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DETERMINANTS AND DYNAMICS OF CAPITAL STRUCTURE IN THE UK: A METHODOLOGICAL COMPARISON APPROACH

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ABSTRACT

Despite considerable theoretical progress, the understanding of the determinants of a firm's capital structure remains incomplete and there are still numerous empirical issues to be resolved. The number of determinants of capital structure identified by theoretical reasoning keeps increasing, and as a result their analysis has become more and more complex. The primary contribution of this thesis is to provide some empirical tests of hypotheses suggested by theoretical models and reasoning. In the search for the most important determinants of capital structure, this study uses a panel of 651 listed UK firms (9,486 firm-year observations) to compare structural equation modelling (SME) and OLS-regression methodologies in both its cross-sectional and dynamic analyses. In addition, the study uses a set of implied gearing ratios to disentangle the impact of equity market timing behaviour from that of stock returns on capital structure. The evidence shows that, following an increase in stock returns, managers of UK firms issue more equity despite the fall in the debt-equity ratio and the consequent increase in debt carrying capacity. This practice has a statistically significant impact on capital structure, as UK firms do not appear to re-adjust their gearing thereafter. The study reveals that stock returns are the most important capital structure determinant. Though the effects of other firm-specific characteristics and equity market timing are persistent and statistically significant, compared to the stock returns effect, their economic role is negligible. Stock returns drive gearing mechanistically for a long time, up to ten years. The findings imply that managers do not strive to adjust their capital structure towards some optimal debt ratio. This casts doubt on theories that advocate a degree of optimisation like the static trade-off theory of capital structure.

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List of Abbreviations used

ACT - Advance corporation tax

ADE - Actual (observed) book debt-to-equity ratio

ADR - Actual debt-to-capital ratio (D/(D+E) with equity measured in market value)

APR - Absolute priority rule

APT - Arbitrage Pricing Theory

CFA - Confirmatory factor analysis

DIP - Debtor-in-possession

EFA – Explanatory Factor Analysis

F-M - Fama-Macbeth statistics i.e. yearly averages of cross-sectional statistics

FRS - (UK's) financial reporting standards

GMM - Generalised Method of Moments

ID/E - Inert book debt-to-equity ratio

IDR - Implied debt-to-capital ratio, with equity measured in market value

IPO – Initial Public Offerings

LISREL - Linear structural relationships (a structural equation modelling software)

MTB – Market-to-book ratio

NDTS – Non-debt tax shields

NeI – Net equity issues (changes) net of changes in retained earnings

OIiT – Operating income less interest expense less taxes (a direct measure of non-debt tax shields)

SEM – Structural equation modelling

SEM-DYNAMICS – A structural equation model used in the analysis of capital structure dynamics in this study.

SEO – Seasonal equity offerings

SEPath – Structural equation path (a structural equation modelling software similar to LISREL that has been used in this study).

SIGOIS – Standard deviation of operating income divided by sales

SIGOITA - Standard deviation of operating income divided by total assets

SSAP – (UK's) Statement of standard accounting practice

WACC – Weighted average cost of capital

Z-score – Altman's Z-Score used to predict probability of bankruptcy

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Chapter 1

1 NTRODUCTION

1.1 Research problem

The use of debt financing remains an area of interest in corporate finance literature; numerous hypotheses have been developed about the choice to finance some of the company's activities with debt and the implications of the choice. The testing of these hypotheses and related modelling has enabled the theory of corporate capital structure decisions to make a considerable progress since the pioneering works by Modigliani and Miller (1958, 1963). The relaxation of the perfect and complete markets assumptions embedded in Modigliani and Miller's irrelevance propositions ushered the search for the imperfections that could render one capital structure better than another.

Although Miller's (1977) analysis showed that the effects of personal taxes can offset the corporate tax advantage of debt, taking the theory back to the Modigliani and Miller (1958) irrelevance propositions, the extensions to his model and departures from these earlier works, show that capital structure choice may be relevant to a firm's value, suggesting the existence of an optimal capital structure. For example De Angelo and Masulis (1980) extended the analysis of taxes effects on debt by incorporating the non-debt tax shields in their analysis. They found that the substitution effect, between the level of non-debt tax shields and the tax benefit, provided a rationale for the existence of the optimal capital structure.

Jensen and Smith (1985), Smith (1986), and Barclay *et al.*, (1999) among others, provide empirical evidence to show how the stock market responds systematically to issues of debt and/or equity by a firm. Whether these responses reflect the fact that the issuing firm is moving towards (or away from) their optimal gearing, or whether the responses simply signals important information about a firm's future prospects, is still debatable (see Jensen, 1986, p.325, and Pinegar and Wilbricht, 1989, pp. 82-83). These responses, not only result in alterations of capital structure, but also influence the value of a firm. However, as Bradley *et al* (1984) argue, the upshot of these extensions has been the recognition that the existence of an optimal capital structure is essentially an empirical question that considers the issue as to whether or not the various leverage-related costs are economically significant enough to influence the costs of corporate borrowing.

There has also been a burgeoning theoretical literature that attempts to explain the variation in debt ratios across firms without using tax considerations (see Harris and Raviv, 1991; and Israel, 1992 among others). These theories suggest that firms select capital structures depending on attributes that determine the various costs and benefits associated with debt and equity financing (Titman and Wessels, 1988). As Rajan and Zingales (1995) point out, theory has clearly made some progress on the subject. However, Titman and Wessels (1988) raise a concern that empirical work in this area has lagged behind the theoretical research.

Not only has the empirical work on determinants of capital structure lagged behind the theoretical research worldwide, but also in the UK there is a dearth of such studies. While the U.S. boasts of scores of such studies from late sixties onwards, in the UK only a few studies have been undertaken. This was the case in 1980s (see Marsh, 1982), and it is still the case to date (see Ozkan, 2001, p. 179). One of the earliest UK studies was that of Marsh (1982). Marsh (1982) summarised a number of prior cross-sectional studies on determinants of capital structure, and postulated that at the time of his research there was support that *business risk, firm size,* and *asset composition* exerted the hypothesized influence on gearing decisions. In the same synthesis of prior literature, Marsh also suggested that the significant industry effect in gearing documented by Schwartz and Aronson (1967) among others might simply be a mere reflection of systematic industry differences in asset composition, risk, and other variables.

A subsequent UK study by Bennett and Donnelly (1993) found that asset structure, and firm size, do affect capital structure in the manner suggested by the 'trade off' theory of capital structure. In addition they document that *non-debt tax shields*, and *past profitability* were both negatively related to gearing, though their results did not provide significant evidence for growth as a determinant of capital structure (see also section 4.9 in this study). Their study provided more significant results for market rather than book value gearing ratios. Bennett and Donnelly also reported that industrial classification explains a significant cross-sectional variation in capital structure of UK firms. However, their findings that earnings volatility is positively related to gearing was both counter intuitive and inconsistent with the theory which suggests that risky firms are more likely to avoid the use of higher levels of debt. Neither did they investigate whether the cross-sectional variation in debt ratios among different industries was due to business risk or due to asset structure as postulated by the theory (see for example Marsh (1982) discussed above; and Kale *et al*, 1991, among others).

Another interesting study was an international study by Rajan and Zingales (1995) in which UK was included only as a component. Apart from investigating the levels and determinants of capital structure in the G-7 countries, the study also examined institutional differences among these countries. Their cross-sectional evidence suggested that *growth prospects* (proxied by market-to-book ratio), and profitability are negatively related to gearing while company size, and tangibility were found to be positively related to gearing in the UK. Bevan and Danbolt (2002) replicated the Rajan and Zingales (1995) study and found almost the same results, except that the tests for tangibility had conflicting results depending on the definition of gearing used. Tangibility generated a positive relationship with the ratio of total debt to total assets. Tangibility however, yielded a significant negative relationship with the ratio of non-equity liabilities to total assets.

Varela and Limmack (1998) examined 112 UK firms for 20 years (1967-1986) in a bid to establish the existence of any industry effect and found that if the industry effect exists it is weak. More recently Ozkan (2001) has also contributed to this body of research. He found that growth opportunities, non-debt tax shields, *current profitability,* and *liquidity* exert a negative influence on gearing. However, he found only limited evidence that size exerts a positive influence on gearing, and surprisingly, he found that past profitability exerts a positive influence on gearing (see also section 4.9). Ozkan's investigations into the dynamics of capital structure suggests that firms have target leverage ratios and that firms adjust to the target ratio relatively quickly.

Findings from previous research on the determinants of capital structure (from both UK studies and similar empirical studies done elsewhere) can therefore be summarized as follows. First, there exists persuasive evidence that size exerts a positive influence on gearing. Secondly, there exists some evidence, albeit weak in some cases, that tangibility is positively related to gearing. Thirdly, in the UK as elsewhere, the evidence as to whether business (operating) risk is negatively related to gearing as the dominant theory predicts is inconclusive. Bennett and Donnelly (1993) who consider the relationship find, as noted earlier, the evidence supporting a somewhat surprisingly, positive relation between earnings volatility and gearing.

When it comes to growth opportunities, negative relationship between growth and gearing outweighs evidence to the contrary. Fifthly, the two studies, which tested for industry classification, one study documents a significant industry effect, while the other reports rather weak evidence. Profitability, the sixth determinant tested in UK studies, just like studies conducted elsewhere (see section 2.6.2.8, 4.8.8, and 4.9) is not found to exert a consistent influence on capital structure. The two studies, which did not separate between past and current profitability, reported a negative relation consistent with the dominant theory (the pecking order theory).

Other studies, which made attempts to distinguish past from current profitability, also have interesting results; some reported a negative relation between past profitability and gearing. Others report a negative relationship between current profitability and gearing but a positive relationship between past profitability and gearing. These findings are the opposite of the expected relationships in the basic theory. It has also been found that liquidity is negatively related to gearing. Inconsistencies in these previous studies are worth re-examining.

The factors, which have been examined by UK studies, are therefore limited to the following i.e. tangibility, business risk, size, growth opportunities, industry influence, profitability, and liquidity. Among the factors included in empirical studies in other countries are *uniqueness,* and *cash holdings.* These factors have not been tested in previous studies using UK companies' data. In addition to providing a further assessment of the role of the factors we have discussed, this thesis reports the results of tests of these two determinants for the first time in the UK (see sections 4.8.5, 4.8.10, 4.12.4 and 4.12.9).

Although there have been numerous references and echoes in the literature about *free cash flow* and the *probability of bankruptcy,* no rigorous empirical analysis regarding these hypothesised determinants has been developed. This study carries out empirical tests on these two determinants by introducing a new proxy for probability of bankruptcy in capital structure research (see sections 2.6.2.9, 4.8.9, and 4.12.8). A rigorous test on free cash flow hypothesis is conducted in order to validate Jensen's 1986 free cash flow theory (see sections 2.6.2.10, 4.8.10, and 4.12.9).

Most previous UK studies have used conventional regression estimates in their analysis of determinants of capital structure. Conventional regression analysis has been criticised for failing to recognise and mitigate measurement errors and other econometric problems that arise in studies involving estimation of latent variables (see Titman and Wessels, 1988). Such problems include ignoring measurement errors in exogenous variables; failing to accommodate models that include *latent variables, reciprocal causation* among variables, and *interdependence* among variables, and failing to include more than one indicator for a latent variable (see Titman and Wessels, 1988; and Chiarella, et al.,1992).

The UK studies summarised above have tended to focus on the cross-sectional variations in gearing, the exceptions being Marsh (1982), and Ozkan (2001). With the exception of Ozkan (2001), there is no other UK study since Marsh's (1982) analysis of the choice of financing between debt and equity more than twenty years ago that has focused on the dynamics of capital structure adjustments. Because Marsh's analysis looked at '...how companies actually select between financing instruments at a given time' (Marsh, 1982, p.121), Ozkan (2001) might have been the first to examine capital structure adjustment process in the UK.

The lack of empirical work on the determinants and the dynamics of capital structure in the UK can be attributable to a number of reasons. First, as Titman and Wessels (1988) put it, the relevant attributes theorised to affect capital structure are usually expressed in fairly abstract concepts not directly observable. Secondly, as argued by Rajan and Zingales (1995), there is lack of consistent accounting and market information outside the U.S.; although it is noteworthy to mention that this is only relevant reason for an international study like theirs, which compares ratios from different countries. For this study the existence of consistent market and accounting information within the UK is sufficient.

Finally, there seems to exist a complacency by some researchers that the UK and the U.S.A exhibit more or less the same economic and financial environment, and it is assumed that the findings of studies carried out in the U.S also apply to the UK. For example Kaplan (1997) points out similarities in corporate governance styles and institutional arrangements between UK and the United States. Similarly, Rajan and Zingales (1995) wonder as to why firms in countries like UK and the United States, with similar capital markets and financial institutions, have different gearing levels.

Previous empirical studies have provided evidence that differences do exist between the UK and the US. Rajan and Zingales (1995) find that when it comes to leverage levels in G-7 countries, U.K. firms are on average significantly less geared than U.S firms, and they also dismiss the classification which uses "bank-oriented" and "market-oriented countries" when dealing with capital structure issues. Bevan and Danbolt (2002) have argued that the determination and levels of capital structure in the U.K. depend on which component of capital structure a researcher is using. They further document that 'trade credit and equivalent' is a significant component of financing for UK companies and must be taken into account when analysing capital structure in the UK. It has also been documented (see Franks *et al* (1996), Kaiser (1996), and Rajan and Zingales (1995), Wald, 1999; and Panno,2003) that institutional differences like tax systems, ownership structures, the role of banks, and bankruptcy codes' orientation, between U.S. and UK are likely to impact on capital structure decisions.

In addition to the dearth of empirical works on capital structure dynamics in the UK, where empirical work in the determinants of capital structure has been undertaken elsewhere, the results are contradictory. For example while both Bradley *et al* (1984) and Titman and Wessels (1988) do not find evidence to support the theory of substitutability between non-debt and debt tax shields which is advocated by De Angelo and Masulis (1980), Givoly *et al* (1992), and Chiarella *et al* (1992) find that there is a substitution effect between debt and non-debt tax shields. Generally the results of a number of U.S studies like Bradley *et al*, (1984) Castanias (1983), Long and Malitz (1985), Titman and Wessels (1988), and Kale *et al* (1991) report evidence of a negative relation between earnings volatility and gearing. To the contrary, a UK study, Bennett and Donnely (1993), document a positive relation between earnings volatility and gearing. See Harris and Raviv (1991) and the literature review in this study for more contradictions, few of which have been resolved.

The absence of rigorous tests of some hypothesised determinants of capital structure (such as the probability of bankruptcy, cash holdings and free cash flows, etc.), the results of previous UK studies cited above, the existence of significant institutional differences between the U.S. and the UK (as discussed in chapter three), and the contradictory findings in previous empirical studies worldwide (discussed above and subsequently in the literature review in section

2.6 and in chapters six and seven), provided the impetus for this study. This study first tests a broader set of attributes, which have been theorised to affect capital structure decisions. Some of the attributes either have not been tested at all or have not been tested in the way they are tested here (for example probability of bankruptcy, and free cash flow hypothesis). Some of the attributes have not been tested in the UK (for example, uniqueness, cash holdings and free cash flow). Ozkan (2001) tests liquidity, but falls short of testing free cash flow. For those attributes that have been tested by previous studies using conventional regression, this study uses an alternative methodology (structural equation modelling) to test them.

First the study synthesizes the theory regarding capital structure determinants and takes the theory further by empirically examining both the determinants, and the newly suggested firm behaviour patterns (capital structure dynamics) in relation to financing decisions in UK firms. First, a rigorous analysis of industry effects on gearing over time is carried out. The cross-sectional analysis part is carried out using a relatively new and innovative methodology (Structural Equation Modelling, (SEM)), which improves the estimation procedure and mitigates measurement and specification errors inherent in conventional regression models. The results from this approach are then compared with the conventional regression estimates to determine their relative superiority and suitability.

The last part of this study investigates the dynamics of capital structure decisions i.e. how does capital structure change over time in relation to changes in the hypothesised determinants. On this, the study investigates whether managers actually adjust their firm's capital structure towards an optimal (target) ratio, and also whether 'equity market timing' (see Jung *et al*, 1996; Baker and Wulger, 2002, Hovakimian, et al (2003), Bevelander, 2002, and Kayhan and Titman, 2003), and share price movements (see Welch, 2002, 2004; and Kayhan and Titman, 2003) have any long-term impacts on capital structures of UK companies. No previous UK study has delved into the last two issues i.e. 'equity market timing' and 'share price movements' as determinants of capital structure.

1.2 Motivation

The motivation for carrying out this research came from the quest for understanding how corporations go about making financing decisions. Contradictory findings, different measurements of proxy variables, and the use of different methodologies found in prior studies, also motivated this research. The use of UK Company data was prompted by lack of a comprehensive empirical analysis in the UK, as discussed in the previous section. Two different methodologies were used on the same sample in order to assess whether the contradictory results could be explained by the use of different methodologies. Research in the area of capital structure determinants has followed one of the following three approaches. The first approach is theoretical modelling where subject to some assumptions (whether explicit or implicit), and the chosen hypothesised determinants of capital structure, the modeller derives a model which s(he) believes to represent how a firm would behave.

One of the weaknesses of modelling approach is that it depends wholly on the modeller's choice of what to model. For example Miller (1977) restricted his model to corporate and personal taxes (after assuming that bankruptcy costs are trivial), and used these to re-emphasize the irrelevance of a firm's capital structure. Subsequently, De Angelo and Masulis (1980) added non-debt tax shields to the miller model, and on the basis of their resulting model, they concluded that it is possible for a firm to have an optimal capital structure. Although the assumptions made by theoreticians simplify the analysis and make it possible for readers to follow the models, these assumptions oversimplify the environment within which corporate finance decision are made. In short, the assumptions and/or the choice of which determinants to model differ with modellers and that may have a bearing on the validity of the model.

The second approach has been to carry out surveys (i.e. questionnaire and interviews), which involves collecting primary data by asking managers how they go about making actual financing decisions (see Remmers *et al.*, 1974; Stonehill *et al.*, 1975, Ang *et al.*, 1997, Pinegar and Wilbricht, 1989, and Graham and Harvey (2001) among others). While this seems to be a direct approach, which may give direct answers, it is also prone to some shortcomings. One such shortcoming is that the persons responding may not be the actual decision makers. In addition, (assuming they give honest responses) the respondents may provide what they think should be the answers, rather than what is actually happening in their firms. This may not reflect their financing policies (see Pinegar and Wilbricht, 1989, p.84).

The third approach in this area of research has been empirical analysis using available secondary data, usually from credible databases. Following this approach the researcher carries out analysis on the data to establish relationships and patterns that may support or refute predetermined hypotheses. Because empirical analysis makes an objective assessment of what the managers do, as reflected in the recorded data, the approach was used in this study in order to bridge the gap between what is actually happening on one hand and what both theoretical modelling and results of surveys imply on the other.

In summary this study carries out a comprehensive empirical analysis in order to establish what the determinants of capital structure are. First a cross-sectional analysis is conducted and then a dynamic approach is used. Under cross-sectional analysis, the study starts with the investigation of the extent to which industry characteristics influence capital structure. The study also examines whether industry influence in capital structure is related to the level of business risk a firm or an industry has. The industry analysis culminates in an investigation of the persistence of inter-industry capital structure differences. For comparison purposes the study employs two methodologies in the investigation of other cross-sectional determinants such as tangibility, non-debt tax shields, growth opportunities, uniqueness, firm size, volatility of earnings, profitability, probability of bankruptcy, and cash holdings. The two methodologies are the traditional (conventional) OLS-regression and structural equation modelling (SEM). The free cash flow hypothesis (Jensen, 1986) is also tested.

The analysis of the dynamics of capital structure starts with tests to establish whether firms adjust their capital structure towards an optimal ratio. The target capital structure adjustment models incorporate interest rates and corporate taxes in addition to the hypothesised determinants of capital structure mentioned in the preceding paragraph. This is because the interest rates and corporate taxes can be meaningfully analysed in a dynamic context. The dynamic analysis also employs two methodologies mentioned in the preceding paragraph. The dynamics part also attempts to disentangle the effects of equity market timing from the effects of stock returns on capital structure. The final all-inclusive dynamic model incorporates the effects of stock returns, the effects of equity market timing, a capital structure adjustment proxy, and the four most important firm-specific characteristics. These firm specific characteristics are profitability, firm size, growth opportunities, and non-debt tax shields. The purpose of the all inclusive dynamic model is to put in perspective the relative importance of stock returns, equity market timing, and the firm specific characteristics as determinants of gearing ratios.

1.3 Research significance

The study intends to extend our knowledge of the determinants of corporate capital structure choice by using companies' panel data from the UK. Given its economy's size of £943 billion gross domestic product (GDP), its history and London's position as a leading financial centre, the UK provides an appropriate environment to undertake such a study.[1] UK is among the G-7 (rich countries), in fact it is the world's 4th largest economy after the U.S., Japan, and Germany; and the similarity of financial markets operations and of some institutional framework between UK and the U.S., make UK a suitable ground for testing the capital structure theories and findings, most of which have evolved from the U.S.[2]

[1] Foreign & Commonwealth Office (2002), *UK Data File 2002*, Whiteoakpress, London, pp. 13, 35.
[2] Foreign & Commonwealth Office (2002), Banking *and Financial Institutions in the UK.*

The study is considered to be useful to both academics and practitioners. To academics the study extends our general understanding of the existing evidence about factors that determine corporate capital structure decision by attempting to identify more appropriate proxies for the theoretical attributes affecting capital structure and by using two alternative methodologies; Structural Equation Modelling (SEM), and the conventional regression estimates. This is achieved after a critical review of both strengths and weaknesses in previous studies followed by an examination of a broader set of more appropriate attributes than any other previous study known to the researcher[3].

The use of alternative methodologies is employed for a number of reasons: First, one of the goals of this study is to test a larger number of determinants of capital structure by examining their impacts on multiple gearing measures. Consequently, the number of *indicators* is also likely to rise. The resulting increase in the number of variables creates two possibilities. One is that some of the variables are likely to be correlated, with the result that they will not represent different influences/determinants and/or there are going to be several proxies (indicators) representing one attribute of interest. This being the case, it is crucial that the interrelatedness between or among variables be identified so that the results are interpreted correctly. It is here where SEM becomes useful (see Titman and Wessels, 1998, and Chiarella et al, 1992).

Secondly, the conventional regression estimation methods have been used for a long period now and researchers have become so accustomed to its merits and demerits (Baker and Wurgler, 2002 refer to them as 'traditional capital structure regressions', p.2), and as the knowledge progresses researchers have now started to look for new innovative techniques capable of dealing with complex situations. The selection of a Structural Equation Modelling (SEM), as an alternative methodology has been prompted by the two previous empirical studies of the determinants of capital structure that have used SEM. Titman and Wessels (1988), the pioneers of the use of structural equation modelling technique called Linear Structural Relationship (LISREL) in capital structure

[3] See sections 2.6.2 and 4.9 for examples of inappropriate proxies in previous literature.

studies, have used the approach in their study of US companies while Chiarella *et al* (1992) subsequently employed a similar approach in a study of capital structure of Australian companies. These studies have claimed that LISREL estimation technique has a number of advantages over the conventional (standard) or traditional regression models, including its ability to recognise and mitigate measurement and specification errors, which have plagued regression based studies.

Despite these statistical advantages, the results of these two studies that used LISREL technique failed to resolve the empirical contradictions and even generated more contradictions and perverse results than most studies that have used variants of the conventional regression estimation models. Before we can judge the practical contribution of the SEM model, we need to use it alongside the conventional regression estimation technique on the same data set so as to be able to compare their explanatory power against both the theory and previous empirical findings. No such studies have been undertaken to provide evidence of the use of structural equation modelling technique (SEM) on UK capital structure empirical studies. Moreover, there are no previous studies of the use of Structural Equation Modelling in an examination of capital structure dynamics.

Having identified more appropriate proxies for the theoretical attributes in this study, both methods are being used on the same data set, one after another, and by using as far as the models permit, the same variables.[4] The results of this study provide future researchers with an input into their decision as to which methodology to adopt in similar empirical investigations. The use of multiple measures of gearing also serves to capture the different forces that influence managers' choices of long-term debt, and short-term debt. Multiple gearing measures also allow the analysis to reveal how book value measures and market value measures relate to determinants of gearing, and thereby provide explanation for theories predicting different relationship between attributes and different types of debt.

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[4] SEM may need more than one proxy per attribute being tested, while for standard OLS regression, it will be necessary to choose one proxy which is considered more influential (see section 4.8).

While the cross-sectional examination of the determinants of capital structure is important, we have good reasons to believe that if managers adjust their capital structure, then they should be making such adjustments whenever random disturbances cause deviations from the optimal capital structure. In order to investigate whether managers make these corrective adjustments to return to the optimal gearing levels, one should make assessment of how gearing changes in response to changes in firm specific, industry specific and/or macro-economic factors having an impact on the firms' environment over time. Cross-sectional static models ignore these adjustments over time and in so doing may fail to capture some important determinants of capital structure and changes in such determinants that occur over time. The final part of this study investigates the process of capital structure adjustment over time, the determinants of that adjustment process, and the speed of that adjustment. In examining this issue, the study attempts the use of SEM technique for the first time in the analysis of both capital structure adjustments and the speed of such adjustments.

To practitioners the study is relevant to those making financing, investment and tax planning decisions, especially those who happen to have debt or are planning to employ debt financing in their firms. As part of their decision process they have to consider the different types (and sources) of debt in relation to their firms' attributes like, tax status (e.g. the level of non-debt tax shields), investment opportunities, collateral, risk, related agency problems and costs. These attributes are among the factors that may influence a stream of future cash flows and affect the value of a firm. These decision makers can therefore decide on the optimum investment level that maximizes firm value. The study's usefulness here is not only the identification of a more appropriate method of investigating the determinants, but also a clear understanding of determinants themselves.

The study recognizes the potential impact of taxes and its interactions with non-debt tax shields, and the expected value of probability of bankruptcy costs. Because of the limitations of cross-sectional tests in the evaluation of the impact of taxes on levels of gearing (Givoly *et al*, 1992, pp. 332-333), the tests of the impact of taxes on gearing are confined to the part investigating the dynamics of capital structure. In this part the study examines whether changes in tax rate over time have any impact on corresponding changes on gearing. This makes the study relevant even to tax planners who may wish to balance their investment (non-debt) tax shields with debt tax shield, or to consider the relative importance of substitution effects (De Angelo and Masulis, 1980) versus the income effects of an increase in the level of their firm's investment (Dammon and Senbet, 1988).

Briefly, the findings of this study are that industry classification explains some variations in capital structure, and this variation is persistent over time. The cross-sectional results (from conventional regression) also indicate strong evidence that past profitability, cash holdings, non-debt tax shields, and the growth/investment opportunities of companies are negatively related to gearing. Evidence is also presented that indicates that business risk, and probability of bankruptcy, are negatively related to gearing. The results show that firm size exerts a strong positive influence on gearing. However, only a weak positive relationship between tangibility and gearing is observed. Although the data relating to 'uniqueness', that is, selling expenses, and research and development (R&D) were limited, contrary to Titman and Wessels (1984, 1988), the tests suggest a positive relationship between uniqueness and gearing. This study also finds a significant negative relation between a firm's free cash flow and gearing and consequently fails to support Jensen's free cash flow hypothesis.

The results of the study of the dynamics of capital structure decisions indicate that gearing responds to past profitability, firm size, growth opportunities (in the short-term), and non-debt tax shields, in the manner prescribed by the dominant theories. There is also evidence from these results that UK firms do not re-adjust their gearing following stock return movements. Because the effects of firm-specific characteristics (profitability, growth opportunities, firm size), and the impact of both corporate taxes and interest rates on gearing are relatively trivial, the stock return mechanistically drives the capital structure ratio. The results also reveal a surprising trend, which shows that when share prices have risen (and the firm's debt capacity has increased) firms issue more equity instead of more debt. This suggests that managers practice equity market timing. Lastly, although there is evidence that profitability is an important determinant of capital structure as the pecking order theory predicts, and also that equity market timing practice has a significant influence on gearing, stock returns is the most important determinant of capital structure.

1.4 Organization of the thesis

This thesis is organised as follows: Chapter two provides a discussion of the capital structure theory before proceeding to a critical review of previous empirical studies of the determinants of capital structure. Chapter three provides a discussion of the features of the UK's institutional environment which are likely to have a differential impact on capital structure in relation to other countries. The conclusion of this analysis influences the design of the empirical tests as well as providing the basis for the interpretation and evaluation of the results of the empirical studies.

Chapter four provides a description and discussion of the research design. The objectives, testable hypotheses, variables, data and methodologies are presented and discussed in this chapter. The chapter also presents and discusses the results of the cross-sectional analyses relating to both OLS-regressions and structural equation modelling (SEM) in this study. The comparison of results from these methodologies is done in this chapter. Chapter five focus on the influence of industry factors on the debt-equity decision. It extends the related literature dealing with the issue, develops the hypotheses regarding industry characteristics and gearing, and describes data and methodology of the investigation as to whether industry-related capital structure pattern exists in the UK. The chapter also gives results from tests carried out on industry influence on capital structure decisions.

The thesis has two chapters that deal with capital structure dynamics, chapter six and chapter seven. Chapter six considers long-run target-capital structure adjustments. It provides a review of the literature dealing with capital structure adjustments. It also specifies the hypothesis and models designed to test them, and discuss the results. Chapter seven considers the extent to which equity market timing, and stock returns influence capital structure. It discusses the literature relating to equity market timing, and stock returns as determinants of capital structure. The chapter specifies the hypotheses and models designed to test them. Finally, the chapter presents and discusses results of the various empirical tests that have been undertaken. Chapter eight provides a summary of findings, a theoretical discussion, and concludes the thesis. The chapter also outline the contributions of this thesis and points out possible future research avenues in the area covered by this thesis.

1.5 Alternative organisation of the thesis

This thesis can also be conveniently divided into six independent empirical analysis papers as follows: The first paper, which comes from part of chapter two, chapter three and part of chapter four, focuses on why inconsistencies and perverse results exists in capital structure empirical research. The paper includes a discussion of institutional and legal differences, and problems related to the choice and measurement of proxies and gearing measures, and suggest how selection and measurement problems can be mitigated. There is a need for such a paper because even some of the most recent empirical studies in this area keep repeating the same anomalies as discussed at length in the literature review and in chapter four and chapter five. The second paper is a comparison of OLS-regression and Structural equation modelling methodologies in capital structure research. This paper also comes from part of chapter four, and would include the discussions of the relative merits of the two methodologies, models specifications and comparison of their results. There has not been any study of this nature known to the current researcher.

Industry related capital structure pattern is another area of interest in capital structure research. The third paper documents the extent to which industry characteristics influence gearing in the UK. Unlike its predecessors, this paper also investigates explicitly whether business risk and production technology are related to gearing. The paper uses both parametric and non-parametric methods, and investigates whether the industry effect persist over the 16-year period examined. UK studies in this area are lacking in many ways as discussed in chapter five.

The fourth paper which can be derived from this thesis is on whether UK companies strive to maintain a long-run target gearing ratio. This paper comprises chapter six. This paper looks at the shortcomings of cross-sectional analysis, and discusses the literature relating to target ratio adjustment, and the speed of that process. The paper then presents the target ratio adjustment models, and introduces, for the first time in capital structure empirical research, the use of structural equation modelling in the dynamics of capital structure. The paper tests those determinants found to be important in the cross-sectional analysis, and in addition includes corporate taxes and interest rates in the analysis. Finally, the paper presents and discusses the results. Because there is a dearth of capital structure dynamics in the UK, there is a need for more evidence in this area. This paper provides evidence to add to that provided by Ozkan (2001).

The extent to which equity market timing affects capital structure is the theme of the fifth paper in this thesis. The paper comes from the first part of chapter seven. Here the literature relating to equity market timing effects on gearing is revisited, and the evidence of the existence of equity market timing practice is established as a prerequisite for further analysis. By using net equity issues and implied gearing ratios, the paper then provides evidence as to whether UK firms rebalance the effects of equity market timing. The equity market timing paper culminates by providing evidence regarding the long-term effects of equity market timing on capital structure. Empirical examination of such kind in the UK is lacking.

The sixth paper, also from chapter seven makes an attempt to disentangle the effects of equity market timing from that of stock returns on gearing. Comparison of the two effects is done both cross-sectionally, and across time in order to establish which between them has a stronger effect on capital structures of UK firms. This paper also reports the results of an 'all-inclusive' model which puts in perspective stock returns, equity market timing, and firm-specific characteristics such as profitability, size, growth, and non-debt tax shields. This last paper is a direct response to the two recent studies. These works are Baker and Wurgler (2002), who claims that capital structure is the outcome of the cumulative effects of equity market timing, and Welch (2004), who asserts that it not equity market timing but stock returns which drive gearing mechanistically for a long time. Both these are US studies. In addition to attempting to reconcile the differences in those two studies, the sixth paper in this thesis provides evidence in relation to the UK environment probably for the first time.

1.6 Summary and conclusion

It has been established that there is a dearth of empirical research in the dynamics of capital structure in the UK where only one study can be found so far. In the UK and elsewhere, empirical research in the whole area of determinants of capital structure has lagged behind theory. Because of contradictory findings from empirical studies, a number of theoretical issues have not been conclusive. A few hypothesised determinants have also not been tested in the UK. This thesis contributes to the ongoing empirical work by extending the research on the dynamics of capital structure using two alternative methodologies, by refining the proxy variables, and testing the untested attributes. Part of this extension examines the effects of equity market timing and stock returns on capital structure. The thesis also investigates industry influence on capital structure. The next chapter reviews the literature relating to capital structure determinants.

Chapter 2

2 LITERATURE REVIEW

2.1 Introduction

This chapter provides an introduction to and an overview of the existing literature on capital structure theory. The first part of the chapter provides a summary of gearing and its manifestations without recourse to any policy implications. This is followed by a critical review of the Modigliani and Miller propositions, which are then contrasted with the traditional approach to capital structure analysis. This review of capital structure theory includes revisiting Miller (1977) model, and its subsequent extensions, culminating in the current version of the trade off theory of capital structure.

One of the propositions tested in this study is whether or not there is industry related capital structure pattern. Because of the different methodological approach taken in the investigation of the industry influence in capital structure, the literature dealing specifically with industry influence on capital structure is considered separately in chapter five. The last part of the chapter summarizes other theories put forth to explain observed capital structures such as pecking order predictions, equity market timing, and also share price movements as a major determinant of capital structure.

2.2 Introduction to gearing and the cost of financing

By using the assets at their disposal, firms carry out varied operations that generate a stream of cash flows. For an all equity-financed firm, these cash flows accrue to equity holders only. For a firm using both debt and equity the cash flows accrue to both debt holders, who have a first claim on the stream of cash flows, and equity holders, who get the residual, and consequently, more risky cash flow stream. For an all equity-financed firm, equity holders bear all the risks of the business. The value of the equity derives solely from the nature and the level of the expected cash flows of the firm. The cost of capital for this type of firm is the minimum rate of return accepted by shareholders, and this reflects the rate of return on alternative investments with comparable risk. For a firm using debt and equity, the situation changes. The splitting of the cash flow streams, and the fact that the risks associated with those streams is different implies that the cost of these two sources are different and also that the value of the firm will be given by the sum of the values of both debt and equity.

2.2.1 Cost of Financing

Each source of finance has a cost to the firm. Although firms sometimes get finance from numerous different sources, most of these sources have features of either debt or equity and for purposes of this study; only the costs of equity and debt are highlighted below. The costs of other sources can easily be derived from the cost of these two types of financing.

2.2.1.1 *Cost of equity finance*

For simplicity, that is ignoring any flotation costs and assuming the shares are neither overvalued nor undervalued, the cost of equity financing to a company can be thought of as the discount rate that equates the present value of the expected stream of dividends with the market price of that company's shares, i.e.

$$NPV = 0 = -P_0 + \sum_{t=1}^{\infty} \frac{D_t}{(1+k_e)^t} \qquad (2.2.1A)$$

and,

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k_e)^t} \qquad (2.2.1B)$$

where

P_0 = the company's current market price of a share

D_t = expected dividend in period t

k_e = the cost of equity financing to the company.

Incorporating any discount and any costs incurred on issuing shares, the (adjusted) cost of equity financing becomes:

$$k_e = k_e^* /(1 - d - c) \qquad (2.2.1C)$$

where

k_e = the adjusted cost of equity financing

k_e^* = shareholders required rate of return

d = discount allowed on shares

c = any other issuing costs as a proportion of the par value of a share.

2.2.1.2 Cost of debt financing

The cost of debt financing or the effective rate of interest, which is likely to be different from the stated rate of interest, is the discount rate that equates the present value of cash flows received as debt finance and the cash payments, which would be made by the company over the duration of the financing, i.e.

$$NPV = 0 = C_0 - \frac{C_1}{(1+k_i)} + \frac{C_2}{(1+k_i)^2} + \frac{C_3}{(1+k_i)^3} + \ldots + \frac{C_t}{(1+k_i)^t} \qquad (2.2.2)$$

where

C_t = cash flow in period t

k_i = cost of debt financing

t = the number of periods over which debt cash outflows have to be made.

Not only do debt holders expect to receive contractually agreed interest payments and repayment of the principal, they also have the first claim on the assets of the firm should the firm fail to honour these fixed payments. Equity holders on the other hand, are the residual risk takers and the return they receive will depend on how profitable a firm is at a given time. It is therefore obvious that debt holders have a lower risk exposure and that means the interest rate to be paid on debt is lower than the expected rate of return necessary to attract equity capital.

The mix of different securities employed to finance a firm's operations is known as capital structure. The use of debt in a firm's capital structure is referred to as gearing in the UK and in the US the term leverage is predominant. The term has been borrowed from physics where gearing means the use of a device for increasing power from a given source of effort. In finance debt is used to gear up equity. It is perceived that the use of debt finance increases the expected return on shareholder's equity while the expected profitability of the assets of the business remains constant. Since the cost of debt finance is lower than the rate of return required by shareholders, if the assets financed by debt are able to generate a rate of return that exceeds the interest rate, a surplus will be created which will accrue to shareholders. In this way the use of debt finance pushes up the required return on equity.

2.2.2 Gearing and Financial Risk

Gearing is a two-edged sword. As long as the use of debt finance results in the expected return on assets, which is higher than the cost of debt, it will be worthwhile investing in these assets. However, as the expected return on assets is uncertain, equity holders could lose rather than gain from gearing. This is because the use of gearing increases not only the shareholder's expected return, but also the risk of their investment. Actually it is the later which causes the former. Gearing magnifies the given volatility of a firm's returns. If a firm's operations generate a lower rate of return than the interest rate, equity holders lose from gearing. The fixed interest payment will have to be made even when the company incurs a loss. The favourable outcome is when the firm makes a higher profit than expected. The cost of servicing debt is constant and shareholders will get a higher return than expected. This greater variability in the returns to shareholders as a result of using debt is what is referred to as *financial risk*.

The use of gearing also may introduce the risk of bankruptcy. If the value of the firm's assets falls below the value of its debt, technically the firm will be bankrupt, the company's equity will be worthless, and the ownership of the assets will pass to the debt holders. As Merton Miller puts it:

> "A run of very bad years might actually find a highly-levered firm unable (or, as the option theorist might prefer, unwilling) to meet its debt service requirements, precipitating thereby any of the several processes of recontracting that go under the general name bankruptcy" (Miller, 1988, p.113).

It should be noted at this point that the existence of financial risk alone might not lead to bankruptcy (insolvency) if the value of the firm's assets does not fall below the value of its debt. Further, although the excessive use of debt financing increases the threat of bankruptcy, the final dramatic occurrence of bankruptcy is not the cause of problems for a financially distressed firm. Bankruptcy is the result of failure by a firm to meet investors' expectations. It is this failure, which leads to the fall of a firm's assets below its debt.

2.2.3 Financing versus maximisation of shareholders' wealth

Despite the existence of divergent views regarding what managers actually do (see for example Jensen, 1986), the objective of the firm is to maximise shareholders' wealth. One of the ways to achieve this is to minimize the firm's cost of capital. The choice of financing to minimise the cost of capital is seen to be consistent with the maximisation of a firm's value. The cost differential between debt and equity suggests the possibility of substituting relatively cheap debt capital for relative expensive equity capital, and thereby reducing the overall cost of capital of the firm.

Any positive net present value resulting from financing rearrangements means that a firm can maximize its value by altering its capital structure. This would imply that a firm should use more and more of the cheap debt up to the point where the cost of capital is minimized and the value of the firm is maximized. This suggests the existence of a particular level (or a range) of optimal financing mix, the target capital structure.

2.2.4 *Does capital structure policy matter?*

Since the seminal papers by Modigliani and Miller (1958, 1963), there have been arguments and counter arguments as to whether debt policy matters. Brealey and Myers (2003, p.489) ask, "If debt policy does not matter then why do financial managers worry about it?" Managers who are responsible for the capital structure decisions would like to know how the decisions impact on the value of the firms they have been entrusted with. If capital structure is irrelevant the finance managers should not bother about the sources of finance, instead they should try to maximize firm's value by concentrating on investment decisions. On the other hand if the capital structure is relevant then corporate decision makers should strive to identify and attain the optimal capital structure, which minimizes the cost of capital to the firm, and thereby maximise the value of the firm, through capital restructuring. Whether or not an optimal capital structure exists is the focus of the remaining part of this chapter, which traces the development of capital structure theory.

2.3 Capital Structure Theory

2.3.1 *Introduction*

One of the important prerequisites of a sound empirical investigation is a thorough examination of the underlying theory, which should then be linked to the design, and the interpretation of results of such investigation. Some critics have argued that capital structure theory does not provide sufficient guidance in explaining how and why corporate decision makers go about setting their capital structure policy (Tsisales, 1986). Others have argued that existing theories neither give clue as to how to measure the variables that are predicted to be crucial nor how these predictions should be tested (Boyle and Eckhold, 1996). Whether this is due to failure on the part of these previous studies to make systematic use of the theory (Taggart, 1977,) or due to the tendency of the theories of optimisation to be normative rather than descriptive (Welch, 2002, p.30), it is still true that the validity of capital structure theories rests on their ability to explain both cross-sectional variations among firms (Bennett and Donnelly, 1993, p. 4) and trends in capital structure over time.

Most previous capital structure studies have found it logical to begin their analysis with the Modigliani-Miller (1958) irrelevance proposition (hereinafter referred to as MM) not only because it is still the classic paper in capital structure analysis, but also because it is considered a special case by most subsequent theories (see Taggart, 1985, p. 29). However, it is more appropriate, and the analysis flows more easily if the thinking before MM, or at least the alternative to MM at that time is also documented here. This alternative is the traditional approach to capital structure analysis.

2.3.2 *Traditional approach to capital structure analysis*

Under the traditional approach, in determining the market value of a firm, investors are assumed to capitalize income after interest at the same rate when a 'judicious' level of debt is employed. For this reason this approach is also known as the net-income (NI) approach. On the other hand, the net operating income (NOI) approach maintains that it is the operating income (i.e. the total dollar return to both debt holders and equity holders) that should be capitalized in the determination of the market value of the firm.[5] A clear grasp of the arguments put forward in the traditional approach, its limitations, and indeed its comparison with the MM analysis, requires the use of the weighted average cost

[5] Brealey and Myers (2003, p.478) documents that this distinction was made by D.Durand in his pre-MM paper "Cost of Debt and Equity Funds for Business: Trends and Problems of Measurement," *in Conference on Research in Business Finance*, NBER, New York 1952.

of capital (WACC). The WACC is the weighted average of costs of all sources of finance, with the weights as the relative market values of these respective securities in relation to the sum of the market values of all securities. If the effects of taxes and flotation costs are ignored, the weighted average cost of capital for a firm, which uses only debt and equity can be expressed as:

$$WACC = k_0 = k_i\left(\frac{D}{V}\right) + k_e\left(\frac{E}{V}\right) \qquad (2.3.2)$$

where $k_0 =$ the cost of capital (the weighted average cost of capital)

$k_i =$ the cost of debt financing

$k_e =$ the cost of equity financing

$D =$ the market value of debt

$E =$ the market value of equity

$V = E + D =$ the total market capitalisation.

The WACC, which could be considered as the return on portfolio of all given securities of a company, could normally be used in investment appraisal decisions to arrive at the net present value (NPV) of investments that are not expected to alter the company's business risk.

As figure 2.1 depicts, on the premise that debt financing is cheaper, and does not increase the level of shareholders' returns risk, and that if gearing is kept within 'judicious', limits the cost of equity financing does not increase in response to the use of more gearing. The traditional approach assumes that the substitution of debt for equity lowers the WACC. This decrease in WACC is assumed to go on until a point where equity cost will start to increase having been triggered by bankruptcy risk from the excessive use of debt. The increase in the cost of equity (and presumably of debt) eventually starts to raise the weighted cost of capital (WACC). This reasoning led to the conclusion that it is possible to lower the WACC to the minimum possible level, and that this minimization of the WACC simultaneously maximizes the value of a company.

The debt-equity ratio at the point where the WACC is minimized and the value of the company is maximised then becomes the optimal debt equity ratio.

The traditional approach arguments have two major limitations. The first is that traditionalists view risk only as the threat of default and bankruptcy likely to arise from the excessive use of debt and fail to take financial risk into account. As discussed earlier even at lower levels of gearing, financial risk (added earnings volatility) exists and that being the case it causes an increase in the required rate of return on equity. The traditional view also does not define clearly what constitutes a 'judicious' level or range of gearing. Despite these limitations, it is important to understand the arguments flowing from this approach because as the next section reveals, the results from extensions to the Modigliani-Miller irrelevance propositions, especially the tax benefit-bankruptcy cost balancing theory resembles the outcome from the traditional approach.

2.3.3 *Competitive Capital Markets approach*

The MM analysis constitutes the competitive capital markets approach because it assumes among many other assumptions the existence of competitive capital markets. It also falls under the net-operating income (NOI) approach because it capitalises the operating income in the determination of the market value of a firm. Modigliani and Miller (1958, 1963) made several assumptions before arguing that capital structure is irrelevant in the determination of the market value of a firm. The assumptions, some of them were explicit, and others were inferred from their analysis comprised the following:

- That capital markets are complete (i.e. integrated and frictionless)
- That individuals investors can also borrow and lend at a risk free rate
- That firms use only risk-free debt and risky equity as sources of finance
- That all firms are in the same risk class
- That corporate income taxes are the only form of government levy
- That all cash flow streams (e.g. earnings) are perpetuities
- That managers and outside investors have the same information

- That managers act in the interest of shareholders

Following from Modigliani and Miller's (1963) 'corporate tax correction' paper, by 1970s, a unified theory seemed to have emerged that a trade-off between potential bankruptcy costs and tax savings benefit from interest tax shields could be the primary determinant of capital structure (see for example Baxter, (1967), Kraus and Litzenberg, (1973), Warner, (1976), and Scot (1976)). This view seemed to have been a refinement by (or at least similar to) the traditionalists' arguments. While these extensions might have admitted that the MM analysis was correct, as applied to complete markets, they argued that the actual capital markets we have, though well functioning, are not perfect. It was therefore generally accepted that each firm had a unique optimal capital structure corresponding to its features. This view was supported by the empirical evidence provided by Taggart (1977), Marsh (1982), Bradley *et al*, (1984), and Bennett and Donnelly (1993) among others.

2.4 Miller's general equilibrium and subsequent extensions

The version of the static trade-off theory described above was challenged and modified by Miller (1977) who argued that the present value of financial distress costs could not be balanced against corporate tax advantage because the former was insignificant. Citing several bankruptcy costs studies, especially Warner (1976) Miller claimed that these studies revealed that bankruptcy costs are disproportionately small relative to the corporate tax savings they are supposedly balancing, comparing it with "horse and (one) rabbit stew". Haugen and Senbet (1978) supported Miller's model, and argued that bankruptcy costs should be measured (and should be considered to be relevant) at the time of making financing decision, and not just prior to the time of financial distress as most studies had done.

Reviewing the history and empirical record of corporate tax rate and capital structures from 1920s to 1960s, Miller (1977) concluded that the corporate tax advantage of debt must have been substantially less than was then suggested.

Miller pointed out that in certain cases (see the following paragraph) tax advantage was nil or negative. The reason was that the corporate tax advantage (the present value of interest tax shield) was being offset by the disadvantage of personal taxes (taxes on interest income and equity income). According to Miller (1977), this was the reason firms did not use more debt despite the interest tax shield.

Having demonstrated that personal taxes on equity income can conceivably be zero if there is a progressive tax rate on interest income, Miller went on to present his equilibrium whereby the marginal personal tax rate on interest income is equal to the corporate tax rate. The corporate tax advantage of debt in this case is cancelled by the personal tax disadvantage of debt, assuming that the tax on equity income can be considered to be zero. Miller documents that in this situation there might be an optimal level of aggregate debt in the economy determined by the differential between personal and corporate tax rates, but not at the level of an individual firm. Assuming that bankruptcy costs are insignificant, Miller's model implies that capital structure might still be irrelevant when both corporate and personal taxes are taken into consideration. This takes the theory back to the MM analysis of 1958, albeit for different reasons, that the capital structure decisions of individual companies are irrelevant for the determination of the company's value and cost of capital.

Several subsequent studies have pointed out problems with Miller's equilibrium model (see Auerbach, 1985; Schneller, 1980; and Bennett and Donnelly (1993). As Bennett and Donnelly (1993) put it - the validity of Miller's model depends on two things, one, is the prevailing tax rate differential not only between corporate and personal taxes, but also between personal tax on equity income and on interest income, and how these are modelled. Secondly, the model depends on the evidence regarding the significance of financial distress (bankruptcy) costs. Schneller, (1980) questioned the assumption of ignoring the impact of capital gains on optimal financial policies of the firm and argued that for shares to have any value, they must appreciate in value over any holding period whatever its length. He pointed out that if the present value of tax on capital gain is negligible, so must the gain itself and hence shares could not have any economic value.

According to Schneller (1980), Miller's assumption of ignoring the impact of capital gains, is also not supported empirically because, for example in 1975 the average US taxpayer realised $3121 in capital gains versus $2472 in dividend income; and whereas 8.8 million taxpayers included dividend income in their returns, 5.0 million included net capital gains. Hence 85% of all (investors) taxpayers realised capital gain (or loss) during 1975, from which 66% realised a net gain that exceeds their dividend income. This is significant evidence that investors turn over their portfolios quite frequently and that the assumption of effective capital gains tax rate of zero is not realistic.

While a number of studies have maintained that bankruptcy costs are insignificant (see Haugen and Senbet, 1978), more recently there have been studies giving evidence of the significance of bankruptcy costs. These include Altman, (1984); Weiss, (1990); and, Andrade and Kaplan, (1998) among others. Altman (1984), the first to measure indirect bankruptcy costs using a proxy, found that on average, (total) bankruptcy costs ranged from 11% to 17% of firm value up to three years prior to bankruptcy. Weiss (1990) estimated the direct bankruptcy costs to be 3.1% of firm value one year prior to bankruptcy. Earlier estimates of direct bankruptcy costs relative to firm value are 24.9% by Stanley and Girth, (1971); 4.0% by Warner, (1976); and 7.5% by Ang *et al*, (1982).

In a study of highly leveraged transactions (HLTs) of 1980s, Andrade and Kaplan (1998) found that the financial distress costs were 10-20 per cent of the pre-distress market value. These estimates show that bankruptcy costs exist; they are not trivial and they might influence capital structure decisions. As argued by Haugen and Senbet (1978), Altman (1984), and Andrade and Kaplan (1998), it is the expected (present) value of bankruptcy costs at the time of making a financing decision, which matters. Indeed Haugen and Senbet (1978) among others have argued that in a competitive capital market bankruptcy costs cannot exceed the costs of financial reorganisation, and if that would be the case then arbitrageurs would buy all creditors instead. Reorganisation efforts may be fraught with conflicts of interests among different classes of creditors and management to the extent of thwarting any success of such process. Although a good number of studies estimate the magnitude of bankruptcy costs, most of them focus on direct bankruptcy costs due to the difficulty of estimating indirect costs. However, empirical tests as to whether the probability of bankruptcy costs determines capital structure are lacking. One of the objectives of this study is to provide evidence in this area.

Extensions to Miller (1977) refined the tax benefit-bankruptcy costs balancing theory to include substitution between debt (interest) tax shield and non-debt tax shields (De Angelo and Masulis, 1980), substitution between investment and income effects (Dammon and Senbet, 1988) to produce a unique interior optimum solution for the debt-equity ratio. Agency costs (see Jensen and Meckling, 1976; and Jensen, 1986), which focus on divergence of interests between managers and shareholders, have also been incorporated into the trade-off model (see for example, Fama and French 2003).

Although Miller's (1977) arguments had the implication of reducing the tax advantage of debt, and to re-emphasize the MM irrelevance propositions, Miller did not succeed to discard the trade-off theory. At least the theory now had a much smaller tax advantage being balanced against smaller bankruptcy costs than originally thought. Givoly *et al*, 1992 tested whether tax is still an important determinant of capital structure in the U.S. after the Tax Reform Act of 1986 and found support for tax based theories. Givoly *et al*, 1992, and Walsh and Ryan, 1997, among others, provide evidence that currently there is tax advantage of debt in the U.S. Studies that took place subsequent to Miller (1977), like Marsh (1982), Bradley *et al* (1984), Jalilvand and Harris (1984), Bennett and Donnelly (1993), Shyam-Sunder (1999), Ozkan (2001) and Fama and French (2002) still document significant support for trade-off theory of capital structure.

In 1980s however, some non-tax based capital structure theories have also been put forward to challenge the tax-based theories. Some of these are; Pecking order (Myers (1984) and Myers and Majluf (1984) which rely on the asymmetric information arguments of Ross (1977); and Leland and Pyle (1977). Other theories include, "product-input market interactions" (Brander and Lewis 1986), and Sarig, (1988); and "corporate control theory" (Stulz (1988), Harris and Raviv (1991), and Israel (1992)). See Harris and Raviv (1991) for summary of non-tax based theories. The pecking order theory is considered to be a competing theory to the static trade off theory of capital structure (see Fama and French, 2003; and Galpin, 2004).

2.5 *Recent developments in capital structure research*

While empirical validation of the two competing capital structure theories, trade-off theory and pecking-order hypothesis, are still going on as evidenced by Taggart (1977), Jalivand and Harris (1984), Shyam-Sunder and Myers (1999), Chirinko *et al* (2000), Ozkan (2001), Fama and French (2002), and Frank and Goyal (2003), among others, alternative theories are also evolving. Both Marsh (1982), and Taggart (1977) had references, which indicated that changes in stock prices, and equity market timing behaviour might influence gearing ratios. Some recent works (see Jung *et al* (1996), and Baker and Wurgler (2002)) have shown that the cumulative effects of 'equity market timing' are one of the major determinants of capital structure. In contrast, Welch (2002, 2004) has argued that share price movements are the real determinant of capital structure, and that even if equity market timing is practiced its effect on capital structure is of the second order.

One important feature of these 'new' theories is that they question the nature of traditional capital structure theories. A question to be asked here is whether this is the beginning of the end of traditional theories, and the beginning of descriptive theories. A detailed review of these new theories is postponed until chapter seven where a review of literature relating to the effects of both equity market timing and stock returns on capital structure precedes empirical tests, which are designed to test, *inter alia*, these 'new theories'. The remaining sections in this chapter look at cross-sectional determinants of capital structure.

2.6 Prior research on determinants of capital structure:

2.6.1 *Introduction:*

Some researchers have tested the relative strength (validity) of the competing capital structure theoretical models like 'trade off' theory, pecking order theory, etc. See for example, Bradley *et al* (1984), Jung *et al* (1996), Shyam-Sunder and Myers (1999), Fama and French (2002), and Kayhan and Titman (2003). All of these are U.S studies.

Another approach has taken the view that there appears to be many factors which affect capital structure choice such that no one model is capable of explaining capital structure decisions. This group therefore seeks to test various factors derived from different but not necessarily incompatible models that may affect capital structure. These studies include Toy *et al* (1974), Ferri and Jones (1979), Marsh (1982), Castanias (1983), Opler and Titman (1994), Auerback (1985), Long and Malitz (1985), and Titman and Wessels (1988) for U.S Studies. Studies looking at UK firms include Bennett and Donnelly (1993), and Bevan and Danbolt (2002). International comparative studies include Rajan and Zingales (1995), Wald (1999), Panno (2003), and Fan et al, (2003).

Consistent with the second approach, this study takes the view that there are many factors that affect capital structure decisions and aims at testing them as a means of validating competing theories discussed above. However, this study also takes the stance that cross-sectional studies do not tell the whole story. The study proceeds to investigate the dynamics of capital structure as well. The recent theories such as equity market timing and stock returns' effects mentioned above are among those tested by empirical models developed in subsequent chapters. But first the cross-sectional determinants are established.

2.6.2 *Possible determinants of leverage:*

Previous theoretical works and empirical research have identified the factors discussed below as possible determinants of leverage.

2.6.2.1 *Industry characteristics:*

The existence of a relationship between gearing and type of industry has been discussed for as long as capital structure. Different industries have been recognised to have different risks, and consequently have been assumed to have different capacities for employing debt in their funding. Both before and after the Modigliani and Miller (1958)-irrelevance propositions, a number of theoretical and empirical studies have argued in favour of the existence of industry-related capital structure patterns (see for example Donaldson, 1957, pp. 331-347). Indeed this was one of the points made by critics of Modigliani and Miller's irrelevance proposition that:

> "...companies in various industry groups appear to use leverage as if there is some optimum range appropriate to each group (Solomon, 1963, p. 98).

The argument for the existence of industry-related capital structure pattern is that an important determinant of the ability of a firm to carry debt lies in its operating earnings stability (business risk). This being the case, firms in the same industry, which by and large face similar supply and demand conditions, similar technology, similar tax status, will have roughly a similar level of business risk (Donaldson, 1957; Cherry and Spradley, 1989; and Ozkan, 2001). It seemed reasonable to assume that competent managers facing those similar circumstances would arrive at roughly similar decisions as to debt level appropriate for those conditions (Cherry and Spradley (1989)), and these firms would have similar leverage ratios. Marsh (1982) suggested that the observed gearing differences among industries might be reflecting systematic industry differences in asset structure, risk, and other variables. These could be thought of as imperfections, which exist in the real world as opposed to the perfect market assumptions of Modigliani and Miller (1958).

Recent works that have examined the existence of industry related capital structure pattern includes Bennett and Donnelly (1993) and Varella and Limmack (1998), MacKay and Phillips (2003), and Fan et al, (2003). The detailed discussion of literature relating to industry influence is postponed until chapter five where its discussion precedes empirical analysis designed to establish the extent to which industry influence affects gearing.

