working capital to sales ratio, that the performance of the target firms of the mechanical sector affects the performance of the target firms in the economy wide sample. Therefore, these are very good examples which suggests that we need to discriminate between different groups by industry. The target firms of the electronics industry seem to show the best performance for the cash to total assets ratio and the worst performance comes from the target firms of the food sector. The current assets to total assets ratio shows that the target firms of the chemical sector has the best performance when compared to the other groups across all the industries under examination.

The non-target group seems to invest a substantial amount of money to improve their asset position which may denote that they have good research and development capabilities as well. Finally, the non-target group of the mechanical sector seems to spend more money on **capital expenditure** and generates more sales compared to the other industries. This may be an indication of good research and development output for the non-target group of the mechanical sector, whose output ultimately generates sufficient sales to sustain competitive advantage in the market.

CHAPTER 5

THE ECONOMY WIDE MODELS

5.1 Introduction

In this chapter, I present the main empirical findings for the economy wide models. Following the discussion in chapter 3 multivariate binomial logit has been selected to estimate the models presented here as it is preferred to MDA and as conclusions drawn from probit are not materially different. First of all I attempt to discriminate between bidders and targets and then between non targets and targets. In undertaking the analysis I distinguish three distinct periods: estimation (1982-1985), validation (1986-1990) and the whole period (1982-1990). In conclusion, I attempt to assess whether the financial characteristics of a typical acquired firm relative to bidders and non targets is recognisable from previous results and the rather tentative data analysis of the previous chapter.

5.2 Modelling merger and acquisition activity

The method of analysis selected is binomial logit. Logit is preferred to the linear probability model for the reasons stated in chapter 3. The choice between logit and probit is quite arbitrary as both methods define nice *s- shaped* functions[1]. The major advantage of logit is that it is easier to generalise which provides us with a simple development path for future research. In addition, I do not impose normality on the choice process which means that the logit for any parametarisation has a fatter tailed distribution. All of the above methods define a probability model for the choice problem which is dependent on a vector of regressors or covariates. The regressors selected define measures of the hypotheses formulated in chapter 2. The probability (Π) that a firm is a takeover target can be described from the following function:

[1] In fact the logit and probit estimates are proportional to each other (Kmenta (1990)).

$$\Pi = f(\rho_1, \rho_2, \rho_3, \rho_4, \rho_5) \qquad (1)$$

where ρ_1 = profitability (-)[2]

ρ_2 = inefficient management (-)

ρ_3 = financial leverage (-)

ρ_4 = corporate liquidity (+)

ρ_5 = capital expenditure (+)

The latent hypotheses behind the underlying theoretical model are described by ρ_1, ρ_2, ρ_3, ρ_4 and ρ_5. In practice, I have a list of regressors (Z_i) which take account of these latent variables and for the binomial logit the following probability model is defined:

$$\text{where } f(Z_i) = \frac{\exp(Z_i)}{1 + \exp(Z_i)} \quad \text{for binomial logit (See chapter 3)}$$

$$Z_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i}$$

As stated in chapter 3, the problem with financial accounting data is the preponderance of measures of similar theoretical variables and the high degree of correlation between the variables. In the first instance I devised a number of strategies to select the appropriate variables for the latent hypotheses that I wished to test. Clearly, the method selected should pick the significant variables to discriminate between the choice states and ideally they should be identified with specific hypotheses. Varimax factor analysis, stepwise regression and the General to specific approach of Davidson et. al. (1978) have been the methods applied to this data. Of these procedures the final results are based on the stepwise method. However, the relative loadings for factor analysis associated with the selected variables are presented in Appendix VI and the percentage variance for the factor associated with specific

[2] In the parenthesis I have put the expected sign from each hypothesis. Each hypothesis is represented from financial accounting ratios that are described in chapter 2 (Section 2.4). Profitability hypothesis is represented from the financial accounting ratios of the profitability group of ratios, inefficient management hypothesis is represented from the financial accounting ratios of the efficiency group of ratios, financial leverage hypothesis is represented from the financial accounting ratios of the leverage group of ratios, corporate liquidity hypothesis is represented from the financial accounting ratios of the liquidity group of ratios and capital expenditure hypothesis is represented from the financial accounting ratios of the capital expenditure group of ratios.

variables are in Appendix VI, as well as in the footnotes. The General to specific approach is the downward testing procedure followed by certain time series econometricians (for more detail see Cuthbertson et. al. (1992)). However high correlation between financial variables means that a general model with 38 variables could not be estimated. Ideally, the stepwise approach and general to specific procedure should in large sample give the same results. In practice, stepwise regression does not appear to suffer from the same type of problems which is important as any misspecification or ommition of variables is likely to cause inconsistency in the discrete choice case (W.Greene (1992)). The multicollinearity observed is a function of the latent structure given by (1) above as many of the covariates define alternative measures of the same thing which is the basis of latent definition behind the use of factor analysis. Unfortunately, factor analysis did not successfully determine the appropriate variables in my final specification. Finally, the specific models selected can always be compared with the most feasible general specification. In what follows I first analyse target firms relative to bidders using the three different sample periods. Then, I analyse targets relative to non- targets.

5.3 Comparing Bidders with Targets: The Economy Wide Models

The purpose of this section is to examine the results of the economy wide sample when comparing bidders with targets. In this section, I examine the financial characteristics of target firms relative to bidder firms. The economy wide sample consists of all the bidder and target firms[3]. Here, I present the multivariate binomial logit models for the time periods 1982-1985 (estimation period), 1986-1990 (validation period) and 1982-1990 (whole period). The validation period is primarily used to examine the parametric stability of the model in the estimation period.

5.3.1 Estimation Period: 1982-1985

This section describes the multivariate model that has been estimated for the period 1982-1985. Once the stepwise procedure has selected a set of important variables, the final specification of the model presented here was based on their significance. Initially weak inference was sufficient to keep variables in the models, but once specific models were

[3] See chapter 4 (Table 4.2-5 and 4.2-6).

found a more usual 5% criterion was used for the results in the estimation period. The final multivariate model was selected using the F criterion from the stepwise regression, then significance, theoretical acceptability and predictive power were used to confirm the results of the logits.

Multivariate Binomial Logit Model

```
Dependent Variable: Bidder= 0
                    Target= 1
Maximum Likelihood Estimates
Log-Likelihood.............    -55.03345
Restricted (Slopes=0) Log-L.   -67.23012
Chi-Squared  (4)...........     24.39335
Significance Level.........    0.6660587E-04
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	0.84505	2.525	0.335	0.73782		
X20	-6.9598	2.629	-2.648	0.00811	0.15346	0.17009
X25	9.5331	2.641	3.610	0.00031	0.35864	0.18326
X7	3.9967	1.521	2.627	0.00861	7.9255	0.78685
X11	-4.5012	1.519	-2.962	0.00305	7.7570	0.80083

```
Constant
X20 = Working Capital to Sales (Significant at 99%) (LIQUIDITY)
X25 = Quick Assets to Sales (Significant at 99%) (LIQUIDITY)
X7  = Annual Sales (Natural Log of Sales) (Significant at 99%) (EFFICIENCY)
X11 = Annual amount of Total Assets- (Natural Log of Total Assets)
      (Significant at 99%) (EFFICIENCY)
```

Table 5.3-1

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	34	14	48
1	15	34	49
TOTAL	49	48	97

Conditional Classification Accuracy: (34/49) X 100 = 69.39%
Overall Classification Accuracy: (34+34)/ 97 X 100 = 70.10%

Table 5.3-2

The results of the model (See Table 5.3-1) based on logit for the period (1982-1985) indicate that working capital to sales (liquidity), quick assets to sales (liquidity), annual sales (natural log of sales) (efficiency) and the annual amount of total assets - (natural log of total assets) (efficiency) are significant at the 99 percent level. The outcome of the present model suggests that the probability of being a target among the sample of targets and bidders increases when working capital to sales (liquidity) and annual amount of total assets - (natural log of total assets) (efficiency) decrease and when quick assets to sales (liquidity) and annual sales (natural log of sales) (efficiency) increase. Therefore when discriminating between bidders and targets at the economy wide level the dominant dimensions are ***liquidity*** and ***efficiency***. The negative sign of the working capital to sales ratio should be investigated further because it suggests that illiquid firms are at risk. This contradicts the results for the quick assets to sales ratio which says the reverse. However, the quick assets ratio incorporates the cash holdings and claims on debtors. These are essentially assets which can be quickly mobilised. Clearly, large holding of such assets relative to sales would be significant attraction to prospective bidding firms.

If I refer to previous studies, then we can see that the ratios in my specified model have appeared before:

Low working capital to sales (liquidity)

This ratio has been used by Belkaoui (1978)[4] and it was one of the proxies for the liquid asset turnover group. The results of the working capital to sales ratio in the present model suggest that target firms do not generate enough working capital from their sales.

Low annual amount of total assets - (natural log of total assets) (efficiency)

This ratio has been employed by Harris et. al.(1982) as a proxy for the size dimension. The present thesis has seen the natural log of total assets as a measure of efficiency. The findings of the present model suggest that target firms are inefficient and this finding is theory consistent with the inefficient management hypothesis.

High quick assets to sales (liquidity)

This ratio has been employed by Belkaoui (1978)[5] and it was one of the proxies for the liquid asset turnover group. The sign of the coefficient of the quick assets to sales ratio in the present model reveals that target firms are liquid and this finding is theory consistent with the

[4] This ratio had the following percentage error in classification for years one to five before the takeover: 50%, 46%, 44%, 54% and 44%.

[5] This ratio had the following percentage error in classification for years one to five before the takeover: 34%, 36%, 40%, 42% and 48%.

liquidity hypothesis which says that acquired firms are liquid firms. This ratio shows that the targets' quick assets are generated from their sales.

High annual sales (natural log of sales) (efficiency)

Simkowitz and Monroe (1971), Wansley and Lane (1983) and Ronnie J. Clayton and M. Andrew Fields (1991) employed the annual sales variable in their studies. Wansley and Lane (1983) and Ronnie J. Clayton and M. Andrew Fields (1991) used this measure as a proxy of size and their results suggest that target firms were of small size. The present thesis has seen the above ratio as a measure of efficiency but for comparison purposes if this is seen as a proxy for size then the present model reveals that target firms were big in size. This is a new finding for the existing literature which suggest that target firms in the 80's were bigger in size.

Table 5.3-2 summarises the frequencies of predicted and actual outcomes. Thirty-four of the bidder firms are correctly classified by the model. Fourteen of the bidder firms are incorrectly classified by the model. Fifteen of the target firms are incorrectly classified by the model. Thirty-four of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 69.39%. The overall prediction accuracy[6] of the model is 70.10%.

5.3.2 Validation Period: 1986-1990

It is proper to think of the prediction period as being based on a completely different sample of firms. In particular Kemp[7] (1995) has suggested, that an analogue of the predictive failure test used in time series might also be used here. Unfortunately, at the time of specifying the original models the exact test procedure was not available. However, I can look at the results for a separate period and determine whether the model parameters have materially changed. When the derived model from the estimation period is tested in the validation period (1986-1990) the variables do give the same sign[8], the variables are jointly

[6] This should properly be viewed as a measure of goodness of fit as this is what Maddala (1992) (p.334) calls the count R^2.

[7] Gordon C.R. Kemp (1995), *Structural Stability Analysis in Duration Models*, Department of Economics, University of Essex, February.

[8] If the signs of the coefficients are the same in the validation period this means that the result of the hypotheses do not alter between the estimation and the validation period.

significant and the fit of the models is similar. This section describes the multivariate model of the validation period 1986-1990.

Multivariate Binomial Logit Model

```
Dependent Variable: Bidder= 0
                    Target= 1
Maximum Likelihood Estimates
Log-Likelihood.............     -76.85682
Restricted (Slopes=0) Log-L.    -89.74850
Chi-Squared  (4)...........      25.78336
Significance Level.........     0.3499141E-04
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	3.4653	1.890	1.833	0.06678		
X20	-6.3378	1.708	-3.711	0.00021	0.69336	4.7612
X25	4.7721	1.268	3.764	0.00017	1.1349	6.6320
X7	1.0469	1.152	0.909	0.36359	7.7765	0.87040
X11	-1.5227	1.188	-1.282	0.19989	7.6614	0.79863

Constant (Significant at 95%)
X20 = Working Capital to Sales (Significant at 99%) (LIQUIDITY)
X25 = Quick Assets to Sales (Significant at 99%) (LIQUIDITY)
X7 = Annual Sales (Natural Log of Sales) (Significant at 75%) (EFFICIENCY)
X11 = Annual amount of Total Assets- (Natural Log of Total Assets)
(Significant at 75%) (EFFICIENCY)

Table 5.3-3

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	18	29	47
1	4	90	94
TOTAL	22	119	141

Conditional Classification Accuracy: (90/94) X 100 = 95.74%
Overall Classification Accuracy: (90+18)/ 141 X 100 = 76.60%

Table 5.3-4

Roughly using 2SE (comparing the standard errors of the variables in tables 5.3-1 and 5.3-3) bands for the estimation period for which model was selected we could accept that all the above parameters are the same (notice that the reverse is not true- hence we might want to be careful in our final interpretation of these results). But they provide weak confirmation of a similar model over the two periods and the fit of the model if anything is better in the validation period. Table 5.3-4 summarises the frequencies of predicted and actual outcomes.

Eighteen of the bidder firms are correctly classified by the model. Twenty-nine of the bidder firms are incorrectly classified by the model. Four of the target firms are incorrectly classified by the model. Ninety of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 95.74%. The overall classification accuracy of the model is 76.60%. On the other hand, the multivariate binomial logit model[9] in the estimation period (1982-1985) has achieved the conditional classification accuracy of 69.39% and an overall classification accuracy of 70.10%. It seems that this model has achieved a high predictive accuracy in identifying takeover target firms (in a sample of bidder and target firms).

5.3.3 The Combined Sample: 1982-1990

In this section I describe the model derived for the period 1982-1990 since it was felt that it would be useful for comparison purposes. The 38 variables[10] which were under consideration have been used in a stepwise regression procedure and in factor[11] analysis.

Multivariate Binomial Logit Model

```
Dependent Variable:   Bidder= 0
                      Target= 1
Maximum Likelihood Estimates
Log-Likelihood..............    -137.2774
Restricted (Slopes=0) Log-L.    -159.5845
Chi-Squared (4) ............     44.61427
Significance Level..........    0.4142439E-08
```

[9] See Table 5.3-1.

[10] The variables under consideration are six year averages for bidder and target firms before the announcement of the bid. For each variable that enters the final model I provide its results for the stepwise regression analysis and its results for factor analysis in the footnotes.

[11] See Appendix II for a theoretical discussion of factor analysis and Appendix VI to examine the results of factor analysis that are associated with the present thesis.

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	3.0930	1.472	2.101	0.03567		
X11	-0.51348	0.1829	-2.807	0.00500	7.6997	0.79916
X20	-7.4049	1.625	-4.556	0.00001	0.47521	3.6783
X25	5.4194	1.168	4.641	0.00000	0.82086	5.1236
X21	2.2465	1.059	2.121	0.03392	0.20167	0.18939

Constant (Significant at 95%)
X11 = Annual amount of Total Assets[12] - (Natural Log of Total Assets) (Significant at 99%) (EFFICIENCY)
X20 = Working Capital to Sales[13] (Significant at 99%) (LIQUIDITY)
X25 = Quick Assets to Sales[14] (Significant at 99%) (LIQUIDITY)
X21 = Working Capital to Total Assets[15] (Significant at 95%) (LIQUIDITY)

Table 5.3-5

Frequencies of actual & predicted outcomes.
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	46	49	95
1	19	123	142
TOTAL	65	172	237

Conditional Classification Accuracy: (123/142) X 100 = 86.62%
Overall Classification Accuracy: (123+46)/ 237 X 100 = 71.30%

Table 5.3-6

[12] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X11:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X11	-0.91409E-01	0.4191E-01	-2.181	0.03032	7.7534	4.7570

In varimax factor analysis it appears under the fifth factor with the highest loading (See Appendix VI- Table 58). The fifth factor explains 7.8% of the total variance (See Appendix VI- Table 58). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis as well.

[13] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X20:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X20	-1.1609	0.2318	-5.008	0.00000	0.18143	25.083

In varimax factor analysis it appears under the fourth and the ninth factor (See Appendix VI- Table 58). The higher loading comes under the fourth factor which explains 8.7% of the total variance (See Appendix VI- Table 58).

[14] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X25:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X25	0.54270	0.1284	4.227	0.00004	0.40755	17.867

In varimax factor analysis it appears under the fourth and the ninth factor (See Appendix VI- Table 58). The higher loading comes under the ninth factor which explains 3.8% of the total variance (See Appendix VI- Table 58). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis as well.

[15] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X21:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X21	0.53346	0.2008	2.656	0.00852	0.19650	7.0568

In varimax factor analysis it appears under the second and the fourth factor (See Appendix VI- Table 58). The higher loading comes under the fourth factor which explains 8.7% of the total variance (See Appendix VI- Table 58). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis as well .

Comparing the specified model which is selected in the periods (1982-1985, 1986-1990) with that of 1982-1990 we have three common variables (X20, X25, X11). These variables for the above models give exactly the same sign for their coefficients.

The results of the model (See Table 5.3-5) based on logit for the period (1982-1990) indicate that the annual amount of total assets - (natural log of total assets) (efficiency), working capital to sales (liquidity), quick assets to sales (liquidity) are significant at the 99 percent level. The working capital to total assets (liquidity) is significant at the 95 percent level. The outcome of the present model suggests that the probability of being a target among the sample of targets and bidders increases when the annual amount of total assets (efficiency) and working capital to sales (liquidity) decrease and when quick assets to sales (liquidity) and working capital to total assets (liquidity) increase. Moreover, the graphical presentation of the means[16] for three[17] of the four financial ratios that have entered the final model do support the sign of the coefficients of the model shown in Table 5.3-5. The liquidity aspect appears to be the predominant one. Two liquidity ratios[18] that have entered the final model are consistent with the liquidity theory which says that acquired firms are liquid firms. However, another liquidity ratio[19] that has entered the model indicates that target firms are illiquid. The results on the liquidity dimension suggest that target firms can cover their short term liabilities from their total asset position but not from their sales. Moreover, the quick asset position of target firms may be an attractive characteristic for potential bidders. From the efficiency aspect the annual amount of total assets (natural log of total assets) has entered the model which suggest that target firms are not efficient enough to generate total assets. Table 5.3-6 summarises the frequencies of predicted and actual outcomes. Forty-six of the bidder firms are correctly classified by the model. Forty-nine of the bidder firms are incorrectly classified by the model. Nineteen of the target firms are incorrectly classified by the model. One hundred and twenty three of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 86.62%. The overall classification accuracy of the model is 71.30%.

[16] See Chapter 4.

[17] The annual amount of total assets - (natural log of total assets) (efficiency) (Figure 4.5-11), quick assets to sales (liquidity) (Figure 4.5-25) and the working capital to total assets (liquidity) (Figure 4.5-21).

[18] Quick assets to sales (liquidity) and working capital to total assets (liquidity).

[19] Working capital to sales (liquidity).

5.4 Comparing Non Targets with Targets: The Economy Wide Models

The purpose of this section is to discriminate between non targets and targets based on their financial characteristics. The economy wide sample used in the present section consists of all the non target and target firms under analysis[20]. This section presents the multivariate binomial logit models for the time periods 1982-1985 (estimation period), 1986-1990 (validation period) and 1982-1990 (whole period).

5.4.1 Estimation Period: 1982-1985

This section presents the economy wide model derived in the estimation period 1982-1985 when comparing non targets with targets.

Multivariate Binomial Logit Model

```
Dependent Variable: Non- Target= 0
                         Target  = 1
Maximum Likelihood Estimates
Log-Likelihood..............     -56.76226
Restricted (Slopes=0) Log-L.     -73.78780
Chi-Squared  (6)............      34.05108
Significance Level..........     0.6575683E-05
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	0.63922	2.490	0.257	0.79743		
X10	7.5526	2.822	2.676	0.00744	7.1373	0.76519
X11	-6.7654	2.647	-2.556	0.01059	7.5242	0.78972
X12	0.11791E-01	0.8089E-02	1.458	0.14493	57.625	28.543
X31	-7.3222	2.508	-2.919	0.00351	0.66861	0.30436
X19	0.47118	0.2658	1.773	0.07627	3.3792	4.9091
X22	-54.732	29.53	-1.853	0.06382	0.32067E-01	0.44719E-01

Constant
X10 = Annual Equity and Capital Reserves- (Natural Log of Equity and Capital Reserves) (Significant at 99%) (EFFICIENCY)
X11 = Annual amount of Total Assets- (Natural Log of Total Assets) (Significant at 99%) (EFFICIENCY)
X12 = Average Debtor Collection Period (Significant at 90%) (EFFICIENCY)
X31 = Loan Capital and Preference Capital to Total Assets (Significant at 99%) (LEVERAGE)
X19 = Cash Position No.3 (Significant at 95%) (LIQUIDITY)
X22 = Cash to Total Assets (Significant at 95%) (LIQUIDITY)

Table 5.4-7

[20] See chapter 4 (Table 4.2-5 and 4.2-6).

```
Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.
```

	Predicted		
Actual	0	1	TOTAL
0	39	19	58
1	11	38	49
TOTAL	50	57	107

```
Conditional Classification Accuracy: (38/49) X 100 = 77.55%
Overall Classification Accuracy: (38+39)/ 107 X 100 = 71.96%
```

Table 5.4-8

The results of the model (See Table 5.4-7) based on logit for the period (1982-1985) indicate that annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency), annual amount of total assets - (natural log of total assets) (efficiency) and the loan capital and preference capital to total assets (leverage) are significant at the 99 percent level, the cash position no.3 (liquidity) and the cash to total assets (liquidity) are significant at the 95 percent level and the average debtor collection period (efficiency) is significant at the 90 percent level. The outcome of the present model suggests that the probability of being a target among the sample of targets and non-targets increases when annual amount of total assets - (natural log of total assets) (efficiency), loan capital and preference capital to total assets (leverage) and cash to total assets (liquidity) decrease and when annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency), average debtor collection period (efficiency) and cash position no.3 (liquidity) increase.

If I refer to previous studies, then we can see that the ratios in my specified model have appeared before:

Low annual amount of total assets - (natural log of total assets) (efficiency)

This ratio has been employed by Harris et. al.(1982) as a proxy for the size dimension. The present thesis has seen the natural log of total assets as a measure of efficiency. The annual amount of total assets in the present model suggests that target firms are inefficient firms. This finding has been significant for the same multivariate analysis when discriminating bidders and targets.

Low loan capital and preference capital to total assets (leverage)

This ratio is used by Stevens (1973) in the final discriminant model and represents the leverage dimension of the study and suggests that acquired firms have a lower Long- Term Liability/ Total Assets ratio. Moreover, Harris et al.(1982) employed this ratio as a proxy for the financial leverage dimension . Besides this, this variable has entered the final LDA model of Wansley and Lane (1983) and it was a proxy for leverage and found that acquired firms use less debt. Dietrich and Sorensen (1984) used this ratio as a proxy for leverage and it has entered the final model and their findings suggest that acquired firms use less leverage. It appears that the finding of the present model for the behaviour of the loan capital and preference capital to total assets ratio which is a proxy of the leverage dimension is consistent with the findings of the previous studies (Stevens (1973), Wansley and Lane (1983) and Dietrich and Sorensen (1984)). This finding suggest that target firms have low leverage and this is theoretically consistent with the financial leverage hypothesis which says that acquired firms use less debt in their capital structure.

Low cash to total assets (liquidity)

This ratio indicates the amount of cash that is generated from the total assets. This ratio has been examined in the study carried out by Belkaoui (1978)[21] and it was one of the ratios under the liquid assets to total asset group. The present model suggest that target firms do not generate a lot of cash from their total assets.

High annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency)

This ratio is employed by Simkowitz and Monroe (1971) and it has entered their final model as a proxy for the growth dimension. Simkowitz and Monroe (1971) found that among the most significant ratios which give the greatest efficiency on standardise coefficients of the discriminant function was the growth rates in equity. This variable in the study developed by Simkowitz and Monroe (1971) indicates that acquired firms were relatively unable to build the equity base needed and this was a signal of low growth in equity. Joel Hasbrouk (1985) employed this ratio as a measure of size and based on the t-statistics, this was the most important determinant and the sign of the coefficient suggested a low size for acquired

[21] This ratio had the following percentage error in classification for years one to five before the takeover: 48%, 44%, 42%, 42% and 36%.

firms. For the present thesis the log of the annual equity and capital reserves has been seen as a measure of efficiency and the result suggests that target firms make an attempt to build up an equity base in the market so as to sustain competitive position in the market.

High average debtor collection period (efficiency)

This ratio shows how frequently debtors pay their debts. The present thesis shows that acquired firms' debtors do not pay at the specific time limits set up by the firms and this may suggest cash flow problems. The present thesis has seen the average debtor collection period as a measure of efficiency and it seems that acquired firms are inefficient in collecting their debts. This finding is theoretically consistent with the inefficient management hypothesis.

High cash position no.3 (liquidity)

The higher the ratio, the higher the cash resources available to the firm. This ratio is employed by Ronnie J. Clayton and M. Andrew Fields (1991) as a proxy of the liquidity dimension but has not been successful to enter their final model. The present thesis suggests that target firms have high cash resources which is theoretically consistent with the liquidity hypothesis which says that target firms are liquid firms.

Table 5.4-8 summarises the frequencies of predicted and actual outcomes. Thirty-nine of the non-target firms are correctly classified by the model. Nineteen of the non-target firms are incorrectly classified by the model. Eleven of the target firms are incorrectly classified by the model. Thirty-eight of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 77.55%. The overall prediction accuracy of the model is 71.96%.

5.4.2 Validation Period: 1986-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Non- Target= 0
                         Target  = 1
Maximum Likelihood Estimates
Log-Likelihood..............   -113.6270
Restricted (Slopes=0) Log-L.   -136.0184
Chi-Squared  (6)............    44.78276
Significance Level..........   0.5105223E-07
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	-2.7225	1.790	-1.521	0.12831		
X10	3.0137	1.137	2.652	0.00801	7.1449	0.75507
X11	-2.6692	1.121	-2.382	0.01724	7.5291	0.74584
X12	0.23128E-01	0.6052E-02	3.822	0.00013	65.573	33.560
X31	-0.90835	0.3835	-2.369	0.01785	0.68975	0.55122
X19	0.42626	0.1198	3.557	0.00038	5.7893	8.4725
X22	-41.630	12.70	-3.279	0.00104	0.60196E-01	0.82851E-01

Constant (Significant at 90%)
X10 = Annual Equity and Capital Reserves- (Natural Log of Equity and Capital Reserves) (Significant at 99%) (EFFICIENCY)
X11 = Annual amount of Total Assets- (Natural Log of Total Assets) (Significant at 99%) (EFFICIENCY)
X12 = Average Debtor Collection Period (Significant at 99%) (EFFICIENCY)
X31 = Loan Capital and Preference Capital to Total Assets (Significant at 99%) (LEVERAGE)
X19 = Cash Position No.3 (Significant at 99%) (LIQUIDITY)
X22 = Cash to Total Assets (Significant at 99%) (LIQUIDITY)

Table 5.4-9

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

Actual	Predicted 0	Predicted 1	TOTAL
0	82	28	110
1	34	54	88
TOTAL	116	82	198

Conditional Classification Accuracy: (54/88) X 100 = 61.36%
Overall Classification Accuracy: (54+82)/ 198 X 100 = 68.69%

Table 5.4-10

The results of the validation model (See Table 5.4-9) reveals the following: the liquidity ratio [cash position no.3 (liquidity)] suggests that acquired firms are more liquid. On the other hand, the cash to total assets (liquidity) ratio is not theory consistent with the liquidity theory of takeovers. Two of the ratios that represent the efficiency dimension, the annual amount of total assets (natural log of total assets) and the the average debtor collection period[22] (efficiency) suggest that target firms are inefficient. On the other hand, the annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency) is not theoretically consistent with the inefficient management hypothesis.

[22] This variable in the model appears with a positive sign and suggests inefficiency because the higher the ratio the more days the firm needs to collect its debts. If this ratio increase then that may imply that we will have liquidity problems. The mean value of the ratio indicates the number of days target firms need to collect their debts.

The leverage dimension has entered the final model with the loan capital and preference capital to total assets (leverage) ratio which appears to be theoretically consistent with the financial leverage hypothesis which says that acquired firms use less financial leverage.

Table 5.4-10 summarises the frequencies of predicted and actual outcomes. Eighty-two of the non-target firms are correctly classified by the model. Twenty-eight of the non-target firms are incorrectly classified by the model. Thirty-four of the target firms are incorrectly classified by the model. Fifty-four of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 61.36%. The overall classification accuracy of the model is 68.69%. On the other hand, the multivariate binomial logit model[23] in the analysis sample (1982-1985) has achieved the conditional classification accuracy of 77.55% and the overall classification accuracy of 71.96%. It seems that this model has achieved a good predictive accuracy in identifying takeover target firms (in a sample of non target and target firms).

5.4.3 The Combined Sample: 1982-1990[24]

Multivariate Binomial Logit Model