2.6.2.2 *Asset structure/Tangibility*

Tangibility refers to the extent to which a firm has tangible assets in its asset composition. 'Collateralizable assets', is another term used in literature to refer to the same concept (see Titman and Wessels (1988) and Chiarella *et al.* (1992)). A number of capital structure theories have associated the level of gearing with tangibility. Theories based on agency problems and those based on asymmetric information for example, suggest that tangibility is likely to be positively related to gearing (see Panno, 2003; Scott, 1977; and Drobetz and Fix (2003) among others. Scott (1977) presents a model which shows that issuance of secured debt can increase the total value of a firm's securities even in the absence of corporate taxes[6]. The arguments flowing from this theory are that by issuing secured debt a firm is not only selling a promise for future repayment; it also sells a valuable right to the secured creditors to rank first in order of priority. Upon bankruptcy, and if creditors are discharged according to absolute priority rule (APR), the promise is met by using the (proceeds of) assets pledged as security.

In addition to expropriating wealth from unsecured creditors, the issuing of secured debt increases the value of the issuing firm's securities by reducing the amount available to pay any potential legal claims upon bankruptcy. This is the

[6] Scott (1977) recognizes that a lease offers a better security than does debt because the lessor retains title to the asset in question bondholders do not.

case because the unsecured creditors and the potential victors in (any future) legal suits are unable to prevent the firm from issuing secured debt if, at the time of issuance, they do not yet have cause for legal action.

Secured debt does not merely redistribute wealth among claim holders. Since the collateral cannot be exchanged for a riskier asset, and because secured creditors do not require stringent covenants, the use of secured debt reduces the need to monitor managers thereby reducing monitoring costs. It is for this reason, together with the argument that shareholders of a firm using secured debt find it more advantageous to take positive net present value projects that enables secured debt to increase the value of the firm rather than merely redistribute wealth. The last argument is also supported by Myers and Majluf (1984) who use asymmetric information premise to argue that the issuance of secured debt (a risk-less debt) enables a firm to avoid the costs associated with issuing securities about which the managers have better information than outsiders. Myers (1977) also asserts that assets in place support a large proportion of debt financing, and predicts that capital intensity should be positively related to heavy debt financing (p. 171).

Combining the arguments in Galai and Masulis (1976), Jensen and Meckling (1976), Scott (1977) and Myers (1977), we get the following implications: Higher levels of external equity create agency costs of managerial discretion. Assuming that these costs decrease as the proportion of external equity decreases, the use of debt financing may reduce the agency costs of (external) equity and align managers' interest with those of external shareholders. On the other hand once a firm employs debt, managers and shareholders have incentives to transfer wealth from bondholders to shareholders through sub-optimal investments. Bondholders anticipate this potential expropriation of their wealth and in addition to other restrictions, require collateral against the loan advances they give the firm (Smith and Warner (1979); Jairo (2000), p. 82). Debt is seen as a mitigating factor because it brings with it restrictive debt covenants, monitoring arrangements, financial reporting and regulatory requirements. All these subject managers' decisions to extensive scrutiny and by increasing the probability of bankruptcy, debt also reduces shirking, and consumption of perquisites by managers who realise the potential impact of bankruptcy on their job security (Grossman and Hart, 1982).

In summary therefore the argument for the tangibility's positive relation with gearing goes as follows. Issuing of secured debt is desirable because it increases the market value of a firm, it enables a firm to avoid the costs that arise due to asymmetric information when it needs to issue securities, and it introduces the threat of bankruptcy thereby reducing consumption of perquisites by managers. However, this 'good' risk-less (secured) debt can only be obtained if a firm can offer collateral required by lenders, otherwise firms would have to borrow at a relatively higher cost (interest rate). Because lenders more readily accept tangible assets than intangible ones, tangibility increases borrowing power and should be positively related to gearing.

Counter hypotheses have also been given that even firms with a relatively low level of collateralizable assets might be inclined to use high levels of debt despite the higher cost if they want to benefit from the more public scrutiny, extensive disclosure, limitation of managers consumption of perquisites, and increasing monitoring of managers' actions (see Chiarella, *et al.* 1992). Berger and Udel (1994) also document that if a firm has sufficiently close relationship with financiers i.e. banks and financial institutions, then it may be able to get credit even if it does not have substantial tangible assets to provide as collateral because the close monitoring replaces or acts as a substitute for the need for collateral (see Rajan and Zingales, 1995, p. 1455). Similarly, Chen et al (2003) have suggested that the absence of a positive relationship between tangibility and gearing may imply that information asymmetry problems do not play an important role.

Despite the seemingly intuitive arguments for the relationship between gearing and tangibility, empirically there is sparse evidence to support this factor's role as a determinant of capital structure. While testing non-debt tax shields, Bradley *et al.* (1984) find perverse results and interpret their results to be evidence in support of tangibility's positive relation with gearing, a view consistent with Scott (1976) analysis. Using a relatively new and sophisticated technique, Titman and Wessels (1988) fail to find evidence in support of tangibility (collateral value) in the USA. Chiarella *et al.* (1992), replicates Titman and Wessels study by applying the same technique in Australia and finds results, which are inconsistent with predicted theory. Contrary to Berger and Udel's (1994) theory, an international study by Rajan and Zingales (1995) finds that tangibility is as important gearing determinant in Japan as in other G-7 countries despite a stronger bank-firm relationship in Japan than elsewhere. Among the UK empirical studies, Bevan and Danbolt (2002) find different results depending on the definition of gearing they employ. Bennett and Donnelly (1993) do not find any significant relationship between gearing and asset structure in any of the models they employ.

The failure by Titman and Wessels (1988) and Chiarella *et al.* (1992) to discern meaningful results can possibly be attributed to the proxy they used for tangibility. As discussed later, the results of this study shows that inventory plus gross plant and equipment (IGP) or INVPTA, used by both these studies, is not a good proxy for tangibility. Furthermore, due to subjective accounting valuation, and the possibility that firms with more tangible assets are also the ones with relatively larger proportion of intangible assets, means that the ratio of intangible assets to total assets used by Titman and Wessels (1988) may not be a good proxy for 'inverse tangibility'. To mitigate for these potential pitfalls, this study uses the ratio of fixed assets to total assets, FA/TA, as a proxy for tangibility.

Even if inventory is excluded from the measure of tangibility, there may still be difficulties in discerning the impact of tangibility (collateralizability) on gearing. The relatively weak evidence supporting tangibility's hypothesised positive relationship with gearing could also be due to the fact that some tangible fixed assets (FA/TA) do not necessarily provide collateral for loans. The theory relating to tangibility stipulates that only those assets that are of general use to many firms (hence could easily be re-sold) may be good candidates for collateral. Assets which are only of use to a specific firm do not command an attractive resale value for lenders should they accept them as collateral. Unfortunately, accounting data generally does not distinguish between these two types of tangible assets.

2.6.2.3 *Non-debt Tax shields:*

De Angelo and Masulis (1980) present a theory of substitutability between non-debt and debt tax shields, arguing that firms with relatively large non-debt tax shields relative to their expected cash flow will have low debt levels. Although De Angelo and Masulis (1980) refer mainly to the Miller (1977) model, which they extend, the non-debt tax shields argument rests on Modigliani and Miller (1963) analysis (henceforth referred to as MM. The outcome from MM analysis is that the advantage a firm gets from gearing comes from the interest tax shield that arises as a result of the deductibility of interest for tax purposes, and that because the cost of capital declines as more and more debt is used, the value of a 'corporate tax paying firm' is maximised when it uses 100 percent (risk-free) debt. Miller's (1977) modification to MM, incorporated differential personal taxes and concluded that the personal tax disadvantage of debt, together with the supply side adjustment by firms may eliminate away the interest tax shield advantage. This may produce an economy wide equilibrium that implies capital structure is irrelevant for a particular firm. Miller's (1977) model tried to explain why firms do not actually use 100 percent debt by incorporating more realistic tax analysis then than in 1963. The analysis took the capital theory structure back to the original MM irrelevancy argument, but this time for different reasons.

Although MM (1963) and indeed Miller (1977) did not explicitly include this in their assumptions, the interest tax shields create incentives to use debt only if a firm has enough taxable income to justify the 100 per cent (or any other 'reasonable' level of gearing). The U.K tax laws, and indeed tax codes in other jurisdictions, allow other deductions in addition to interest on debt to be made from a firm's taxable income. These include, for example, accelerated depreciation allowance on fixed assets, tax-loss-carry-forwards, and immediate recognition of research and development expenditures as an expense.

Elsewhere, notably the US, oil and/or other mining depletion allowances, and investment tax credit also constitute significant non-debt tax shields.

Recognising these other tax shields, De Angelo and Masulis (1980) questioned the assumptions, and as a result some of the implications of Miller (1977) model. This led them to extend the model and to incorporate even more realistic analysis of the effects of corporate tax code. They analysed how the Miller (1977) model, and by implication, MM (1963) model would change as a results of incorporating the role of non-debt tax shields. According to De Angelo and Masulis (1980), capital and depletion allowances, investment tax credits and other non-debt tax shields are substitutes for the tax benefits of gearing. The possibility of losing (not using) non-debt tax shields due to exhaustion of taxable income creates a substitution effect between the level of non-debt tax shields and the tax benefit of gearing. This being the case firms with substantial non-debt tax shields relative to their profitability will be inclined to use less gearing.

Because firms have different levels of non-debt tax shields over time De Angelo and Masulis (1980) model brings a new dimension into Miller (1977) analysis, and implies that capital structure decisions are relevant to a given firm. A rationale is consequently provided for an optimal level of gearing (*a unique interior optimum*) whether or not gearing related costs (like bankruptcy, or agency costs) are incorporated into analysis (De Angelo and Masulis, 1980, pp.12-18).

In extending Miller's (1977) equilibrium, and with positive bankruptcy costs, De Angelo and Masulis model further demonstrates that the net-marginal personal tax savings is of the same order of magnitude to the expected bankruptcy costs thereby refuting Miller's 'horse and rabbit stew' analogy regarding the *tax-benefit-bankruptcy cost* trade off model. This arises because each successive increase in the level of gearing reduces the chances of having taxable income and leads to a reduction in the expected value of the interest tax shields. This line of extension also generates for each firm *a unique interior optimum* level of gearing within the market equilibrium.[7]

The basic non-debt tax shield arguments of De Angelo and Masulis (1980) have been extended, and several empirical studies have tried to verify them. The crux of their substitution effect of the tax shield hypothesis relies heavily on their underlying assumption of independence between the firm's optimum investment and financing decisions, plus the use of historical cost accounting. Treating output level as exogenous, Dotan and Ravid (1985) theoretically modified De Angelo and Masulis (1980) model by endogenizing the firm's investment decisions. In their extensions, they generate a model where the production and gearing decisions both giving rise to tax shields that act as substitutes for each other, are concurrently made. They suggest that less gearing be employed to finance higher productive capacity. Their model confirms De Angelo and Masulis (1980) non-debt tax shield hypothesis.

In another theoretical extension to De Angelo and Masulis (1980), Dammon and Senbet (1988) also relax the independence assumption (independence between the firm's optimum investment and financing decisions) and argue that the certainty of the net effect of an increase in investment tax shield on optimal gearing level cannot be guaranteed as this is a function of the trade-off between the De Angelo and Masulis' substitution effect and the income effect from an increase in optimum investment. This being the case, the tax shields prediction changes in response to whether the firm's optimum investment and financing decision are independent or not. There has been some documented evidence of significant interactions between the firm's optimum investment and financing decisions (see Sener, 1989, p.25). Dammon and Senbet (1988) demonstrate that the relationship between gearing and non-debt tax shields is not that straight forward.

Another related assumption in De Angelo and Masulis (1980) is that operating and financial leverage are independent because firms in the same industry use

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[7] Opcit pp. 19-20.

similar production processes and have constant business and total risk. This being the case, a firm's gearing level is a function of its business risk and therefore non-debt tax shield and gearing level are negatively related across industries. Releasing this assumption, Dammon and Senbet (1988) argue that non-debt tax shields and gearing for firms in the same industry may increase simultaneously and put the firms in a new risk class. They further argue that firms with lower non-debt tax shields need not have higher interest (debt) tax shields. They however, confirm De Angelo and Masulis non-debt tax shield argument for firms with identical production process.

Building on both Dotan and Ravid (1985) and Dammon and Senbet (1988), Sener (1989) avoids the use of historical cost accounting, introduces inflation effects on the firms capital structure. The study then tests the De Angelo and Masulis non-debt tax shield and tax rate hypotheses with and without industry classification. The findings indicate a positive relationship between the optimum level of investment and debt financing, analogous to a positive relationship between operating and financial leverage as claimed by Dammon and Senbet (1988). Sener's results also cast doubt on De Angelo and Masulis (1980) tax rate hypothesis as the inverse relationship is observed between gearing and effective tax rate.

Empirical studies have not been able to establish any consensus so far. While some studies have generated results that contradict the theory, others had vague findings. After getting perverse results (significant but positive), Bradley *et al.* (1984) suggest that lack of consensus may be due to *variable measurement error* whereby researchers may use a proxy for non-debt tax shields that is highly correlated with the level of tangible assets. If this is the case then what is tested is tangibility and not non-debt tax shields.

While Bennett and Donelly (1993) confirm De Angelo and Masulis (1980) tax shields hypothesis, Long and Malitz (1985), and Titman and Wessels (1988) find insignificant negative results. In his tests, aimed at confirming or refuting De Angelo and Masulis (1980) tax shields hypothesis, Mackie-Mason (1988) finds results that are inconsistent with theoretical predictions. Finally, in what they claim to be the first evidence that is consistent with De Angelo and Masulis (1980) hypothesis, Chiarella *et al.* (1992) find that their proxy for non-debt tax shield is negatively related to gearing and is significant at 1% for three out of four of their gearing measures. Recently, Drobetz and Fix (2003) who examined Swiss company data have reported insignificant results. In an international comparative study, Wald (2003) confirmed the existence of a negative relationship between non-debt tax shields and gearing for UK.

What is of most relevance to this study is that De Angelo and Masulis (1980) generates testable hypothesis that firms will select a level of gearing, which is negatively related to the level of available non-debt tax shields. The related extensions by Dammon and Senbet (1988) that the degree of substitutability (of debt and non-debt tax shields) changes depending on the level of investment (or production process) for a given firm also provide ground for additional test for robustness of the results.

2.6.2.4 Growth/Investment opportunities:

Myers (1977) suggests that the valuation of a firm a as going concern reflects the expectation of continued investment by the firm, and that part of the market value of such firms is accounted for by the expected future investments which he call 'assets not yet in place'. The present value of these future growth opportunities, which are intangible assets, cannot be used as collateral for debt. That being the case, if a substantially larger part of the market value of a firm is accounted for by these future growth opportunities, the lower will be that firm's ability to support higher levels of debt in relation to its market value. In addition to the collateralizability concerns, Titman and Wessels (1988) also argue that growth opportunities are capital assets that do not generate current taxable income. We therefore should observe a negative relation between gearing and higher growth opportunities.

Agency-based theories also relate gearing to growth opportunities. Myers (1977) also argues that future investment opportunities are discretionary, and that when these are substantial they give managers greater discretion in their choice of future investments. This brings difficulties in monitoring the actions of managers and may lead into expropriation of wealth from bondholders to equity holders through sub-optimal investments. Knowing this, bondholders are likely to become reluctant to grant long-term debt to firms with substantial investment opportunities. Potential future growth is hypothesised to be negatively related to long-term debt because of higher associated agency cost of managerial discretion.

Myers (1977) therefore suggests further that in order to achieve both desired outcomes i.e. (1) reduce the bonding costs by management, and (2) pre-empt sub-optimal investment by firms, firms with substantial investment opportunities should use short-term debt. These firms can then replicate long-term debt by rolling-over short-term debt. These desired outcomes become possible because short-term debt matures before an investment option is exercised, and the rolling-over of short-term debt provides continuous and gradual renegotiation, thereby precluding sub-optimal investment decisions.

Rajan and Zingales (1995) and Ozkan (2001) among others, document an additional reason why market-to-book ratios, which proxies growth opportunities, should be negatively correlated with gearing. Building on Myers (1977, 1984), Williamson (1988) and Harris and Raviv (1990), Ozkan (2001) summarises that the intangibility nature of growth opportunities means that they are only valuable as long as the firm is alive. Should a firm face bankruptcy, the value of its non-transferable intangibles would fall sharply.

Citing Fama and French (1992), Rajan and Zingales (1995) attributes this fall in value to the possibility that the shares of firms in financial distress (highly geared) being discounted at higher rate. Rajan and Zingales hypothesize that if this is the dominant factor then firms with low market-to-book ratio should drive the negative relation. Their empirical tests however, find that the negative relation is driven by firms with higher market-to-book ratio. Rajan and Zingales (1995) therefore conclude that financial distress may not be the reason for the negative relation.

Though there exists contradictory empirical evidence, there is some support for the hypothesised negative relation between gearing and growth opportunities. Bradley *et al.* (1984) uses advertising and R&D to test for agency costs implications for growth opportunities and find a significant negative relationship. Titman and Wessels (1988) find an insignificant negative relationship for market value gearing, and a positive relationship for book value gearing (the coefficient of long-term debt being significant). Chiarella *et al.* (1992) use the same methodology as Titman and Wessels and generally find a significant positive relation for both book and market values gearing. In contrast Barclay *et al* (1995) find a negative relation between gearing and the level of market-to-book (a proxy for growth).

Rajan and Zingales (1995) find a significant negative relationship for both book and market gearing measures in all G-7 countries. Lang *et al.* (1996) show that the negative relationship between gearing and growth holds for firms with low Tobin's q ratio but not for those with high q ratio. They assert that their findings suggest that the negative effects of gearing on growth influences only firms whose investment opportunities are not recognized by the market and those that do not have good investment opportunities. These results imply that gearing has less negative impact for firms whose ample investment opportunities are recognized by outside investors.

On the other hand the cost of capital of firms with low Tobin's q increases with their gearing because the market does not know whether the funds raised externally will be used profitably. Ozkan (2001) also finds significant negative coefficients between the proxy for growth and gearing. Bevan and Danbolt (2002) find significant negative relationship for market value gearing but either insignificant negative or positive relationship for book value gearing. Fama and French (1999), finds that firms with more investment opportunities are less levered. Chen et al (1998) uses two proxies to examine Dutch firms and find mixed results for growth attribute. On the other hand Drobetz and Fix (2003) report that among seven determinants they tested growth (investment opportunities) had the strongest and most reliable negative relationship with gearing.

2.6.2.5 Uniqueness/specialized products:

Titman (1984) predicts that firms, which produce products that are unique or require service or parts, and firms for which a reputation for producing high quality products is important, may be expected to have less debt. In Titman's model, in the event of bankruptcy, these firms could potentially impose higher costs to their customers, suppliers and employees. These higher costs may arise because customers will face difficulties finding alternative servicing for unique products. Employees and suppliers are likely to have job-specific skills and the firm's bankruptcy may render them jobless. Titman and Wessels (1988) find that in the US debt levels are negatively related to uniqueness, this evidence supports Titman's (1984) earlier prediction. Tests of Uniqueness by Drobetz and Fix (2003) on Swiss companies generated insignificant results.

2.6.2.6 Firm Size:

A number of studies have suggested that large firms are likely to be relatively highly geared than small firms. The static trade-off theory of capital structure uses bankruptcy costs to argue that the threat of costly bankruptcy will discourage firms from using debt to fully exploit the potential tax advantage (see for example Kraus and Litzenberger, 1973; and Scott, 1976 among others). Warner (1977), and Ang *et al.* (1982), provide evidence that direct bankruptcy costs form a larger part of the value of a small firm, as opposed to larger firms where these costs are insignificant. Smaller firms suffer the loss of a relatively higher proportion of their value during bankruptcy. This means larger firms face a lower proportion of their value as bankruptcy costs.

Size is therefore seen as an inverse proxy for the probability of bankruptcy (see Rajan and Zingales, 1995; and Ozkan, 2001). Because they are relatively more diversified and less prone to bankruptcy (Titman and Wessels, 1988; Chiarella *et al.* 1992), large firms can easily access capital markets and borrow cheaply (Ferri and Jones, 1979). The agency costs of asset substitution and under investment are also lower for large firms (Chung, 1993).

Rajan and Zingales (1995) postulates that because larger firms have lower informational asymmetries between insiders and the capital markets, they should be able to issue informationally sensitive securities like equity and have lower debt. Large firm size is hypothesized to be positively related to gearing. Transaction costs in issuing securities also helps to explain the importance of firm size in financing decision. Proportionately, small firms incur higher transaction costs when they issue new equity (Smith, 1977) and long-term debt. This implies that smaller firms will be inclined to avoid issuing equity and probably long term-debt and rely much more on short-term debt (mainly bank loans) (Titman and Wessels, 1988). Ozkan (1996, 2001) further argue that smaller firms are more likely to be liquidated when they experience financial distress. All these arguments point towards a positive relationship between firm size and gearing.

Evidence on the importance of firm size on capital structure decisions is also varied. Titman and Wessels (1988) generally find a negative relation, they show that size is negatively related to long-term debt (book value) but not market value, and conclude that the finding may be due to a close relationship between the market value of equity and borrowing capacity. They also report that smaller firms tend to use more short-term debt than large firms, and conclude that this reflects proportionate higher transaction costs, smaller firms incur in issuing long-term debt, in relation to their value.

Rajan and Zingales (1995) find positive coefficients for the relationship between firm size and gearing using U.K data. However, they are baffled by the negative correlation between size and gearing for their data relating to France and

Germany. Relying on proneness to bankruptcy argument, smaller firms should be wary of using more debt in Germany. Their findings show that larger firms have substantially less debt than small firms in Germany. They conclude that they do not know why size is correlated with gearing. They also provide some evidence that size does not only proxy for low bankruptcy risk.

As discussed more fully in chapter four institutional differences in capital markets and ownership structure between the UK on one hand and Germany and France on the other could explain the negative relationship between size and gearing for large firms in these countries. Consistent with Rajan and Zingales (1995) results, Drobetz and Fix (2003) find that size is not an important determinant of gearing for Swiss firms as large firms seem to be less geared than small firms. In a more recent international comparative study, Wald (1999) also finds size to be positively related to gearing in the UK, Japan, and US, but not in Germany and France, and suggests that the centralised control in France and Germany is responsible for the low coefficients on size.

Many other researchers, notably Ferri and Jones (1979), Friend and Hasbrouck (1988), Crutchley and Hansen (1989), Krishnan and Moyer (1996), and Chiarella *et al.* (1992) generally find significant positive relation between size and gearing consistent with the underlying theory. Ozkan (2001) uses GMM estimation method on U.K data and only finds limited evidence to support a positive relationship between size and gearing. Bevan and Danbolt (2002), another U.K study, finds positive significant coefficients for all book value measures of gearing. They however report that the size of the coefficients tended to be small, and at market values the relationship was not significant.

2.6.2.7 Volatility of earnings/firm value:

There is a significant volume of literature, which documents that a firm's optimal debt level is a decreasing function of business risk (volatility of earnings or cash flows) (Bradley *et al*, 1984; Castanias, 1983; Long and Malitz, 1985; Titman and Wessels, 1988; and Kale, Noe and Ramirez (1991). The basis for these arguments is that firms whose earnings or cash flows is more volatile have greater chance of failing to meet their debt commitments. The failure increases their chances of incurring financial distress costs. On the assumption that the marginal tax rate is the same for all firms, Kale *et al.* (1991) adds that firms with higher business risk should have less debt. It is the business risk argument that supports the balancing of tax benefits with bankruptcy costs in the trade-off theory of capital structure.

A counter hypothesis based on agency considerations has also been suggested that higher business risk may encourage the increasing use of debt and reverse the said negative relation between business risk and gearing. This can happen because the large gains form the use of debt accrues to equity holders while large losses are shared between these equity holders and debt holders (Boyle and Eckhold, 1996). Miller (1977), Haugen and Senbet (1978), and Castanias (1983), among others, have also argued that the existence of positive bankruptcy costs (of small magnitude compared to the tax advantage of debt) is not sufficient to ensure a negative relationship, and more importantly, the trade-off theory of capital structure. Jaffe and Westerfield (1987) argue that given appropriate choice of parameters, optimal gearing level is likely to be an increasing function of business risk.

Probably because of counter arguments, empirical evidence on the relationship between business risk and gearing depicts diverse findings. Bradley *et al.* (1984), and Drobetz and Fix (2003) find earnings volatility to be an important inverse determinant of gearing. Titman and Wessels (1988) uses the standard deviation of operating income (SIGOI) to proxy for business risk and does not find significant evidence that volatility is negatively related to gearing. Ferri and Jones (1979), and Flath and Knoeber (1980) also concluded that there is no significant relationship between gearing and business risk. Contrary to the dominant theory, Bennett and Donnelly (1993) reported a positive relationship between gearing and volatility of earnings.

Mikkleson (1984) claims that lack of a neatly specified functional relationship is a major weakness in this area of research. Kale *et al.* (1991) then go on to specify the functional relationship between optimal debt level and business risk as being roughly U-shaped, decreasing for low levels of business risk, and increasing for high levels of business risk. Contrary to Kale *et al.* (1991), recently, Ghosh, Cai, and Li (2000) have found that the relationship between business risk and gearing is quadratic, first increasing and then decreasing, a relationship, which, as they put it, is more close to the traditional theory. Bradley *et al* (1984) had also mentioned that that leverage decreases with variability of firm value, although in their empirical section they only tested the variability of operating income (using book earnings).

2.6.2.8 Profitability:

A good starting point for an investigation into whether profitability is an important determinant of capital structure is to recognise that there are two main theoretical arguments, which use profitability as their tool of analysis. It is also important to recognise that while one theory (i.e. pecking-order) relies on past profitability, the other (i.e. signalling theory) relies on future profitability. Myers (1984) pecking order theory attempts to explain firms' behaviour as reflecting the preference of firms to use internal funds to finance their investments. Should there be a need for external finance, firms issue safest security first, i.e. starting with debt, then hybrid securities like convertible debt, equity is the last resort.

Donaldson (1961), among others, had similar arguments although the term-pecking order is attributed to Myers. The rationale for this clearly defined hierarchy of sources of finance is not only based on the transaction costs associated with issuing equity, but also that the existence of asymmetric information between managers who have superior information to the market, causes the stock price to fall if a firm issues equity instead of debt (Myers and Majluf (1984). The level of retained earnings (past profitability) is therefore hypothesized to be negatively related to gearing, as firms tend to exhaust internal sources before thinking of debt, and as a result profitable firms will have a tendency to have less debt.

In general signalling models say that individuals or entities whose superior features cannot be observed by outsiders normally adopt behaviours (or policies) to signal their superiority over their inferior counterparts. Brennan has the following to say on signalling models:

> "An example from the natural world is offered by the tail feathers of the peacock which, while dysfunctional for the male bird, serve to signal its health and breeding potential to females" (Brennan, 1999, p.20).

In finance, the signalling theory, which is about future profitability, mainly comes from the works of Ross (1977) and Leland and Pyle (1977) who argue that managers posses private information about the characteristics of the firm's return streams or investment opportunities. Investors on the other hand do not have this information. Investors take the (issue of) debt as a signal of higher quality of earnings or investments stream. It is true that managers have intimate knowledge of their firms because they spend most of their time analysing their firms' day-to-day operations, as well as strategies. This unlimited access to their firms' information enables them to make superior forecasts regarding their firms' future prospects. Perhaps it is due to these reasons that managers have been reported to out-perform the market in insider trading studies (see for example Seyhun, 1986).

It is due to these reported pieces of evidence, that stock markets do react by adjusting a firms share price (either favourably or adversely) following announcements by managers about some important investment or financing decision, or any other important decision by managers (see Smith (1986) and Barclay *et al* (1999) among others for examples). Barclay *et al* (1999) further document that capital structure and dividend choices are notably effective signalling devices. Managers of 'high-quality firms', that is firms whose managers are confident of future profitability, who think that their firms share price is undervalued will issue more debt and are likely to pay higher dividends than low-quality firms. And because low-quality firms cannot imitate, outside investors get the right signals. It is important to emphasize that the authenticity of these signals is guaranteed because by issuing more debt (or paying higher dividends), managers of a high quality firm commit themselves to a series of future fixed interest payments which the failure to realise may lead to the firm's bankruptcy and/or loss of their jobs.

As for the payment of higher dividends, managers signal that they will be able to sustain that level of dividends because they are confident of their firm's future profitability. Since lower-quality firms have higher marginal expected bankruptcy costs for any debt level, they do not imitate higher quality firms by issuing more debt or raising the level of dividends. When managers issue debt, their action is taken as a signal that they expect their firm to be profitable in the future. Signalling theory therefore predicts a positive relation between future profitability and gearing.

There is yet another reason why the issue of debt or equity may be interpreted as a signal. The fixed return on debt securities make them less sensitive to changes in a firm's value compared to equity. This means that, for an undervalued firm, debt is likely to be less undervalued. Faced with the necessity to issue new security, managers of high-quality firms whose goal is to maximize firm value, will choose to issue debt, the less undervalued security. Note that for overvalued firms managers may be inclined to issue equity because equity will be more overvalued than debt.

Following from this dichotomy, a meaningful empirical test should therefore come up with a means of differentiating between a proxy for past profitability and that of future profitability. In addition to the failure of all previous studies (including international studies) to separate the two, the evidence relating to these predictions has not been widely explored in the U.K. Although there is well-documented evidence in support of profitability as an important determinant of financing decision, these studies do not differentiate between past and future (expected) profitability. As a result some (see Titman and Wessels, 1988) fail to get significant evidence, while others (see for example Chiarella *et al.* (1992), pp.153-154) contradict themselves in interpretation.

Titman and Wessels (1988), whose proxies for profitability do not separate past and future profitability, find a significant negative relation for gearing ratios scaled by market value of equity but not those scaled by book values. Friend and Hasbrouck (1988) also find a significant negative relationship consistent with the pecking order predictions. Chiarella *et al.* (1992) recognise to using an indicator, which measures only past profitability, they consequently get mixed results, and proceed to contradict themselves in their interpretation. They attribute a significant positive relationship between past profitability and long term debt (market value) to Ross's (1977) signalling theory (p.154), and a negative relationship to the pecking order theory (p.153). They finally conclude that the positive relationship may be a statistical anomaly (p.154). This interpretation appears contradictory because, a measure of past profitability cannot be used as evidence in support of the pecking order predictions, and at the same time be expected to serve as a signalling instrument.

Perpetuating the problem, Ozkan (2001) report a negative relationship between current profitability and gearing and interpret this to be consistent with the pecking order theory. In addition Ozkan report that the coefficient on lagged profitability is positive and significant, and concede that the result is inconsistent with the view that past profitability should relate negatively to gearing. Ozkan appears to expect both past and current profitability to relate negatively to gearing. In the view of the dichotomy discussed earlier, this is contradictory. Jung *et al* (1996) finds that firms depart from the pecking order because of agency considerations. Shyam-Sunder and Myers (1999) finds that the pecking order model has much greater time-series explanatory power than the traditional static trade off model. Fama and French (2002), Wald (1999), and Drobetz and Fix (2003) also confirm the pecking order model's that more profitable firms are less levered.

This evidence in support of the pecking order theory has not gone without questions. Chirinko and Singha (2000) for example, provide a critique of the Shyam-Sunder and Myers' (1999) interpretation of regression tests by arguing that Shyam-Sunder and Myers (1999) tests generate misleading inferences. They argue that Shyam-Sunder and Myers (1999) tests are tests of the joint hypothesis of the financial hierarchy and proportions (of financing), and that the tests are unable to detect situations where the ordering hypothesis is violated. The pecking order model predicts that a firm will only resort to equity issues as a last resort (i.e. equity issues will be at the bottom of financing hierarchy).

Chirinko and Singha (2000) assert that the ability of Shyam-Sunder and Myers (1999) tests to identify this financing pattern against relevant alternatives is limited. They conclude that even if the pecking order model is valid, the testing technique put forward by Shyam-Sunder and Myers (1999) can evaluate neither the pecking order nor the static trade off models. Frank and Goyal (2003) also test the pecking order theory on a broad cross-section of publicly traded American firms for the period 1971 to 1998, and contrary to the theory, they find that net equity issues track the financing deficit more closely than do the net debt issues. They therefore question whether the pecking order theory is broadly applicable.

Barclay *et al* (1999) test specifically for the signalling hypothesis and find a positive and statistically significant relationship between gearing and future profitability. Barclay *et al* (1999) also report that the stock market responds in a systematically positive (negative) fashion to announcements of large leverage increasing (decreasing) transactions. For example, they report, stock price rises by 14%, by 8.3%, and by 2.2% following a large debt-for-stock exchange, a preferred stock for common exchange, and debt-for-preferred stock exchange respectively. For leverage reducing transactions however, stock prices falls by 9.9%, and by 7.7% following a common stock-for-debt exchange, and a preferred-for-debt exchange respectively.

These figures are consistent with those quoted by Jensen (1986) from their earlier work, (see Jensen and Smith (1985) and Smith (1986)), that 2-day gains from leverage increasing transactions range from 2.2% (debt or income bonds-for-preferred) to 21.9% (debt-for-common). For leverage decreasing transactions however, Jensen and Smith report that 2-day losses range from -9.9 percent (for common-for-debt) to -4 percent (for call of convertible preferred forcing conversion to common).

In their survey of 176 firms in the Fortune 500 list, Pinegar and Wilbricht (1989) report that it is unlikely that managers make deliberate signals of firm value (or quality) through their debt-equity choice. Instead they argue that because their findings show that managers evaluate investments and financing decisions simultaneously, these decisions are not independent and security price reactions to capital structure changes may therefore be a reflection of revisions in market expectations of the firms operating performance.

There are also some studies, which used data relating to U.K companies, although they did not differentiate between past and future profitability. Bennett and Donnelly (1993) test the relationship between past profitability and gearing and report a significant negative relationship only when debt is measured in market value. While generally Rajan and Zingales (1995) find a negative relationship, they do not get such a relationship in Germany and France. They also find that the gearing of larger firms is more positively correlated with profitability in the UK than in other G-7 countries. Ozkan (2001), a UK study, reports significant evidence of current profitability's negative influence on firms' borrowing decisions. Another UK cross-sectional study by Bevan and Danbolt (2002) also reports a significant negative relation between profitability and gearing and interprets this to be consistent with the pecking order theory.

2.6.2.9 Probability of bankruptcy:

As discussed earlier, there have been a lot of arguments and counter arguments about bankruptcy costs and how these costs discourage managers from borrowing as much as they could to finance their firm's investments and/or operations. Some researchers have even resorted to estimating the magnitude of both direct and indirect bankruptcy costs (see Warner, (1976) Altman, (1984); Weiss, (1990); and, Andrade and Kaplan, (1998) among others). However, as argued by Haugen and Senbet (1978), Altman (1984), and Andrade and Kaplan (1998), it is the expected (present) value of bankruptcy costs at the time of making a financing decision, which matters, and its relevance should be considered at the time of making a decision to issue debt and not a few years prior to bankruptcy.

Bradley *et al* (1984) finds that a firm's leverage is inversely related to the expected costs of financial distress. In his study of debt and equity issues, Marsh (1982) reported that firms with greater bankruptcy risk are more likely to issue equity. Although there has been a number of studies of bankruptcy costs, theoretical analyses of their role (Haugen and Senbet (1978), and on studies of bankruptcy law and/or insolvency codes by for example Franks *et al.*, (1996), Kaiser (1996), and Thoburn (2000), empirical investigations as to whether the probability (threat) of bankruptcy influences financing decisions are lacking. This could be caused by difficulties in identifying an appropriate proxy, which is capable of capturing such a probability.

Besides a mere mention that size may be an inverse proxy for probability of bankruptcy (Rajan and Zingales (1995, p. 1456), no previous UK studies have empirically examined the influence of the probability of bankruptcy to capital structure decisions. One of the contributions of this study is to attempt to introduce a measure of probability of bankruptcy in capital structure empirical analysis. Altman (1968) introduced Multiple Discriminant Analysis (MDA) in finance, and used Z-score to predict firms' proneness to bankruptcy (see also Altman, 2000; and Altman et al (1977). This study uses Altman's Z-score to investigate the influence of the probability of bankruptcy on capital structure decisions (see section 4.8.9 in chapter four).

2.6.2.10 Cash holdings and free cash flow

Jensen (1986) uses both agency and the market for corporate control theories to argue that when such market is effective it actually forces managers to pay out 'free cash flows' by resorting to the use of more debt finance. Because managers like to expand their corporate empire in order to seek prestige and increase their managerial compensation, the availability of free cash flows may tempt them to use it in sub-optimal investments. To prevent managers from misusing these cash holdings, shareholders of firms, which are capable of generating free cash flows, should use more debt in their capital structure. Following from this argument, cash-rich firms should be using more debt, hence suggesting a positive influence of cash and cash equivalents on gearing.

While Jensen (1986) suggest that it is the shareholders of these cash-rich firms who should initiate the use of more debt (by repurchasing equity) in order to disgorge the free cash flow, there are other theories that have suggested that managers themselves face a number of disciplinary forces which might lead them to take on more debt financing. For example, in Zwiebel's (1996) managerial entrenchment theory, each period managers set their firm's gearing ratio in a way that enables them to build their empire subject to ensuring that they maintain sufficient efficiency to prevent takeover contests. Safieddine and Titman (1996) also contributes to the capital structure theories that are driven by corporate control considerations (see Harris and Raviv (1991) and Israel (1992) for earlier expositions of these theories).

Safieddine and Titman (1996) uses a sample of unsuccessful takeovers and provide evidence that as a defensive strategy, targets that terminate takeover attempts substantially increases their gearing ratios. They show that this increase in gearing decreases the chances of a target being taken over because it commits the target management to make the improvements that would have been made by a potential raider. They document further that targets that increase their gearing the most also reduce capital expenditure, sell assets, reduce employment and increase their focus. Consistent with existing literature (see Harris and Raviv, 1991, and Israel, 1992), increases in target's gearing which is combined with improvements by target managers, might increase the target's stock price, which implies the higher cost of takeover to potential raiders. Safieddine and Titman's (1996) results support this view as they find that stock prices of gearing-increasing targets outperform their benchmarks for five years following takeover termination

Alternatively, a high level of cash and cash equivalents may also be an indicator of availability of internal funds, which a firm following a pecking order of financing would use. It is reasonable to assume that this cash comes from past profitability. The connection between higher levels of cash and past profitability therefore predicts a negative relationship between cash holdings and gearing consistent with Myers (1984) and Myers and Majluf (1984). Two theoretical predictions are contradictory here, and it is the results of tests conducted in this study that will confirm or refute either theory.

Chiarella *et al.* (1992), a study using Australian data, uses two different proxies to empirically test for cash holdings. Though they generally get positive relationship, the study does not provide any significant results. They also claim to have been the first to test cash holdings as a determinant of capital structure. In the U.K, Ozkan (2001) tested for liquidity by using the ratio of current assets to current liabilities (CA/CL) as a proxy for liquidity. He finds statistically significant evidence that liquidity exerts a negative impact on gearing, and uses this evidence to argue that because liquid assets can be manipulated by owners at the expense of debt holders, these assets have a negative impact on gearing. Though related, but liquidity and cash holdings are different concepts. Furthermore, the proxy for liquidity used by Ozkan seems inappropriate.[8] This

[8] The ratio of current assets over current liabilities may be a good measure for liquidity or working capital in an accounting sense. The ratio however includes inventory, prepayments, and other current assets, which are not readily available for use by managers for financing purposes. The use of this ratio may mask important relationships between cash flows and gearing. Because 'cash and cash equivalents' is the item which can be used by managers to either substitute for debt, or provide a firm with ability to service high levels of debt, it is more appropriate than the working capital ratio.

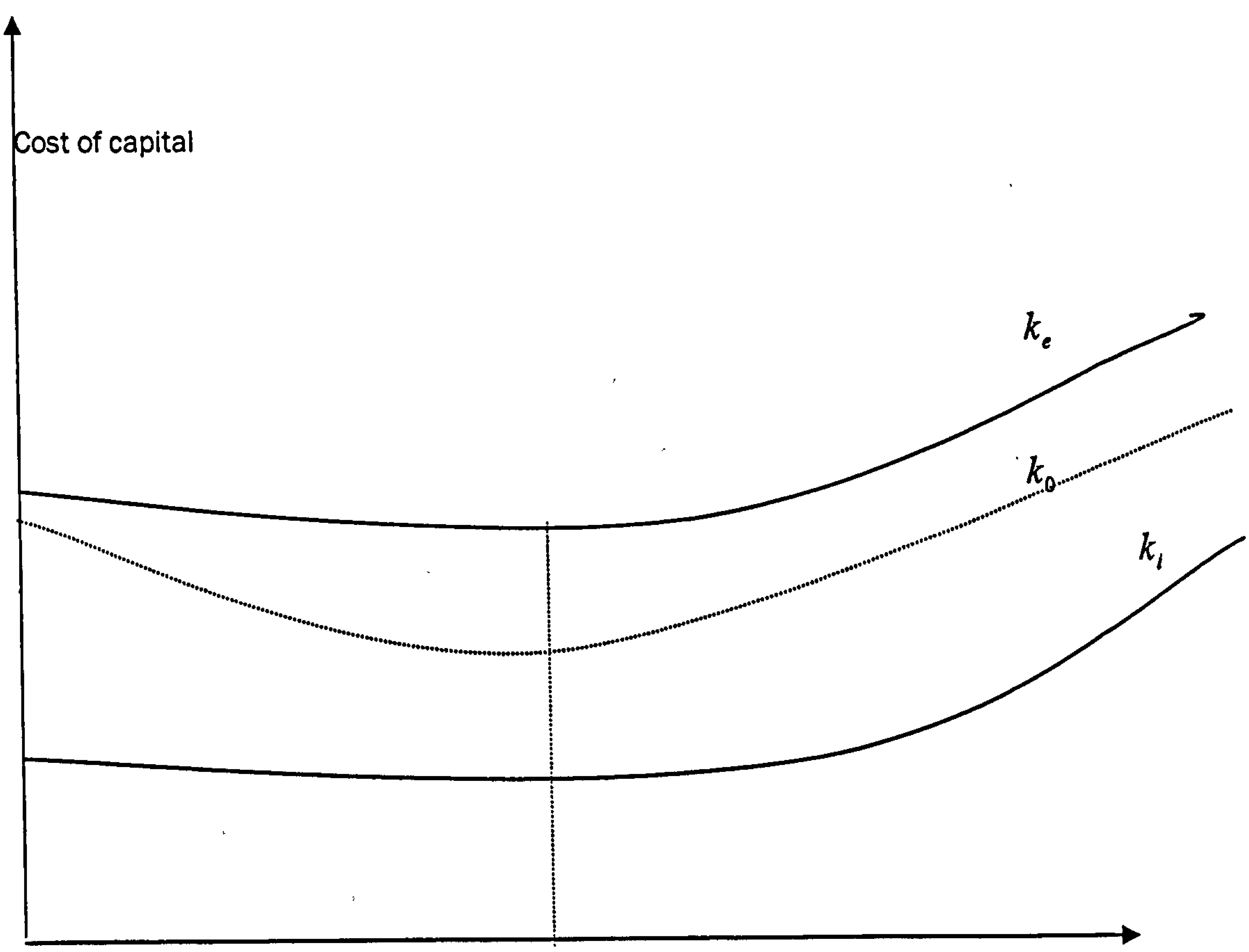
study designs the appropriate tests for Jensen's free cash flow in chapter four, and reports the results.

2.7 Summary

This chapter has reviewed the literature relating to capital structure theory in general and prior empirical research on determinants of capital structure in particular. Hypothesised determinants that have been highlighted by prior research include tangibility, non-debt tax shields, growth, uniqueness, firm size, business risk, profitability and profitability. The review in this chapter shows that results of empirical research are mixed and it is still inconclusive whether these hypothesised determinants influence gearing in the manner prescribed by the dominant theories. Attributes such as probability of bankruptcy, cash holdings, and uniqueness have not been widely tested. The next chapter (chapter three) discusses the institutional environment and legal framework in the UK which might have differential impact on gearing. This is done as a prerequisite for designing the empirical tests on these determinants in subsequent chapters, as well as ensuring a meaningful interpretation of the results emanating from these tests.

2.8: Appendix: Tables and Figures

Figure 2.1: Cost of capital under the traditional approach to capital structure



Explanation: On the assumption that debt financing is cheaper than equity financing (because the cash flows from investment in debt are relatively safe), the cost of debt finance k_i is lower than the cost of equity capital, k_e. By using more (cheaper) debt, a geared company will be able to push down the overall cost of capital (WACC), k_0, as long as gearing is kept within 'judicious level'. Beyond the 'judicious level' however, the now excessive use of debt finance causes k_e, and even the marginal k_i to increase. As a result, k_0 also starts to rise. The level of debt at which the overall cost of capital is minimised (and the value of a firm maximised) is therefore the optimal capital structure.

Chapter 3

3 UK'S FINANCING AND INSTITUTIONAL ENVIRONMENT

3.1 Introduction

This chapter provides a discussion of the UK's institutional and other features, which are likely to impact differently on capital structure among countries. Evidence suggested by Remmers *et al* (1974), Rajan and Zingales (1995), Stonehill *et al* (1975), Booth *et al* (2001) Wald (1999), Panno (2003), and Fan et al (2003) among others, suggest that capital structure of companies differ not only between developed and developing countries, but also among highly industrialized developed countries. Table 3.3 and table 3.4 provide examples of different capital structures for firms in selected developed economies.

Capital structure differences are due to some macro-economic conditions and financial constraints (Korajczyk and Levy, 2003), and institutional features (Wald, 1999; and Rajan and Zingales, 1995). These institutional features include *inter alia*, capital market environment, the role of banks in corporate finance, unique tax legislation, and the bankruptcy code (see Franks *et al*, 1996; Kaiser, 1996; Wald, 1999, and Fan et al, 2003). The understanding of these features is necessary to ensure both proper designs of the various tests conducted in this study, and sound interpretation of results from these tests. The UK's financing and institutional framework discussed in this chapter are going to be compared and contrasted with those of other countries such as the US, Japan, Germany and France, to mention a few. This discussion is important because there is a cohort of factors likely to influence gearing, which have not been tested in the UK.

The United Kingdom (U.K) constitutes the greater part of the British Isles. The largest of the islands is the Great Britain (GB), which comprises England, Scotland and Wales. The next largest comprises Northern Ireland, which is part of the U.K, and the Irish Republic. The U.K covers about 243,000 sq. km; and its population in mid-2000 was estimated at 60 million, the second largest in the European Union after Germany. The ten-year census of population was held on April 29th 2001. In the 18th and part of the 19th centuries, the U.K was the leading manufacturing, trading and shipping country in the world. Today, it is the world's fourth largest economy after those of the U.S, Japan, and Germany (Foreign and Commonwealth UK data file, 2002). This places U.K within the G-7 countries, which includes in addition, France, Italy and Canada. In 2000 U.K GDP at current market prices (money GDP) totalled £943 billion. In 2000 growth in U.K economy continued for the ninth consecutive years, and average annual growth in GDP from 1995 to 2000 was 2.8% (at 1995 market prices). The Economy is going through the longest period of sustained low inflation since the 1960's. The underlying inflation was below the government's 2.5% target throughout 2000, averaging 2.1%.

UK is therefore a typical large developed economy and to a large extent its corporate system resembles that of the US. Black and Coffee (1994) say that the UK corporate system is similar to that of US in many ways: First, both have similar legal system, which on the other hand is totally different from systems in other developed markets. Secondly, in both UK and US, shares of mostly large corporations are publicly held as opposed to the case in other markets where family ownership plays a significant role. Thirdly, and fourth, both the London stock exchange 'the City', and the New York Stock Exchange 'the Wall Street', have similar institutional framework, and have enjoyed a similar level of liquidity over a long period.

According to Rajan and Zingales (1995), although G-7 countries are fairly homogeneous in their level of economic development, they exhibit differences in their institutional framework. Among the areas in which these differences are to be found are tax laws (Graham, 1996; Ashton (1989), and Fan et al (2003)), Insolvency code (Jairo (2003a), Thoburn (2000), Franks *et al* (1996) and Kaiser (1996)), market for corporate control, the capital market environment, and the role played by banks in corporate finance (Kaplan, 1997). These institutional differences, together with the general economic trend do affect financing decisions in one way or another. It is necessary therefore that an examination of determinants and dynamics of capital structure in the U.K must take into account the unique features of the country's institutions, as well as the economic environment. This view is supported by, among others, Rajan and Zingales (1995) who argue that;

> "...the review of institutions is important because they may affect the within-country cross-sectional correlation between leverage and factors such as firm profitability and firm size" (p. 1422).

It is from this background that this chapter gives an overview of institutional arrangements, and macro economic factors between 1980's and 2002 in the U.K and examine how these are likely to impact on gearing.

3.2 Institutional framework

3.2.1 Corporate governance and finance systems

Corporate governance refers to a mechanism through which boards and directors are able to direct, monitor, and supervise the conduct and operation of the corporation and its management in a manner that ensures appropriate levels of authority, accountability, stewardship, leadership, direction and control. Corporate governance relates to the internal means by which corporations are operated and controlled, and while governments have a role to play particularly in shaping the legal, institutional and regulatory environment within which individual corporate governance systems are developed, the main responsibility lies with the private sector (OECD, 1999).

There are two predominant corporate finance and governance systems among developed economies (see for example Rajan and Zingales, 1995, and Chew, 1997). On the one hand there is the Anglo-American market oriented system, which is characterised by widely dispersed equity holders and fairly rigorous corporate control (takeover) market. The relatively more widely dispersed shareholders have led to this system being called "outsider system". Examples of countries where this system is prevalent are the U.S., UK, and Canada. On the other hand there is a relation-based system, which is characterised by a strong influence and close relation of large banks (in Japan 'main banks', in Germany 'universal banks') to the corporate sector. In addition to each company having its main or universal bank, there also exist a widespread inter-corporate holdings and an obvious lack of takeover activities. Because these banks are so close to (and finance) the companies, this system is also called "insider system". Japan, Germany, France and Italy are examples of this system. Table 3.1 compares the salient features of the two major corporate governance systems.

It is important to understand the differences in corporate governance systems for a number of reasons. As Kaplan (1997) documents, these differences are generally associated with different managerial behaviour and firm objectives. These differences have also been associated with differences in capital structure among countries (see Rajan and Zingales, 1995; Wald, 1999, and Fan *et al*, 2003). In order to appreciate the effects of market-oriented features in the UK, it is better to make some comparisons between the UK as a market oriented economy and some of the bank oriented countries. It has been documented that market-oriented countries have larger capital markets while bank-oriented countries have relatively smaller financial markets (Rajan and Zingales 1995).

3.2.1.1 Market participation

In their recent work, Fan, Titman and Twite (2003) find that cross-country differences in gearing ratios can be explained by institutional differences. Particularly, Fan *et al.*, document that market participation (i.e. financial market development, institutional investment activity, and the activity of information intermediaries) affect financing decisions. Panno (2003) analyses security issues in the UK and in Italy, and finds that in well developed financial system (UK), firms tend to have more obvious long-term target debt ratios, than in less developed market (Italy). Although this thesis does not focus on international comparison of capital structure like Fan *et al.* (2003), the study stresses the importance of understanding firm-specific and industry specific factors within the context of institutional factors affecting financing decisions in the UK. Such an understanding is only possible if one can have a glimpse of how UK stands in relation to other industrialised countries.

Table 3.2 depicts the size of capital markets and measures of their liquidity in G-7 countries in 1986 (the beginning of the period covered in this study) as well as the most currently available figures (2001, 2002, and 2003 as the case may be). In the UK a relatively large number of large companies' shares are quoted on the London stock exchange (LSE). As table 3.2 shows in absolute terms UK has been the third largest country in terms of market capitalization, only coming after the U.S. and Japan. This has been the case despite the fact that Germany is the third largest economy in the world (see World Bank's World Development Indicators (WDI), 2001). Both Germany and Japan are characterised by a relatively more concentrated ownership of corporations than the UK, U.S. and Canada (see Kaplan, 1997). Rajan and Zingales (1995) document that much of the capital market growth in Japan came in the 1980s following reforms aimed at relaxing the control of corporations by banks.

The appropriate indicator of the relative size of the stock market is the ratio of stock market capitalization divided by the GDP of the host country. Table 3.2 shows that UK had the largest ratio than all other countries both in 1986 and 2001. Actually the WDI database (not shown here) reveals that for the whole period covered by this study (1985-2000), UK has had the largest ratio. The same database also shows that from 1990 to 1997, the market capitalization as a fraction of GDP for all bank-oriented countries (except Japan) was lower than the average for developing countries. For Italy even the measure of liquidity was lower. It was only from 1997 (1998 for Italy) that these countries overtook the developing countries' average. The dramatic rise in market capitalization of bank-oriented countries from 1997/98, which has been ever increasing to-date, could have been a result of reforms in these countries towards the market-oriented system (see Chew, 1997; Kester, 1997; and Kaplan, 1997).

As for the 2001 and 2003 relative measure of size, the distinction between market and bank oriented categorization is brought out more clearly in table 3.2, the UK leads (182.2%), followed by the U.S. (153.5%), and then Canada (122.3%). All bank-oriented countries except France have a measure of relative size of the stock market of less than 100%, and have more or less comparable sizes. As regards the measure of the liquidity of the stock markets, the ratio of stocks traded divided by the GDP of host country; only UK and the U.S. have a ratio higher than 100% (US having a higher liquidity). Another clear distinction between the two systems is shown by the ratio of the bank credit to the private sector as a fraction of GDP. This is shown in the second column of table 3.2 for 1986. It is obvious that in bank-oriented countries banks had been giving more credit to the private sector, as the ratio is highest for Japan, followed by Germany, and then by France.

3.2.1.2 Financial markets development vs. financing decisions

Do these established differences in size and liquidity of capital markets have any bearing on capital structures of corporations in these countries? This is a major question that this chapter addresses. First the search for any observed differences in capital structure patterns is carried out. Tables 3.3 and 3.4 provide an indication of capital structure patterns among several highly industrialized (G-7) countries from 1984 to 1994. These tables, together with the subsequent discussion in this part set the scene for tests conducted in this study and helps in the interpretation of the results obtained from subsequent tests. In table 3.3, for the period 1984 to 1991, the UK, USA, and Canada (the market oriented countries) used smaller proportion of external financing, whereas Japanese corporations were largely financed by external sources. Over the same period (1984 to 1991) Germany issued more net debt than the UK. And Canada and UK issued the same level of debt.

Relying on OECD data Rajan and Zingales (1995) also reported that Japan's greater reliance on external financing was also noted from 1972 to 1981, which shows that its reliance on external financing is not an artefact of the rise in Japanese stock market in the late 1980s. As for table 3.4, the sources of financing as a percentage of total sources are reported for the middle of the period covered by the sample used in this study (i.e. 1990 to 1994). Table 3.4 indicates that over that period UK had the lowest increment in debt, and the highest increment in stock.

A higher stock market capitalisation and higher stock market liquidity depicted in table 3.2 is a strong indication that UK's capital markets are highly developed and have a higher level of investor participation than countries like Germany, France, and Italy. Such higher levels of market development provide managers with flexibility in financing decisions. For example, a developed capital market implies an increasing use of bonds (long-term debt) by companies as opposed to a less developed capital market where short-term debt in form of bank loans is likely to be predominant. Rajan and Zingales (1995, p. 1448) and Fan *et al*, (2003, pp. 9-11) support this view.

A developed capital market also might imply a wide dispersion of ownership of corporations among individuals and institutional investors, and an active takeover market. While the dispersion of ownership might lead to investor pressure on managers for short-term return, both *short-termism* and active takeover market are likely to encourage higher performance by managers. Faced with such pressure, managers in a capital market, which provides relatively higher flexibility in financing decisions, are likely to be effecting adjustments in capital structure more often to attain the target-gearing ratio.

Aside from the classification into market-based and bank-oriented countries discussed above, UK still exhibits a lower level of gearing not only compared to bank-oriented countries, but also compared to the U.S., and Canada (see Rajan and Zingales, 1995; and Wald, 1999). What could be causing this? Could other factors like the tax framework, insolvency code, or macroeconomic factors be responsible for the low gearing? The next section turns to the UK's tax regime, before a look at the insolvency code, and other macroeconomic factors.

3.3 Tax system

3.3.1 Introduction

The influence of taxes on financing decisions has been a focus of an enormous body of corporate finance research for decades. There is no doubt that the deductibility of interest paid on debt by a tax-paying company, shields that company from part of the tax burden. It is now obvious that a more appropriate analysis of this relationship has to incorporate no only corporate taxes, but also non-debt tax shields, and personal taxes on both equity income (dividends and capital gains), and interest income (see Modigliani and Miller, (1958,1963), Miller (1977), De Angelo and Masulis (1980)). This is because the differential tax treatment of interest, dividends, and capital gains incomes received by investors, are important factors that may influence a company's capital structure decisions.

In a more recent work Panno (2003) provides evidence that the tax advantage of debt financing plays a role in capital structure decisions in the UK. It is also obvious that different tax jurisdictions charge different tax rates, and have different tax treatments regarding both corporate and personal taxes. Despite a diversity of tax regimes worldwide, for this study's purposes most of these can conveniently be put into two (Swoboda and Zechner, 1995) or three (Fan *et al.*, (2003) categories, namely, classical system, dividend relief system and dividend imputation system (see also Walsh and Ryan, 1997, and Ashton, 1989,1991).

3.3.2 The classical taxation system

In the classical system interest payments by companies to investors are tax deductible at corporate level, and are only taxed at personal level. Dividends payments are however, not tax deductible at corporate level, and are taxed at personal level at the rate of ordinary income. Capital gains are taxed at capital gains rate, which is usually lower or equal to the tax on ordinary income. Therefore dividends are double-taxed under this system, first at corporate level and then at personal level. Examples of countries in which this system operate are Australia (pre-1987), Netherlands, South Africa, Switzerland, and the US. In the remaining two tax systems, the tax framework is designed to reduce or eliminate the double-taxation of dividends.

3.3.3 *The dividend relief and dividend imputation systems*

In the dividend relief system, either the dividends are not taxed at corporate level, but are still taxed at the same rate as interest payments, at the personal level (treating both interest and dividends symmetrically), or, dividend payments are taxed at the corporate level, but taxed at a reduced rate at personal level. Examples of countries employing such a tax regime include Denmark, Greece, Thailand and Turkey. Some scholars sometimes regard the dividend relief system as a variant of the imputation system, which is described below (see Swoboda and Zechner, 1995).

In the dividend imputation system interest payments are deductible at the corporate level and taxable only at personal level. Dividends are not tax deductible from corporate taxable income, only that the double-taxation of dividends is mitigated by granting a tax credit to recipients of dividends equal to some fraction of the domestic corporate tax paid on the dividends. This system exists in Australia (post-1987), Canada, France, Germany, Norway, Italy, New Zealand, and in the United Kingdom. Fan *et al.*, 2003 document that the full amount of domestic corporate tax paid is distributed as tax credit only in Australia, Germany, Italy, New Zealand and Norway.

These different tax systems impact differently on the relationship between taxes and capital structure. This is because the attractiveness of debt financing differs from one system to another; and this is likely to be reflected in gearing levels. For example by double taxing dividends, particularly if capital gains are taxed at the same rate as dividends, the classical system makes debt financing more attractive to companies. Following this line of reasoning (Swoboda and Zechner, 1995) argued that debt financing may be expected to dominate equity if only taxes are considered under the US tax system. Perhaps this partly explains why US corporations are highly geared than UK corporations.

It is also evident that some of the features of these tax systems have been changing over time. For example, in the US, the Tax Reform Act (TRA) of 1986 drastically changed the US's tax regime by abolishing some non-debt tax shields, lowering the corporation taxes, and reducing the preferential treatments of capital gains. It also lowered the personal tax rates on ordinary income. Such changes alter the environment within which companies and investors operate. Consequently, a significant increase in gearing by US companies has been reported by post-TRA studies (see Givoly, *et al.*, 1992; and Walsh and Ryan (1997)). Walsh and Ryan, 1997, among others question the attainability of the Miller's (1977) equilibrium after the TRA, 1986, as there appear to be marginal benefits to gearing.

3.3.3.1 The influence of taxation on capital structure in the UK

For most of this study's sample period, UK was operating a dividend imputation system (see for example Rau and Vermaelen, 2002, and Fan *et al.,* 2003). The corporation tax credit, which is granted to equity investors in an imputation system, mitigates the double-taxation of dividends thereby decreasing the relative attractiveness of debt over equity. This leaves only a minimal tax advantage of debt (estimated by Ashton, 1989, and 1991, to be 6 percent of the market value of perpetual debt). Citing Scholes and Wolfson (1992), Walsh and Ryan (1997) have contended that Ashton (1989, 1991) overstates the tax advantage of debt by arguing that if a firm with finite life and/or issues debt with finite life, the present value of interest tax shields will be lower than that for perpetual debt. They further attack Ashton's (1989, 1991) estimates for the failure take into account the possibility that non-debt tax shields may reduce even further the tax advantage of debt.

Following this line of argument Walsh and Ryan (1997) document evidence, which show that non-debt tax shields have had a relatively more significant impact on UK firms' interest tax shields. They observe for example that between 1982 and 1984, despite a corporate tax rate of 52% and an Advance Corporation Tax (ACT) rate of 30%, many UK companies had accumulated tax losses, and less than half of the companies were paying corporation taxes in excess of the ACT payable. There were also generous depreciation allowances of up to 100% in the first year of investment (in fixed assets).

While Ashton (1991) suggested that in the UK the role played by taxation in influencing financial decisions is minor rather than major, Walsh and Ryan (1997) concluded that '...if the UK tax system is examined in isolation, taxes are unlikely to be a consideration in the debt versus equity issuance decision' (p. 946). UK firms should be expected to be less geared because under the dividend imputation system the tax benefit of debt, relative to equity, is lowest.

3.4 Insolvency code

Insolvency laws have a major impact on lender-borrower relationships and therefore on the structure of ownership and capital in private companies, and this means that these laws are likely to influence borrowing and lending decisions (Kaiser, 1996). Some scholars have even questioned whether a bankruptcy code is needed at all. They have argued that such a code limits the contracts that can be written between creditors and debtors and it is debatable whether this is desirable (see Franks *et al*, 1996).

Bankruptcy laws and procedures date back centuries in the developed world. The *Economist* (February 24th, 1990) provides a clue about the origins of modern bankruptcy:

> 'The word *bankruptcy* comes from *banca rotta*, Italian for broken bench. The custom was that when a medieval trader failed to pay his creditors his trading bench was broken. Since bankruptcy was taken off the streets and put into the statute book it has become rather complicated...England's first bankruptcy law, signed by Henry VIII in 1542, was an "Act against such

persons as do make bankrupt". For centuries British bankrupts went to debtor's prison: Charles Lamb, an essayist, thought they should be hanged...In contrast, one of America's attractions to immigrants was its very lack of a debtor's prison. Bankruptcy is still viewed in America as a side-effect of entrepreneurship.' (Quoted from Senbet and Seward, 1995, p. 925).

It has been documented that the role of bankruptcy law is to:

"...Provide a framework to permit viable but liquidity constrained firms (those which can be reasonably expected to earn at least their cost of capital if continued but which are presently unable to meet their financial obligations) to reorganize and continue doing business and nonviable firms to be liquidated" (Kaiser, 1996, p. 67).

Although this seems to be the ideal role, some bankruptcy codes focus more on ensuring the continued operation of firms thought to be viable, some concentrate on enforcing credit contracts by making sure that claims are paid following the absolute priority rule (APR). Others are aiming at preservation of employment, while the remaining ones seem to be more inclined to speed up the liquidation of nonviable firms. The salient features of UK insolvency code are given below

3.4.1 UK's Insolvency code

Prior to the 1986 Insolvency Act in the UK there were three possible routes for a financially distressed company: liquidation, receivership and company voluntary arrangements (CVA), and liquidation (Franks *et al*, 1996). After the Insolvency Act of 1986 limited companies have access to the following routes: (1) receivership, (2) administrative receivership, (3) administration, (4) company voluntary arrangements (CVA), (5) arrangements under the Companies Act, 1985, and (6) liquidation (Kaiser, 1996).

Receiverships, Administration and Administration receivership

Receivership occurs when the holder of a fixed charge appoints a receiver whose task is to realize the asset securing the fixed charge and distributes the proceeds to the security holder. The receiver does not take control of the firm. Although it does not prevent reorganization, receiverships usually result in a prompt sale; only 22% of reorganizations are accounted for by receiverships (Rajak, 1994). *Administration receivership* is the method by which holders of floating charges enforce their security by appointing an administrative receiver who assumes control of the entire firm in order to realise sufficient value from the assets of the firm to repay the floating claims. The administrative receiver normally discharges employees before sale and the buyer may re-employ them.

Under *Administration,* directors, who are required to propose a plan within three months, initiate the procedure. Approval is given only when there is a good chance of the firm emerging as a going concern. Administration aims at providing firms without floating claim holders, access to an administrator with powers similar to those enjoyed by the administrative receiver. However this alternative is rarely used compared to receiverships or liquidation.

Company Voluntary Arrangements (CVA) and Companies Act, 1985 Arrangements

These are initiated by directors' petition and were intended to be used by viable firms to restructure their financial obligations. This option is most effective when used jointly with administration, which is what usually happens. Approval of the scheme requires 75% in attendance or voting by proxy in favour. However, under CVA there is no automatic stay. *Arrangements under the Companies Act 1985* were introduced to provide an alternative to liquidation. However, the newer procedures of administration and CVA (introduced in 1986) render this route unattractive. These arrangements require acceptance by 75% in value of each class of creditors and shareholders, hence may only be more appropriate for firms with highly complicated financial structure, making approval at a single meeting of creditors difficult (Kaiser, 1996).

Liquidation

This is so far the most widely used route and account for about 75% of all formal insolvency proceedings (Rajak, 1994; Olsen, 1996). The objective of the liquidator is to sell sufficient of the firm's assets to repay creditors, although he can also sell the company as a going concern. In all UK's insolvency procedures, control of the company is transferred from the incumbent management to a "licensed insolvency practitioner", usually a professional accountant or an accounting firm (Kaiser, 1996). The relative advantages of UK's reorganization procedures include the existence of automatic stay in administration, the possibility of exchanging existing securities for new ones, simple voting procedures under the Insolvency Act of 1986, and the possibility of obtaining new financing. These imply that it is likely that a firm will be nursed and become healthy or being sold as a going concern.

The general view however is that drawbacks outweigh benefits. First, the removal of management negatively impacts the value and viability of the business. The opportunity for financing is not as developed, as it will be seen below under US's Chapter 11. All in all UK Insolvency law is creditor oriented, and in the case of receivership priority is given to one creditor. Another problem associated with this set up are that managers and employees loose jobs, and equity holders get nothing in case of financial distress. Managers therefore have incentives to delay the formal filing and do so when the firms have reached an alarming stage of distress, this minimises chances of a successful reorganization (See Kaiser, (1996), and Franks *et al*, (1996)). As discussed earlier in chapter two and in this chapter, an insolvency code may influence capital structure of a firm. The threat of premature liquidation, which results in the loss of jobs, is likely to lead to lower gearing ratios.

3.5 Codes in other jurisdictions

International comparative analysis of bankruptcy laws and practices is a difficult task. This difficulty is exacerbated by the fact that in some cases the same terminology may mean a different thing in another country. Table 3.5 summarizes central characteristics of the legal rules under the eight bankruptcy jurisdictions investigated in this study. A brief description of some of the codes listed in the table is provided hereunder:

3.5.1 US bankruptcy code

The US Bankruptcy Reform Act, of 1978 was criticised and subsequently reformed in 1994. The current formal bankruptcy proceedings entail two alternative routes: a liquidation process "*Chapter 7*", whose provisions are intended to implement a quick and efficient liquidation. Following a firm shut down by a court-appointed trustee, the liquidation proceeds are distributed in accordance with the absolute priority rule (APR). The second route, "*Chapter 11*", is intended to encourage and facilitate the reorganization of a financially distressed firm, and the incumbent management remain in charge and plays a crucial role in the reorganization process. While all the European codes discussed in this chapter have been revised in the past twenty years, none permit the debtor (distressed company) such powers as that given to the debtor in Chapter 11. The rationale is that existing management representing shareholders will have greater incentives to maintain the firm as a going concern in order to preserve some value for equity claims (Franks, *et al* (1996); Gilson (1989)).

Most firms enter Chapter 11 after attempting "workouts" which involve lower direct costs, as time spent in workouts is shorter, i.e. 17 months against 27 months in Chapter 11 (Franks and Torous, 1994). Pre-packaged bankruptcy or "Prepacks" are also used in order to forestall future litigation and take the tax benefit of Chapter 11 (Franks *et al*, 1996). Workouts are private (out of court) agreements between the debtor and creditors, while prepacks are basically workouts which are submitted to the court for approval so as to avoid potential future litigation by any party. The US code is a predominantly debtor-oriented.

3.5.2 *The German code*

The code provided for two forms court of proceedings, Composition proceedings (*Vergleichsordnung*), and Compulsory liquidation (*Konkursordnung*). This German code gave more rights to secured creditors hence a possibility of premature liquidation. New code passed in 1994, which came into effect in 1999, mitigates these effects by introducing automatic stay and diluting secured creditors rights through majority voting procedures. There is also a composition procedure incorporated into bankruptcy status, *Zwangsvergleich*, which is similar to out-of-court composition. Although composition was intended to reorganize a firm, it is extremely rare for firms to survive through either route. This makes most firms to opt for out-of-court workout (Franks *et al*, 1996).

3.5.3 *French code*

Of the European nations, France has gone the furthest toward providing opportunities for reorganizing a distressed firm. The 1985 law and also the 1994 revision state that the objectives of the law, in order of priority, are (1) to maintain the firm's operations (2) to preserve employment, and (3) to enforce credit contracts. The main outcome of 1994 revision was to shift (modestly) some balance of power back to creditors. Three alternatives exist: Prior to ceasing payments on its debts a firm can use the negotiated settlement (*reglement amiable)* to restructure its liabilities. The debtor petitions, then remains in control and negotiates with creditors. After having ceased payments a firm enters judicial arrangement (*redressement judiciare)*, which can also be filed by creditors and commercial court. An 'observation stage' of between eight to eighteen months is allowed for parties to consider a reorganization option.

Should the firm prove to be nonviable it will be moved to judicial liquidation (*liquidation judiciare)*. The stay is imposed on creditors and the court appoints an administrator to supervise the debtor who continues to manage the firm. The administrator (working with the "supervisory judge"), crafts the plan, which must satisfy the three purposes mentioned earlier. Employees' salaries are given highest priority and if the firm is sold as a going concern, the buyer must assume all employment contracts, leases, and suppliers. The 1985 law tried to take 'good' attribute of US's Chapter 11 and leave 'bad' attributes. The 1994 revision returned some power to the creditor without weakening the role of the court (Kaiser, 1996).

3.5.4 *Swedish auction bankruptcy code*

Under the Swedish bankruptcy code all bankruptcy filings are resolved through an English-style public auction requiring cash payment and the firm is liquidated piecemeal or survives as a going concern. An independent, court-appointed trustee immediately replaces the incumbent management. The code permits debtor-in-possession (DIP) financing with super-priority. No deviations from absolute priority are allowed, and there is a government wage guarantee to employees up to a certain limit (Thorburn, 2000).

3.6 Summary and conclusion

The foregoing discussion on the institutional framework, ownership structures, and legal systems (tax regimes and insolvency codes), has several implications for the gearing decisions of UK firms. First, the level of development of the capital market and the dispersed ownership structure implies relatively higher levels of external equity and long-term debt than most other (similar industrialised) countries with the exception of the USA. Flexibility of financial decisions also means the UK firms are more likely to adjust faster to their target debt levels (if any). The relatively lower tax benefit of debt implies that corporation taxes may not be an important determinant of gearing ratios in the UK. The generous tax depreciation allowances in 1980s imply that non-debt tax shields are likely to be a significant factor in lowering the gearing levels. The creditor oriented insolvency code with its threat of premature liquidation, which results in the loss of jobs, is likely to lead to lower gearing ratios. Finally, the long period of low interest rates and low levels of inflation also reduces the impact of these macro-economic factors on gearing levels.

The next chapter describes the data and presents the research design relating to the thesis. The objectives, hypothesis and expected results are provided in that chapter. The research design attempts as much as possible to take into account the UK's financing, institutional, legal environment. For example the sample period is selected to coincide with the period of active bond activities in the UK (see Blume, 1980). As discussed in this chapter, non-debt tax shields were an important element in the relationship between taxes and gearing in early 1980s (see Walsh and Ryan, 1997). The tests in the next chapter investigate, *inter alia*, the influence of non-debt tax shields in the UK. Lastly, prior empirical research in the UK by Bevan and Danbolt (2002) pointed out that 'credit and equivalent' comprises a large proportion of total liabilities in UK firms. The empirical analysis in the next chapter not only try to confirm this, but ensures that 'credit and equivalent' are also taken into account in the subsequent analysis of the relationship between gearing and its hypothesised determinants.

3.7. Appendix: Tables and Figures

Table 3.1: A comparison of Relation based vs. Anglo-American corporate governance systems

	RELATION BASED		*ANGLO-AMERICAN*
	Germany	Japan	
EXECUTIVE COMPENSATION	MODERATE	LOW	HIGH
BOARD OF DIRECTORS	MGT/SUPERVISORY	PRIMARILY INSIDERS	PRIMARILY OUTSIDERS
OWNERSHIP	CONCENTRATED: HIGH FAMILY/ CORPORATE/ BANK	LESS CONCENTRATED: HIGH BANK/ HIGH CORPORATE/ LOW MGT	WIDESPREAD/ NON-CORPORATE
CAPITAL MARKETS	RELATIVELY LIQUID	SOMEWHAT LIQUID	VERY LIQUID
CORPORATE CONTROL/TAKEOVER MARKET	LACKING	LACKING	RIGOROUS
BANKING SYSTEM	UNIVERSAL BANKING	MAIN BANKING	

Source: Adapted from Kaplan (1997).

Table 3.2: Size and liquidity of capital markets in G-7 countries in 1986, 2001, and 2003

	1986			*2001-2003*		
Country	Domestic Bank Credit to the Private sector as a Fraction of GDP (%)	Stock Market Capitalizatio n ($billions)	Stock Market Capitalization as a Fraction of GDP (%)	Stock Market Capitalization ($trillions)	Stock Market Capitalization as a Fraction of GDP (%) (2001)	Stocks traded as a Fraction of GDP (%) (2001)
U.S.	70.90	2128.00	49.85	13.2 (2003)	153.5	323.9
Japan	104.22	1794.29	83.31	2.99 (2001)	65.2	55.6
Germany	86.58	257.68	25.79	1.3 (2001)	67.8	57.1
France	80.03	153.42	19.54	1.45 (2001)	111.8	83.7
Italy	33.04	140.24	21.17	0.78 (2001)	71.5	72.5
UK	53.85	472.90	83.70	2.7 (2002)	182.2	129.7
Canada	44.21	185.20	50.56	0.8 (2001)	122.3	92.3

Source: The 1986 figures are from Rajan and Zingales (1995), the 2001 figures are from the World Bank Indicators Database (WDI) (2001), the 2002 and 2003 figures are from the respective websites of New York Stock Exchange (NYSE), and London Stock Exchange (LSE) as of March 2003.

Explanation: The table shows the relative sizes and liquidity of the financial markets, as well as sizes of bank credit to the private sector for G-7 countries for 1986 (the beginning of the sample period) and for 2001 or 2003.

Interpretation: UK has had the third largest capital market capitalisation, after the U.S and Japan. The measure of relative size (i.e. market capitalisation divided by the host country's GDP) shows that UK had the largest ratio (182.2%) than all the other countries over the period. Column seven shows that the US's capital market leads (323.9%) and the UK's capital market is the second (129.7%) for a measure of liquidity, which is the percentage of stocks traded as a fraction of GDP. All the so-called 'bank-oriented' countries have less than 100% of this ratio. Column two shows the extent to which the private sector relies on bank credit. As expected bank-oriented countries like Japan, Germany, and France have highest ratios of domestic bank credit as a fraction of GDP than for example the US and the UK. The differences between these two groups of countries are in the level of development of their capital markets. These differences are likely to have an impact on financing decisions of firms.

Table 3.3: Sources of external Financing for G-7 countries (1984-1991).

Country	*External Financing as a proportion of Total Financing*	*Composition of external Financing*	
		Net Debt Issuance	Net Equity Issuance
U.S.	0.23	1.34	-0.34
Japan	0.56	0.85	0.15
Germany	0.33	0.87	0.13
France	0.35	0.39	0.61
Italy	0.33	0.65	0.35
UK	0.49	0.72	0.28
Canada	0.42	0.72	0.28

Source: Rajan and Zingales (1995)

Explanation and Interpretation: The table shows external financing for G-7 countries between 1984 and 1991, the beginning of this study's sample period. The US, UK and Canada used a smaller proportion of external finance (i.e. UK 49%) whereas Japanese corporations were largely financed by external finance (i.e. 56%). Japan and Germany issued more net debt than the UK and Canada (column three), and the UK and Canada issued more equity than Japan and Germany (column four). Italy and France do not seem to fit properly into this dichotomised categorisation.

Table 3.4: Financing patterns for G-7 countries (minus Italy) (1990-1994).

	U.S.	*Japan*	*UK*	*Germany*	*France*	*Canada*
Internally generated funds	82.8	49.3	68.3	65.5	54.0	58.3
Externally generated funds	17.2	50.8	31.7	34.5	46.0	41.7
- increase in LTD	17.4	35.9	7.4	31.4	6.9	37.5
- increase in STD	-3.7	9.7	6.1	-	10.6	3.8
- increase in stock	3.5	5.1	16.9	-	12.4	10.3

Source: OECD (1995) Financial Statements of Nonfinancial Enterprises

Explanation and Interpretation: The table shows sources of financing as a percentage of total sources for G-7 countries for the middle of the sample period of this study (1990-1994). UK companies had the lowest increment of debt and the highest increment in stock. Japan had the largest increment in debt

Table 3.5: Differences of bankruptcy codes among eight countries

Country	*Forms of liquidation*	*Forms of reorganization*	*Control Rights*	*Automatic stay*	*Rights of Secured creditors*
United Kingdom	Members' voluntary winding up, Creditors' voluntary winding up, Compulsory winding up	Administration, Administrative receivership, Voluntary arrangement	Debtors removed from control except in members' voluntary winding up.	On all creditors in administration, on unsecured creditors only in liquidation, and none in voluntary arrangements	May prevent administration by appointing own receiver. Can appoint administrative receiver to realize his security
United States	Ch.7: Voluntary (management files) or involuntary (creditors file)	Ch.11: Voluntary or Involuntary	Trustee appointed in Ch. 7, Management stays in control in Ch.11	Exist on any attempt to collect debt after filing	Get highest priority in any settlement. Their attempts to collect debt are also stayed
Germany	Liquidation: Can be requested by creditors or debtor. Management required to file as soon as it detects insolvency.	Composition: can be filed for only by debtor.	Receiver appointed to mange firm	Only unsecured creditors are stayed.	Secured creditors are not stayed and can recover their claims even after a bankruptcy filing
France	Liquidation	Negotiated settlement (Reglement Amiable) where the court appointed consiliator attempts a settlement with creditors and Judicial Arrangement (Redressment Judiciaire)	Debtor losses control in liquidation. Debtor remains in control otherwise but submits to administrator's decisions in judicial arrangement.	Stay on all creditors in judicial arrangement.	Secured creditors may lose status if court determines the security is necessary for continuation of the business, or if the security is sold as part of settlement.
Italy	Bankruptcy (Fallimento)	Preventive Composition (Conordato Preventino).	Debtor is removed from control over the firm	Stay on all creditors.	Composition allowed if enough value exists to pay secured creditors in full and 40% of unsecured creditors.
Sweden	Public Auction. Can be requested by the firm or an individual creditor.	Composition (accord) court supervised. Almost never used	Debtor is removed from control of the firm. Independent court-appointed trustee takes control the auction.	Stay on all creditors, except in limited circumstances when collateral is in creditor's physical possession.	Get highest priority in settlement. No deviations allowed. However there is no seizure.
Canada	Liquidation proceedings much like Ch. 7 in the US	Firms can file for automatic stay under the Companies Creditors Arrangement Act or the Bankruptcy and Insolvency Act.	Firm in control (reorganizations). Trustee appointed in liquidations.	Stay on all creditors in reorganization	Secured creditors have to give 10 days notice to debtor of intent to repossess collateral. Repossession stayed after.
Japan	Court supervised Liquidation (Hasan), and less costly Special Liquidation (Tokubetsu Seisan) under which a broader set of forms are eligible to file.	Composition (Wagi-ho), Corporate Arrangement (Kaisha Seiri) and Reorganization (Kaisha Kosei-ho). The list is in order of increasing eligibility. Only debtors file.	Third party is appointed except in composition and corporate arrangement.	Exists. In supervised liquidation and composition only unsecured creditors are stayed.	Have highest priority and greater voting rights in renegotiation. However can be stayed depending on the petition filed.

Source: Constructed from Jairo (2003a), Thorburn (2000), Franks et *al*, (1996), Kaiser, (1996) and Rajan and Zingales, (1995).

Chapter 4

4 RESEARCH DESIGN, DATA AND METHODOLOGY

4.1 Introduction

The first part of this chapter provides a description and discussion of the research design. The objectives, testable hypotheses and expected results are given here. The second and last part describes the sample selected, the period covered, and the methodologies used. It also provides justifications for the methodologies used.

Estimation of variables and model(s) specifications are also discussed culminating in a description of how the tests are going to be conducted. While this chapter provides the general design and hypotheses for the whole thesis, in-depth clarification of the hypotheses and methodology for the analysis of industry influence, target debt ratio adjustment, and the effects of equity market timing and stock returns are covered in chapter five, six, and seven respectively. This chapter provides detailed explanations for the methodologies used for the cross-sectional analysis of firm-specific characteristics hypothesised to be determinants of capital structure, leaving those relating to capital structure dynamics to subsequent chapters. The chapter also presents and discusses the results of the cross-sectional analysis.

4.2 Objectives

The objectives of this study are:

4.2.1. To analyse capital structure decisions within a dynamic context by examining both the determinants of capital structure adjustment process and the speed of adjustment over a period of 16-years.

4.2.2. To compare the relative superiority of conventional capital structure regression models against Linear Structural Relationship (LISREL), a factor-analytic technique, relatively new to capital structure research.

4.2.3. To provide additional evidence on the importance and significance of determinants of capital structure in UK corporations by refining the proxies for theoretical attributes and using multiple gearing ratios in order to try to capture more accurately the cause and effect of the theories that predict different relationships between firm attributes and different measures of gearing.

4.2.4. To empirically explore the validity of some the theoretical determinants, which have not been empirically previously tested in the context of the UK e.g. probability of bankruptcy, uniqueness, and the role of cash holdings (and/or free cash flow).

4.2.5. To disentangle the testing of the pecking order hypothesis (Myers, 1984; and Myers and Majluf, 1984) from free cash flow prediction (Jensen, 1986) and also from the signalling theory (Ross, 1977), by making an attempt to separate past profitability from current or future profitability.

4.2.6. To disentangle the effect of equity market timing from that of stock returns on capital structure and assess their relative importance as determinants of capital structure.

4.3 Hypotheses

The main research questions are: whether capital structures of the UK companies' suggest the existence of an optimal capital structure and if so how do these companies adjust towards their target debt ratio, and what factors do affect the adjustment and the speed of that process. Specific hypotheses to investigate these questions are outlined in the following alternative hypotheses. The null hypothesis is generally that these factors do not influence capital structure in the hypothesised direction.

4.3.1. H_1 :There is a systematic relation between gearing and industry classification, which is caused by the level of operating risk and production technology.

4.3.2. H_1 : Asset structure or tangibility is positively related to gearing.

4.3.3. H_1 : Non-debt tax shields are negatively related to gearing.

4.3.4. H_1 : Growth potential/investment opportunities are negatively related to gearing.

4.3.5. H_1 : Firms with unique/specialised products are likely to use less gearing.

4.3.6. H_1 :The size of a firm is positively related to gearing.

4.3.7. H_1 :Volatility of returns (risk) is negatively related to gearing.

4.3.8. H_1 : The level of past profitability is negatively related to gearing, but also potential (future) profitability is positively related to gearing.

4.3.9. H_1 : Probability of bankruptcy is negatively related to leverage.

4.3.10. (a). H_1 : Firms with higher cash holdings are likely to use less debt (pecking order), but also,

(b) H_1 : Firms with 'free cash-flows' and less growth opportunities should be highly geared to deter managers from wasting the cash on unprofitable investments. Two theories give rise to two competing hypotheses.

4.3.11. H_1 : Companies adjust their capital structure towards an optimal target ratio in response to changes in factors, which influence capital structure.

4.3.12. H_1 : Equity market timing is positively related to gearing and is its cumulative effect is a major determinant of capital structure.

4.3.13. H_1 : Share price movement has a larger impact on changes in capital structure than other factors like deliberate adjustments, and/or equity market timing.

4.3.14. H_0 :SEM model performs just as well as conventional regression model

H_1 :SEM model performs better than conventional regression model

4.4 Expected results:

Because firms do not operate in the hypothetical environment (or rather because we relax the perfect, efficient and complete market assumptions of Modigliani and Miller's (1958) capital structure irrelevance propositions) we expect to see some evidence in support of the existence of an optimal capital structure. We expect to find evidence of industry related capital structure patterns. We also expect firm-specific characteristics to be related to gearing in the hypothesised manner. Following the trade off theory we expect firms to adjust towards an optimal gearing level over time. We also expect to see an inverse relationship between gearing and profitability consistent with the pecking order predictions.

We expect the results to reveal the extent to which the two competing models, i.e. trade off theory, and pecking order model, explain variations in capital structure of UK companies. Depending on what the results are for the cross-sectional tests as well as the tests on the relationship between changes in hypothesised determinants and changes in gearing measures, we will carry out additional tests on the recent theories.

The tests on the recent theories will reveal whether managers practice equity market timing, and whether such practice has a statistically significant influence on capital structure decisions. Finally, we will assess whether stock returns are the major determinant of capital structure by comparing the relative effect of stock returns on gearing against all other hypothesised determinants discussed and tested in this study. Following from the hypotheses we expect the following specific results:

4.4.1. If capital structure is relevant in the determination of the value of a firm in the UK, then firms in a given industry will seek an optimal capital structure and they will be seen adjusting towards this target debt ratio. We can also extend this expectation and say that, if a firm is influenced by its level of business risk and production technology as approximated by industry classification, then the observed optimal capital structure will be significantly different across UK industries.

4.4.2. Firms with tangible assets that can be used as collateral are likely to hold more debt.

4.4.3. Firms with more non-debt tax shields are likely to hold less debt (However, some non-debt tax shields like depreciation also means a high degree of tangibility and it will not be surprising to find these firms holding a large amount of debt due to tangibility.

4.4.4. Growth firms (or firms with investment opportunities) will generally be negatively related to gearing, or at least to long term debt and positively related to short-term debt.

4.4.5. Unique firms or firms producing highly specialised products are likely to be less geared.

4.4.6. Larger firms are likely to be relatively highly geared.

4.4.7. Firms with volatile earnings or with more variable return are likely to be less geared.

4.4.8. Firms that have been profitable (in the past) will be less geared but potentially (future) profitable firms are likely to be highly geared.

4.4.9. Firms with a high probability of bankruptcy will be less levered.

4.4.10. Firms with large amounts of cash holding will be found to be less levered (following pecking order theory). Alternatively, firms with 'free cash flow' will be relatively highly levered.

4.4.11. UK corporations will be found to be adjusting their capital structure over time, and various factors will be found to determine the adjustment process and the speed of adjustment.

4.4.12. Equity market timing will be found to have an impact on capital structure.

4.4.13. Share price movements will be found to have an impact on capital structure

4.4.14. Structural Equation modelling (e.g. SEPath, LISREL) test results will have superior explanatory power than traditional regression models.

Any new findings not conforming to previous theories will be investigated further in an effort to seek explanations for it and for the prevailing contradictory findings in previous research.

4.5 Data and Methodology

4.5.1 Data:

Panel data relating to a sample of 1277 UK industrial (non-financial) companies were collected from DataStream. The database contains accounting data and market values data of companies for a number of countries. The collected data relate to the 16-years from 1985 to 2000. Panel data is considered appropriate because, it blends the characteristics of both cross-sectional and time series data, improves the efficiency of econometric estimations, and also because of its relative flexibility it affords in choosing instruments to control for endogeneity problem (see Ozkan (2001), and Hsiao (1985, 1986)). The endogeneity problem emerges when the attributes, some of which are not observable, impacts on both gearing decisions as well as on other firm-specific characteristics like a firm's market value (Ozkan, 2001). The variables described in section 4.7 and 4.8 were analysed over the 16 years period (from 1985 to 2000 inclusive). The required variables for non-regulated, non-financial, companies in the U.K were computed as far as the data permitted. The Bank of England interest rate database also provided the interest rate data for the same period.

4.5.2 Sample selection:

The sample selection went as follows; from the initial sample of 1277 companies, only 702 were identified as having data available on the appropriate variables of interest. To be included in the final sample a firm had to have at least eleven years of data on a variable of interest. In addition the firm should not be a 'financial firm' such as bank, financial institutions, insurance companies etc., or a regulated or a utility company.

Regulated firms and utilities, such as railroads, electricity, and gas and telephone providers were excluded because regulation limits managerial discretion by transferring much of the investment and financing decisions to regulatory authorities. Such managerial restrictions together with a stable cash flow stream brought about by the regulatory process, implies that regulated firms should be expected to have higher leverage and pay high dividends than unregulated firms (Barclay *et al*, 1999. p.225-226). It has also been argued that regulation 'protects' firms (or industries) from failure and therefore could lead to higher gearing (Bowen, *et al*. 1982, p. 13).

Empirically, Bradley *et al* (1984) provided evidence that out of 54% capital structure variation explained by industry classification, 29% percent was due to regulation effect. Financials like banks and insurance companies were also excluded because their capital structures are not normally a result of pure financing decisions but also reflect regulations such as minimum capital requirements, and insurance scheme such as deposit insurance (see Rajan and Zingales, 1995, p. 1424,). Other scholars have supported this view by saying, "Financial intermediaries do not seem relevant for testing models of financing decisions..." (Fama and French (2003, p.8). One of the outcomes of regulation of both utilities and financial intermediaries is that financing decisions of these firms are unlikely to convey new information to the market (Pinegar and Wilbricht, 1989, p. 84). Out of the reduced sample of 702 firms, some companies could not meet the criteria set. These selection criteria reduced the number of firms to the final panel of 651 firms, which is analysed over the 16-year period, giving a total of 9,486 firm-year observations.

4.5.3 Period covered:

The period covered, i.e. 1985-2000, has been selected because, firstly 16 years is considered long enough a period to allow a meaningful analysis of capital structure dynamics. Secondly, economic developments, and legal framework operating during this period provide a basis for research in capital structure decisions. After 1960s there were virtually no corporate bonds in the UK until late 1980s (see Blume, 1980). These developments plus lack of profitability (tax exhaustion) discussed in chapter four provide justification for choosing this period. Thirdly, as shown in table 4.1, with few exceptions most of the previous similar cross-sectional studies ended before or around 1985.[9] Studies that covered the period after 1986 had the shortest sample period. Leverage ratios over such a short period may be affected by short-term adjustments in capital structure, and may therefore not be representative of long-term equilibrium capital structure. Although Varela and Limack covered 20 years, like the others it ended in 1986 and was concerned only with one factor, industry characteristics.

Ozkan (2001) covered a relatively longer period and dealt with a number of factors theorised to influence capital structure. However, the study did not deal with other factors like asset structure (tangibility), industry characteristics, volatility of earnings, probability of bankruptcy, and cash holdings, the study also did not find sufficient evidence that size exerts any impact on capital structure decisions. Furthermore Ozkan's findings that firms adjust to the target ratio faster, contradicts those of Taggart (1977) who asserted that the speed is relatively slow.

The most important difference however, between this study and that of Ozkan (2001) is that in addition to testing a broader set of attributes (some of them have not been tested at all or in the UK), this study uses a factor-analytic methodology, while Ozkan used conventional regression. In capital structure dynamics, this study also considers the possible influence of the level of interest rate on the capital structure adjustment process. The level of interest rate is considered to be one of the important environmental factors, which affect the determinants of financing decisions. This discussion is picked up in chapter six where empirical investigation relating to the dynamics of capital structure is carried out.

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[9] Of the few studies which covered the period after 1986 are Rajan and Zingales (1995) and Bevan and Danbolt (2002). In addition to the fact that the later was a replication of the former, they also covered the shortest period of all the studies (i.e. four years).

4.6 Methodological comparison

The above captioned sub-heading is considered appropriate for this section because this study is not only examining the determinants of capital structure and its changes over time, but the study also investigates the relative merits of two alternative methodologies used in capital structure determinants empirical studies. Previous empirical works on determinants of capital structure can be broadly classified into two categories. In the first category are cross-sectional studies which basically use static models and focus on incremental influence different factors exert on capital structure. These include for example Bradley *et al* (1984), Titman and Wessels (1988) for US studies, Chiarella *et al* (1992), an Australian study, international studies by Rajan and Zingales (1995), Wald (1999), and Fan et al (2003). In the UK, examples include Bennett and Donnelly (1993), and Bevan and Danbolt (2002). Elsewhere, more recent works include Drobetz and Fix (2003) for Switzerland firms and Chen et al (1998) for Dutch firms.

The second broad category includes time-series studies which look at the dynamics of capital structure by focussing on capital structure changes over time. Some of these emphasise the existence of a long-run optimal capital structure (i.e. target debt ratio) and assume (or try to investigate) the process of adjustment towards this ratio. Some of them however, do not assume the existence of an optimal capital structure. The discussion of dynamics of capital structure will be picked up again in chapter six, where the related literature is reviewed and empirical tests are carried out. For the time being the next section turns back to methodologies used by previous cross-sectional studies.

Generally previous cross-sectional empirical studies have followed one of the following two methodologies: The majority of studies have estimated regression equations (using for example OLS-regression, Generalised Method of Moments (GMM), etc.), which incorporate proxies for unobservable theoretical attributes, and have proceeded to analyse the statistical significance of the regression coefficients. This method continues to be used to date (see for example Bradley *et al* (1984), Givoly *et al* (1992), Bennett and Donnelly (1993), Ghosh *et al* (2000), Ozkan (2001), Bevan and Danbolt (2002), Baker and Wurgler (2002), and Welch (2002, 2004) among many).

In the context of this study the first approach to cross-sectional studies will be referred to as *conventional (or standard) regression analysis*. Another, relatively new and innovative technique, called Structural Equation Modelling (SEM) has also emerged in capital structure empirical research. SEM can be implemented by using statistical software like Linear Structural relationships (LISREL), Structural Equation Path (SEPath), EQS, and many others. This approach, which uses Linear Structural Modelling, is an adaptation of Joreskog and Sorbom (1981, 1988) model and has its origins in the structural equation modelling.

4.6.1 Conventional regression analysis

Conventional regression estimation is essentially a prediction technique in which one or more variables are explicitly considered the dependent variable(s) and all others the predictor variable(s). Although conventional regression does not imply causation (something the researcher infers from the underlying theory), a standard regression equation computes a conditional expectation for the dependent variable given that the explanatory variable takes the specific value. Such a distinct asymmetrical dichotomy in the way the dependent variable and the explanatory variables are treated may violate some important relationships between variables in certain cases.

In capital structure theories in particular, a number of factors (attributes) have been theorised to influence capital structure. Size, business risk, profitability, growth, and uniqueness are but a few examples. Although these attributes exist, a good number of them are not readily identifiable and sometimes difficult to quantify. Consequently researchers have to come up with some indicators (proxies) for the attributes of interest. In the research on the determinants of capital structure, these indicators are conventionally included in regression equation as explanatory variables.

Some practical problems usually crop up at this stage. First, not only there may be more than one proxy contributing towards one attribute, the relationships which may not be captured by conventional regression estimates without a considerable degree of collinearity problems. Alternatively the researcher may be biased towards working with fewer proxies by selecting those which are statistically convenient (i.e. have higher explanatory power in terms of higher R-sq, etc.) even if some indicators are ignored or even if the relationship between variables is mechanistic or spurious.[10]

4.6.1.1 *OLS-Multiple regression: Model Specification*

For hypotheses 4.3.2 to 4.3.10, cross-sectional OLS-multiple regression is used as the main tool of analysis.

The basic regression estimate is:

$$L_i = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_n X_{in} + \varepsilon \qquad (4.6.1)$$

Where: L_i is the observed gearing ratio (leverage) for firm *i*

$X_1 \ldots X_n$ are proxies for the independent variables.

We expect the regression coefficients to show either positive or negative signs depending on the hypothesised relation. The statistical and economic significance coefficients will then be analysed. Depending on the results, additional tests for robustness will be carried out. OLS-regression results will then be compared with the underlying capital structure theory, previous empirical research findings, and with those from Structural Equation Modelling (SEM) technique presented in the following sections.

[10]See Titman and Wessels (1988); Chiarella *et al*, (1992); Bevan and Danbolt (2002); and Welch (2002, 2004).

For a long time ordinary least squares analysis has dominated research related to controlled experiments, group comparisons, and prediction studies. These regression models have been used in many fields including physical science for curve-fitting problems and even in financial economics where an empirical relationship between an observed dependent variable and a manipulated (varying) independent variable must be estimated. One key feature of regression models is that only the dependent variable is assumed to be subject to measurement errors or subject to random variations. The independent variable is assumed to be fixed by the researcher at known values. There is a problem with this assumption because in most such experiments, the measurements of independent variables are also subject to errors.

In addition to ignoring measurement errors in exogenous variables, traditional regression models are not designed to accommodate models that include *latent variables*, *reciprocal causation* among variables, and *interdependence* among variables. In most previous similar studies, proxies for latent variables have been used in place of the latent variables. The use of proxies creates an additional problem to regression models not only because there is a possibility that there may be no one unique proxy for a latent variable being examined, but also a proxy may be correlated with other variables in the model (Titman and Wessels, 1988).

4.6.2 Structural Equation Modelling (SEM) Technique

In many fields of scientific inquiry (financial economics included) sometimes a mere empirical prediction is not an objective of the study. In these cases the essential problem of data analysis is the estimation of *structural* relationships between quantitative observed variables. When the mathematical model that represents these relationships is linear, a *linear structural relationship* emerges. The various aspects of formulating, fitting, and testing such relationships are referred to as *structural equation modelling*.

Structural Equation Modelling (SEM) is a descendant of factor analysis. Factor analysis is the generic name given to a class of multivariate statistical methods whose primary purpose is to define the underlying structure in a data matrix. Factor analysis is a statistical approach that can be used to analyse interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors). It is a statistical approach involving finding a way of condensing the information contained in a number of original variables into smaller set of dimensions (factors) with a minimum loss of information.

Factor analysis addresses the problem of analysing the structure of the interrelationships (correlations) among a large number of variables by defining a set of common underlying dimensions, known as factors. With factor analysis, the researcher can first identify the separate dimensions of the structure and then determine the extent to which each variable is explained by each dimension. Once these dimensions and the explanation of each variable are determined, two primary uses of factor analysis-summarization and data reduction can be achieved.

Exploratory factor analysis (EFA)

Unlike conventional regression, which is a dependence (or a prediction) technique, factor analysis is an interdependence technique in which all variables are simultaneously considered, and although still employing the concept of the linearity, each variable is related to all others. Factor analytic techniques can either be used as an exploratory tool or as a confirmatory tool. The earliest and most common form of factor analysis is exploratory factor analysis (EFA), also known as correspondence analysis.

EFA is a descriptive technique useful in studies seeking to uncover the underlying structure of relatively large set of variables or as a data reduction method, in cases where the researcher has no pre-established theory and his a priori assumption is that any indicator may be associated with any factor. The researcher has a 'take what the data give' attitude. The exploratory factor analysis enables the researcher to see the relationships among variables that are not at all obvious in the original data or even in the correlations among variables. The factor loadings in this case are used to gain insights into the factor structure of the data.

Confirmatory factor analysis (CFA)

Confirmatory factor analysis (CFA) on the other hand, refers to cases where the researcher has preconceived ideas about the actual structure of the data, may be from the underlying theory or prior research. The researcher therefore wishes to test some hypothesis about the data structure. In the language of factor analysis, the researcher wishes to determine if the number of factors and the loadings of measured (indicator) variables on them conform to the underlying theory. In this approach, indicator variables are selected on the basis of this underlying theory and factor analysis is used to confirm if they load as predicted on the expected number of factors.

The basic idea behind Structural Equation Modelling (SEM)

The structural equation modelling (SEM) approach is typically used to model causal relationships among unobservable variables (factors). The simple basic idea behind SEM is that if a set of numbers X relates to another set of numbers Y such that $Y = 3X$, then the variance of Y must be 9 times that of X. The point here is that one can test the hypothesis that Y and X are related by the equation $Y = 3X$ indirectly by comparing the variances of the Y and X variables. Although the rules and calculations become more complex, the basic principle remains the same: the interrelatedness of variables can be tested through a set of linear relationships by examining the variances and covariances of the variables. Confirmatory factor analysis through Structural equation modelling (SEM-CFA) requires a software package such as SEPath, AMOS, LISREL, or EQS. The SEPath/LISREL model specification is discussed in detail in the next section.

In capital structure empirical research, LISREL has been used in the US by Titman and Wessels (1988), who were the pioneers of its use. Subsequently, the methodology was used in an Australian study, Chiarella *et al* (1992). Both studies have claimed that its use improves the estimation procedure and mitigates measurement and specification errors inherent in other previous studies that have not used this methodology. Having identified more appropriate proxies for the theoretical attributes, the application of two alternative methodologies on the same data for the first time is likely to assess the relative importance of these methods' explanatory power.

This independent testing of a new methodology against the traditional OLS-regression methodology by using the same data set is vital for a number of reasons. First, both studies that have used the new technique contend that the technique has relative merits over traditional approaches used so far. Titman and Wessels (1988) argue that because there is no single unique proxy for a theoretical (unobservable) attribute, researchers may select a statistically convenient variable with a resulting consequence of a bias in interpretation. They suggest further that the interrelation among variables of interest implies that a selected variable for one attribute may actually be measuring the effects of other variables as well.

Finally they claim that the correlation between measurement errors in proxy variables with similar errors in gearing measures are likely to cause spurious results whether or not the unobservable attribute is related to the measure of gearing. Both Titman and Wessels (1988) and Chiarella *et al* (1992) maintain that LISREL explicitly recognises and mitigates these measurement and specification problems.

LISREL related methodology has also been used in other areas of financial research. Titman and Wessels (1988) say that the methodology is very similar to the return generating process used by Roll and Ross (1980) to test the Arbitrage Pricing Theory (APT) formulated by Ross (1976). In that empirical investigation

Roll and Ross use similar technique and conclude that APT performs well under empirical scrutiny and they recommend that APT should be considered a reasonable model for explaining cross-sectional variation in average returns (Roll and Ross, 1980, p. 1076).

Despite claims for superiority of structural equation modelling provided by Titman and Wessels (1988) and Chiarella *et al* (1992), these empirical studies do not seem to resolve much of the inconsistencies in capital structure research. Their results are consistent in that both found no significant support for tangibility and growth opportunities as determinants of capital structure. However, despite the use of the same technique the studies had some contradictory results in that while the former did not provide significant evidence that non-debt tax shield has any effect on gearing and also found that size is negatively related to gearing, the latter study found strong evidence in support of non-debt tax shield as an inverse determinant of gearing, and that size is positively related to gearing.

Titman and Wessels (1988) also fails to provide support for volatility as a determinant of gearing and as a result wonder whether their model captured the relevant aspects of the attributes as per theory prescriptions. Perhaps the differences between these studies can partly be explained by differences in both the time period covered, and the institutional structures between the US and Australia environments. Independent testing carried out in this study may help to shed some light on the efficacy of the technique.

Generally, either the SEM model does not perform well for both studies or their data is not representative of a cross-section of Australian or US firms. Titman and Wessels (1988) uses data relating to 469 firms while Chiarella *et al* (1992) uses 226 firms (see table 4.1). Their results are actually more perverse than most other studies that have used traditional OLS regression. For example Titman and Wessels (1988) does not provide evidence to support the theoretical predictions regarding the impact of growth opportunities, non-debt tax shields, volatility, or collateralizable assets.

Most other studies using traditional methods (OLS-regressions, GMM etc.) have generally agreed on the direction of influence these attributes have on gearing (see for example Rajan and Zingales, 1995; Bennett and Donnelly, 1993; Wald, 1999; Ozkan, 2001; Bevan and Danbolt, 2002, and Nivorozhkin (2004) among others). With hindsight it seems likely that the two studies that used SEM also used some inappropriate proxies, the problem which is also addressed later in this study.[11]

Differences in results between these two studies, and between these two on one hand and the rest of other studies, call for the use of alternative methodologies to test the same data set taken from a different environment (something which has not been done before). This is done in this study in order to explore whether the new methodology has any potential, whether it is just another method, or indeed whether it is inferior to the traditional methods. If the SEM generates results which are consistent with both the theory and also consistent with the evidence from prior empirical research than the traditional regression then we may conclude that it is a better technique. However, if SEM generates more contradictory results, then it may be judged to be inferior to the conventional regression.

A relatively larger sample is used, a longer period is covered and a larger number of attributes are tested in an attempt to both avoid econometric problems and extend empirical research to untested theoretical attributes. In particular the hypothesis tested here is whether in the determination of the determinants of capital structure, structural equation modelling gives better results (in terms of conformity with capital structure theory) than conventional regression. The result from the use of alternative methodologies will help us judge the practical superiority (or rather inferiority) of the structural equation modelling methodology in capital structure empirical research.

[11] See section 2.6.2, and section 4.9 for examples of inappropriate proxies in previous literature and section 4.9 for the suggested mitigation to this problem.

4.6.2.1 *The SEM Model specification*

The application of this model in this study flows from the discussion of factor analysis discussed above and relies on statistical software called structural equation path (*SEPath)* authored by James Steiger based on his earlier EzPath package (see Steiger, 1989). The package is distributed as part of *Statistica* software package by *Statsoft Inc.* From the preceding discussion and the hypotheses developed earlier in this chapter, it has become evident that this study has a number of a priori assumptions about the relationships among different variables used. The assumptions have to be tested in order to confirm a number of theoretical predictions in capital structure theory. It has also been stated that the use of a factor analytic technique in this context is known as confirmatory factor analysis (CFA).

In factor analytic terms the study seeks to test specific hypotheses about the factor structure for a set of variables in a given sample. Such application of factor analysis requires the use of a structural equation modelling (SEM). This study therefore fits into confirmatory factor analysis through structural equation modelling (SEM-CFA) approach. A particular software package used for this kind of study is known as structural equation path (*SEPath)*. SEPath is similar to and operates under the same principles as the Linear Structural Relationships (LISREL), which was developed by Joreskog and Sorbom (see Joreskog (1977); and Joreskog and Sorbom (1981, 1988).

Because in this study factor analysis takes a confirmatory (CFA) approach, which implies that the researcher hypothesize beforehand about the number and the factor structure for a set of variables, it is necessary that a brief summary of the variables be presented at this point. For purposes of this study, the variables are divided into two categories; (i) 18 indicator variables (proxies) which represent eight attributes, and (ii) eight gearing ratios. The use of SEM CFA and SEPath allows more than one indicator for each attribute, which is why the number of indicators exceeds the number of attributes. In addition, an indicator variable can contribute to more than one attribute, although in the model used here there was no such relationship. As detailed in section 4.8, and shown in figure 4.2, some attributes have four, three or two indicators, others have only one depending on theoretical predictions and/or existence of sufficient correlation among them. Some of these indicators have been used following previous research. Others however, are new to capital structure research, and have been used because it is considered that they have stronger linkages with the relevant attributes.

Most structural equations can be expressed as *path diagrams*. It is argued that complicated models such as these are often easily understood when they are expressed as path diagrams (Loehlin, 1987). Path diagrams are like flow charts. They show variables interconnected with lines that are used to indicate causal flow (although these diagrams need not be thought of strictly in this way). All variables in the equation system are included in the diagram. The names of *manifest variables* in boxes, and *latent variables* in oval or circle. A latent variable is a variable that cannot be measured directly, but is hypothesized to underlie the observed variables. An example of a latent variable is a factor in factor analysis. One advantage of path diagrams over equations is that variances and covariances can be shown directly in the path diagram (see figure 4.1). The coefficients in each equation are indicated by drawing arrows from the independent variables to the dependent variables. Coefficients between exogenous variables are drawn as two-headed arrows.

The variances of independent variables, which must be known in order to test the structural relations model, are shown on the diagram using curved lines without arrowheads attached. These lines are called *wires*; sometimes a wire is displayed as a two-headed curved line with both heads pointing at the exogenous variable because the variance of a variable is the covariance of the variable with itself (Loehlin, 1987, and McArdle and McDonald, 1984).

Despite the merits of path diagrams presented in the immediate preceding paragraphs, modern form of linear structural analysis includes an algebraic formulation of the model in addition to/or instead of the path diagram representation. The two forms are equivalent and the implementation of the analysis in the SEPath program permits the user to submit the model to the computer in either representation. The path diagram works well when the number of variables in the relationship is moderate. However there is bound to be a degree of clutter in diagrams involving too many variables. In such cases symbolic representation of the relationship is more convenient. In this study the model is represented by a system of equations (matrices).

In its most general form, SEPath consists of a set of equations. Variables in the equation system may be either directly observable variables, or latent variables. In the model, the linear structural relationship and the factor structure are combined into one comprehensive model applicable to observational studies in many fields. It is assumed in the model that there is a causal structure among a set of latent variables, and that the observed variables are indicators of the latent variables. The model consists of two parts, the measurement model and the structural equation model.

The Measurement Model

The measurement model in SEPath specifies how hypothetical constructs (latent variables), are indicated by the indicators (observed variables). In this way it describes the measurement properties (reliabilities and validities) of the indicators. The measurement model is expressed as in the following equation:

$$x = \Lambda\xi + \delta, \qquad (4.6.2)$$

where x is a $(q \times 1)$ vector of indicators (proxies),

ξ is a $(m \times 1)$ vector of latent (unobservable) attributes,

Λ is a $(q \times m)$ matrix of factor loadings (a matrix of regression coefficients of x on ξ), and

δ is a vector of measurement errors in the measurement model.

The measurement model functions like a process of forming a portfolio of several proxies for each latent variable, the 'portfolio weights' being the factor loadings. It is the factor loadings, which are then related to measures of gearing in the structural model. Both these processes are however, taking place simultaneously in the SEPATH model. This study has eight (unobservable) attributes, which are potential determinants of gearing and 18 indicators whose proxies have been calculated. Hence x is 18x1 and the dimensions of lambda (Λ) are18×8. Because there may exist more than one proxy for the latent attributes specified by capital structure theory as determinants of capital structure, equation 4.6.2 imply that these proxies (measured by accounting or market value data) can be expressed as linear function of one or more latent attributes plus a random measurement error.

The Structural Equation Model

The structural equation model specifies the causal relationships among the latent variables, describes the causal effects, and assigns the explained and unexplained variance. By so doing the model estimates the impact of each of the latent variables on each of the gearing ratios used in this study. The structural equation model is specified as:

$$y = \Gamma \xi + \varepsilon \qquad (4.6.3)$$

Where, y is px1 vector of gearing ratios,

Γ is a $p \times m$ matrix of factor loadings,

ξ is an $m \times 1$ vector of latent attributes (as defined in the measurement model),

ε is a vector of $p \times 1$ vector of random errors (random disturbance) in the structural relationship.

The SEPath technique estimates the unknown coefficients of the set of linear structural equations. It is particularly designed not only to accommodate models that include latent variables, but also those with measurement errors in both endogenous and exogenous variables, reciprocal causation, simultaneity, and interdependence. The random components in each equation are assumed to be uncorrelated with the variables in that equation, and with other random variables in other equations. That is in the case of the two equations specified above:

δ is not correlated with ξ

ε is not correlated with ξ and,

δ is not correlated with ε, or any other random component.

Nested within the general model are simpler models that the user of SEPath program may choose as special cases. These specializations include procedures like confirmatory factor analysis (CFA), multiple regression analysis, path analysis etc. If some of the variables involved in the structural relationship are observed directly, rather than indicated, part of the factor analysis model may be excluded.

The version of the SEM model employed in this study is a constrained factor-analytic technique in which additional restrictions are imposed on the parameters of the measurement model. Figure 4.2 shows that a total of 126 restrictions are imposed on matrix Λ of factor loadings. These restrictions are specified to equal zero. The restrictions are not arbitrary as they are guided by theory predictions. For example since FA/TA is not theorised to be an indicator of growth, its factor loading on growth attribute is set to zero. Unlike the parameters of the measurement model, those of the structural equation do not contain any restriction. The structural model in which the calculated gearing ratios are expressed as functions of the attributes specified in the measurement model, an 8×1 vector of debt ratios is specified.

4.6.2.2 *Mitigation of measurement problems*

A number of advantages have been associated with SEPath or LISREL technique. Firstly, the estimation models i.e. the measurement model and the structural model, are actually two parts of one model because they are estimated simultaneously. Secondly, unlike in conventional regression, more indicators are used per latent variable, which is likely to provide better results because the researcher can attempt to use all indicators, which adequately reflect the nature of the attribute suggested by the theory. For example it is possible to include both depreciation and investment tax credit as indicators of non-debt tax shield in the model.

Thirdly, again unlike conventional regression, the model allows for indicators to load (contribute) to more than one latent attribute. An example if research and development expenditure (R&D) was one of the proxies used then it could be used as an indicator for growth opportunities as well as for non-debt tax shields, with different factor loadings. Finally, as Titman and Wessels (1988) and Chiarella *et al.* (1992) put it, the technique explicitly specify the relation between the unobservable attribute and the observable (measurable) indicators.

4.7 Dependent variable

The endogenous variable is gearing (or leverage, as it is called in the US) for which a total of eight different measures are used in this study. Finance theory does not restrict us to a single ratio, as a measure of gearing, neither does the theory straightjacket researchers as to how gearing should be computed. Measures of gearing are tools in assessing the probability that the firm will meet both interest and principal payments on debt as they fall due. Debt ratios also highlight the protection of investors from insolvency and the ability of companies to obtain financing for potentially profitable investment opportunities. Financial analysts assert that "however leverage measures may be calculated they should be computed consistently both over time and when making comparisons between companies" (Samuels *et al*, 1995, p.18).

4.7.1 Measures of gearing:

Some previous similar studies used one (Bradley *et al*, 1984, and Givoly *et al*, 1992) or two (Bowen *et al*, 1982) measures of gearing, and regressed them against the independent attributes. Bradley *et al* (1984) estimated gearing as the ratio of the mean level of long-term debt (book value) for the sampling period to the mean level of long-term debt plus market value of equity over the same time period. Givoly *et al*, (1992) defined leverage as the ratio of 'the value of debt to the sum of the value of debt and equity'.

However, as Titman and Wessels (1988) and Chiarella *et al*, (1992) argue, a single measure of gearing may not be appropriate because some theories of capital structure have different implications for the different types of debt. These theories predict different relationships between firm attributes and measures of gearing. For example Myers (1977) predicts that short-term debt ratios might be positively related to growth opportunities if growth firms pursue a policy of rolling over short maturity debt claims because short-term debt does not induce sub optimal investment decisions. Jensen and Meckling (1976) and Warner (1979) among others, argue that issuing convertible debt may reduce the agency costs of debt. Titman and Wessels (1988) also finds that smaller firm size and short-term financing are positively related and interprets such findings to be due to high transaction costs that small firms face when they opt for long-term debt or equity.

To capture different implications from these theories Titman and Wessels (1988) used six measures of financial leverage, the long-term, short-term, and convertible debt divided by market and by book values of equity. Because of unavailability of convertible debt data in Australia, Chiarella *et al*, (1992) used only long-term and short-term debt divided by market and book values of equity in replication of Titman and Wessels work.

Rajan and Zingales (1995) also points out that, "...the extent of leverage and the most relevant measure depends on the objective of analysis" (p.1427). They further argue that for agency problems of debt, which relate to how the firm has been financed in the past and thus on the relative claims held by equity and debt, the relevant measure is the stock of debt relative to firm value. However, when focussing on gearing as a potential for the transfer of control from equity holders to debt holders in an economically distressed firm, income gearing the kind of interest coverage ratio is relevant.

With these in mind this study uses a total of eight different measures of gearing. These measures of gearing have been selected because of a number of reasons. First, the results from these different measures can be compared with the results of various previous U.K. studies that have employed different measures of gearing (i.e. Bennett and Donnelly (1993), Rajan and Zingales (1995), Varela and Limmack (1998), Bevan and Danbolt (2002), and Ozkan (2001). These previous studies used some of these gearing measures. Secondly, some of the measures are appropriate as regards to U.K. financial statements disclosure as corroborated by data stream definitions.

4.7.2 *Gearing Ratios*

The following abbreviations are used to denote different measures of gearing used in this study.

TL_p = Total Liabilities (including preference capital and current liabilities).

D_p = Debt (short term debt plus long-term debt including preference capital)

CAP = Total capital i.e. Debt plus Equity,(where debt= $STD + LTD_p$).

LTD_p =Long term debt (including preference capital).

STD = Short term debt.

TA = Total assets

BV =Book value

MV =Market value

$EBIT / I$ = Profit before interest and tax divided by interest charge

$EBITDA / I$ = Profit before interest, tax and depreciation over interest charge.

In all market value (MV) ratios except the debt to equity, the market value gearing is calculated by adjusting total assets value, by subtracting the book value of equity from total assets and adding the market value of equity.