```
Dependent Variable: Non- Target= 0
                         Target  = 1
Maximum Likelihood Estimates
Log-Likelihood..............    -188.5325
Restricted (Slopes=0) Log-L.    -212.8196
Chi-Squared  (7)............     48.57425
Significance Level..........    0.2676049E-07
```

[23] See Table 5.4-7.

[24] The 38 variables which were under consideration have been used all in a stepwise regression procedure. As it is discussed in Appendix II, this procedure proved to be satisfactory because it can isolate the variables which will be significant in the logit models. Moreover, the 38 variables were subject to factor analysis in an attempt to isolate the significant variables from each dimension under examination. For each variable that enters the final model I provide its results for stepwise regression analysis and its results for factor analysis.

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	-1.3634	1.377	-0.990	0.32228		
X12	0.15522E-01	0.4352E-02	3.567	0.00036	62.471	32.167
X10	3.9336	1.032	3.812	0.00014	7.1315	0.76299
X14	-2.4028	0.6544	-3.672	0.00024	1.6795	0.81275
X21	3.6842	1.287	2.863	0.00419	0.20867	0.17361
X31	-1.3926	0.3827	-3.639	0.00027	0.68062	0.47635
X11	-3.4602	0.9978	-3.468	0.00052	7.5208	0.75811
X15	1.5333	0.6015	2.549	0.01080	1.4831	0.77819

Constant (Significant at 75%)
X12 = Average Debtor Collection Period[25] (Significant at 99%) (EFFICIENCY)
X10 = Annual Equity and Capital Reserves[26] - (Natural Log of Equity and Capital Reserves)(Significant at 99%) (EFFICIENCY)
X14 = Current Ratio[27] (Working Capital Ratio) (Significant at 99%) (LIQUIDITY)
X21 = Working Capital to Total Assets[28] (Significant at 99%) (LIQUIDITY)
X31 = Loan Capital and Preference Capital to Total Assets[29] (Significant at 99%)(LEVERAGE)
X11 = Annual amount of Total Assets[30] - (Natural Log of Total Assets) (Significant at 99%) (EFFICIENCY)
X15 = Acid Test or Liquid Asset or Quick Asset Ratio[31] (Significant at 99%) (LIQUIDITY)

Table 5.4-11

[25] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X12:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X12	0.38960E-02	0.9861E-03	3.951	0.00010	64.586	15.609

In varimax factor analysis it appears under the fifth factor, the sixth factor and the eighth factor (See Appendix VI- Table 59). The higher loading comes under the eighth factor which explains 4.9% of the total variance (See Appendix VI- Table 59). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis as well.

[26] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X10:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X10	0.50736	0.1410	3.598	0.00039	7.2045	12.948

In varimax factor analysis it appears under the first factor, the sixth factor and the seventh factor (See Appendix VI- Table 59). The higher loading comes under the sixth factor which explains 6.0% of the total variance (See Appendix VI- Table 59). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis as well.

[27] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X14:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X14	-0.57723	0.1274	-4.531	0.00001	1.5964	20.527

In varimax factor analysis it appears under the fourth factor and the fifth factor (See Appendix VI- Table 59). The higher loading comes under the fourth factor which explains 8.0% of the total variance (See Appendix VI- Table 59).

[28] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X21:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X21	1.0416	0.3053	3.412	0.00076	0.19947	11.640

In varimax factor analysis it appears under the third factor, the fourth factor and the fifth factor (See Appendix VI- Table 59). The third factor and the fourth factor produce a similar value of loading (See Appendix VI- Table 59). The third factor explains 11.4% of the total variance while the fourth factor explains 8.0% of the total variance (See Appendix VI- Table 59).

[29] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X31:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X31	-0.26702	0.7010E-01	-3.809	0.00018	0.70034	14.510

In varimax factor analysis it appears under the first factor, the third factor and the seventh factor (See Appendix VI- Table 59). The higher loading comes under the third factor which explains 11.4% of the total variance (See Appendix VI- Table 59).

[30] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X11:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X11	-0.41774	0.1414	-2.955	0.00345	7.5935	8.7306

In varimax factor analysis it appears under the sixth factor (See Appendix VI- Table 59). The sixth factor explains 6.0% of the total variance (See Appendix VI- Table 59).

[31] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X15:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X15	0.32771	0.1291	2.539	0.01178	1.3735	6.4448

In varimax factor analysis it appears under the third factor, the fourth factor and the fifth factor (See Appendix VI- Table 59). The higher loading comes under the fourth factor which explains 8.0% of the total variance (See Appendix VI- Table 59).

```
Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.
```

Actual	Predicted[32] 0	1	TOTAL
0	122	47	169
1	58	82	140
TOTAL	180	129	309

Conditional Classification Accuracy: (82/140) X 100 = 58.57%
Overall Classification Accuracy: (82+122)/ 309 X 100 = 66.02%

Table 5.4-12

Comparing the specified model which is selected in the periods (1982-1985, 1986-1990) with that of 1982-1990 we have four common variables (X12, X10, X31, X11). These variables for the above models give exactly the same sign for their coefficients.

The results of the model (See Table 5.4-11) based on logit for the period (1982-1990) indicate that average debtor collection period (efficiency), annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency), current ratio (working capital ratio) (liquidity), working capital to total assets (liquidity), loan capital and preference capital to total assets (leverage), annual amount of total assets - (natural log of total assets) (efficiency), acid test or liquid asset or quick asset ratio (liquidity) are significant at the 99 percent level. The outcome of the present model suggests that the probability of being a target among the sample of targets and non-targets increases when current ratio (working capital ratio) (liquidity), loan capital and preference capital to total assets (leverage) and annual amount of total assets - (natural log of total assets) (efficiency) decrease and when average debtor collection period (efficiency) annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency) working capital to total assets (liquidity) and acid test or liquid asset or quick asset ratio (liquidity) increase. Moreover, the findings of the model get a positive support from the graphical presentation of the mean ratios from chapter 4. Moreover, the graphical presentation of the means[33] for five[34] of the seven

[32] The results of this table show very good discrimination for the two states (0 and 1) under examination.

[33] See Chapter 4.

[34] Average Debtor Collection Period (efficiency) (Figure 4.5-12), Annual Equity and Capital Reserves- (Natural Log of Equity and Capital Reserves) (efficiency) (Figure 4.5-10), Current Ratio (liquidity) (Figure 4.5-14), Working Capital to Total Assets (liquidity) (Figure 4.5-21) and Loan Capital and Preference Capital to Total Assets (leverage)(Figure 4.5-31).

financial ratios that have entered the final model do support the sign of the coefficients of the model shown in Table 5.4-11. The liquidity aspect appears to be important. Two liquidity ratios[35] suggest that target firms are liquid firms. On the other hand, the current ratio (working capital ratio) (liquidity) is not theory consistent with the liquidity hypothesis. Clearly, target firms are characterised by excess liquidity. As it was explained in chapter 3 the acid test ratio is a better indicator of the liquidity position than the current ratio, therefore the fact that the current ratio contradicts the acid test ratio should not affect the finding that target firms are liquid firms. The results of the ratios from the efficiency dimension that have entered the final model indicate that target firms are inefficient in terms of generating total assets, they make a positive attempt to build up an equity base in the market and they do face problems in collecting their debts. The leverage dimension has entered the final model with the loan capital and preference capital to total assets (leverage) ratio which appears to be theoretically consistent with the financial leverage hypothesis which says that acquired firms use less financial leverage. Table 5.4-12 summarises the frequencies of predicted and actual outcomes. One hundred and twenty-two of the non-target firms are correctly classified by the model. Forty-seven of the non-target firms are incorrectly classified by the model. Fifty-eight of the target firms are incorrectly classified by the model. Eighty-two of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 58.57%. The overall classification accuracy of the model is 66.02%.

[35] Working capital to total assets (liquidity) and acid test or liquid asset or quick asset ratio (liquidity).

5.5 Conclusion

The present chapter has analysed one multivariate model for bidders and targets over the estimation period 1982- 1985. This has been further tested using another sample of firms for mergers and acquisitions for the period 1986-1990. A similar analysis is undertaken for non targets against targets. This is essentially a way of testing the models' predictive ability and if either the parameters or the model structure differs, then the model has failed for the subsequent period. In discrete choice literature models have been validated using a subset for the existing data period. In this analysis a separate time period is used which as was suggested above is similar to the procedure devised by Chow for testing parameter stability in time series. As a consequence it seemed natural to also look at the whole period. A test of parameter stability was not undertaken, but a slightly different model does seem to apply for the two sub-periods as compared with the whole period. The model for the whole period does include more variables (when comparing non targets with targets) which are significant, but the predictive accuracy or overall fit is slightly less impressive. A further reason for looking at this sample (i.e. whole period) is to provide a comparison for the sectoral models, as the sectoral sample size precludes a validation period. Therefore, a further model is also developed for the whole period (1982-1990), for each comparison, bidders with targets and non targets with targets.

THE ECONOMY WIDE MODELS FOR THE PERIOD 1982-1990

The results of the **multivariate binomial logit model**[36] **(Bidders against Targets)** in the analysis sample for the period **(1982-1990)** has achieved the conditional classification accuracy of 86.62% and an overall classification accuracy of 71.30%. The liquidity aspect appears to be the predominant one. The results on the liquidity dimension suggest that target firms can cover their short term liabilities from their total asset position but not from their sales. Moreover, the quick asset position of target firms may be an attractive characteristic for potential bidders. From the efficiency aspect the annual amount of total assets (natural log of total assets) has entered the model which suggest that target firms are not efficient enough to generate total assets.

[36] See Table 5.3-5.

On the other hand, the results of the **multivariate binomial logit model**[37] **(Non Targets against Targets)** in the analysis sample **(1982-1990)** has achieved the conditional classification accuracy of 58.57%. The overall classification accuracy of the model is 66.02%. The liquidity aspect appears to be important again. Clearly, target firms are characterised by excess liquidity. The results of the ratios from the efficiency dimension that have entered the final model indicate that target firms are inefficient in terms of generating total assets, they make a positive attempt to build up an equity base in the market and they do face problems in collecting their debts. The leverage dimension has entered the final model with the loan capital and preference capital to total assets (leverage) ratio which appears to be theoretically consistent with the financial leverage hypothesis which says that acquired firms use less financial leverage.

Concluding from the above, for both analyses (i.e. bidders against targets and non targets against targets) for the period 1982-1990 target firms are characterised by a negative coefficient for the annual amount of total assets which denotes that target firms are inefficient and this finding is theoretically consistent with the inefficient management hypothesis. Moreover, target firms for the same period and analyses possess a positive coefficient for the working capital to total assets which denotes that target firms are liquid firms which is theory consistent with the liquidity hypothesis.

COMPARING BIDDERS WITH TARGETS - (1982-1985) and (1986-1990)

The results of the **multivariate binomial logit model**[38] in the **estimation period (1982-1985) (Bidders against Targets)** has achieved the conditional classification accuracy of 69.39% and an overall classification accuracy of 70.10%. In the **validation period**[39] **(1986-1990)** the model has achieved the conditional classification accuracy of 95.74% and an overall classification accuracy of 76.60%.

[37] See Table 5.4-11.

[38] See Table 5.3-1.

[39] See Table 5.3-3.

In an attempt[40] to discriminate between bidders and targets at the economy wide level the dominant dimensions are ***liquidity and efficiency***. The fundamental characteristics of takeover targets as identified in the period 1982-1985 and then tested again in 1986-1990 are: **low working capital to sales (liquidity), low annual amount of total assets - (natural log of total assets) (efficiency), high quick assets to sales (liquidity) and high annual sales (natural log of sales) (efficiency).** These findings suggest that when comparing bidders with targets, target firms are inefficient in terms of generating total assets but efficient in terms of generating sales. Their sales can assist them to generate quick assets but not to generate working capital. The present thesis has seen the annual sales figure as a measure of efficiency but for comparison purposes with the previous studies if this is seen as a proxy for size then the present model reveals that target firms were big in size. This is a new finding for the existing literature which suggest that target firms in the 80's were bigger in size.

COMPARING NON TARGETS WITH TARGETS - (1982-1985) and (1986-1990)

The results of the **multivariate binomial logit model**[41] **(Non Targets against Targets)** in the analysis sample **(1982-1985)** has achieved the conditional classification accuracy of 77.55%. The overall classification accuracy of the model is 71.96%. The results of the multivariate binomial logit model[42] derived in the validation sample **(1986-1990)** has achieved the conditional classification accuracy of 61.36%. The overall classification accuracy of the model is 68.69%.

In an attempt[43] to discriminate between non targets and targets at the economy wide level the dominant dimensions are ***liquidity, leverage and efficiency***. The fundamental characteristics of takeover targets when compared with the non targets as identified in the period 1982-1985 and then tested again in 1986-1990 are: **low annual amount of total assets - (natural log of total assets) (efficiency), low loan capital and preference capital to total assets (leverage), low cash to total assets (liquidity), high annual equity and**

---

[40] This is the model that is derived in the estimation period (1982-1985) (See Table 5.3-1)and has been tested in the validation period (1986-1990) (See Table 5.3-3).

[41] See Table 5.4-7.

[42] See Table 5.4-9.

[43] This is the model that is derived in the estimation period (1982-1985) (See Table 5.4-7) and has been tested in the validation period (1986-1990) (See Table 5.4-9).

capital reserves - (natural log of equity and capital reserves) (efficiency), high average debtor collection period (efficiency) and high cash position no.3 (liquidity). These findings suggest that when comparing non targets with targets, target firms are inefficient in terms of generating total assets, they use less leverage in their capital structure, they utilise limited amount of cash from their total assets but they have good liquidity position when they add the interest received to their cash position (See Cash position no.3), they make a positive attempt to build up an equity base in the market and they do face problems in collecting their debts.

CHAPTER 6

THE INDUSTRY SPECIFIC MODELS

6.1 Introduction

In this chapter, I present the main empirical findings for the industry specific models. The present chapter develops industry specific models for the following industries: chemical, construction, food, electrical and electronics and mechanical engineering. As was advocated by Stanley B. Block (1969) merger candidates may be identified, to some extent, through intensive industry analysis. The industry specific models provide information about the financial profiles of takeover targets by industry. The methodology selected to estimate the models is multivariate binomial logit. Initially, there is an attempt to discriminate between bidders and targets and then between non targets and targets, by industry. In undertaking the analysis I have only one period under examination (1982-1990) whereas for the economy wide models I distinguish three distinct periods for estimation (1982-1985), validation (1986-1990) and finally for comparison, the whole sample is used (1982-1990). The sample sizes of the industry specific models were very small when I made an attempt to derive samples in the estimation and validation period by industry (See Chapter 4- Table 4.2-5 and Table 4.2-6). Because of that in order to provide a comparison of the sectoral models with the economy wide model I have re-estimated: i) the sectoral models using the variables in the economy wide model for the period 1982-1990 and ii) the sectoral models using the variables in the economy wide model plus the industry variables for the period 1982-1990. For the above models I provide the likelihood ratio derived.
The variables[1] under consideration are the financial ratios as described in chapter 3.

[1] The variables under consideration are six year averages taken prior to the announcement year for each firm under examination .

6.2 The Industry Specific Models

As stated in the previous chapter $\Pi = f(\rho_1, \rho_2, \rho_3, \rho_4, \rho_5)$ where the specific hypotheses are represented by the same set of basic regressors. However the selection procedure leads to a number of different variables at the sectoral level. As stated above to provide some degree of consistency I test each model against a simple general model which captures the sectoral and economy wide variables. In all cases I am interested in looking at the probability of being a target versus another state. In what follows I will analyse the results sector by sector starting with the chemicals industry.

6.3 Chemicals - Bidders against Targets

6.3.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Bidder= 0
                    Target= 1
Maximum Likelihood Estimates
Log-Likelihood.............     -21.23994
Restricted (Slopes=0) Log-L.    -24.98028
Chi-Squared (2)............      7.480662
Significance Level.........     0.2374624E-01
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	-8.0552	4.537	-1.775	0.07582		
X6	1.2537	0.9622	1.303	0.19258	1.7757	1.5139
X34	9.2080	6.332	1.454	0.14590	0.71628	0.11043

Constant (Significant at 95%)
X6 = Sales to Total Assets[2] (Significant at 90%) (EFFICIENCY)
X34 = Gearing Ratio[3] (Significant at 90%) (LEVERAGE)

Table 6.3-1

[2] The variable under varimax factor analysis it appears under the first factor (See Appendix VI- Table 60). The first factor explains 34.7% of the total variance (See Appendix VI- Table 60). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[3] The variable under varimax factor analysis it appears under the sixth factor (See Appendix VI- Table 60). The sixth factor explains 4.9% of the total variance (See Appendix VI- Table 60). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

```
Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.
```

	Predicted		
Actual	0	1	TOTAL
0	8	7	15
1	3	19	22
TOTAL	11	26	37

```
Conditional Classification Accuracy: (19/22) X 100 = 86.36%
Overall Classification Accuracy: (19+8)/ 37 X 100 = 72.97%
```

Table 6.3-2

The results of the model (See Table 6.3-1) based on logit for the period (1982-1990) indicate that sales to total assets (efficiency) and the gearing ratio (leverage) are significant at the 90 percent level. The outcome of the present model suggests that the probability of being a target from the chemical sector among the sample of chemical targets and chemical bidders increases when sales to total assets (efficiency) and gearing ratio (leverage) increase. The findings of the model are not theory consistent with the finance literature for the two dimensions that have been identified as important for the chemical sector. The financial characteristics that make chemical target firms takeover candidates are: their efficiency position and the level of debt in their capital structure. Table 6.3-2 summarises the frequencies of predicted and actual outcomes. Eight of the bidder firms are correctly classified by the model. Seven of the bidder firms are incorrectly classified by the model. Three of the target firms are incorrectly classified by the model. Nineteen of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 86.36%. The overall classification accuracy of the model is 72.97%.

	Industry[4] (2- 37)[5] Restricted Model	Economy wide[6] (4- 37)[7] Restricted Model	Economy wide+Industry[8] (6-37)[9] Unrestricted Model
Logit Log- Likelihood	-21.23994	-23.25763	-20.50255

<u>Industry Test</u>

LR[10] (Logit Model)$_{\text{Industry}}$ = 1.47478 < $X^2_{(2)(0.05)}$ = 5.99 (The industry model works) .

<u>Economy wide Test</u>

LR[11] (Logit Model)$_{\text{Economy wide}}$ = 5.51016 < $X^2_{(4)(0.05)}$ = 9.48 (The economy wide model works).

On the basis of the X^2 tests neither the sectoral nor the economy wide models can be rejected. Hence, they fit the data equally well. However, the industry model is more parsimonious. It has a better fit and by definition the two variables used must capture the same information as the economy wide model. Hence, it would be judged that the industry model provides a better explanation of the determinants of acquisition, but this explanation does not differ greatly from the economy wide model (we are still capturing efficiency).

---

[3] The variables included in this model are: X6, X34.

[4] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[5] The variables included in this model are: X11, X20, X25, X21.

[6] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[7] The variables included in this model are: X11, X20, X25, X21, X6, X34.

[8] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[10] LR_{Industry}= -2[Restricted Log-L_{Industry} - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

[11] $LR_{\text{Economy wide}}$= -2[Restricted Log-$L_{\text{Economy wide}}$ - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

6.4 Chemicals - Non Targets against Targets

6.4.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Non- Target= 0
                        Target  = 1
Maximum Likelihood Estimates
Log-Likelihood..............    -4.011504
Restricted (Slopes=0) Log-L.   -34.29649
Chi-Squared (2).............    60.56997
Significance Level..........    0.0000000
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	-20.477	16.52	-1.240	0.21514		
X16	14.989	11.13	1.347	0.17791	1.1543	0.57349
X22	37.934	32.01	1.185	0.23602	0.44775E-01	0.77317E-01

Constant (Significant at 75%)
X16 = Asset Cover[12] (Significant at 90%) (LIQUIDITY)
X22 = Cash to Total Assets[13] (Significant at 75%) (LIQUIDITY)

Table 6.4-1

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	26	2	28
1	1	21	22
TOTAL	27	23	50

Conditional Classification Accuracy: (21/22) X 100 = 95.45%
Overall Classification Accuracy: (21+26)/ 50 X 100 = 94.00%

Table 6.4-2

[12] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X16:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X16	0.81717	0.5036E-01	16.226	0.00000	1.1583	263.28

The variable under varimax factor analysis it appears under the eighth factor (See Appendix VI-Table 61). The eighth factor explains 3.8% of the total variance (See Appendix VI-Table 61). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[13] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X22:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X22	3.1084	0.4151	7.488	0.00000	0.37197E-01	56.076

The variable under varimax factor analysis it appears under the first factor (See Appendix VI-Table 61). The first factor explains 26.9% of the total variance (See Appendix VI-Table 61).

The results of the model (See Table 6.4-1) based on logit for the period (1982-1990) indicate that the asset cover (liquidity) is significant at the 90 percent level. The cash to total assets (liquidity) is significant at the 75 percent level. The outcome of the present model suggests that the probability of being a chemical target among the sample of chemical targets and chemical non-targets increases when asset cover (liquidity) and cash to total assets (liquidity) increase. The liquidity aspect appears to be the predominant one for the chemical sector. The liquidity ratios which have entered the final model suggest that chemical target firms are characterised by excess liquidity. Table 6.4-2 summarises the frequencies of predicted and actual outcomes. Twenty-six of the non-target firms are correctly classified by the model. Two of the non-target firms are incorrectly classified by the model. One of the target firms is incorrectly classified by the model. Twenty-one of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 95.45%. The overall classification accuracy of the model is 94%.

	Industry[14] (2-50)[15] Restricted Model	Economy wide[16] (7-50)[17] Restricted Model	Economy wide+Industry[18] (9-50)[19] Unrestricted Model
Logit Log- Likelihood	-4.01150	-6.24109	-0.00002

Industry Test

LR^{20} (Logit Model)$_{Industry}$ = 8.02296> $X^2_{(2)(0.05)}$ = 5.99 (The industry model does not work).

Economy wide Test

LR^{21} (Logit Model)$_{Economy\ wide}$ = 12.4821< $X^2_{(7)(0.05)}$ = 14.06 (The economy wide model works).

[14] The variables included in this model are: X16, X22.

[15] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[16] The variables included in this model are: X12, X10, X14, X21, X31, X11, X15.

[17] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[18] The variables included in this model are: X12, X10, X14, X21, X31, X11, X15, X16, X22.

[19] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[20] $LR_{Industry}$= -2[Restricted Log-$L_{Industry}$ - Unrestricted Log-$L_{Economy\ wide+Industry}$]

[21] $LR_{Economy\ wide}$= -2[Restricted Log-$L_{Economy\ wide}$ - Unrestricted Log-$L_{Economy\ wide+Industry}$]

We must prefer the economy wide model on the basis of the test or move to an intermediate model which augments the industry model by variables in the economy wide model.

6.5 Construction - Bidders against Targets

6.5.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Bidder= 0
                    Target= 1
Maximum Likelihood Estimates
Log-Likelihood..............    -31.09608
Restricted (Slopes=0) Log-L.    -35.42796
Chi-Squared (2).............     8.663750
Significance Level..........    0.1314288E-01
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	-5.1070	3.651	-1.399	0.16182		
X33	-0.30583E-01	0.3121E-01	-0.980	0.32713	6.1902	8.9835
X34	8.5931	5.148	1.669	0.09508	0.79066	0.24582

Constant (Significant at 90%)
X33 = Total Profit to Interest Paid[22] (Significant at 75%) (LEVERAGE)
X34 = Gearing Ratio[23] (Significant at 95%) (LEVERAGE)

Table 6.5-1

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

Actual	Predicted 0	1	TOTAL
0	3	14	17
1	3	39	42
TOTAL	6	53	59

Conditional Classification Accuracy: (39/42) X 100 = 92.86%
Overall Classification Accuracy: (39+3)/ 59 X 100 = 71.19%

Table 6.5-2

[22] The variable under varimax factor analysis it appears under the fifth factor (See Appendix VI- Table 62). The fifth factor explains 7.4% of the total variance (See Appendix VI- Table 62). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[23] The variable under varimax factor analysis it appears under the seventh factor (See Appendix VI- Table 62). The seventh factor explains 5.4% of the total variance (See Appendix VI- Table 62). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

The results of the model (See Table 6.5-1) based on logit for the period (1982-1990) indicate that the gearing ratio (leverage) is significant at the 95 percent level. The total profit to interest paid (leverage) is significant at the 75 percent level. The outcome of the present model suggests that the probability of being a target from the construction sector among the sample of construction targets and construction bidders increases when total profit to interest paid (significant at 75%) (leverage) decreases and when gearing ratio (significant at 95%) (leverage) increases. The leverage dimension is the predominant one for the construction sector. The results suggest that construction target firms use more debt in their capital structure because the gearing ratio is positive and it seems that they can not cover interest payments from their profits.

Table 6.5-2 summarises the frequencies of predicted and actual outcomes. Three of the bidder firms are correctly classified by the model. Fourteen of the bidder firms are incorrectly classified by the model. Three of the target firms are incorrectly classified by the model. Thirty-nine of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 92.86%. The overall classification accuracy of the model is 71.19%.

	Industry[24] (2-59)[25] Restricted Model	Economy wide[26] (4-56)[27] Restricted Model	Economy wide+Industry[28] (6-55)[29] Unrestricted Model
Logit Log- Likelihood	-31.09608	-33.45494	-29.94192

Industry Test

LR[30] (Logit Model)$_{\text{Industry}}$ = 2.30832 < $X^2_{(2)(0.05)}$ = 5.99 (The industry model works).

Economy wide Test

LR[31] (Logit Model)$_{\text{Economy wide}}$ = 7.02604 < $X^2_{(4)(0.05)}$ = 9.48 (The economy wide model works).

[13] The variables included in this model are: X33, X34.

[14] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[15] The variables included in this model are: X11, X20, X25, X21.

[16] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[17] The variables included in this model are: X11, X20, X25, X21, X33, X34.

[18] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[20] LR_{Industry}= -2[Restricted Log-L_{Industry} - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

[31] $LR_{\text{Economy wide}}$= -2[Restricted Log-$L_{\text{Economy wide}}$ - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

On the basis of the X^2 tests neither the sectoral nor the economy wide models can be rejected.

6.6 Construction - Non Targets against Targets

6.6.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

Dependent Variable: Non- Target= 0	
Target = 1	
Maximum Likelihood Estimates	
Log-Likelihood.............	-49.24204
Restricted (Slopes=0) Log-L.	-59.58740
Chi-Squared (3)............	20.69071
Significance Level..........	0.1220501E-03

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	-18.038	8.769	-2.057	0.03968		
X10	13.133	6.350	2.068	0.03861	7.0396	0.62503
X11	-12.363	6.260	-1.975	0.04829	7.4846	0.57995
X34	24.382	14.09	1.730	0.08361	0.77755	0.20815

Constant (Significant at 95%)
X10 = Annual Equity and Capital Reserves[32] - (Natural Log of Equity and Capital Reserves) (Significant at 95%) (EFFICIENCY)
X11 = Annual amount of Total Assets[33] - (Natural Log of Total Assets) (Significant at 95%) (EFFICIENCY)
X34 = Gearing Ratio[34] (Significant at 95%)(LEVERAGE)

Table 6.6-1

[32] Due to the fact that varimax factor analysis has failed to converged, the dimensions that will be analyse in this section are the dimensions produced by the principal components. The variable appears in more than two dimensions in the principal components analysis, therefore the interpretation is difficult (See Appendix VI- Table 63). This variable has been significant in the univariate binomial logit univariate binomial probit analysis.

[33] Due to the fact that varimax factor analysis has failed to converged, the dimensions that will be analyse in this section are the dimensions produced by the principal components. The variable appears in more than two dimensions in the principal components analysis, therefore the interpretation is difficult (See Appendix VI- Table 63). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[34] Due to the fact that varimax factor analysis has failed to converged, the dimensions that will be analyse in this section are the dimensions produced by the principal components. The variable appears in more than two dimensions in the principal components analysis, therefore the interpretation is difficult (See Appendix VI- Table 63). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

```
Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.
```

```
            Predicted

Actual        0     1        TOTAL

  0          33    11           44
  1          16    26           42

TOTAL        49    37           86

Conditional Classification Accuracy: (26/42) X 100 = 61.90%
Overall Classification Accuracy: (26+33)/ 86 X 100 = 68.60%
```

Table 6.6-2

The results of the model (See Table 6.6-1) based on logit for the period (1982-1990) indicate that the annual equity and capital reserves- (natural log of equity and capital reserves) (efficiency), annual amount of total assets - (natural log of total assets) (efficiency) and the gearing ratio (leverage) are significant at the 95 percent level. The outcome of the present model suggests that the probability of being a target from the construction sector among the sample of construction targets and construction non-targets increases when annual amount of total assets -(natural log of total assets) (efficiency) decreases and when annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency) and the gearing ratio (leverage) increase. The important dimensions are: efficiency and leverage. The annual amount of total assets - (natural log of total assets) (efficiency) ratio indicates that target firms are inefficient. The gearing ratio which is a proxy for the leverage dimension enters the final model but is not theory consistent since one would expect that acquired firms would use less financial leverage. Therefore construction target firms are inefficient and have high leverage in their capital structure. Table 6.6-2 summarises the frequencies of predicted and actual outcomes. Thirty-three of the non-target firms are correctly classified by the model. Eleven of the non-target firms are incorrectly classified by the model. Sixteen of the target firms are incorrectly classified by the model. Twenty-six of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 61.90%. The overall classification accuracy of the model is 68.60%.

	Industry[35] (3-86)[36] Restricted Model	Economy wide[37] (7-82)[38] Restricted Model	Economy wide+Industry[39] (8-82)[40] Unrestricted Model
Logit Log- Likelihood	-49.2420	-51.2811	-45.6768

Industry Test

LR[41] (Logit Model) $_{\text{Industry}}$ = 7.1304< $X^2_{(3)(0.05)}$ = 7.81 (The industry model works).

Economy wide Test

LR[42] (Logit Model) $_{\text{Economy wide}}$ = 11.2086< $X^2_{(7)(0.05)}$ = 14.06 (The economy wide model works).

On the basis of the X^2 tests neither the sectoral nor the economy wide models can be rejected.

6.7 Food- Bidders against Targets

6.7.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Bidder= 0
                    Target= 1
Maximum Likelihood Estimates
Log-Likelihood..............    -34.40393
Restricted (Slopes=0) Log-L.    -39.89164
Chi-Squared (3).............     10.97542
Significance Level..........    0.1185956E-01
```

[35] The variables included in this model are: X10, X11, X34.