4.7.2.1. The ratio of total liabilities to total assets

$$\frac{TL_P}{TA}BV \qquad (1B)$$

And,

$$\frac{TL_P}{TA}MV \qquad (1M)$$

This is the broadest measure of gearing. It serves as an indicator of shareholders' residual claim on the firm's assets. Its major shortcoming is that it includes current liabilities like trade credit and equivalent, which may have little to do with a firm's longer term financing decisions. The inclusion of these liabilities may have the effect of overstating the extent of gearing and implies that the ratio may be a poor indicator of the risk of default in the foreseeable future. However, Rajan and Zingales (1995) suggests that in countries or industries that use trade credit as a means of financing, accounts payables should be included in the measure of gearing. The results of this study, which are discussed in chapter seven indicates that in the UK current liabilities comprise of a large proportion of total liabilities (i.e. 76 percent). This implies that UK companies use trade credit as a means of financing; and it is therefore appropriate to use this ratio in a UK study.[12]

4.7.2.2. Debt to total assets; where debt includes both short and long term debt.

$$\frac{D_P}{TA}BV \qquad (2B)$$

and,

$$\frac{D_P}{TA}MV \qquad (2M)$$

[12] Bevan and Danbolt (2002) also report corroborating evidence that trade credit account for 62 percent of total liabilities in the UK.

This ratio excludes trade credit and equivalent liabilities and hence fails to match those assets that are covered by current liabilities. As both trade credit and equivalent, and current assets are likely to be a by-product of a firm's operating activities, which have nothing to do with financing decision, this can be viewed as a more appropriate total gearing measure.

4.7.2. 3. The ratio of total debt to total equity.

$$\frac{D_p}{E}BV \qquad (3B)$$

and,

$$\frac{D_p}{E}MV \qquad (3M)$$

Ever since Modigliani and Miller (1958) used debt-to-equity ratio to present their world famous proposition II, it has become the usual debt-to-equity ratio commonly used in finance literature as a measure of gearing. Ratio 3B is the ratio of total book debt (short term debt plus long term debt, including preference shares) divided by the book value of equity. The denominator of the market value ratio, which is denoted as 3M, is simply the market value of equity.

4.7.2.4. Debt to capital; where capital (CAP) is defined as total debt plus equity.

$$\frac{D_P}{CAP}BV \qquad (4B)$$

and,

$$\frac{D_P}{CAP}MV \qquad (4M)$$

In some literature it is expressed as $\frac{D}{(D+E)}$. Following from the discussion in 4.7.1 above, the effect of past financing decisions is probably most effectively captured by this ratio as it measures the proportion of debt relative to the total sources of financing (see Rajan and Zingales (1995)). Its market value variant is calculated by adding the book value of total debt (short-term debt plus long-term debt) to the market value of equity.

4.7.2.5. The ratio of long-term debt to total assets.

$$\frac{LTD_P}{TA} BV \qquad (5B)$$

This ratio is appropriate in examining those theoretical predictions, which imply different relationships between long and short-term borrowing. The explanation in the immediate ensuing section (section 4.7.3) provides justifications for specifying it in book values.

4.7.2.6. The ratio of short-term debt to total assets.

$$\frac{STD}{TA} BV \qquad (6B)$$

This is ratio designed to capture the validity of the theories that predict different relationship between short-term debt and some firm/industry attributes. Like long-term debt (LTD), it is also expressed in book values.

4.7.2.7. The ratio of current liabilities to total assets.

$$\frac{CL}{TA} BV \qquad (7B)$$

Although trade credit and equivalent may not arise as a result of (deliberate) financing decisions, the preliminary descriptive statistics shown in table 4.3 depicts that they account for 76 per cent (39/51) of total liabilities. This result, which is also supported by Bevan and Danbolt (2002), suggests that further analysis of gearing on the UK companies is likely to be sensitive to whether or not these current liabilities are taken on board. For the above reason and for completeness, this ratio is also included in this study's analysis.

4.7.2.8. Earnings Before Interest and Tax divided by Interest Expense.

$$\frac{EBIT}{I} \qquad (8B)$$

High indebtedness only may not be a problem unless the firm fails to meet its fixed obligations. This ratio, which measures how many times the operating income covers the interest expense, is a sign of the firm's ability to generate sufficient profits over time in relation to its fixed financial obligations. As mentioned previously when focussing on gearing as a potential for the transfer of control from equity holders to debt holders in an economically distressed firm, income gearing such as interest coverage ratio is relevant. However, Rajan and Zingales (1995) suggests that this ratio is appropriate where investments equal in magnitude to depreciation are needed to keep the firm as a going concern. If no such investment is necessary, a more appropriate measure of the firm's ability to service its financial obligations is $EBITDA/I$ given below.

4.7.2.9. Earnings Before Interest, Tax and Depreciation divided by Interest:

$$\frac{EBITDA}{I} \qquad (9B)$$

The data stream definition for the item used in this ratio is 'net profit derived from normal trading activities before depreciation and operating provisions'. It is noteworthy to mention that $EBIT/I$ uses earnings rather than cash flows in measuring ability to meet fixed financial obligations. The use of $EBITDA/I$ mitigates this shortcoming because depreciation and other profit and loss account non-cash expenses (operating provisions) are added back. Hence its use approximates actual cash flows.

For the first four measures (i.e. 4.7.2.1 to 4.7.2.4), both the book and the market values of assets/equity will be used. This study also attempts to include all conceivable fixed-claim financing in the gearing measures. Thus following previous research, all ratios that include long-term debt also includes preference capital. In addition the ratios using total liabilities, and total debt also includes convertible debt (item 320 in DataStream), as well as leasing finance and hire purchase (item 267) whose obligations are due after one year. The total assets exclude intangibles since these may be distorted not only by subjective valuation but also by the treatment of acquired goodwill, research and development expenditure, and other discretionary accounting treatments of intangibles.

Due to the existing accounting disclosure requirements, our measures may not include operating leases: according to the UK's lease accounting standard, SSAP 21 and other related financial reporting standards like FRS 5, operating leases are likely to be off-balance sheet items, which our data source does not provide[13]. To the extent that operating leases are an important fixed-claim financing that constitute a limitation to this study.

4.7.3 *Book value vs. market values of debt*

While it would have been more appropriate theoretically to measure debt in market values, data limitation has forced this study, like most of previous researchers in this area, to use book values of debt rather than market values. The problem with accounting data is that debt in the balance sheet is carried simply as the unpaid balance without adjustment for the prevailing level of interest rates or risk. The interest rate may have changed from the level necessary to equate the book and market values, to the rate set when the debt was originally issued. Because of this the market value of debt is likely to differ from its book value. Besides, some forms of claims that are very similar to debt,

[13] Beattie *et al.* (2000) investigates the degree of substitutability between leasing and non-lease debt, and documents that leasing and debt are partial substitute. They then, *inter alia*, make a case for pooling operating lease with finance lease. Beattie *et al.* (1998) reports that operating leases are not only a major source of long-term finance but are also considerably more important than finance leases.

like pension liabilities and operating lease obligations may not appear on the balance sheet. However as discussed in ensuing paragraphs, these will be our concern only to the extent that they have something to do with financing decisions.

In theoretical analysis, financial economists prefer market values rather than book values when measuring debt because they believe that current market values better reflect future cash flows than do historical based value like book values. However, this contrasts with what practitioners do, corporate practitioners use book values. For example, Graham and Harvey (2001) report that managers do focus on book values when making financing decisions. Myers (1977) suggests that there may be an element of sense in the practical procedures. He says that book values are not used because they are more accurate; rather it is because book values refer to assets already in place and it is these assets that support debt capacity.

Perhaps it is for the 'assets in place' reason that restrictions of debt in bond covenants (and hence debt capacity) is usually based on the book values (see Smith and Warner (1979), and Varella and Limack, (1998)). Or may be book values are used and market values are avoided because of the volatility of the stock markets. Bond rating firms like Standard & Poor and Moody's use debt ratios expressed in book values. Titman and Wessels (1988) cites a survey presented in Stonehill *et al* (1973) as evidence that managers do think in terms of book values.

It may not be surprising therefore to find that in most cases previous empirical studies have used book values. For instance Barclay *et al.* (2001) show preference for book gearing in empirical analysis. They argue that using market values in the denominator is prone to spurious correlation with explanatory variables such as Tobin's q. Earlier Titman and Wessels (1988) had similar concerns although their results for book gearing and for market gearing were very similar.

Welch (2002) however, argues against book values gearing measures (especially book value of equity) in favour of market values. Citing Welch and Hoberg (2002), Welch argues that the book value of equity is a problematic measure as it is simply a 'plug number' to equalize assets and liabilities. It can be (significantly) negative and has varying degrees of correlations with market values (pp. 6-7). The recent strikingly different results for book gearing and market gearing by Fama and French (2002), and the similar results between book gearing and market gearing found by Mackay and Phillips (2002) is a reminder that the controversy is not over yet.

There is still another argument, which is not only a stronger justification for the use of book values of both debt and equity, but is also more relevant to the objective of this study. The use of market values, which is justified theoretically, may show changes in leverage whenever share prices or market values of debt changes (see Welch, 2002). This does not necessarily reflect intentional adjustments by managers (Givoly *et al*, (1992). It was also mentioned previously that the most relevant measure of gearing depends on the objective of analysis. Since one of the major objectives in this study is concerned with managers' intentional adjustments, it is perhaps more appropriate to use book values of debt. However, in the light of all this diversity and for purpose of completeness in this study ratios are computed using both book and market values of equity. The use of market values of equity will be particularly important in the last part of this study that investigates the impact of share price movement s to capital structure.

4.8 Independent variables:

These independent variables are the exogenous variables or attributes (i.e. factors) for which proxies have been developed; these proxies are tested against the various measures of gearing defined in the previous section. Except where it is inapplicable, in cross-sectional analysis all the exogenous (explanatory) variables are 16-years averages (1985-2000). These independent variables are as follows:

4.8.1. Industry characteristics:

Due to the large number of industries analysed in this study, the testing of this attribute uses a different approach from the rest of the study. The tests are done independently of the cross-sectional approach adopted for the other ten determinants. As a proxy for industry characteristics, the *DataStream* industry group classification is used. The use of a dummy variable equal to one for firms in the same industry and zero otherwise, is used in conjunction with two-sample t-test, standard analysis of variance (ANOVA), analysis of industry gearing ratios over time, and analysis of summary statistics. Because a number of sub-samples in this part are not normally distributed, non-parametric test, Kruskal-Wallis is also used (see chapter three).

4.8.2. Asset structure/Tangibility:

Tangibility may be proxied by the ratio of inventory, gross plant and equipment to total assets (IGP/TA); using either gross (IGP/TA) or net assets (IGPA/TAn). Previous studies do not mention whether they used gross or net assets. Tangibility has also been proxied by the natural logarithm of the (inverse) ratio of intangible assets to total assets where available (LnInvInt) Titman and Wessels (1988). Rajan and Zingales (1995) measured tangibility using the ratio of fixed assets to book value of total assets, (FA/TA). For OLS regression estimation, this study uses only FA/TA. For SEM technique this study uses FA/TA, and the (inverse) ratio of intangible assets to total assets (LnInvInt). Contrary to some previous studies the IGP/TA is avoided altogether because it is considered inappropriate proxy for collateralizability (see also section 2.6.2.2).

4.8.3. Non-debt Tax shields:

Non-debt tax shields may be proxied by the ratio of depreciation over total assets (D/TA); and by investment tax credits over total assets (ITC/TA). Bradley *et al.* (1984) measure the non-debt tax shield as the sum of annual depreciation charges and investment tax credits divided by the sum of annual earnings before depreciation, interest and taxes. Because of its availability of this data in the US, a number of other studies use investment tax credit (ITC), as a proxy for non-debt tax shields. ITC however, are not used in the UK, the fact that is reflected in our data source. Lack of data for investment tax credit in the UK prevents this study to come up with similar measure. Instead, this study uses two measures of non-debt tax shields.

In a bid to disentangle the influence of non-debt tax shield from tangibility, this study follows the Titman and Wessels (1988) and Chiarella *et al*, (1992) direct measure of non-debt tax shields, which is derived using corporate tax payments (T), operating income (OI), interest payments (i), and the corporate tax rate applicable during the period (τ_c) using the following equation:

$$NDT = OI - i - T / \tau_C \qquad (4.8.3)$$

Equation 4.8.3 simply states that corporate tax payments are equal to corporate tax rate multiplied by whatever remains after interest payments and non-debt tax shields have been taken out of the operating income.

i.e. $T = \tau_c(OI - i - NDT)$.[14]

However, it is important to note that equation 4.8.3 used here differs from the one used by both Titman and Wessels (1988) and Chiarella *et al*, (1992) in that while they used one average rate for the whole period covered by their respective

[14] Which is the same as, $T = \tau_c(OI) - \tau_c i - \tau_c(NDT)$. And also the same as

$$\tau_c(NDT) = \tau_c(OI) - \tau_c i - T$$

Dividing throughout by τ_c gives,

$$NDT = OI - i - T / \tau_C.$$

data, here our equation captures τ_c for each of the 16 years covered. This is necessary because our analysis also involves an examination of the dynamics of capital structure adjustments. For OLS regression estimation the natural log of this direct measure of non-debt tax shield, which is abbreviated *OliT* is used. For SEM-SEPath technique, both *LnOliT*, and another proxy, depreciation over total assets (D/TA) are used.

Extensions to De Angelo and Masulis (1980) are also tested in this study. Relying on the suggestion that capital intensity may be an indicator of production technology (see Boyle and Eckhold, 1996, p.9; and MacKay and Phillips 2002, p.10), This study uses fixed assets over total assets (FA/TA) a proxy for capital intensity, to test for a modified model by Dammon and Senbet (1988), which suggest that the cross-sectional differences in non-debt tax shields need not be inversely related to gearing if firms have different production technologies.

To test the extension by Dammon and Senbet (1988) that inverse relationship between gearing and non-debt tax shields may not obtain for firms with lower levels of non-debt tax shields, the sample was segmented into four quartiles according to the level of non-debt tax shields, and regression was run for each of these quartiles. To test the other extension that substitutability of debt and non-debt tax shields depend on the level of investment (production process), the original sample was divided into four quartiles according to the level of capital intensity (FA/TAn). Regressions were run for each of these quartiles in a similar way to previous regressions.

4.8.4. Growth/Investment opportunities:

Growth may be proxied by the ratio of capital expenditure to total assets (CE/TA); and by the percentage of changes in total assets (GTA) (see Titman and Wessels (1988)). Growth can also be proxied by the ratio of research and development expenditure to sales (RD/S). Numerous empirical studies have used the ratio of the aggregate market value to the aggregate book value of assets (market-to-book ratio), or Tobin's Q to proxy for efficient management (or for existence of real growth opportunities). See for example Fama and French (1999a, 1999b), Rajan and Zingales (1995), and Bevan and Danbolt (2002) to mention a few.

Bevan and Danbolt (2002) document that if book values are a good estimate of replacement values of 'assets in place', a market-to-book that is substantially above 1 indicates availability of significant investment opportunities or future growth, although this may also be a sign that a firm has invested in positive NPV projects. There is another ratio, called Tobin's Q, which is very much like Market to book ratio. Tobin's Q ratio divides the market value of all the firm's debt plus equity by the replacement value of the firm's assets.

The Q ratio differs from the M/B ratio in that the Q ratio uses market value of the debt plus equity. It also uses the replacement value of all assets and not the historical cost value. It should be obvious that if a firm has a Q ratio above 1 it has an incentive to invest that is probably greater than a firm with a Q ratio below 1. Firms with high Q ratios tend to be those firms with attractive investment opportunities or a significant competitive advantage (Ross et al., (1999, pp. 37-38). Despite the differences in the market-to-book ratio and the Q ratio, they measure the same concept.

Although market-to-book ratio (or the Q ratio) may not be a direct measure of growth opportunities, the MTB ratio is preferred because (unlike other proxies used in previous studies) as explained below, it directly relates to capital structure theory and it commands stronger support in literature. Both Modigliani and Miller's (1958) irrelevance proposition, and their 1963 tax analysis are specified in terms of market values. Among the previous studies that have used MTB or its variant include Rajan and Zingales (1995), Bevan and Danbolt (2002), Ozkan (2001), Fan et al (2003) and Drobetz and Fix (2003). Most of these studies documented the results that are consistent with the underlying theory. On the other hand there are other studies that have used realised (historical) values of average growth in sales or assets. These studies include Titman and Wessels (1988), Chiarella et al., (1992), Bennett and Donnelly (1993), Wald (1999), Krishnan and Moyer (1996), and Lang et al., (1996).

Generally, the actual past growth rates measures have not faired well in these studies. With the exception of Wald (1999) and Lang et al., (1996) most other studies that used realised growth rate measures did not find the expected negative relationship between gearing and past growth rates. The use of past growth rate does not seem appropriate than the use of either MTB or the q ratio because the historical growth rate is not necessarily linked to future (expected) growth rate (Drobetz and Fix, 2003), and Chan et al., 2003). The theory that relates growth to gearing is specified in terms of expected future growth (not past growth), and this makes market-to-book ratio, MTB, a better candidate.

Bevan and Danbolt (2002) cite Barclay and Smith (1999) who find that market-to-book generates results that are similar to those obtained by using other proxies for growth in cross-sectional studies. Consequently, the OLS regression model in this study uses the market-to-book (MTB) ratio. For the SEM model, three indicators are used; the MTB ratio, the Q ratio, and the ratio of capital expenditure to total assets (CE/TA). The decision to use all three indicators was arrived at because they were considered the likely proxies to be capturing growth/investment opportunities.

4.8.5. Uniqueness/Specialized product

The proxies for uniqueness may be the ratio of research and development expenditure to sales (RD/S), the ratio of selling expenses to sales (SE/S), and quit ratio (QR). Titman and Wessels (1988, p. 5) justifies the use of these proxies. Data limitation in the UK prevents this study from using (QR) as proxy for uniqueness Titman and Wessels justification for using (QR) was that firms that produce relatively unique product tend to employ workers with high levels of job-specific human capital who will thus find it costly to leave their jobs. In an unreported model, preliminary tests revealed that both RD/S and SE/S have very low explanatory power on gearing. For this reason, and also because it is not considered that either of them (without combining them) represents uniqueness, both these indicators are not used in the final OLS regression model or in the

SEM model. However, the results of preliminary tests on them are reported in a section 4.12.4.

4.8.6. Firm Size

Appropriate proxies for firm size may be the natural logarithm of sales (LnSales), the natural logarithm of total assets (LnTA), or the number of employees (Titman and Wessels (1988)). The very high correlation between LnSales and LnTA (0.95) meant that only one of them could be used. Because of lack of data relating to QR, both methodologies in this study use only LnTA as an indicator (or exogenous) variable for firm size. Other recent studies like Fan *et al.*, (2003) have used LnTA as a proxy for firm size.

4.8.7. Volatility of earnings (returns)

Volatility of earnings may be proxied by the standard deviation of the percentage of change in operating income (SIGOI) (Titman and Wessels, 1988), or by the standard deviation of the first difference in annual earnings, scaled by the average value of the firm's total assets over the period (Bradley *et al*, 1984). Other studies have also used the coefficient of variation of earnings before interest and tax (CVEBITDA) (see for example, Cherry and Spradley, 1989). Because the investigation into industrial influence in gearing uses a different approach and models, both SIGOI and coefficient of variation of earnings before interest tax and depreciation (CVEBITDA) are used. The two proxies for business risk are used to explore whether the observed persistent differences in gearing among different industries is due to business risk.

SIGOI was found to be highly correlated with other variables like OIiT, and was therefore considered inappropriate for inclusion in a cross-sectional multiple regression model. Standard deviation of share price, SIGP can also be used as a proxy for the volatility of returns. Titman and Wessels (1988) uses only one measure, fearing that other indicators of risk such as stock beta or total volatility may bring about spurious correlation because they are partially determined by the firm's debt ratio.

These precautions are taken on board and it is found that the standard deviation of share price is not a potential source of spurious correlation with the market value gearing ratios.[15] The correlations between SIGP and measures of market value gearing are 0.025 (D/CAP), 0.007 (Dp/E), 0.072 (Dp/TA), and -0.208 (TLp/TA). These are not sufficiently large to cause colinearity problems in the regression model. In this study the cross-sectional OLS-regression model uses the standard deviation of the percentage of change in operating income divided by total sales (SIGOIS). In the SEM methodology, four proxies (indicators) are used as inputs in the measurement model i.e., SIGOI, SIGOIS, CVEBITDA, SIGP.

4.8.8. Profitability:

The dichotomy inherent in theoretical predictions regarding profitability (see section 2.5.2.8) requires that two proxies be estimated. Following from this dichotomy, a meaningful empirical test should therefore come up with a means of differentiating between a proxy for past profitability and that of future profitability. Past profitability is readily observable and is proxied by the ratio of retained earnings to total book value of assets (RE/TA), which is used in both models. In the SEM model RE/TA is used together with other proxies, the ratio of retained earnings to total sales (RE/S), and the sum of cash and cash equivalents scaled by current and long-term debt, CACL used as indicators of past profitability.

The challenge is how to measure future profitability or what is referred to as 'quality' by Barclay *et al* (1999). Because it is not observable, we have to come up with a good proxy for future profitability. Assuming that the best known predictor of a company's next year's profitability is current year's earnings, (see Barclay *et al* (1999), this study uses the ratio of operating income to total sales

[15] Other measures of volatility were considered but it was found that SIGP is the one, which has low correlation with measures of gearing which are scaled by market value of equity.

(OI/S), to proxy for future profitability in the OLS regression estimation. In the SEM model, both OI/S and the ratio of earnings before interest, tax, and provisions, divided by Total assets (EBITDA/T), are used.

4.8.9. Probability of bankruptcy:

Theory has suggested that bankruptcy costs influence leverage (Ross, 1977). Haugen and Senbet (1978), Altman (1984), and Andrade and Kaplan (1998) among others have argued that it is the expected (present) value of bankruptcy costs at the time of making a financing decision, which matters. In the simulation of their theoretical model Bradley *et al*, (1984) find that firm leverage is inversely related to the expected costs of financial distress. Rajan and Zingales (1995) suggest that size may be a proxy for the (inverse) probability of bankruptcy.

For a cross-sectional study like this one, which does not distinguish between healthy companies and those that are already financially distressed, the variable of importance is the one which assesses how likely a firm, is to experience financial distress, and then relates this to measures of gearing. In this way we can investigate the potential impact of the probability of bankruptcy on capital structure decisions. Instead of inferring the probability of bankruptcy using firm size (as suggested by Rajan and Zingales (1995), the probability of bankruptcy of the sample companies is estimated using Altman's *Z-Score*.[16] Altman (1968) developed a Multiple Discriminant Analysis (MDA) model (equation 4.8.9 below) and used it to predict firms' bankruptcy with 94 per cent accuracy on a sample of 66 firms comprising of healthy and bankrupt firms.

$$Z = .012X_1 + .014X_2 + .033X_3 + .006X_4 + .999X_5 \qquad (4.8.9)$$

where

Z = Z-score,

[16] Other measures like the inverse of size (*LnSales* and *LnTotal Assets*) were also considered, however, the very high correlation between Total sales and Total assets meant that neither could be used in the presence of the log of total assets which is used to proxy for size.

$X_1 =$ Working capital/Total assets

$X_2 =$ Retained Earnings/Total assets

$X_3 =$ Earnings before interest and taxes/Total assets

$X_4 =$ Market value of equity/Book value of total debt

$X_5 =$ Sales/Total assets.

If Altman's Z-score had a higher degree of success in predicting company failure, and its variants are continuing to be used by consulting firms in credit rating,[17] and if the threat of bankruptcy is able to deter managers from using debt, then Z-score should also enable us to find out if the firms with higher probability of bankruptcy actually avoid the use of debt.

To be able to use this model properly the ratios comprising the MDA model for all companies in our sample were calculated for each of the 16-years, and then the average Z-score over the sample period was used for subsequent analysis. Those observations whose Z-score falls within the grey area (between 1.81 and 2.99) are removed because they may have a neutral impact on gearing and thereby distort the influence of probability of bankruptcy on gearing.[18] Firms with a score below this range are considered good candidates for bankruptcy and are expected to use less debt, while those whose score is above this range are not likely to be bankruptcy and may use higher levels of debt.

The major aim is to find out whether those firms that are predicted to have a higher probability of bankruptcy (i.e. lower Z-score) actually avoid debt and vice versa. It should be noted that in the results of the regression model (or even the SEM model) used in this study, it is the positive relationship between Z-score and gearing which will confirm whether debt is inversely related to probability of bankruptcy. This is because the higher the Z-score, the lower the probability of bankruptcy and hence the higher the likelihood of using debt. Alternatively, the

[17] see Altman, 2000; and Altman et al, 1977

[18] Alternative OLS-regressions were run with and without observations falling within Z-score's 'grey' area. Results were not significantly different. In both cases the results showed a significant negative relation between the probability of bankruptcy and gearing.

lower the Z-score, the higher the probability of bankruptcy, and hence the higher the likelihood of companies avoiding the use of debt.

4.8.10. Cash holdings/Free Cash flow

Cash holdings are a measure of internal funds available for financing investments by a firm. The pecking order theory developed by Myers (1984) and Myers and Majluf (1984) predicts that financing follows a pecking order. In this order, financing follows a hierarchy, which descends from internal funds (retained earnings), then to external least risk debt. In such financing hierarchy equity is seen as a last resort.

Assuming that it is the past profitability that generated the current levels of cash holdings, it is predicted that leverage is inversely related to cash holdings. The correlation between past profitability (RE/TA) and cash holdings (CACLL) in this study is 0.3. This significant positive correlation between past profitability and cash holdings indicates that a substantial part of cash holdings for these companies was generated from past profitability. This therefore suggests that CACL may as well serve as another proxy for past profitability.

Alternatively, Jensen (1986) suggests that, given 'free cash flows', managers will be motivated to increase firm size to enhance prestige and compensation. Therefore the shareholders of firms with high levels of free cash flow should use debt to prevent managers from investing the cash into negative NPV or sub-optimal projects. This is because the gearing will increase fixed charges and reduce free cash flow.

Chiarella et al (1992) claim to have tested this theory for the first time. However, it is obvious from their reported methodology that Chiarella et al (1992) tested for 'cash holdings' and not free cash flow hypothesis. In order to test the free cash flow hypothesis, one must ensure that the sample tested exhibits both the features of lower growth (mature) companies as well as higher levels of free cash flow. Failure to ensure that the sample exhibits such features means that the test will either be testing Myers' (1984) pecking-order predictions or Myers' (1977) growth firms' hypothesis.

In this study an attempt is made to avoid these previous pitfalls by testing the free cash flow hypothesis. To start with a sub-sample of low growth (mature) firms, which generate substantial cash flows, is identified and tested. This study uses only one proxy for cash holdings, the sum of cash and cash equivalents scaled by current and long-term debt, (CACL).[19] This is likely to be the first such test in the U.K. Although the study uses the same proxy again to test Jensen's free cash flow hypothesis, the sample is segmented and tests are conducted only on the sample with low growth (mature firms) with high levels of CACL.

4.9 Measurement weaknesses in previous empirical studies

As discussed earlier, the major reasons for the results which are inconsistent with the underlying capital structure theories, and those that are contradictory (see Bradley *et al.* (1984), Titman and Wessels,(1988), and Chiarella *et al.* (1992)) and low explanatory power (see Boyle and Eckhold, 1996), are the choice of inappropriate proxies and the use of a single or few measures of gearing. These inappropriate proxies either fail to capture the relationship between the attributes suggested by the theories, or do not have stronger linkages with the attributes. The use of one (or a few) measure(s) of gearing also fails to capture the implications of those theories that predict different relationship between predicted attributes and different types/measures of debt. Examples of some of the measurement weaknesses are given below.

Bradley et al. (1984)

Bradley *et al.* (1984) used a single measure of gearing i.e. "the ratio of the mean of long-term debt (book value) during 1962-1981 to the mean level of long-term

[19] The very high correlation between this ratio and the second one used by Chiarella *et al* (1992) i.e. 0.999, created a singularity in the covariance matrix. The singularity would have caused problems in estimating both models, forcing this study to use only one ratio.

debt plus market value of equity over the same period" (p.869). They measured non-debt tax shields, as the sum of annual depreciation charges and investment tax credit divided by EBITDA..." (p.871). As a result they get a positive significant relationship between gearing and non-debt tax shields and interpret this to mean positive relationship between gearing and tangibility (p.874). In their conclusion, they suggest that their findings on non-debt tax shields could have arisen from misspecification due to a 'missing variable' (p.877).

Titman and Wessels (1988)

Titman and Wessels (1988) used multiple (3) measures of gearing and also as mentioned earlier, they pioneered a new sophisticated technique (LISREL). However, the study is still plagued by some identification and measurement problems. They also used a single proxy for risk, which could not measure market (share) return volatility. Further, they used inventory plus gross plant and equipment (IGP/TA) as a proxy for collateralizable value of assets.

In another anomaly, Titman and Wessels (1988) used the 'realised values' of average growth in total assets (GTA) as a proxy for expected (future) growth opportunities. In addition the study did not separate past from current profitability. Having failed to get satisfactory results to support non-debt tax shields, collateral value, volatility, and future growth, as determinants of capital structure, they wondered whether their measurement model captures the relevant aspects of the attributes suggested by capital structure theory (p.17). They then call for further research to come up with indicators with stronger linkages with (and which adequately reflect the nature of) the attributes suggested by the theory (p.17).

Chiarella et al. (1992)

Chiarella *et al.* (1992) uses multiple measures of gearing. However, like Titman and Wessels (1988), which they replicate by using Australian data, their study is also plagued by some measurement problems, which they admit to. For example they use inventory plus gross plant and equipment (INVPTA) as a proxy for collateralizable assets. Again like Titman and Wessels (1988), they use average growth rate of total assets (AVGRTA) as a proxy for future growth. They also do not separate past from current profitability.

Chiarella *et al.* (1992) point out that empirically the relationship between gearing and non-debt tax shields has been difficult to discern. They attribute this difficulty in part to the difficulties associated with deriving an accurate measure of non-debt tax shields (p.140-141). Having found a negative relationship between gearing and tangibility (which is inconsistent with the theory), they doubt whether the measure used was adequate to substantially capture tangibility (p.155). Like Titman and Wessels (1988) they do not find support for collateral value, and growth opportunity as determinants of capital structure, and they then attribute the perverse results to data limitations (p.155-156).

However, unlike Titman and Wessels (1988), Chiarella *et al.* (1992) find very strong support for a negative relationship between gearing and non-debt tax shields despite using the same methodology and the same proxies. As their results show, the reason is that their direct measure of non-debt tax shield (NDTA) loading for independent variables in their LISREL's measurement model has a larger negative value, which offsets the positive value for the depreciation proxy. For Titman and Wessels (1988), in addition to depreciation having a larger value than NDT/TA, all the three factor-loadings for non-debt tax shield are positive.

Bennett and Donnelly (1993)

Like other previous studies discussed above, Bennett and Donnelly (1993) also use the average annual growth in assets as a proxy for growth opportunities, and expect to capture future growth opportunities, which they do not capture. They also did not separate past from current profitability; they simply measured profitability as the ratio of operating income divided total assets.

Boyle and Eckhold (1996)

Boyle and Eckhold (1996) used two different measures of gearing (p.15) and pointed out that the identification and measurement of non-debt tax shields is somewhat problematic (p.8). They also used percentage change in total assets to proxy for growth (similar to GTA in Titman and Wessels (1988) or AVGRTA in Chiarella *et al.* (1992), and Bennett and Donnelly (1993)). Not surprising, Boyle and Eckhold's (1996) result provide little explanatory power (R-sq. of 0.09) and insignificant F-statistic of 1.47 (p.11 and table III). Because their data and results are unable to explain the existing theory, they get the same results like those of Titman and Wessels (1988) and Bennett and Donnelly (1993) and conclude that their results add to a growing evidence that observed capital structure patterns cannot be explained by existing theory, measurement and estimation tools (p.11-12).

Boyle and Eckhold (1996) attribute the low explanatory power of their model to their suggestion that there are undiscovered determinants of capital structure policy waiting to be discovered. They attack the existing capital structure theories (i.e. trade off theory, and pecking order predictions) by claiming that these theories neither give real clue as to how to measure some variables they predict nor how they should be tested. Finally they say that better methods of measurement and testing remain to be devised by empiricists (p.13).

Ozkan (2001)

Ozkan (2001) uses a single measure of gearing (p.185, 187), and also uses depreciation over total assets, which he denotes as 'Ndts', as a proxy for non-debt tax shields (p.185, 187). He admits that he did not intend to test for tangibility. , He however, replaced 'Ndts' by tangible assets in order to explore more about non-debt tax shields, and could not discern any significant relation between tangible assets and gearing (p.190).

Ozkan further perpetuated the confusion inherent in most previous similar studies by (1) failing to separate *past* from current profitability, (2) failing to recognise that the pecking order theory is specified in terms of retained earnings, which imply *past profitability*, and that this theory should better be tested as such, (3) actually using an inappropriate proxy for past profitability, i.e. the lagged (EBITDA/TA), instead of taking a straight forward measure of past profitability like (RE/TA) or (RE/Sales).

Not surprisingly, Ozkan's findings on profitability like those of Titman and Wessels (1988), and Chiarella *et al* (1992) are strictly speaking, inconsistent with the theory as developed by Myers (1984); and Myers and Majluf, (1984) and also inconsistent with many other previous empirical studies' findings (see for example Bennett and Donnelly (1993), Rajan and Zingales (1995), Barclay *et al.*, (1999) and, Bevan and Danbolt (2002) to mention a few).

Way forward

In this study attempts are made to improve on the identification and measurement issues by learning from mistakes of previous studies in several ways. For example this study carried out analysis using eight different measures of gearing in a bid to capture the implications of capital structure theories that predict different relationship between predicted attributes and different types/measures of debt. In carrying out the analysis, more realistic proxies have been chosen by avoiding those, which lack strong linkages with the relevant attribute.

This study also introduces additional attributes, either those not used before or not used before in the UK (e.g. *Z-Score* as a proxy for probability of bankruptcy, and cash holdings). The study has also made attempts to separate profitability into a proxy for past profitability, and a different proxy for current profitability, which serves as an approximation for future profitability. In a similar way to profitability, risk has been separated into a proxy for operating risk measured by accounting earnings (CVEBITDA), and a proxy for the volatility in market return, the standard deviation of share price (SIGP)

4.10 Computation of variables and tests

From the accounting and market data relating to 702 companies, thirteen (13) measures of gearing, and twenty-two (22) proxies representing the nine attributes were calculated. Descriptive statistics were computed for all these variables to determine their distribution as well as the existence of any outliers. Outliers were identified and removed. This screening process further reduced the number of sample companies from 702 to 651. Correlations among all independent and dependent variables were computed. For pairs of highly correlated dependent variables, it was necessary to remove one of them. Consequently EBIT/I was removed because correlation between itself and EBITDA/I was 0.99. This meant that the only 12 measures of gearing remained. In order to avoid any collinearity problems, for all independent variables, which were highly correlated with any other variable, it was ensured that any of the two were not used in one model.

Best subsets regression was run for each measure of gearing, using the remaining independent variables in order to determine which ones best explains the gearing ratios with regard to the hypotheses at the beginning of this chapter. The decision to include or exclude an independent variable in the final regression was taken on the basis of (1) its contribution to the model's explanatory power, (2) the model having the lowest c-p value, and (3) the variable's contribution in reducing the standard error.

4.11 Results

4.11.1 Introduction

In this chapter, the results of all cross-sectional empirical tests conducted in this thesis are presented and discussed. The detailed results are presented in various tables and figures provided in the appendix at the end of the chapter. The cross-sectional tests conducted in this thesis can be classified into two main categories: OLS-regression analysis, and structural equation modelling. The results from the two alternative methodologies adopted for cross-sectional analysis are also compared in this section.

Table 4.3 provides a general picture of gearing in the UK, giving the mean and the median for each of the thirteen measures of gearing employed in the study. The table also shows gearing ratios taken from three previous studies for purposes of comparison. Columns one to four relate to the current study. The overall mean and standard deviation is calculated from the whole sample of 651 companies using the cross-sectional data (1985-2000). The overall mean depicts, on average, the extent to which U.K companies are geared. Taking total liabilities to total assets for example the gearing is 51%. One notable feature is that current liabilities account for a significant 39% of total assets. This means that current liabilities, on average, account for 76% (39/ 51) of total liabilities. It is therefore important to take the composition of liabilities into account especially if the long-term debt and the short-term debt accounts for only 4% and 6% respectively.

These results support those of Bevan and Danbolt (2002) who also found that the determinants of gearing vary significantly depending on the component of debt used. They found that 'credit and equivalent', which is similar to current liabilities in this study, accounted for more than 62% of total liabilities. The implications from these findings is that the results of any further analysis of gearing on the U.K companies will be sensitive to whether or not current liabilities are taken into account. Elsewhere, in an international study of capital structure and maturities involving 47 developed and developing countries, Fan *et al.*, (2003) documents that the relation between gearing and some hypothesised determinants change depending on whether trade credit is included in total debt (total liabilities). Because of this, although this study uses other measures of gearing as well, the ratio of total liabilities to total assets is reported despite the possibility that current liabilities may not have much to do with financing decisions as it may simply reflect operations of a business.

Initially a total of 13 different measures of gearing were computed. Pearson's correlation revealed that some of them were highly correlated and on this basis some measures were dropped. For example despite the differences in both the means and the medians of EBIT/I and EBITDA/I, Pearson's correlation revealed that these variables are almost perfect correlated indicating that one could be dropped in subsequent analysis. It may be worth mentioning that most of the overall (cross-sectional) ratios computed in this study are similar to the comparable ratios in two previous studies as shown in table 4.3.

4.12 Cross-sectional OLS-regression results

As it was discussed in chapter two, in addition to industry influence, there are other factors that have been theorised to influence capital structure choices. It was also mentioned that a number of studies have attempted to test these various factors in order to find out if these factors actually have a significant effect on capital structure. A summary of previous cross sectional studies in chapter one revealed that similar UK studies examined factors like tangibility, business risk, firm size, growth opportunities, profitability, and liquidity, in addition to industry influence. Table 4.1 provides a summary of selected previous cross-sectional studies on determinants of capital structure, including UK studies. These UK studies have not considered whether uniqueness and/or cash holdings influence capital structure.

Elsewhere, no rigorous analysis has been developed to tests probability of bankruptcy and free cash flows as determinants of capital structure. In chapter five empirical procedures were designed to test these factors. This section reports and discusses results of tests conducted on tangibility, non-debt tax shields, future growth or investment opportunities, profitability, business risk, and firm size. Other factors reported are, uniqueness, cash holdings (and free cash flows), and probability of bankruptcy. Table 4.4 report OLS regression coefficients of the model used for cross-sectional analysis. A total of eight measures of gearing are used and the table shows the coefficients together with the corresponding t-statistics for all nine independent variables included in the model.

4.12.1 Tangibility

As table 4.4 depicts, the relationship between tangibility (FA/TA) differ depending on the gearing measure used. Total liabilities to total assets (TLp/TA) and current liabilities to total assets (CL/TA), give significant negative coefficients at 1% contrary to theoretical predictions. The long-term debt (LTD/TA) gives an insignificant negative coefficient. Total debt to total assets (Dp/TA-BV) gives a significant positive coefficient (at 10% level). The remaining capital gearing measures (i.e. Dp/E-BV, STD/TA-BV, and Dp/CAP-MV show insignificant positive relationships. The income gearing, EBITDA/I, shows a significant positive coefficient, which however, should be interpreted as a significant negative relation between capital gearing and tangibility. There is sufficient evidence to believe that the significant negative coefficients associated with total liabilities to total assets (both at book and market value), is driven by a significant negative relation between current liabilities to total assets (CL/TA) and tangibility. As table 4.2 and table 4.3 indicate, current liabilities account for over 76 percent of total liabilities, and correlation between CL/TA and TL/TA is 0.76. Many previous studies fell into this trap (see for example, Titman and Wessels (1988), Chiarella *et al.* (1992), and Bevan and Danbolt (2002)).

The coefficients for tangibility in table 4.4 resemble those of Bevan and Danbolt (2002) who also used FA/TA to proxy for tangibility. Both results have significant negative coefficients for the ratio of total liabilities to total assets (TLp/TA) and for the ratio of current liabilities to total assets (CL/TA). The feasible explanation here could be that the level current of liabilities arises not because of any deliberate financing decisions but due to operational (transactional) decisions. What is clear is that despite the short period covered by Bevan and Danbolt (2002), their findings regarding current liabilities and their relation with tangibility is valid. The significant negative relation between the ratio of current liabilities to total assets and tangibility in table 4.4 may be an indication that current liabilities are used to finance current assets in a bid to match maturities of assets with debt obligations as suggested by Myers (1977).

Additional tests were carried out to find out the reasons for the observed negative relation between gearing and fixed assets. The sample was divided into quartiles according to the level of fixed assets. In general, the results of a re-run of the multiple OLS-regression model on the basis of the sub-samples, reported in table 4.4 reveals that for the quartile with the highest level of fixed assets, the relationship between gearing and fixed assets was more (significantly) negative than the quartile with the lowest level of fixed assets. In fact, for the quartile with the lowest level of FA/TA, there were more positive (though insignificant) coefficients than in the quartile with highest level of fixed assets. These results point towards FA/TA being a determinant of the level of non-debt tax shields as discussed in the remainder of this section and in the next section.

Other studies have used the ratio of inventory and gross plant assets over total assets, IGP/TA, to proxy for tangibility. For most of these studies, the results did not provide support for the hypothesis that fixed assets are positive determinants of gearing. The IGP/TA includes inventory in the numerator. Inventory and current liabilities are likely to be a by-product of a firm's operating activities, and consequently may not have any bearing on its financing decisions. If current liabilities are used to finance current assets then inventories are likely to be financed with current liabilities. Given the size of current liabilities, and possibly the size of inventories, in relation to their denominator, their inclusion in the numerator of variables such as IGP/TA, and TLp/TA only serves to blur the predicted relationship between tangibility and gearing.

The most appropriate proxy for tangibility is therefore the ratio of fixed assets to total assets (FA/TA). The coefficients for tangibility in table 4.4 indicate that tangibility is either positively or insignificantly related to other measures of gearing which exclude current liabilities. It may be worthwhile mentioning here that Rajan and Zingales (1995) used FA/TA and generated significant positive coefficients, while Bennett and Donnelly (1993) used 'plant and machinery divided by total assets' and did not find any significant relationship between gearing and asset structure in any of the models they employed.

In the light of the foregoing discussion these results could be interpreted as evidence, albeit weak, to support the theory that tangibility is positively related to gearing. Some previous studies lacked strong support for tangibility because of their use of inappropriate proxies for tangibility (examples are Titman and Wessels (1988, p.17), and Chiarella *et al.* (1992, p.155). Recently, Drobetz and Fix (2003) has reported a positive relationship between tangibility and gearing for Swiss firms, and Nivorozhkin (2004) has reported a negative relationship. However, in the UK it seems that most studies report similar findings. The general weak results obtained by this study and other previous UK studies, like Bevan and Danbolt (2002), using total liabilities, and lack of any significant relation between 'fixed assets' and gearing reported by Ozkan (2001), and Bennett and Donnelly (1993), may be an indicator that tangibility may not be as important for gearing as other determinants in the UK.

It is likely that the ratio of fixed assets to total assets is a good proxy for tangibility. The relatively less strong evidence regarding tangibility's hypothesised positive relationship with gearing could also be due to the fact that simply by having tangible fixed assets (FA/TA) may not necessarily ensure that those assets can easily be used (or accepted by lenders as collateral). The theory stipulates that only those assets that are of general use to many firms (hence could easily be re-sold and command a higher resale value) may be good candidates for collateral. To the contrary, fixed assets which are only of use to a specific firm may not readily be usable by other firms, and would therefore not command a higher resale value for lenders should they accept them as collateral. Accounting data from which assets have been taken does not distinguish between these two types of tangible fixed assets.

There is yet another possible reason for the weak positive relationship between gearing and tangibility (or collateralizability). The hypothesized positive relationship is specified under the usual *ceteris paribus* assumption. Relaxing this assumption the relationship may not hold. As additional robustness tests for non-debt tax shields carried out in this thesis (discussed in the next section) revealed, by investing more in fixed assets, a firm is likely to increase its level of non-debt tax shields (see Dammon and Senbet, 1988). The theory (see De Angelo and Masulis, 1980), and empirical studies (the results in this, and other studies) show that non-debt tax shields are negatively related to gearing. This means two opposing forces are at work for firms with higher levels of fixed assets (i.e. collateralizability enabling firms to employ more debt, whereas the non-debt tax shields brought by fixed assets, and their amortized capital allowances, reduces the value of debt tax shields and thereby the incentive to use gearing).

As the results in this study and those of Bevan and Danbolt (2002) indicate, the influence of fixed assets as a source of non-debt tax shields is stronger than its role as a form of security for the use of debt in the UK. Anecdotal evidence suggests that the relatively well developed capital markets,[20] financial reporting and disclosure system, related superior monitoring by UK institutional investors (Franks and Mayer, 1997), and fewer legal and regulatory limitations than in the US (see Short and Keasey, 1999), may also reduce the importance of tangibility for financing decisions.

4.12.2 Non-debt tax shields

All the eight coefficients for our proxy for non-debt tax shields in table 4.4 show a negative relationship with measures of gearing. Five of the coefficients are significant at the 5% or 1% levels. These results provide a strong support for the De Angelo and Masulis (1980) hypothesis that non-debt tax shields are negatively related to the level of gearing. This is also consistent with previous UK studies. Unlike studies done in the US and elsewhere (see Bradley *et al.*, 1984; Long and Malitz, 1985; Mackie-Mason, 1988; and Titman and Wessels, 1988), most UK studies that tested non-debt tax shields have reported a strong significant negative relation between gearing and non-debt tax shields (see for example, Bennett and Donnelly, 1993; and Ozkan, 2001).

[20] See chapter three

Walsh and Ryan (1997) also document some evidence, which show that non-debt tax shields have had a relatively more significant impact on UK firms. They observe for example that between 1982 to 1984, despite a corporation tax rate of 52% and an Advance Corporation Tax (ACT) rate of 30%, many UK companies had accumulated tax losses, and less than half of the companies were paying corporation taxes in excess of the ACT payable. There were also generous depreciation allowances of up to 100% in the first year of investment (in fixed assets). Despite tax authorities moves to remove the loopholes, by enacting Finance Acts of 1984 and 1996, this study and other recent ones (Bevan and Danbolt, 2002; and Ozkan, 2001), show that non-debt tax shields are still more important in financing decisions than collateralizability.

Next we consider the results of tests on the extension to the original theory, as proposed by Dammon and Senbet (1988) that firms with lower non-debt tax shields need not have higher interest (debt) tax shields. The evidence demonstrates that the negative relation between non-debt tax shields and gearing is stronger for firms in the quartile with higher levels of non-debt tax shields. While this supports De Angelo and Masulis (1980) model, it also supports Dammon and Senbet (1988) who argue that firms with lower non-debt tax shields need not have higher debt tax shield. Dammon and Senbet (1988) hypothesis that the substitutability of debt and non-debt tax shields depends on the level of investments (production process) was also tested. The results show that the quartile with higher FA/TA also has higher non-debt tax shield, which is negatively related to gearing. This supports Dammon and Senbet (1988) that the relationship between non-debt tax shields and gearing changes depending on the level of investment (or production process) for a given firm. This proposed relationship works against fixed assets (tangibility) being positively related to gearing.

Although the results from all these additional tests of robustness were significant enough to warrant rejection of the hypothesis that tangibility is positively related to gearing, the results of tests of the influence of the level of fixed assets on the substitutability between debt and non-debt tax shields were relatively weaker than others. The relatively weaker results, in favour of rejecting the hypothesis that tangibility is positively related to gearing, in the last test compared with other tests in this part, may possibly be accounted for by the sources of non-debt tax shields, other than investment in fixed assets (e.g. R&D expenditures) also playing a role in the substitutability of debt and non-debt tax shields. Firms with substantial levels of non-debt tax shields arising from sources other than investment in fixed assets could possibly have been omitted from the sub-sample used in the test.

4.12.3 Growth/Investment opportunities:

As table 4.4 shows, employing the gearing measures that omit current liabilities leads to results that show a significant negative relation between gearing and growth proxy (MTB), for both book and market value gearing measures. The coefficient for long-term debt is also negative and significant. It is highly likely that the coefficient for current liabilities, which is positive and significant, influences the coefficient of total liabilities to total assets, which is also positive and significant. This is the case because current liabilities comprise of seventy six percent of total liabilities. As noted earlier, the current liabilities may have little to do with financing decisions

It has been suggested that a significant coefficient between market-to-book ratio and gearing measured in market values is a result of a mechanistic relationship. Barclay *et al.* (1995), Barclay and Smith (1999), and Bevan and Danbolt (2002), among others mention the possibility that a negative relationship may arise as a results of the market value of a firm being found in both sides of the regressions, as the denominator of the respondent variable and also as a numerator of the explanatory variable. An inspection of the correlation matrix of gearing and proxy variables to find out if the correlation between market-to-book ratio and any of the gearing ratios is capable of explaining the significantly large negative relation, shows that there is no correlation which is higher than plus or minus 0.3. These correlations are too low to be of concern. The use of long-term debt to total assets (in book value) as one of measures of gearing also serves to control for the alleged mechanistic relation. As table 4.4 shows, the coefficient for long-term debt (book value) is negative and significant at 10%.

The observed positive coefficient for short-term debt (book value), while that of long-term debt is negative, provides additional evidence that the negative relationship between gearing and market-to-book ratio is not simply the result of a mechanistic relationship. This relationship also confirms Myers' (1977) contention that high growth firms can be expected to use short-term rather than long-term debt. Although this hypothesis is recognized in literature (see for example, Chiarella *et al*, 1992), most empirical studies do not pursue it further or document any results supporting or refuting it (see Titman and Wessels (1988) and Chiarella *et al*. (1992)).

The study, which tested this hypothesis, is Barclay and Smith (1999) who found that the lower level of debt used by growth firms tends to have shorter maturity and higher priority. The results presented in table 4.4 provide evidence in the UK, which is consistent with Barclay and Smith (1999) regarding this issue. The evidence supports Myers (1977) hypothesis that high growth firms tend to use short-term debt and possibly rolling it over in the longer-term, to mitigate higher agency costs of managerial discretion.

The source of data used in this research, defines short-term debt as debt payable between 2 to 5 years. Barclay and Smith (1999) extend capital structure empirical studies into the areas of maturity and priority, and argue that these features are potentially important in determining the extent to which debt can help or increase financing problems. They also provide some evidence that debt maturity is correlated with the sources of debt finances (i.e. whether (debt) is held by banks or insurance companies (private placement), or public bondholders); and that on average bank debt maturity is 5.6 years.

In line with Myers (1977) and Barclay and Smith (1999), the results in table 4.4, which show that short-term debt is positively related to growth opportunities, imply that growth firms with more investment opportunities, use mainly bank (and other private placed) loans. Presumably these firms do this in an effort to preserve financial flexibility and ensure future ability to invest by pre-emptying sub optimal investment. The financial flexibility is ensured because it is relatively easy to renegotiate a private placed debt than with a wider public of bondholders.

Equity market timing by firms has also has been put forward as potential explanation for a negative relationship between market-to-book ratio and gearing. Following this practice firms issue shares when their stock price is high relative to earnings or book value and repurchase their shares when the price is low (see Rajan and Zingales, 1995; and Baker and Wurgler, 2002, among others).

Ozkan (2001) also echoes this point. Firms employ this practice in order to try to take advantage of temporary stock fluctuations in the cost of equity relative to the cost of other sources of finance. Rajan and Zingales (1995) argue that if this tendency could be responsible for the negative correlation between growth and gearing, then it would imply that the correlation is driven by firms which issue a lot of equity. They test for this and confirm their hypothesis. Recently, Baker and Wurgler (2002) have also provided evidence that low geared firms tend to be those that raised funds when their valuations were high, and high geared firms tend to be those that raised funds when their valuations were low.

However, Rajan and Zingales (1995) questions both the theory and evidence (including their own results) regarding the effects of equity market timing on the negative relationship with market-to-book ratio. They find the evidence to be counterintuitive because the issue of shares usually has the effect of moving the post-issue market-to-book ratio towards one. Therefore for firms that issue a lot of equity, the market-to-book ratio should be even closer to one, and this should result into less significant negative correlation.

Titman and Wessels (1988) and Chiarella *et al.* (1992), having both found a significant positive relationship between their measure of growth and book value gearing, point out that the positive coefficient may not be necessarily inconsistent with the agency- and tax-based theories that predict a negative relation. They suggest that this could imply that growth opportunities add value to a firm and therefore increase the firm's debt capacity and the book gearing. The results of tests on the effects of equity market timing in this chapter (discussed at length later in this chapter) show that firms do not increase their debt following an increase in the firm's debt capacity. This being the case, the findings of Titman and Wessels (1988) and Chiarella *et al.*, (1992) are likely to have resulted from statistical anomalies.

Chiarella *et al.* (1992) also maintain that because growth opportunities increase the market value of a firm, it has a dampening effect on the market value gearing ratios, which produces a 'weak positive' relationship. The findings in this study do not support either of these positions. If the first of their statements was the case, then we should observe positive relation in both long-term and short-term book value gearing measures. The findings are also inconsistent with Chiarella *et al.* (1992) 'weak positive' relationship between growth opportunities and gearing, as the results show substantially significant negative relationship for all market value measures.

The results of this study therefore suggest that high growth firms or firms with ample investment opportunities use less long-term debt. This could be due to either higher associated agency costs (Jensen and Meckling, 1976) or their large proportion of intangible assets (investment opportunities) failing to support higher debt levels (Myers, 1977). However, the findings that these firms actually use more short-term debt lend more support for the agency costs considerations. This is likely to be the case because of the weak support for tangibility as a (positive) determinant of gearing which is also documented in this study. The results relating to growth attribute are consistent with those of Hovakimian, et al (2003) who also find that high book to market firms have good growth opportunities and have low target debt ratios. Similarly, Drobetz and Fix (2003) uses market-to-book ratio and report that growth opportunities is the attribute with the strongest and most reliable (negative) relationship with gearing.

4.12.4 Uniqueness

Probably because selling expenses and research and development expenditure (R&D) data were missing for many of the companies in the data set for the sample of companies used in this study, the preliminary best subsets regression tests revealed that these proxies have rather low explanatory power for most of the gearing measures. An attempt to include these two variables, one in turn, and later both, into the final model showed that most of the coefficients were positive, some were significant at both 5% and 10% and some were not. There were hardly negative coefficients.

Because the effect on the adjusted R-squared was negligible compared to the increase in standard error, in the interest of working with a more parsimonious model, these variables were removed from the final model. Generally the inclusion of these variables in the model generated positive coefficients and hardly any negative coefficients. This would be inconsistent with Titman (1984) predictions and Titman and Wessels (1988) findings that debt levels are negatively related to uniqueness. This would imply either that this relationship does not hold for U.K companies as in the USA, or that the variables R&D to total sales and selling expenses to total sales do not actually capture the attribute 'uniqueness'.

4.12.5 Size

This study finds very strong evidence in support of a positive relation between size and gearing. All but one coefficient in table 4.4 for the eight measures of gearing, whether using book or market values are positive and significant at 1% level. Only the coefficient for current liabilities to total assets, CL/TA, is significant at 10%. There is no coefficient that shows a negative relationship. This is consistent with the underlying theory that larger firms use more debt. This is also consistent with the arguments that these firms are more diversified and less prone to bankruptcy risk, and/or have easy access to (cheaper) capital markets.

The results however do not differentiate whether smaller firms make relatively more use of short-term debt as argued by the 'transaction costs' school of thought (Titman and Wessels, 1988). Even the current liabilities, which in principle may not have a lot to do with deliberate financing decisions, has a positive significant coefficient. The income gearing shows a significant negative coefficient, which implies that the inverse of coverage ratio has a positive relation and this, is significant at 1% level. The positive relationship between firm size and gearing appears to be a consensus in literature as reported by Ozkan (2001), Drobetz and Fix (2003), and Nivorozhkin (2004), in addition to the studies discussed in chapter two.

4.12.6 Volatility in firm's earnings (business risk):

Consistent with the theory proposing negative relationship between business risk and gearing, table 4.4 shows that all of the coefficients on SIGOIS, a proxy for business risk are negative. The coefficients for total liabilities and for current liabilities are significant at 1% level, those for long-term debt, and short-term debt at 5%, and 10% levels respectively. The remaining negative coefficients are insignificant. The evidence is consistent with the findings of Bradley et al (1984), Titman and Wessels (1988), Kale et al (1991), Drobetz and Fix (2003), and Nivorozhkin (2004). The results however contradict those of Bennett and Donnelly (1993).

4.12.7 Profitability

4.12.7.1 Past profitability

Table 4.4 shows that *past* profitability as measured by the ratio of retained earnings to total assets, is very strongly negatively related to gearing. For every single measure of capital gearing used in this study, the proxy for past profitability has a negative coefficient, which is significant at 1% level. For the income gearing (i.e. EBITDA/I), past profitability coefficient is significantly positive at 1% level, which implies a significant negative relation between past profitability and capital gearing. Actually, past profitability is the variable with the strongest explanatory power in this study's cross-sectional analysis. These findings are consistent with the Myers (1984) pecking order predictions and the Myers and Majluf (1984) asymmetric information arguments, those firms with higher levels of accumulated retained earnings prefer using internal finance than external finance.

The findings also confirm previous studies' evidence of the existence of negative relationship between past profitability and gearing (see for example, Shyam-Sunder and Myers, 1999, and Fama and French, 2002). Wald (1999) also found that profitability was the single largest (most important) factor influencing gearing ratios for the UK, US, Germany, France and Japan. The negative coefficients for past profitability however, contradict the findings of Ozkan (2001).

4.12.7.2 Future (current) profitability

Because we cannot observe future profitability, this study uses the ratio of operating income to total sales (net of discounts and rebates), to proxy for future profitability (see sections 2.6.2.8 and 4.8). The results, also in table 4.4, show that all capital gearing measures (at both book and market values) have positive coefficients. These coefficients are significant at 1%, except for the coefficient relating to the long-term debt (at book value), which though also positive, is insignificant. Its magnitude and t-statistic however, point towards a positive relation. This is a strong support for the signalling theory.

The findings are consistent with the signalling theory assertion that managers actually effect capital structure changes to indicate their confidence in future profitability of their firms. Of the most recent works, these findings support the findings of Drobetz and Fix (2003) and those of Nivorozhkin (2004), and contradict the findings of Ozkan (2001) who report a negative relationship between current profitability and gearing.

The stronger positive relationship between future profitability and gearing for both the book and market values gearing measures and a weaker positive relationship for long-term gearing suggest that managers use more of short-term debt than long term-debt as a signalling device[21]. As Barclay *et al* (1999) caution, however, the signalling theory and hence the evidence obtained by this study, can only tell us about the likely choice between debt and equity at the time of making an issue decision and not about a firm's long-run optimal capital structure.