[36] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[37] The variables included in this model are: X12, X10, X14, X21, X31, X11, X15.

[38] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[39] The variables included in this model are: X12, X10, X14, X21, X31, X11, X15, X34.

[40] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[41] LR_{Industry}= -2[Restricted Log-L_{Industry} - Unrestricted Log-L $_{\text{Economy wide+Industry}}$]

[42] $LR_{\text{Economy wide}}$= -2[Restricted Log-$L_{\text{Economy wide}}$ - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	1.2689	0.4758	2.667	0.00765		
X17	-0.15606	0.1084	-1.440	0.14990	10.402	9.4821
X18	-0.46879	0.3441	-1.363	0.17303	2.0404	2.2013
X19	0.41292	0.2704	1.527	0.12670	3.5960	4.0456

Constant (Significant at 99%)
X17 = Cash Position No.1 [43] (Significant at 90%) (LIQUIDITY)
X18 = Cash Position No.2 [44] (Significant at 90%) (LIQUIDITY)
X19 = Cash Position No.3 [45] (Significant at 90%) (LIQUIDITY)

Table 6.7-1

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	15	11	26
1	7	25	32
TOTAL	22	36	58

Conditional Classification Accuracy: (25/32) X 100 = 78.13%
Overall Classification Accuracy: (25+15)/ 58 X 100 = 68.97%

Table 6.7-2

The results of the model (See Table 6.7-1) based on logit for the period (1982-1990) indicate that the cash position no.1 (liquidity), cash position no.2 (liquidity) and the cash position no.3 (liquidity) are significant at the 90 percent level. The outcome of the present model suggests that the probability of being a target from the food sector among the sample of food targets and food bidders increases when cash position no.1 (liquidity) and the cash position no.2 (liquidity) decrease and when the cash position no.3 (liquidity) increases. The cash position no.3 (liquidity) which has entered the final model for the food sector is theory consistent with the finance

[43] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X17:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X17	-0.17875E-01	0.6850E-02	-2.610	0.01171	10.608	6.8096

The variable under varimax factor analysis it appears under the second factor (See Appendix VI- Table 64). The second factor explains 15.2% of the total variance (See Appendix VI- Table 64). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[44] The variable under varimax factor analysis it appears under the second factor (See Appendix VI- Table 64). The second factor explains 15.2% of the total variance (See Appendix VI- Table 64). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[45] The variable under varimax factor analysis it appears under the second factor (See Appendix VI- Table 64). The second factor explains 15.2% of the total variance (See Appendix VI- Table 64). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

literature which says that acquired firms are more liquid. On the other hand, cash position no.1 (liquidity) and cash position no.2 (liquidity) are not theoretically consistent with the liquidity theory. Table 6.7-2 summarises the frequencies of predicted and actual outcomes. Fifteen of the bidder firms are correctly classified by the model. Eleven of the bidder firms are incorrectly classified by the model. Seven of the target firms are incorrectly classified by the model. Twenty-five of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 78.13%. The overall classification accuracy of the model is 68.97%.

	Industry[46] (3-58)[47] Restricted Model	Economy wide[48] (4-59)[49] Restricted Model	Economy wide+Industry[50] (7-58)[51] Unrestricted Model
Logit Log- Likelihood	-34.40393	-33.99021	-28.82481

<u>Industry Test</u>

LR[52] (Logit Model)$_{\text{Industry}}$ = 11.15824 > $X^2_{(3)(0.05)}$ = 7.81 (The industry model does not work).

<u>Economy wide Test</u>

LR[53] (Logit Model)$_{\text{Economy wide}}$ = 10.3308 > $X^2_{(4)(0.05)}$ = 9.48 (The economy wide model does not work).

On the basis of the X^2 tests both the sectoral and the economy wide models can be rejected.

46 The variables included in this model are: X17, X18, X19.

47 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

48 The variables included in this model are: X11, X20, X25, X21.

49 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

50 The variables included in this model are: X11, X20, X25, X21, X17, X18, X19.

51 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

52 LR_{Industry}= -2[Restricted Log-L_{Industry} - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

53 $LR_{\text{Economy wide}}$= -2[Restricted Log-$L_{\text{Economy wide}}$ - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

6.8 Food- Non Targets against Targets

6.8.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Non- Target= 0
                        Target  = 1
Maximum Likelihood Estimates
Log-Likelihood..............   -40.42823
Restricted (Slopes=0) Log-L.   -51.17645
Chi-Squared (5).............    21.49646
Significance Level..........   0.6524916E-03
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	5.2114	1.818	2.867	0.00415		
X23	-3.2824	1.624	-2.021	0.04329	0.12443	0.21163
X24	4.6268	2.263	2.045	0.04090	0.45051	0.18964
X16	-1.8102	0.6988	-2.590	0.00959	1.8288	0.74294
X26	19.190	14.52	1.321	0.18643	1.3582	0.31836
X30	-21.820	14.58	-1.497	0.13446	1.3940	0.32400

Constant (Significant at 99%)
X23 = Cash to Current Liabilities[54] (Significant at 95%) (LIQUIDITY)
X24 = Quick Assets to Total Assets[55] (Significant at 95%) (LIQUIDITY)
X16 = Asset Cover[56] (Significant at 99%) (LIQUIDITY)
X26 = Long Term Liabilities to Shareholders' Equity[57] (Significant at 90%) (LEVERAGE)
X30 = Preference and Loan Capital to Equity and Reserves[58] (Significant at 90%) (LEVERAGE)

Table 6.8-1

---

[54] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X23:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X23	-0.77770	0.2875	-2.705	0.00863	0.11432	7.3160

The variable under varimax factor analysis it appears under the third factor (See Appendix VI- Table 65). The third factor explains 13.3% of the total variance (See Appendix VI- Table 65).

[55] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X24:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X24	0.86116	0.3688	2.335	0.02251	0.45102	5.4518

The variable under varimax factor analysis it appears under the fourth factor and the fifth factor (See Appendix VI- Table 65). The higher loading comes under the fourth factor which explains 9.5% of the total variance (See Appendix VI- Table 65).

[56] The variable under varimax factor analysis it appears under the first and the fourth factor (See Appendix VI- Table 65). The higher loading comes under the fourth factor which explains 9.5% of the total variance (See Appendix VI- Table 65). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[57] The variable under varimax factor analysis it appears under the second and the sixth factor (See Appendix VI- Table 65) . The higher loading comes under the sixth factor which explains 6.4% of the total variance (See Appendix VI- Table 65). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[58] The variable under varimax factor analysis it appears under the second and the sixth factor (See Appendix VI- Table 65). The higher loading comes under the sixth factor which explains 6.4% of the total variance (See Appendix VI- Table 65). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

```
Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.
```

	Predicted		
Actual	0	1	TOTAL
0	32	11	43
1	10	22	32
TOTAL	42	33	75

Conditional Classification Accuracy: (22/32) X 100 = 68.75%
Overall Classification Accuracy: (22+32)/ 75 X 100 = 72.00%

Table 6.8-2

The results of the model (See Table 6.8-1) based on logit for the period (1982-1990) indicate that the asset cover (liquidity) is significant at the 99 percent level. The cash to current liabilities (liquidity) and the quick assets to total assets (liquidity) are significant at the 95 percent level. The preference and loan capital to equity and reserves (leverage) and the long term liabilities to shareholders' equity (leverage) are significant at the 90 percent level. The outcome of the present model suggests that the probability of being a target from the food sector among the sample of food targets and food non-targets increases when cash to current liabilities (liquidity), asset cover (liquidity), preference and loan capital to equity and reserves (leverage) decrease and when quick assets to total assets (liquidity) and long term liabilities to shareholders' equity (leverage) increase. The liquidity aspect appears to be important for the food sector. The quick assets to total assets (liquidity) is theory consistent as one would expect that acquired firms are more liquid. On the other hand, the cash to current liabilities (liquidity) and asset cover (liquidity) are not theory consistent. The leverage dimension has entered the final model with the preference and loan capital to equity and reserves (leverage) ratio which appears to be theoretically consistent with the financial leverage hypothesis which says acquired firms use less financial leverage. Another ratio from the leverage group that has entered the final model is the long term liabilities to shareholders' equity (leverage) which is not theoretically consistent with the financial leverage hypothesis. Therefore, food target firms are characterised from the dimensions of liquidity and leverage but the results are mixed for both dimensions. Table 6.8-2 summarises the frequencies of predicted and actual outcomes. Thirty-two of the non-target firms are correctly classified by the model. Eleven of the non-target firms are incorrectly classified by the model. Ten of the target firms are incorrectly classified by the model. Twenty-two of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 68.75%. The overall classification accuracy of the model is 72%.

	Industry[59] (5-75)[60] Restricted Model	Economy wide[61] (7-76)[62] Restricted Model	Economy wide+Industry[63] (12-75)[64] Unrestricted Model
Logit Log- Likelihood	-40.4282	-40.8380	-33.7752

Industry Test

LR[65] (Logit Model) $_{\text{Industry}}$ = 13.306> $X^2_{(5)(0.05)}$ = 11.07 (The industry model does not work).

Economy wide Test

LR[66] (Logit Model)$_{\text{Economy wide}}$ = 14.1256> $X^2_{(7)(0.05)}$ = 14.06 (The economy wide model does not work).

As in the previous analysis, in section 6.7 on the basis of the X^2 tests both the sectoral and the economy wide models can be rejected.

6.9 Mechanical- Bidders against Targets

6.9.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Bidder= 0
                    Target= 1
Maximum Likelihood Estimates
Log-Likelihood..............   -17.52597
Restricted (Slopes=0) Log-L.   -28.92142
Chi-Squared (3).............    22.79089
Significance Level..........   0.4464466E-04
```

[59] The variables included in this model are: X23, X24, X16, X26, X30.

[60] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[61] The variables included in this model are: X12, X10, X14, X21, X31, X11, X15.

[62] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[63] The variables included in this model are: X12, X10, X14, X21, X31, X11, X15, X23, X24, X16, X26, X30.

[64] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[65] LR_{Industry}= -2[Restricted $\text{Log-L}_{\text{Industry}}$ - Unrestricted Log-L $_{\text{Economy wide+Industry}}$]

[66] $LR_{\text{Economy wide}}$= -2[Restricted $\text{Log-L}_{\text{Economy wide}}$ - Unrestricted $\text{Log-L}_{\text{Economy wide+Industry}}$]

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	0.77377E-01	1.050	0.074	0.94128		
X3	-0.52068	0.2202	-2.364	0.01806	3.4414	2.9663
X15	2.0038	0.7669	2.613	0.00898	1.5643	0.87158
X17	-0.69073E-01	0.4501E-01	-1.535	0.12484	14.599	11.404

Constant
X3 = Profit to Total Assets[67] (Significant at 99%) (PROFITABILITY)
X15 = Acid Test or Liquid Asset or Quick Asset Ratio[68] (Significant at 99%) (LIQUIDITY)
X17 = Cash Position No.1[69] (Significant at 90%) (LIQUIDITY)

Table 6.9-1

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	15	4	19
1	3	20	23
TOTAL	18	24	42

Conditional Classification Accuracy: (20/23) X 100 = 86.96%
Overall Classification Accuracy: (20+15)/ 42 X 100 = 83.33%

Table 6.9-2

The results of the model (See Table 6.9-1) based on logit for the period (1982-1990) indicate that the profit to total assets (profitability) and the acid test or liquid asset or quick asset ratio (liquidity) are significant at the 99 percent level. The cash position no.1 (liquidity) is significant at the 90 percent level. The outcome of the present model suggests that the probability of being a target from the mechanical sector among the sample of mechanical targets and mechanical bidders increases when cash position no.1 (liquidity) and profit to total assets (profitability) decrease and when acid test or liquid asset or quick asset ratio (liquidity) increases. The results

[67] The variable under varimax factor analysis it appears under the third factor (See Appendix VI- Table 66). The third factor explains 16.2% of the total variance (See Appendix VI- Table 66). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[68] The variable under varimax factor analysis it appears under the first factor (See Appendix VI- Table 66). The first factor explains 26.9% of the total variance (See Appendix VI- Table 66). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[69] The variable under varimax factor analysis it appears under the second factor (See Appendix VI- Table 66). The second factor explains 16.8% of the total variance (See Appendix VI- Table 66). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

of the model concerning the mechanical sector are theory consistent with the profitability hypothesis which says that acquired firms have low profitability but the results about the liquidity hypothesis are mixed. Table 6.9-2 summarises the frequencies of predicted and actual outcomes. Fifteen of the bidder firms are correctly classified by the model. Four of the bidder firms are incorrectly classified by the model. Three of the target firms are incorrectly classified by the model. Twenty of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 86.96%. The overall classification accuracy of the model is 83.33%.

	Industry[70] (3-42)[71] Restricted Model	Economy wide[72] (4-43)[73] Restricted Model	Economy wide+Industry[74] (7-42)[75] Unrestricted Model
Logit Log- Likelihood	-17.52597	-5.452911	-4.189376

Industry Test

LR[76] (Logit Model) $_{\text{Industry}}$ = 26.67319 > $X^2_{(3)(0.05)}$ = 7.81 (The industry model does not work).

Economy wide Test

LR[77] (Logit Model)$_{\text{Economy wide}}$ = 2.52707< $X^2_{(4)(0.05)}$ = 9.48 (The economy wide model works).

We must prefer the economy wide model on the basis of the test or move to an intermediate model which enhances the industry model by variables in the economy wide model.

70 The variables included in this model are: X3, X15, X17.

71 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

72 The variables included in this model are: X11, X20, X25, X21.

73 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

74 The variables included in this model are: X11, X20, X25, X21, X3, X15, X17.

75 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

76 LR_{Industry}= -2[Restricted Log-L_{Industry} - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

77 $LR_{\text{Economy wide}}$= -2[Restricted Log-$L_{\text{Economy wide}}$ - Unrestricted Log-$L_{\text{Economy wide+Industry}}$]

6.10 Mechanical- Non Targets against Targets

6.10.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Non- Target= 0
                         Target  = 1
Maximum Likelihood Estimates
Log-Likelihood..............   -14.90029
Restricted (Slopes=0) Log-L.   -39.42947
Chi-Squared (3).............    49.05834
Significance Level..........   0.1000000E-06
```

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	-1.3072	0.5073	-2.577	0.00997		
X23	-16.782	6.520	-2.574	0.01006	0.22881	0.67196
X19	2.3588	0.7555	3.122	0.00179	1.8286	4.0577

Constant (Significant at 99%)
X23 = Cash to Current Liabilities (Significant at 99%) (LIQUIDITY)
X19 = Cash Position No.3[78] (Significant at 99%) (LIQUIDITY)

Table 6.10-1

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

Actual	Predicted 0	1	TOTAL
0	37	1	38
1	3	19	22
TOTAL	40	20	60

Conditional Classification Accuracy: (19/22) X 100 = 86.36%
Overall Classification Accuracy: (19+37)/ 60 X 100 = 93.33%

Table 6.10-2

The results of the model (See Table 6.10-1) based on logit for the period (1982-1990) indicate that the cash to current liabilities (liquidity) and the cash position no.3 (liquidity) are significant at the 99 percent level. The outcome of the present model suggests that the probability of being a target from the mechanical sector among the sample of mechanical targets and mechanical non-targets increases when cash to current liabilities (liquidity) decreases and when the cash position

[78] This variable has been identified by the stepwise regression analysis. Stepwise Regression Result for X19:

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
X19	0.12062	0.1977E-01	6.102	0.00000	2.0466	37.232

The variable under varimax factor analysis it appears under the third factor (See Appendix VI- Table 67). The third factor explains 13.0% of the total variance (See Appendix VI- Table 67). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

no.3 (liquidity) increases. The results of the model for the mechanical sector indicates that the liquidity dimension is important but the results are mixed. Table 6.10-2 summarises the frequencies of predicted and actual outcomes. Thirty-seven of the non-target firms are correctly classified by the model. One of the non-target firms is incorrectly classified by the model. Three of the target firms are incorrectly classified by the model. Nineteen of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 86.36%. The overall classification accuracy of the model is 93.33%.

	Industry[79] (2-60)[80] Restricted Model	Economy wide[81] (7-59)[82] Restricted Model	Economy wide+Industry[83] (9-58)[84] Unrestricted Model
Logit Log- Likelihood	-14.90029	-33.6336	-12.56833

Industry Test

LR[85] (Logit Model) $_{\text{Industry}}$ = 4.66392< $X^2_{(2)(0.05)}$ = 5.99 (The industry model works).

Economy wide Test

LR[86] (Logit Model)$_{\text{Economy wide}}$ = 42.13054> $X^2_{(7)(0.05)}$ = 14.06 (The economy wide model does not work).

On the basis of the X^2 tests we must prefer the sectoral model.

---

79 The variables included in this model are: X23, X19.

80 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

81 The variables included in this model are: X12, X10, X14, X21, X31, X11, X15.

82 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

83 The variables included in this model are: X12, X10, X14, X21, X31, X11, X15, X23, X19..

84 The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

85 LR_{Industry}= -2[Restricted $\text{Log-L}_{\text{Industry}}$ - Unrestricted $\text{Log-L}_{\text{Economy wide+Industry}}$]

86 $LR_{\text{Economy wide}}$= -2[Restricted $\text{Log-L}_{\text{Economy wide}}$ - Unrestricted $\text{Log-L}_{\text{Economy wide+Industry}}$]

6.11 Electronics- Bidders against Targets

6.11.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

Dependent Variable: Bidder= 0	
Target= 1	
Maximum Likelihood Estimates	
Log-Likelihood.............	-21.79188
Restricted (Slopes=0) Log-L.	-29.83346
Chi-Squared (3)............	16.08315
Significance Level.........	0.1090326E-02

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	10.988	4.185	2.626	0.00865		
X10	-1.1200	0.4850	-2.310	0.02092	7.1788	0.79918
X9	-1.5101	0.8108	-1.863	0.06253	-19.985	149.28
X23	3.6035	2.587	1.393	0.16367	0.17340	0.21157

Constant (Significant at 99%)
X10 = Annual Equity and Capital Reserves[87] - (Natural Log of Equity and Capital Reserves)(Significant at 99%) (EFFICIENCY)
X9 = Sales to Current Assets[88] (Significant at 95%) (EFFICIENCY)
X23 = Cash to Current Liabilities[89] (Significant at 90%) (LIQUIDITY)

Table 6.11-1

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

Actual	Predicted 0	Predicted 1	TOTAL
0	11	6	17
1	4	24	28
TOTAL	15	30	45

Conditional Classification Accuracy: (24/28) X 100 = 85.71%
Overall Classification Accuracy: (24+11)/ 45 X 100 = 77.78%

Table 6.11-2

[87] Due to the fact that varimax factor analysis failed to converged in this sample I will analyse the variables based ion the principal components. The variable under principal components analysis appears under the fourth factor and the fifth factor (See Appendix VI- Table 68). The higher loading comes under the fourth factor which explains 9.7% of the total variance (See Appendix VI- Table 68). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[88] Due to the fact that varimax factor analysis failed to converged in this sample I will analyse the variables based ion the principal components. The variable under principal components analysis appears under the second factor and the sixth factor (See Appendix VI- Table 68). The second factor explains 15.0% of the total variance while the sixth factor explains 6.4% of the total variance (See Appendix VI- Table 68). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[89] Due to the fact that varimax factor analysis failed to converged in this sample I will analyse the variables based ion the principal components. The variable under principal components analysis appears under the first factor (See Appendix VI- Table 68). The first factor explains 22.3% of the total variance (See Appendix VI- Table 68). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

The results of the model (See Table 6.11-1) based on logit for the period (1982-1990) indicate that the annual equity and capital reserves- (natural log of equity and capital reserves) (efficiency) is significant at the 99 percent level. The sales to current assets (efficiency) is significant at the 95 percent level and the cash to current liabilities (liquidity) is significant at the 90 percent level. The outcome of the present model suggests that the probability of being a target from the electronics sector among the sample of electronic targets and electronic bidders increases when annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency) and the sales to current assets (efficiency) decrease and when cash to current liabilities (liquidity) increases. The ratios that represent the efficiency dimension [annual equity and capital reserves - (natural log of equity and capital reserves) (efficiency) and sales to current assets (efficiency)] are theoretically consistent with the inefficient management hypothesis which says that mergers and acquisitions are a mechanism by which managers who fail to maximise the efficiency of their company are replaced. In addition, the liquidity ratio that has entered the final model [cash to current liabilities (liquidity)] is theoretically consistent with the liquidity theory which says that target firms are more liquid. Table 6.11-2 summarises the frequencies of predicted and actual outcomes. Eleven of the bidder firms are correctly classified by the model. Six of the bidder firms are incorrectly classified by the model. Four of the target firms are incorrectly classified by the model. Twenty-four of the target firms are classified correctly by the model. The conditional classification accuracy of the model is 85.71%. The overall classification accuracy of the model is 77.78%.

	Industry[90] (3-45)[91] Restricted Model	Economy wide[92] (4-42)[93] Restricted Model	Economy wide+Industry[94] (7-41)[95] Unrestricted Model
Logit Log- Likelihood	-21.79188	-22.36438	-18.23060

Industry Test

LR[96] (Logit Model) $_{Industry}$ = 7.12256 < $X^2_{(3)(0.05)}$ = 7.81 (The industry model works).

Economy wide Test

LR[97] (Logit Model)$_{Economy\ wide}$ = 8.26756 < $X^2_{(4)(0.05)}$ = 9.48 (The economy wide model works).

On the basis of the X^2 tests neither the sectoral nor the economy wide models can be rejected.

6.12 Electronics- Non Targets against Targets

6.12.1 Multivariate Binomial Logit Analysis - Time Period 1982-1990

Multivariate Binomial Logit Model

```
Dependent Variable: Non- Target= 0
                         Target  = 1
Maximum Likelihood Estimates
Log-Likelihood.............    -5.839370
Restricted (Slopes=0) Log-L.   -28.85647
Chi-Squared ( 2)...........     46.03420
Significance Level.........    0.1000000E-06
```

[90] The variables included in this model are: X10, X9, X23.

[91] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[92] The variables included in this model are: X11, X20, X25, X21.

[93] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[94] The variables included in this model are: X11, X20, X25, X21, X10, X9, X23.

[95] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[96] $LR_{Industry}$= -2[Restricted Log-$L_{Industry}$ - Unrestricted Log-L $_{Economy\ wide+Industry}$]

[97] $LR_{Economy\ wide}$= -2[Restricted Log-$L_{Economy\ wide}$ - Unrestricted Log-$L_{Economy\ wide+Industry}$]

Variable	Coefficient	Std. Error	t-ratio	Prob|t|≥x	Mean of X	Std.Dev.of X
Constant	0.87062	2.471	0.352	0.72461		
X17	6.6491	3.188	2.085	0.03703	9.7014	15.064
X15	-3.3095	2.355	-1.405	0.15997	1.5672	0.63570

Constant
X17 = Cash Position No.1 [98] (Significant at 95%) (LIQUIDITY)
X15 = Acid Test or Liquid Asset or Quick Asset Ratio[99] (Significant at 90%) (LIQUIDITY)

Table 6.12-1

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	16	1	17
1	1	25	26
TOTAL	17	26	43

Conditional Classification Accuracy: (25/26) X 100 = 96.15%
Overall Classification Accuracy: (25+16)/ 43 X 100 = 95.35%

Table 6.12-2

The results of the model (See Table 6.12-1) based on logit for the period (1982-1990) indicate that the cash position no.1 (liquidity) is significant at the 95 percent level. The acid test or liquid asset or quick asset ratio (liquidity) is significant at the 90 percent level. The outcome of the present model suggests that the probability of being a target from the electronics sector among the sample of electronic targets and electronic non-targets increases when the acid test or liquid asset or quick asset ratio (liquidity) decreases and when cash position no.1 (liquidity) increases. The important dimension of the model is only liquidity and the results about the liquidity hypothesis are mixed. Table 6.12-2 summarises the frequencies of predicted and actual outcomes. Sixteen of the non-target firms are correctly classified by the model. One of the non-target firms is incorrectly classified by the model. One of the target firms is incorrectly classified by the model. Twenty-five of the target firms are classified correctly by the model. The

[98] The variable under varimax factor analysis it appears under the second factor (See Appendix VI- Table 69). The second factor explains 17.7% of the total variance (See Appendix VI- Table 69). This variable has been significant in the univariate binomial logit and univariate binomial probit analysis.

[99] The variable under varimax factor analysis it appears under the first factor (See Appendix VI- Table 69). The first factor explains 24.5% of the total variance (See Appendix VI- Table 69).

conditional classification accuracy of the model is 96.15%. The overall classification accuracy of the model is 95.35%.

	Industry[100] (2-43)[101] Restricted Model	Economy wide[102] (7-42)[103] Restricted Model	Economy wide+Industry[104] (8)[105] Unrestricted Model
Logit Log- Likelihood	-5.83937	-24.6434	Models- Singular Hessian during Newton iterations.

Industry Test

LR[106] (Logit Model)$_{Industry}$ = 11.67874> $X^2_{(2)(0.05)}$ = 5.99 (The industry model does not work).

Economy wide Test

LR[107] (Logit Model)$_{Economy\ wide}$ = 49.2868 > $X^2_{(7)(0.05)}$ = 14.06 (The economy wide model does not work).

---

[100] The variables included in this model are: X17, X15.

[101] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[102] The variables included in this model are: X12, X10, X14, X21, X31, X11, X15.

[103] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[104] The variables included in this model are: X12, X10, X14, X21, X31, X11, X15, X17.

[105] The first number in the parenthesis indicates the number of the variables and the second number indicates the number of observations used in the model.

[106] $LR_{Industry}$= -2[Restricted Log-$L_{Industry}$ - Unrestricted Log-$L_{Economy\ wide+Industry}$]

[107] $LR_{Economy\ wide}$= -2[Restricted Log-$L_{Economy\ wide}$ - Unrestricted Log-$L_{Economy\ wide+Industry}$]

6.13 Conclusion

In the present chapter, I have selected with a small sample industry models which are parsimonious with a view to determining how different they are to the economy wide models[108]. In certain cases the economy wide model was found to dominate, in others there was little difference, but on the grounds of simplicity explanation we would select the industry model.