4.12.8 Probability of bankruptcy

It should be noted that in the results of the regression model (or even the SEM model) used in this study, it is the positive relationship between *Z-score* and gearing which will confirm whether debt is inversely related to probability of bankruptcy. This is because the higher the Z-score, the lower the probability of bankruptcy and hence the higher the likelihood of using debt. Alternatively, the lower the Z-score, the higher the probability of bankruptcy, and hence the higher the likelihood of avoiding the use of debt.

All but one of the eight regression coefficients in table 4.4 have positive coefficients on Z-score, our proxy for probability of bankruptcy; four out of seven positive coefficients are significant, two at 1% level, one at 5% level, and the remaining one at 10% level. The only negative coefficient (which is insignificant anyway) arises from long-term debt. As the majority of coefficients are positive, and also the majority of this majority is significant, this is evidence that probability of bankruptcy is inversely related to gearing. Excluding the measures of gearing that are influenced by current liabilities, the reported market value

[21] The short-term debt is used in this study and indeed in DataStream definition to mean all debt payable between 2-5 years from the balance sheet date.

gearing measure show the highest t-statistic. Further tests revealed that the evidence is stronger for gearing measures scaled by market value.

The evidence support Marsh (1982) who suggested that firms with greater bankruptcy risk are more likely to issue equity. His findings are also consistent with Panno (2003) who report that bankruptcy risk has a negative impact on financial leverage of companies in the UK and in Italy. The lack of a positive (negative) relation between long-term debt and Z-score (probability of bankruptcy) could be implying that when firms are threatened by the probability of bankruptcy, managers find it more flexible to manipulate short-term debt than long-term debt in order to avert the threat of bankruptcy.

4.12.9 Cash holdings/Free cash flow

4.12.9.1 Cash holdings

The majority of cash holdings coefficients in table 4.4 are significantly negative either at 1% or 5% level. The cash holdings coefficient relating to income gearing (coverage ratio) is also significantly positive at 1% level.[22] These results are inconsistent with Chiarella et al., (1992), who report a positive relation between gearing and cash holdings, and concluded that their results support Jensen's (1986) free cash flow hypothesis. However, it is obvious from their proxy and reported methodology that Chiarella et al (1992) tested for 'cash holdings' and not the free cash flow hypothesis.

In order to test the free cash flow hypothesis, one must ensure that the sample tested exhibits both the features of lower growth (mature) companies as well as higher levels of free cash flow. If the sample consists of only cash rich firms, the test will be testing Myers (1984) pecking-order predictions. This is because profitable firms are likely to have retained their earnings and also might have accumulated cash reserves. Alternatively, if the sample consists of only low

[22] Note that the positive coefficient for income gearing is the same as a negative coefficient for capital gearing.

growth firms, the test will be testing (the inverse of) Myers (1977) agency hypothesis that firms with growth opportunities are likely to use less gearing. In this study an attempt is made to avoid these previous pitfalls by testing the free cash flow hypothesis. To start with a sub-sample of low growth (mature) firms, which generate substantial cash flows, is identified and tested as discussed below.

4.12.9.2 Free Cash Flow

In order to test the potential influence of free cash flow on the capital structures of low growth (mature) firms, with higher levels of free cash flow, three alternative procedures were carried out. These alternative procedures where designed to identify a sub-sample of low growth-cash rich firms. This is the sub-sample which meets Jensen's free cash flow hypothesis. To begin with, the entire data was sorted in descending order of market-to-book ratio (growth opportunities). The sorted data was divided into two sub-samples of about 350 companies, one representing high growth and the other representing low growth. The sub-sample of low growth companies was sorted in descending order on the basis of free cash flow, and further divided into two sub-samples of higher levels of cash holdings and another of lower levels of cash holdings. The sub-sample with the highest level of free cash flow represented the low growth (mature) companies with higher levels of free cash flows. OLS regression was performed on this sample, with gearing as the dependent variable, and free cash flows as the independent variable. The expectation, and indeed the Jensen (1986) theoretical prediction is that there should be a positive relationship between gearing and the level of free cash flows.

The second alternative started by sorting the entire original sample of 651 companies in descending order of free cash flow, then segmenting the sample into two sub-samples of about 350 companies, selecting the sub-sample with the highest level of free cash flow. The selected sample was sorted in descending order of market-to-book ratio (growth), and further divided into two sub-samples, one with higher market-to-book ratio, and the other one with low market-to-book ratio. The sample with the lowest growth was taken to represent low growth (mature) companies with higher levels of free cash flow. OLS-regression was performed again on this sub-sample.

A third alternative was considered necessary in order to assess Jensen's (1986) control hypothesis. The initial sample of 651 companies was sorted in a descending order of the level of free cash flows, and divided into three sub-samples each of about 217 companies. The sub-sample with the lowest level of free cash flow was discarded. The remaining two sub-samples (with higher levels of free cash flows) were combined and sorted again in the descending order of market-to-book (growth) and then divided into two sub-samples, one of high growth, the other of lower growth. The low growth sub-sample was assumed to represent the low growth-higher free cash flow companies. An OLS-regression was run of gearing on free cash flow, expecting to find a positive relationship between gearing and free cash flow.

For all three alternatives considered not even a single positive coefficient was found. As shown in table 4.5 all the free cash flow coefficients were negative; most of them significant at 1% and 5% levels, and a few were significant at 10% level. Table 4.5 shows the results for alternative one described above. Regression results for other alternatives were similar to those in table 4.5. If the procedure employed is able to identify mature firms with low growth opportunity and with free cash flow, then these results suggest that gearing is strongly negatively related to cash holdings. These results are inconsistent with Jensen's free cash flow hypothesis, which predicts a positive relationship between gearing, and free cash flow for low growth (mature) cash-rich firms. These results generate a major question as to whether the theory advocated by Jensen can be generalized and be applied to a wide range of companies, and suggests that the observations he reported were possibly peculiar to that particular period of time and specific to the firms/industries observed. Graham and Harvey (2001) also report that they find little evidence that executives are concerned about free cash flow.

Going back to table 4.4 (the results from the OLS-regression model for cross-sectional determinants of gearing) we see that the (adjusted) R-squared for book gearing models, range from 20.8% (for long-term debt), to 66% for total liabilities. The income gearing (EBITDA/I) has an (adjusted) R-squared of 67%. Although only debt to capital (D/CAP-MV) is reported in this table, for market value gearing ratios, the (adjusted) R-squared for market value gearing models ranged from 37.5% (debt-to-equity) to 70% (total liabilities to total assets, TLp/TA-MV). This shows how well the models used here explain the variations in firm gearing for the sample firms. Although table 4.9 (which is discussed later in section 4.14) is meant to compare the results of the two methodologies used in this cross-sectional part as discussed later, it also provides a summary of the OLS-regressions results discussed above.

Some general remarks to conclude this section are in order before moving to the next section. First, it is not only the choice of proxies for attributes (theorised determinants) that matter for empirical research in this area, but how gearing is measured, and the later seems to be the more important of the two. The results reported in this study so far, have revealed that different measures of gearing give rise to different relationships between gearing and the attributes being tested. This is the case not only between market and book gearing, but also for the different book value and market value measures. While most market value coefficients show the same directional relationship between the attributes and gearing, in some cases their statistical significance differs, and that may influence researchers' interpretation.

One of the caveats necessary to emphasise is that if current liabilities (credit and equivalent liabilities) are included in total liabilities (or total debt) whatever terminology used, distortions arise in the relationship between hypothesised determinants and that measure of total debt. This final observation implies that studies that use only a single measure of gearing may not be giving the whole picture of determinants of capital structure.

4.13 Cross-sectional Structural Equation Modelling (SEM) results

As table 4.8 shows, the findings of previous Structural Equation Modelling (SEM) studies are mixed. Some findings are contradictory; while others are inconsistent with theoretical predictions. In many cases (especially for Titman and Wessels, 1988), while the sign is in the hypothesized direction, the results fall short of being significant. In relation to the previous studies, the results presented here are more promising. Titman and Wessels (1988) had perverse results relating to growth, tangibility, and firm size, and had insignificant results regarding business risk and non-debt tax shields, while Chiarella *et al*, (1992) had perverse results for both growth and asset structure proxies.

Table 4.6 presents the estimates of the parameters of the measurement model, which is within the overall Structural Equation Modelling (SEM) methodology reported in this section. The magnitude and the statistical significance of the estimates show that the manifest variables measure the underlying attributes well. Each group of indicators measures the constructs of the attributes considered to be determinants of capital structure. As the table shows, this study uses between one and three manifest variables (or indicators) to represent one attribute. This is in recognition of the fact that there may be many possible proxies for one attribute of interest. In total, 18 indicators are used, in different groupings, for eight attributes. Although it is also possible for a manifest variable to be used as a proxy for more than one attribute, in the final model reported here there was no need for that. Having got the factor loadings reported in table 4.6, the model then generates the measures of the impact the groups of indicator variables have on each measure of gearing employed in table 4.7 which is discussed in the next paragraph.

Before a closer look at the coefficients of table 4.7 it is appropriate to explain how the SEPath model works and also how to interpret the summary box below that table. Structural equation modelling generally must obtain their parameter estimates by using iterative techniques. These techniques are special cases of nonlinear optimization procedures for minimizing a function of 'n' unknowns.

When iteration begins each parameter in the model is given an initial value, or start value. These values are 'plugged in' to the model equations and used to generate an estimated covariance matrix which is compared to the actual sample covariance matrix, and the value of the discrepancy function. The programme alters the parameter values to improve the discrepancy function (i.e. make it smaller). If the discrepancy function has improved sufficiently, the programme goes on to the next iteration. If the programme is anywhere near the correct solution, the process will continue smoothly until it reaches the minimum, usually in 20 iterations or less.

The SEM results summary box below table 4.7 gives two sets of statistics. The information on the left is designed to enable a quick and efficient evaluation of as to whether iteration was successful. The evaluation of this information is as follows: At the top left the method of estimation is given as Generalized least squares - maximum likelihood. This shows the discrepancy function used. Then the numerical value of the discrepancy function is given (in the model used this is 0.4). The maximum residual cosine should be close to zero if iteration was successful (in the model used it is 0.00108, which is close to zero). The Maximum absolute gradient gives the absolute value of the largest element of the gradient. If the structural model is invariant under a constant scaling factor (ICSF), and/or if the model is invariant under changes of scale (ICS), then these criteria should be close to zero. Both these criteria are close to zero in the model used. The boundary condition shows that it is zero as required. If this number is not zero, then the *Chi*-square statistic will not necessarily have the proper distribution. Generally, these statistics show that the iteration was successful.

The information on the right side is basic statistical information about the fit of the model. The *Chi*-square statistic, the degrees of freedom for the *Chi*-square statistic, and the *Chi*-square p-level are displayed first. Then the point estimate and the 90% confidence interval for the Steiger-Lind RMSEA are also shown. Lastly the root mean square (RMS) standardized residual is given. As the box shows in the model used, this number is 0.0769, which is close to the required

0.05 for the fit to be 'good' in a practical sense. The model is therefore not a perfect fit but also not a bad one.

Table 4.7 presents the estimates of the structural coefficients, along with their corresponding t-statistics. The coefficients specify the relationships between unobservable attributes (i.e. factors) hypothesised to influence capital structure and the computed gearing measures. In general, the direction of the relationship between hypothesised determinants and measures of gearing is consistent with the theory. The only exceptions are growth and past profitability. As table 4.7 shows, all coefficients for non-debt tax shields are negative and most of these are significant at 1% level. Even the few coefficients, which are not significant, have magnitudes and t-statistics that point towards an inverse relationship between non-debt tax shields and gearing. This is consistent with both the theory, and some previous findings.

All eight coefficients for firm size are positive, seven of them significant at 1%; the only insignificant coefficient is that of current liabilities, and the problems associated with this measure have already been discussed. Consistent with the theory, all coefficients for business risk are negative; five of them are significant, two at 1%, one at 5%, and the remaining two at 10%. Excluding the influence of current liabilities, all coefficients relating to probability of bankruptcy are positive. There was only one indicator for this attribute. It should be noted that in this study, it is the positive relationship between Z-score and gearing which confirms whether debt is inversely related to probability of bankruptcy. This is because the higher the Z-score, the lower the probability of bankruptcy and hence the higher the likelihood of using debt, and vice versa. This being the case, the results in table 4.7 show that all capital gearing measures (except total liabilities and current liabilities) are significantly inversely related to the probability of bankruptcy. The market value measure is also significantly inversely related to gearing.

Consistent with the signalling hypothesis, current profitability (which is used as a proxy for future profitability) coefficients for book capital gearing measures (except that of long-term debt), show a positive relationship with gearing. The book value income gearing and the market value gearing however, indicate a significant negative relationship between current profitability and gearing. But income gearing negative relationship should be interpreted with caution, as it may be a result of the very high correlation between the proxies of current profitability (OI/S, and EBITDA/TA) and the income gearing, which is the inverse of the coverage ratio (i.e. I/EBITDA). While the model gives mixed results, making it difficult to draw a conclusion, the stronger significant positive relation shown by short-term debt coefficient (against the insignificant negative coefficient by that of long-term debt) corroborates the results obtained by using traditional regression in the preceding section, that in the signalling process, firms may be using mainly short-term debt.

The coefficients for both, book value and market value gearing show that past profitability is significantly positively related to gearing. This renders both of the proxies for profitability to be positively related to gearing. While this can be explained by the correlation between the indicators used for past and current profitability (see table 4.2), it is inconsistent with the theory (Donaldson, 1961; Myers, 1984; and Myers and Majluf, 1984), which prescribes that past profitability should be negatively correlated with gearing. Some previous studies however, have also reported a significant positive relation between past profitability and gearing (see Ozkan, 2001, p.191).

As for growth opportunities, all coefficients depict a positive relationship between growth and gearing. There is no difference between book and market values, and the coefficient for income gearing is insignificant. This relationship contradicts the theory, which prescribes a negative relationship between growth opportunities and gearing. The results however, are consistent with both Titman and Wessels, (1999), and Chiarella *et al*., (1992), the two previous studies that had used structural equation modelling methodology. This would imply that either this or those two studies are missing something in the process of testing the attribute, or that the methodology captures some relationship which the theory ignores. One notable feature of the result is that while the coefficient for long-term debt is insignificant, that of short-term debt is significant. As discussed in the previous section, this could imply that growth firms use short term-debt and possibly roll them over to mimic long-term borrowing (Myers, 1977).

In cases where book value gearing measures are employed the coefficients for tangibility are positive; while in cases where the market value gearing measure is employed the coefficient for tangibility is negative and significant at 10% level. Some of the book value gearing measures like long-term debt, debt-to-equity, and the income gearing are insignificant. This is evidence, of a weak positive relationship between tangibility and gearing. While these mixed results are inconsistent with the dominant theory and expectations, these results are typical of previous empirical findings (see Bevan and Danbolt, 2002; Titman and Wessels, 1988, and Chiarella *et al*, 1992, among others). The insignificance of a positive relationship between tangibility and gearing could be arising due to a number of reasons as discussed in the previous section.

In summary, the use of structural equation modelling (SEM), and particularly the statistical software SEPATH, has given the following results. Consistent with theory and a consensus of previous research, strong evidence has been found in support of a positive relationship between gearing on one hand, and firm size, and current profitability. Though for tangibility the evidence of positive relationship is rather weak. There is also strong evidence regarding negative relationship between gearing and the non-debt tax shields, business risk, and probability of bankruptcy. The perverse results have been identified for growth opportunities and on past profitability.

4.14 Comparison of methodologies used in this study:

A snapshot of comparison between the two methodologies that were used for cross-sectional analysis, along with the hypothesised relationships according to the dominant capital structure theories, is provided in table 4.9. An interpretation of the results reported in the table in line with the discussion in the two preceding sections enables us to present a meaningful comparison of the two methodologies used in this study as hereunder.

For tangibility, structural equation modelling (SEM) produces more significant positive coefficients than does traditional OLS-regression. Although the SEM results obtained from this study are stronger than those of previous studies that used the same methodologies, in this study both methodologies reveal that the evidence regarding positive relationship between gearing and tangibility is rather weak (probably due to the trade-off between tangibility and the forces of non-debt tax shields discussed in the previous section). As for the tests on non-debt tax shields, both methodologies give clear evidence that non-debt tax shields are negatively related to gearing. This evidence supports the existence of an optimal capital structure as argued by De Angelo and Masulis, (1980).

The SEM results for growth opportunities show a positive relationship with gearing while those of OLS-regression show a negative relationship with gearing like previous similar studies. In this case one may conclude that OLS-regression captures the relationship better in line with the theory prescribing a negative relation. This study's results from SEM methodology, which could be considered more supportive of theory in terms of both significance and directional relation, are almost identical with those of OLS-regression for firm size and business risk in that they both support a strong positive and negative relation with gearing respectively.

Many previous studies did not bother to use a different proxy for past profitability and another for current profitability. It is therefore difficult to make a straightforward meaningful comparison in the area of profitability with previous studies. It is only possible to compare the results of two methodologies in this study as follows. Results of both methodologies provide strong support for a positive relation between current profitability and gearing in line with the signalling theory. For past profitability the results are different. SEM results show a strong positive relationship between past profits and gearing, while OLS-regression shows a strong negative relationship. It is therefore OLS-regression, which gives the expected results according to the underlying theory.

The probability of bankruptcy has not been tested in any of the previous studies discussed. Both the methodologies have given results that show that the probability of bankruptcy is inversely related to gearing. This implies that financial distress or the threat of going bankrupt deters managers from using more debt to finance their investments and/or operations. This is yet more evidence that firms strive to achieve or maintain an optimal capital structure. Table 4.9 provides a concise summary of comparison between the results of the two methodologies, which are being presented here. From the table and the discussion above, it can be concluded that the traditional OLS-regression performs as well as (in some cases better than) the structural equation modelling if proxies for exogenous variables are selected in accordance with the underlying capital structure theories.

Before conducting the detailed and more rigorous tests on capital structure dynamics, an attempt was made to find out if the cross-sectional determinants of gearing, which were revealed by the 16 years' average cross-sectional regression, actually behaved in the same way for each of the ten-years from 1990 to 1999. Table 4.10 gives summary of the signs of the coefficients for cross sectional OLS-regressions for the ten years. Most of the determinants behaved in exactly the same way in each year as they did in the 16-year average cross-sectional results.

In addition to the weaker results for tangibility, which have been discussed, the results for the business risk proxy, SIGOIS, were also mixed, in some years a positive relationship was found and in other years a negative relationship was evident. In some years the results were so insignificant that it was not possible to discern either a dominant positive or negative relation between business risk and gearing. Taking all the years, business risk explained little variation in gearing. With these findings in mind the study delved into tests designed to explore the dynamics of capital structure to find evidence as to whether managers adjust their gearing in response to changes in the determinants of capital structure or not.

4.15 Summary and Conclusion

In short the cross-sectional results reported here show strong evidence of a positive relationship between gearing and firm size, and current profitability. There is also a weak positive relationship between gearing and tangibility. The attributes which have a strong negative relationship with gearing are non-debt tax shields, and cash holdings. Consistent with the dominant theory, past profitability and growth coefficients are significantly negative only under conventional regression method. These two attributes have perverse relationship under SEM method. There is also a negative relationship between gearing on one hand and business risk, and probability of bankruptcy under both methods. The R-squared of the models used ranges from about 21% to 67% for book value gearing measures while for market value measures it ranges from 37.5% to 70%.

In either method the choice of proxy variables for the theorised determinants is important. The choice and the measurement of gearing are also important. Robustness checks carried out have revealed that different choices and measurements of gearing generate different relationships. These results are rather mixed. Some support the existence of an optimal debt ratio, others do not. One of the arguments for the existence of an optimal gearing ratio has been that different industries exhibit different levels of debt. This has actually been one of the arguments against the MM irrelevance propositions (see for example, Solomon, 1963). In order to get more insights into the question as to whether UK industries maintain (or adjust towards) a target debt ratio the next chapter (chapter five) focuses on the investigation of industry related capital structure patterns. The chapter looks at cross-sectional differences among industries as well as whether industry capital structure differences persist over time.

4.16. Appendix: Tables and Figures:

Table 4.1: A C COMPARISON BETWEEN THIS STUDY AND SOME PREVIOUS CROSS-SECTIONAL STUDIES ON DETERMINANTS OF CAPITAL STRUCTURE

PANEL A: A SUMMARY OF SELECTED PREVIOUS STUDIES ON DETERMINANTS OF CAPITAL STRUCTURE VS. THIS STUDY

	BJK (1984)	TW (1988)	CHIAR (1992)	BeDon (1993)	RZ (1995)	VL (1998)	BevDan (2002)	THIS STUDY
Sample period	1962-1981	1974-1982	1977-1985	1977-1988	1987-1990	1967-1990	1987-1990	1985-2000
No.of Yrs	20YRS	9YRS	9yrs	12YRS	4	20YRS	4	16YRS
Sample size	851	469	226	433	4557(522UK)	112	822	651
No. of Industries	25	N/A	N/A	19	N/A	9	N/A	28
Factors tested	4	8	6	7	4	1	4	10
Methodology	OLS-regr.	SEM/LISREL	SEM/LISREL	OLS-regr	OLS-regr.	Ratio Analysis	Ols-regr	OLS-regression SEM-SEPATH
Strength	Broad test	New technique	New tech, cashh	Compr UK study	International	20yrs,P+NPtest	Large sample	Lrg sample, 10 factors, New technique
Weakness	R&D proxy	Perv/contr Results	Perv/contr Results	Growth, Profit proxies	Few attributes	Small sample	Replication, 4factors	-

PANEL B: HYPOTHESISED AND ACTUAL RELATION BETWEEN FIRM ATTRIBUTES AND CAPITAL STRUCTURE

<u>ATTRIBUTES:</u>	BJK (1984)	TW (1988)	CHIAR (1992)	BeDon (1993)	RZ (1995)	VL (1998)	BevDan (2002)	THIS STUDY	HYPOTHESIS
1.IND. INFLUENCE	Strong	N/A	N/A	Present	N/A	Weak	N/A	Strong	Strong
2.TANGIBILITY	+	+, -	-	+	+	N/A	+, -	+, -	+
3. NDTSHIELD	+	-	-	-	N/A	N/A	N/A	-	-
4.GROWTH	N/A	+, -	+	0	-	N/A	-	-, +	-
5. UNIQUENESS	N/A	-	N/A	N/A	N/A	N/A	N/A	+	-
6. FIRM SIZE	N/A	-	+	+	+	N/A	+	+	+
7. BUS. RISK	-	0	N/A	+	N/A	N/A	N/A	-	-
8. PAST PROFIT.	N/A	N/A	+		-	N/A	-	-	-
9. CURR. PROFIT.	N/A	-		-	N/A	N/A	N/A	+	+
10. CASH HOLDINGS	N/A	N/A	+, -	N/A	N/A	N/A	N/A	-	+, -

KEY:
BJK (1984) = Bradley *et al* (1984)
TW (1988) = Titman and Wessels (1988)
CHIAR (1992) = Chiarella *et al* (1992)
BenDon (1993) =Bennett and Donnelly (1993)
RZ (1995) = Rajan and Zingales (1995)
VL (1998) =Varela and Limmack (1998)
BevDan (2002) = Bevan and Danbolt (2002)

Figure 4.1: Path diagram representing equation $Y = aX + e$

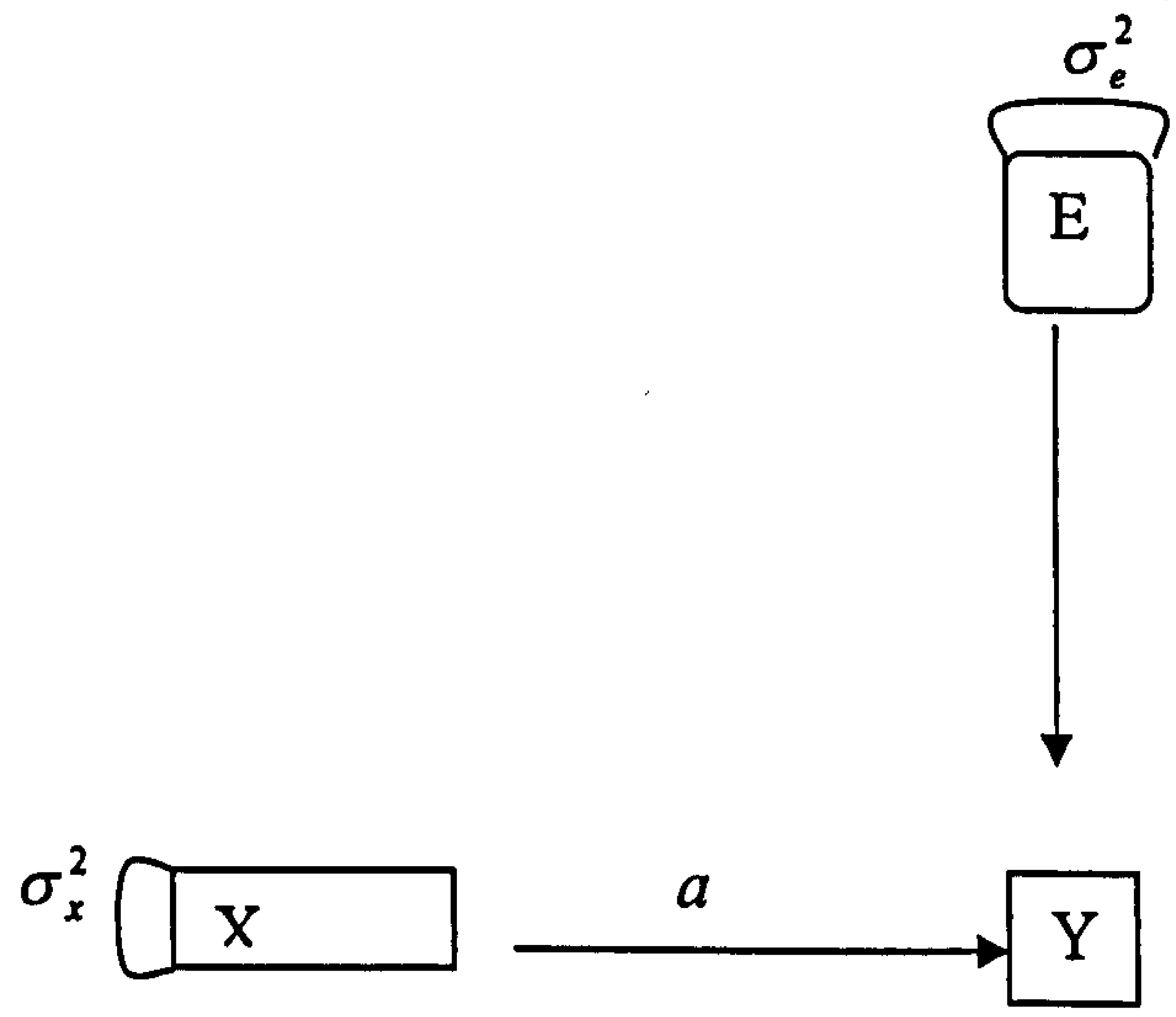

Figure 4.2: Structural Equation Model's Measurement model matrices

$$\begin{bmatrix} FA/TA \\ LnInvInt \\ D/TA \\ OIiT \\ MTB \\ TQ \\ CE/TA \\ LnTA \\ SIGOI \\ SIGOIS \\ CVEB/TA \\ SIGP \\ RE/TA \\ RE/S \\ CACL \\ OI/S \\ EBITD/TA \\ Zscore \end{bmatrix} = \begin{bmatrix} \lambda_{1,1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \lambda_{2,1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \lambda_{3,2} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \lambda_{4,2} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda_{5,3} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda_{6,3} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda_{7,3} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \lambda_{8,4} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \lambda_{9,5} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \lambda_{10,5} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \lambda_{11,5} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \lambda_{12,5} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \lambda_{13,6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \lambda_{14,6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \lambda_{15,6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \lambda_{16,7} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \lambda_{17,7} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \lambda_{18,8} \end{bmatrix} * \begin{bmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \\ \xi_4 \\ \xi_5 \\ \xi_6 \\ \xi_7 \\ \xi_8 \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \\ \delta_7 \\ \delta_8 \\ \delta_9 \\ \delta_{10} \\ \delta_{11} \\ \delta_{12} \\ \delta_{13} \\ \delta_{14} \\ \delta_{15} \\ \delta_{16} \\ \delta_{17} \\ \delta_{18} \end{bmatrix}$$

These are the matrices, which represent equation $x = \Lambda\xi + \delta$ (i.e. equation 5.5.2). These matrices depict a constrained factor analysis in which additional restrictions are imposed on the parameters of the measurement model. A total of 126 restrictions have been imposed on matrix Λ of factor loadings. These restrictions are shown as factor loadings that are specified to equal zero. These restrictions are in accordance with theory predictions. For example, since FA/TA is not theorised to be an indicator for business risk, its factor loading on business risk is set to zero.

Table 4.2: Correlation Matrix for variables in cross-sectional analysis

	TLB	*DTAB*	*DEB*	*DCM*	*LTD*	*STD*	*CL*	*EBI*	*FA*	*OIiT*	*MTB*	*LnTA*	*Sig*	*RET*	*OIS*	*Zsc*
DTAB	0.39															
DEB	0.53	0.85														
DCM	0.29	0.72	0.71													
LTD	0.19	0.65	0.61	0.58												
STD	0.30	0.71	0.59	0.57	0.32											
CL	0.76	-0.04	0.08	-0.02	-0.07	-0.02										
EB	-0.28	-0.24	-0.29	-0.43	-0.20	-0.16	-0.13									
FA	-0.25	0.29	0.15	0.25	0.23	0.24	-0.41	-0.01								
OIiT	0.10	0.28	0.25	0.14	0.18	0.29	-0.05	0.29	0.08							
MTB	0.23	0.01	0.06	-0.30	-0.07	0.03	0.17	0.29	-0.17	0.29						
LnTA	0.08	0.38	0.38	0.35	0.39	0.35	-0.13	0.07	0.24	0.85	0.02					
Sig	-0.01	0.09	-0.04	-0.04	-0.09	0.03	-0.07	-0.26	-0.02	-0.21	0.08	-0.27				
RET	-0.55	-0.34	-0.33	-0.26	-0.19	-0.28	-0.39	0.49	-0.02	0.08	0.00	0.02	-0.31			
OIS	-.31	0.13	0.01	-0.09	0.06	0.11	-0.41	0.43	0.31	0.31	0.27	0.19	0.01	0.32		
Zsc	0.45	-0.18	-0.03	-0.11	-0.19	-0.12	0.63	0.03	-0.38	-0.06	0.17	-0.18	-0.22	-0.11	-0.53	
CAC	-0.23	-0.08	-0.09	-0.24	-0.03	-0.13	-0.26	0.26	-0.10	0.08	0.24	0.09	0.08	0.29	0.22	-0.14

Table 4.3: UK gearing ratios as per comparable studies

Gearing measures	*This Study*			*BevDan (2002)*		*VL (1998)*		*RZ (1995)*	
	Mean	Median	N	Mean	N	Mean	N	Mean (Medians*)	N (UK)
TLP/TA-BV	0.51	0.51	651	0.49	822	-	112	0.48	522
TLP/TA-MV	0.38	0.37	651	-	822	-	112	-	522
Dp/TA-BV	0.10	0.08	651	0.18	822	-	112	0.13	522
Dp/TA-MV	0.08	0.06	651	-	822	-	112	-	522
Dp/E-BV	0.23	0.22	651	-	822	0.40	112	-	522
Dp/E-MV	0.17	0.10	651	-	822	-	112	-	522
Dp/CAP-BV	0.19	0.16	651	0.13	822	-	112	0.19	522
Dp/CAP-MV	0.12	0.09	651	-	822	-	112	-	522
LTD/TA-BV	0.04	0.02	651	-	822	-	112	-	522
STD/TA-BV	0.06	0.05	651	-	822	-	112	-	522
CL/TA-BV	0.39	0.38	651	0.40	822	-	112	-	522
EBIT/I	7.25	5.0	651	-	822	5.56	112	4.79*	522
EBITDA/I	9.2	7.1	651	-	822	-	112	6.4*	522

Key:

BevDan (2002) = Bevan and Danbolt (2002)

VL (1998)=Varela and Limmack (1998)

RZ (1995) = Rajan and Zingales (1995)

Table 4.4: CROSS-SECTIONAL OLS-REGRESSION MODEL RESULTS

The basic regression estimate is:

$$L_i = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + ... + \beta_n X_{in} + \varepsilon$$

Where:

L_i is the observed gearing ratio (leverage) for firm *I*

$X_1 ... X_n$ are proxies for the independent variables

GEARING MEASURE	FAn/TAn	OIiT	MTB	LnTA	SIGOIS	RE/TA	OI/S	Zscore	CACL	Rsq(adj) %	Fstat
PANEL A: BOOK VALUE GEARING											
TLp/TA-BV	-0.2 (-7.7)*	-0.03 (-3.8)*	0.05 (3.1)*	0.04 (5.15)*	-0.36 (-2.8)*	-0.49 (-14.8)*	0.86 (4.9)*	0.133 (8.8)*	-0.08 (-3.5)*	66.1	88.9
Dp/TA-BV	0.03 (1.8)[b]	-0.005 (-0.8)	-0.01 (-1.1)	0.02 (3.5)*	-0.04 (-0.51)	-0.23 (-10.1)*	0.40 (3.3)*	0.003 (0.29)	0.01 (0.84)	38.2	28.5
Dp/E-BV	0.03 (0.5)	-0.03 (-1.88)[b]	-0.01 (-0.30)	0.08 (4.4)*	-0.27 (-1.07)	-0.58 (-8.5)*	0.97 (2.7)*	0.05 (1.8)[b]	0.01 (0.36)	32.5	22.5
LTD/TA-BV	-0.001 (-0.1)	-0.002 (-0.9)	-0.01 (-1.7)[b]	0.01 (2.80)*	-0.09 (-2.4)[a]	-0.06 (-6.6)*	0.07 (1.5)	-0.004 (-0.9)	0.011 (1.4)	20.8	12.2
STD/TA-BV	0.014 (1.2)	-0.004 (-1.3)	0.001 (0.09)	0.01 (3.6)*	-0.10 (-1.78)[b]	-0.07 (-5.5)*	0.20 (2.9)*	0.001 (0.12)	-0.01 (-1.7)[b]	26.9	16.4
CL/TA-BV	-0.2 (-9.2)*	-0.01 (-2.8)*	0.07 (5.5)*	0.013 (1.82)[b]	-0.28 (-3.0)*	-0.22 (-8.9)*	0.20 (1.5)	0.10 (9.5)*	-0.11 (-6.3)*	66.3	87.0
EBITDA/I	0.5 (3.9)*	0.36 (10.3)*	0.47 (5.9)*	-0.4 (10.9)*	-0.77 (-1.35)	1.34 (9.4)*	-0.48 (-0.6)	0.04 (0.8)	0.6 (4.9)*	67.3	86.1
PANEL B: MARKET VALUE GEARING											
Dp/CAP-MV	0.02 (1.2)	-0.01 (-1.9)[a]	-0.10 (-7.7)*	0.03 (4.5)*	-0.05 (-0.50)	-0.19 (-7.5)*	0.4 (3.3)*	0.02 (2.3)[a]	-0.02 (-1.2)*	40.8	30.2

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b', respectively. The numbers in the parentheses are corresponding t-statistics

Table 4.5: Regression coefficients, for a sub-sample of low growth (mature) firms with higher levels of free-cash flows. Sorting started with growth (market-to-book), then with free cash flow.

Gearing Measure	*Constant*	*CACLL*	*Obs.*	*R-sq (adj.)*	*Fstat*
TLp/TA-BV	0.68 (22.7)	-0.47* (-4.2)	145	0.11	18.2
Dp/TA-BV	0.16 (10.0)	-0.14[b] (-2.3)	137	0.03	5.3
Dp/E-BV	0.40 (8.4)	-0.32[b] (-1.77)	141	0.01	3.1
Dp/CAP-BV	0.28 (11.3)	-0.27* (-2.8)	139	0.05	8.2
LTDp/TA-BV	0.44 (6.08)	-0.03(-0.95)	131	0.0	0.91
STD/TA-BV	0.06 (8.9)	-0.05[b] (-1.77)	132	.016	3.14
CL/TA-BV	0.47 (19.8)	-0.32* (-3.4	138	0.07	11.8
EBITDA/I	0.84 (5.0)	-0.76 (-1.2)	143	0.003	1.45
TLp/TA-MV	0.54 (21.3)	-0.38* (-3.9)	147	0.09	15.5
Dp/TA-MV	0.12 (9.6)	-0.10[a] (-2.1)	134	0.02	4.43
Dp/E-MV	0.25 (9.8)	-0.27* (-2.8)	133	0.05	8.07
Dp/CAP-MV	0.19 (11.2)	-0.21* (-3.2)	131	0.06	10.3

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, a, and b respectively. The numbers in the parentheses in columns 3 and 4 are corresponding t-statistics.

Table 4.6: SEM Measurement Model: Factor Loadings for manifest variables.

The table shows the results of equation $x = \Lambda\xi + \delta$,

Where: x is a ($q \times 1$) vector of indicators (proxies), ξ is a ($m \times 1$) vector of latent (unobservable) attributes,

Λ is a ($q \times m$) matrix of factor loadings (a matrix of regression coefficients of x on ξ), and

δ is a vector of measurement errors in the measurement model

Manifest Variables	*ATTRIBUTES*							
	ξ_1 Tang	ξ_2 Ndts	ξ_3 Grow	ξ_4 Size	ξ_5 Brisk	ξ_6 PProfit	ξ_7 Cprofit	ξ_8 PrBankr
FA/An	-0.025 (-3.13)*							
LnInvInt	12.13 (6.34)*							
D/TA		-0.41 (-0.42)						
OliT		3.50 (2.05)a						
MTB			10.6 (15.6)*					
TQ			29.8 (36.0)*					
CE/TA			-1.23 (-1.62)					
LnTA				0.92 (8.94)*				
SIGOI					-3.87 (-3.2)*			
SIGOIS					0.39 ((5.8)*			
CVEBITDA					27.9 (36.0)*			
SIGP					3.78 (3.2)*			
RE/TA						7.99 (8.3)*		
RE/S						34.1 (11.1)*		
CACL						3.02 (2.6)*		
OI/S							16.64 (13.9)*	
EBITD/TA							23.12 (19.3)*	
Zscore								-3.27 (-3.1)*

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses are corresponding t-statistics

Table 4.7: The SEM Estimates of the Structural Coefficients

The table shows the results of equation $y = \Gamma\xi + \varepsilon$,

where; y is px1 vector of gearing ratios,

Γ is a $p \times m$ matrix of factor loadings,

ξ is an $m \times 1$ vector of latent attributes (as defined in the measurement model),

ε is a vector of $p \times 1$ vector of random errors (random disturbance) in the structural relationship

GEARING MEASURES	*ATTRIBUTES/FACTORS*							
	ξ_1 Tang	ξ_2 Ndts	ξ_3 Grow	ξ_4 Size	ξ_5 Brisk	ξ_6 PProfit	ξ_7 Cprofit	ξ_8 PrBankr
PANEL A: BOOK VALUE GEARING MEASURES								
TLp/TA (BV)	15.4 (11.1)*	-7.32 (-3.07)*	3.37 (4.95)*	3.66 (2.69)*	-3.22 (-4.74)*	2.02 (2.47)*	4.32 (5.92)*	-2.15 (-0.73)
Dp/TA (BV)	7.01 (3.29)*	-8.64 (-3.14)*	1.90 (2.1)[a]	10.6 (6.36)*	-0.73 (-0.81)	1.76 (1.62)	1.99 (2.1)[a]	8.96 (3.27)*
Dp/E (BV)	2.41 (1.3)	-9.51 (-5.68)*	3.95 (4.8)*	7.83 (5.57)*	-1.41 (-1.73)[b]	5.53 (5.33)*	2.08 (2.42)[a]	5.02 (1.85)[b]
LTD/TA (BV)	3.3 (1.22)	-11.9 (-3.73)*	0.23 (0.2)	11.6 (5.61)*	-1.34 (-1.17)	7.36 (5.08)*	-0.32 (-0.26)	10.9 (3.12)*
STD/TA (BV)	17.76 (6.03)*	15.1 (3.13)*	2.75 (2.37)[a]	11.79 (4.91)*	-2.48 (-2.14)[a]	-1.14 (-0.83)	3.16 (2.6)*	15.7 (3.26)*
CL/TA (BV)	8.54 (6.12)*	-2.79 (-1.56)	3.6 (3.3)*	1.87 (1.18)	-3.48 (-3.2)*	7.84 (5.64)*	1.64 (1.44)	-2.57 (-1.33)
EBITD/I (BV)	-3.28 (-1.5)	-3.97 (-1.39)	0.75 (0.65)	-17.1 (-10.9)*	1.99 (1.72)[b]	-4.52 (-3.2)*	14.5 (10.5)*	8.46 (3.58)*
PANEL B: MARKET VALUE GEARING MEASURE								
Dp/CAP-MV	-3.52 (-1.71)[b]	-4.34 (-1.48)	3.93 (3.34)*	11.0 (6.0)*	-0.83 (-0.71)	8.43 (5.6)*	-3.44 (-2.78)*	9.68 (4.61)*

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses are corresponding t-statistics

SEM results summary box

```
      Method of Estimation: GLS -> ML        Chi-Square Statistic: 2842.95
      Discrepancy Function: 0.4               Degrees of Freedom: 243
   Maximum Residual Cosine: 0.00108            Chi-Square p-level: 0.000000
        Max. Abs. Gradient: 0.000947           Steiger-Lind RMSEA
            ICSF Criterion: 0.000384           --->Point Estimate: 0.0978
             ICS Criterion: 0.000306           -->Lower 90% Bound: 0.0776
       Boundary Conditions: 0                  -->Upper 90% Bound: 0.119
                                              RMS Stand. Residual: 0.0769
```

Table 4.8: Comparison between this study and previous Structural Equation Modelling (SEM) studies' results

Factors/ Determinants	*Relationship between hypothesized determinants and measures of gearing*		
	This Study	Titman & Wessels (1988)	Chiarella et al (1992)
Tang	6+, 5 (S) 2-, 1(S), 1 (NS)	2+, (NS) 4-, (NS)	1+, (NS) 3-, (NS)
Ndts	2+, 1(S) 6-, 4(S)	0+ 6-, (NS)	0+ 4-, 3 (S)
Growth	7+, 6 (S) 1-, (NS)	3+ (BV), 1 (S) 3- (MV), (NS)	3+, 1 (S) 1-, (NS)
Size	8+, (S) 0-	2+, (NS) 4-, 3 (S)	4+, 1 (S) 0-
Brisk	0+ 8-, 5 (S)	0+ 6-, (NS)	N/A
PProfit	7+, 6 (S) 1-, (NS)	N/A	N/A
Cprofit	5+, 4 (S) 3-, 2 (S)	0+ 6-, 3 (S)	1+, (S) 3-, (S)
PrBankr	3+, 1 (S) 5-, (S)	N/A	N/A

Explanation: appears that this study shows better (significant) results for most of the factors tested by all three studies. However, for the factor 'Growth', all three studies show perverse results. Though both 'Past profitability', and 'Probability of bankruptcy' which were tested by this study only, are significant, the former is inconsistent with the underlying theory, while the later is consistent with the theoretical predictions.

Key:

S = significant relation
NS = Not Significant
N/A = Not Applicable
BV = Book Value
MV = Market Value

Table 4.9: Comparison of two Alternative Methods used in this study

	The dominant relationship between hypothesized determinants and measures of gearing			
	Hypothesized relation	OLS Regression	Structural Equation Modelling (SEM)	REMARKS
Tang	+	+, -	+	Both +ve and -ve relations are significant in OLS regression coefficients
Ndts	-	-	-	N/A
Growth	-	+, -	+	Both +ve and -ve relations are significant in OLS regression coefficients. The SEM results are perverse but consistent with previous empirical studies' findings.
Size	+	+	+	N/A
Brisk	-	-	-	N/A
PProfit	-	-	+	The SEM results are perverse. Previous studies did not separate past from current profitability
Cprofit	+	+	+	N/A
PrBankr	-	-	-	N/A
Cash holding	-, +	-	N/A	Cash holdings were included as a second manifest variable for past profitability in SEM model

The table compares the results of the two methods employed in cross-sectional analysis against the theorised relationships between the hypothesised determinants and gearing. OLS Regression performs as well as (or better than) SEM if proxies for independent variables are chosen in accordance with the underlying capital structure theories.

Table 4.10: Summary of dominant relationship from yearly OLS-regression results (1990-1999)

Year	FA/TA	OI/T	MTB	LnTA	SIGOIS	RE/TA	OI/S	Zscore	CACL
1990	-	-	-	+	+ NS	-	+	+	-
1991	- + NS	-	-	+	+ - NS	-	+	+ - NS	-
1992	-	-	-	+	-	-	+	+ NS	-
1993	- + NS	-	-	+	+	-	+	+	-
1994	+	-	-	+	- + NS	-	+	+	-
1995	+	-	+, -	+	+, - NS	-	+	-	-
1996	+	-	-	+	+ , - NS	-	+	-	-
1997	-	-	-	+	+	-	+	+	-
1998	-	-	-	+	- , + NS	-	+	+ NS	-
1999	+	-	- , +	+	-	-	+	-	- , +

This table shows the summary of relationships from yearly cross-sectional regressions of the eight measures of gearing on the nine hypothesised determinants. NB: A plain -, or + sign denotes a significant negative or positive relationship between hypothesized determinants and gearing. NS denotes insignificant relation. From the table it is not possible to determine whether the dominant relation is positive or negative. The same problem applies to SIGOIS; in addition many cases in SIGOIS are insignificant. (Best subsets regression in *Minitab* revealed that business risk explains very little variation in gearing). The dominant positive relation between gearing and *Z-score* implies that there is a negative relation between probability of bankruptcy and gearing. There is strong evidence of a positive relation regarding *LnTA* (firm size) and OIS (Current profitability). There is also strong evidence of a negative relation between gearing and non-debt tax shield, past profitability, growth opportunities, and cash holdings.

Chapter 5

5 INDUSTRY INFLUENCE IN CAPITAL STRUCTURE

5.1 Introduction

This chapter considers the evidence of industry influence in capital structure in UK companies. As mentioned earlier (sections 2.6.2.1 and 2.6.2.7), capital structure theory stipulates that business risk determines debt carrying capacity. This theory rests on the argument that a firm with highly volatile operating income has a higher chance of failing to meet its fixed financial obligations such as interest payments. Because different industries have been recognised to have different levels of business risk, it has been hypothesised that they also have different capacities for employing debt in their capital structure (see Donaldson, 1957; Solomon, 1963; Kale *et al*, 1991); and Bradley *et al*, 1984). The testing of this hypothesis is the theme of this chapter.

To start with, the findings of previous research in this area are reviewed. Then a critique of previous studies methodologies is also provided before developing hypotheses to be tested. The data specifically relating to industry influence analysis is discussed, and then the methodology employed is presented. Results of tests carried out are then reported.

5.2 Prior research relating to industry influence on capital structure

The possible link between industry and the use of debt financing has been investigated since the earliest discussions of the capital structure decision. But despite the number of empirical studies, the nature of the relationship is still far from clear. The results from these previous empirical works have generally been contradictory. While Schwartz and Aronson (1967), Scott (1972), Scott and Martin (1975), Bowen, *et al* (1982), Bradley *et al* (1984), and Bennett & Donnelly (1993) reported significant differences in industry gearing, there exist almost an equal number of studies, which decry the existence of any such significant differences. These include for example Wippern (1966), Gupta (1969), Cherry and Spradley (1989), and Varela and Limmack (1998).

Schwartz and Aronson (1967), one of the earliest empirical studies in this area, drew a sample of eight firms at random from each of the four broad industry classifications - railroads, gas and electricity utilities, mining and industrials - and measured the percentage of common stock equity, at book value, for 1928 and 1961. They reported that this ratio was relative stable over time within each industry classification, and there were also persistent differences in the value of the ratio across industries. Unfortunately, this study was tainted by both the use of regulated industries in the sample (see Varela and Limmack, 1998, p.1), and the use of very broad categories of industries e.g. 'Mining and Industrials' as one industry (see Bowen *et al* (1982). Scott (1972) aimed at eliminating the bias caused by the presence of regulated industries by analysing data for 77 firms in 12 non-regulated industries over the period 1959-1968. Excluding railroads and utilities, the study measured leverage as the percentage of common equity to total assets, at book value, and concluded that various industries did, in fact, develop characteristically different financial structures.

In a subsequent study Scott and Martin (1975) selected both large and small firms from 12 industries, measuring leverage as the ratio of common equity to total assets, at book value. After a Bartlett test failed to establish homogeneity of variance among the industry groups, they used standard one-way analysis of variance (ANOVA) and its non-parametric counterpart, the Kruskal-Wallis one-way analysis of variance by ranks. Both the parametric and the nonparametric tests identified a statistically significant relationship between industry and leverage. Bowen, *et al* (1982) studied nine industries with 10 firms from each industry for the period from 1951 to 1969. Significant differences in leverage were found across industries, and the rankings of mean industry financial structure were stable over time. Individual firms were also found to exhibit mean reversion tendencies towards their industry mean over both five-and 10-year periods.

Bradley *et al*, (1984) utilized 20-year average firm leverage ratios for 851 firms drawn from 25 two-digit SIC industries, and performed a standard ANOVA using industry dummy variables. The study found that 54% of variation in firm leverage could be explained by industry classification, but excluding all regulated industries from the sample, the R-squared fell to 25%. In the UK, Bennett and Donnelly (1993), who were the first to examine some determinants of cross-sectional variation in gearing for UK companies, used Financial Times All-share industry classification to analyse a sample of 433 companies covering 19 industries over the 1977-1980 period and concluded that capital structures vary across industrial classification. The study examined various determinants including asset structure, non-debt tax shields, growth, volatility, size, profitability, and some industry dummy variables.

The findings of studies, which refute the hypothesis of industry-related capital structures, are generally viewed as providing support for the MM-irrelevance proposition. Wippern (1966) concluded that it was not possible to reject the hypothesis of equal capital structure ratios among eight industries except for regulated electrical utilities. Gupta (1969) using the ratio of total debt to total equity, at book value, to measure capital structure for 173,000 manufacturing firms in two-digit SIC industries for 1961-1962 found no significant relationship between a firm's leverage and its membership in a particular industry. After examining variations of such corporate attributes as asset utilization, liquidity, profitability, size, growth in these industries, the study concluded that leverage is a function of multi-variate factors that have varying significance in different industries.

A study of gearing ratios in USA, Japan, Norway, France, and the Netherlands by Remmers, *et al* (1974), utilizing the 1971 Fortune 500 list, drew a sample consisting of all industries that had at least 20 firms (nine groups), analysed their data for 1966, 1970 and 1971, measuring leverage as the ratio of total debt to total assets, both at book value. The study concluded that there was no support for the hypothesis that industry was a determinant of corporate debt ratios in manufacturing firms in the USA, Norway and the Netherlands, although industry group was a significant determinant in both France and Japan. Similarly Belkaoui (1975) reported that although there were industry-related capital structure patterns among some Canadian firms, the majority firms did not exhibit this pattern. Both Stonehill, *et al* (1975), a survey of financial executives in France, Japan, the Netherlands, Norway and the USA, and Sekely and Collins (1988) concluded that cultural factors rather than achievement of industrial norms played an important role in setting financial policy. In addition, Sekely and Collins (1988) found that although gearing levels were different among countries, industry group had no significant impact on gearing in 23 countries.

Ferri and Jones (1979) used a sample of 223 firms in 10 industries for two five-year periods, 1969-1974 and 1971- 1976 and concluded that although financial structure is not totally independent of industry classification, the dependence is at best, modest. They also found no relationship between income variability and leverage. Cherry and Spradley (1989), took 59 firms from five industries and analysed data for the period from 1981 to 1985, their study found that there is no statistically significant industry effect on the firm's leverage. The regression analysis also failed to show any significant relationship between a firm's business risk and its average debt ratio. They therefore concluded that firms within most industries do not face a common level of business risk as has been generally assumed, and that business risk itself does not exert any significant influence on the firm's capital structure decision.

A UK study by Varella and Limack (1998) examined the capital structure for 112 companies encompassing nine UK industries from 1967 to 1986. Their study reports significant company gearing differences but no significant industry differences. They conclude that there is no optimal financial structure for firms in a given industry in the UK. More recently, Mackay and Phillips (2002) have documented that risk and technology are simultaneously determined with financial structures. In their international comparative study of capital structures, Fan et al (2003) report that industry factors are less important than firm level factors.

5.3 A critique of previous studies' methodologies

There are some weaknesses in previous studies, that need to be addressed in any rigorous study investigating industry-related capital structure pattern. With few exceptions, these earlier studies used broader industry classification. In terms of the Standard Industrial Classification (SIC) codes in the US, a four-digit SIC code would represent the finest available industry classification.[23] However, some previous studies used broader classification than four-digit, some like Schwartz and Aronson (1967) used 1 or 2 digits, and Scott (1972) used 1, 2 or 3 digits (see Bowen *et al*, 1982, p. 12). Ignoring the possibility of perverse results, which could have arisen, some these studies like Schwartz and Aronson (1967) included even regulated industries, and Belkaoui (1975) included 'utilities industry' in his sample (Bowen *et al*, 1982, lament about the use of regulated industries). Although a number of subsequent studies dropped regulated industries to conform with the 'current thinking' (see section 4.5.2), and also tested more industries, Bowen *et al* (1982) document that they did not make clear the basis on which firms were grouped together as an industry.

In some cases the sample sizes were very small (ranging from 77, 59, and even 8 firms), and some of them covered relatively short periods (5, 4, 3 years, even 1 year) (see Scott, 1972, Cherry and Spradley, 1989, and Schwartz and Aronson, 1967 for examples of both anomalies). Resulting measures of gearing from such short periods may not be representative of long-term equilibrium gearing ratio and may be affected by short-term adjustments in capital structure. Smaller samples may also fail to generate significant results which can be inferred from a large population of firms (or industry) in an economy.

Methodologically most of the studies are also found wanting. Bennett and Donnelly (1993) for example use only parametric tests without disclosing whether they tested their data for normality. Such use of parametric tests to the

[23] The SIC codes are stated in four digits where the first-digit corresponds to the broadest categories (ten in total). A two-digit code represents a narrower classification, a three-digit is even narrower, and a four-digit is the narrowest available classification.

exclusion of nonparametric tests has been criticised in related studies (see for example, Varela and Limmack, 1998). With the exception of Ferri and Jones (1979), and Bowen *et al* (1982) most studies do not examine whether their cross-sectional results are persistent over-time. These previous studies have either ignored the relationship between business risk and industry leverage or assumed that the similarities in industry ratios is a proxy for similar business risk within an industry (see Varella and Limack, 1998, p.8). Of all the studies cited above, only Ferri and Jones (1979) and Cherry and Spradley, (1989) explicitly test for the relationship between gearing and business risk. While the former study found no relationship between earnings variability and gearing, the later found that business risk is only weakly related to a firm's membership in a particular industry. Not surprisingly, the results for studies, which both employed small samples and also covered shorter periods, produce particularly mixed results.

Generally those studies that have utilized reasonably larger samples, combined with coverage of longer periods of between ten to twenty years reported significant evidence of industry-related capital structures (see Bradley *et al* (1984), Bennett and Donnelly (1993), and Bowen *et al* (1982) for empirical studies). Studies employing large surveys such as Remmers *et al* (1974) also report evidence of industry differences in capital structure. Bowen *et al* (1982) draws attention to the interesting observation that those studies that used equity in the numerator of their gearing ratio found significant differences in industry gearing while those that used debt did not.

The summary above seems to indicate that the existence or non-existence of industry-related capital structure pattern has not yet been resolved. The failure to find consistent support for industry differences has led to the widely held belief that the level of a firm's business risk is an important determinant of its debt carrying capacity being questioned. The findings of both Ferri and Jones (1979), and those of Cherry and Spradley (1989), cast doubt on standard textbook presumption, and the implicit assumption of most other studies, that business risk exerts a significant influence on a firm's financing decision. This study, among other things, embarks on finding evidence of the existence of industry-related capital structure pattern by using a sample of UK industrial companies, and whether the observed relationships are stable over time. The study also looks at whether business risk is an important determinant of a firms (or an industry's) ability to carry debt.

5.4 Hypotheses on industry-related capital structure pattern

The purpose of this part of the research is to find out whether capital structures differ among different industries in the U.K., and whether such differences, if they exist, are due to different levels of business risk across industries. In addition to the use of both parametric and non-parametric tests, the study will go further than most previous studies. By using a relatively larger sample (more industries and more firms per industry), and covering a 16-year period, this study embarks on providing a more comprehensive assessment of the existence of debt ratios' industry herding in the UK.

This study also tests explicitly whether business risk differs among different industries. This will be done by testing for equality (or similarity) of levels of business risk (as proxied by income variability) among the 28 industries. The study also dwells on examining whether business risk exerts any influence on debt levels, and also examining how persistent the industry gearing ratios are over time. If capital structure is relevant in the determination of the value of a firm, then firms in a given industry will seek an optimal capital structure, and they will be seen to be adjusting towards this target debt ratio. We can also extend this expectation and say that, if a firm's level of business risk (and technology) as approximated by industry classification influences its financing decisions, then the observed optimal capital structure will be significantly different across all industries. The specific hypotheses are given as hereunder:

$H_O: \overline{L_i} = \overline{L_j}$ for all i and j

$H_1: \overline{L_i} \neq \overline{L_j}$ for some i and j

where L is the ratio of a measure of gearing for a sample firm over the period 1985-2000, and $\overline{L}$ is the mean of the debt ratios for firms in the *i*th and *j*th industries.

$$H_O : \overline{SIGOITA_i} = \overline{SIGOITA_j} \text{ for all } i \text{ and } j$$

$$H_1 : \overline{SIGOITA_i} \neq \overline{SIGOITA_j} \text{ for some } i \text{ and } j$$

where *SIGOITA* is the standard deviation of operating income, i.e. earnings before interest and tax scaled by total assets for a sample firm over the period 1985-2000, and $\overline{SIGOITA}$ is the mean of the *SIGOITA* for firms in the *i*th and *j*th industries. The study also uses coefficient of variation in operating income, i.e. earnings before interest tax and depreciation (CVEBITDA) as an alternative to *SIGOITA*.

$$H_o : b = 0$$

$$H_1 : b \neq 0$$

for the cross sectional regression equation:

$$\overline{L} = \alpha + b_1 X_1 + \varepsilon \quad (5.1)$$

and,

$$\overline{L} = \alpha + b_1 X_1 + b_2 X_2 + \varepsilon \quad (5.2)$$

where $\overline{L}$ is the mean of computed measure of gearing for a firm, and X_1 is the *SIGOITA* for the firm, X_2 is the ratio of fixed assets to total assets (FA/TA) net of both depreciation and intangibles (a proxy for production technology) for that firm. Alternatively, the coefficient of variation in earnings before interest and tax (CVEBITDA) may be used in place of *SIGOITA*.