The present chapter examines the financial characteristics of takeover targets by industry. The examination is based on a comparison of the financial characteristics of target firms of a particular industry against the financial characteristics of potential bidder firms that made an attempt to takeover a firm which belongs to that particular industry and then a comparison of the financial characteristics of target firms of a particular industry against the financial characteristics of non target firms that belong to the same industry. **When examining the first case (bidders against targets) the major findings can be summarised as follows:** chemical target firms are characterised by high efficiency and use more debt in their capital structure, construction target firms use more debt, food target firms are affected by the liquidity dimension but as far as this dimension is concerned the findings are mixed, mechanical target firms are characterised by low profitability and high liquidity and electronics target firms are inefficient firms and more liquid. **When examining the second case (non targets against targets) the major findings can be summarised as follows:** chemical target firms are characterised by excess liquidity, construction target firms are inefficient and have high leverage in their capital structure, food target firms are characterised from the dimensions of liquidity and leverage but the results are mixed for both dimensions, the results of the model for the mechanical and electronics sector suggest that the liquidity dimension is important but for both sectors the results about the liquidity hypothesis are mixed.

---

[108] i) when comparing bidders with targets the following sectoral models hold: chemical, construction and electronics.

ii) when comparing bidders with targets the economy wide model holds for chemicals, construction, mechanical and electronics.

iii) when comparing non targets with targets the following sectoral models hold: construction and mechanical.

iv) when comparing non targets with targets the economy wide model holds for chemicals and construction.

CHAPTER 7

CONCLUSION

The present thesis analyses mergers and acquisitions within the UK for the period 1982-1990. There is a valid justification from the previous studies that one can predict mergers and acquisitions by using the financial characteristics of the firms involved in a potential merger or acquisition and that the financial characteristics of target firms will give an insight as to what are the real financial motives for the takeover activity in U.K.

Initially there has been a **review of the theories of mergers.** The different theories provided a background for the formulation of the hypotheses to be tested. The present study has chosen to examine five hypotheses which are financial in nature and they are the representatives of five important theories. The hypotheses under investigation are: profitability, inefficient management, financial leverage, corporate liquidity, and research and development. The above hypotheses have been chosen because all of them are purely financial in nature and therefore they satisfy the requirements of the data that has been collected. In addition, these hypotheses are representatives of the respective theories of mergers that are described in chapter 1 under section 1.2. It is beyond the scope of the present thesis to test all the theories outlined in chapter 1. Clearly due to the nature of the data some economic theories can not be tested (e.g. monopoly theory, economies of scale theory, growth, diversification, etc.). Moreover, the present thesis has reviewed the different merger waves that appear in the literature and has revealed that the major industries that participated in almost all the waves are: chemicals, food, electricals, petroleum, machinery, financial services. This was the rationale for selecting the sectors that have been examined.

An extensive analysis is provided for the **review of the studies on the prediction** of takeover targets so as to find the limitations of previous studies and to identify the most common characteristics of acquired firms that appear in the literature. The present thesis attempts to rectify some of the problems that traditionally the literature has faced in the area of predicting takeover targets. The **major limitations** of the previous studies are: industry classification was not considered, estimation samples and validation samples were chosen from the same time period, analysis of financial characteristics of acquired firms for a limited time period before the announcement of the acquisition, limited number of variables under consideration, the use of MDA analysis and the use of small sample sizes for both the estimation and validation periods. The present thesis tests the estimation models (1982-1985) in a different time period (1986-1990) and it collects financial statement information of the firms under analysis six years preceding the acquisition and derives 38 financial accounting ratios from the available information. Moreover, it examines the firms at an economy wide level and at an industrial level with an initial sample size of 1,153 firms. The methodologies adopted are logit analysis and probit analysis, methodologies that have been employed so as to overcome the pitfalls of discriminant analysis. The results of probit analysis are similar to that of logit and they are not presented in the thesis.

Industrial specific models are estimated in the present thesis so as to give an insight into what are the real financial characteristics of the target firms. This is a **major contribution** of the present thesis in the existing finance literature. Traditionally researchers have examined the financial characteristics of takeover targets at an economy wide level paying very little attention to predicting takeover targets and identifying their financial characteristics by industry. The firms under investigation belong to the following sectors of the economy: chemical, construction, food, electrical and electronics engineering and mechanical engineering. The rationale for industry classification is justified because firm characteristics vary substantially across industries and across the three groups under investigation. It is clearly shown that the financial characteristics of the groups under investigation by industry are different from the financial characteristics of the groups at the economy wide level. **Moreover, there are specific industry characteristics that affect the economy wide sample.** It is obvious that by disaggregating the sectors of the economy a lot of interesting findings are produced.

Data has been collected for three different groups namely bidders, targets and non targets. The previous studies in the area of the prediction of takeover targets considered either targets against bidders or targets against non-acquired firms and this makes the comparison of the results of the previous studies problematic because the financial characteristics of target firms will be different if they are compared with bidders and different if these are compared with non targets, something that is clearly evident from the present thesis. Therefore, the present thesis is taking a step further by comparing the target firms with bidders and then the target firms with non target firms. Beside this, the present thesis employs two techniques that are normally used so as to achieve the reduction of the variables without losing any significant information: varimax factor analysis and stepwise regression analysis. Both methodologies have been analysed in Appendix II. Stepwise regression analysis proved to be a satisfactory technique as it is shown in the empirical chapters (5+6). Factor analysis has been extremely useful for the determination of the relative importance of the different dimensions under investigation. Finally, the ratios under investigation have been analysed together with the rationale of their inclusion in the present study.

The present thesis agree with the opinions put forward by Thomas Hogarty (1970) and Ajit Singh (1992) who both suggest that mergers have a neutral impact on **profitability**. There is no strong evidence behind this theory. Recalling, M.Firth (1979), he supports that maximising management utility in the form of growth and size is perhaps a more important influence in many firms than the alternative theory of profit maximisation. The suggestion of M. Firth (1979) is even more interesting for the present thesis because, indeed U.K mergers and acquisitions for the 80's are dominated from the theory of the market for corporate control where the evidence gets clear support from the present thesis. From the multivariate models, mechanical target firms are characterised by low profitability when they are compared to the bidders.

The **market for corporate control** seems to be a very important issue for mergers and acquisitions. There is sufficient empirical evidence[1] which suggest that the "market for corporate control" through take-overs is a mechanism for disciplining managers who operate their firms in ways that do not maximise profits. The market for corporate control indicates a number of important favourable outcomes for a firm such as avoidance of the bankruptcy legal proceedings, more efficient management of firms and generally a more efficient allocation of resources. The market for corporate control captures a very important aspect of mergers and acquisition, the fact that inefficient managers through mergers and acquisitions are replaced. Efficiency means how successful the management of a firm is in using the resources of the firm. In other words, efficiency ratios, for the present thesis

[1] Henry G. Manne (1965), Michael C. Jensen and Richard S. Ruback (1983), Ajit Singh (Jan.1992).

measure the operational efficiency of the firm. Within the merger context a rigorous definition of efficiency is lacking and it has to be differentiated from the pareto efficiency as defined in micro- economics. For the purpose of the present thesis, if a firm has operational inefficiency then this is a signal that may employ inefficient managers, therefore this firm is a takeover target. From the multivariate models, when comparing bidders with targets[2], target firms are inefficient in terms of generating total assets but efficient in terms of generating sales. When comparing, non targets with targets[3], target firms are inefficient in terms of generating total assets. In the sectoral models, when comparing bidders with targets, chemical target firms are characterised by high efficiency and electronic target firms are inefficient firms. In the sectoral models, when comparing non targets with targets, construction target firms are inefficient.

Another important theory developed and tested within the M&A framework is that of **leverage** or increased debt capacity[4]. Acquisition candidates are characterised by excess debt capacity which means that a merger produces debt capacity for the post-merger firm which exceeds the firms combined premerger debt capacities. From the multivariate models, when comparing non targets with targets[5], target firms use less financial leverage in their capital structure. In the sectoral models, when comparing bidders with targets, chemical and construction target firms use more debt in their capital structure. In addition, when comparing non targets with targets, construction target firms have high leverage in their capital structure. Therefore, though the economy wide model (non targets against targets) suggests that target firms are characterised by excess debt capacity, this is not the case for some sectoral models that indicate that target firms in particular sectors have high leverage in their capital structure.

Liquidity theory has been developed and well documented for mergers and acquisitions and suggests that target firms have a very good liquidity position[6] when compared to the non-acquired firms. From the multivariate models, when comparing bidders with targets[7],

[2] Economy wide sample.

[3] Economy wide sample.

[4] Jack O. Vance (1969), Ronald E. Shrieves and Mary M. Pashley (1984).

[5] Economy wide sample.

[6] Jack O. Vance (1969), Simkowitz and Monroe (1971), Stevens (1973), Rege (1984).

[7] Economy wide sample.

target firms have sufficient sales that can assist them to generate quick assets but not to generate working capital . When comparing, non targets with targets[8], target firms utilise limited amount of cash from their total assets but they have good liquidity position when they add the interest received to their cash position (See Cash Position No.3). In the sectoral models, when comparing bidders with targets, mechanical and electronic target firms are characterised by high liquidity. Moreover, when comparing non targets with targets, chemical target firms are characterised by excess liquidity.

The ratios that are associated with **capital expenditure** which are the proxy for the money that firms spend in **research and development programs** do not have any significant impact for the mergers and acquisitions under examination.

The **multivariate model**[9] which is derived when comparing **bidders with targets** at the economy wide level shows that the dominant dimensions are ***liquidity*** and ***efficiency***. The fundamental characteristics of takeover targets when comparing bidders against targets as identified in the period 1982-1985 and then tested again in 1986-1990 are: target firms are inefficient in terms of generating total assets. This finding is theory consistent with the inefficient management hypothesis which says that target firms employ inefficient managers and that mergers and acquisitions act as a mechanism where inefficient managers are removed. On the other hand, target firms are efficient in generating sales. Wansley and Lane (1983) and Ronnie J. Clayton and M. Andrew Fields (1991) used sales as a proxy of size and their results suggest that target firms were of small size. The present thesis has seen the above ratio as a measure of efficiency but for comparison purposes if this is seen as a proxy for size then the present model reveals that target firms were big in size. This is a new finding for the existing literature which suggest that target firms in the 80's were bigger in size. Another finding is that the sales amount of target firms can assist them to generate quick assets but not to generate working capital.

[8] Economy wide sample.

[9] This is the model that is derived in the estimation period (1982-1985) (See Table 5.2-3)and has been tested in the validation period (1986-1990) (See Table 5.2-5).

The **multivariate** model[10] which is derived when comparing **non targets with targets** at the economy wide level shows that the dominant dimensions are ***liquidity***, ***leverage*** and ***efficiency***. The fundamental characteristics of takeover targets when comparing non targets against targets as identified in the period 1982-1985 and then tested again in 1986-1990 are: target firms are inefficient in terms of generating total assets. This finding says that target firms have a low annual amount of total assets. This measure has been employed by Harris et. al.(1982) as a proxy for the size dimension. The present thesis has seen the natural log of total assets as a measure of efficiency. This finding suggests that target firms are inefficient firms which is theoretically consistent with the inefficient management hypothesis[11].

In addition, target firms use less leverage in their capital structure. This is indicated from the low loan capital and preference capital to total assets which is a measure of the leverage dimension. This finding is consistent with the following studies which employed the same ratio as a representative of leverage: Stevens (1973), Wansley and Lane (1983), Dietrich and Sorensen (1984). Therefore, this finding suggest that target firms have low leverage and this is theoretically consistent with the financial leverage hypothesis which says that acquired firms use less debt in their capital structure. Moreover, target firms, utilise limited amount of cash from their total assets. This measure has been examined in the study carried out by Belkaoui (1978)[12] and it was one of the ratios under the liquid assets to total asset group. On the other hand, target firms have good liquidity position when they add the interest received to their cash position (See Cash position no.3). This ratio suggests that target firms have high cash resources which is theoretically consistent with the liquidity hypothesis which says that target firms are liquid firms. In addition, this ratio is employed by Ronnie J. Clayton and M. Andrew Fields (1991) as a proxy of the liquidity dimension but has not entered the final model.

Moreover, there is evidence that target firms make a positive attempt to build up an equity base in the market. This finding is suggested from the high annual equity and capital reserves. This finding is not consistent with the findings of the study of Simkowitz and

---

[10] See Table 6.2-3.

[11] This finding has been significant for the same multivariate analysis when discriminating bidders and targets.

[12] This ratio had the following percentage error in classification for years one to five before the takeover: 48%, 44%, 42%, 42% and 36%.

Monroe (1971) where their study indicates that acquired firms were relatively unable to build the equity base needed and this was a signal of low growth in equity. On the other hand, Joel Hasbrouk (1985) employed this ratio as a measure of size and based on the t-statistics, this was the most important determinant and the sign of the coefficient suggested a low size for acquired firms. For the present thesis the log of the annual equity and capital reserves has been seen as a measure of efficiency and the result suggests that target firms make a positive attempt to build up an equity base in the market so as to sustain competitive position in the market.

Another variable that enters the final model when comparing non targets against targets is the high average debtor collection period which indicates that target firms face problems in collecting their debts. This shows that target firms' debtors do not pay at the specific time limits set up by the firms and this may suggest cash flow problems. This finding suggests that acquired firms are inefficient in collecting their debts and is theoretically consistent with the inefficient management hypothesis.

But, the **major contribution** of the present thesis stems from the fact that presents the financial characteristics of takeover targets **by industry.** The examination is based on a comparison of the financial characteristics of **target** firms of a particular industry against the financial characteristics of potential **bidder** firms that made an attempt to takeover a firm which belongs to that particular industry. The findings of the multivariate models by industry suggest that chemical target firms are characterised by high efficiency and use more debt in their capital structure, construction target firms use more debt, food target firms are affected by the liquidity dimension but as far as this dimension is concerned the findings are mixed, mechanical target firms are characterised by low profitability and high liquidity and electronics target firms are inefficient firms and more liquid.

In addition, **sectoral models** are developed when comparing non targets with targets. The examination is based on a comparison of the financial characteristics of **target** firms of a particular industry against the financial characteristics of **non target** firms that belong to the same industry. The findings of the multivariate models by industry suggest that chemical target firms are characterised by excess liquidity, construction target firms are inefficient and have high leverage in their capital structure, food target firms are characterised from the dimensions of liquidity and leverage but the results are mixed for both dimensions, mechanical and electronic target firms have the liquidity dimension as important but the results about this dimension are mixed for both sectors.

The results of the present thesis may be useful for regulators that want to derive policies on regulating the merger and acquisition activity in UK. The present thesis has showed that the financial characteristics of target firms vary between different industries. Therefore, different government policies should regulate different industries. .

The table on page 177 presents the classification accuracies of the models derived from the present thesis together with the variables that enter each model. In front of each variable the sign of the coefficient is stated.

Groups under examination	Time Period	Sample	Methodology	Conditional Classification Accuracy	Overall Classification Accuracy	Significant Variables
Bidders - Targets	1982-1990	Economy wide	Logit	86.62%	71.30%	-X11, -X20, +X25, +X21
Bidders - Targets	1982-1985	Economy wide	Logit	69.39%	70.10%	-X20, +X25, +X7, -X11
Bidders - Targets	1986-1990	Economy wide	Logit	95.74%	76.60%	-X20, +X25, +X7, -X11
Non/Targets - Targets	1982-1990	Economy wide	Logit	58.57%	66.02%	+X12, +X10, -X14, +X21, -X31, -X11, +X15
Non/Targets - Targets	1982-1985	Economy wide	Logit	77.55%	71.96%	+X10, -X11, +X12, -X31, +X19, -X22
Non/Targets - Targets	1986-1990	Economy wide	Logit	61.36%	68.69%	+X10, -X11, +X12, -X31, +X19, -X22
Bidders - Targets	1982-1990	Chemicals	Logit	86.36%	72.97%	+X6, +X34
Non/Targets - Targets	1982-1990	Chemicals	Logit	95.45%	94%	+X16, +X22
Bidders - Targets	1982-1990	Construction	Logit	92.86%	71.19%	-X33, +X34
Non/Targets - Targets	1982-1990	Construction	Logit	61.90%	68.60%	+X10, -X11, +X34
Bidders - Targets	1982-1990	Food	Logit	78.13%	68.97%	-X17, -X18, +X19
Non/Targets - Targets	1982-1990	Food	Logit	68.75%	72%	-X23, +X24, -X16, +X26, -X30
Bidders - Targets	1982-1990	Mechanical	Logit	86.96%	83.33%	-X3, +X15, -X17
Non/Targets - Targets	1982-1990	Mechanical	Logit	86.36%	93.33%	-X23, +X19
Bidders - Targets	1982-1990	Electronics	Logit	85.71%	77.78%	-X10, -X9, +X23
Non/Targets - Targets	1982-1990	Electronics	Logit	96.15%	95.35%	+X17, -X15

SUGGESTIONS FOR FURTHER RESEARCH

The collection of more data will give greater meaning to the industry specific models and allow them to be developed further. The present thesis presents results for five different industries. Further research may include more industries so as to identify the financial characteristics of target firms for a range of industries.

It is of interest to compare the predictive power of the competing methods suggested by the existing literature applied in discrete choice models. (logit and probit analysis, hazard models and neural networks[1]).

Multinomial logit was used, but the limits of time and space prohibited its inclusion. Therefore, multinomial logit analysis can be useful when examining three groups at a time. (For example bidders, targets and non- acquired firms) or (successful acquisitions, unsuccessful acquisitions and firms that enter bankruptcy).

The theory of the market for corporate control is a very important issue. Therefore, the ownership management control must always be incorporated in the different models so as to provide more evidence for the theory of the market for corporate control. The ownership management control can be measured by the proportion of shares that the directors have in the firm. This is an important issue because as it was outlined in chapter 1, some researchers believe that mergers are planned and executed by managers who thereby maximise their own utility[2] to the detriment of their shareholders.

---

[1] R.H. Berry and Duarte Trigueiros in the book *Neural Networks in Finance and Investing* have developed a chapter called *Applying Neural Networks to the Extraction of Knowledge from Accounting Reports: A Classification Study* which gives an overview of an application of neural networks in finance.

[2] Fridrich Trautwein (1990), H. Nejat Seyhum (1990), T. Boone Pickens Jr. (1985).

APPENDIX I

TABLE 1 - SIMKOWITZ AND MONROE (1971) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Simkowitz - Monroe (1971) USA	Initial dimensions: • Price - Earnings. • Dividend Policy. • Growth. • Sales Volume. • Earnings. • Activity. • Dividend Policy. Final dimensions: • Price - Earnings. • Dividend Policy. • Growth. • Sales Volume.	Initial variables: • Price/Earnings per share. • Dividends Paid/Earnings available to common. • Three year annual percentage change in equity. • Annual Sales. • Dummy variable for negative earnings. • Volume of shares traded/ Two year average of shares outstanding. • Three years average dividend payout. (Past three years' dividend divided by the past three years' earnings available to common). Final variables: • Price/Earnings per share. • Dividends Paid/Earnings available to common. • Three year annual percentage change in equity. • Annual Sales.	• Methodology: Stepwise MDA with 24 financial ratios. • Time period: Acquisitions occurred in 1 April to 31 Dec. 1968. • Estimation sample: 25 non-acquired firms and a sample of 23 acquired firms. • Validation sample: 64 non-acquired firms and a group of 23 acquired firms.	• Overall predictive power of the estimation sample: 77 percent. This model can correctly classified 82.6 percent of the acquired firms. • Overall predictive power of the validation sample: 63.2 percent. This model can correctly classified 64 percent of the acquired firms. • Financial characteristics of acquired firms: low P/E ratios, low dividend payout, low growth in equity, smaller in size.	• Estimation samples and validation samples were chosen from the same time period as the analysis sample. • Analysed financial characteristics of acquired firms shortly preceding to an acquisition. • Industry classification was not considered. • The use of stepwise discriminant analysis which suffers from the problem of multicollinearity may have omitted certain financial characteristics which were significant. (e.g. the discriminant function does not include any variable which represents either liquidity or profitability or the debt position).

APPENDIX I

TABLE 2 - SINGH (1971) (UK)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Singh (1971) UK	• Pretax rate of return on net assets. • Post-tax rate of return on equity assets. • Dividend return (gross of tax) on equity assets. • Productivity return. • Liquidity. • Gearing. • Retention ratio. • Size. • Growth of net assets. • Valuation ratio.	• Pre-tax profits as a percentage of net assets. • Post-tax profits as a percentage of equity assets. • Dividends before income tax as a percentage of equity assets. • Return on financial capital employed. • Current assets to total assets. • Long-term liabilities, plus preference capital as a percentage of total capital and reserves, plus long-term liabilities. • Earnings after tax and after fixed interest and dividend. • Net Assets. • Growth of net assets. • Stock market value of the ordinary shares to the book value of the assets owned by ordinary shareholders.	• Methodology: Univariate and Discriminant Analysis. • Time Period: 1954-1960 . • Sample size: A sample of 847 firms when all industries were combined, 132 firms from the food industry, 176 firms from the drink industry, 96 firms from the clothing industry, 319 firms from the non- electrical engineering industry, 124 firms from the electrical engineering industry.	• Singh suggested that the major variable influencing takeover incidence is profitability. • Financial characteristics of acquired firms : low profitability, low growth, and low valuation ratios when compared against non-taken over firms. • When short-term records were used the misclassification rate was 35.6%. • The use of long term records the misclassification rate was 36.8%.	• The use of discriminant analysis, a technique which employs some statistical problems.(See chapter 3 for a discussion)

APPENDIX I

TABLE 3 - TZOANNOS AND SAMUELS (1972) (UK)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
J. Tzoannos and Samuels (1972) UK	• Capital structure. • Profitability. • Liquidity. • Investment. • Dividend policy.	• Trend in capital gearing. • Volatility in capital gearing. • Percentage of fixed interest capital in the total capital employed of a firm. • Trend in ratio of profit to capital employed. (Pretax profit as a percentage of capital employed). • Volatility of profit to capital employed. (Pre-interest profit as a percentage of capital employed). • Net cash/Capital employed. • Acid Test Ratio. (Current Assets-inventory/Current liabilities). • P/E ratio • Price cash flow ratio.(Price per share/Retained cash flow). • Trend in dividends per share. • Volatility of dividends per share.	• Methodology: Discriminant analysis. • Time Period: July 1967 to the end of March 1968. • Sample size: 36 randomly selected mergers . A control group of 32 non acquired firms was constructed as a random sample.	• Financial characteristics of acquired firms: high absolute level of capital , high rate of increase in the capital gearing, slow increase in profits, lower P/E ratio , slow rate of increase in dividends, great variation over time in the rate of dividends. • Financial characteristics of acquiring firms an above average downward trend in capital gearing, low absolute level of capital , high average increase in profits to capital employed, a high increase in the trend of dividends.	• The use of discriminant analysis, a technique which employs statistical problems.

APPENDIX I

TABLE 4 - STEVENS (1973) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Stevens (1973) USA	Initial dimensions: • Leverage • Profitability • Activity • Liquidity • Dividend policy • Price earnings • Other • Profitability • Liquidity • Activity • Leverage • Dividend policy • Price earnings	Initial variables: • Long term debt [LT]/market value equity • LT debt/total assets • LT debt/net stockholders equity • LT liabilities/total assets • total liabilities/total assets • EBIT/total sales • Gross profit/sales • EBIT/sales • Net income/sales • EBIT/sales • Net income/net stockholders equity • Net income/total assets • sales/total assets • cost of goods sold/inventory • sales/current assets-inventory • net working capital/total assets • net working capital/sales • cash dividends/net income • price/earnings • interest/cash + marketable securities Factor analysis- variables: • EBIT/Sales • Net Working Capital/Total Assets • Sales/Total Assets • Long Term Liability/Total Assets • Dividends/Net Income • Price/Earnings Ratio	• Methodology: Factor analysis to reduce 21 ratios entering the MDA. MDA with 6 financial ratios. • Time period: 1966-1970. • Estimation sample: contained mergers occurred in 1966. 80 firms (40 acquired and 40 non-acquired firms). Validation sample: contained mergers occurred during the period 1967-1968. (20 acquired and 20 non-acquired firms). • He matched firms by size.	• Overall predictive power of the estimation sample: 70 percent. • Overall predictive power of the validation sample: 67.5 percent. • Financial characteristics of acquired firms: low EBIT/Sales, low Sales/Total Assets, low Long -Term Liability/Total Assets.	• Analysed financial characteristics of acquired firms only two years prior to acquisition. • Industry classification was not considered. • The use of discriminant analysis, a technique which employs statistical problems. Factor analysis was applied because of the high degree of multicollinearity present in the original data set. • The use of small sample sizes for both the estimation and validation periods.

	Final dimensions: • Leverage. • Profitability. • Activity. • Liquidity.	Final variables: • Long-Term Liabilities/Total Assets. • EBIT/Sales. • Sales/Total Assets. • NWC/ Total Assets.			

TABLE 5 - KUEHN (1975) (UK)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Kuehn (1975) UK	• Valuation. • Size. • Profit Rate. • Growth Rate. • Retention. • Liquidity.	• Stock market value of the capital/ Book value of the assets. • Net Assets. • Net profit before interest payments and tax. • Growth rate of net assets. • Net profits after tax-(preference+ordinary dividends) • (Cash+tax reserve certificates+marketable securities) -(bank overdrafts+short term loans) / Interest liabilities+current tax liabilities.	• Methodology: LPM [Linear Probability Models] and Univariate Probit . • Time Period: examination of the firms that were merged from 1957-1969.	• No classification accuracy was reported. • Financial characteristics of acquired firms: low valuation ratios, low profitability and low growth. • There was also a tendency for the acquired firms to have low liquidity. • The valuation ratio was the major variable in determining the likelihood of a takeover. Financial characteristics of acquiring firms: tended to have lower profitability than in the industry average, higher growth in net assets than in the industry average, and higher valuation ratios than in the industry average.	• The non-performance of multivariate probit analysis.

APPENDIX I

TABLE 6 - BELKAOUI (1978) (CANADA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Belkaoui (1978) CANADA	• Non-Liquid Asset Group. • Liquid Assets to Total Asset Group. • Liquid Asset to Current Debt Group. • Liquid Asset Turnover Group.	• Cash Flow/Net Worth. • Cash Flow/Total Assets. • Net Income/Net Worth. • Net Income/Net Assets. • Long-term debt-Prefered Stock/ Total Assets. • Current Assets/Total Assets. • Cash /Total Assets. • Working Capital/Total Assets. • Quick Assets/Total Assets. • Current Assets/Current Liabilities. • Quick Assets/Current Liabilities. • Cash/Current Liabilities. • Current Assets/Sales. • Quick Assets/Sales. • Working Capital/Sales. Cash Sales.	• Methodology: MDA with 16 financial ratios. • Time Period: mergers occurred between 1960-1968 in Canada. • Estimation sample: 50 firms. [25 acquired and 25 non-acquired firms]. • Validation sample: 22 firms. [11 acquired and 11 non-acquired firms].	• Overall predictive power of the estimation sample: Years prior to the merger — Classification Accuracy 1 — 72% 2 — 80% 3 — 84% 4 — 78% 5 — 80% • Overall predictive power of the validation sample: Years prior to the merger — Classification Accuracy 1 — 70% 2 — 76% 3 — 85% 4 — 76% 5 — 75% • The use of the dichotomous test showed the superiority of the nonliquid ratios in predicting takeovers. • Among the liquid ratios the surprising result was the superiority of working capital/total assets.	• Estimation sample and validation sample were selected from the same time period. • Industry classification has not been taken into account. • Small sample sizes under examination .

APPENDIX I

TABLE 7 - HARRIS ET. AL. (1982) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Harris et al. (1982) USA	Final Dimensions: • Corporate liquidity. • Financial leverage. • Financial leverage. • Activity. • Earnings per share manipulation. • Profitability. • Size. • Profitability.	Final Variables: • working capital/total assets • total liabilities/total assets • L-T liabilities/total assets • Sales/total assets • P/E ratio • Operating income/sales • Natural log of total assets • Operating income/total assets	• Methodology: Probit Analysis was employed to estimate the probability that a firm would be acquired. • Time Period: 1974-1977. • Sample: The sample used here consists of: a sample of 61 firms acquired in 1976 and 1977, a sample of 45 firms acquired in 1974 and 1975 and a sample of approximately 1,200 nonacquired firms. • Estimation period: The characteristics of firms acquired in 1974-1975 are measured by using averages for the years 1972-1973. • Validation period: The characteristics of the sixty-one firms acquired in 1976 and 1977 are measured by averaging 1974 and 1975 data for those firms. • The interpretation of this convention is as follows: At the end of 1975, two years of data are used to measure the financial characteristics of two sets of firms (acquired in 1976 or 1977, or nonacquired); these characteristics are then used in an attempt to see which firms will be acquired in the subsequent two years. An interpretation holds for the 1974-1975 sample of mergers.	• No classification or prediction accuracy is reported. • Only one variable has been useful for the prediction: Total Liabilities/Total Assets. • In sample design, it is important to keep the ratio of acquired to nonacquired firms approximately equal to the ratio found in the firm population. • The estimated probit models are statistically significant but are not very powerful in explaining the determinants of the acquisition activity. • A focus on characteristics of only the acquired firms may miss important phenomena that involve specific matching of acquired and acquiring firms.	