To examine persistency of gearing ratios over time, mean debt ratios were computed for each of the 28 industries for every year from 1985 to 2000, these ratios were ranked for each single year.

The specific hypothesis tested here is

H_0 :The relative industry-mean gearing rankings are random

H_1 :*The relative industry-mean gearing rankings over time are stable.*

5.5 Data and Methodology:

5.5.1 Data

The data was taken from DataStream, a database containing both accounting and market value data for companies. From the sample of 702 companies identified as having data available on the appropriate variables, the study investigating the role of industry influences, utilizes a panel of 570 companies, which gives 8,595 firm-year observations.

Firms were selected for the study on the basis of certain criteria. Regulated firms and utilities, such as railway, electricity, gas, and telephone companies were excluded because of the possibility of an impact of regulation affecting their gearing ratios. This is likely to be the case when the transfer of financing decisions to regulatory authorities restricts firm-level managerial discretion. Using US industries, Bradley *et al.*, (1984) provided empirical evidence that regulation influences financing decisions. Financial firms, like banks and insurance companies, were also excluded because financial intermediaries are not relevant for testing models of financing decisions (see Fama and French, 2003, p.8). The reasons for excluding regulated industries and financials are discussed in much detail in section 4.5.2, where the data for the whole of this thesis is described and discussed. Some companies could not meet the criteria set. Only firms with at least 11 years of data (out of the 16-years) were included.

In addition, only industries, which had at least 10 firms, were included. These criteria resulted into a final sample of 570 firms encompassing 28 industries.

5.5.2 *The sample period*

Most of the previous similar studies cover the period up to around 1985 (see table 4.1 in chapter four). This study covers a period of 16-years (1985-2000 inclusive), which is considered a long enough period to provide meaningful results. This timing, the use of a comparable long period, and broadening of the sample have been done in order to find out whether previous findings were the result of either their particular samples (some of them very small) or the limited time period covered. The sample period is discussed in more detail in Section 4.5.3.

5.5.3 *Empirical analysis*

In this part of study the methodology involves parametric tests like standard analysis of variance (ANOVA) combined with OLS multiple regression of industry dummy-variables, two-sample t-test, analysis of summary statistics, and analysis of industry gearing ratios over time. Despite having a relatively large sample, the non-parametric test Kruskal-Wallis, is also used to take care of the data relating to some measures of gearing whose distribution did not appear to be normally distributed. From the initial sample of 702 non-regulated and non-financial firms, 45 industries were identified. Out of these, industries with only a handful of firms, and those, which did not have variables of interest to this study, were dropped. Only industries with at least ten firms were included on board.

The final sample constituted 570 firms covering 28 industries. These industries were grouped according to DataStream classification industry number (INDNUM) and industry groups (INDG) (see table 5.20). This classification was used because it provides an independent method of classifying companies into functionally defined industries. Eight different measures of gearing were computed for all firms in all industries. Other variables of interest like *SIGOITA*, CVEBITDA, and the ratio of fixed assets to total assets, FA/TA, were also computed for the entire final sample. The ratio of fixed assets to total assets is used here following suggestions in the literature that capital intensity may be an indicator of production technology (see for example Rajan and Zingales, 1995; Boyle and Eckhold, 1996, p.9; and Mackay and Phillips, 2002, p.10). Table 5.1 shows descriptive statistics for each of the gearing ratios and other variables used in industry influence analysis.

One-way analysis of variance (ANOVA) was run using the 28 industries as levels (treatments) in 28 columns. ANOVA was run for all of the eight measures of gearing for each of the 16-years (1985-2000). In addition ANOVA was run for cross section values of *SIGOITA*, CVEBITDA, and FA/TA. ANOVA is similar to regression in that it is used to investigate and model the relationship between a response variable and one or more exogenous variables.

ANOVA differs from regression in that the exogenous variables are qualitative (categorical), in the case of this study; these are 'industry groups'. In ANOVA no assumption is made about the nature of the relationship, therefore the model does not include coefficients for variables. This is why in this study ANOVA is combined with OLS multiple-regression of industry dummy-variables, and the resulting t-statistics are matched with industry means and standard deviations. This process was done using the following equation:

$$Lev = \alpha + \sum_{i=1}^{28} \beta_i D_i + \varepsilon \qquad (5.3)$$

where Lev = gearing measure

D_i = the dummy variable representing industry i

ε is the random error.

ANOVA extends the two-sample t-test for testing the equality of two population means to a more general null hypothesis of comparing the equality of more than two means (in the case of this study 28-means) versus them not all being equal. For one-way analysis of variance (AOVONEWAY), there is no need to have the same number of observations in each level. Being parametric tests, two-sample t-test and ANOVA assume that the sample is normally distributed. While simple histogram plots and Anderson-Darling normality test indicated that the data relating to the ratio of total liabilities to total assets (TLp/TA-book-value) was normally distributed (see figure 5.1 versus figure 5.2), other measures of gearing showed a slight departure from a normal distribution. That being the case, non-parametric tests were carried out as well.

5.5.4 *Non-parametric tests*

Despite using a relatively large sample and the fact that ANOVA can prove to be very robust to such modest departures from normality assumption, a non-parametric test, Kruskal-Wallis, was performed to ensure robustness of the results. Non-parametric tests do not rely on any assumption about the distribution of the parameters of interest. Specifically non-parametric methods were developed to be used in cases when nothing is known about the parameters of the variable of interest in the population. For this reason they are also known as *parameter-free* or *distribution-free* methods.

Non-parametric tests are resorted to because of the possibility that the normality assumption in parametric tests may render their conclusions misleading. The results from a non-parametric test are more robust against violations of the assumptions on which parametric tests are based. Despite these differences, both parametric and non-parametric tests are procedures used to perform tests about a population's measures of central tendencies, the mean for parametric tests, and the median fro non-parametric tests. Kruskal-Wallis particularly performs a hypothesis test of the equality of population medians for a one-way design in relation to two or more populations. This test is a generalization of the procedure used in the Mann-Whitney test and like Mood's median test offers a non-parametric alternative to the one-way analysis of variance. The test looks for differences among the medians of the populations tested and assumes that data constitute k independent random samples from continuous distributions, all having the same shape. Kruskal-Wallis hypotheses are:

H_0: The population medians are all equal

H_1: The medians are not all equal.

This test is more powerful (the confidence interval being narrower, on average) than Mood's median test for analysing data from many types of distributions, including data from normal distribution.

To test for the influence of business risk, simple ordinary least squares (OLS)-regression was run using SIGOITA as an independent variable. To test for the influence of both business risk and production technology, multiple OLS-regression was run using SIGOITA and FA/TA as independent variables. These tests were conducted first at firm level (i.e. 570 firms), and then at industry level (28 industries). The non-parametric test, Kruskal-Wallis, was also performed on SIGOITA, CVEBITDA, and FA/TA in order to find out if the tests corroborate parametric tests results for the influence of business risk and technology on gearing. The results are presented and discussed in chapter seven. Finally to test for persistency, mean debt ratios were computed for each of the 28 industries by using eight different gearing measures for every year from 1985 to 2000. These ratios were ranked for each single year. The relative rankings of these industries were observed for each measure of gearing to find out whether the rankings are random or whether the rankings are persistent over the sample period.

5.6 Results

5.6.1 Introduction

In this section we will consider the influence of industry characteristics on capital structure policies. Table 5.1 and table 5.2 present descriptive statistics and correlation matrix respectively for variables used in industry influence analysis.

This part of study used only 570 firms out of the whole sample of 651 firms because some of the firms were not suitable for industry analysis, despite having relevant data for the sample period (see section 5.5.1). It is also noteworthy to highlight that the correlation between the ratio of current liabilities to total assets, CL/TA and total liabilities to total assets, TL/TA is the highest of all correlations. This reflects the findings discussed in the previous section about the proportion of total liabilities accounted for by current liabilities. Table 5.3 presents the industry range as well as the intertemporal range. The industry range presents the high and low gearing ratios and the corresponding industry identification number in brackets. This is the serial number given to the industry in the list of industries dealt with in this study in table 5.20 Oil & Gas Exploration/Production, Motor vehicle distribution, and Publishing industries, are on average, the most geared industries for most of the gearing measures, while Engineering Fabrication, Software, and Pharmaceuticals industries, had the lowest gearing for most of the gearing measures. Distribution: other, and Computer services industries had the highest coverage (lowest income gearing) while Motor vehicle distribution industry had the lowest coverage ratio (highest income gearing).

The intertemporal range shows the highest and the lowest industry annual gearing ratios with the respective years in brackets. The sample includes some companies, which did not have relevant data from 1985 to 1988. This seems to be the reason why in column six of table 5.3 the years 1985-1988 accounted for most of the lowest ratios. To remove this bias, the last column shows the lowest ratios from 1989 onwards, as this is the period when almost every company had relevant data. The interpretation of results also takes this into account. The highest total liabilities to total assets ratio, debt to capital ratio, debt to total assets, long term debt to total assets, and short term debt to total assets, occurred In 1998, 1999, and 2000, and (save for the 1985-1988 bias) the lowest of these ratios occurred in 1989, 1993, and 1997. The highest book debt equity ratio occurred in 1992, the highest current liabilities to total assets ratio, occurred in 1995, while the lowest of these three ratios occurred in 1989.

As for the income gearing (in terms of both the means and the medians) the highest gearing (the lowest coverage ratio) occurred in 1991-1992 while the lowest gearing (the highest coverage ratio) occurred in 1997. Long-term debt financing was therefore highest in the 1998 through to 2000 years, and lowest in the 1989-93 and 1997 years. The highest coverage ratios reveal that on average UK companies had the ability to service their debts in 1996-1997 years and had difficulties servicing debt in the 1991-1992 years.

Table 5.3 also show that generally total debt financing has been stable over the study period (1985-2000). Major fluctuations have been rare and there appear to be signs of mean reversion after approximately every five years. The stability in total liabilities owes much from the stability in long-term debt, which is more stable. The short-term debt shows a rising trend over the sixteen-year period. Consistent with expectations, the current liabilities fluctuate more than long-term debt. However, unlike short-term debt, the current liabilities exhibit signs of mean reversion over every two to three years.[24] The Income gearing is not stable and their movement seems unpredictable.

In summary, the long-term debt (LTD/TA) was stable and influenced total liabilities (TL/TA). The current liabilities ratio (CL/TA) was somehow stable, and the short-term debt (STD/TA) has been rising. This seems to imply that companies appear to maintain a long-run target debt ratio, and use short-term debt and probably current liabilities to meet temporary financing needs as they arise. However, UK companies seem to have increased their use of short-term debt in the recent past, and the time series plot over the sample period depicts that this trend is likely to go on in the near future. An alternative explanation for the stability in current liabilities may be that they are not entirely caused by financing needs, but by the scale of operations and therefore move in tandem with revenues and assets.

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[24] Mean-reversion is used here to describe the tendency for the level of a measure of gearing, which fluctuates over time; to approximately equal the entire period's mean after several years.

Table 5.3 also shows two measures of operating risk, the standard deviation of operating income scaled by total assets (SIGOITA), and the coefficient of variation (C.V) of profit before interest, tax and provisions (EBITDA) which is subsequently referred to as CVEBITDA. The industry range shows that on average, Software industry is the most risky based on both measures, and that Furniture and Floor Covering industry is the least risky based on CVEBITDA, and Malt and Beverages industry is the least risky based on SIGOITA.

5.6.2 *Statistical significance*

To test the statistical significance of the observed differences in the mean gearing ratios across industries two related tests were conducted: a two-sample t-test and a standard one-way Analysis of Variance (ANOVA). Figure 5.1 presents the results of Anderson-Darling normality test and these show that the total debt to total liabilities ratios only depart slightly from similar results (figure 5.2) of normality tests of a normal distribution, which has been generated using normally distributed random data. ANOVA is very robust to such modest departures from normality assumption.

Tables 5.4 to 5.10 show the results of one-way ANOVA for six different measures of gearing, and also for SIGOITA, a proxy for business risk. The one-way ANOVA results are combined with the coefficients from industry dummy variable regression coefficients. Two-sample t-test was also conducted on each pair of 28 industries; the resulting matrix (not shown) corroborated the ANOVA results. The mean debt ratios of the 28 industries are shown (in ascending order) along with their standard deviations, F-statistic, p-value, and R-sq % in tables5.4 to 5.10. The sample mean, (the mean debt ratio of all firms in 28 industries) and the sample standard deviations are also shown in these tables.

Generally, tables 5.4 to 5.10 show that highly geared industries like motor vehicles distribution, malt beverages, construction, leisure facilities, and oil & gas, have significant positive industry dummy variable coefficients while the least geared industries like pharmaceuticals, computer services, and software show negative industry dummy variable coefficients. Also the same industries, which have highest levels of capital gearing (e.g. motor vehicle distribution, leisure facilities, malt beverages and distribution), also happen to have the lowest income gearing or coverage ratio. Likewise those industries, which have the lowest capital gearing like computer services, pharmaceuticals, etc, also have the highest income gearing. There is consistency of the differences in gearing across industries for different measures of gearing. This shows that there is also consistency in the industry differences between capital and income gearing. This is clear evidence that the industry effect revealed by this study is not an accidental influence.

Statistically, book values of gearing show that about 10% to 16% of variation in gearing is explained by industry influences, while market value measures of gearing explain about 12% to 34%. The proportion of variation in gearing explained by industry classification compares favourably with the 25% reported by Bradley *et al* (1984) in the US, and also with the 18% reported by Bennett and Donnelly (1993) in the UK. Table 5.10 indicates that industry classification explains just over 14% of variation in business risk, the table also confirms that business risk is negatively related to gearing because highly geared industries like motor vehicle (distribution), motor vehicle (parts), food processors, malt and beverages, oil and gas, and construction, are also the industries with lowest levels of business risk (as measured by SIGOITA). On the other hand, the least geared industries like pharmaceuticals, software, computer services, and medical equipments, have the highest levels of business risk.

5.6.3 *Non-Parametric test results*

Table 5.11 show results of Kruskal-Wallis test for differences across industries by using ten measures of gearing. With k-1=27 degrees of freedom and $\alpha =$ 0.01 in the upper tail of Chi-square distribution, the critical chi-square value χ^2 = 46.9630. Since the test statistic (H) in each case is greater than 46.96, the null hypothesis that the industry medians are all equal is rejected. This non-parametric test strongly supports the existence of significant differences in capital structure among UK industries. Consistent with the results found by using parametric tests (ANOVA, two sample t-test, etc.) is that the differences are more pronounced for market value gearing measures. Consistent with Bennett and Donnelly (1993), this suggests (as the theory prescribes) that market values be given priority in future research.

As non-parametric tests results in table 5.11 also reveal, there are significant differences in the level of business risk across industries: the Kruskal-Wallis test statistic (H) is 117.56 and 78.48 for SIGOITA and CVEBITDA respectively, and both of these are higher than the critical chi-square value of 46.96. The results also show that there are even more significant differences in production technology (the ratio of fixed assets to total assets) across industries, as the Kruskal-Wallis test statistic (H) is 212.98 against the critical chi-square value of 46.96.

5.6.4 Business risk and technology versus gearing.

The results of explicit tests as to whether the observed differences in industry capital structure relate to differences in industries' operating risk, and production technology, are presented in tables 5.12 to 5.15. The tables show regression coefficients and corresponding t-statistics for both simple and multiple cross-sectional OLS-regressions of eight different gearing measures vs. SIGOITA and FA/TA. Most of the regression coefficients are significant at 1% and 5%. If we exclude the influence of current liabilities, by ignoring the coefficients relating to both current liabilities over total assets, and total liabilities over total assets, the results indicate that at firm level both business risk and production technology do not explain very much of the observed variation. Only 3.7% of the observed differences in gearing is explained by the business risk (table 5.12), and only 5.1% is explained by the combined effects of both business risk and technology on firm gearing (table 5.13).

At industry level, business risk explains up to 27.3 percent (table 5.14). The combined influence of business risk and production technology explains up to

42.4 percent of variation in industry gearing (table 5.15). As discussed in subsequent sections of this chapter, other firm-specific characteristics like profitability, non-debt tax shields, firm size, and a firm's growth opportunities also appear to play a significant role in the determination of capital structure policy.

5.6.5 *Persistency of industry gearing ratios*

To examine the persistency of industry debt ratios over time, industry mean debt ratios were computed for each of the 28 industries for every year from 1985 to 2000. Table 5.16 to 5.19 show the rankings of mean gearing ratios for five selected different gearing measures for the 28 industries from 1990-2000 in descending order. During the period from1985 to 1989 some of the companies included in our sample did not have relevant data. The industries in which these companies are have smaller samples than other industries from 1985 to 1989. Therefore the industry mean debt ratios for these years would be biased in favour of (against) those industries in which some firms have (have no) data. The rankings show stability over time. For example the rankings for total liabilities over total assets (TLp/TA) were stable over time.

As table 5.16 shows motor vehicle distribution industry ranked first on average over the sample period. The industry also ranked first in three years out of 11 years. An examination of other industries in the table reveals that for more than 50% (for some industries 91%) of the time, the first three industries were within three positions of their average ranking. These industries did not fall below the tenth position in any of the 11 years. The industries, which were the last three on average (malt beverages, retail: multi-departments, and pharmaceuticals), were within three positions of their average rankings for more than 64% (i.e. retail: multi-departments was there for 100%) of the time. Three industries, which on average occupied the middle positions (i.e.13th, 14th, and 15th), were within three positions of their average for more than 54% of the time.

In general, the rankings for other measures of gearing, shown in table 5.17 through 5.19 also exhibit persistence of differences over time among industries.

Industries like motor vehicle (parts), motor vehicle (distribution), food processors, publishing, oil and gas, and chemicals, have relatively higher levels of gearing than other industries in each year for all measures of gearing. On the other hand, industries like pharmaceuticals, computer services, household appliances, engineering fabrication, and retail (multi-department), consistently show lower levels of gearing. The tables (5.16 to 5.19) also show that gearing is negatively related to business risk (as the last two columns in each of these tables reveal). In most gearing measures shown in table 5.16 through to table 5.19, the highly geared industries are also the least risky, and the less geared industries are also the most risky.

5.7 Summary and conclusion

The results in this chapter show that there is a strong industry effect in capital structures of UK firms. The results also show that gearing is inversely related to business risk, and positively related to production technology in the industries examined. The relative stability of industry rankings over time supports the findings of Bowen *et al.* (1982) but contradicts those of Ferri and Jones (1979). The evident persistent gearing levels among industries may suggest that firms try to maintain their capital structure by adjusting their debt and/or equity levels over time in response to changes in determinants of capital structure. If this is the case then the evident industry influence provides support for the existence of an optimal capital structure, which firms in a given industry strive to maintain. Alternatively, the observed strong industry effect may simply be arising from the fact that different industries need different assets mix in their operations. It may also be argued that because firms in a given industry face similar types and levels of risks, they consistently have similar gearing levels even if they do not make deliberate capital structure adjustments over time.

The conclusive evidence as to whether managers of these firms make deliberate adjustments to their firm's capital structure can only be obtained by first finding out other determinants (in addition to industry characteristics, business risk and technology) and then by investigating the changes in capital structure (capital structure dynamics) in order to determine what actually cause those changes from year to year. That is the focus of the next chapter.

5.8. Appendix: Tables and Figures

Table 5.1: Descriptive statistics for variables in industry influence analysis

Variable	*Mean*	*STDev*	*Min*	*Qrt1*	*Median*	*Qrt3*	*Max*	*N*
TL/TA-BV	0.51	0.15	0.10	0.41	0.51	0.59	0.97	566
TL/TA-MV	0.37	0.16	0.00	0.25	0.37	0.49	0.78	570
D/E-BV	0.22	0.22	0.00	0.05	0.16	0.33	0.98	545
D/E-MV	0.14	0.15	0.00	0.03	0.09	0.20	0.89	566
D/CAP-BV	0.18	0.16	0.00	0.05	0.15	0.26	0.99	566
LTD/TA-BV	0.03	0.04	0.00	0.002	0.02	0.049	0.28	566
STD/TA-BV	0.05	0.04	0.00	0.02	0.05	0.09	0.20	562
CL/TA-BV	0.39	0.14	0.07	0.30	0.39	0.48	0.89	570
EBITDA/I	9.9	8.4	0.56	4.5	7.1	12.5	49.7	505
SIGOITA	0.06	0.06	0.01	0.02	0.045	0.07	0.56	570
CVEBITDA	0.78	0.51	0.14	0.44	0.63	0.98	4.03	536
FA/TA	0.34	0.19	0.00	0.21	0.32	0.43	0.93	568

Table 5.2: Correlation Matrix for variables in industry influence analysis

	TL/TA-BV	*TL/TA-MV*	*D/E-BV*	*D/E-MV*	*LTD/TA-BV*	*STD/TA-BV*	*CL/TA-BV*	*EBITDA/I*	*SIGOITA*	*FA/TA*
TL/TA-MV	0.50									
D/E-BV	0.54	0.27								
D/E-MV	0.37	0.60	0.68							
LTD/TA-BV	0.14	0.14	0.38	0.39						
STD/TA-BV	0.32	0.12	0.71	0.49	0.25					
CL/TA-BV	0.80	0.44	0.06	0.00	-0.01	-0.08				
EBITDA/I	-0.34	-0.55	-0.34	-0.43	-0.15	-0.29	-0.13			
SIGOITA	0.01	-0.19	-0.10	-0.19	-0.14	-0.10	0.08	-0.06		
CVEBITDA	0.21	0.01	0.01	-0.07	-0.15	-0.00	0.25	-0.14	0.59	
FA/TA	-0.28	-0.07	0.09	0.17	0.10	0.18	-0.45	-0.06	-0.22	-0.15

Table 5.3: Industry and Intertemporal range for 1985 to 2000

	Overall		Industry range (Mean)		Intertemporal range (Mean)		
	Mean	STDev	High	Low	High	Low	Low**
TL/TA-BV	0.51	0.15	0.65 (16)	0.37 (27)	0.66 (1999)	0.32 (1985)	0.47 (1989)
D/TA-BV	0.10	0.09	0.15 (8)	0.03 (4)	0.13 (2000)	0.05 (1985)	0.08 (1989)
D/E-BV	0.24	0.25	0.48 (20)	0.05 (4)	0.25 (1999)	0.10 (1985)	0.17 (1989)
D/E-MV	0.15	0.18	0.33 (16)	0.02 (11)	0.35 (1992)	0.09 (1987)	0.14 (1989)
D/CAP-BV	0.18	0.16	0.26 (20)	0.05 (4)	0.25 (1998)	0.09 (1986)	0.15 (1993)
LTD/TA-BV	0.04	0.06	0.09 (8)	0.005 (11)	0.05 (2000)	0.02 (1985)	0.04 (1997)
STD/TA-BV	0.06	0.05	0.10 (20)	0.02 (4)	0.08 (2000)	0.02 (1985)	0.04 (1989)
CL/TA-BV	0.39	0.14	0.61 (12)	0.24 (8)	0.76 (1995)	0.28 (1985)	0.38 (1989)
EBIT/I	7.25	6.56	11.8 (7)	3.15 (16)	6.24 (1997)	2.33 (1985)	3.1 (1992)
EBITDA/I	9.9	8.4	16.3 (12)	4.23 (16)	8.88 (1997)	3.37 (1985)	4.86 (1991)
<u>*MEDIANS*</u>:							
EBIT/I	5.06	-	-	-	-	-	-
EBITDA/I	7.01	-	-	-	-	-	-
OP.RISK <u>*(MEAN)*</u>:							
SIGOITA	0.06	0.06	0.14 (11)	0.03 (18)	-	-	-
CVEBITDA	0.78	0.51	1.11 (11)	0.51 (14)	-	-	-

Key:

TL=Total liabilities (including preference shares)

D= Total debt (including preference shares)

LTD=Long term debt (including preference shares)

STD= Short term debt

TA=Total assets

BV= Book value

MV= Market value

EBIT/I= (Profit before Interest and tax)/Interest charge

EBITDA/I= (Profit before Interest, tax and Depreciation)/Interest charge

SIGOITA= Standard deviation of operating income over total assets for 1985-2000period

CVEBITDA= Coefficient of variation (C.V) of EBITDA for 1985-2000 period

** The lowest gearing during the 1989-2000 sub-period.

Table 5.4: ANOVA results with dummy variables coefficients for TL/TA-BV

S/N	INDNUM	INDG	N	Mean	Std. Dev	Dummy var.coeff.	t-stat
27	95	Pharmaceuticals	12	0.37	0.19	-0.14	-2.49
18	67,68,72,114	Malt Beverages	24	0.38	0.15	-0.13	-2.69
24	87	Retail: Multidept.	13	0.40	0.13	-0.11	-2.02
8	31,50,51,97	Oil &Gas expl/prodn.	11	0.40	0.18	-0.11	-1.82
13	59,62	Household apps & house ware	11	0.44	0.16	-0.07	-1.29
4	120	Engineering Fabrication	14	0.44	0.11	-0.07	-1.30
14	60	Furniture +Floor covering	13	0.46	0.08	-0.05	-0.89
5	37,57	Electronics: Parts & Equipments	34	0.46	0.15	-0.05	-1.07
19	69,78	Apparel	30	0.47	0.13	-0.04	-0.85
9	33,92,93	Chemicals	15	0.48	0.06	-0.03	-0.55
25	94	Broadcasting	13	0.49	0.20	-0.03	-0.51
1	30,32	Construction materials	35	0.50	0.12	-0.01	-0.38
10	55	Leisure facilities	14	0.50	0.12	-0.01	-0.20
11	58	Software	12	0.51	0.16	*	*
23	66,90	Retail: Soft & Hard lines	28	0.51	0.15	-0.005	-0.11
7	40	Distribution: Other	13	0.51	0.16	-0.004	-0.07
28	132	Medical Equipment & Supplies	13	0.52	0.19	*	*
12	150,151	Computer & Internet services	14	0.52	0.17	0.00	0.00
3	74	Engineering: General	48	0.52	0.14	0.008	0.17
15	63	Motor vehicle: Parts	10	0.53	0.13	0.01	0.18
20	84	Publishing	25	0.53	0.12	0.01	0.37
17	71	Food Processors	27	0.54	0.12	0.02	0.57
21	86	Business Support	35	0.56	0.18	0.04	0.98
2	36,39,43	Construction	51	0.57	0.15	0.05	1.18
6	46	Distribution: Indus. components	19	0.58	0.16	0.06	1.19
22	83	Food & Drug Retailers	12	0.62	0.27	0.10	1.70
26	41	Media Agencies	10	0.65	0.17	0.13	2.08
16	64	Motor vehicle: Distribution	14	0.65	0.09	0.13	2.30
		TOTAL	570	0.51	0.16		
		R-SQRD/R-SQRD (adj.)				16%	12%
		F-STATISTIC				3.93	
		P-VALUE				0.000	

Software industry was removed because its mean was closest to the sample mean. In addition, Minitab, the statistical software used for regression removed 'medical equipment and supplies' industry from regression, because it was highly correlated to other industries. Highly geared industries like motor vehicles (distribution) and media agencies exhibits significant positive dummy variable coefficients. On the other extreme the least geared industries like pharmaceuticals have significant negative dummy variable coefficients.

Table 5.5: ANOVA results with dummy variables coefficients for TL/TA-MV

S/N	INDNUM	INDG	N	Mean	Std. Dev	Dummy var.coeff.	t-stat
27	95	Pharmaceuticals	12	0.14	0.11	-0.086	-1.57
11	58	Software	12	0.17	0.07	-0.056	-1.03
25	94	Broadcasting	13	0.18	0.11	-0.041	-0.77
28	132	Medical equipments and Supplies	13	0.22	0.12	*	*
12	150,151	Computer and Internet	14	0.27	0.14	0.041	0.78
24	87	Retail: Multidept.	13	0.27	0.11	0.044	0.82
8	31,50,51,97	Oil & Gas expl/prodn	11	0.28	0.12	0.052	0.93
20	84	Publishing	25	0.30	0.13	0.071	1.51
13	59,62	Household apps &house ware	11	0.30	0.08	0.074	1.32
5	37,57	Electronics: Parts & Equipments	34	0.32	0.16	0.096	2.15
21	86	Business Support	35	0.33	0.15	0.100	2.26
9	33,92,93	Chemicals	15	0.33	0.05	0.102	1.97
23	66,90	Retail: Soft & Hard lines	28	0.36	0.14	0.102	2.91
10	55	Leisure facilities	14	0.36	0.15	0.135	2.57
18	67,68,72,114	Malt beverages	24	0.36	0.12	0.137	2.90
6	46	Distribution: Components	19	0.38	0.16	0.157	3.18
22	83	Food & Drug Retailers	12	0.38	0.15	0.159	2.91
14	60	Furniture + Floor covering	13	0.41	0.15	0.182	3.39
15	63	Motor vehicle: Parts	10	0.41	0.09	0.183	3.18
17	71	Food processors	27	0.42	0.10	0.191	4.14
4	120	Engineering: Fabrication	14	0.43	0.15	0.201	3.80
19	69,78	Apparel	30	0.43	0.14	0.204	4.49
1	30,32	Construction materials	35	0.43	0.14	0.225	5.93
26	41	Media Agencies	10	0.43	0.17	0.210	3.65
3	74	Engineering: General	48	0.44	0.14	0.215	5.04
7	40	Distribution: Other	13	0.46	0.13	0.235	4.38
2	36,39,43	Construction	51	0.51	0.17	0.285	6.70
16	64	Motor vehicle: Distribution	14	0.63	0.10	0.408	7.73
		TOTAL	570	0.37	0.16		
		R-SQRD/R-SQRD (adj.)				34.4%	31.1%
		F-STATISTIC				10.53	
		P-VALUE				0.000	

The statistical software used for regression removed 'medical equipment and supplies' industry from regression, because it was highly correlated to other industries. Highly geared industries like motor vehicles (distribution), construction distribution, and general engineering and media agencies exhibits significant positive dummy variable coefficients. On the other extreme the least geared industries like pharmaceuticals and software show negative dummy variable coefficients.

Table 5.6: ANOVA results with dummy variables coefficients for Dp/TA-BV

S/N	INDNUM	INDG	N	Mean	Std. Dev	Dummy var.coeff.	t-stat
4	120	Engineering Fabrication	14	0.03	0.02	-0.077	-2.30
12	150,151	Computer services and Internet	14	0.05	0.06	-0.056	-1.69
24	87	Retail: Multidept.	13	0.05	0.04	-0.053	-1.56
19	69,78	Apparel	30	0.06	0.05	-0.050	-1.74
27	95	Pharmaceuticals	12	0.06	0.04	-0.048	-1.39
11	58	Software	12	0.06	0.05	-0.046	-1.33
13	59,62	Household apps. & House ware	11	0.06	0.08	-0.043	-1.2
14	60	Furniture + Floor covering	13	0.07	0.06	-0.040	-1.18
7	40	Distribution: Other	13	0.07	0.05	-0.039	-1.14
26	41	Media Agencies	10	0.07	0.06	-0.034	-0.93
25	94	Broadcasting	13	0.08	0.10	-0.028	-0.82
5	37,57	Electronics: Parts and equipments	34	0.08	0.12	-0.025	-0.89
2	36,39,43	Construction	51	0.08	0.06	-0.022	-0.83
6	46	Distribution: Other	19	0.10	0.14	-0.008	-0.25
16	64	Motor vehicle: distribution	14	0.10	0.06	-0.006	-0.17
21	86	Business support	35	0.10	0.10	-0.003	-0.12
28	132	Medical equipment & supplies	13	0.11	0.09	*	*
23	66,69	Retail: Soft & Hard lines	28	0.11	0.09	0.005	0.18
3	74	Engineering: General	48	0.11	0.09	0.006	0.23
1	30,32	Construction materials	35	0.11	0.09	0.008	0.29
22	83	Food and Drug Retailers	12	0.12	0.12	0.014	0.42
18	67,68,72,114	Malt Beverages	24	0.12	0.08	0.017	0.55
17	71	Food processors	27	0.12	0.08	0.017	0.59
15	63	Motor vehicles: Parts	10	0.13	0.09	0.021	0.57
10	55	Leisure facilities	14	0.13	0.09	0.029	0.86
9	33,92,93	Chemicals	15	0.14	0.05	0.034	1.04
20	84	Publishing	25	0.15	0.11	0.044	1.48
8	31,50,51,97	Oil & Gas expl/prodn	11	0.15	0.14	0.049	1.37
		TOTAL	570	0.10	0.09		
		R-SQRD/R-SQRD (adj.)				11.14%	6.6%
		F-STATISTIC				2.49	
		P-VALUE				0.000	

Minitab, the statistical software used for regression removed 'medical equipment and supplies' industry from regression, because it was highly correlated to other industries. Highly geared industries like motor vehicles (distribution), chemicals and publishing have positive dummy variable coefficients while the least geared industries like pharmaceuticals, computer services, and software show negative dummy variable coefficients.

Table 5.7: ANOVA results with dummy variables coefficients for Dp/E-MV

S/N	INDNUM	INDG	N	Mean	Std. Dev	Dummy var.coeff.	t-stat
11	58	Software	12	0.02	0.02	-0.040	-0.57
27	95	Pharmaceuticals	12	0.03	0.04	-0.030	-0.43
25	94	Broadcasting	13	0.04	0.05	-0.023	-0.33
12	150,151	Computer services & Internet	14	0.04	0.06	-0.020	-0.30
28	132	Medical equipment & supplies	13	0.06	0.04	*	*
24	87	Retail: Multidept.	13	0.06	0.07	0.003	0.04
13	59,62	Household apps. & House ware	11	0.06	0.09	0.005	0.07
4	120	Engineering Fabrication	14	0.07	0.07	0.007	0.10
22	83	Food & drug Retailers	12	0.11	0.08	0.048	0.70
6	46	Distribution: Ind.Components	19	0.11	0.10	0.049	0.78
19	69,78	Apparel	30	0.11	0.15	0.052	0.91
26	41	Media Agencies	10	0.12	0.13	0.055	0.76
21	86	Business Support	35	0.12	0.16	0.060	1.07
5	37,57	Electronics: Parts & Equipments	34	0.12	0.29	0.063	1.12
7	40	Distribution Other	13	0.12	0.14	0.063	0.93
14	60	Furniture Floor covering	13	0.13	0.18	0.070	1.04
9	33,92,93	Chemicals	15	0.15	0.07	0.142	2.01
23	66,90	Retail: Soft & Hard lines	28	0.16	0.19	0.099	1.71
20	84	Publishing	25	0.16	0.25	0.104	1.77
15	63	Motor vehicles: Parts	10	0.17	0.11	0.107	1.48
10	55	Leisure facilities	14	0.19	0.18	0.129	1.94
17	71	Food Processors	27	0.19	0.14	0.129	2.21
3	74	Engineering: General	48	0.19	0.20	0.133	2.46
1	30,32	Construction materials	35	0.20	0.16	0.138	2.46
8	31,50,51,97	Oil & Gas expl/prodn.	11	0.20	0.22	0.142	2.01
2	36,39,43	Construction	51	0.21	0.21	0.155	2.89
18	67,68,72,114	Malt Beverages	24	0.22	0.20	0.162	2.72
16	64	Motor vehicle: Distribution	14	0.33	0.23	0.270	4.07
		TOTAL	570	0.15	0.18		
		R-SQRD/R-SQRD (adj.)				12.6%	8.2%
		F-STATISTIC				2.89	
		P-VALUE				0.000	

'Medical equipment and supplies' industry was removed from regression, because it was highly correlated to other industries. Highly geared industries like motor vehicles (distribution), malt beverages, construction, Leisure facilities and oil & gas have significant positive dummy variable coefficients while the least geared industries like pharmaceuticals, computer services, and software show negative dummy variable coefficients.

Table 5.8: ANOVA results with dummy variables coefficients for STD/TA

S/N	INDNUM	INDG	N	Mean	Std. Dev	Dummy var.coeff.	t-stat
4	120	Engineering Fabrication	14	0.02	0.02	-0.050	-2.54
24	87	Retail: Multidept.	13	0.03	0.03	-0.040	-1.99
19	69,78	Apparel	30	0.03	0.03	-0.039	-2.26
14	60	Furniture + Floor covering	13	0.03	0.02	-0.037	-1.82
12	150,151	Computer services & Internet	14	0.04	0.06	-0.035	-1.75
7	40	Distribution: Other	13	0.04	0.03	-0.034	-1.70
13	59,60	Household apps & House ware	11	0.04	0.06	-0.031	-1.48
27	95	Pharmaceuticals	12	0.04	0.04	-0.029	-1.43
5	37,57	Electronics: Parts & Equipments	34	0.04	0.04	-0.026	-1.58
2	36,39,43	Construction	51	0.05	0.04	-0.023	-1.43
25	94	Broadcasting	13	0.05	0.05	-0.022	-1.11
6	46	Distribution: Ind. Components	19	0.05	0.04	-0.022	-1.19
26	41	Media Agencies	10	0.05	0.05	-0.018	-0.84
11	58	Software	12	0.05	0.05	-0.017	-0.83
3	74	Engineering: General	48	0.06	0.05	-0.010	-0.61
23	66,90	Retail: Soft & Hard lines	28	0.06	0.05	-0.010	-0.56
1	30,32	Construction materials	34	0.06	0.05	-0.007	-0.40
8	31,50,51,97	Oil & Gas expl/prodn	11	0.07	0.04	-0.005	-0.22
16	64	Motor vehicle: Distribution	14	0.07	0.05	-0.001	0.00
28	132	Medical Equipment & Supplies	13	0.07	0.06	*	*
21	86	Business support	35	0.07	0.07	0.003	0.19
18	67,68,72,114	Malt Beverages	24	0.08	0.05	0.005	0.29
22	83	Food & Drug Retailers	12	0.08	0.08	0.007	0.35
10	55	Leisure Facilities	14	0.08	0.06	0.008	0.42
17	71	Food Processors	27	0.08	.05	0.013	0.73
9	33,92,93	Chemicals	15	0.09	.03	0.014	0.74
15	63	Motor vehicles: Parts	10	0.09	0.08	0.018	0.84
20	84	Publishing	25	0.10	0.08	0.028	1.56
		TOTAL	570	0.06	0.05		
		R-SQRD/R-SQRD (adj.)				12.5%	8.1%
		FSTATISTIC				2.86	
		P-VALUE				0.000	

Minitab, the statistical software used for regression removed 'medical equipment and supplies' industry from regression, because it was highly correlated to other industries. Publishing industry has the highest level of short -term debt and has a positive dummy variable coefficient. The least geared industries at the top of the table have significantly negative dummy variable coefficients.

Table 5.9: ANOVA results with dummy variables coefficients for EBITDA/I

S/N	INDNUM	INDG	N	Mean	Std. Dev	Dummy var.coeff.	t-stat
16	64	Motor vehicle: Distribution	14	4.23	1.94	-8.710	-2.49
10	55	Leisure Facilities	14	4.97	3.59	-7.977	-2.07
7	40	Distribution: Other	13	7.07	8.41	-5.875	-1.56
18	67,68,72,114	Malt Beverages	24	7.33	5.46	-5.610	-1.72
3	74	Engineering: General	48	7.77	7.07	-5.177	-1.73
17	71	Food Processors	27	7.89	4.33	-5.052	-1.60
1	30,32	Construction Materials	35	8.24	4.98	-4.700	-1.52
2	36,39,43	Construction	51	8.48	7.77	-4.459	-1.50
8	31,50,51,97	Oil & Gas expl/prodn	11	8.88	6.11	-4.061	-1.10
22	83	Food & Drug Retailers	12	9.02	4.23	-3.922	-1.04
23	66,90	Retail: Soft & Hard lines	28	9.35	9.16	-3.590	-1.13
9	33,92,93	Chemicals	15	9.37	3.68	-3.573	-1.03
20	84	Publishing	25	9.66	8.79	-3.278	-1.00
19	69,78	Apparel	30	9.8	8.76	-3.144	-1.01
15	63	Motor vehicle: Parts	10	10.27	5.92	-2.672	-0.71
26	41	Media Agencies	10	10.59	9.35	-2.353	-0.61
21	86	Business Support	35	10.97	8.59	-1.970	-0.64
5	37,57	Electronics: Parts and Equipments	34	12.22	9.46	-0.723	-0.23
11	58	Software	12	12.69	8.56	-0.255	-0.07
6	46	Distribution: Ind. Components	19	12.90	12.19	-0.045	-0.01
28	132	Medical Equipments & Supplies	13	12.94	7.98	*	*
24	87	Retail: Multidept.	13	13.07	7.15	0.128	0.03
27	95	Pharmaceuticals	12	13.32	6.82	0.382	0.08
14	60	Furniture + Floor covering	13	13.58	8.44	0.638	0.17
4	120	Engineering Fabrication	14	13.69	12.76	0.749	0.21
25	94	Broadcasting	13	15.46	10.88	2.515	0.68
13	59,62	Household apps & House ware	11	16.28	16.61	3.339	0.89
12	150,151	Computer services & Internet	14	16.33	11.84	3.388	0.95
		TOTAL	570	9.96	8.42		
		R-SQRD/R-SQRD (adj.)				10.3%	5.3%
		F-STATISTIC				2.04	
		P-VALUE				0.000	

The statistical software used for regression removed 'medical equipment and supplies' industry from regression, because it was highly correlated to other industries. The same industries, which had highest levels of capital gearing (e.g. motor vehicle: distribution, leisure facilities, malt beverages and distribution), also happen to have the lowest income gearing or coverage ratio. Likewise those industries, which had the lowest capital gearing like computer services, pharmaceuticals, etc have the highest income gearing.

Table 5.10: ANOVA results with dummy variables for SIGOITA

S/N	INDNUM	INDG	N	Mean	Std. Dev	Dummy var.coeff.	t-stat
18	67,68,72,114	Malt Beverages	24	0.03	0.02	-0.06	-3.08
24	87	Retail: Multidept.	13	0.03	0.01	-0.06	-2.70
9	33,92,93	Chemicals	15	0.03	0.02	-0.06	-2.57
15	63	Motor vehicle: Parts	10	0.04	0.02	-0.05	-2.11
3	74	Engineering: General	48	0.04	0.02	-0.04	-2.44
16	64	Motor vehicle: Distribution	14	0.04	0.03	-0.04	-1.98
1	30,32	Construction Materials	25	0.05	0.03	-0.04	-2.24
22	83	Food & Drug Retailers	12	0.05	0.05	-0.04	-1.72
17	71	Food Processors	27	0.05	0.07	-0.04	-1.94
4	120	Engineering Fabrication	14	0.05	0.03	-0.04	-1.65
2	36,39,43	Construction	51	0.05	0.03	-0.03	-1.94
14	60	Furniture + floor covering	13	0.05	0.02	-0.03	-1.53
19	69,78	Apparel	30	0.05	0.02	-0.03	-1.77
5	37,57	Electronics:Parts/ Component	34	0.06	0.04	-0.03	-1.60
13	59,62	Household apps. & Hse ware	11	0.06	0.03	-0.03	-1.20
6	46	Distribution: Ind. Components	19	0.06	0.04	-0.02	-1.17
8	31,50,51,97	Oil & Gas expl/prodn	11	0.07	0.05	-0.02	-0.88
23	69,90	Retail: Soft & Hard lines	28	0.07	0.05	0.02	-0.91
7	40	Distribution: Other	13	0.08	0.08	-0.01	-0.55
10	55	Leisure Facilities	14	0.08	0.06	-0.01	-0.51
25	94	Broadcasting	13	0.08	0.03	-0.01	-0.35
21	86	Business Support	35	0.09	0.10	0.00	-0.14
20	84	Publishing	25	0.09	0.11	0.00	0.00
28	132	Medical Equip. & Supplies	13	0.09	0.10	*	*
26	41	Media Agencies	10	0.09	0.09	0.01	0.21
27	95	Pharmaceuticals	12	0.10	0.10	0.01	0.64
12	150,151	Computer services & internet	14	0.11	0.08	0.02	1.08
11	58	Software	12	0.14	0.11	0.05	2.22
		TOTAL	570	0.06	0.06		
		R-SQRD/R-SQRD (adj.)				14.4%	10.1%
		F-STATISTIC				3.36	
		P-VALUE				0.000	

Minitab, the statistical software used for regression removed 'medical equipment and supplies' industry from regression, because it was highly correlated to other industries. This table confirms that business risk is negatively related to gearing because highly geared industries (at the top) like motor vehicle (distribution), motor vehicle (parts), food processors, malt and beverages, chemicals, and construction, are also the industries with lowest levels of business risk (as measured by SIGOITA). These industries have significant dummy variable coefficients. On the other hand, the least geared industries (at the bottom) like pharmaceuticals, software, computer services, and medical equipments, have the highest levels of business risk. The most risky industry, software, has a significant positive dummy variable coefficient.

Table 5.11: Results of Non-Parametric tests on gearing industry rankings

GEARING MEASURE	KRUSKAL-WALLIS (H) TEST	CRITICAL CHI-SQUARE VALUE χ^2 AT .01 LEVEL (D.F =27)
	BOOK VALUE GEARING MEASURES	
TLp/TA-BV	89.46	46.96
Dp/TA-BV	83.17	46.96
Dp/E-BV	80.78	46.96
Dp/CAP	75.54	46.96
LTDP/TA-BV	64.38	46.96
STD/TA-BV	75.6	46.96
CL/TA-BV	121.14	46.96
EBITDA/I	64.43	46.96
	MARKET VALUE GEARING MEASURES	
TLp/TA-MV	187.29	46.96
Dp/E-MV	118.01	46.96
Dp/CAP-MV	118.01	46.96
	OPERATING RISK PROXIES	
SIGOITA	117.56	46.96
CVEBITA	78.49	46.96
	PRODUCTION TECHNOLOGY PROXY	
FAn/TAn	212.98	46.96

The test statistic (H) in each case is greater than 46.963; the null hypothesis that the industry medians are all equal is rejected

Table 5.12: Firm-level business risk regression coefficients

	GEARING	SIGOITA	OBS.	R-sq (adj.)	F-STATISTIC
1	TLp/TA-BV	0.043 (0.41)	566	0	0.17
2	Dp/E-BV	-0.38 (-2.47)*	545	0.9	6.09
3	LTD/TA-BV	-0.02 (-2.77)*	362	1.8	7.7
4	STD/TA-BV	-0.083 (-2.50)*	562	0.9	6.27
5	CL/TA-BV	0.198 (2.10) a	570	0.6	4.42
6	EBITDA/I	-10.89 (-1.52)	505	0.3	2.32
7	TLp/TA-MV	-0.54 (-4.79)*	570	3.7	22.97
8	Dp/E-MV	-0.48 (-4.60)*	566	3.4	21.12

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, *a*, and *b* respectively. The numbers in the parentheses in column 3 are corresponding t-statistics.

Table 5.13: The combined influence of business risk and technology on firm gearing

	GEARING	SIGOITA	FAn/TAn	OBS.	R-sq (adj.)	F-STATISTIC
1	TLp/TA-BV	-0.10 (-0.98)	-.023 (-7.16)*	565	8.1	25.77
2	Dp/E-BV	-0.31 (-2.01)*	0.09 (1.82) b	544	1.3	4.63
3	LTD/TA-BV	-0.017 (-2.43) a	0.004 (1.59)	361	2.2	5.05
4	STD/TA-BV	-0.054 (-1.62)	0.042 (3.83)*	561	3.3	10.45
5	CL/TA-BV	-0.012 (-0.14)	-0.33 (-11.82)*	568	20.2	72.96
6	EBITDA/I	-13.5 (-1.85) b	-3.5 (-1.73) b	504	0.7	2.66
7	TLp/TA-MV	-0.60 (-5.31)*	-0.11 (-2.98)*	568	5.0	15.83
8	Dp/E-MV	-0.39 (-3.77)*	0.115 (3.36)*	564	5.1	16.23

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, *a*, and *b* respectively. The numbers in the parentheses in columns 3 and 4 are corresponding t-statistics.

Table 5.14: Industry level business risk regression coefficients

	GEARING	SIGOITA	OBS.	R-sq (adj.)	F-STATISTIC
1	TLp/TA-BV	0.407(0.81)	28	0	0.66
2	Dp/E-BV	-0.66 (-1.09)	28	0.7	1.19
3	LTD/TA-BV	-0.05 (-2.27)a	28	13.4	5.17
4	STD/TA-BV	-0.08 (-0.64)	28	0	0.41
5	CL/TA-BV	0.53 (0.94)	28	0	0.89
6	EBITDA/I	43.3 (1.98)b	28	9.8	3.94
7	TLp/TA-MV	-2.22 (-3.33)*	28	27.2	11.08
8	Dp/E-MV	-1.46 (-3.33)*	28	27.3	11.11

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, *a*, and *b* respectively. The numbers in the parentheses in columns 3 are corresponding t-statistics.

Table 5.15: The-combined influence of business risk and technology on industry gearing

	GEARING	SIGOITA	FAn/TAn	OBS.	R-sq (adj.)	F-STATISTIC
1	TLp/TA-BV	-0.13 (-0.27)	-0.26 (-2.58)a	28	16.8	3.73
2	Dp/E-BV	-0.39 (-0.58)	0.13 (0.97)	28	0.5	1.07
3	LTD/TA-BV	-0.055 (-1.98)b	0.001 (0.12)	28	10	2.5
4	STD/TA-BV	0.036 (0.27)	0.06 (2.14)a	28	10.1	2.52
5	CL/TA-BV	-0.29 (-0.58)	-0.40 (-3.94)*	28	35.5	8.44
6	EBITDA/I	32.6 (1.36)	-5.2 (-1.06)	28	10.2	5.54
7	TLp/TA-MV	-2.98 (-4.58)*	-0.38 (-2.81)*	28	42.4	10.95
8	Dp/E-MV	-1.39 (-2.83)*	0.036 (0.35)	28	24.7	5.43

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, *a*, and *b* respectively. The numbers in the parentheses in columns 3 and 4 are corresponding t-statistics.

Table 5.16: Persistency: Industry rankings from 1990 to 2000 using TLP/TA-BV

Industries			N	$\overline{X}$	Mean gearing rankings for each year from 1990 to 2000											Overall ranking	
S/N	INDNUM	INDG			90	91	92	93	94	95	96	97	98	99	00	Rank	SIG
16	64	M/ v: Distribn	14	.65	9	5	6	6	2	1	1	1	3	4	3	1	23
26	41	Med. agencies	10	.65	1	1	1	1	3	2	2	10	2	3	1	2	4
22	83	F&DRetailers	12	.62	2	3	5	2	4	6	8	5	5	5	2	3	21
6	46	Dist:Ind.comp	19	.57	5	16	12	14	11	10	9	2	8	8	4	4	13
2	36,39,43	Construction	51	.57	6	6	4	3	8	8	7	4	9	11	6	5	18
21	86	Bus. Support	35	.56	12	8	14	8	12	5	6	8	6	9	5	6	7
17	71	Food process	27	.54	17	12	10	10	5	4	5	9	7	12	8	7	20
20	84	Publishing	25	.53	14	4	3	9	10	11	10	6	11	6	7	8	6
15	63	M/ v: Parts	10	.53	8	13	17	16	15	15	14	18	14	18	15	9	25
3	74	Engin.: Gen	48	.53	10	15	15	11	13	16	15	14	18	14	9	10	24
12	150,151	Computer	14	.52	18	11	11	15	7	17	11	7	10	16	11	11	2
28	132	Medical Equi	13	.52	13	22	7	4	6	7	4	3	1	13	27	12	5
7	40	Distr.other	13	.51	11	10	24	20	16	12	12	11	19	22	21	13	10
23	66,90	Retail: S&H	28	.51	7	9	8	12	14	14	13	12	16	19	16	14	11
11	58	Software	12	.51	4	7	13	7	18	18	18	15	15	7	19	15	1
10	55	Leisure Facili	14	.50	3	2	2	5	1	3	3	13	26	23	20	16	9
1	30,32	Constr. mater	35	.50	16	14	9	13	9	13	16	16	17	1	22	17	22
25	94	Broadcasting	13	.49	25	25	25	25	21	21	19	17	4	10	10	18	8
9	33,92,93	Chemicals	15	.48	19	20	20	19	22	24	22	20	13	15	17	19	26
19	69,78	Apparel	30	.47	22	21	22	18	19	20	20	19	12	2	12	20	16
5	37,57	Electron.P&E	34	.46	21	18	18	22	24	22	21	23	20	20	14	21	15
14	60	Furnitre&floo	13	.46	15	19	19	21	23	25	23	24	22	24	25	22	17
4	120	Engin. Fabric	14	.45	20	23	21	17	20	19	17	21	21	21	23	23	19
13	59,62	Households	11	.44	23	24	23	24	17	23	25	22	25	28	24	24	14
8	50,51,97	Oil &Gas	11	.40	24	17	16	23	27	26	24	25	24	27	28	25	12
24	87	Retail: Multi	13	.40	26	27	28	28	26	27	27	26	28	26	26	26	27
18	67,68,72	Malt Bevges	24	.38	27	26	27	27	28	28	26	27	27	25	18	27	28
27	95	Pharmaceutic	12	.37	28	28	26	26	25	9	28	28	23	17	13	28	3

Explanation: Names of industries are given in full in table 5.20; space does not allow some full names in this table. However, identification is possible. The aim of this table is to show the mean gearing ratio rankings for each year from 1990 to 2000, as well as the mean for the entire sample period (1985-2000), and relating these to the level of business risk as measured by the ratio of standard deviation of operating income divided by total assets (SIGOITA), for the entire sample period. S/N is the industry serial number given to a particular industry in table 7.1.9, INDNUM refers to DataStream industry number, and INDG is the DataStream industry group name. $\overline{X}$, denotes the cross-sectional mean gearing ratio for 16-years from 1985 to 2000, the mean is presented in descending order. Under 'overall ranking', 'rank' gives the position of a particular industry according to its cross-sectional mean for the 16-years, starting with the highest geared industry to the lowest geared, and 'SIG' denotes the corresponding ranking for the measure of business risk, SIGOITA.

Interpretation: Industry rankings exhibit persistency for the 1990-2000 period. There is also evidence that business risk is negatively related to gearing, as some of the highly geared industries like both motor vehicle industries, food & drug retailers, and food processors, are also the least risky industries. On the other hand, the least geared industry, pharmaceuticals, is one of the risky industries, as it ranks third.

Table 5.17: Persistency: Industry rankings from 1990 to 2000 using Dp/TA-BV

Industries			*N*	$\overline{X}$	*Mean gearing rankings for each year from 1990 to 2000*											*Overall ranking*	
S/N	INDNUM	INDG			90	91	92	93	94	95	96	97	98	99	00	Rank	SIG
8	50,51,97	Oil & Gas	11	.15	1	1	1	1	1	1	2	5	3	3	10	1	12
20	84	Publishing	25	.15	4	3	2	8	12	10	5	1	8	2	1	2	6
9	33,92,93	Chemicals	15	.14	8	9	9	5	7	13	8	3	1	1	3	3	26
10	55	Leisure Facili	14	.13	2	4	6	4	4	4	9	10	16	16	9	4	9
15	63	M/ v: Parts	10	.13	11	8	6	10	13	9	10	14	7	6	4	5	25
17	71	Food process	27	.12	12	13	10	11	3	3	1	8	4	9	8	6	20
18	67,68,72	Malt Bevges	25	.12	15	16	14	13	8	8	4	4	6	8	2	7	28
22	83	F&DRetailers	12	.12	3	5	4	15	10	14	13	6	5	4	6	8	21
1	30,32	Constr. mater	35	.11	7	6	3	2	6	5	3	7	11	13	15	9	22
3	74	Engin.: Gen	48	.11	5	11	12	17	17	12	14	13	10	5	7	10	24
23	66,90	Retail: S&H	28	.11	6	2	8	3	2	6	7	9	14	14	14	11	11
28	132	Medical Equi	13	.11	18	18	15	14	16	16	11	2	2	11	16	12	5
21	86	Bus. Support	35	.10	16	19	21	23	18	18	16	17	12	12	12	13	7
16	64	M/v: distrbn	14	.10	13	10	11	6	9	7	6	11	15	18	13	14	23
6	46	Dist:Ind.comp	19	.10	23	25	26	25	25	26	23	12	9	7	5	15	13
2	36,39,43	Construction	51	.08	14	14	19	12	14	11	12	15	19	20	19	16	18
5	37,57	Electron.P&E	34	.08	19	22	20	18	15	15	15	19	17	15	11	17	15
25	94	Broadcasting	13	.08	22	26	23	26	22	23	19	25	13	10	18	18	8
26	41	Med.agencies	10	.07	10	12	7	16	23	25	24	23	27	19	26	19	4
7	40	Distr.other	13	.07	17	20	22	21	24	24	25	21	24	22	22	20	10
14	60	Furnitre&floo	13	.07	9	7	5	19	20	19	22	22	25	25	27	21	17
13	59,62	Households	11	.06	21	21	17	20	26	21	26	18	18	21	20	22	14
11	58	Software	12	.06	28	23	27	28	28	27	28	26	22	17	17	23	1
27	95	Pharmaceutic	12	.06	25	17	18	9	5	2	21	27	21	24	21	24	3
19	69,78	Apparel	30	.06	24	27	24	27	21	22	17	20	23	23	24	25	16
24	87	Retail: Multi	13	.05	26	24	25	22	19	20	20	24	26	26	23	26	27
12	150,151	Computer	14	.05	20	15	13	7	11	17	18	16	20	27	25	27	2
4	120	Engin. Fabric	14	.03	27	28	28	24	27	28	27	28	28	28	28	28	19

Explanation: Names of industries are given in full in table 5.20; space does not allow some full names in this table. However, identification is possible. The aim of this table is to show the mean gearing ratio rankings for each year from 1990 to 2000, as well as the mean for the entire sample period (1985-2000), and relating these to the level of business risk as measured by the ratio of standard deviation of operating income divided by total assets (SIGOITA), for the entire sample period. S/N is the industry serial number given to a particular industry in table 7.1.9, INDNUM refers to DataStream industry number, and INDG is the DataStream industry group name. $\overline{X}$, denotes the cross-sectional mean gearing ratio for 16-years from 1985 to 2000, the mean is presented in descending order. Under 'overall ranking', 'rank' gives the position of a particular industry according to its cross-sectional mean for the 16-years, starting with the highest geared industry to the lowest geared, and 'SIG' denotes the corresponding ranking for the measure of business risk, SIGOITA.

Interpretation: Generally most industry rankings show persistency for the whole of the 1990-2000 period. The inverse relation between industry gearing ratios and the level of business risk is also evident as highly geared industries like chemicals, motor vehicle parts, and malt beverages are actually the least risky three industries in the sample. On the other hand, the less geared industries like computer services & internet, pharmaceuticals, and Software, are actually the first three industries with the highest level of business risk.