APPENDIX I

TABLE 8 - WANSLEY AND LANE (1983) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Wansley-Lane (1983) USA	Initial dimensions: • Profitability • Size • Leverage • Liquidity • Price Earnings • Stock market characteristics • Market valuation • Growth • Activity • Dividend policy	Initial variables: • EBIT/ Net Sales • Rate of Return on equity • Intercept of regression of EPS over time • Natural log of net sales • Long-term debt/ total assets • Long-term debt/ equity • Short-term liabilities/ total assets • Net working capital/total assets • Cash and equivalents per share • Cash and equivalents per share/share price • Price-Earnings ratio • Natural log of common shares outstanding • Common shares traded/common shares outstanding • Market value per share/ book value per share • 3-year percentage change in share price • 3-year compound growth in net sales • 3-year compound growth in total assets • Compound growth in EPS • Net Sales/Total Assets • Cash Dividends/Earnings available to common shareholders	• Methodology: MDA using twenty financial ratios. The final LDA model constructed via stepwise discriminant procedures showed that 5 of the original 20 variables were useful in prediction. • Time period: 1975-1977. • Estimation sample: 44 firms that merged during the period 1975-1976. • Validation sample: 39 firms that merged in 1977.	• 75% correct classification on the estimation sample. • 69.2% on the validation sample (intertemporal test) • Financial characteristics of acquired firms: smaller P/E ratios, used less debt, were smaller in size, were growing more rapidly, had less market value in relation to book value than randomly selected nonacquired firms.	• Analysed financial characteristics of acquired firms only one year prior to acquisition. • Industry classification was not considered. • The authors accept the fact that since linear discriminant algorithm employs averages, some information relevant to particular mergers is lost in the discriminant function. Thus although no liquidity, profitability or activity variable enters the model as significant the authors do admit that these are important attributes in particular mergers.

APPENDIX I

	<u>Final dimensions:</u> • Size. • Valuation. • Growth. • Leverage. • Price-Earnings.	<u>Final variables:</u> • Natural Log of Sales. • Market Value/Book Value. • Three year average growth in Sales. • Long-Term Debt/Total Assets. • Price/Earnings per Share.			

APPENDIX I

TABLE 9 - REGE (1984) (CANADA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Rege (1984) CANADA	• Liquidity. • Leverage. • Payout. • Activity. • Profitability.	• Current Assets-Current Liabilities/Total Assets. • Current Assets+Long Term Liabilities/Total Assets. • Cash/EBIT-Depreciation Expense-Interest Expense - Income Tax Payable. • Net Sales/Total Assets. • EBIT-Depreciation Expense/Total Assets.	• <u>Methodology:</u> univariate discriminant analysis as well as multiple discriminant analysis (MDA). • <u>Time Period:</u> 1962-1973. • <u>Sample:</u> 55 domestic taken-over firms matched 55 foreign taken over and 55 non-taken over firms according to industry, year of takeover and asset size. Therefore the total sample size was 165 for the present study. • <u>Estimation sample:</u> For finding the coefficients by using the MDA 44 firms were chosen from each group at random. • <u>Validation sample:</u> The remaining 11 firms from each sample were included in the third group for each run in order to find the possibility of misclassification.	• Financial ratios based on historical accounting information cannot differentiate between firms which are likely to be taken over and those which are not likely to be taken over by either domestic or foreign entrepreneurs even if a connection between historical accounting information and the firm's expected cash flow were to be hypothesised. • No classification result was reported. • Their ranking in the multivariate setting puts the payout variable first followed by activity,liquidity,leverage and profitability in that order.	• Analysed financial characteristics of acquired firms only one year prior to acquisition. • Industry classification was not considered. • Estimation samples and validation samples were chosen from the same time period. • Limited number of variables under consideration. Five accounting ratios were selected based upon the findings of previous studies.

APPENDIX I

TABLE 10 - DIETRICH AND SORENSEN (1984) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Dietrich and Sorensen. (1984) USA	Initial Dimensions: • Price-Earnings. • Profit Margin. • Leverage. • Times Interest Earned. • Payout. • Investment. • Asset Turnover. • Current Ratio. • Size. • Trading Volume. Final Dimensions: • Price-Earnings. • Profit Margin. • Leverage. • Times Interest Earned. • Payout. • Investment. • Asset Turnover.	Initial Variables: • P/E ratio • EBIT/sales • L-T liabilities/total assets • EBIT/interest • Dividend/earnings • Capital expenditures/total assets • Sales/total assets • Current ratio • Market value of equity • Trading volume of common stock. Final Variables: • Price/Earnings per Share. • EBIT/Sales. • Long-Term Debt/Total Assets. • EBIT/Interest Payment. • Dividends/Earnings. • Capital Expenditures/Total Assets. • Sales/Total Assets.	• Methodology: Logit analysis. • The variables were measured by the percentage deviation from industry averages. • Time Period: Data concerned the period 1969-1973. • Estimation sample: 24 merged and 43 nonmerged firms were selected at random and used in estimation. • Validation sample: 6 merged and 16 nonmerged firms.	• Overall predictive power of the estimation sample: 92.54 percent. When the variables were reduced to five the accuracy in the classification of the estimation sample fell to 85.55 percent. • Overall predictive power of the validation sample: By holding industry variation in financial variable constant the predictive power of the model was 91 percent for the validation sample. • Factors tending to increase the NPV of cash flows of a potential target are expected to increase the attractiveness of a particular merger candidate while increasing the cash outflows associated with a merger tend to reduce its attractiveness. • The probability that a firm is a merger target increases as PAYOUT, ASSET TURNOVER, SIZE and LEVERAGE decrease and as VOLUME increases. • A merger candidate is heavy equity financing by retained earnings [not issuing debt and paying dividends] and in investing in assets which fail to generate sales and target's management is deficient in producing sales.	• One year old data was used for the merged firms but five year old data was used for the nonmerged firms. • Small sample sizes under examination . • Estimation samples and validation samples were chosen from the same time period .

APPENDIX I

TABLE 11 - JOEL HASBROUCK (1985) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Joel Hasbrouck (1985) USA	• Measure for common equity. • Measure for the entire firm. • Measure of size. • Measure of total financial leverage. • Measure of long-term financial leverage. • Measure of current liquidity. • Measure of net current liquidity.	• QEQU=q measure for common equity, defined as (market value of equity)/(replacement value of assets-market value of liabilities) • QASSET= q measure for the entire firm, defined as (market value of equity+ market value of liabilities)/(replacement value of assets) • LSIZE=log(market value of equity) • TDEBT=total financial leverage:(market value of liabilities)/(market value of equity) • LTDEBT=long-term financial leverage:(market value of long -term liabilities)/(market value of equity) • CFIN=current liquidity:(current financial assets)/(market value of equity) • CNFIN=net current liquidity:(current financial assets net of current liabilities)/(market value of equity)	• Methodology: Logit analysis. • Time Period: 1976-1982. • Sample: the matching of firms was by size and industry. i) target group: 86, ii) non-targets (size matched) 172, iii) non-targets (industry matched)172 .	• Unregulated non-financial target firms are characterised by low q ratios(market/replacement values)and to a lesser extent high current financial liquidity (high level of liquid assets). • Measures of financial leverage were not found to be significant. • The q ratio (both equity and assets) is very important. The relative magnitude implies that low q firms are more likely to be targets. • The significant variables were found to be q and (in the size-matched analysis) current financial liquidity. This is consistent with a role of q as a firm-specific signal of managerial incompetence, but other explanations (including disequilibrium valuation) may be advanced.	• The population of available firms was too small to permit control matching by size and industry simultaneously.

APPENDIX I

TABLE 12 - VICTOR PASTENA AND WILLIAM RULAND (1986) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Victor Pastena and William Ruland (1986) USA	• Share Capital. • Leverage. • Tax. • Size. • Consumer Price Index.	• CON_J is the percentage of outstanding shares owned by major shareholders as reported in Standard and Poor's Corporate Records. • LEV_J is the ratio of total debt to total equity, • TAX_j is the ratio of available tax loss carryforwards (including investment tax credit carryforwards) to total revenues, and • $SIZE_J$ is the natural logarithm of total revenue adjusted for changes in the • Consumer Price Index.	• <u>Methodology:</u>Discriminant analysis and Probit analysis. • <u>Time Period:</u> 1970-1983 • <u>Sample:</u> 531 manufacturing firms that merged during the study period. The study used 68 distressed manufacturing firms that merged remained for study. The study uses 42 manufacturing bankrupt firms. Therefore, the final sample contains 110 distressed firms that either merged or entered bankruptcy.	• Distressed firms that merge have lower financial leverage and are larger than firms that enter bankruptcy. • Tax carryforwards are not important in the model. • Distressed firms with high ownership concentration (or owner control) show an increase tendency to merge rather than to declare bankruptcy. • Self-interest of managers, rather than just the interests of shareholders and creditors, seems to help motivate the merger/bankruptcy choice. • The probit model correctly classifies 73.6 percent of the cases. • The authors conducted multiple discriminant analysis to test the predictive power of the variables considered in the merger/bankruptcy choice. The results are consistent with the hypothesis that the self-interest of managers seems to be at least partly responsible for the merger/bankruptcy choice.	• The use of discriminant analysis, a technique which employs statistical problems.

APPENDIX I

TABLE 13 - KRISHNA G. PALEPU (1986) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Krishna G. Palepu (1986) USA	• Inefficient management hypothesis: Firms with inefficient managements are likely targets. • Growth-resource mismatch hypothesis: Firms with a mismatch between their growth and the financial resources at their disposal are likely targets. • Industry disturbance hypothesis: Firms that are in an industry subjected to "economic disturbances" are likely acquisition targets. • Size Hypothesis: The likelihood of acquisition decreases with the size of the firm. • Market-to-book Hypothesis: Firms whose market values are low compared to their book values are likely acquisition targets. • Price-Earnings Hypothesis: Firms with low P/E ratios are likely acquisition targets.	• Average excess return (AER). • Growth resources dummy (GRDUMMY). • Industry dummy (IDUMMY). • SIZE. • Market-to-book value (MTB). • Price-earnings ratio(P/E).	• Methodology: Logit analysis. • Estimation Sample: A sample of 163 firms that were acquired and a random sample of 256 firms that were not acquired during the period 1971-1979. • Validation Sample: This includes all the targets from the year 1980 and all the non-targets, other than those used in the estimation sample, listed on the COMPUSTAT tape in 1980. This group consists of 30 targets and 1087 non-targets.	• Predictive power of the validation sample: When the model is tested on a group of 1117 firms, 24 of the 30 (80%)actual targets and 486 of the 1087 (45%) actual non-targets are correctly classified. • The estimated model's ability to predict targets is not superior to that of the stock market. • Since the market does not seem to identify targets very accurately long before the takeover announcements, it is concluded that the model also does not predict targets accurately. • While the estimated model is found to be statistically significant, its explanatory power is quite small.	

APPENDIX I

TABLE 14 - PAUL BARNES (1989) (UK)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Paul Barnes (1989) UK	Initial dimensions: • Liquidity. • Leverage. • Activity. • Profitability. Final dimensions: • Liquidity. • Profitability.	Initial variables: • Current Assets/Current Liabilities • Quick Assets/Current Liabilities • Cash/ current liabilities • Total loan capital + short-run debt/ total equity capital + deferred tax- intangibles • Loan capital/ equity and reserves • Sales/ assets • Return on Shareholders' Equity • Pre-tax profit margin • Net Profit Margin The data has been subjected to factor analysis and five factors found to explain 91.48 per cent of the variance in the original data matrix. Final variables: • Quick Assets/Current Liabilities • Current Assets/Current Liabilities • Pre-tax profit margin • Net Profit Margin • Return on Shareholders' Equity	• Methodology: MDA • Time Period: 1986- 1987. • Sample: Data concerning 92 successful takeover bids of UK quoted firms. Each firm was matched with a non-acquired listed firm within the same industrial sector whose market capitalisation immediately prior to the merger was the nearest. Nine basic financial ratios for each firm two years prior to the merger were obtained. • Estimation sample: 55 acquired firms and 55 matched non-acquired firms. • Validation sample: 37 acquired firms and 37 matched non-acquired firms.	• Predictive power of the estimation sample: 68.48 percent were correctly • Predictive power of the validation sample: 74.3 percent • The use of industry relative ratio was advocated and was illustrated by means of some UK data giving a reasonably high prediction success rate.	• Nine variables in the initial data set and the use of factor analysis in only 9 variables raises some doubts about the validity of factor analysis. • MDA also is a technique which has a lot of limitations.

APPENDIX I

TABLE 15 - JON W. BARTLEY AND CALVIN M. BOARDMAN (1990) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Jon W. Bartley and Calvin M. Boardman (1990) USA Note: In the present table the dimensions and variables of the historical model are presented. The results for all the models developed in the study by Jon W. Bartley and Calvin M. Boardman (1990) are presented in the results column.	Historical Cost Model: • INT/INC+ • GROWTH • SIZE • INC/SE • III/SE • WC/TA • CGS/INV • D/CF • CA/CL • RD/S • S/FA • C/MVSE	Historical Cost Model: • INT/INC+ = Interest + preferred dividends/ income+interest+income taxes+minority interest • GROWTH = Compound growth rate of sales (1975-79) • SIZE = Natural log of market value of stockholders' equity • INC/SE = Income available to common to book value of stockholders' equity • III/SE = Income available to common plus interest and income taxes to book value of stockholders' equity • WC/TA = Working Capital/ Total Assets • CGS/INV = Cost of goods sold/ Inventory • D/CF = Common dividends/ Cash flow from operations • CA/CL = Current Assets/ Current Liabilities • RD/S = Research and development/ Sales • S/FA = Sales/ Fixed assets • C/MVSE = Cash equivalents/ Market value of stockholders' equity	• Methodology: MDA. • Time Period: Takeover attempts for the period 1979-1981. • Sample size: 194 firms(41 targets and 153 nontargets).	MDA Set 1- Stepwise MDA models with equal priors: Historical Cost Model (12) Percentage Correctly classified targets: 53.7% Current Cost Model (10) Percentage Correctly classified targets: 58.5% Constant Dollar (11) Percentage Correctly classified targets: 53.7% Combination(18) Percentage Correctly classified targets: 61.0% MDA Set 2- Uniform Variable MDA Models: Historical Cost Model (14) Percentage Correctly classified targets: 53.7% Current Cost Model (14) Percentage Correctly classified targets: 56.1% Constant Dollar (14) Percentage Correctly classified targets: 51.2% Combination (11) Percentage Correctly classified targets: 36.6% Stepwise MDA Model with actual priors Combination (18) Percentage Correctly classified targets: 46.3% * The number of independent variables in each model is shown in the parentheses.	• Some variables that initially entered the models were removed in subsequent steps of the stepwise procedure because of multicollinearity.

APPENDIX I

TABLE 16 - RONNIE J. CLAYTON AND M. ANDREW FIELDS (1991) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Ronnie J. Clayton and M. Andrew Fields (1991) USA	Initial dimensions: • Liquidity • Leverage • Coverage • Profitability	Initial Variables: • Cash/ Total Assets • Net Working Capital (log) • Current Ratio • Industry Adjusted Current Ratio • Current Assets/ Total Assets • Industry Adjusted Current Assets/ Total Assets • Debt Ratio • Industry Adjusted Debt Ratio • Book Value Debt/ Market Value Equity • Times Interest Earned • Industry Adjusted Times Interest Earned • Cash Flow/ Interest • Industry Adjusted Cash Flow/ Interest • Cash Flow/ Total Debt • Industry Adjusted Cash Flow/ Total Debt • Net Profit Margin • Industry Adjusted Net Profit Margin • Total Asset Turnover • Industry Adjusted Total Asset Turnover • Return on Assets • Industry Adjusted Return on Assets	• Methodology: Logit analysis, Probit analysis and Discriminant analysis. • Time period: The four-year period, 1976 to 1979. The first two years is the estimation period while the second two years is the validation period. • Estimation sample: During 1976-77, 71 acquisitions were completed for which data were available in the Compustat Industrial Files. For modelling purposes a random sample of 71 other firms was selected also. • Validation sample: In order to provide an appropriate prediction sample , a total population of 1967 firms with complete data, including 171 acquisitions, was identified during the 1978-79 period.	Estimation sample: Logit Model • Overall Classification Accuracy: 82.39% Conditional Classification Accuracy • Of 71 acquired firms, 61 were correctly specified: 85.92% • Of 76 firms predicted acquired, 61 were correctly specified: 80.26% Probit Model • Overall Classification Accuracy: 80.99% Conditional Classification Accuracy • Of 71 acquired firms, 59 were correctly specified: 83.10% • Of 74 firms predicted acquired, 59 were correctly specified: 79.73% Discriminant Analysis Model • Overall Classification Accuracy:73.94% Conditional Classification Accuracy • Of 71 acquired firms, 49 were correctly classified: 69.01% • Of 64 firms predicted acquired, 49 were correctly specified: 76.56%	

APPENDIX I

	• Firm Size • Firm Growth • Dividend Policy • Variability • Market Factors	• Return on Net Worth • Industry Adjusted Return on Net Worth • Earnings before Interest and Taxes(EBIT)/ Interest • Industry Adjusted Earnings before Interest and Taxes(EBIT)/ Interest • EBIT/ Net Worth • Industry Adjusted EBIT/ Net Worth • Cash Flow/ Total Assets • Industry Adjusted Cash Flow/ Total Assets • Cash Flow/ Net Worth • Industry Adjusted Cash Flow/ Net Worth • Sales (log) • Total Assets (log) • Sales Growth • Total Asset Growth • Earnings per Share (EPS)Growth • Average Dividends • Dividends per Share/ EPS • Industry Adjusted Dividends per Share/ EPS • Sales Variability • EPS Variability • Price-Earnings Ratio • Industry Adjusted Price-Earnings Ratio • Market Price/ Cash Flow per Share • Market Price/ Book Value per Share • Shares Traded/ Shares Outstanding • Accumulated Depreciation/ Fixed Assets		<u>Validation Sample:</u> <u>Logit Model</u> • Overall Classification Accuracy: 85.71% <u>Conditional Classification Accuracy</u> • Of 171 acquired firms, 20 were correctly specified: 11.70% • Of 150 firms predicted acquired, 20 were correctly specified: 13.33% <u>Probit Model</u> • Overall Classification Accuracy: 78.24% <u>Conditional Classification Accuracy</u> • Of 171 acquired firms, 37 were correctly specified: 21.64% • Of 331 firms predicted acquired, 37 were correctly specified: 11.18% <u>Discriminant Analysis Model</u> • Overall Classification Accuracy: 87.85% <u>Conditional Classification Accuracy</u> • Of 171 acquired firms, 13 were correctly specified: 7.60% • Of 94 firms predicted acquired, 13 were correctly specified: 13.83%	

APPENDIX I

	Final dimensions for Logit and Probit models: • Liquidity • Leverage • Profitability • Dividend Policy • Market Factors Final dimensions for MDA: • Liquidity • Leverage • Coverage • Profitability	Final Variables entered Logitl and Probit models: • Net Working Capital (log) • Industry Adjusted Debt Ratio • Cash Flow/ Total Assets • Average Dividends • Market Price/ Cash Flow per Share Final Variables entered MDAs: • Net Working Capital (log) • Industry Adjusted Debt Ratio • Industry Adjusted Times Interest Earned • Industry Adjusted Net Profit Margin		Classification Accuracy for Logit, Probit and Discriminant Models: Predicted by A Priori Group Size Logit Model • Overall Classification Accuracy: 84.85% • Conditional Classification Accuracy (both):12.87% Probit Model • Overall Classification Accuracy: 84.95% • Conditional Classification Accuracy (both): 13.45% Discriminant Analysis Model • Overall Classification Accuracy: 85.05% • Conditional Classification Accuracy (both): 14.04% • Financial characteristics of target firms: Size: small size. Leverage: Acquired firms use less leverage. Return on Assets: Buying firms prefer targets with a higher return on assets. Dividends: Acquired firms pay lower dividends. Price to cash Flow: Buying firms prefer targets with a higher PCF. Net Profit Margin: Acquired firms have relatively lower industry adjusted NPM's. Coverage: This ratio is higher for acquired firms. Unlike the other variables it is not significant.	

APPENDIX I

TABLE 17 - P. HOLL AND J. F. PICKERING (1991) (UK)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
P. Holl and J. F .Pickering (1991) UK	• Financial Performance • Growth • Change in ownership • Size • Diversification	• Financial Performance: An integer variable measuring the financial performance of an establishment compared with other establishments in the same industry. Values of financial performance range from 1 to 5 . • Growth: Change in the value of sales over the past 12 months: 1 if failing (105 cases); 2 if stable(279 cases); 3 if rising (547 cases). • Change in ownership: Measure of change in ownership over the previous four years: 0 if no change (789 cases); 1 if change occurred as a result of takeover or merger (98 cases); 2 if change occurred for reasons other than a takeover or merger (85 cases). • Size: Size of establishment as measured by the number of employees. • Diversification: Measure of diversification of establishment: 1 if single product (445 cases); 2 if main product accounts for at least 25% of sales revenue (294 cases); 3 if main product accounts for less than 25% of sales revenue (142 cases).	Methodology: logit analysis. Time Period: 1984. Sample: 972 establishments.	• The main determinants of relative financial performance are avoidance of takeover and strength of market position. The main determinants of growth of sales are profitability, change of ownership, smaller size and lack of market dominance.	

APPENDIX I

	• Capacity utilisation • Market • Competitive position • Age • Single • Manufacturing	• Capacity utilisation: Capacity utilisation of establishment at the time of survey: 1 if at full capacity (451 cases); 2 if a little below full capacity (397 cases); 3 if considerably below full capacity (86 cases). • Market: A measure of the extent of the market served by the plant: 1 if local (156 cases); 2 if regional (103 cases); 3 if national (314 cases); 4 if international cases (205 cases). • Measure of competitive position: 1 if main supplier, i.e. effectively a monopolist (66 cases); 2 if few competitors (348 cases) ; 3 if many competitors (462 cases). • Age: Number of years establishment has been engaged in its main activity: 1 if less than three years (18 cases); 2 if there to five years (34 cases); 3 if five to ten years (97 cases); 4 if ten to 25 years (258 cases); 5 if more than 25 years (541 cases). • Single: Nature of establishment (195 cases); 2 if plant is part of a multi-plant organisation (777 cases). • Manufacturing status of establishment: 1 if manufacturing (477 cases); 2 if non- manufacturing (495 cases).			

APPENDIX I

TABLE 18 - STEPHEN A. RHOADES (1993) (USA)

STUDY	DIMENSIONS	VARIABLES	METHODOLOGY AND DATA	RESULTS	LIMITATIONS
Stephen A. Rhoades (1993) USA		*DOAG* = percentage of deposit overlap of the acquiring firm with the acquired firm ('other' firms have 0% overlap); *DOAD* = percentage of deposit overlap of the acquired firm with the acquiring firm with the acquiring firm ('other' firms have 0% overlap); *TA* = total assets; *L/A* = total loans to total assets; *FG* = firm deposit growth; *NBR* = number of branches; *LD/TD* = large domestic deposits (over $100,000) to total domestic deposits; S_i = 1, if the bank is located in state i. Logit equations are estimated for each of the three samples of firms for each of the years 1981-1986. The logit equation is as follows: where the dependent variables are: 1, if change in efficiency quartile is up, 0, if efficiency quartile is unchanged; 1, if change in efficiency quartile is down, 0, if efficiency quartile is unchanged, 1, if change in efficiency quartile is up, 0, if change in efficiency quartile is down.	• Methodology: Logit analysis. • Sample: The analysis covers 898 bank mergers • Time Period: 1981-1986.	The results of this study indicate consistently that horizontal bank mergers during 1981-1986 did not generally result in efficiency gains.	

APPENDIX II

Factor Analysis - A technique for the reduction of the variables.

> **"Factor analysis refers to a variety of statistical techniques whose common objective is to represent a set of variables in terms of a smaller number of hypothetical variables. "**
> **Jae- On Kim and Charles W. Mueller (1991)**

In general, the first step of factor analysis involves an examination of the interrelationships among the variables under investigation. Suppose that we use the correlation coefficient as a measure of association and we have prepared a table of correlations. Inspection of the correlation matrix may show that there are positive relationships among these variables, and that the relationships within some subsets of variables are higher than those between the subsets. A factor analysis may be used to address whether these observed correlations can be explained by the existence of a small number of hypothetical variables. The researcher may not have any idea as to how many underlying dimensions there are for the given data. Therefore, factor analysis may be used as a tool of ascertaining the minimum number of hypothetical factors that can account for the observed covariation, and as a means of exploring the data for possible data reduction. The researcher may anticipate or hypothesise that there are two different underlying dimensions and that certain variables belong to one dimension while others belong to the second. If factor analysis is used as a mean of confirming a certain hypothesis and not as a mean of exploring underlying dimensions, this is referred to as confirmatory factor analysis. Concluding, the purpose of factor analysis is to enable the researcher to reduce a large number of observable variables to a small number of unobserved variables called factors without significant loss of information. In other words, factor analysis can be viewed as a technique of data reduction and to identify underlying dimensions which are not directly measurable. The basic idea is that a set of undeveloped variables, called factors, exists and the factors derived can adequately explain the interrelationship of the original variables. Stevens (1973) supports that in interpreting factor analysis, one is generally interested to find the number of distinct factors, how original data is grouped in the factors and if the factors can be given a meaningful interpretation in terms of the research problem at hand. Factor analysis looks only at the total set of data (all ratios and combined groups) and its interdependence, whereas MDA divides the total set into the predefined groups and finds a variable profile to best separate the groups. Stevens (1973) carried out factor analysis when the original group of ratios was factored into six dimensions being a linear combination of the original 20 ratios. The reduction from 20 ratios to 6 factors was possible due to the high level of multicollinearity or redundancy.

THE BASIC APPROACH OF FACTOR ANALYSIS

Jae- On Kim and Charles W. Mueller (1991) defined factors as "hypothesised, unmeasured, and underlying variables which are presumed to be the sources of the observed variables; often divided into unique and common factors"(p.77).

The basic steps that a researcher has to follow to carry out factor analysis can be described as follows:

The **first step** is the collection of the data and the preparation of the appropriate matrix which will be used in the analysis. Raw data variables for factor analysis are generally assumed to be of metric measurement, although dummy variables could also be used. Jae- On Kim and Charles W. Mueller (1991) support that in this step assumes that the basic covariance structure (matrix) of interest is for the variables, and one could still make the choice between analysing the covariance matrix or the correlation matrix. Jae- On Kim and Charles W. Mueller (1991) suggest that in exploratory factor analysis, one may rely on the use of correlation matrix because there are two practical advantages. Firstly, many existing computer programs do not accept the covariance matrix as basic input data, and secondly almost all of the examples in the literature are based on correlation matrices- hence it will be easier for the reader to understand and compare results with others.

The **second step** is to extract the number of factors that can adequately explain the correlation among the observed variables. There are several methodologies[1] to derive the initial factors like: the principal component analysis, least-squares method (variants are principal axis factoring with iterated communalities or Minres), canonical factoring or maximum likelihood method, alpha factoring (a method of initial factoring in which the

[1] An extensive and detailed analysis of these methodologies is provided by Harry H. Harman (1976), *Modern Factor Analysis*, The University of Chicago Press, Third Edition, Part II, (Direct Factor Analysis Methods), pp. 113-217.

variables included in the analysis are considered samples from a universe of variables[2]), image factor analysis. The most popular method is that of principal components and this is the method that has been applied in the present thesis. C. R. Laurent (1979) examines the impact of the principal components analysis in the effectiveness of financial ratio analysis. The study achieved its objectives of identifying a small set of financial ratios which: firstly account for a significant proportion of the total variance in a (relatively) complete set of financial ratios, and thus provide most of the information that would be obtained from a highly detailed analysis, secondly are sufficiently few in number to increase the efficiency and effectiveness of financial ratio analysis and finally are sufficiently independent of each other to permit proper identification of their individual effects in multivariate analysis.
The criteria that may be used so as to find out how many factors to extract or how well does the model with a particular number of common factors fit the data can be described as follows:

- ***Latent root criterion (or eigenvalues):*** Eigenvalues equal or greater than one are retained. (Eigenvalue: a mathematical property of a matrix; used in relation to the decomposition of a covariance matrix, both as a criterion of determining the number of factors to extract and a measure of variance accounted for by a given dimension[2]).

- ***Percentage variance criterion:*** The cumulative percentage of the variance explained/extracted when successive factors are used. It is important to note that the first factor is the most important one. Subsequent factors are based on the residual amount of variance and are progressively by less important.

The **third step** is to determine the significance levels of factor loadings which as "a general term referring to a coefficient in a factor pattern or structure matrix[2] " (p.77) and in the present thesis factor loadings have been found using the Burt-Banks[3] formula:

---

[2] Jae- On Kim and Charles W. Mueller (1991), *Introduction to Factor Analysis: What it is and How to do it*, Sage University Paper, Series: Quantitative Applications in the Social Sciences, Sage Publications.

[3] Dennis Child (1990), *The Essentials of Factor Analysis*, Cassell, Second Edition, p.114.

$$VL = VC \left[\sqrt{\frac{n}{n+1-r}} \right]$$

where

VL= value which a loading must reach in order to be significant for a given sample size.

VC= value a correlation must reach in order to be significant for a given sample size.

n = the number of variables in the analysis, and

r = the factor number, that is the position of the factor during extraction.

The standard error of a correlation can be obtained from the above formula.

I will illustrate the Burt-Banks formula with an example from my thesis.

In the present thesis I have 38 variables. Suppose that I have to examine with factor analysis a sample size of 51 firms. From the current Appendix II - Table 19 based on the number of observations at 1% I have a 0.346 as a standard error of a correlation. Suppose that from the analysis the number of factors extracted were 8 the standard error of a loading is calculated as follows:

$$0.346\left(\sqrt{\frac{38}{38+1-8}}\right) = 0.346(1.107) = 0.383$$

In other words, for loadings to satisfy the one per cent level of significance in the 8th factor they must be at least 0.383. Since factor loadings represent correlation coefficients, critical values can be obtained for different levels of significance and degrees of freedom from Table 19 which is presented in the current appendix (Appendix II) : Significance Levels for Pearson product-moment correlation coefficients. Given that it is problematic to estimate the error involved in factor analysis a conservative approach, 1% level of significance, is recommended. It has been observed from the current research that the larger the sample size the smaller the loading to be considered significant.

Another important statistic which should be mentioned at this stage is that of communality. Communality is a measure of how well the variation of each observed variable is explained by all the retained factors together. Jae- On Kim and Charles W. Mueller (1991) defined communality as the variance of an observed variable accounted for by the common factors; in an orthogonal factor model, it is equivalent to the sum of the squared factor loadings.

The **fourth step** is that although the initial solution fulfils certain statistical conditions, it does not provide the best means of interpretation. Therefore, the factors are rotated in order to improve interpretability and avoid a situation where an expression could be able to be interpreted in more than one way. The rotation of the factors is essential so as to provide a clear interpretation of the final solution. Jae- On Kim and Charles W. Mueller (1991) when discussing the fourth step they say that in order to obtain the initial solution, certain restrictions typically are imposed. These restrictions are (1) there are k common factors, (2) underlying factors are orthogonal to each other and (3) the first factor accounts as much variance as possible, the second factor accounts for as much of the residual variance left unexplained by the first factor, the third factor accounts for as much of the residual variance left unexplained by the first two factors, and so on.

There are two basic methods of rotation each having a variety of approaches[4]:

Orthogonal rotations (Jae- On Kim and Charles W. Mueller (1991): factors obtained by this rotation are by definition uncorrelated): The rotation maintains the orthogonality of the original factors. The most commonly used approaches are Quartimax, Varimax, and Orthomax. The most commonly used method is that of varimax and this methods is used in the present thesis. Jae- On Kim and Charles W. Mueller (1991) define varimax method as a method of orthogonal rotation which simplifies the factor structure by maximising the variance of a column of the pattern matrix. D. N. Lawley and A. E. Maxwell (1971 p.72) support that with varimax method factors are rotated in such a way that the new loadings tend to be either relatively large or relatively small in absolute magnitude compared with

[4] An extensive and detailed analysis of these approaches is provided by Harry H. Harman (1976), *Modern Factor Analysis*, The University of Chicago Press, Third Edition, Part III, (Derived Factor Solutions), pp. 247-336.

the original ones. This is accomplished by maximising a certain function of the squares of the loadings, the procedure being iterative.

Oblique rotations : Jae- On Kim and Charles W. Mueller (1991) explain that when factors are rotated without imposing the orthogonality condition and resulting terminal factors are in general correlated with each other. Therefore, the orthogonality of factors is not maintained and no restriction upon the independence of the factors is imposed into the solution. The most commonly used approaches are Oblimax (a criterion for obtaining an oblique rotation: it is equivalent to the quartimax criterion in orthogonal rotation[5]), Quartimin, Oblimin (a general criterion for obtaining an oblique rotation which tries to simplify the pattern matrix by way of reference axes; its variants include biquartimin, covarimin, and quartimin[5]), Orthoblique.

The **final stage** is where the solution has been obtained with the pattern of the factor loadings should be interpreted in order to assign a name for each of the factor. All significant factor loadings and their respective signs (interpreted as in correlation, i.e. negative signs indicate negative relationship) are used. In attempting to name the factors it must be borne in mind that the first factors is usually a general one and in some cases it is not possible to name it. In such cases the interpretation is based on subsequent factors only. For the present thesis, the statistical package of SPSS has been used to carry out varimax factor analysis (See Appendix VI - Table 58 to 69).

[5] Jae- On Kim and Charles W. Mueller (1991), *Introduction to Factor Analysis: What it is and How to do it*, Sage University Paper, Series: Quantitative Applications in the Social Sciences, Sage Publications.

APPENDIX II

Stepwise Regression Analysis -A Technique for the reduction of the variables for Logit/Probit Model.

A. H. Studenmund (1992) discuss stepwise regression analysis. In stepwise regression analysis you need a list of possible independent variables, and then stepwise regression analysis form the equation in steps. It chooses as the first explanatory variable the one that by itself explains the largest amount of the variation of the dependent variable around its mean. It chooses as the second variable the one that adds the most to R^2, given that the first variable is already in the equation. The stepwise procedure continues until the next variable to be added fails to achieve some researcher- specified increase in R^2 (or all the variables are added). The measure of the supposed contribution of each independent variable is the increase in R^2 caused by the addition of the variable. For the present thesis, the statistical package of LIMDEP has been used to carry out stepwise regression analysis.

APPENDIX II

Table 19: SIGNIFICANCE LEVELS FOR PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS

Degrees of Freedom	**Values of correlations required at 5% level**	**Values of correlations required at 1% level**
5	.755	.875
10	.576	.714
15	.483	.605
20	.425	.538
25	.380	.488
30	.338	.440
35	.320	.417
40	.300	.394
45	.280	.370
50	.262	.346
60	.248	.328
70	.233	.308
80	.220	.290
90	.206	.272
100	.194	.255
150	.158	.209
200	.137	.182
250	.125	.163
500	.088	.115

Table extracted from : Dennis Child, " The Essentials of Factor Analysis", Year 1990, pp109.

APPENDIX III

Table 20: Chemical Industry -Bidders

1. Unilever (1982)
2. Laporte Industries (1982)
3. Fisons (1982)
4. Brent Chemicals (1982)
5. May & Baker (1982)
6. Hoechst UK (1982)
7. Moss Robert (1982)
8. Kalon Group (1985)
9. Croda International (1985)
10. Beecham (1985)
11. Ellis & Everard (1986)
12. ICI (1986)
13. BTP (1987)
14. MTM (1989)
15. Chemoxy International (1989)

APPENDIX III

Table 21: Chemical Industry - Non-Targets

1. Air Products (1987)
2. Akzo Chemicals Holdings Ltd (1987)
3. Albright & Wilson (1982)
4. Allied Colloids Group Plc (1989)
5. Amersham International Plc (1988)
6. Associated Octel Co (1987)
7. Atochem UK Holdings Ltd (1986)
8. Avon Cosmetics Ltd (1985)
9. Boc Group Plc (1982)
10. Bader (Scott) Co Ltd (1987)
11. Bespak Plc (1990)
12. Bioplan Holdings (1986)
13. Bristol-Myers Co Ltd (1985)
14. Bush Boake Alen Holdings UK Ltd (1990)
15. Ciba - Ceigy Plc (1982)
16. Colgate-Palmolive Ltd (1982)
17. Dashtag (1987)
18. Eli Lilly Group Ltd (1986)
19. Enimont Holdings UK Ltd (1985)
20. Exxon Chemical Ltd (1987)
21. Gillette Industries Ltd (1987)
22. Henkel Chemicals (1987)
23. Interox Chemicals Ltd (1990)
24. Johnson Wax Ltd (1982)
25. Merck Holdings Ltd (1985)
26. Monsanto Plc (1985)
27. Pavion International (1987)
28. Tennants Cons. Ltd (1982)

APPENDIX III

Table 22: Chemical Industry - Targets

1. Dow Chemical (1982)
2. DSM (1982)
3. May & Baker (1982)
4. Rhone- Poulenc (1982)
5. Wigglesworth (1982)
6. ICI (1985)
7. Kalon Ltd (1985)
8. Mebon (1985)
9. Barrow Hepburn (1986)
10. Scottish Agr. Industries Plc (1986)
11. Barrow Hepburn (1987)
12. Feb International (1987)
13. Reed International (1987)
14. Armitage Bros. (1987)
15. Reabrook Holdings (1987)
16. Rotunda (1987)
17. Coates Bros (1987)
18. Hallite (1987)
19. Carless (1988)
20. Caradon (1989)
21. Chemoxy International (1990)
22. Foseco (1990)
23. Just Rubber (1990)

APPENDIX III

Table 23: Construction Industry - Bidders

1. Wimpey George (1982)
2. Wiggins Group (1982)
3. Lilley FJC (1982)
4. Cakebread Robey (1982)
5. Roberts Thomas (1982)
6. Redland (1982)
7. Wilson (1984)
8. Lovell Y J (Holdings) (1984)
9. Costain Group (1984)
10. Falcon Industries (1984)
11. Tarmac (1984)
12. Lawrence (1984)
13. Cala (1986)
14. Tilbury Gr. (1986)
15. Turriff Corporation (1986)
16. Raine Industries (1987)
17. BHH Group (1988)

APPENDIX III

Table 24: Construction Industry - Non- Targets

1. Arncliffe Holdings Plc (1984)
2. Bailey (Ben) Construction Plc (1984)
3. Barratt Development Plc (1982)
4. Blackwood Hodge Plc (1982)
5. Boscalis Westminster Ltd (1982)
6. Bowmer & Kirkland Ltd (1988)
7. British Building & Engineering Appliances Plc (1987)
8. Bryant Group Plc (1984)
9. Carter (R.G) Holdings Ltd (1987)
10. Chelsea Harbour Ltd (1988)
11. Christiani & Nielsen Ltd (1984)
12. Comben Group Plc (1985)
13. Combustion Engineering Ltd (1987)
14. Douglas (Robert M.) Holdings Plc (1988)
15. Drilton Ltd (1987)
16. Dunton Group Plc (1990)
17. EBC Group Plc (1987)
18. Edmond Holdings Plc (1989)
19. Havelock Europa Plc (1988)
20. Haymills Holdings Ltd (1988)
21. Howard Holdings (1988)
22. Hunting Gate Group Ltd (1987)
23. Hollansche Beton Gr.(UK) Ltd (1986)
24. ISIS Group Plc (1988)
25. Jackson Group Plc (1988)
26. Kyle Stewart Ltd (1987)
27. Laing(John) Plc (1985)
28. Lelliott (john) Group Plc (1987)
29. Longley(James) Holdings Ltd (1985)
30. Mansell (R.) Ltd (1985)
31. Maunders (John) Group Plc (1987)
32. May Gurney Holdings Ltd (1986)
33. McCarthy & Stone Plc (1987)
34. McLaughlins & Harvey Plc (1987)
35. Miller (Stanley) Holdings Plc (1985)
36. NSM Plc (1985)
37. Newwarthill Plc (1986)
38. North Midland Construction Plc (1986)
39. Pochin's Plc (1982)
40. Shepherd Building Group Ltd (1985)
41. Thyssen(GB) Ltd (1984)
42. Vibroplant Plc (1985)
43. Willmott Dixon Holdings (1988)
44. Wiltshier Plc (1987)

APPENDIX III

Table 25: Construction Industry - Targets

1. Cawoods (1982)
2. Ibstock Johnsen (1982)
3. Tunnel Holdings (1982)
4. Bath & Portland Group (1984)
5. Glossop (1984)
6. Streeters of Godalming (1984)
7. UBM Scaffolding (1984)
8. Wiljay (1984)
9. London Brick (1984)
10. Westbrick (1984)
11. Booth Alfred (1985)
12. IDC Group (1985)
13. Leech William (1985)
14. Pearce CH & Sons (1985)
15. Vectis Stone (1985)
16. Wallis GE (1985)
17. French Kier (1986)
18. Hat Group (1986)
19. Monk A. (1986)
20. Wiggins Group (1986)
21. Aberdeen Construction Group (1987)
22. Ford & Weston Group (1987)
23. Nolton (1987)
24. Trentham G. Percy (1987)
25. Clarke Securities (1987)
26. Baldwin (1987)
27. Babcock International (1987)
28. London and Northern Group (1987)
29. Scott Greenham (1987)
30. Crouch (Derek) (1987)
31. Trade Promotion Services Group (1987)
32. Jarvis (J) & Sons (1987)
33. Benlox (1987)
34. Oakwood Group (1987)
35. Ecorbic Holdings (1988)
36. Ruberoid (1988)
37. Nocros (1988)
38. Foster Wheeler Power Products (1988)
39. Costain (1988)
40. Frogmore Est. (1988)
41. Hay & Croft (1988)
42. Rush & Tompkins (1988)
43. Wimpey George (1988)
44. Crown House Engineering (1989)
45. Colroy (1990)

APPENDIX III

Table 26: Food Industry - Bidders

1. Argyll Foods (1982)
2. Northern Foods (1982)
3. Fitch Lovell (1982)
4. Hazlewood Foods (1982)
5. Fisher Albert Gr. (1982)
6. Preedy Alfred & Sons (1982)
7. Rowntree Mackintosh (1982)
8. Whitbread (1982)
9. Boddingtons Breweries (1982)
10. Dewhurst (1984)
11. Scottish Newcaslte (1984)
12. Vaux Breweries (1984)
13. Basset Foods (1985)
14. Tate and Lyle (1985)
15. Dalgety (1986)
16. Unigate (1986)
17. General Foods (1986)
18. Bodycote International (1986)
19. Ranks Hovis Mc Dougall (1987)
20. Dalepak Foods (1988)
21. United Biscuits (1988)
22. Cadbury Schweppes (1988)
23. Guinness (1988)
24. Brake Bross (1989)
25. Lovell(G.F) (1989)
26. Perkins Foods (1990)

APPENDIX III

Table 27: Food Industry - Non-Targets

1. Berisford International Plc (1989)
2. Ajinomoto Co (1990)
3. Billington (Ed) & Son Ltd (1987)
4. Alpine Group Plc (1988)
5. Anglo Eur. Food Group Ltd (1987)
6. Chambers & Fargus Plc (1985)
7. Associated Fisheries Plc (1984)
8. BSN (1987)
9. Buitelaur (Frans.) Ltd (1987)
10. Bulmer (H.P) Holdings Plc (1989)
11. CPC (UK) Ltd (1982)
12. Carlsberg Brewery Ltd (1986)
13. De Mulder (Prosper) Ltd (1990)
14. Devenish (J.A) Plc (1984)
15. ESS - Food (UK) Group Ltd (1986)
16. Favor Parker Ltd (1990)
17. Food Manufacturers GB Co Ltd (1987)
18. Foodane Ltd (1984)
19. Fuller, Smith & Turner Plc (1982)
20. Heald (A.) Ltd (1984)
21. Heavitree Brewery Plc (1984)
22. Kerrygold Co Ltd (1982)
23. Kraft Foods Ltd (1982)
24. McMullen & Sons Ltd (1990)
25. Meat Trade Suppl. Plc (1982)
26. Mecaniver S.A (1984)
27. Mischeffkirl Holdings Ltd (1984)
28. Nichols (J.N)(V) Plc (1985)
29. Padway Holdings Ltd (1986)
30. Princes Foods Ltd (1985)
31. Shelton Jones Plc (1990)
32. Shrewsbury Wem Brewery Co Ltd (1987)
33. Taunton Cider Co Ltd (1988)
34. Taveners Plc (1982)
35. Thwaites (Daniel) Plc (1987)
36. Tollemache & Cobbold Breweries Ltd (1984)
37. Union International Plc (1990)
38. Usborne Plc (1987)
39. Weetabix Ltd (1986)
40. Weston(George) Holdings Ltd (1982)
41. Whiworths Holdings Ltd (1988)
42. Wolverhampton & Dudley Breweries (1982)
43. Young & Co's Brewery Plc (1986)

APPENDIX III

Table 28: Food Industry - Targets

1. Avana Group Plc (1987)
2. Bassett Foods Plc (1989)
3. Bishop's Group Plc (1982)
4. Blue Bird Confectionery Holdings Plc (1986)
5. Boddingtons Breweries Ltd (1987)
6. Border Breweries (Wrexham) Plc (1984)
7. Bowyers (Wiltshire) Ltd (1985)
8. British Sugar Plc (1990)
9. Brown (Matthew) Plc (1987)
10. Buckley's Brewery Plc (1987)
11. Burns Philip & Co (1984)
12. Cameron (J.W.) & Co Ltd (1984)
13. Carlton Industries Plc (1984)
14. Clark (Matthew) & Sons(Holdings) Plc (1982)
15. Dalgety Plc (1984)
16. Fenwick Ltd (1984)
17. Fitch Lovell Plc (1990)
18. Haverhill Meat Products Ltd (1990)
19. Hazlewood Foods Plc (1990)
20. Hillsdown Holdings Plc (1990)
21. Home Farm Products Plc (1987)
22. Huntley & Palmer Foods Plc (1982)
23. Maynards Plc (1985)
24. Northern Foods Plc (1989)
25. Oldham Brewery Plc (1982)
26. Pauls Plc (1985)
27. Peerless Plc (1982)
28. Porter Chadburn Plc (1984)
29. Premier Brands Ltd (1989)
30. Silver (John) Holdings Ltd (1986)
31. Slaters Food Products Plc (1986)
32. Thornhill(J.)& Sons Ltd (1982)
33. Unigate Plc (1986)
34. Vaux Group Plc (1988)

APPENDIX III

Table 29: Electronics Industry - Bidders

1. AB Electronic Products (1982)
2. Cabridge Electronic Industries (1982)
3. Ferranti (1982)
4. Telephone Rentals (1985)
5. Emess Lighting (1985)
6. Dowty (1985)
7. AMS Industries (1986)
8. Dowding & Mills (1986)
9. Sunleigh Electronics (1986)
10. Forward Tecnology Inds. (1986)
11. STC (1986)
12. Tunstall Group (1987)
13. Plessey (1987)
14. Prestwich (1987)
15. GEC (1988)
16. Bowthorpe Hldgs (1988)
17. Alphameric (1988)

APPENDIX III

Table 30: Electronics Industry - Non-Targets

1. Arcolectric (Holdings) Plc (1987)
2. Arlen Plc (1988)
3. Bailey (N.G.) Organisation Ltd (1988)
4. Bulgin (A.F) & Co Plc (1985)
5. CEF Holdings Ltd (1988)
6. Chemring Gr.Plc (1989)
7. Clarke (T.) Plc (1989)
8. Combined Electrical MFRS Ltd (1989)
9. Emerson Electric UK Ltd (1988)
10. Fujitsu Europe Ltd (1988)
11. LPA Industries Plc (1990)
12. LEC Refrigeration Plc (1982)
13. Pillar Electrical Plc (1987)
14. Scholes Group Plc (1985)
15. Siemens Plc (1986)
16. Western Selection Plc (1982)
17. Wholesale Fittings Plc (1986)

APPENDIX III

Table 31: Electronics Industry - Targets

1. Avesco Plc (1989)
2. BTS Group Plc (1988)
3. Crystalate Holdings Plc (1990)
4. DBE Technology Group Plc (1987)
5. Dixons Group Plc (1989)
6. Dubilier International Plc (1988)
7. Ealing Electro-Optics Plc (1988)
8. Ferranti International Plc (1987)
9. Gardiner Group Plc (1988)
10. Morceau Holdings Plc (1988)
11. Pilgrim House Group Plc (1988)
12. Polly Peck International Plc (1988)
13. Polytechnic Electronics Plc (1989)
14. Symonds Engineering Plc (1988)
15. U.E.I Plc (1989)
16. American Electronic Componet (1987)
17. Breville Europe Plc (1985)
18. Cass Group Plc (1985)
19. Derritron Plc (1982)
20. First Castle Electronics Plc (1986)
21. Friedland Doggart Group Plc (1985)
22. Inspectorate EAE Plc (1985)
23. International Signal and Control Group (1987)
24. Muirhead Plc (1985)
25. Sheffield Smelting Co Ltd (1984)
26. Shorrock Plc (1986)
27. Stone International Plc (1987)
28. Webber Electro Components Plc (1986)

APPENDIX III

Table 32: Mechanical Engineering Industry - Bidders

1. Verson International (1982)
2. EIS Group (1984)
3. Bullough (1984)
4. BM Group (1985)
5. Simon Engineering (1985)
6. Newman Tonks (1985)
7. 600 Group (1985)
8. Glynwed International (1986)
9. Davy Corporation (1986)
10. Aerospace Engineering (1986)
11. Eadie Hldgs (1986)
12. Carclo Engineering Group (1986)
13. IMI Engineering (1986)
14. Howden Group (1986)
15. Habit Precision Engineering (1987)
16. CI Group (1987)
17. GKN (1987)
18. Braithwaite Group (1987)
19. Metalrax Group (1987)
20. Fife Indmar (1989)
21. Weir Group (1989)

APPENDIX III

Table 33: Mechanical Engineering Industry - Non-Targets

1. AT Trust Plc (1986)
2. Alfa - Laval Co Ltd (1982)
3. Arley Holdings Plc (1985)
4. Baxi Partnership Ltd (1989)
5. Bogod Group Plc (1987)
6. British Shipbuilders (1987)
7. Crosby Woodfield Plc (1988)
8. Davies & Metculfe Plc (1989)
9. Dexion Group Plc (1987)
10. Epicure Industries Plc (1988)
11. Ferrum Holdings (1988)
12. Flexello Castors & Wheels Plc (1987)
13. Folkes Group Plc (1984)
14. H.M. Holdings Plc (1986)
15. Haden Maclellan Holdings Plc (1986)
16. Hall Engineering Holdings Plc (1989)
17. Lancer Boss Group Ltd (1986)
18. Linde Holdings Ltd (1986)
19. Martin - Baker Aircraft Co Ltd (1986)
20. Martin- Baker Engineering Ltd (1984)
21. Mining & Allied Supplies Plc (1986)
22. Parsons (Ralph M)Co Ltd (1986)
23. Powerscreen International Plc (1985)
24. Renold Plc (1987)
25. Raleigh Industries (1988)
26. Robinson Thomas Group Plc (1988)
27. Rockwell International Ltd (1988)
28. S.I. Group Plc (1988)
29. SKF (UK) Ltd (1987)
30. SKF Invest. Ltd (1987)
31. Short Bros. Plc (1985)
32. Siebe Plc (1986)
33. Slingsby (HC) Plc (1986)
34. Unicorn Industries Plc (1985)
35. W.B. Industries Plc (1985)
36. Walker & Staff Holdings Plc (1984)
37. Walker (Thomas) Plc (1988)
38. West Industries Plc (1986)

APPENDIX III

Table 34: Mechanical Engineering Industry - Targets

1. Allen (Edgar), Balfour Ltd (1986)
2. Allen(W.G.) & Sons (Tipton) Plc (1985)
3. Armstrong Equipment Plc (1984)
4. Astra Holdings Plc (1986)
5. Babcock International Plc (1987)
6. Baker Perkins Plc (1987)
7. Baldwin Plc (1987)
8. Benford Concrete Machinery Plc (1986)
9. Bestobell Plc (1986)
10. Brickhouse Dudley Plc (1986)
11. Brown(John) Plc (1986)
12. Burgess Group Plc (1984)
13. Christy Hunt Plc (1988)
14. Ferranti International Plc (1989)
15. Foster Wheeler Ltd (1988)
16. Giltspur Ltd (1987)
17. Victor Products Plc (1988)
18. Wadkin Plc (1986)
19. Wilkins & Mitchell Plc (1982)
20. Yarrow Plc (1986)
21. Herman Smith Plc (1985)
22. Tyzack Plc (1989)
23. Wyndham Group Plc (1989)

APPENDIX IV

Table 35:Aggregate Sample - Bidders Vs Targets

Year relative to the announcement	Number of factors extracted	Factor loading accepted and above
5	9	0.287
4	8	0.282
3	8	0.282
2	9	0.287
1	8	0.282
0	9	0.287
6 years average	10	0.292

Table 36:Aggregate Sample - Non Targets Vs Targets

Year relative to the announcement	Number of factors extracted	Factor loading accepted and above
5	9	0.287
4	9	0.287
3	9	0.287
2	8	0.282
1	9	0.287
0	10	0.292
6 years average	11	0.297

APPENDIX IV

Table 37: Chemicals - Bidders against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy[6]	Factor loading accepted and above
5	6	0.88142	0.577
4	6	0.73567	0.577
3	6	0.87036	0.577
2	6	0.80873	0.577
1	6	0.92179	0.577
0	6	0.92354	0.577
6 years average	7		0.586

Table 38: Construction - Bidders against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	8	0.57250	0.487
4	8	0.72792	0.487
3	8	0.42726	0.487
2	7	0.45779	0.479
1	8	0.50581	0.487
0	7	0.78936	0.479
6 years average	7		0.479

[6] According to Marija J. Norusis (1990) in the manual of "SPSS/PC+ Statistics 4.0" (p.B-128-129) supports that the Kaiser-Meyer-Oklin measure of sampling adequacy is an index for comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. Small values for the KMO measure indicate that a factor analysis of the variables may not be a good idea, since correlations between pairs of the variables cannot be explained by other variables. Kaiser (1974) characterises measures in the 0,90's as marvelous, in the 0.80's as meritorious, in the 0.70's as middling, in the 0.60's as mediocre, in the 0.50's as miserable, and below 0.5 as unacceptable.

APPENDIX IV

Table 39: Food - Bidders against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	7	0.51572	0.479
4	7	0.36298	0.479
3	7	0.81121	0.479
2	8	0.50214	0.487
1	8	0.28273	0.487
0	8	0.59218	0.487
6 years average	8		0.487

Table 40: Mechanical- Bidders against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	6	0.94271	0.766
4	6	0.93066	0.766
3	6	0.88744	0.766
2	6	0.82255	0.766
1	6	0.94470	0.766
0	5	0.94514	0.755
6 years average	7		0.788

Table 41: Electronics- Bidders against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	6	0.96719	0.649
4	5	0.97594	0.640
3	5	0.91066	0.640
2	5	0.96636	0.640
1	5	0.94165	0.640
0	5	0.88493	0.640
6 years average	7		0.659

APPENDIX IV

Table 42: Chemicals - Non Targets against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	7	0.81753	0.586
4	7	0.58804	0.586
3	8	0.69619	0.596
2	7	0.67789	0.586
1	7	0.88574	0.586
0	6	0.77866	0.577
6 years average	8		0.596

Table 43: Construction - Non Targets against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	6	0.81642	0.472
4	8	0.87067	0.487
3	6	0.77599	0.472
2	7	0.75161	0.479
1	6	0.81091	0.472
0	6	0.85569	0.472
6 years average	7		0.479

Table 44: Food- Non Targets against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	7	0.53519	0.454
4	7	0.66154	0.454
3	7	0.42742	0.454
2	7	0.26897	0.454
1	8	0.48353	0.462
0	8	0.49331	0.462
6 years average	7		0.454

Table 45: Mechanical- Non Targets against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	6	0.83178	0.649
4	6	0.82086	0.649
3	7	0.86398	0.659
2	5	0.95919	0.640
1	5	0.94878	0.640
0	6	0.91772	0.649
6 years average	6		0.649

Table 46: Electronics- Non Targets against Targets

Year relative to the announcement	Number of factors extracted	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Factor loading accepted and above
5	4	0.97087	0.744
4	3	0.99453	0.734
3	2	0.99752	0.724
2	4	0.98697	0.744
1	4	0.97525	0.744
0	2	0.99770	0.724
6 years average	6		0.766

APPENDIX V

The analysis provided in Appendix V is an indicative one. It shows which dimensions and variables have been significant for each industry for the last six years before the announcement of the bid (including the year of announcement). The significant variables[7] in the estimation period are marked with a shaded box[8]. The significant variables in both the estimation and validation period are marked with a black box[9]. The methodologies adopted for this analysis is univariate logit and univariate probit analysis.