Table 5.18: Persistency: Industry rankings from 1990 to 2000 using Dp/E-MV

Industries			*N*	$\overline{X}$	*Mean gearing rankings for each year from 1990 to 2000*											*Overall ranking*	
S/N	INDNUM	INDG			90	91	92	93	94	95	96	97	98	99	00	Rank	SIG
16	64	M/v: distrbn	14	.33	3	5	6	6	2	2	1	1	1	1	1	1	23
18	67,68,72	Malt Bevges	25	.22	18	12	13	10	9	9	5	3	6	4	2	2	28
2	36,39,43	Construction	51	.21	2	3	4	3	5	5	3	5	9	9	11	3	18
8	50,51,97	Oil & Gas	11	.20	7	2	2	1	1	1	6	9	16	7	17	4	12
1	30,32	Constr. mater	35	.20	8	1	1	5	8	8	4	2	4	11	14	5	22
3	74	Engin.: Gen	48	.19	11	8	9	11	12	12	12	11	7	3	3	6	24
17	71	Food proces	27	.19	12	10	3	8	4	4	2	4	11	8	7	7	20
10	55	Leisure Facili	14	.19	1	6	7	4	6	6	9	12	13	13	8	8	9
15	63	M/ v: Parts	10	.17	6	4	12	12	16	16	11	16	3	5	6	9	25
20	84	Publishing	25	.16	14	13	5	17	18	18	15	14	18	15	15	10	6
23	66,90	Retail: S&H	28	.16	9	9	8	6	10	10	10	10	12	14	13	11	11
9	33,92,93	Chemicals	15	.15	13	16	17	14	14	14	8	7	2	2	4	12	26
14	60	Furnitre&floo	13	.13	10	11	10	15	7	7	14	13	14	17	19	13	17
7	40	Distr.other	13	.12	4	7	11	13	20	20	16	18	21	16	22	14	10
5	37,57	Electron.P&E	34	.12	16	19	16	19	21	21	18	20	20	20	16	15	15
21	86	Bus. Support	35	.12	15	15	18	23	13	13	17	19	15	18	10	16	7
26	41	Med.agencies	10	.12	5	18	27	2	3	3	22	24	24	19	25	17	4
19	69,78	Apparel	30	.11	21	22	22	21	22	22	7	8	8	12	12	18	16
6	46	Dist:Ind.comp	19	.11	19	14	15	20	15	15	19	6	5	10	9	19	13
22	83	F&DRetailers	12	.11	17	24	19	18	19	19	13	15	10	6	5	20	21
4	120	Engin. Fabric	14	.07	23	25	14	7	25	25	25	25	23	22	23	21	19
13	59,62	Households	11	.06	26	26	20	22	27	27	27	21	17	21	18	22	14
24	87	Retail: Multi	13	.06	22	21	23	24	11	11	20	22	26	24	20	23	27
28	132	Medical Equi	13	.06	27	20	25	25	24	24	21	17	19	23	24	24	5
12	150,151	Computer	14	.04	25	17	26	16	23	23	24	23	28	27	27	25	2
25	94	Broadcasting	13	.04	20	27	21	26	26	26	23	26	25	25	28	26	8
27	95	Pharmaceutic	12	.03	28	23	28	27	17	17	26	27	22	26	26	27	3
11	58	Software	12	.02	24	28	24	28	28	28	28	28	27	28	21	28	1

Explanation: Names of industries are given in full in table 5.20; space does not allow some full names in this table. However, identification is possible. The aim of this table is to show the mean gearing ratio rankings for each year from 1990 to 2000, as well as the mean for the entire sample period (1985-2000), and relating these to the level of business risk as measured by the ratio of standard deviation of operating income divided by total assets (SIGOITA), for the entire sample period. S/N is the industry serial number given to a particular industry in table 7.1.9, INDNUM refers to DataStream industry number, and INDG is the DataStream industry group name. $\overline{X}$, denotes the cross-sectional mean gearing ratio for 16-years from 1985 to 2000, the mean is presented in descending order. Under 'overall ranking', 'rank' gives the position of a particular industry according to its cross-sectional mean for the 16-years, starting with the highest geared industry to the lowest geared, and 'SIG' denotes the corresponding ranking for the measure of business risk, SIGOITA.

Interpretation: Though the order of rankings changes form one measure of gearing to another, but most of the highly geared industries are still highly geared, and the rankings are persistent over the years. Gearing is inversely related to business risk as the highly geared industries also exhibit low levels of risk. Examples are, motor vehicle industries, malt beverages, and engineering: general. The least geared industries with highest levels of business risk are software, pharmaceuticals, computer & internet, and medical equipments & supplies.

Table 5.19: Persistency: Industry rankings from 1990 to 2000 using STD/TA-BV

Industries			*N*	$\overline{X}$	*Mean gearing rankings for each year from 1990 to 2000*											*Overall ranking*	
S/N	INDNUM	INDG			90	91	92	93	94	95	96	97	98	99	00	Rank	SIG
20	84	Publishing	25	.10	6	1	5	11	14	13	15	3	7	2	6	1	6
15	63	M/ v: Parts	10	.09	7	2	12	2	4	5	1	9	19	15	1	2	25
9	33,92,93	Chemicals	15	.09	5	4	6	5	10	18	3	2	1	1	5	3	26
17	71	Food process	27	.08	11	13	9	10	1	2	2	4	2	3	3	4	20
10	55	Leisure Facili	14	.08	1	3	1	19	19	4	6	8	14	14	13	5	9
22	83	F&DRetailers	12	.08	21	15	3	12	15	22	14	13	4	4	2	6	21
18	67,68,72	Malt Bevges	25	.08	15	12	11	9	3	6	5	1	5	7	4	7	28
21	86	Bus. Support	35	.07	9	11	16	14	12	16	13	10	3	8	9	8	7
28	132	Medical Equi.	13	.07	14	17	14	16	8	9	18	14	10	10	14	9	5
16	64	M/v: distrbn.	14	.07	13	9	8	6	2	3	4	5	9	16	7	10	23
8	50,51,97	Oil & Gas	11	.07	12	20	4	8	7	1	9	21	8	11	11	11	12
1	30,32	Constr. mater.	35	.06	2	5	7	4	6	7	7	6	6	12	20	12	22
23	66,90	Retail: S&H	28	.06	17	8	10	7	9	10	12	11	15	17	17	13	11
3	74	Engin.: Gen	48	.06	4	14	15	13	18	15	11	16	11	5	8	14	24
11	58	Software	12	.05	25	18	21	22	26	14	26	19	12	6	10	15	1
26	41	Med.agencies	10	.05	3	6	2	1	5	17	23	24	28	19	26	16	4
6	46	Dist:Ind.comp	19	.05	20	22	24	21	22	24	22	12	17	18	12	17	13
25	94	Broadcasting	13	.05	23	26	25	27	27	25	20	27	23	9	15	18	8
2	36,39,43	Construction	51	.05	10	16	13	3	13	8	8	15	20	20	23	19	8
5	37,57	Electron.P&E	34	.04	19	21	20	15	11	12	10	18	18	13	16	20	15
27	95	Pharmaceutic	12	.04	18	28	19	18	16	20	17	25	16	22	19	21	3
13	59,62	Households	11	.04	16	10	18	25	28	26	21	7	13	28	18	22	14
7	40	Distr.other	13	.04	22	19	23	20	21	19	25	22	25	27	25	23	10
12	150,151	Computer	14	.04	27	23	27	24	25	27	27	20	24	21	21	24	2
14	60	Furnitre&floo	13	.03	8	7	17	17	17	21	24	26	22	25	27	25	17
19	69,78	Apparel	30	.03	24	24	22	26	23	23	19	17	21	26	24	26	16
24	87	Retail: Multi	13	.03	28	27	28	28	20	11	16	23	27	23	22	27	27
4	120	Engin. Fabric	14	.02	26	25	26	26	23	28	28	28	26	24	28	28	19

Explanation: Names of industries are given in full in table 5.20; space does not allow some full names in this table. However, identification is possible. The aim of this table is to show the mean gearing ratio rankings for each year from 1990 to 2000, as well as the mean for the entire sample period (1985-2000), and relating these to the level of business risk as measured by the ratio of standard deviation of operating income divided by total assets (SIGOITA), for the entire sample period. S/N is the industry serial number given to a particular industry in table 7.1.9, INDNUM refers to DataStream industry number, and INDG is the DataStream industry group name. $\overline{X}$, denotes the cross-sectional mean gearing ratio for 16-years from 1985 to 2000, the mean is presented in descending order. Under 'overall ranking', 'rank' gives the position of a particular industry according to its cross-sectional mean for the 16-years, starting with the highest geared industry to the lowest geared, and 'SIG' denotes the corresponding ranking for the measure of business risk, SIGOITA.

Interpretation: Like in all immediately preceding tables industry rankings exhibit persistency over the whole period shown. In addition to the industries mentioned in the preceding tables, another good example of an inverse relationship between gearing and business risk is food processors industry.

Table 5.20: Sample Industries

S/N	INDNUM	INDG	N
1	30,32	Construction materials	35
2	36,39,43	Construction	51
3	74	Engineering: General	48
4	120	Engineering: Fabrication	14
5	37,57	Electronics: Parts & Equipments	34
6	46	Distribution: Industrial Components	19
7	40	Distribution: Other	13
8	31,50,51,97	Oil & Gas Exploration and Production	11
9	33,92,93	Chemicals	15
10	55	Leisure Facilities	14
11	58	Software	12
12	150,151	Computer services & internet	14
13	59,62	Household appliances & House ware	11
14	60	Furniture & Floor covering	13
15	63	Motor vehicles: Parts	10
16	64	Motor vehicles: Distribution	14
17	71	Food processors	27
18	67,68,72,114	Malt Beverages	24
19	69,78	Apparel	30
20	84	Publishing	25
21	86	Business Support	35
22	83	Food & Drug Retailers	12
23	66,90	Retail: Soft & Hard lines	28
24	87	Retail: Multi-departments	13
25	94	Broadcasting	13
26	41	Media Agencies	10
27	95	Pharmaceuticals	12
28	132	Medical Equipments & Supplies	13
		TOTAL	570

Column two show the DataStream industry number (INDNUM), and column three shows the DataStream industry group name (INDG). Some of industries are combined into a bigger industry group as column two reveals. This combination produced a total of 28 industries, which formed the sample for industry effect analysis. Column four shows the number of firms per industry. Column one is simply the serial number assigned to each of the resulting 28 industries for easy identification and reference.

Figure 5.1: Normal Probability Plot for TL/TA

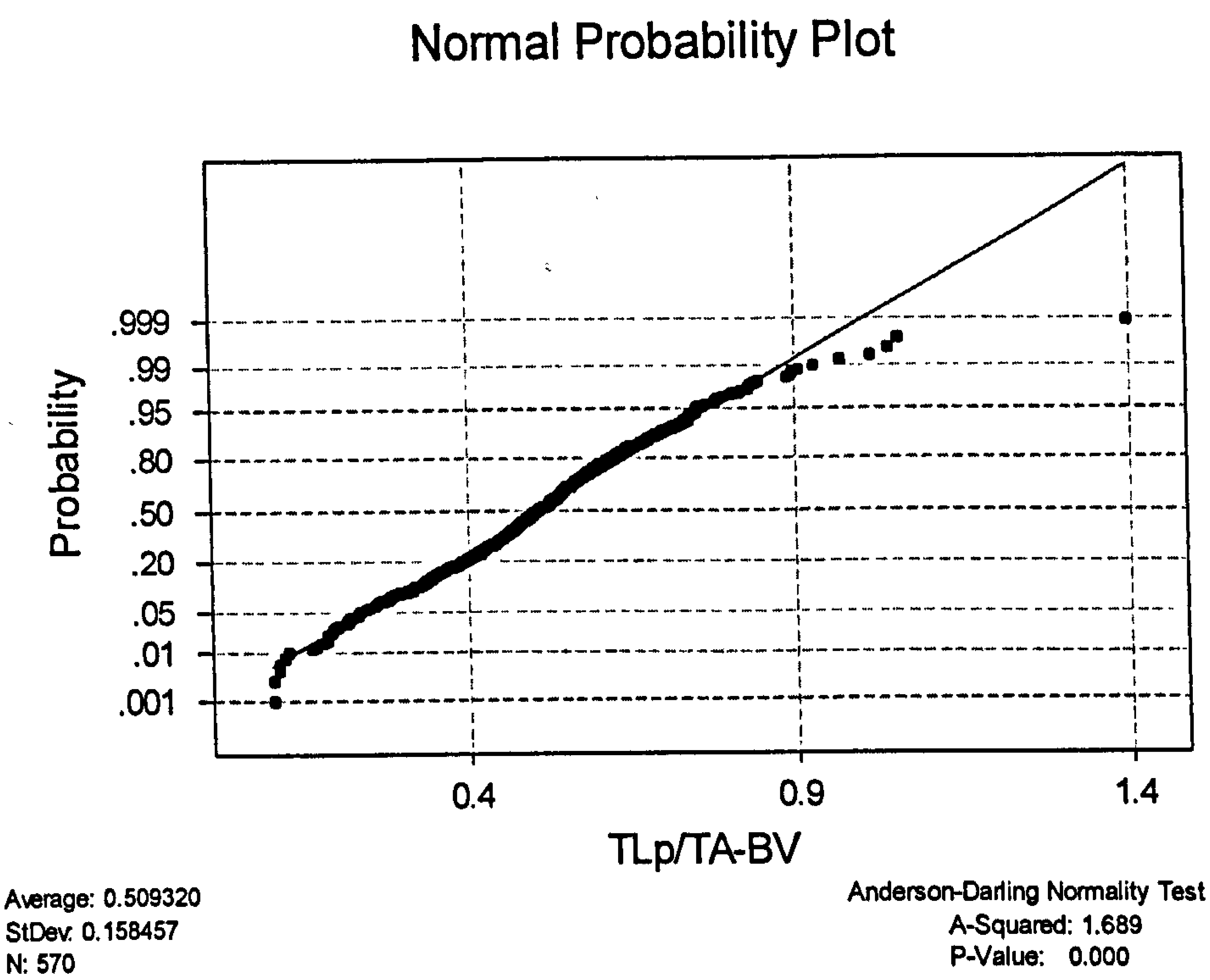
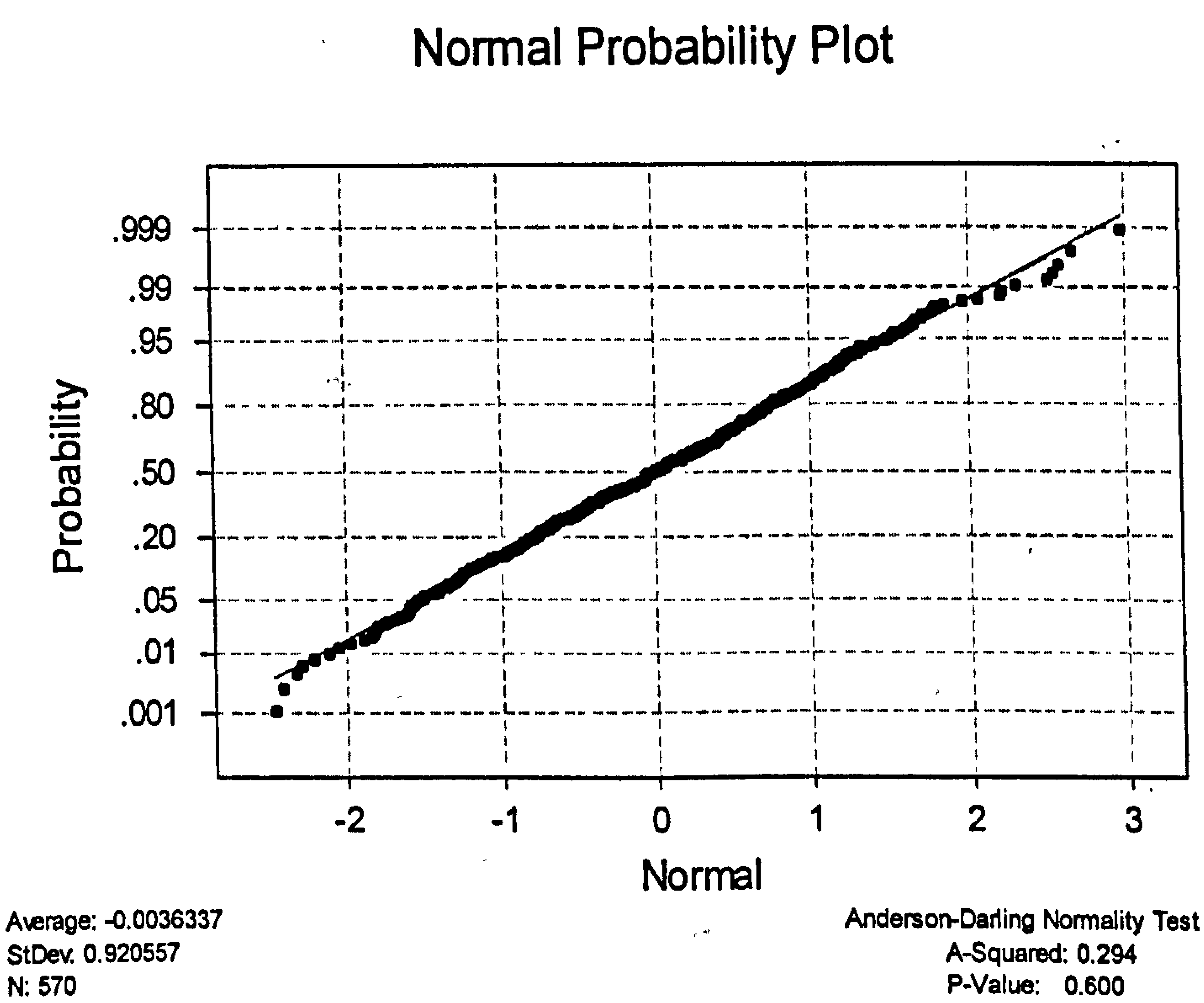


Figure 5.2: Normal Probability Plot for Normal distribution



Chapter 6

6 DYNAMICS: LONG-RUN TARGET RATIO ADJUSTMENT

6.1 Introduction

Most empirical studies on determinants of capital structure approach this issue on a static basis; mainly by using cross-sectional analysis to explore the relationship between the firm's gearing level and its hypothesised determinants. These studies normally use either one of the standard regression estimation techniques and rely on the significance of the regression coefficients to identify which of the hypothesised determinants influence the capital structure choices of companies. Alternatively, others have used a factor analytic technique to generate structural coefficients. These can be analysed in a similar way to conventional regression coefficients. As explained in chapter five, factor analytic technique allows more than one proxy per independent variable to be used in a single model.

The most common feature is that static models average the data variables and test them as if they occur at one point in time. Cross-sectional regressions therefore measure an 'average response' (Fama and French, 2003, 2). If managers adjust their capital structures, we would expect them to effect such adjustments in response to the changing firm specific and/or macro-economic factors having an impact on their environment. Standard cross-sectional methodologies ignore the capital structure adjustments and therefore fail to capture some important capital structure determinants, which can only be captured by looking at capital structure in a dynamic context. Nivorozhkin (2004), Welch (2004), and Kayhan and Titman (2003), among others, find that the dynamic models provide more insight into the behaviour of companies than simple static models. That being the case this chapter investigates the process of capital structure adjustment, the determinants and the speed of that adjustment process. Even if managers do not deliberately change their capital structure as some studies have claimed, it is still important to investigate what else drive the changes in corporate capital structure over time and how such changes are likely to impact on the value of such corporations.

This chapter is organised as follows: section two provides a review of previous research on capital structure dynamics. The section is mainly concerned with those studies that focus on the adjustments towards a long-run optimal capital structure, and on the speed of adjustment to this target debt ratio. Section three describes the two methodologies used in this chapter. Two methodologies (OLS-regression and Structural equation modelling) are used in the investigation of target capital structure adjustments and speed. Results are presented in section four, and section five summarises and concludes the chapter.

6.2 Previous works on capital structure adjustment process

Modigliani and Miller's (1958) irrelevancy proposition rests on the assumption of 'perfect capital markets'. While capital markets generally function well, they are not always perfect. This implies that the MM may not hold in certain instances. Most extensions to MM irrelevance propositions, and even extensions to Miller (1977) model have tried to identify instances and types of capital market imperfections, which may cause debt ratios to be relevant (or optimal). However, there is still no unified theory as to whether firms have optimal debt ratios and/or whether firms actually strive to maintain such ratios, if they exist at all.

Though there have been several US studies looking at dynamics of capital structure, in the UK such studies are still lacking. This study is therefore an addition to the very few studies looking at capital structure dynamics by using panel data from UK companies. This part of the study is a close relative to studies undertaken by Taggart (1977), Jalillvand and Harris (1984), Auerbach (1985), Shyam-Sunder and Myers (1999), Barnejee (2000), and Kayhan and Titman (2003) for the US, and the UK study undertaken by Ozkan (2001). Other similar studies include Drobetz and Fix (2003) which examines Swiss firms, and Nivorozhkin (2004) which considers the two transitional economies of Czech Republic and Bulgaria.

These studies emphasize the adjustments towards a firm's long-run target debt-equity ratio. Some also look at the existence of any adjustment costs, and others examine the speed of the adjustment process. For example, Taggart (1977) documents that despite divergent arguments, by that time (1977), there appeared to exist some consensus that the target debt ratio was determined by *corporate taxes*, *financial distress costs*, and *rationing by lenders*-and that this ratio is expressed in terms of market values (for example the ratio of market value of debt to the market value of equity).[25] Taggart's (1977) empirical model which is based on the interrelationships of balance sheet items, provides evidence that the speed of adjustment towards the long term target ratio tends to be relatively slow, and that this leads to a situation where liquid assets and short term debt are used by firms in order to meet the short-run financing needs which arise from temporary fluctuations.

Marsh (1982) used logit analysis to develop a descriptive model of the choice between equity and long-term debt. His model revealed that companies are heavily influenced by both market conditions and past history of security prices when they choose between debt and equity. Marsh (1982) contends that the existence of significant flotation costs and the need to minimize them, coupled with the costs of deviating from firms' target ratios, give rise to infrequent 'lumpy' issues, with debt ratios over time fluctuating around the target. The results of tests designed to confirm his model's predictive ability provide some evidence that companies in aggregate appear to make financing decisions as if they had a target level of debt in mind; and that these targets are influenced by *firm size*, *bankruptcy risk* and *asset composition*.

Marsh also stated that although firms try to maintain their debt ratios, market conditions force them to deviate behind these targets. While Taggart (1977) reports that both *the level* and *the structure of interest rates* are important

[25] The expression of debt ratios in terms of market values is also supported by Bennett and Donnelly (1993) in their cross-sectional study when they argue that theory (MM propositions) is prescribed in terms of market values. Section 4.7.3 discussed the pros and cons of using market and book values.

determinants of the level of long term debt issues in the USA, Marsh (1982) cites his earlier study (i.e. Marsh, 1977), which found that interest rates have a much weaker effect in capital structures of UK firms.

In their empirical investigation into the process of partial adjustment, Jalilvand and Harris (1984) allow the speeds of adjustment to vary across firms and over time, depending on firm size and capital market conditions. Their results suggest that firms adjust to long-term financial targets, and also that firm size, interest rate conditions, and stock price levels influence the speed of adjustment.

Perhaps to avoid the use of a constant target ratios used by both Marsh (1982), and Jalilvand and Harris (1984), Auerbach (1985) uses partial adjustment model in which target debt ratios are allowed to change over time. Auerbach (1985) finds that there is a rapid speed of adjustment, particularly for short-term debt towards the desired ratios of debt. Some more recent works in this area include, Shyam-Sunder and Myers (1999), which tests the relative explanatory power of target adjustment model against pecking-order predictions and find that the pecking-order model has much greater time-series explanatory power than a static trade-off model. In another study Barnejee (2000) utilises a capital structure adjustment model, which does not assume the observed capital structure to be the optimal, and proceeds to identify the factors affecting the target ratio and estimate e speed of adjustment to this target ratio.

In a survey of US chief financial officers (CFOs), Graham and Harvey (2001) document that 37% of firms have a flexible target debt ratio, 34% have somewhat tight target ratio, or range, and only 10% have a strict target ratio. These findings are consistent with both the static trade off theory, and the argument that target ratios may be flexible. Drobetz and Fix (2003) use a simple target adjustment model and find that firms adjust to long-term financial target. More recently, Kayhan and Titman (2003) have reported their findings that firms behave as if they have target debt ratios although their cash flows, investment needs, and stock price fluctuations result in transitory deviations from these targets. In Nivorozhkin (2004) dynamic adjustment model, gearing responds positively to firm size, and negatively to profitability, tangibility, and volatility.

Lack of capital structure dynamics studies that have used UK data is evidenced by the fact that since Marsh (1982) (the first to examine capital structure adjustment process in the UK), which analysed the choice of financing between debt and equity, there was no other study for almost twenty years. It is only recently that Ozkan (2001) reported additional evidence in this area. Ozkan (2001) estimates a partial adjustment model using the General Method of Moments (GMM), and focuses on the dynamics of capital structure and the nature of adjustment process.

Because Ozkan (2001) addresses some of the issues considered in this study, we shall consider his study in a more detail and highlight the differences between the two. Ozkan (2001) finds that firms have long-term leverage ratios and that they adjust to the target ratio relatively quickly. Consistent with the received wisdom, Ozkan finds that non-debt tax shields, liquidity, and growth opportunities, exert a negative impact on firms' gearing decisions, but finds only limited evidence to support the hypothesised positive effect by firm size. He also does not find a significant relationship between 'tangible assets' and gearing.

As discussed earlier, Ozkan (2001) seems to have perpetuated the confusion inherent in most previous similar studies that tested profitability as a determinant of capital structure. For example, he does not separate *past* from current profitability, and does not use *past profitability* to test the pecking order theory which is specified in terms of past profitability (i.e. retained earnings). Ozkan, therefore, finds results which are inconsistent with the underlying theory. Ozkan's findings are also inconsistent with the findings of many other previous empirical studies (see for example Bennett and Donnelly (1993), Rajan and Zingales (1995), Barclay *et al.*, (1999) and, Bevan and Danbolt (2002) to mention a few). Problems with profitability aside, Ozkan (2001) differs from this study in that Ozkan did not look at many other hypothesised determinants of capital structure such as industry classification, volatility of earnings (returns), probability of bankruptcy, free cash flow, and collateralizable assets. This study examines all these, as well as including those tested by Ozkan. For comparison purposes, table 6.1 summarises the salient features of selected previous capital structure dynamics studies.

Although both are UK studies, and both make use of panel data, this study also differs from Ozkan (2001) in terms of the methodologies adopted. While Ozkan (2001) uses GMM estimation, this study embarks on a comparison of the conventional OLS regression estimation against structural equation modelling (SEM) technique known as SEPath. As part of investigation into the dynamics of capital structure, this study also investigates the role of interest rates, tax rates, and other recent theories such as equity market timing (Baker and Wurgler, 2002), and stock returns (Welch, 2002, 2004) effects in capital structure. Ozkan does not venture into these areas.

6.2.1 *On the speed of adjustment to the target debt ratio*

Few studies have analysed the speed of capital structure adjustment. As mentioned earlier, Taggart (1977) found that the speed of adjustment towards the target ratio is rather slow and reported that both *the level* and *the structure of interest rates* are important determinants of the level of long-term debt issues. Jalilvand and Harris (1984) find that firm size, interest rate conditions, and stock price levels influence the speed of adjustment. In his partial adjustment model Auerbach (1985) found that there is a rapid speed of adjustment, particularly for short-term debt towards the desired ratios of debt.

Like Auerbach (1985) but contrary to Taggart (1977), Ozkan (2001) finds the speed to be relatively fast. These are some of the few contradictions this study aims to investigate. The hypothesis tested here is hypothesis 4.3.11. i.e. whether UK companies' capital structures confirm the existence of an optimal capital structure and if so how do these companies adjust towards their target debt ratio, and what factors do affect the adjustment and the speed of that process.

6.3 Empirical Analysis

6.3.1 Introduction

While the extensions to MM irrelevance propositions have succeeded to pinpoint (and even to verify) various imperfections in capital markets, which may make one debt to equity ratio preferable to any other (for example Jensen and Meckling, 1976; Myers, 1977; and De Angelo and Masulis, 1980), they have not been able to come up with a means of identifying the optimal debt ratio. In an attempt to model the process of capital structure adjustment, several empirical studies however, have attempted to come up with proxies for the unobservable target debt ratio.

Because the target ratio is unobservable Marsh (1982) suggests that we may look at past behaviour to approximate, albeit crudely, the target ratios a company had in mind when it was making financing decisions. This would imply taking some n- years average debt ratio as a proxy for the long run target ratio. It is noteworthy to mention here that there are problems associated with this approach. First, as argued by Jalivand and Harris (1984), there are no *a priori* reasons for the target ratios to be constant over time. As Marsh (1982) admits, target ratios themselves may change over time. Ideally, if its determinants change following changes in either a firm's operations and or the economic environment, the (unobservable) optimal debt ratio should also change over time. Changes in tax rates for example (see Jalilvand and Harris, 1984) and share price movement (see Taggart, 1977; Marsh, 1982; and Welch, 2002, 2004) are among the factors that may shift the optimal debt ratio for a firm.

Secondly, Jalilvand and Harris (1984) contend that the adjustment costs or constraints may prevent firms from complete adjustment to the long run target and instead forces them to follow a partial adjustment. If this argument is correct then a proxy taken by observing past behaviour may only capture the effects of this partial adjustment.

This study does not try to come up with some estimated constant (or even a changing) proxy for target debt ratio. Such proxies may not have theoretical support (Marsh, 1982; Jalivand and Harris, 1984), and may be fraught with measurement errors (Jalivand and Harris, 1984); this study simply examines the observed changes in the hypothesised determinants of the target ratio in relation to the observed changes in gearing ratios over time.[26] By focussing on changes, this study actually analyses the derivative of the optimal capital structure with respect to its likely determinants (see Givoly *et al.,* 1992). Using two alternative methods; conventional OLS regression estimates, and a factor analytic technique - SEM (SEPath), whose specifications are presented and discussed at length in chapter five this study proceeds to examine the capital structure adjustment process and factors influencing that process. The same panel data of 651 UK companies from 1985 to 2000 is used for the analysis in this chapter. This data was described in section 4.5 in chapter four.

The hypothesised determinants tested in this chapter are those that are strongly supported by, the theory and previous empirical works cited above, and also by survey studies such as that of Stonehill *et al.,* (1973), and Pinegar and Wilbricht (1989). The proxies (or indicator variables, as they are called in factor analysis) have been selected on the basis of close linkages between them and the attributes they are supposed to measure. The cross-sectional results from tests in chapter four have reinforced the choice of these determinants.

The use of changes in determinants to track the changes in gearing ratios seems more realistic than the use of some arbitrary constant or changing target ratio used by some previous studies like Marsh (1982) and Jalilvand and Harris (1984). The tests in the current study seek to establish if changes in such hypothesised determinants are persistently related to corresponding changes in gearing ratios in the manner prescribed by the theory. These determinants comprise all those determinants identified in the cross-sectional analysis part; in

[26] This links with the views of Marsh (1982), who argued that, "since target ratios are unobservable, we need to concern ourselves with their likely determinants" p.123.

addition, interest rate, and corporate tax rate have been added to the determinants. The effects of interest rate and corporate tax rate on gearing can only be meaningfully investigated in a dynamic context (see for example, Givoly, *et al*, 1992).

The period from 1985 to 2000 provides a suitable opportunity for tracking the relationship between capital structure adjustments and interest rates. As depicted in figure 6.1, in the UK the interest rate in January 1985 was 11.8%, and this rate rose to a maximum of 14.9% in October 1989 and stayed around this level up to early 1991 before starting to fall steadily. Between 1993 and 2000 the interest rate was never above 7.5 percent, and beyond 2001 the interest rate fell even further to 4 percent. These interest rate movements provides ample opportunity to test whether there is a significant relationship between the level of interest rates and companies' financing decisions.

This study also investigates the cumulative effects of equity market timing on capital structure, as well as the long-run impact of share price movement on capital structure. If such relationships are also confirmed by some prior empirical research, then that would constitute corroborating evidence that firms adjust their capital structures towards the (unobservable) target debt ratio. The confirmed determinants (among the tested ones) will be the determinants of that target ratio. The following sections specify the models that are used to test hypotheses.[27]

6.3.2 *Adjustments towards an optimal capital structure*

6.3.2.1 *Moving window regression model*

The moving window regression model is employed for testing hypothesis that UK companies adjust their capital structure towards an optimal target ratio in response to changes in factors, which influence capital structure. In this model

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[27] Hypotheses 4.3.11 to 4.3.13 will be tested by using the models described in this chapter.

the following procedure is followed: in order to reduce measurement errors and contain the noise from yearly fluctuations all variables are smoothed by the use of three year moving averages. Only data from 1990 to 2000 is used for this model. The period 1985 to 1989 is omitted because for this period some of the firms in the sample do not have all the relevant data. The averages for the independent variables are defined as follows:

$$X_{i\bar{3}_t} = \left(X_{i_{t-3}} + X_{i_{t-2}} + X_{i_{t-1}}\right)/3. \qquad (6.2.1).$$

And the averages for gearing measures are defined as:

$$Lev_{\bar{3}_t} = \left(Lev_{t-2} + Lev_{t-1} + Lev_t\right)/3. \qquad (6.2.2)$$

As equations 6.2.1 and 6.2.2 show, for a start there is a lag of one year between the average for dependent variables and the average for independent variables. This lag is increased first to two years, and then to three years. Each number of lags has two windows (window I and window II). The windows simply separate the regressions relating to the earlier and later years of the 1990s. For example in table 6.2, window I regresses the change in gearing from 1991-93 average to 1994-96 average on the change in exogenous variables from the 1990-92 average to 1993-95 average. Window II regresses the change in gearing from 1994-96 average to 1997-99 average on the change in exogenous variables from the 1993-95 average to 1996-98 average. The independent variables' averages are calculated from 1990 to 1998. The dependent variable averages are calculated from 1991 to 1999 for the one-year lag case, and from 1990 to 2000 for the two-years lag case.

The lags between the independent variables and the dependent variable are used in order to relate gearing to the proxies (attributes) of independent variables obtaining earlier when the capital structure decision was made. For example, the smoothed proxies for independent variables for the first window are the differences between the averages for years 1993, 1994, and 1995, minus the averages for years 1990, 1991, and 1992. The dependent variable for this window is the difference between the average gearing for years 1994, 1995, and 1996 minus the average for years 1991, 1992, and 1993. Doing this for two windows per n-years' lag and applying the OLS-regression equation 6.2.3 below, generates the regression coefficients shown in table 6.2.

Table 6.4 shows the results of the pooled regressions for the moving window model, and finally tables 6.3 and 6.5 provide easy to follow summaries of the moving window regression for all windows and all years' lags as well as for the pooled regressions. The general regression model used in the moving window regression model is:

$$\Delta Lev_{\bar{3}_t} = \alpha + \beta_1 \Delta X_{1\bar{3}_t} + \beta_{\bar{2}} \Delta X_{2\bar{3}_t} + \beta_3 + \Delta X_{3\ \bar{3}_t} + \ldots + \beta_k \Delta X_{k\bar{3}_t} + \varepsilon \quad (6.2.3)$$

Where:

$$\Delta Lev_{\bar{3}_t} = Lev_{\bar{3}_t} - Lev_{\bar{3}_{t-3}}$$

$$\Delta X_{i_{\bar{3}_t}} = X_{i\bar{3}_t} - X_{i\bar{3}_{t-3}}$$

$X_{i\bar{3}_t}$ is as defined in equation 6.2.1 and,

ε is the error term.

The OLS multiple regression model expressed by equation (6.2.3) is used to regress the changes (Δs) in smoothed dependent variables on the changes (Δs) in smoothed independent variables, which provides regression estimates for all the explanatory variables, for each of the moving windows, over the 1990 to 2000 period.

Best subset regression was used to select those determinants to be employed in the moving window model. Only those hypothesised determinants which explain significant variation in gearing in the cross-sectional analysis are used. In addition, interest rates and corporate tax rates are also included as independent variables. Earlier studies have suggested that the level and the structure of interest rates are important determinants of the level of long-term debt issues (See Taggart, 1977), but as stated earlier, Marsh (1977) found that the influence of interest rates on gearing is weaker in the UK than the USA. Because cross-sectional studies cannot provide us with evidence on the importance of taxes as a determinant of capital structure (see Marsh, 1982; and Givoly *et al.*, 1992), or interest rates, this study therefore uses this dynamic model to investigate whether changes in interest rates and corporate taxes have any impact on capital structure over time.

6.3.2.2 Investigating the speed of adjustment.

Equations 6.2.1, 6.2.2, and 6.2.3 are flexible enough to allow different manipulations depending on what is to be tested. For example the number of years for purposes of averaging (smoothing) can either be reduced to two or increased to 4 or five to change the number of windows. Alternatively, the number of years-lag between the dependent variables and independent variables can be increased and/or the overlap (with independent variables be removed). This flexibility has been deliberately designed to allow various tests of different hypotheses and robustness of the results. For example, the tests for the speed of adjustment towards target ratio will involve varying the number of years' lags and removing the overlapping years in order to be able to tell after how many years on average the changes in gearing occur in response to changes in hypothesised determinants.

6.3.3 *Use of SEM technique in the adjustment model*

Structural equation modelling (SEM) is also be used for purposes of investigating determinants of capital structure adjustments towards an optimal capital structure. This is be done by fitting the changes (Δ's) in the indicator variables over the period of study, into the measurement model in order to determine the factor loadings (see figure 6.2). The factor loadings estimated by the measurement model, together with the changes (Δ's) in gearing ratios over time, then form the inputs into the structural model. This process is repeated twice because of the number of the moving windows. The length of (number of years in) the windows and the number of years' lag is varied in order to investigate the speed with which the gearing ratios change following changes in the theorised determinants. This is the first attempt to use the structural equation modelling (SEM) in a study of capital structure adjustments and speed of adjustments. If using a number of indicator variables per latent attribute generates improved results (Chiarella *et al.*, 1992. p.145), then SEM should be able to explain more changes in gearing and the corresponding determinants than OLS-regression analysis.

6.4 Results of tests on target ratio adjustments

6.4.1 *Introduction*

If managers make intentional adjustments to their firms' capital structure in response to changes in the values of the theorised capital structure determinants then further evidence can be obtained from analysing capital structure changes in relation to those determinants. The results of tests conducted on capital structure changes in relation to determinants for the sample period (1985-2000) are reported in this section. This section presents and discusses the results from the tests, which consider capital structure in a dynamic context. The results are reported from two alternative methodologies designed to investigate how gearing responds to changes in its hypothesised determinants. These determinants comprise those factors which were found to influence gearing in the cross-sectional analysis, together with changes in both interest rates and corporate tax rate.

6.4.2 *Capital structure adjustment process*

6.4.2.1 *Moving window regression results*

Table 6.2 presents the results of OLS-regression of the changes in eight measures of gearing on corresponding changes in the determinants of capital structure. In the moving windows regressions, both the independent and the dependent variables are three-year averages of yearly data from 1990 to 2000. The averaging is done to remove the 'noise', which may result if yearly data are used as they are.

Table 6.2 has three panels, A, B, and C. In panel A, there is a lag of one year between the three years of independent variables and the three years of dependent variables. For example in window I of Panel A, the change in independent variable is the difference between the three years' average of 1993, 1994, and 1995, and the three years' average of 1990, 1991, and 1992. The dependent variable is the difference between the averages of gearing for three years 1994, 1995, and 1996, and that of 1991, 1992, and 1993. The changes in independent variables precede those of the dependent variables. Panels B and C follows the same approach but the number of years' lag between the independent and dependent variables is two and three respectively.

These alternative lags are deliberate, and serve two main purposes. First is the recognition that if managers do make adjustments in their capital structure, the decisions involving capital structure changes are made in response to the determinants whose changes precede the actual capital structure changes. Secondly, the comparative results from each panel may provide an indication as to the speed with which capital structure changes occur in response to changes in the underlying hypothesised determinants. Each panel has two windows; the windows simply move the regressions from earlier years to later years (i.e. from

1990 to 2000). Table 6.3 provides a summary of relationships from the results of moving windows regressions.

Table 6.4 shows the results of the moving window pooled regressions, which are similar to those in immediately preceding tables. The only difference is that for the pooled regressions, the regression is done on pooled data of all one-year lags, of all two-year lags, and of all three-year lags, regardless of window. This has the effect of increasing observations in order to discern more meaningful relationships. The pooling of observations doubles the observations from 651 to 1302. Table 6.5 presents a summary of relationships between the hypothesised determinants and gearing from the results of pooled regressions. Combining the results shown in tables 6.2, 6.3, 6.4, and 6.5 the following can be deduced from this analysis.

The determinants whose changes are strongly (significantly) related to corresponding changes in gearing are, non-debt tax shields, firm size, past profitability, cash holdings, and corporate tax rate, and to some extent interest rate. The relationship between changes in these six determinants and gearing is generally consistent in all lags (panels), all windows, and even in the pooled regressions results. This means that the relationship is not merely an artefact of a particular sub-period, neither is it only for a short-term or for a long-term. It seems that changes in gearing are a positive response to firm size, corporate tax rate, and interest rate, both in short- and long term.

Changes in gearing relate positively to changes in interest rates both in the short-term and in the long-term, except for long-term debt whose relationship with interest rates is insignificant. With the exception of a sharp fall in interest rates between 1991 and 1993, changes in interest rates did not have a significant impact on the level of gearing. Changes in gearing appear to respond negatively to non-debt tax shields, past profitability, and cash holdings. Though the relationship is not very strong, the evidence points towards a positive relationship between changes in corporation tax and changes in gearing.

Gearing appears to respond positively to current profitability in the short-term (within 1 to 3 years). Beyond that duration there appears to be no significant relation relationship between gearing and current profitability. Likewise changes in growth opportunities seem to influence gearing negatively only in the short-term (one to three years). Beyond that horizon, although there is still a significant relationship, but the relationship becomes consistently positive. Bevan and Danbolt (2003) use interactive annual dummies in their dynamic analysis and find a positive relationship between growth and gearing. Gearing also responds negatively to probability of bankruptcy (both in the short- and long-term). Although in the short-term business risk exhibits a negative relationship with gearing, there are virtually no consistent relationship between changes that occur in tangibility, and business risk. It may be argued that short- term changes (of between 1 to three years) in business risk are meaningless and gearing cannot be expected to respond to them, and that the short-term inverse relationship simply echoes their cross-sectional relationship.

The findings of a target ratio adjustment proven in this study are consistent with Ozkan (2001) who finds that non-debt tax shields, liquidity, and growth opportunities, exert a negative effect on firms' gearing decisions. The positive response relating to firm size and the negative response relating to past profitability supports the findings of Nivorozhkin (2004), but is not consistent with Ozkan's (2001) findings on these attributes. In addition, this study's findings relating to how gearing responds to corporation taxes, cash holdings, and to profitability, are also consistent with Panno (2003).

As panel A of table 6.2 and table 6.4 show, changes in determinants that occur around 1 to 2 years (one year lag), are more significant for short-term debt than for long-term debt. The tendency starts to fade in panel B of those tables, and certainly in panel C the situation reverses. The changes in the relevant determinants in panel C become more significant for long-term debt than for short-term debt. This observation is corroborated by the differences in the (adjusted) R-squared and even F-statistics relating to short-term debt and long-term debt between panels A and B of these tables. In the pooled regression results, while the R-squared for long-term debt rises (from 0.1% to 1.4%), that of short-term debt falls (from 8.0% to 4.2%).

The R-squared for short-term debt continues to fall even further in panel C, while that of long-term debt remains more or less stable. In fact while the R-squared of all other gearing measures fall as the variables are lagged for more and more years (by 2, 3 years) that of long-term debt rises to begin with and then stabilises. While this in itself suggests the existence of some capital structure adjustment activity it also indicates that as firms try to adjust their gearing in response to changes in their firm specific or macroeconomic environment, they adjust short term debt first (and faster) because it is flexible or convenient to do so than for long-term debt. The findings that firms adjust to the target ratio quickly are consistent with both Ozkan (2001) and Auerbach (1985), and are inconsistent with Taggart (1977). Nivorozhkin (2004) also finds that target leverage and speed of adjustment fluctuates over time, and that the direction of these changes is traceable to firm characteristics, the macroeconomic environment of the country, and the policies of financial intermediaries. Generally, the explanatory power of the target adjustment model used in this section is very low. This implies that the variables used as independent variables explain very little changes in gearing. The next section gives the results of the alternative target adjustment model which is used for the first time in the dynamics of capital structure by this study.

6.4.2.2 *Results of Structural Equation Dynamics Model*

It was pointed out earlier that structural equation modelling (SEM) recognizes that there may be more than one proxy for a hypothesized determinant of capital structure. To address this issue, SEM therefore includes more than one indicator for a latent variable in its measurement model. If more than one indicator per latent variable captures the relationship between the attributes and gearing in a cross-sectional analysis, then the technique might also work for changes in these variables. As part of the analysis of capital structure in a dynamic context, a dynamic version of SEM was generated by fitting the changes in indicator variables into the SEM's measurement model. The resulting factor loadings were then related to the changes in gearing ratios in the structural model. There is no previous study that has used structural equation modelling in the tests of capital structure dynamics. The previous two studies that employed SEM were limited to cross-sectional analysis.

The Structural Equation Model was used to test the relationship between changes in the theorised attributes versus changes in the eight measures of gearing between 1990 and 1999. As it was done under OLS-regression, structural equation modelling was applied to the different windows of the moving windows model. Figure 6.2 shows the measurement model matrices of the model used. To differentiate between this model and the one used for cross-sectional analysis, this model is referred to as 'structural equation-dynamics (SEM-DYNAMICS) model'. The tests were carried out in two windows. The tests were conducted such that the changes in gearing were related to changes in manifest variables that occurred one to three years prior to changes in gearing. Table 6.6 shows factor loadings for the indicator variables, and table 6.7 shows the estimates of the structural coefficients from the pooled SEM-DYNAMICS model. The pooled model uses the data for different windows in one model.

The SEM-Dynamics model's results summary box at the bottom of table 6.7 shows the statistics which can be used to assess the success of the iterations and the fit of the model. (The basic interpretation of these numbers was provided in section 4.13 of chapter four where the results of cross-sectional SEM were presented). The SEM-Dynamics summary box shows that the discrepancy function is 1.74, a little bit higher than the one for cross-sectional results. Both the maximum residual cosine (0.022) and maximum absolute gradient (0.000198) are close to zero. The ICSF and the ICS are equal and are close to zero. The boundary condition shows that there were four inequality constraints operating at convergence in the model. The right side statistics shows the *Chi*-square of 2265.4, the degree of freedom for the *Chi*-square statistic, and the probability level of 0.000 for *Chi*-square. The point estimate and the 90% confidence interval for the Steiger-Lind RMSEA statistic are also shown. The root mean square (RMS) standardized residual of 0.0937 is close to 0.05 which is required for the perfect fit. Generally, the summary box shows that the iteration was successful and the fit is good.

As table 6.7 shows, changes in gearing relate positively to changes in firm size, and changes in Z-score (the proxy for probability of bankruptcy). This implies that firm size is a positive determinant of gearing, and probability of bankruptcy is a negative determinant of gearing. Likewise, changes in gearing relate negatively to changes in non-debt tax shields, and to changes in current profitability. Other relationships are either insignificant or perverse. The changes in tangibility show a negative relation to changes in gearing, and changes in growth depict a positive relationship to changes in gearing, although the coefficient for market value gearing is insignificant. Excluding the effects of current liabilities, most of the coefficients for business risk show insignificant relationship. Changes in past profitability seem to have a positive impact on gearing.

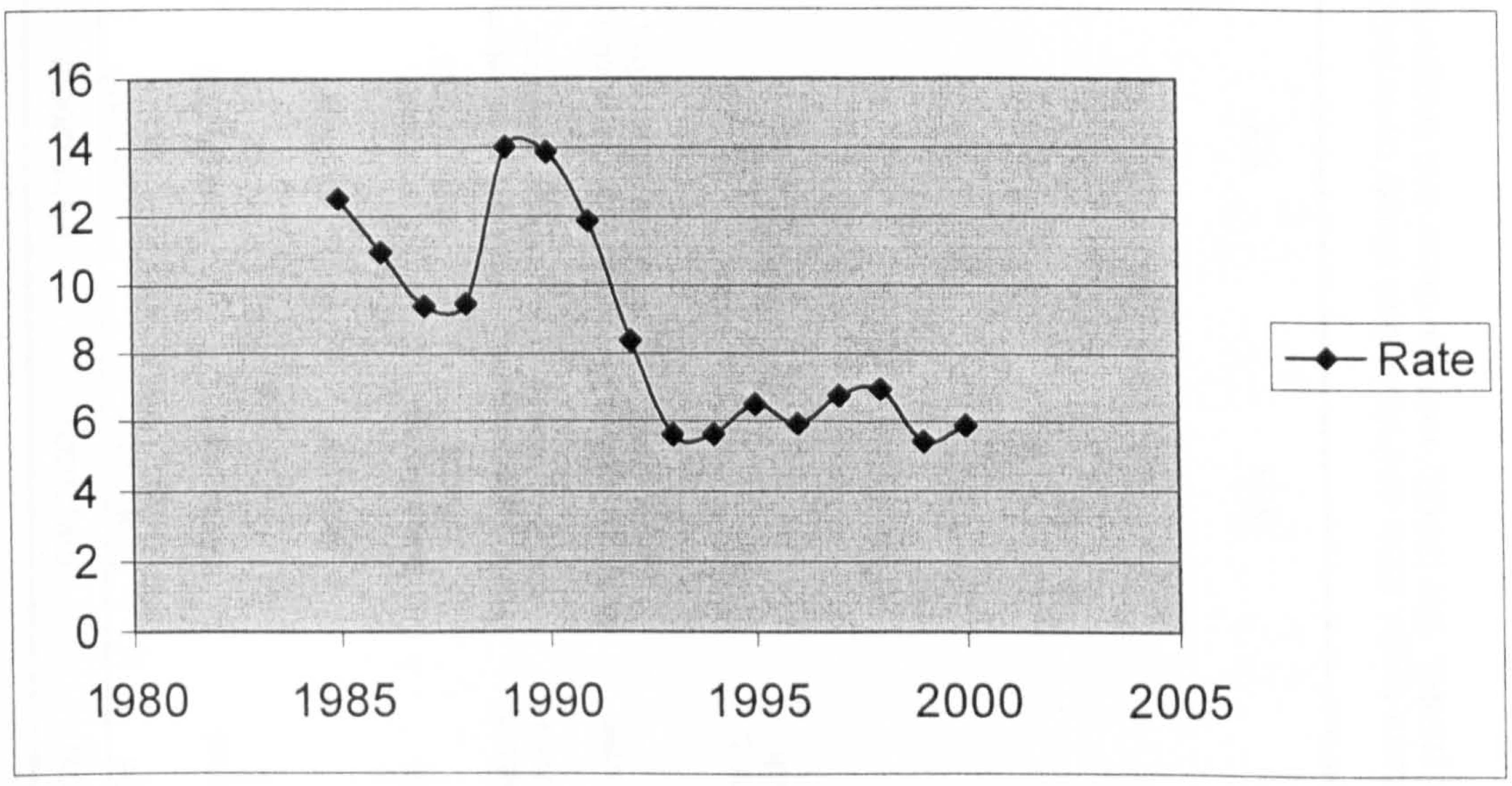
6.5 Summary and conclusion

The conventional regression model's results in this chapter have shown that changes in firm size and changes corporate taxes are positively related to changes in gearing. Changes in non-debt tax shields, past profitability, and cash holdings are negatively related to changes in gearing. Changes in other attributes do not have consistent relationship with changes in gearing. On the other hand it can be concluded that the SEM-DYNAMICS model in this chapter has confirmed the persistent negative relationship between gearing and both non-debt tax shields, and probability of bankruptcy. The model has also confirmed the positive relation between gearing and firm size. As for other determinants tested by the model, the results are either insignificant or perverse.

The two target-adjustment models' results have only provided support for firm size and corporate taxes, as positive determinants of gearing, and non-debt tax shields, past profitability and cash holdings, as inversely related to gearing. The results for other attributes are insignificant, mixed or perverse. Typical of previous similar studies, the explanatory power of these target adjustment models is generally low. This seems to imply that some important variable(s) which determine changes in gearing ratios have been left out of the models. The next chapter extends the analysis of capital structure dynamics by testing the effects of equity market timing and stock returns on capital structure. The chapter tries to disentangle the two effects in order to find out which one has a greater impact on gearing. The relative importance of all other determinants is also examined.

6.6. Appendix: Tables and Figures:

Figure 6.1: Average yearly interest levels 1985-2000



Source: Bank of England monthly interest rate database (2001)

Table 6.1: A Summary of selected previous capital structure dynamics studies in comparison to this study

	Taggart (1977)	*Marsh(1982)*	*JH (1984)*	*Auerbach (1985)*	*Ozkan (2001)*	*BW (2002)*	*Welch (2002)*	*This Study*
Sample period	1951-1972	1959-1974	1966-1978	1969-1977	1984-1996	1968-1999	1975-2000	1985-2000
No of Yrs	21	15	15	9	13	31	26	16
Sample size (firms)	62 obs.	856 obs.	108	143	390 (4132obs)	2839 obs.	Over 50,000	651 (9,486 obs)
No of Industries	-	-	-	-	-	-	-	28
Methodology	B/sheet ratios	Logit &Probit	OLS-regr, SUR	Δs in debt levels	GMM	OLS-regr	OLS-regr	SEM, OLS-regr Δs in debt levels
Strength	-	Examine issues of securities	Varying speed	Δs in debt levels, adj. for inflation	Latest UK Study.	Track timing Effects.	Track stock return effects	Δs in debt levels' SEM, Comparison
Weakness	Small sample	-	Small sample	Contradict Taggart (1977) on speed	Contradict Taggart (1977) on speed	Timing & stock return effects combined	Timing & stock return Effects combined	-
Findings	S/t debt absorb s/t changes	Firms have target ratio	Fin. decisions interdependent	Rapid adj. speed for s/t debt	Firms have target ratio	No target ratio, cum. timing effect	No target ratio, cum. Stock return effect	Stock return effects have stronger impact than equity market timing.
<u>*Target determinants*</u>					Liquidity, profit, Ndts, growth	-	-	Stock return, Past profit, timing, size, growth Ndts.
1.Corp. tax	YES	-	-	-	-	-	-	YES
2.Financial distress	YES	YES	-	-	-	-	-	YES
3.Rationing by lenders	YES	-	-	-	-	-	-	-
4. Firm size	-	YES	-	-	-	-	-	YES
5.Asset composition	-	YES	-	-	-	-	-	NO
<u>*Adj. process & Speed*</u>								
1.Interest rate	YES	-	YES	-	-	-	-	
2.stock price	YES	YES	YES					YES
3. Firm size	-	-	YES			YES	YES	YES
4. Speed	SLOW	-	-	RAPID	FAST	-	-	FAST (s/t debt)

The summary gives salient features of previous studies on capital structure adjustments towards long-term target ratio, and those that simply try to establish forces behind capital structure fluctuations. Marsh (1982) looked at securities issues, JH (1984) refers to Jalilvand and Harris (1984), 'BW (2002)' refers to Baker and Wurgler (2002), and 'Ndts' refers to non-debt tax shields. The last column summarises this study's features.

Table 6.2: Moving Windows OLS Regression Coefficients

Gearing, R-sq (adj.), Fstat	FA/TA	OI/T	MTB	LTA	SIGOI	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
Panel A: Dependent variable lagged one year, N=651											
Window I											
TLp/TA (BV) *R=17.5, F=10.7*	-0.27 (3.9)*	-0.03 (-3.5)*	0.03 (2.8)*	0.04 (2.0)*	0.67 (1.2)	-0.21 (-4.9)*	-0.17 (-0.98)	-0.01 (-0.54)	-0.11 (-5.3)*	0.03 (0.68)	1.0 (2.2)[a]
Dp/TA (BV) *R=5.2, F=3.4*	0.11 (2.2)[a]	-0.02 (-3.1)*	0.003 (0.44)	0.03 (1.97)[a]	0.003 (0.01)	-0.06 (-2.1)[a]	-0.05 (-0.43)	-0.01 (-1.16)	0.00 (0.03)	0.02 (0.83)	0.32 (0.96)
Dp/E (BV) *R=9.7, F=5.6*	0.12 (0.95)	-0.07 (-4.8)*	0.02 (0.87)	0.05 (1.3)	0.33 (0.3)	-0.28 (-3.4)*	-0.05 (-0.14)	-0.08 (-2.5)[a]	-0.02 (-0.64)	0.04 (0.58)	1.79 (2.0)[a]
LTD/TA (BV) *R=0.5, F=1.2*	0.04 (1.38)	-0.005 (-1.49)	-0.003 (-0.55)	0.01 (0.72)	0.003 (0.01)	-0.03 (-1.8)[b]	0.02 (0.24)	-0.004 (-0.58)	0.01 (0.68)	-0.02 (-1.32)	0.12 (0.62)
STD/TA (BV) *R=3.9, F=2.8*	0.05 (1.31)	-0.01 (-1.9)[b]	0.003 (0.49)	0.02 (2.01)[a]	-0.18 (-0.58)	-0.03 (-1.43)	0.10 (1.06)	-0.02 (-1.9)[b]	-0.01 (-0.72)	0.04 (1.78)[b]	-0.02 (-0.07)
CL/TA (BV) *R=18.2, F=10.9*	-0.3 (-5.6)*	-0.01 (-1.9)[a]	0.03 (2.7)*	-0.01 (-0.40)	1.29 (2.8)*	-0.01 (-2.7)*	-0.28 (-2.0)[a]	0.01 (0.48)	-0.11 (-6.6)*	-0.02 (-0.54)	1.08 (2.9)*
EBITD/I (BV) *R=20.0, F=8.3*	-0.74 (-0.86)	0.20 (1.95)[a]	0.72 (4.17)*	-0.53 (-2.1)[a]	17.8 (2.3)[a]	1.76 (3.16)*	3.83 (1.62)	0.06 (0.24)	0.6 (1.81)[b]	2.04 (4.08)*	2.6 (0.46)
Dp/CAP-MV *R=17.9, F=10.7*	0.13 (2.10)[a]	-0.05 (-7.1)*	-0.02 (-1.9)[b]	0.06 (3.43)*	-0.27 (-0.52)	-0.004 (-0.11)	-0.09 (-0.61)	-0.02 (-1.2)	-0.02 (-0.92)	0.05 (1.4)	0.87 (1.99)[a]
Window II											
TLp/TA (BV) *R=17.1, F=10.3*	-0.29 (-3.6)*	-0.03 (-2.7)*	0.03 (2.38)[a]	0.004 (0.14)	1.45 (1.95)[a]	-0.32 (-5.5)*	0.27 (1.25)	0.01 (0.65)	-0.08 (-3.7)*	0.92 (2.55)*	0.86 (1.54)
Dp/TA (BV) *R=5.7, F=3.7*	-0.09 (-1.7)[b]	-0.03 (-2.9)*	0.006 (0.58)	0.03 (1.32)	0.37 (0.73)	-0.12 (-3.1)*	0.32 (2.14)[a]	-0.01 (-0.53)	-0.01 (-0.58)	0.41 (1.64)[b]	0.39 (1.01)
Dp/E (BV) *R=6.9, F=4.3*	-0.14 (-0.87)	-0.04 (-1.56)	-0.005 (-0.17)	0.13 (2.09)[a]	0.34 (0.23)	-0.62 (-5.4)*	0.95 (2.12)[a]	0.01 (0.20)	0.007 (0.17)	0.43 (0.60)	-1.53 (-1.36)
LTD/TA (BV) *R=0.0, F=0.81*	-0.02 (-0.51)	-0.001 (-0.20)	0.005 (0.91)	-0.01 (-0.90)	-0.33 (-1.14)	-0.03 (-1.43)	-0.06 (-0.77)	-0.007 (-0.73)	0.00 (0.02)	0.22 (1.56)	0.11 (0.52)
STD/TA (BV) *R=7.0, F=4.4*	-0.02 (-0.53)	-0.01 (-2.1)[a]	0.01 (1.02)	0.03 (1.90)[b]	-0.01 (-0.27)	-0.13 (-4.5)*	0.15 (1.41)	-0.01 (-0.96)	0.01 (1.04)	0.23 (1.32)	-0.08 (-0.28)
CL/TA (BV) *R=18.8, F=11.5*	-0.16 (-3.2)*	-0.01 (-1.28)	0.01 (1.64)[b]	-0.002 (-0.11)	0.50 (1.10)	-0.17 (-4.8)*	0.18 (1.39)	0.03 (2.29)[a]	-0.08 (-5.7)*	0.47 (2.18)[a]	-0.04 (-0.12)
EBITDA/I (BV) *R=8.6, F=2.9*	2.84 (1.98)[a]	0.23 (1.05)	0.32 (1.34)	0.89 (1.76)[b]	5.4 (0.37)	0.69 (0.72)	0.52 (0.12)	0.14 (0.38)	0.61 (1.56)	-25.2 (-3.65)	3.1 (0.37)
Dp/CAP-MV *R=12.8, F=7.7*	-0.02 (-0.43)	-0.04 (-4.5)*	-0.02 (-2.3)[a]	0.05 (2.39)[a]	-0.64 (-1.2)	-0.17 (-4.1)*	0.02 (0.13)	-0.01 (-0.81)	0.01 (0.71)	0.09 (0.37)	0.45 (1.11)

Window I regresses the change in gearing from 1991-93 average to 1994-96 average on the change in exogenous variables from the 1990-92 average to 1993-95 average. Window II regresses the change in gearing from 1994-96 average to 1997-99 average on the change in exogenous variables from the 1993-95 average to 1996-98 average. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses in columns 3 through 13 are corresponding t-statistics. R-sq (adj.) % and F-statistic are shown under each model (gearing measures) in column two.