Summarising the findings of this analysis the financial ratios that do tend to be very significant in both the estimation and validation periods are:

Table 47: Chemicals - Bidders Vs Targets

X27 = Total Liabilities to Shareholders' Equity (LEVERAGE)

Table 48: Chemicals - Non Targets Vs Targets

X26 = Long Term Liabilities to Shareholders' Equity (LEVERAGE)
X30 = Preference and Loan Capital to Equity and Reserves (LEVERAGE)
X32 = Interest Paid to Loan Capital (LEVERAGE)

Table 51: Food - Bidders Vs Targets

X14 = Current Ratio (Working Capital Ratio) (LIQUIDITY)
X15 = Acid Test or Liquid Asset or Quick Asset Ratio (LIQUIDITY)
X17 = Cash Position No.1 (LIQUIDITY)
X21 = Working Capital to Total Assets (LIQUIDITY)
X24 = Quick Assets to Total Assets (LIQUIDITY)
X28 = Current Assets to Total Assets (LIQUIDITY)

Table 53: Mechanical - Bidders Vs Targets

X1 = Return on Capital Employed (PROFITABILITY)
X2 = Profit to Sales (PROFITABILITY)
X3 = Profit to Total Assets (PROFITABILITY)
X4 = EBIT to Sales (PROFITABILITY)
X15 = Acid Test or Liquid Asset or Quick Asset Ratio (LIQUIDITY)
X19 = Cash Position No.3 (LIQUIDITY)
X22 = Cash to Total Assets (LIQUIDITY)

---

7 They may have been significant at 90% or 95% or 99% confidence level.

8

9

APPENDIX V

Table 47: Chemicals - Bidders Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

Table 48: Chemicals- Non Targets Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

APPENDIX V

Table 49: Construction - Bidders Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

APPENDIX V

Table 50: Construction - Non-Targets Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

APPENDIX V

Table 51: Food - Bidders Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

Table 52: Food - Non Targets Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

APPENDIX V

Table 53: Mechanical - Bidders Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

Table 54: Mechanical - Non Targets Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

APPENDIX V

Table 55: Electronics - Bidders Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

APPENDIX V

Table 56: Electronics- Non Targets Vs Targets

	5	4	3	2	1	0	Group
X1							PROF.
X2							PROF.
X3							PROF.
X4							PROF.
X5							EFF.
X6							EFF.
X7							EFF.
X8							EFF.
X9							EFF.
X10							EFF.
X11							EFF.
X12							EFF.
X13							LIQ.
X14							LIQ.
X15							LIQ.
X16							LIQ.
X17							LIQ.
X18							LIQ.
X19							LIQ.
X20							LIQ.
X21							LIQ.
X22							LIQ.
X23							LIQ.
X24							LIQ.
X25							LIQ.
X26							LEV.
X27							LEV.
X28							LIQ.
X29							LIQ.
X30							LEV.
X31							LEV.
X32							LEV.
X33							LEV.
X34							LEV.
X35							LEV.
X36							LEV.
X37							R&D
X38							R&D

APPENDIX VI

TABLE 57: RATIOS USED IN THE STUDY

A = Return on Capital Employed (PROFITABILITY)
B = Profit to Sales (PROFITABILITY)
C = Profit to Total Assets (PROFITABILITY)
D = EBIT to Sales (PROFITABILITY)
E = Sales to Shareholders' Funds (EFFICIENCY)
F = Sales to Total Assets (EFFICIENCY)
G = Annual Sales (Natural Log of Sales) (EFFICIENCY)
H = Sales to Fixed Assets (EFFICIENCY)
I = Sales to Current Assets (EFFICIENCY)
J = Annual Equity and Capital Reserves - (Natural Log of Equity and Capital Reserves) (EFFICIENCY)
K = Annual amount of Total Assets - (Natural Log of Total Assets) (EFFICIENCY)
L = Average Debtor Collection Period (EFFICIENCY)
M = Debtors Turnover (EFFICIENCY)
N = Current Ratio (Working Capital Ratio) (LIQUIDITY)
O = Acid Test or Liquid Asset or Quick Asset Ratio (LIQUIDITY)
P = Asset Cover (LIQUIDITY)
Q = Cash Position No.1 (LIQUIDITY)
R = Cash Position No.2 (LIQUIDITY)
S = Cash Position No.3 (LIQUIDITY)
T = Working Capital to Sales (LIQUIDITY)
U = Working Capital to Total Assets (LIQUIDITY)
V = Cash to Total Assets (LIQUIDITY)
W = Cash to Current Liabilities (LIQUIDITY)
X = Quick Assets to Total Assets (LIQUIDITY)
Y = Quick Assets to Sales (LIQUIDITY)
Z = Long Term Liabilities to Shareholders' Equity (LEVERAGE)
AA = Total Liabilities to Shareholders' Equity (LEVERAGE)
AB = Current Assets to Total Assets (LIQUIDITY)
AC = Current Assets to Sales (LIQUIDITY)
AD = Preference and Loan Capital to Equity and Reserves (LEVERAGE)
AE = Loan Capital and Preference Capital to Total Assets (LEVERAGE)
AF = Interest Paid to Loan Capital (LEVERAGE)
AG = Total Profit to Interest Paid (LEVERAGE)
AH = Gearing Ratio (LEVERAGE)
AI = Debt to Equity Ratio (LEVERAGE)
AJ = Interest Cover (LEVERAGE)
AK = Capital Expenditure to Total Assets (R&D)
AL = Capital Expenditure to Total Sales (R&D)

APPENDIX VI

TABLE 58: ECONOMY WIDE SAMPLE - BIDDERS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R   A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.90747	*	1	7.06395	18.6	18.6
B	.94626	*	2	4.74862	12.5	31.1
C	.95054	*	3	4.41349	11.6	42.7
D	.95645	*	4	3.31167	8.7	51.4
E	.78748	*	5	2.98013	7.8	59.3
F	.92504	*	6	2.15195	5.7	64.9
G	.98340	*	7	2.12784	5.6	70.5
H	.69661	*	8	1.74191	4.6	75.1
I	.71213	*	9	1.43417	3.8	78.9
J	.97931	*	10	1.16127	3.1	81.9
K	.99112	*	11	1.05183	2.8	84.7
L	.79076	*	12	1.01597	2.7	87.4
M	.79117	*				
N	.91234	*				
O	.89656	*				
P	.87942	*				
Q	.90541	*				
R	.93121	*				
S	.95875	*				
T	.76431	*				
U	.93886	*				
V	.96056	*				
W	.91997	*				
X	.93139	*				
Y	.97409	*				
Z	.95781	*				
AA	.86159	*				
AB	.96405	*				
AC	.97980	*				
AD	.93339	*				
AE	.86306	*				
AF	.31041	*				
AG	.87392	*				
AH	.60912	*				
AI	.83165	*				
AJ	.87445	*				
AK	.86798	*				
AL	.88495	*				

APPENDIX VI

---- F A C T O R   A N A L Y S I S ----

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
W	.92798				
R	.92754		.20560		
Q	.92234				
V	.88768	.38543			
S	.87905	.40877			
AB		.87430		.31769	
X		.85383		.33667	
F		.77206	-.22998		
AE		.75878			
D			.92915		
B			.92562		
A	.21546	.38659	.75805		
C	.26888	.46273	.74634		
N				.91711	
O				.89140	
U		.60070		.74385	
T				.60770	
I				-.52569	
K					.96964
J					.96512
G					.96101
G					.96101
AD					
Z					.21358
P				-.25150	
AA				-.19309	
H				.25057	
E			-.39781		
M					
L					-.28670
Y				.23322	
AC				.22583	
AG			.21481		
AJ			.25692		
AL		-.22494	.21457		
AK		.22697			

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
AB		.24054			
X		.21913			
F			.38968		
AE		-.44302			
A					.29215
C					.24598
N					
O				.21126	
U					
T				.54647	
I			.51912	-.23886	
AD	.95272				
Z	.94669				
Z	.94669				
P		.86746			
AA	.60741	.62803			
H		.61141	.44746		
E	.25259	.47342	.42096		
M			.87936		
L			-.79570		
Y				.94870	
AC				.94817	
AG					.88837
AJ					.86998
AL					
AK					
AF					-.22909
AH	.36743	.36440			

	FACTOR 11	FACTOR 12
E	-.22155	
AL	.87386	
AK	.86264	
AF	-.36412	
AI		.89734
AH		.49836

APPENDIX VI

TABLE 59: ECONOMY WIDE SAMPLE - NON TARGETS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R   A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.89756	*	1	7.36916	19.4	19.4
B	.86783	*	2	4.41446	11.6	31.0
C	.93387	*	3	4.31330	11.4	42.4
D	.89047	*	4	3.03195	8.0	50.3
E	.88391	*	5	2.74842	7.2	57.6
F	.85244	*	6	2.28189	6.0	63.6
G	.98322	*	7	1.89347	5.0	68.6
H	.70240	*	8	1.86318	4.9	73.5
I	.80669	*	9	1.72674	4.5	78.0
J	.97419	*	10	1.36470	3.6	81.6
K	.99119	*	11	1.13594	3.0	84.6
L	.81637	*	12	1.01060	2.7	87.2
M	.80201	*				
N	.90568	*				
O	.85060	*				
P	.95753	*				
Q	.77662	*				
R	.91273	*				
S	.91427	*				
T	.92745	*				
U	.91043	*				
V	.95440	*				
W	.90702	*				
X	.91088	*				
Y	.86403	*				
Z	.71282	*				
AA	.77913	*				
AB	.95344	*				
AC	.88452	*				
AD	.77054	*				
AE	.85890	*				
AF	.94282	*				
AG	.68758	*				
AH	.88084	*				
AI	.82389	*				
AJ	.74329	*				
AK	.95865	*				
AL	.96359	*				

APPENDIX VI

\- - - - F A C T O R A N A L Y S I S - - - -

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
D	.86563	.16819	-.15029		.20856
A	.85365	.19713	.29488		
B	.85027	.17536			.20766
C	.83267	.21555	.36441		
AJ	.70641			.37195	-.25760
AG	.67570			.32012	-.27549
AG	.67570			.32012	-.27549
W	.16093	.91312		.19337	
R	.20104	.90989			.17331
V	.14313	.89143	.36558		
S	.16891	.85808	.37979		
Q	.15008	.83405		.14615	
AB			.90736	.17401	
X		.16241	.90089		
AE	.17596		.64412		
F			.55222		-.39595
N				.90726	.16325
O			.14241	.85009	.23851
T				.69775	.62162
U			.63008	.63304	.16017
Y				.17890	.90277
AC				.21690	.90168
J	.15463				
E	-.13967				-.21093
H			.16093		
AA				-.25368	
M					
L					.23981
I				-.24886	-.51494
AL			-.13983		
P				-.14875	
AH	-.20530				
AI				-.16835	

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
AB		.21023	-.14029		
X		.17200			
AE		-.37013		.46344	
F		.47994	.35819		
K	.98275				
G	.96826				
J	.94884	-.16944			
E		.81600	.16157	.31552	
H		.76673	.19078		
AA		.71900	-.16556	.37315	
M			.88039		
L	-.18964		-.84428		
I		.30229	.59838		
AD				.85786	
Z		.14206		.81011	
AL					.95718
AK					.95552
AF					
P		.17183		-.20819	
AI		.42080		.37830	

	FACTOR 11	FACTOR 12
B		-.14311
C	-.16249	-.14770
U	-.16560	
AF	.96146	
P	.91458	
AH		.90181
AI		.67038

APPENDIX VI

TABLE 60: CHEMICAL INDUSTRY - BIDDERS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R   A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.91291	*	1	13.17693	34.7	34.7
B	.95582	*	2	7.23008	19.0	53.7
C	.97068	*	3	4.68032	12.3	66.0
D	.90705	*	4	4.20917	11.1	77.1
E	.93936	*	5	2.56781	6.8	83.9
F	.99173	*	6	1.85575	4.9	88.7
G	.96865	*	7	1.21534	3.2	91.9
H	.83115	*	8	1.01692	2.7	94.6
I	.93479	*				
J	.97482	*				
K	.97487	*				
L	.86875	*				
M	.87267	*				
N	.94976	*				
O	.96248	*				
P	.94945	*				
Q	.97151	*				
R	.95709	*				
S	.99288	*				
T	.97523	*				
U	.99168	*				
V	.99183	*				
W	.96992	*				
X	.99173	*				
Y	.90036	*				
Z	.91829	*				
AA	.94728	*				
AB	.99673	*				
AC	.95755	*				
AD	.95565	*				
AE	.98157	*				
AF	.75189	*				
AG	.94912	*				
AH	.92589	*				
AI	.98372	*				
AJ	.95334	*				
AK	.96108	*				
AL	.96303	*				

APPENDIX VI

---- F A C T O R   A N A L Y S I S ----

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
X	.98914				
AB	.98751				
AE	.97237				
F	.94471				
U	.92505				
S	.87523	.46859			
V	.86508	.48730			
C	.83807				
A	.78902				
AK	.68152				
P	-.64474				-.49773
R		.93893			
W		.89697			
Q		.88669			
B		.68176			
D		.66288			
I			-.87011		
AC			.84930		
H			-.80589		
M			-.77137		
L			.75795	-.44710	
E			-.73288		
Y		.47848	.66418		
J				.97564	
K				.96768	
G				.96690	
Z				.65907	
N					.92753
O					.86290
T			.50035		.83898
AD					
AI					
AH					
AJ					
AG					
AF					-.47203
AA					-.50136
AL		.47274			

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8
AK			.62032
B		.54241	
D		.51355	
Z	.52086		
AD	.93327		
AI	.83325		
AH	.82967		
AJ		.67696	
AG		.64555	
AF		-.56242	
AA	.50470	-.53654	
AL			.73271

APPENDIX VI

TABLE 61: CHEMICAL INDUSTRY - NON TARGETS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R   A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.92010	*	1	10.22306	26.9	26.9
B	.93764	*	2	6.59836	17.4	44.3
C	.95307	*	3	4.28279	11.3	55.5
D	.91563	*	4	3.84273	10.1	65.6
E	.91788	*	5	3.45765	9.1	74.7
F	.98627	*	6	2.77851	7.3	82.1
G	.96053	*	7	1.71215	4.5	86.6
H	.58266	*	8	1.45493	3.8	90.4
I	.90398	*				
J	.95952	*				
K	.96621	*				
L	.86219	*				
M	.81927	*				
N	.93686	*				
O	.90895	*				
P	.89130	*				
Q	.96765	*				
R	.95399	*				
S	.98951	*				
T	.95690	*				
U	.96427	*				
V	.98720	*				
W	.92974	*				
X	.98135	*				
Y	.88544	*				
Z	.94766	*				
AA	.96690	*				
AB	.98753	*				
AC	.93740	*				
AD	.70825	*				
AE	.95723	*				
AF	.81546	*				
AG	.92214	*				
AH	.66990	*				
AI	.94702	*				
AJ	.83820	*				
AK	.78094	*				
AL	.83345	*				

APPENDIX VI

\- - - - F A C T O R   A N A L Y S I S - - - -

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
X	.98956				
AB	.98897				
F	.95152				
S	.91128			.39558	
V	.90853			.39868	
U	.88409				
AE	.87783				
C	.71133				
A	.63530				
AI		.95436			
Z		.94603			
AA		.93693			
E		.92285			
AD		.68870			
AH		.58672			
N			.92190		
O			.88549		
T			.88423		
Y			.64052		-.59261
R				.91372	
W				.88369	
Q				.85949	
AL				.55012	
L					-.85436
I			-.39683		.81124
M					.78235
AC			.63188		-.67715
H					.56036
D				.51207	
B				.62916	
K				.42256	

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8
AE			.38704
C	.52972		
A	.56831		
AD			.42214
AL			.50130
L			
I			
M			
AC			
H		-.38391	
AG	.92216		
AJ	.81501		
D	.73485		
B	.64619		
K		.96383	
G		.95031	
J		.93462	
P			-.85879
AF			-.71122
AK			.47163

APPENDIX VI

TABLE 62: CONSTRUCTION INDUSTRY - BIDDERS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R   A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.89766	*	1	9.73364	25.6	25.6
B	.94261	*	2	6.68083	17.6	43.2
C	.87773	*	3	5.96936	15.7	58.9
D	.93308	*	4	3.54078	9.3	68.2
E	.95700	*	5	2.80352	7.4	75.6
F	.92662	*	6	2.31256	6.1	81.7
G	.99007	*	7	2.05804	5.4	87.1
H	.81805	*	8	1.11942	2.9	90.0
I	.88346	*				
J	.98377	*				
K	.98715	*				
L	.70225	*				
M	.57425	*				
N	.90647	*				
O	.91844	*				
P	.95960	*				
Q	.98074	*				
R	.94358	*				
S	.98116	*				
T	.96826	*				
U	.95649	*				
V	.98552	*				
W	.97896	*				
X	.94740	*				
Y	.91704	*				
Z	.93829	*				
AA	.96525	*				
AB	.96371	*				
AC	.93656	*				
AD	.92556	*				
AE	.93931	*				
AF	.76846	*				
AG	.76438	*				
AH	.64003	*				
AI	.95408	*				
AJ	.80118	*				
AK	.79450	*				
AL	.90948	*				

APPENDIX VI

---- F A C T O R   A N A L Y S I S ----

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
U	.89694				
T	.89369				
O	.87122				
N	.82081	-.39648			
X	.78980	.46534			
AB	.78559	.39040			
Y	.77389				-.41431
AC	.77253				-.42979
I	-.68869				.55931
AI		.93663			
P		.92774			
AA		.91382			
AE		-.90840			
E		.76467			.46278
H		.56437		.55777	
V			.97290		
W			.96436		
S			.96379		
Q			.96282		
R			.92799		
B				.82975	
D				.81396	
L				-.63267	
M	.42122			.60885	
C				.56953	.43730
A				.54405	.46564
AJ					.86919
AG					.85979
F		.38874			.70944
AL				.47743	

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8
K	.95117		
G	.94788		
J	.94199		
AD		.91856	
Z		.91740	
AH		.64382	
AK			-.79657
AF		-.36782	.68552
AL			-.65059

APPENDIX VI

TABLE 63: CONSTRUCTION INDUSTRY - NON TARGETS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R   A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.92755	*	1	9.16205	24.1	24.1
B	.93532	*	2	6.68711	17.6	41.7
C	.91130	*	3	5.61153	14.8	56.5
D	.93535	*	4	3.26548	8.6	65.1
E	.92162	*	5	3.09096	8.1	73.2
F	.95371	*	6	2.31263	6.1	79.3
G	.96886	*	7	2.06370	5.4	84.7
H	.76886	*	8	1.38389	3.6	88.4
I	.93099	*	9	1.08028	2.8	91.2
J	.98181	*				
K	.97080	*				
L	.87770	*				
M	.85821	*				
N	.93917	*				
O	.95180	*				
P	.97509	*				
Q	.96891	*				
R	.90765	*				
S	.97988	*				
T	.97030	*				
U	.98023	*				
V	.98270	*				
W	.94930	*				
X	.95968	*				
Y	.94553	*				
Z	.98133	*				
AA	.89727	*				
AB	.96162	*				
AC	.96738	*				
AD	.98001	*				
AE	.95312	*				
AF	.52400	*				
AG	.74776	*				
AH	.74693	*				
AI	.95053	*				
AJ	.83530	*				
AK	.76386	*				
AL	.89618	*				

APPENDIX VI

- - - - PC A N A L Y S I S - - - -

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
T	.85145		-.38520		
O	.79686		-.37633		
N	.78096		-.34007		
AC	.76029		-.30983		
U	.74120	.37256	-.37640		
Y	.72290		-.31205		
I	-.70630			.39493	.36029
B	.69873		.46567		
AA	-.67678	.33754			
AE	.66479	-.42787			
F	-.65745	.31091		.46929	.39318
D	.65125		.46928		
E	-.63717	.47827		.38168	
P	-.62903		-.55833	-.32294	
M	.61188				.38721
C	.55792	.42246	.52607		
V		.81929			
S	-.34857	.80376			
W		.75666			
Q		.73091	.31200		
R		.70339		-.37448	-.34945
X		.67272	-.60396		
AB		.66867	-.60884		
H	.34582	.45612			.44724
Z	.31932		.68186	.37655	-.31903
AD	.31812		.67734	.37938	-.32876
J			.59938	-.36357	.31648
A	.49048	.42148	.51485		
K			.40435	-.58372	.41805
AJ		.33064		.45654	.32948
L	-.36307				-.68067
G		.31284	.33741	-.41951	.50640
AI		.40077	.45969		-.33586
AL		-.41033	.40556		
AF					
AH				-.37373	-.31224
AK		-.41258	.34652		
AG		.35289		.37730	

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
AA		.31424		
AE	.33133	-.32793		
M				-.40353
W	.37007			
Q	.38385			
R				
X				
AB				
H		.44613		
Z	-.38450			
AD	-.38363			
J	-.37785	-.35606		
A			.33831	
K	-.35882	-.32855		
AJ	.33158			.40978
L				.36846
G	-.36536	-.39069		
AI	-.52746			
AL		.42580	-.33072	
AF		-.38684		
AH			.64318	
AK		.43420	-.44030	
AG				.52229

APPENDIX VI

TABLE 64: FOOD INDUSTRY - BIDDERS VS TARGETS

TIME PERIOD: 1982-1990

---- F A C T O R   A N A L Y S I S ----

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.92014	*	1	8.74730	23.0	23.0
B	.83958	*	2	5.78343	15.2	38.2
C	.90571	*	3	5.19095	13.7	51.9
D	.86239	*	4	4.49462	11.8	63.7
E	.94558	*	5	3.44745	9.1	72.8
F	.96126	*	6	2.20876	5.8	78.6
G	.94956	*	7	1.97214	5.2	83.8
H	.82584	*	8	1.51707	4.0	87.8
I	.90737	*	9	1.34621	3.5	91.3
J	.95448	*				
K	.96641	*				
L	.84872	*				
M	.76024	*				
N	.96826	*				
O	.92538	*				
P	.89074	*				
Q	.96601	*				
R	.96529	*				
S	.97630	*				
T	.95466	*				
U	.97788	*				
V	.97593	*				
W	.98039	*				
X	.95129	*				
Y	.97464	*				
Z	.84567	*				
AA	.93274	*				
AB	.97605	*				
AC	.98086	*				
AD	.84427	*				
AE	.93023	*				
AF	.83000	*				
AG	.77864	*				
AH	.95706	*				
AI	.94977	*				
AJ	.77639	*				
AK	.87362	*				
AL	.87859	*				

APPENDIX VI

---- F A C T O R   A N A L Y S I S ----

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
P	.91059				
AE	-.89447				
AA	.88626				
E	.87388				
H	.77501				
F	.74067				
AF	.62098				-.40459
Z	.56209			.54354	
AD	.54900			.54181	
W		.98218			
V		.97449			
S		.96675			
Q		.94663			
R		.93944			
N			.97158		
U			.96930		
O			.95080		
X	.49380		.80795		
AB	.51743		.79920		
K				.94469	
J				.93211	
G				.92994	
A					.89386
C					.87616
AG					.68649
AJ					.67720
D	-.49209				.62776
B	-.50654				.56902
B	-.50654				.56902
T			.53276		
AK					
AL	-.39844				
AH	.60305				

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
F	.56815			
AG			.37657	
I	.87380			
L	-.85449			
M	.85051			
Y		.97363		
AC		.96991		
T		.77122		
AK			.86937	
AL			.83642	
AI				.94453
AH				.68476

APPENDIX VI

TABLE 65: FOOD INDUSTRY - NON TARGETS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.88699	*	1	9.78044	25.7	25.7
B	.88728	*	2	5.89161	15.5	41.2
C	.86988	*	3	5.03802	13.3	54.5
D	.88547	*	4	3.60073	9.5	64.0
E	.92426	*	5	3.09533	8.1	72.1
F	.91698	*	6	2.42200	6.4	78.5
G	.98583	*	7	1.95395	5.1	83.6
H	.91336	*	8	1.54904	4.1	87.7
I	.88688	*	9	1.12217	3.0	90.7
J	.96852	*				
K	.97955	*				
L	.85196	*				
M	.80904	*				
N	.93940	*				
O	.90045	*				
P	.92042	*				
Q	.65778	*				
R	.94967	*				
S	.95657	*				
T	.97286	*				
U	.93748	*				
V	.96287	*				
W	.97751	*				
X	.92970	*				
Y	.97459	*				
Z	.86457	*				
AA	.94904	*				
AB	.96960	*				
AC	.98357	*				
AD	.82852	*				
AE	.90750	*				
AF	.92642	*				
AG	.73496	*				
AH	.86816	*				
AI	.93340	*				
AJ	.81240	*				
AK	.91601	*				
AL	.91383	*				

APPENDIX VI

---- FACTOR ANALYSIS ----

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
AF	.94769				
AA	.91691				
AI	.91572				
E	.76921			.41924	
H	.76095			.42861	
C		.90056			
A		.89528			
AJ		.76395			
AG		.75162			
D		.74982		-.43835	
B		.74449		-.44188	
V			.95544		
W			.95306		
S			.95263		
R			.94021		
Q			.68311		
AH		-.44718		.79212	
AB				.78061	.50427
P	.49810			.75977	
X				.72615	.52459
AE	-.60250			-.68845	
F	.46484			.61247	
F	.46484			.61247	
U					.91717
O					.90421
N					.90244
M			.34110		
I	.33179				
T					.53857
AD		-.43704			
Z		-.38005			

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
F		.46604		
G	.97024			
K	.96490			
J	.93424			
L		-.85933		
M		.80567		
I		.74031		
Y			.97812	
AC			.97807	
T			.76228	
AL				.93730
AK				.92802
AD	.46828			.57217
Z	.50172			.54480

APPENDIX VI

TABLE 66: MECHANICAL INDUSTRY - BIDDERS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R   A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.87580	*	1	10.20338	26.9	26.9
B	.93720	*	2	6.37496	16.8	43.6
C	.93941	*	3	6.13743	16.2	59.8
D	.86881	*	4	3.50599	9.2	69.0
E	.97745	*	5	2.83648	7.5	76.5
F	.90735	*	6	2.34460	6.2	82.6
G	.94020	*	7	1.63235	4.3	86.9
H	.72358	*	8	1.23468	3.2	90.2
I	.86736	*				
J	.90971	*				
K	.92663	*				
L	.86188	*				
M	.85936	*				
N	.93138	*				
O	.89645	*				
P	.94433	*				
Q	.97349	*				
R	.99037	*				
S	.97280	*				
T	.67208	*				
U	.90875	*				
V	.96515	*				
W	.95255	*				
X	.91730	*				
Y	.91898	*				
Z	.97562	*				
AA	.98584	*				
AB	.86562	*				
AC	.91044	*				
AD	.97632	*				
AE	.95448	*				
AF	.71558	*				
AG	.78265	*				
AH	.88049	*				
AI	.98299	*				
AJ	.84995	*				
AK	.79313	*				
AL	.95843	*				

APPENDIX VI

---- F A C T O R   A N A L Y S I S ----

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
Y	.92334				
I	-.90073				
AC	.87080				
U	.85748				
X	.81052				
O	.78467				-.41106
AB	.61150				
R		.96436			
Q		.95557			
W		.95273			
S		.92725			
V		.91993			
V		.91993			
C			.89217		
B			.85630		
A			.85354		
D			.82619		
AJ			.80895		
AG			.78274		
AF			-.60998		.42756
AD				.95485	
Z				.94434	
AH				.78874	.41230
AI				.74740	.52836
AA				.73508	.53716
AE					-.88894
P					.84823
N	.52356				-.71396
E				.56034	.56249
T					-.44936

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8
AB			.51245
E	.43383		
T	-.44744		
M	.79518		
L	-.79338		
F	.64387		.58066
H	.54981		
J		.90598	
K		.86121	
G		.83077	
AL			-.93689
AK			-.83562

APPENDIX VI

TABLE 67: MECHANICAL INDUSTRY - NON TARGETS VS TARGETS

TIME PERIOD: 1982-1990

---- FACTOR ANALYSIS ----

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.90708	*	1	8.42743	22.2	22.2
B	.94378	*	2	6.13619	16.1	38.3
C	.97770	*	3	4.92587	13.0	51.3
D	.93352	*	4	4.06642	10.7	62.0
E	.93675	*	5	3.24290	8.5	70.5
F	.96878	*	6	2.75500	7.3	77.8
G	.94859	*	7	2.08214	5.5	83.3
H	.78279	*	8	1.68535	4.4	87.7
I	.91212	*	9	1.24161	3.3	91.0
J	.90181	*				
K	.94424	*				
L	.90534	*				
M	.95594	*				
N	.95022	*				
O	.83802	*				
P	.96345	*				
Q	.95351	*				
R	.92635	*				
S	.75231	*				
T	.93586	*				
U	.96966	*				
V	.96319	*				
W	.91060	*				
X	.87754	*				
Y	.88706	*				
Z	.84396	*				
AA	.94762	*				
AB	.90132	*				
AC	.91487	*				
AD	.94149	*				
AE	.89488	*				
AF	.96256	*				
AG	.86191	*				
AH	.88648	*				
AI	.87307	*				
AJ	.85280	*				
AK	.88467	*				
AL	.85109	*				

APPENDIX VI

- - - - F A C T O R   A N A L Y S I S - - - -

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
B	.94961				
D	.92779				
C	.91910				
A	.86801				
AG	.75570				
AJ	.70520		.38076		
AH	-.59472				
AC		-.87560			
I		.87364			
F		.86784			.44096
Y		-.83575			
M		.71044			
L		-.67184			
V			.92750		
Q			.92239		
W			.91702		
R			.88745		
S			.74582		
N				.96024	
U				.83480	
T				.83103	
O				.77798	
AE				.71039	
AB					.84314
X					.82129
AL					-.68127
H			.40189		.66153
AK				-.37078	-.52358
AI	-.51937				
E		.39299			
Z	-.39225				

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
AH	.50639			
M				.52746
L				-.50200
AK		.38174		
K	.91616			
G	.91245			
J	.89555			
AI	.54545			
AA		-.92436		
AD		-.85210		
E		-.78960		
AF			-.94596	
P			-.92328	
Z				.65960

APPENDIX VI

TABLE 68: ELECTRONICS INDUSTRY - BIDDERS VS TARGETS

TIME PERIOD: 1982-1990

---- FACTOR ANALYSIS ----

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.84389	*	1	8.47321	22.3	22.3
B	.92373	*	2	5.71406	15.0	37.3
C	.95369	*	3	4.92574	13.0	50.3
D	.89392	*	4	3.68927	9.7	60.0
E	.74228	*	5	3.07856	8.1	68.1
F	.87458	*	6	2.43821	6.4	74.5
G	.96153	*	7	2.16206	5.7	80.2
H	.76567	*	8	1.85740	4.9	85.1
I	.63735	*	9	1.11534	2.9	88.0
J	.97228	*				
K	.96921	*				
L	.80756	*				
M	.56208	*				
N	.89651	*				
O	.89595	*				
P	.92094	*				
Q	.87172	*				
R	.94171	*				
S	.94974	*				
T	.97011	*				
U	.92238	*				
V	.96129	*				
W	.90239	*				
X	.83660	*				
Y	.85947	*				
Z	.95321	*				
AA	.81433	*				
AB	.93293	*				
AC	.85610	*				
AD	.96634	*				
AE	.96397	*				
AF	.68606	*				
AG	.91181	*				
AH	.94723	*				
AI	.79198	*				
AJ	.94316	*				
AK	.91045	*				
AL	.93967	*				

APPENDIX VI

---- PC ANALYSIS ----

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
W	.72507				
T	.71357	.59968			
AH	-.71144		.54504		
O	.70495	.54753			
N	.69509	.56175			
AE	.66669		-.46840		
Q	.62357				
AF	-.61319				
R	.60154		.49185		
Y	.59151	.50373			
C	.58792	-.47263	.45110		
A	.58158				
AC	.57435	.50922			
P	-.57289		.48745		-.45771
U	.49415	.67780			
B	.46689	-.62324			
AB		.61757	.46745		
D	.50667	-.61373			
X		.61351			
E		.59826			
H		.53005			
AA			.67378		
V	.51734		.60147	-.45568	
S	.50575		.56763	-.45303	
AI			.56012		
AL			-.52379		
Z			.47376	.43714	.46223
AD			.47116	.43415	.46520
G				.68763	
L				-.66242	
K				.64216	-.45525
J				.61415	-.47784
M				.57427	
F		.48958			.62848
AK					
I		-.46139			
AJ	.44638				
AG	.46349				

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
Q	-.41827			
AB	.45495			
X	.44944			
E				
H		.50938		
AL	.42750			.46387
Z			-.42808	
AK	.70829			
I	-.47150			
AJ		.59569		
AG		.59166		

APPENDIX VI

TABLE 69: ELECTRONICS INDUSTRY - NON TARGETS VS TARGETS

TIME PERIOD: 1982-1990

- - - - F A C T O R   A N A L Y S I S - - - -

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
A	.81008	*	1	9.31223	24.5	24.5
B	.95249	*	2	6.70884	17.7	42.2
C	.92511	*	3	4.33195	11.4	53.6
D	.95354	*	4	3.37291	8.9	62.4
E	.75873	*	5	2.81173	7.4	69.8
F	.91025	*	6	2.40212	6.3	76.2
G	.96226	*	7	2.07676	5.5	81.6
H	.74581	*	8	1.65996	4.4	86.0
I	.84155	*	9	1.28465	3.4	89.4
J	.97190	*				
K	.97099	*				
L	.79448	*				
M	.81295	*				
N	.91572	*				
O	.85318	*				
P	.93908	*				
Q	.89627	*				
R	.94020	*				
S	.95800	*				
T	.97072	*				
U	.95052	*				
V	.95055	*				
W	.91150	*				
X	.86208	*				
Y	.88820	*				
Z	.96469	*				
AA	.83930	*				
AB	.91838	*				
AC	.88270	*				
AD	.98145	*				
AE	.97321	*				
AF	.68220	*				
AG	.87694	*				
AH	.95279	*				
AI	.81045	*				
AJ	.91788	*				
AK	.87070	*				
AL	.84427	*				

APPENDIX VI

- - - - F A C T O R   A N A L Y S I S - - - -

Varimax Rotation 1, Extraction 1, Analysis 1 - Kaiser Normalization.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
AE	.91891				
AH	-.90347				
P	-.89988				
N	.78516				
U	.74246				
O	.70722			.51122	
AF	-.62711				
E	-.61230		.44869		
H	-.50623				
V		.95536			
S		.94644			
R		.93240			
W		.74230		.42660	
C		.73742			
A		.66517			
Q		.62566		.54495	
F			.79537		
I			.77445	-.42209	
D		.51636	-.74357		
B		.52437	-.73859		
M			.70446		
L			-.68030		
Y				.88174	
AC				.87139	
T	.56254			.76175	
J					.94559
K					.94103
G					.89286
G					.89286
AA	-.55513				

APPENDIX VI

	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
AD	.98209			
Z	.96829			
AI	.76013			
AA	.62230			
AJ		.92356		
AG		.86929		
AK			-.79449	
AL			-.73089	
X				.85531
AB			.46508	.75365

Altman, E. I., (1968), *Financial Ratios , Discriminant Analysis and the Prediction of Corporate Bankruptcy*, The Journal of Finance, September Vol. XXIII, No 4, pp. 589- 609.

Amihud Yakov, Peter **Dodd**, Mark **Weinstein** (1986), *Conglomerate Mergers, Managerial Motives and Stockholder Wealth*, Journal of Banking and Finance 10, pp. 401- 410.

Asquith Paul (1983), *Merger Bids, Uncertainty, and Stockholders Returns*, Journal of Financial Economics, 11, pp. 51- 83.

Asquith Paul , Robert F. **Bruner** and David W.**Mullins** Jr. (1983), *The Gains to Bidding Firms from Merger*, Journal of Financial Economics, 11, pp. 121- 139.

Baker H.Kent, Thomas O.**Miller** and Brian J.**Ramsperger** (1981), *A Typology of Merger Motives*, Akron Business and Economic Law Review, Winter , pp. 24- 29.

Barnes P., (1982), *Methodological Implications of Non-Normally Distributed Financial Ratios*, Journal of Business Finance and Accounting, pp. 51- 62.

Barnes Paul (1989), *The Prediction of Takeover Targets in the UK by means of multiple discriminant analysis*, Journal of Business Finance and Accounting, pp. 73- 84.

Bagnoli Mark , Roger **Gordon** and Barton L. **Lipman** (1989), *Stock Repurchase as a Takeover Defense*, The Review of the Financial Studies, Vol. 2, No. 3, pp. 423- 443.

Bartley Jon W. and Calvin M. **Boardman** (1990), *The Relevance of Inflation Adjusted Accounting Data to the Prediction of Corporate takeovers*, Journal of Business Finance and Accounting, Spring, pp. 53- 71.

Belkaoui, A. (1978), *Financial Ratios as predictors of Canadian Takeovers*, Journal of Business Finance and Accounting, pp. 93- 107.

Berkovitch Elazar and M. P. **Narayanan** (1990), *Competition and the Medium of Exchange in Takeovers*, The Review of Financial Studies, Vol. 3, No. 2, pp. 153- 174.

Bernstein Howard I. (1988), *Mergers and Acquisitions in the Food Processing Industry: The Taste of Success*, Cereal Foods World, Vol. 33, Part 12, pp. 982- 984.

Best William J. and Ron E. Seger (1989), *Synergy Benefits in Distribution: Easy to See, Harder to Get*, M&A Europe, November\ December, pp. 44- 49.

Billingsley, Randall S. and **Johnson**, Dana J.and **Marquette**, R. Penny (1988), *Bankruptcy Avoidance as a Merger Incentive*, Journal of Managerial Finance (UK), Vol. 14, Iss. 1, pp. 25- 33.

Block Stanley B. (1969), *The Effect of Mergers and Acquisitions on the Market Value of Common Stock* , Southern Journal of Business 4, October, pp. 189- 195.

Boag, David A. and **Dastmalchian**, Ali (1988), *Growth Strategies and Performance in Electronics Companies*, Journal Industrial Marketing Management, Vol. 17, Iss. 4, Nov., pp. 329- 336.

Borenstein Severin (1990), *Airline Mergers, Airport Dominance, and Market Power*, American Economic Review, Vol. 80, Iss. 2, pp. 400- 404.

Brannas, K (1986), *Prediction in a Duration Model*, Journal of Forecasting, Vol. 5, Iss. 2, pp. 97- 103.

Caudill- Sb (1988), *An Advantage of the Linear Probability Model over Probit or Logit*, Oxford Bulletin of Economics and Statistics, Vol. 50, Iss. 4, pp. 425- 427.

Chatterjee, Sayan (1992), *Sources of Value in Takeovers Synergy or Restructuring - Implications for Target and Bidder Firms*, Journal Strategic Management Journal, Vol. 13, Iss. 4, May, pp. 267- 286.

Clayton Ronnie J. and M. Andrew **Fields** (1991), *Prediction of Acquisition Candidates: Methodological Comparisons*, The Mid-Atlantic Journal of Business, Vol. 27, Number 3, December.

Cosh, A. D., **Hughes**, A., Lee, K., **Singh,** A. (1989), *Institutional Investment, Mergers and the Market for Corporate Control,* International Journal of Industrial Organization (Netherlands), Vol. 7, Iss. 1, pp. 73- 100.

Copeland Thomas E. and J. Fred **Weston** (1992), *Financial Theory and Corporate Policy*, Addison Wesley, Third Edition.

Cuthbertson Keith, Stephen G. **Hall and** Mark P. **Taylor** (1992), *Applied Econometric Techniques*, Harvester Wheatsheaf.

Dana J. Johnson and Ashok **Abbott** (August 1991), *Wealth Effects of Acquiring Financially Distressed Firms*, The Financial Review, Vol. 26, No. 3, pp. 275- 302.

Davidson, J. , D.F. **Hendry**, F, **Srba** and S. **Yeo** (1978), *Econometric modelling of the aggregate time series relationships between consumers expenditure and income in the United Kingdom*, Economic Journal, 88, pp. 661-92.

Dennis Child (1990), *The Essentials of Factor Analysis*, Cassell, Second Edition.

Deakin, E. B. (January 1976), *Distributions of Financial Accounting Ratios: Some Empirical Evidence*, The Accounting Review, pp. 90- 96.

Dietrich, J Kimball and E. **Sorensen** (1984), *An application of logit analysis to prediction of merger targets*, Journal of Business Research, pp. 393- 402.

Donald G. Margotta, (1989), *The Separation of Ownership and Responsibility in the Modern Corporation*, Journal Business Horizons, Vol. 32, Iss. 1, Jan/Feb., pp. 74- 77.

Dodd Peter (1980), *Merger Proposals, Management Discretion and Stockholder wealth* Journal of Financial Economics, June, pp. 105- 137.

Eckbo B. Espen (1983), *Horizontal Mergers, Collusion and Stockholder Wealth,* Journal of Financial Economics, 11, pp. 241- 273.

Eisenbeis Robert A. (1977), *Pitfalls in the application of Discriminant Analysis in Business, Finance, and Economics,* The Journal of Finance, Vol. XXXII, No. 3, June, pp. 875- 900.

Eisenbeis Robert A. and Robert B. **Avery**, *Discriminant Analysis and Classification Procedures*, Lexington Books, Massachusetts, DC Heath and Co.

Firth Michael (1976), *Share Prices and Mergers: A study of Stock Market Efficiency Saxon House* , D. C. Heath Ltd.

Firth Michael. (1979), *The Profitability of Takeovers and Mergers* , The Economic Journal ,89, June, pp. 316- 328.

Franks J. R., J. E. **Broyles**, M. J **Hecht** (1977), *An Industry study of the Profitability of Mergers in the United Kingdom*, The Journal of Finance, Vol. XXXII, No. 5, December, pp. 1513- 1525.

Frecka, T. J., and W. S. **Hopwood**, (January 1983), *The Effect of Outliers on the Cross Sectional Distributional Properties of Financial Ratios*, The Accounting Review, pp. 115- 128.

Gart, Alan (1990), *Leveraged Buyouts: A Re-Examination*, Journal Advanced Management Journal, Vol. 55, Iss. 3, Summer 1990, pp. 38- 46.

Gaugham Patrick A.(1991), *Mergers & Acquisitions*, HarperCollins Publishers.

Greene William H. (1993), *Econometric Analysis,* Macmillan Publishing Company.

Giammarino Ronald M. and Robert L. **Heinkel** (1986), *A Model of Dynamic Takeover Behavior*, The Journal of Finance, Vol. XLI, No. 2, June, pp. 465- 480.

Gregg A. Jarrell and Annette B. **Poulsen** (Autumn 1989), *The Returns to Acquiring Firms in Tender Offers: Evidence from Three Decades*, Financial Management, pp. 12- 19.

Griffin, James M. and **Wiggins**, Steven N.(1992), *Takeovers Managerial Incompetence or Managerial Shirking?*, Journal Economic Inquiry, Vol. 30, Iss. 2, Apr., pp. 355- 370.

Gressle Mark (1989), *How Corporate Restructuring can create value for 1992*, M&A Europe, January/February, pp. 37- 43.

Gujarati Damodar N. (1988), *Basic Econometrics*, Second Edition, McGraw-Hill International Editions.

Hancock G. D. and M. **Mougoue** (1991), *The Impact of Financial Factors on Proxy Contest Outcomes*, Journal of Business Finance & Accounting, 18(4), pp. 541- 551.

Harris Robert S., John F. **Stewart** ,and Willard T. **Carleton** (1982), *Financial Characteristics of Acquired Firms Mergers and Acquisitions*: Michael Keenan and Lawrence J. White- Lexington Books) pp. 223- 241.

Haugen Robert A. and Terence C. **Langetieg** (1975), *An Empirical Test for Synergism in Merger*, The Journal of Finance- Vol. XXX., No. 4- September.

Hannan, Timothy H., **Rhoades**, Stephen A. (1987), *Acquisition Targets and Motives: The Case of the Banking Industry*, Journal Review of Economics & Statistics (Netherlands), Vol. 69, Iss. 1, Feb., pp. 67- 74.

Harman Harry H. (1976), *Modern Factor Analysis*, The University of Chicago Press, Third Edition.

Hasbrouck Joel (1985), *The Characteristics of Takeover Targets*, Journal of Banking and Finance , 9, pp. 351- 362.

Hunter, William C., **Wall**, Larry D.(1989), *Bank Merger Motivations: A Review of the Evidence and an Examination of Key Target Bank Characteristics*, Journal of Economic Review (Federal Reserve Bank of Atlanta), Vol. 74, Iss. 5, Sep/ Oct, pp. 2- 19

Hisham Fadel (1977), *The Predictive Power of Financial Ratios in the British Construction Industry*, Journal of Business Finance and Accounting, 4, 3, pp. 339-351.

Hodes Robert B. (1971), *The merger boom- An American view,* Journal of Business Finance, Vol. 3, No.3, pp. 6- 12.

Holl P. and **Pickering** J.F. (1991), *Takeovers and other influences on economic performance: A plant level analysis*, Applied Economics, 23, pp. 1779- 1788.

Hogarty Thomas (1970), *The Profitability of Corporate Mergers*, The Journal of Business, Vol. 43, July, pp. 317- 327.

Jensen Michael C. and Richard S. **Ruback** (1983), *The Market for Corporate Control: The Scientific Evidence*, Journal of Financial Economics ,11, pp. 5- 50.

Kelly Eamon M. (1967), *The Profitability of Growth Through Mergers*, Center for Research of the College of Business Administration, The Pennsylvania State University.

Gressle Mark (1989), *How Corporate Restructuring can create value for 1992*, M&A Europe, January/February, pp. 37- 43.

Gujarati Damodar N. (1988), *Basic Econometrics*, Second Edition, McGraw-Hill International Editions.

Hancock G. D. and M. **Mougoue** (1991), *The Impact of Financial Factors on Proxy Contest Outcomes*, Journal of Business Finance & Accounting, 18(4), pp. 541- 551.

Harris Robert S., John F. **Stewart** ,and Willard T. **Carleton** (1982), *Financial Characteristics of Acquired Firms Mergers and Acquisitions*: Michael Keenan and Lawrence J. White- Lexington Books) pp. 223- 241.

Haugen Robert A. and Terence C. **Langetieg** (1975), *An Empirical Test for Synergism in Merger*, The Journal of Finance- Vol. XXX., No. 4- September.

Hannan, Timothy H., **Rhoades**, Stephen A. (1987), *Acquisition Targets and Motives: The Case of the Banking Industry*, Journal Review of Economics & Statistics (Netherlands), Vol. 69, Iss. 1, Feb., pp. 67- 74.

Harman Harry H. (1976), *Modern Factor Analysis*, The University of Chicago Press, Third Edition.

Hasbrouck Joel (1985), *The Characteristics of Takeover Targets*, Journal of Banking and Finance , 9, pp. 351- 362.

Hunter, William C., **Wall**, Larry D.(1989), *Bank Merger Motivations: A Review of the Evidence and an Examination of Key Target Bank Characteristics*, Journal of Economic Review (Federal Reserve Bank of Atlanta), Vol. 74, Iss. 5, Sep/ Oct, pp. 2- 19

Hisham Fadel (1977), *The Predictive Power of Financial Ratios in the British Construction Industry*, Journal of Business Finance and Accounting, 4, 3, pp. 339-351.

Hodes Robert B. (1971), *The merger boom- An American view,* Journal of Business Finance, Vol. 3, No.3, pp. 6- 12.

Holl P. and **Pickering** J.F. (1991), *Takeovers and other influences on economic performance: A plant level analysis*, Applied Economics, 23, pp. 1779- 1788.

Hogarty Thomas (1970), *The Profitability of Corporate Mergers*, The Journal of Business, Vol. 43, July, pp. 317- 327.

Jensen Michael C. and Richard S. **Ruback** (1983), *The Market for Corporate Control: The Scientific Evidence*, Journal of Financial Economics ,11, pp. 5- 50.

Kelly Eamon M. (1967), *The Profitability of Growth Through Mergers*, Center for Research of the College of Business Administration, The Pennsylvania State University.

Kemp Gordon C.R. (1995), *Structural Stability Analysis in Duration Models,* Department of Economics, University of Essex, Unpublished paper, February 1995.

Kim Jae- On and Charles W. **Mueller** (1991), *Introduction to Factor Analysis: What it is and How to do it,* Sage University Paper, Series: Quantitative Applications in the Social Sciences, Sage Publications.

Klecka William R. (1980), *Discriminant Analysis,* Series: Quantitative Applications in the Social Sciences, Sage University Paper, Bevery Hills, London .

Kmenta Jan (1990), *Elements of Econometrics,* Maxwell Macmillan International Editions, Second Edition.

Komis Stelios (1992), *The Prediction of Takeover Targets in UK using Probit and Logit approach,* Paper presented in BAA ICAEW Doctoral Colloquium for Accounting and Finance held at Brunel University.

Kuehn Douglas (1975), *Takeovers and the Theory of the Firm : An Empirical Analysis for the United Kingdom 1957-69,* The Macmillan Press Ltd.

Laurent C. R. (1979), *Improving the Efficiency and Effectiveness of Financial Ratio Analysis,* Journal of Business Finance and Accounting, 6, 3, pp. 401- 413.

Langetieg Terence C. (1978), *An Application of a three-factor performance index to measure stockholder gains from merger,* Journal of Financial Economics, 6, pp. 365- 383.

Lardaro Leonard (1993), *Applied Econometrics,* Harper Collins.

Lawley D. N. and A. E. **Maxwell** (1971), *Factor Analysis as a statistical Method,* Butterworths, Second Edition.

Lev, B. and S. **Sunder**, (December 1979), *Methodological Issues in the Use of Financial Ratios,* Journal of Accounting and Economics, pp. 187- 210.

Lichtenberg Frank R., Donald **Siegel** (1990), *The Effects of leveraged buyouts on productivity and related aspects of firm behavior,* Journal of Financial Economics, 27, pp. 165- 194.

Maddala G. S. (1991), *A Perspective on the Use of Limited-Dependent and Qualitative Variables Models in Accounting Research,* The Accounting Review , Vol. 66, No. 4, October, pp. 788- 807.

Maddala G. S. (1992), *Introduction to Econometrics,* Macmillan, Second Edition.

Maddala G. S. (1983), *Limited- Dependent and Qualitative Variables in Econometrics* Econometric Society Monographs (No.3) , Cambridge University Press.

Manne Henry G. (1965), *Mergers and the Market for Corporate Control*, Journal of Political Economy, April , pp. 110- 120.

Malatesta Paul H. (1983), *The wealth effect of merger activity and the objective functions of merging firms*, Journal of Financial Economics 11, pp. 155- 181.

Maurise O. Joy and John O. **Tollefson** (1975), *On the Financial Applications of Discriminant Analysis*, Journal of Financial and Quantitative Analysis, December, pp. 723- 739.

Melicher Ronald W. and Thomas R. **Harter** (1972), *Stock Price Movements of Firms Engaging in Large Acquisitions* , Journal of Financial and Quantitative Analysis, March, pp. 1469- 1475.

Meador, Joseph W., **Madden**, Gerald P., **Johnston**, David J. (1986), *On the Probability of Acquisition of Non-Life Insurers*, Journal of Risk & Insurance, Vol. 53, Iss. 4, Dec., pp. 621- 643.

Monroe Robert J. (1973), *Comment: Financial Characteristics of Merged Firms: A Multivariate Analysis* , Journal of Financial and Quantitative Analysis, March, pp. 163- 165.

Morley Michael F. , *Ratio Analysis*, Published for The Institute of Chartered Accountants of Scotland, by Gee & Co (Publishers) Limited.

Palepu Krishna G. (1990), *Consequences of leveraged buyouts*, Journal of Financial Economics, 27, pp. 247- 262.

Palepu Krishna G. (1986), *Predicting Takeover Targets: A methodological and empirical analysis*, Journal of Accounting and Economics, 8, pp. 3- 35.

Pastena Victor and William **Ruland** (1986), *The Merger/Bankruptcy Alternative* , The Accounting Review, April, pp. 288- 301.

Penrose Edith T.(1980), *The Theory of the Growth of the Firm*, Oxford, Basil Blackwell, Second edition.

Pettway Richard H. and Takeshi **Yamada** (1986), *Mergers in Japan and their Impacts upon Stockholders' Wealth*, Financial Management, Vol. 15, Number 4, Winter, pp. 43- 52.

Pickens T. Boone Jr. (1985), *A Stockholder's view of mergers and acquisitions*, Chemtech, Vol. 15, Part 11, pp. 648-649.

Post Alexandra M. (1994), *Anatomy of a Merger*, Prentice-Hall.

Rege Udayan P. (Autumn 1984), *Accounting Ratios to Locate Takeover Targets*, Journal of Business Finance and Accounting , pp. 301- 311.

Roll Richard (1986), *The Hubris Hypothesis of Corporate Takeovers*, Journal of Business, Vol. 59, No. 2, pp. 197- 216.

Ruback Richard S. (1983), *Assessing Competition in the Market for Corporate Acquisitions*, Journal of Financial Economics, 11, pp. 141- 153.

Schipper Katherine and Rex **Thompson** (1983), *Evidence on the Capitalized value of merger activity for acquiring firms*, Journal of Financial Economics, 11, pp. 85- 119.

Seymour, Tim (1986), *Avoid Becoming a Takeover Target*, Journal Accountancy (UK) Vol. 98, Iss. 1120, Dec., pp. 82- 85.

Seyhum H. Nejat (1990), *Do Bidder Managers Knowingly Pay Too Much for Target Firms?*, Journal of Business, Vol. 63, No. 4, pp. 439- 464.

Shrieves Ronald E. and Mary M. **Pashley** (1984), *Evidence on the Association Between Mergers and Capital Structure*, Financial Management , Autumn, pp. 39- 48.

Shick Richard A. (1972), *The Analysis of Mergers and Acquisitions*, The Journal of Finance , May, pp. 495- 502.

Shrieves Ronald E. and Donald L. **Stevens** (1979), *Bankruptcy Avoidance as a Motive for Merger*, Journal of Financial and Quantitative Analysis, Vol. XIV, no.3, September, pp. 501- 515.

Simkowitz Michael and Robert J. **Monroe** (1971), *A Discriminant Analysis Function for Conglomerate Targets*, The Southern Journal of Business

Singh Ajit (1971), *Take-overs :Their Relevance to the Stock Market and the Theory of the Firm,* Cambridge University Press, University of Cambridge, Monographs: 19.

Singh Ajit (January 1992), *Regulation of Mergers in the US and the UK: A New Agenda* University of Cambridge, Working Paper No: 9207.

Singh Ajit (December 1991), *Corporate Takeovers: A Review*, University of Cambridge, Working Paper No: 9206.

Smith Abbie J. (1990), *Corporate ownership structure and performance: The case of management buyouts*, Journal of Financial Economics, 27, pp. 143- 164.

Stacey Nicholas A. H. (1970), *Mergers in Modern Business*, Hutchinson & Co (Publishers) Ltd, Second Edition.

Stevens Donald (March 1973), *Financial Characteristics of Merged Firms: A Multivariate Analysis*, Journal of Financial and Quantitative Analysis, pp. 149- 158.

Stern Joel M. and Donald H. **Chew**, Jr. (1987), *The Revolution in Corporate Finance*, Basil Blackwell.

Steiner Peter O., *Mergers: motives, effects, policies,* Ann Arbor, University of Michigan Press

Studenmund A. H. (1992), *Using Econometrics: A Practical Guide*, Harper Collins Publishers.

Sullivan Michael J., Pamela P. **Peterson** and David R. **Peterson** (1990), *Two-Stage Acquisitions, Free- Riding, and Corporate Control,* The Financial Review, Vol. 25, No. 3, August, pp. 405-419.

Taqi S. J. (1991), *Catching Shadows: Success and Failure in the Search for Synergies,* M&A Europe, May/June, pp. 24- 37.

Tzoannos J. and J. M. **Samuels** (1972), *Mergers and Takeovers: The financial characteristics of companies involved,* Journal of Business Finance, Vol. 4, no.3, pp. 5- 16.

Trautwein Friedrich (1990), *Merger Motives and Merger Prescriptions*, Strategic Management Journal, Vol. 11, pp. 283- 295.

Vance Jack O. (1969), *Is your company a take-over target?*, Harvard Business Review , May-June , pp. 93- 98

Van Horne James C. (1983), *Financial Management and Policy*, Prentice/ Hall International editions, Sixth edition.

Watson, Collin J. (1990), *Multivariate Distributional Properties, Outliers, and Transformation of Financial Ratios*, Journal Accounting Review, Vol. 65, Iss.3, July, pp. 682- 695.

Walter, Gordon A., **Barney,** Jay B. (1990), *Management Objectives in Mergers and Acquisitions*, Journal Strategic Management Journal (UK), Vol. 11, Iss. 1, Jan., pp. 79- 86.

Wansley James W. and **William** R. Lane (1983), *A Financial Profile of Merged Firms*, Review of Business and Economic Research, Fall, pp. 87- 98.

Wansley James W., Rodney L. **Roenfeldt** and Philip L. **Cooley** (1983), *Abnormal Returns from Merger Profiles*, Journal of Financial and Quantitative Analysis, Vol. 18, No. 2, June, pp. 149- 162.

Wansley James W. (1984), *Discriminant Analysis and Merger Theory*, Review of Business and Economic Research, (Fall) , pp. 76- 85.

Weston J. Fred , Kwang S. **Chunk** and Susan E. **Hoag** (1990), *Mergers, Restructuring, and Corporate Control* , Prentice-Hall International Editions.

Whittington Geoffrey (1980), *Some Basic Properties of Accounting Ratios*, Journal of Business Finance and Accounting, 7, 2, pp. 219- 232.