Table 6.2: Continued...

	Gearing, R-sq(adj.), Fstat	FA/TA	OI/T	MTB	LTA	SIGOI	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
	Panel B: Dependent variable lagged two years, N=651											
Window I	TLp/TA (BV) *R=9.3, F=5.6*	-0.15 (1.72)[b]	-0.01 (1.10)	0.06 (3.82)[*]	0.04 (1.65)[b]	1.82 (2.49)[a]	-0.01 (-0.28)	-0.33 (-1.48)	-0.01 (-0.62)	-0.07 (-2.7)[*]	0.04 (0.87)	1.19 (1.94)[a]
	Dp/TA (BV) *R=5.4, F=3.5*	0.07 (1.44)	-0.01 (-1.53)	0.03 (3.21)[*]	0.02 (1.56)	1.03 (2.44)[a]	0.02 (0.67)	-0.23 (-1.7)[b]	-0.01 (-1.32)	-0.01 (-0.84)	0.02 (0.55)	0.44 (1.24)
	Dp/E (BV) *R=4.7, F=3.1*	0.34 (2.36)[a]	-0.03 (-2.1)[a]	0.03 (1.4)	0.06 (1.56)	1.08 (0.89)	-0.10 (-1.15)	-0.28 (-0.76)	-0.01 (-0.43)	-0.02 (-0.47)	-0.01 (-0.09)	2.23 (2.21)[a]
	LTD/TA (BV) *R=3.8, F=2.7*	0.04 (1.29)	-0.01 (-2.3)[a]	0.02 (2.93)[*]	-0.01 (-1.09)	0.63 (2.30)[a]	-0.02 (-0.94)	-0.18 (-2.1)[a]	-0.007 (-0.80)	0.003 (0.32)	-0.01 (-0.42)	0.58 (2.54)[a]
	STD/TA (BV) *R=3.2, F=2.4*	0.04 (1.09)	-0.004 (-1.10)	0.014 (2.10)[a]	0.03 (2.50)[a]	0.15 (0.47)	0.01 (0.61)	0.007 (0.07)	-0.01 (-1.12)	-0.01 (-0.80)	0.01 (0.57)	0.04 (0.14)
	CL/TA (BV) *R=6.0, F=3.8*	-0.14 (-2.6)[a]	-0.001 (-0.12)	0.01 (0.90)	-0.01 (-0.53)	1.62 (3.49)[*]	-0.03 (-1.01)	-0.15 (-1.08)	0.02 (1.14)	-0.04 (-2.2)[a]	0.01 (0.40)	0.92 (2.36)[a]
	EBITD/I (BV) *R=4.9, F=2.3*	0.11 (0.09)	0.13 (0.90)	0.54 (2.14)[a]	-0.19 (-0.48)	17.9 (1.61)	0.76 (0.95)	3.6 (1.04)	0.20 (0.54)	0.61 (1.40)	2.23 (3.35)[*]	-7.8 (-0.87)
	Dp/CAP-MV *R=10.9, F=6.4*	0.12 (2.04)[a]	-0.03 (-4.7)[*]	0.02 (2.09)[a]	0.06 (3.37)[*]	0.11 (0.22)	0.07 (1.84)[b]	-0.03 (-1.7)[b]	-0.02 (-1.56)	-0.03 (-1.42)	0.02 (0.50)	0.54 (1.27)
Window II	TLp/TA (BV) *R=5.6, F=3.7*	-0.2 (-2.0)[a]	-0.01 (-0.59)	0.04 (2.52)[a]	-0.02 (-0.50)	1.4 (1.56)	-0.17 (-2.4)[a]	0.18 (0.70)	0.01 (0.39)	-0.04 (-1.57)	1.12 (2.59)[*]	-0.01 (-0.02)
	Dp/TA (BV) *R=4.6, F=3.1*	-0.07 (-1.16)	-0.01 (-0.93)	0.02 (2.21)[a]	0.02 (0.74)	0.12 (0.22)	-0.16 (-3.8)[*]	0.28 (1.72)[b]	-0.01 (-0.50)	-0.02 (-0.11)	0.4 (1.49)	-0.39 (-0.96)
	Dp/E (BV) *R=8.3, F=4.9*	-0.11 (-1.1)	0.03 (1.24)	0.03 (1.11)	0.10 (1.60)	1.02 (0.65)	-0.62 (-5.3)[*]	0.50 (1.07)	-0.03 (-0.55)	0.02 (0.49)	1.13 (1.50)	-3.11 (-2.6)[*]
	LTD/TA (BV) *R=1.0, F=1.4*	-0.03 (-0.88)	-0.003 (-0.60)	0.004 (0.80)	-0.004 (-0.33)	-0.23 (-0.82)	-0.06 (-2.5)[a]	-0.02 (-0.28)	-0.005 (-0.56)	0.001 (0.07)	0.24 (1.71)[b]	-0.01 (-0.03)
	STD/TA (BV) R=4.1, F=2.9	-0.04 (-1.00)	-0.01 (-1.23)	0.01 (1.62)	0.02 (1.23)	-0.43 (-1.09)	-0.10 (-3.4)[*]	0.18 (1.55)	-0.01 (-0.91)	0.01 (1.16)	0.28 (1.46)	-0.3 (-1.01)
	CL/TA (BV) *R=4.4, F=3.1*	-0.06 (-1.11)	-0.005 (-0.63)	0.01 (1.02)	-0.02 (-1.33)	0.07 (0.15)	-0.1 (-2.3)[a]	0.18 (1.21)	0.02 (1.21)	-0.04 (-2.6)[*]	0.50 (2.09)[a]	-0.1 (-0.26)
	EBITD/I (BV) *R=3.5, F=1.6*	1.9 (1.16)	0.41 (1.64)[b]	-0.2 (-0.67)	0.45 (0.78)	35.0 (2.15)[a]	0.36 (0.35)	-2.7 (-0.56)	0.70 (1.60)	1.0 (1.88)[b]	-16.3 (-1.9)[a]	-4.2 (-0.45)
	Dp/CAP-MV *R=5.1, F=3.4*	-0.03 (-0.48)	-0.02 (-1.9)[b]	-0.004 (-0.40)	0.03 (1.40)	-0.34 (-0.59)	-0.16 (-3.59)	-0.03 (0.23)	-0.02 (-1.06)	0.01 (0.79)	0.26 (0.94)	-0.01 (-0.03)

Window I regresses t the change in gearing from 1992-94 averages to 1993-97 averages on the change in exogenous variables from the 1990-92 averages to 1993-95 averages. Window II regresses on the change in gearing from 1995-97 average to 1998-2000 averages on the change in exogenous variables from the 1993-95 average to 1996-98 average. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses in columns 3 through 13 are corresponding t-statistics. R-sq (adj.) % and F-statistic are shown under each model (gearing measures) in column two.

Table 6.2: Continued...

	Gearing, R-sq(adj.), Fstat	FA/TA	OI/T	MTB	LTA	SIGOI	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
	Panel C: Dependent variable lagged three years, N=651											
Window I	TLp/TA (BV)	-0.08	-0.06	0.01	0.02	1.32	0.07	-0.14	-0.02	-0.04	-0.04	1.54
	R=5.0, F=3.2	(-0.99)	(-0.70)	(0.90)	(0.88)	(1.91)[b]	(1.50)	(-0.70)	(-1.11)	(1.78)[b]	(-0.82)	(2.76)*
	Dp/TA (BV)	-0.004	-0.00	0.03	0.02	1.5	0.08	-0.36	-0.007	-0.03	-0.004	0.69
	R=8.7, F=5.2	(-0.07)	(-0.01)	(2.68)*	(1.64)[b]	(3.44)*	(2.42)[a]	(-2.58)*	(-0.49)	(-1.9)[b]	(-0.12)	(1.86)[b]
	Dp/E (BV)	0.23	-0.002	0.02	0.08	0.46	0.20	-0.25	0.03	-0.05	-0.09	1.3
	R=4.8, F=3.2	(1.58)	(-0.11)	(0.90)	(1.96)[a]	(0.37)	(2.18)[a]	(-0.65)	(0.91)	(-1.09)	(-1.00)	(1.27)
	LTD/TA (BV)	0.01	-0.001	0.01	0.003	0.17	-0.00	-0.11	-0.004	-0.004	-0.005	0.20
	R=0, F=0.8	(0.49)	(-0.36)	(1.43)	(0.44)	(0.74)	(-0.02)	(-1.50)	(-0.53)	(-0.49)	(-0.31)	(1.06)
	STD/TA (BV)	0.02	-0.002	0.006	0.01	0.32	0.04	-0.14	-0.01	-0.01	-0.03	0.46
	R=3.7, F=2.6	(0.67)	(-0.42)	(0.93)	(1.43)	(1.16)	(1.71)[b]	(-1.6)[b]	(-1.16)	(-1.20)	(-1.48)	(2.0)[a]
	CL/TA (BV)	-0.06	0.001	-0.001	-0.004	1.13	0.04	-0.05	0.001	-0.004	0.005	0.64
	R=0.5, F=1.2	(-1.13)	(0.14)	(-0.15)	(-0.25)	(2.38)[a]	(1.08)	(-0.36)	(0.05)	(-0.23)	(0.15)	(1.63)[b]
	EBITD/I (BV)	-0.99	0.34	-0.004	-0.41	15.4	0.29	6.02	0.46	0.48	3.7	-8.5
	R=13.6, F=4.6	(-0.78)	(2.41)[a]	(-0.02)	(-1.11)	(1.46)	(0.39)	(1.79)[b]	(1.31)	(1.13)	(5.54)*	(-0.98)
	Dp/CAP-MV	0.10	-0.02	0.04	0.04	0.7	0.09	-0.45	-0.007	-0.03	0.03	0.93
	R=10.9, F=6.5	(1.73)[b]	(-2.9)*	(3.72)*	(2.26)[a]	(1.40)	(2.64)*	(-2.9)*	(-0.48)	(-1.8)[b]	(0.96)	(2.23)[a]
Window II	TLp/TA (BV)	-0.15	0.002	0.03	-0.05	1.52	-0.18	0.34	0.01	0.01	1.09	-0.05
	R=5.7, F=3.7	(-1.7)[b]	(0.15)	(2.42)[a]	(-1.55)	(1.87)[b]	(-2.7)*	(1.43)	(0.56)	(0.59)	(2.73)*	(-0.08)
	Dp/TA (BV)	-0.07	-0.004	0.01	-0.01	0.28	-0.11	0.24	-0.001	-0.001	0.52	0.02
	R=3.4, F=2.5	(-1.3)	(-0.50)	(1.42)	(-0.44)	(0.58)	(-2.9)*	(1.70)[b]	(-0.03)	(-0.02)	(2.22)[a]	(0.06)
	Dp/E (BV)	-0.18	-0.01	0.07	-0.05	1.6	-0.28	0.57	-0.05	-0.06	0.71	-0.33
	R=1.7, F=1.7	(-0.96)	(-0.29)	(2.21)[a]	(-0.68)	(0.96)	(-2.1)[a]	(1.10)	(-0.96)	(-1.12)	(0.86)	(-0.25)
	LTD/TA (BV)	-0.01	-0.007	0.001	-0.01	-0.19	-0.06	-0.02	-0.005	0.007	0.32	0.24
	R=3.8, F=2.7	(-0.64)	(-1.7)[b]	(0.28)	(-1.02)	(-0.86)	(-3.3)*	(-0.43)	(-0.70)	(1.07)	(2.88)*	(1.39)
	STD/TA (BV)	-0.04	0.002	0.01	-0.01	0.21	-0.08	0.14	-0.00	0.008	0.17	0.12
	R=0.9, F=1.4	(-0.87)	(0.25)	(1.53)	(-0.56)	(0.48)	(-2.2)[a]	(1.08)	(-0.02)	(0.57)	(0.79)	(0.34)
	CL/TA (BV)	-0.01	-0.002	0.02	-0.04	0.21	-0.03	-0.1	0.005	0.007	0.49	0.09
	R=0, F=0.8	(-0.24)	(-0.15)	(1.59)	(-1.7)[b]	(0.38)	(-0.69)	(-0.57)	(-0.28)	(0.43)	(1.90)[b]	(0.23)
	EBITD/I (BV)	4.7	2.1	-1.4	-1.71	13.9	2.9	-11.01	1.99	4.36	-8.57	-43.9
	R=2.7, F=2.0	(0.83)	(2.44)[a]	(-1.38)	(-0.85)	(0.27)	(0.79)	(-0.72)	(1.17)	(2.83)*	(-0.36)	(-1.22)
	Dp/CAP-MV	-0.08	-0.014	0.01	-0.04	0.46	-0.11	0.12	-0.02	-0.003	0.95	0.63
	R=1.9, F=1.88	(-1.02)	(-1.1)	(0.82)	(-1.45)	(0.68)	(-2.1)[a]	(0.61)	(-0.81)	(-0.16)	(2.86)*	(1.21)

Window I regresses the changes in gearing from 1993-95 average to 1996-98 average on the changes in exogenous variables from the 1990-92 average to 1993-95 average. Window II regresses the change in gearing from 1996-98 average to 1999-2000 average on the change in exogenous variables from the 1993-95 averages to 1996-98 averages.. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses in columns 3 through 13 are corresponding t-statistics. R-sq (adj.) % and F-statistic are shown under each model (gearing measures) in column two.

Table 6.3: Summary of Relations in Moving Windows' OLS Regression Coefficients

	Proxies for hypothesized determinants of capital structure										
	FA/TA	OI/T	MTB	LnTA	SIGOIS	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
Panel A: Dependent variable lagged one year, N=651											
Window I	+	-	-	+	-	-	-	-	-	+, -	+
Window II	-	-	-	+	+	-	+	+	-	+	+, -
Panel B: Dependent variable lagged two years, N=651											
Window I	+	-	+, -	+	+, -	+	-	NS	-	-	+
Window II	-	-	+	+	-	-	+	NS	-	+	-
Panel C: Dependent variable lagged three years, N=651											
Window I	+	-	+	+	+	+	-	NS	-	-	+
Window II	-	-	+	-	+	-	+	NS	-	+	NS
Overall Relation between changes in proxies and changes in gearing											
	mixed	-	- + +	+	mixed	- mixed	mixed	NS	-	mixed	+

Explanation: A plain -, or + sign denotes a significant negative or positive relationship respectively between hypothesised determinants and gearing. NS denotes insignificant relationship.

Interpretation: It is not possible to determine whether the dominant relationship between changes in tangibility and changes in gearing is positive or negative. The same problem applies to changes in SIGOIS (the proxy for business risk). The relationship between changes in Z-score (the proxy for the probability of bankruptcy) and changes in gearing is insignificant. There is a strong evidence of a positive relationship between changes in firm size and changes in gearing. There is also a strong evidence of a negative relationship between changes in non-debt tax shields, in cash holdings, in past profitability and changes in gearing. Changes in current profitability show both positive and negative relationship to changes in gearing. Growth opportunities start with a negative relationship in the short term, but in the long run, there is a positive relationship between growth and gearing. Changes in corporate tax exhibit a positive relationship to changes in gearing, while interest rate has mixed relationship.

Table 6.4: Moving window pooled regressions

Gearing, R-sq(adj.), Fstat	*FA/TA*	*OI/T*	*MTB*	*LTA*	*SIGOIS*	*RE/TA*	*OI/S*	*Zscore*	*CACL*	*Intr.*	*Tax*
Panel A: Dependent variable lagged one year, N=1302											
TLp/TA (BV) *17.6, 20.29*	-0.28 (-5.2)*	-0.031 (-4.3)*	0.034 (3.69)*	0.05 (3.07)*	1.13 (2.4)•	-0.26 (-7.6)*	0.10 (0.74)	0.005 (0.37)	-0.09 (-6.4)*	0.03 (2.6)•	0.84 (2.3)•
Dp/TA (BV) *6.6, 7.34*	-0.001 (-0.03)	-0.02 (-4.1)*	0.005 (0.77)	0.04 (3.7)*	0.28 (0.89)	-0.09 (-3.9)*	0.15 (1.62)	0.01 (-0.79)	-0.005 (-0.52)	0.028 (3.90)*	0.27 (1.08)
Dp/E (BV) *9.5, 10.24*	-0.03 (-0.31)	-0.06 (-4.05)	0.01 (0.38)	0.11 (3.62)*	0.21 (0.24)	-0.45 (-6.6)*	0.50 (1.82)b	-0.02 (-0.97)	-0.01 (-0.41)	0.09 (4.66)*	-0.14 (-0.20)
LTD/TA (BV) *0.1, 1.08*	0.01 (0.46)	-0.003 (-1.13)	0.002 (0.49)	0.004 (0.62)	-0.16 (-0.88)	-0.04 (-2.5)*	-0.01 (-0.18)	-0.005 (-0.83)	0.001 (0.24)	-0.001 (-0.12)	0.07 (0.51)
STD/TA (BV) *8.0, 8.83*	0.008 (0.31)	-0.01 (-2.7)*	0.005 (1.05)	0.03 (4.16)*	-0.15 (-0.64)	-0.084 (-4.6)*	0.12 (1.69)b	-0.01 (-1.7)b	0.003 (0.45)	0.028 (5.3)*	-0.08 (-0.46)
CL/TA (BV) *17.4, 19.94*	-0.22 (-6.1)*	-0.01 (-2.0)•	0.018 (2.9)*	0.01 (1.13)	0.86 (2.7)*	-0.13 (-5.5)*	-0.01 (-0.10)	0.02 (2.13)•	-0.09 (-9.1)*	-0.001 (-0.08)	0.37 (1.52)
EBITD/I (BV) *9.8, 6.42*	0.35 (0.45)	0.18 (1.71)b	0.47 (3.19)*	-0.37 (-1.7)b	9.25 (1.27)	1.22 (2.39)•	1.11 (0.52)	0.17 (0.85)	0.82 (3.40)*	-0.61 (-3.8)*	6.8 (1.34)
Dp/CAP-MV *18.6, 21.6*	0.04 (1.00)	-0.05 (-8.3)*	-0.02 (-3.0)*	0.06 (5.0)*	-0.48 (-1.31)	-0.08 (-3.0)*	-0.05 (-0.48)	-0.01 (-1.12)	-0.001 (-0.05)	0.06 (7.5)*	0.62 (2.1)•
Panel B: Dependent variable lagged two years, N=1302											
TLp/TA (BV) *6.4, 7.16*	-0.18 (-2.7)*	-0.01 (-0.99)	0.05 (4.4)*	0.05 (2.4)•	1.63 (2.8)*	-0.09 (-2.2)•	-0.02 (-0.15)	0.001 (0.08)	-0.05 (-3.2)*	0.02 (1.45)	0.37 (0.84)
Dp/TA (BV) *4.9, 5.67*	-0.000 (-0.01)	-0.007 (-1.37)	0.02 (3.7)*	0.03 (2.9)*	0.60 (1.75)b	-0.07 (-2.6)*	0.03 (0.31)	-0.007 (-0.71)	-0.009 (-0.79)	0.03 (4.24)	-0.11 (-0.42)
Dp/E (BV) *6.7, 7.29*	0.08 (0.72)	-0.002 (-0.18)	0.03 (1.68)b	0.13 (3.9)*	0.89 (0.90)	-0.35 (-4.8)*	0.16 (0.56)	-0.006 (-0.19)	-0.001 (-0.04)	0.09 (4.5)*	-0.88 (-1.14)
LTD/TA (BV) *1.4, 2.3*	0.006 (0.29)	-0.005 (-1.7)b	0.009 (2.40)•	0.002 (0.35)	0.20 (1.02)	-0.04 (-2.7)*	-0.09 (-1.59)	-0.04 (-0.64)	0.001 (0.18)	0.002 (0.61)	0.18 (1.18)
STD/TA (BV) *4.7, 5.45*	-0.003 (-0.10)	-0.005 (-1.39)	0.01 (2.48)•	0.03 (3.91)*	-0.13 (-0.55)	-0.04 (-2.3)•	0.08 (1.16)	-0.008 (-1.04)	0.004 (0.53)	0.02 (4.48)	-0.21 (-1.08)
CL/TA (BV) *4.4, 5.1*	-0.09 (-2.4)•	-0.000 (-0.15)	0.009 (1.36)	-0.002 (-0.17)	0.89 (2.59)*	-0.06 (-2.45)	0.02 (0.19)	0.02 (1.87)b	-0.04 (-3.7)*	-0.01 (-2.3)•	0.29 (1.06)
EBITD/I (BV) *1.8, 1.8*	0.46 (0.47)	0.15 (1.25)	0.14 (0.77)	-0.16 (-0.61)	18.7 (2.11)	0.43 (0.69)	0.43 (0.16)	0.48 (1.70)b	0.93 (2.80)*	-0.13 (-0.70)	-2.16 (-0.35)
Dp/CAP-MV *10.6, 11.7*	0.04 (0.86)	-0.03 (-4.4)*	0.07 (0.96)	0.05 (4.34)*	-0.17 (-0.45)	-0.04 (-1.39)	-0.15 (-1.37)	-0.02 (-1.58	-0.03 (-0.31)	0.06 (7.67)	0.16 (0.56)

Table 6.4: Continued...

Gearing, R-sq(adj.), Fstat	FA/TA	OI/T	MTB	LTA	SIGOIS	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
Panel C: Dependent variable lagged three years N=1302											
TLp/TA (BV) 2.9, 3.61	-0.12 (-2.0)•	-0.002 (-0.34)	0.03 (2.69)*	0.02 (0.94)	1.4 (2.60)*	-0.04 (-1.19)	0.17 (1.09)	0.000 (0.01)	-0.02 (-1.05)	0.00 (0.38)	0.53 (1.28)
Dp/TA (BV) 3.4, 4.1	-0.03 (-0.81)	-0.000 (-0.04)	0.02 (2.87)*	0.02 (2.27)•	0.97 (2.94)*	-0.01 (-0.36)	-0.04 (-0.47)	0.001 (0.09)	-0.02 (-1.5)	0.01 (1.24)	0.2 (0.84)
Dp/E (BV) 1.3, 2.1	0.02 (0.15)	-0.005 (-0.30)	0.05 (2.45)•	0.03 (0.85)	1.26 (1.19)	-0.01 (-0.16)	0.16 (0.52)	0.001 (0.02)	-0.06 (-1.6)[b]	0.04 (1.72)[b]	0.39 (0.47)
LTD/TA (BV) 0.8, 1.7	0.000 (0.03)	-0.003 (-1.05)	0.003 (1.08)	0.006 (1.20)	-0.006 (-0.04)	-0.03 (-2.4)*	-0.07 (-1.40)	-0.003 (-0.65)	0.002 (0.45)	-0.000 (-0.15)	0.15 (1.20)
STD/TA (BV) 1.4, 2.3	-0.01 (-0.46)	-0.000 (-0.08)	0.01 (2.04)	0.005 (0.66)	0.27 (1.02)	-0.02 (-1.03)	0.03 (0.41)	-0.002 (-0.30)	-0.003 (-0.34)	0.01 (2.18)•	0.2 (1.13)
CL/TA (BV) 0.2, 1.1	-0.04 (-0.92)	0.000 (0.09)	0.01 (1.21)	-0.01 (-0.53)	0.65 (1.81)[b]	0.03 (0.12)	-0.06 (-0.62)	0.004 (0.40)	-0.001 (-0.08)	-0.01 (-1.8)[b]	0.28 (1.01)
EBITD/I (BV) 5.2, 4.7	2.5 (0.7)	1.16 (2.39)•	-1.0 (-1.45)	-1.2 (-1.27)	4.14 (0.13)	2.0 (0.90)	-4.8 (-0.51)	1.4 (1.36)	3.36 (3.21)	-2.7 (-3.9)*	-29.0 (-1.23)
Dp/CAP-MV 7.0, 7.8	0.01 (0.20)	-0.02 (-2.5)*	0.02 (2.80)	0.02 (1.77)[b]	0.65 (1.55)	-0.001 (-0.02)	-0.12 (-0.92)	-0.01 (-0.66)	-0.02 (-1.32)	0.07 (7.1)*	0.62 (1.85)[b]

Explanation: The summary of the relationships between independent attributes and the measures of gearing used in the moving window pooled regressions is provided in table 6.5

Table 6.5: Summary of pooled regressions

	Proxies for hypothesized determinants of capital structure										
	FA/TA	OliT	MTB	LnTA	SIGOIS	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
Panel A: Dependent variable lagged one year											
	NS	-	-	+	-	-	+	-	-	+	+
Panel B: Dependent variable lagged two years											
	NS	-	+	+	+, -	-	-	-	-	+	+,NS
Panel C: Dependent variable lagged three years											
	NS	-	+	+	+	-	-	-, NS	-	+	+
Overall Relation between changes in proxies and changes in gearing											
	mixed	-	-, +	+	-, +	-	+, -	-,NS	-	+	+

Explanation: A plain -, or + sign denotes a significant negative or positive relationship respectively between hypothesised determinants and gearing. NS denotes insignificant relationship, and 'mixed' denotes cases where the relationship between changes in an attribute and changes in gearing are positive in some windows and negative in others.

Interpretation: It is not possible to determine whether the dominant relationship between changes in tangibility and changes in gearing is positive or negative. The coefficients show mixed relationship. The same problem applies to changes in SIGOIS (the proxy for business risk). The coefficients show an inverse relationship between SIGOIS and gearing in the short- term. In the long-term the relationship becomes positive. The relationship between changes in Z-score (the proxy for the probability of bankruptcy) and changes in gearing is negative in the short term and insignificant in the long term. There is a strong evidence of a positive relationship between changes in firm size and changes in gearing. There is also a strong evidence of a negative relationship between changes in non-debt tax shields, in cash holdings, in past profitability and changes in gearing. Changes in current profitability show both positive and negative relationship to changes in gearing. Growth opportunities start with a negative relationship in the short term, but in the long run, there is a positive relationship between growth and gearing. Changes in corporate tax and interest rates exhibit a positive relationship to changes in gearing.

Figure 6.2: SEM DYNAMICS Measurement model matrices

$$
\begin{bmatrix} \Delta FA/TA \\ \Delta LnInvInt \\ \Delta D/TA \\ \Delta OIiT \\ \Delta MTB \\ \Delta TQ \\ \Delta CE/TA \\ \Delta LnTA \\ \Delta SIGOI \\ \Delta SIGOIS \\ \Delta CVEB/TA \\ \Delta SIGP \\ \Delta RE/TA \\ \Delta RE/S \\ \Delta CACL \\ \Delta OI/S \\ \Delta EBITD/TA \\ \Delta Zscore \end{bmatrix}
=
\begin{bmatrix}
\lambda_{1,1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\lambda_{2,1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & \lambda_{3,2} & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & \lambda_{4,2} & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \lambda_{5,3} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \lambda_{6,3} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \lambda_{7,3} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & \lambda_{8,4} & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \lambda_{9,5} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \lambda_{10,5} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \lambda_{11,5} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \lambda_{12,5} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & \lambda_{13,6} & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & \lambda_{14,6} & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & \lambda_{15,6} & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & \lambda_{16,7} & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & \lambda_{17,7} & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & \lambda_{18,8}
\end{bmatrix}
*
\begin{bmatrix} \Delta\xi_1 \\ \Delta\xi_2 \\ \Delta\xi_3 \\ \Delta\xi_4 \\ \Delta\xi_5 \\ \Delta\xi_6 \\ \Delta\xi_7 \\ \Delta\xi_8 \end{bmatrix}
+
\begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \\ \delta_7 \\ \delta_8 \\ \delta_9 \\ \delta_{10} \\ \delta_{11} \\ \delta_{12} \\ \delta_{13} \\ \delta_{14} \\ \delta_{15} \\ \delta_{16} \\ \delta_{17} \\ \delta_{18} \end{bmatrix}
$$

These matrices represent equation $\Delta x = \Lambda \Delta \xi + \delta$. These matrices depict a constrained factor analysis in which additional restrictions are imposed on the parameters of the measurement model. A total of 126 restrictions have been imposed on matrix Λ of factor loadings. These restrictions are shown as factor loadings that are specified to equal zero. These restrictions are in accordance with theory predictions. For example, since $\Delta FA/TA$ is not theorised to be an indicator for changes in business risk, its factor loading on change in business risk is set to zero.

Table 6.6: Pooled SEM-dynamics Factor Loadings for changes in proxies

Manifest Variables	ATTRIBUTES							
	ξ_1 Δ Tang	ξ_2 Δ Ndts	ξ_3 Δ Grow	ξ_4 Δ Size	ξ_5 Δ Brisk	ξ_6 Δ Pprof	ξ_7 Δ Cprof	ξ_8 Δ Pbank
FA/TAn	0.13 (0.74)							
LnInvInt	2.6 (1.9)[b]							
D/TA		0.32 (2.9)*						
OliT		5.2 (5.2)*						
MTB			1.8 (5.0)*					
TQ			4.2 (7.8)*					
CE/TA			0.62 (2.01)*					
LnTA				-0.63 (-3.6)*				
SIGOI					-2.6 (-1.64)[b]			
SIGOIS					15.8 (10.5)*			
CVEBITD					17.3 (10.8)*			
SIGP					2.3 (4.5)*			
RE/TA						18.9 (16.1)*		
RE/S						12.5 (14.2)*		
CACL						-0.01 (-0.04)		
OI/S							6.9 (7.6)*	
EBITD/TA							7.2 (7.6)*	
Zscore								2.5 (8.3)*

The table reports how the changes in manifest variables load on the attributes of interest (determinants of gearing). In the structural equation model, these factor loadings and the coefficients in table 6.7 are determined simultaneously. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses are corresponding t-statistics.

Table 6.7: Pooled SEM-dynamics: Estimates of the Structural Coefficients

GEARING MEASURES	ATTRIBUTES/FACTORS							
	ξ_1 ΔTang	ξ_2 ΔNdts	ξ_3 ΔGrow	ξ_4 ΔSize	ξ_5 ΔBrisk	ξ_6 ΔPprof.	ξ_7 ΔCprof.	ξ_8 ΔPbank.
PANEL A: BOOK VALUE GEARING MEASURES, N = 1302								
TLp/TA (BV)	-2.6 (-1.47)	-0.69 (-0.57)	5.52 (7.27)*	-7.04 (-8.14)*	1.93 (5.18)*	1.12 (3.77)*	-1.01 (-2.38)*	2.05 (2.77)*
Dp/TA (BV)	-6.3 (-17.8)*	-0.95 (-0.91)	0.20 (0.30)	0.58 (0.37)	0.29 (1.13)	0.21 (1.03)	0.23 (0.77)	-0.18 (-0.32)
Dp/E (BV)	-4.6 (-1.5)	18.0 (18.2)*	4.8 (2.9)*	0.15 (0.05)	0.57 (0.75)	5.16 (8.0)*	-3.43 (-3.91)*	4.1 (2.7)*
LTD/TA (BV)	-1.49 (-1.07)	-2.59 (-2.85)*	6.25 (10.9)*	4.6 (5.8)*	-0.24 (-0.75)	0.82 (3.13)*	-1.16 (-3.0)*	2.61 (3.9)*
STD/TA (BV)	-4.5 (-6.8)*	-1.45 (-1.75)b	1.21 (2.09)a	2.14 (1.87)b	0.20 (0.63)	-0.36 (-1.41)	0.34 (0.93)	1.39 (2.72)*
CL/TA (BV)	-0.18 (-0.16)	-0.36 (-0.45)	1.15 (1.58)	-3.69 (-5.69)*	2.61 (5.57)*	2.4 (6.3)*	-1.16 (-2.19)*	7.5 (15.7)
EBITD/I (BV)	-2.02 (-1.33)	-0.51 (-0.34)	0.45 (0.28)	1.17 (0.77)	5.17 (2.71)*	-1.1 (-0.73)	7.12 (3.27)	-3.81 (-1.87)b
PANEL B: MARKET VALUE GEARING MEASURE, N = 1302								
Dp/CAP-MV	-2.29 (-5.35)*	-0.28 (-0.61)	0.05 (0.16)	1.55 (2.63)*	0.36 (1.7)b	0.27 (1.61)	-0.42 (-1.71)b	1.19 (3.9)*

The table reports the relationship between changes in attributes hypothesised to influence gearing and changes in eight different gearing ratios. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses are corresponding t-statistics.

CHAPTER 7

7 DYNAMICS: EQUITY MARKET TIMING Vs STOCK RETURNS EFFECTS

7.1 Introduction

In its general meaning market timing refers to an approach that attempts to determine when to be in the market, when to be out of the market, and even when to go short on any asset. In relation to an investor, market timing may include switching between investing in bonds and stocks, or switching between stocks and risk-free treasury bills, or alternatively, switching among sectors. In the context of this thesis the focus is on equity market timing, particularly how and to what extent, that practice influences capital structure. In the process of timing the equity market, managers presumably look at the level of stock returns and expected movements in such prices. That being the case the effects of equity market timing behaviour and the effects of stock returns simultaneously impact on the gearing ratios.

This chapter makes attempts to disentangle the effects of equity market timing from the effects of stock returns in order to be able to determine which exerts the greatest influence on capital structure. Section two reviews theory and prior empirical research relating to equity market timing. Section three describes the empirical tests which suggest that UK firms practice equity market timing, as well as identifying the short and long-term effects of that practice on gearing ratios. Section four turns to the theory relating to stock returns effects on gearing ratios, and section five carries out empirical tests designed to establish the extent of stock returns effects on gearing. Finally, an 'all-inclusive' model is generated and tested in section six. This model puts in perspective the relative impact of stock returns, equity market timing behaviour, and selected firm-specific characteristics. Results are discussed in section seven, and the summary in section eight.

7.2 Equity Market timing and capital structure

Equity market timing has been defined as:

> "the practice of issuing shares at high prices and purchasing at low prices" (Baker and Wurgler, 2002, p. 1)

These timed issues can be seasonal equity issues (SEOs) (see Taggart, 1977; Marsh, 1982; and Jung et al, 1996), or they can be initial public offerings (IPO) as documented by Baker and Wurgler (2002), among others. Evidence of timed repurchases is provided by Rees (1996) and Rau and Vermaelen (2002) for the UK. Baker and Wurgler (2002) argue that equity market timing is an important aspect of real corporate policy and that managers practice equity market timing to take advantage of temporary fluctuations in the cost of equity relative to other sources of capital.

The evidence of the existence of equity market timing practice implies that firm managers do not believe in market efficiency. There is an extensive literature which shows that firms experience long-run underperformance following equity issues (see for example Loughran and Ritter (1995) and Spiess and Affleck-graves (1995)). It follows that if a firm's equity is overvalued in the market and that firm issues equity, any market undereaction to the equity issue maximises the wealth of existing shareholders (see Stein, 1995). Jung et al (1996) document that the markets do under react to equity issues and it is the undereaction which leads to a firm's long-run poor performance. This happens when the market corrects the overvaluation that existed when equity was issued. Therefore it seems managers engage in equity market timing for the benefit of existing shareholders. However, in fairly efficient capital markets we have there is little that can be gained from such timing attempts. Moreover, transaction costs are likely to reduce any potential benefits from such timing behaviour. Whether or not managers are able to increase value through market timing is still debatable (see Bevelander (2002), and Song (2003)).

Empirical analysis of equity market timing by UK firms is even more interesting because of the predominant use of rights issues in the UK. As pointed out earlier, if in the USA (and elsewhere) managers practice equity market timing in order to maximise the wealth of continuing shareholders (at the expense of new shareholders), then the reason for such practice in the UK (if the practice exists) ought to be a different one. This is because with rights issues new equity is issued to the same existing shareholders.

Jung et al (1996) addressed the question as to whether equity market timing is a first order condition in security issues. Baker and Wulger (2002), and Rajan and Zingales (1995) considered the influence of past stock returns in relation to equity market timing. These previous studies did not consider implied change in capital structure. This chapter uses net equity issues (NeI), and following Welch (2004), implied change in gearing ratios is also used to capture the impact of equity market timing on capital structure (while holding constant the effects of stock returns on gearing ratio).

Although empirical researchers have just recently shown keen interest in the relationship between market timing and capital structure (see Baker and Wurgler, 2002; Alti, 2003; Bevelander, 2002; and Kayhan and Titman, 2003), the possibility has been recognised in the literature for quite sometime. Back in 1970s Taggart (1977) indicated that equity issues tend to follow periods of market rises. In conclusion Taggart suggested that market timing might speed up or postpone a firms' adjustment to its target debt ratio. Taggart (1977) however, conceded that stock market timing considerations seemed somewhat questionable and called for further research in this area.

In the UK study Marsh (1982) cited two earlier unpublished PhD dissertations, Bodenhammer (1968) and Marsh (1977), which had indicated that managers and their financial advisers regarded equity market timing as extremely important. Marsh (1982) recognised that changes in stock prices do alter debt/equity ratios and this makes the observed equity market timing behaviour puzzling considering that equity is issued at times when the debt capacity has increased. Given the then prevailing 'tax-leverage related costs balancing' theory, an increase in debt capacity (the value of equity) might have been expected to an increase in debt.

Empirical investigations by Rajan and Zingales (1995) confirm their suspicion that the negative relationship between the market-to-book ratio and gearing is brought about by the tendency for firms to issue stock when their price is higher relative to earnings or book value. Perhaps recent empirical investigations into the ability of equity market timing to explain both cross-sectional and time series variations in capital structure, have been triggered by the studies of Loughran and Ritter (1995), and Spiess and Affleck (1995) indicating that firms issuing equity tend to under-perform in the longer-term.

The poor long-term performance following equity issue has been interpreted to imply that managers time their equity issues to coincide with periods when their stock price is overvalued (Jung *et al*, 1996, p. 168). The poor performance is consequently perceived to occur when the market corrects the overvaluation. The market undereaction maximizes the wealth of ongoing shareholders at the expense of entering and exiting ones. Equity-issuing firms that do not invest their issue proceeds are plagued by the worst abnormal returns. In contrast, debt-issuing firms do not experience such long-term abnormal returns (Stein, 1995; and Baker and Wurgler, 2002, and Jung *et al*, 1996).

Baker and Wurgler (2002) give a long list of studies providing evidence not only that seasoned equity issues (SEOs) and initial public issues (IPOs) coincide with market rise, but also that repurchases have coincided with low valuations. Over time researchers have tried to come up with a logical explanation for the observed market timing behaviour. Marsh (1982) among others, wondered whether the behaviour is due to managers' disbelief in market efficiency or whether managers just think that it is relatively easier to raise new equity finance when the stock price is high? Baker and Wurgler (2002) ascribe this behaviour to the intention to take advantage of short-term fluctuations in the cost of equity compared to the cost of other sources of finance, the explanation based on disbelief in market efficiency. Graham and Harvey (2001) also suggest that managers believe that they can raise equity capital under favourable terms during high valuations.

The support for equity market timing is however, not unanimous. Consistent with the findings of Graham and Harvey (2001), the results from a survey by Pinegar and Wilbricht (1989) indicate that although some managers perceive their firm's equity to be mispriced 'some of the time', such perceptions of market (in) efficiency appear to have little impact on financing decisions. In their empirical analysis Jung *et al* (1996) do not find any evidence that firms time equity issues to exploit temporary fluctuations in equity mis-pricing when they know that their firm will undergo long-term underperformance subsequently. Jung *et al* (1996) also argue that the market underreaction to equity issues could as well be associated with agency problems or even pecking order predictions.

It is therefore obvious here that the equity market timing debate has just begun and a lot of questions have to be addressed. The major impetus, however, for investigating equity market timing in this study, was provided by the results of two recent works, Baker and Wurgler (2002), and subsequently, Welch (2002, 2004). Baker and Wurgler (2002) find that capital structure is strongly related to past market values, the results they interpret as being consistent with the hypothesis that market timing has large and persistent effects on capital structure. Having failed to find an explanation for their results in all major extant theories of capital structure, i.e. trade off theory, pecking order or even managerial entrenchment, Baker and Wurgler (2002) come up with an alternative approach to determination of a company's capital structure. They contend that 'capital structure evolves as the cumulative outcome of past attempts to time the equity market' (p. 27).

Baker and Wurgler (2002) argue that there is no optimal capital structure as market timing decisions accumulate over time into the capital structure outcome.[28] On the face of it, this new theory appears to be a validation of Modigliani and Miller (1958) irrelevance proposition (MM). However, MM assumes the existence of frictionless capital markets where there would not be any advantage from the use of either debt or equity. Market timing on the other hand relies on the gains managers aim to get from opportunistically switching from debt to equity and vice versa.

Following Baker and Wurgler (2002), the other closely related study that examines the capital structure implications of equity market timing is Alti (2003). Alti (2003) agrees that the evidence relating to the tendency of firms to issue equity when its cost is temporarily low is convincing. Like this study, Alti (2003) also investigates the long-term impact of equity market timing on capital structure. Alti (2003) however follows a different approach by identifying market timers as firms that go public (make initial public offerings) in a hot issue market. Welch (2002, 2004) on the other hand argues that even if equity market timing practice exists, its effects on capital structure is insignificant compared to the effect of stock returns.

Another recent empirical study by Kayhan and Titman (2003) has also found that equity market timing has only a weak effect on observed capital structure. This study has supported Welch (2004) that stock returns have a stronger and persistent effect on capital structure. More on stock returns is discussed in the immediate following section. The contradictory findings between these recent studies regarding equity market timing require further empirical validation. To this end this study also tests the hypothesis *that equity market timing is of first-order consideration in the security issue consideration by UK corporations.*[29] This hypothesis is tested having regard to the competing hypothesis that share price movement have a larger impact on changes in capital structure than other factors like deliberate adjustments towards an optimal capital structure, and/or equity market timing as discussed in the next section.[30]

[28] See Baker and Wurgler (2002) p.29.
[29] See hypothesis 4.3.12 in chapter four
[30] See hypothesis 4.3.13 in chapter four.

7.3 Cumulative effect of equity market timing practice

The hypothesis that *equity market timing is positively related to gearing and its cumulative effect is a major determinant of capital structure* is tested by using models specified in this section[31]. Although the theory of capital structure is specified in terms of market value of equity (Modigliani and Miller, 1958; Taggart, 1977, Bennett and Donnelly, 1993), the capital structure literature has so far entertained both the market value of equity and the book value of equity (Welch, 2002). After all, there is documented evidence that debt contracts are based on book values and that managers think in terms of book value when making financing decisions.[32] The measures used by Baker and Wurgler (2002) were driven by the market value of equity, consequently, the method, and especially the variables they use did not disentangle the effects of share price movement from those of pure market timing behaviour. It is not surprising that Welch (2002), who deals with share price movements and does not address market timing behaviour, argues that market timing behaviour does not have a significant impact on capital structure.

One may as well argue that timing behaviour and share price movements are inseparable since the timing is all about the price of stock. However, in order to be able to explore the extent to which market timing behaviour (equity issuing) alone influences capital structure over time, while controlling for the effects of share price movements on capital structure, it is necessary to make an attempt to separate the two. The use of net equity issues (NeI), and its cumulative effect for 2, 3, 4, 5, and 10 years in relation to the observed capital structure i.e. debt-to-equity ratio (in book values) may serve the purpose. The net equity issue provides an approximation (if not the exact) measure of the volume of shares involved in a given issue timing event. The net equity issues (NeI), refers to the annual equity changes net of changes in retained earnings. The NeI can

[31] See hypothesis 4.3.12 in chapter four
[32] See section 4.7.3.

therefore serve as a qualitative measure of the timing behaviour, which explicitly controls for the effects of stock returns. The NeI is scaled by total assets.

Three tests have to be carried out here. The first one is designed to look for evidence that firms (managers) practice equity market timing. The relationship between net equity issues, (NeI) from period $t-1$ to period t and the stock return from period $t-1$ to t, $\ln\frac{P_t}{P_{t-1}}$ is assessed over the entire sample period. The following regression equation is run for each of the 14 years:

$$NeI/TA_{t-1,t} = \alpha + \beta_1 \Delta MTB_{t-1,t} + \beta_2 \Delta LnTA_{t-1,t} + \beta_3 \Delta RE/TA_{t-1,t} + \beta_4 Ln(P_t/P_{t-1}) + \varepsilon \quad (7.3.1)$$

where

NeI is the net equity issues from period $t-1$ to period t

$\Delta MTB_{t-1,t}$, $\Delta LnTA_{t-1,t}$, and $\Delta RE/TA_{t-1,t}$ denote annual changes in market-to-book, firm size, and past profitability respectively.

$Ln(\frac{P_t}{P_{t-1}})$ is the stock return from period $t-1$ to t, and

ε is the random error

The regression model specified above is run in order to establish whether there is a consistent positive relation between NeI and $Ln(\frac{P_t}{P_{t-1}})$ over the 14 years. The other regressors in the model have been included because both the cross-sectional tests and the analysis of capital structure dynamics in this study have revealed that these are among the most important determinants of capital structure. If equity market timing is an equally (or a more) important determinant of capital structure, then its influence should better be compared with the influence of other comparable determinants such as these other regressors. If managers practice equity market timing then a consistently higher positive relationship between NeI and $Ln(P_t/P_{t-1})$ is expected from this regression.

As Welch (2002) argues, managers may practice equity market timing without such practice significantly influencing corporate capital structures. The second test in this section therefore seeks to establish whether equity market timing influences corporate capital structures. Changes in two gearing measures are employed, change in book debt-to-equity ratio $(\Delta(D/E))$, and change in debt-to-capital ratio $(\Delta(D/(E+D))$ where equity is measured in market value. OLS-regression is run for both gearing measures on the same regressors as the ones used in equation 7.3.1 except that the natural log of stock returns is replaced by $NeI/TA_{t-1,t}$. Regression equations for the two gearing measures are specified below.

$$\Delta D/E_{t-1,t} = \alpha + \beta_1 \Delta MTB_{t-1,t} + \beta_2 \Delta LnTA_{t-1,t} + \beta_3 \Delta RE/TA_{t-1,t} + \beta_4 NeI/TA_{t-1,t} + \varepsilon \quad (7.3.2)$$

And,

$$\Delta D/(D+E)_{t-1,t} = \alpha + \beta_1 \Delta MTB_{t-1,t} + \beta_2 \Delta LnTA_{t-1,t} + \beta_3 \Delta RE/TA_{t-1,t} + \beta_4 NeI/TA_{t-1,t} + \varepsilon \quad (7.3.3)$$

Where variables are as described in equation 7.3.1

The third and last test under this section looks at whether managers bother to rebalance the effects of equity market timing during the year in which the timed equity issues are made as well as in subsequent years. Tests are conducted for 1, 2, 3, 4, 5, and 10 years. These tests also seek to establish the extent to which the cumulative market timing effects influence capital structure over time. OLS regression of observed yearly actual debt-to-equity ratio (ADE_t) on inert debt-to-equity ratio ($ID/E_{t-1,t}$) and a lagged debt-to-equity ratio (D/E_{t-1}) is used, i.e.

$$ADE_t = \alpha + \beta_{ID/E}(ID/E_{t-1,t}) + \beta_{D/E}(D/E_{t-1}) + \varepsilon \quad (7.3.4).$$

The actual debt to equity ratio ADE_t is the value to be explained, the inert debt ratio, $ID/E_{t-1,t}$ is the lagged debt to equity ratio grossed up by the net equity issue over the year. The inert debt-to-equity ratio is the debt to equity ratio that would occur if only net equity issues influence changes in the debt-to-equity ratio from year $t-1$ to year t. If managers rebalance their gearing following net equity issue (NeI) effects, the coefficient on the lagged debt to equity ratio D/E_{t-1} should be close to 1 (100%). If mangers do not rebalance their gearing, in which case net equity issues mechanistically drive gearing, then the coefficient on ($ID/E_{t-1,t}$) should be one (100%). To start with equation 7.3.4 is run for each of the 14 years from 1986 to 1999. The regressions are run first with intercept and then without intercept.

To determine the longevity of market timing influences on observed debt to equity ratios, the inert book debt-to-equity ratio $ID/E_{t-1,t}$, is adjusted for the number of periods from the observed period. The lagged debt to equity ratio is also lagged for the same number of period as the inert debt to equity ratio. The procedure generates the following regression equation:

$$ADE_t = \alpha + \beta_{ID/E}(ID/E_{t-a,t}) + \beta_{D/E}(D/E_{t-a}) + \varepsilon \qquad (7.3.5)$$

Where the variables are as described in equation 7.3.4, and $t-a$ denote the number of years' effect equity market timing has on the observed debt-to-capital ratio. Tests are carried out for the cumulative effects of net equity issues over two, three, four, five, and ten years. The pooled regressions are first run with intercept and then without intercept.

The results of tests in this section are to be compared with those of section 7.4 below to assess the extent to which equity market timing and stock returns determine observed gearing ratios. Although the comparison may be criticised on the basis that one set of tests uses book gearing and the other uses market gearing, there does not appear to be another way of separating the effect of equity market timing from stock price changes effects. Neither Baker and Wurgler (2002) nor Welch (2002) does this separation.

7.4 Stock returns as a major determinant of capital structure

Another, very recent theory is propagated by Welch (2002, 2004) who purports to show that firms do not adjust their capital structure in response to changes in stock prices. Welch contends that the lack of any deliberate internal corporate decision-making to rebalance capital structure as equity values change is what determines the observed capital structure. While Welch admits that it may be true that managers do time the market, as argued by Baker and Wurgler (2002), he argues that the effects of such behaviour on capital structure is of a second order magnitude and cannot be compared with the effect of share price movements.

Earlier, Taggart (1977) and Marsh (1982) reported that movements in security prices have effects on the capital structure. In another more recent study, Kayhan and Titman (2003) examine how cash flows, investment expenditure and stock price histories affect corporate debt ratios. Kayhan and Titman (2003) use a partial adjustment model to model a firm's capital structure as a function of a firm's past profitability, financial deficit, cumulative returns, and market timing activities that can lead to deviations from a firm's target capital structure. They find that stock returns have relatively strong effects on capital structure that persists for quite sometime. Unfortunately, no UK study investigates the impact of stock returns on capital structure.

The hypothesis tested here is; *do share price movements have a larger impact on changes in capital structure than other factors such as deliberate adjustments, and/or equity market timing?* Although this hypothesis does not completely contradict the immediate previous one, it reduces its importance, and it is only through an empirical investigation will it be possible to assess its validity.

While there are some previous UK studies on capital structure dynamics (see for example Marsh, (1982); and Ozkan (2001)), none of them has dealt with as broad number of determinants as the current study, and certainly none has tested the recently proposed theories about the cumulative effects of equity timing and share price movements on capital structure. A summary of the findings of selected previous studies on capital structure dynamics is given in table 6.1.

7.5 Stock returns and capital structure: Empirical tests

Following Welch, (2002, 2004), the hypothesis that share price movements have a larger impact on changes in capital structure than other factors like deliberate adjustments, and/or equity market timing, is tested by using the models that are specified in this section. Two variables are needed to be able to test these assertions:

(1) the actual (observed) debt ratio,

$$ADR_t = \frac{D_{p_t}}{CAP_{MV}} \qquad (7.4.1)$$

where:- D_{p_t} is the total loan capital in book value, plus preference capital at the end of year t.

CAP_{MV} is the total capital, defined as D_{p_t} plus the market value of equity, E_t, at the end of year t.

(2) the implied debt ratio,

$$IDR_t = \frac{D_{p_{t-1}}}{D_{p_{t-1}} + E_{t-1} * (1 + R_{t-1,t})} \quad (7.4.2)$$

where: - $D_{p_{t-1}}$ and E_{t-1} are as defined above, and $R_{t-1,t}$ is the share price movement from $t-1$ to t.

One of the 12 measures of gearing calculated before in section 4.7.2, i.e. $D_p / CAP_P - MV$, is the actual debt ratio ADR_t used here. The implied debt ratio, IDR_t, which is the measure of the debt ratio if only the share price had changed from period $t-1$ to period t, is regressed with the observed debt ratio in order to ascertain the influence of share price on observed capital structure. As the available data does not go further back than 1985, and the calculation of the IDR_t requires the previous year's share price, the ADR_t, and IDR_t are calculated for 15 years from 1986 to 2000. To begin with ADR_t is regressed on IDR_t and the lagged debt-to-capital ratio, ADR_{t-1} for each of the 15 years. This is done not only to determine whether changes in share price have a significant influence on capital structure, but also to establish whether managers make any readjustment of their firms' gearing ratios following stock return movements. The regression equation for this test is specified as equation 7.4.3 below. Both the with intercept regressions and without intercept regressions are run.

$$ADR_t = \alpha + \beta_{IDR_{t-1,t}}(IDR_{t-1,t}) + \beta_{ADR_{t-1}}(ADR_{t-1}) + \varepsilon \quad (7.4.3)$$

where

ADR_t and IDR_t are as defined by equations 7.4.1 and 7.4.2 respectively.

To determine the long-term effect of stock returns on gearing versus the readjustment of gearing, the observed debt to capital ratio (ADR_t) is regressed (with intercept and without intercept) on implied debt-to-capital ratio ($IDR_{t-a,t}$)

and a lagged debt-to-capital ratio (ADR_{t-a}) over different time horizons, i.e. 2-years, 3-years, 4-years, 5-years, and 10-years. The implied debt-to-capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-a$ years to t. The following equation is used.

$$ADR_t = \alpha + \beta_{IDR_{t-a,t}}(IDR_{t-a,t}) + \beta_{ADR_{t-a}}(ADR_{t-a}) + \varepsilon \qquad (7.4.4)$$

Where:

variables are as defined under equation 7.4.1, and 7.4 2 above, and $t-a$ denote the number of years' effect stock returns have on observed debt-to-capital ratio.

7.6 *Stock returns vs. other determinants (all-inclusive model)*

Recent prior research (see Welch, 2002, 2004) and results of tests in this study (see section 7.7.3) provides evidence that managers do not readjust their firms' capital structure to allow for the impact of stock returns on their gearing ratios. If this is the case, the implied debt ratio (see table 7.5 and table 7.6) is a better predictor of observed debt ratio than the previously obtaining debt ratio (i.e. the debt ratio before taking into account the stock return from $t-a$ years to year t. Evidence from the current study and that from Welch (2002, 2004) reveal that stock returns mechanistically drive the gearing ratios over time. On the other hand there has been considerable body of research (both cross-sectional and dynamic analysis) which shows that some firm-specific characteristics like tangibility, growth, non-debt tax shields, profitability, firm size etc., are the determinants of capital structure.[33] The key question to be asked at this point is; if stock returns mechanistically drive the gearing ratio, then what role do these firm-specific characteristics play in determining capital structure?

[33] Among these research studies are Rajan and Zingales (1995), Bennett and Donnelly (1993), Bevan and Danbolt (2002), Titman and Wessels (1988), and Harris and Raviv (1991) taking a cross-sectional approach. Studies on the dynamics of capital structure, which also identify these firm-specific characteristics, include Jalilvand and Harris (1984), Auerbach (1985), Ozkan (2001), and Bevan and Danbolt (2003).

There is a need to assess whether stock returns are the major determinant of gearing, or indeed whether stock returns mechanistically drive the gearing ratio, and to determine the relative explanation power of stock returns versus other documented determinants. To do this the observed (actual) debt-to-capital ratio ($(D/(D+E)$ with equity measured in market value) is regressed on the implied debt-to-capital ratio $IDR_{t-1,t}$, the lagged debt equity ratio, ADR_{t-1}, changes in market-to-book ratio, natural log of total assets, retained earnings, non-debt tax shields, and on net equity issues *(NeI/TA)* for each year from 1985 to 1999.

Prior tests under both the cross-sectional as well as dynamic analyses in the current study have revealed that the selected firm-specific characteristics are the most important determinants of capital structure. Changes in predictor variables are changes from $t-1$ years to year t. NeI/TA is the ratio of net equity issue (net of retained earnings) over the year. Equation 7.6.1 below is used:

$$ADR_t = \alpha + \beta_{IDR_{t-1}} IDR_{t-1,t} + \beta_{ADR_{t-1}} ADR_{t-1} + \beta_{MTB} \Delta MTB_{t-1,t}$$
$$+ \beta_{LnTA} \Delta LnTA_{t-1,t} + \beta_{RE} \Delta RE_{t-1,t} + \beta_{NDTS} \Delta NDTS_{t-1,t} + \beta_{NeI} NeI/TA_{t-1,t} + \varepsilon \quad (7.6.1)$$

Where

ADR_t and IDR_t are as defined by equations 7.4.1 and 7.4.2 respectively.

$\Delta MTB_{t-1,t}$, $\Delta LnTA_{t-1,t}$, $\Delta RE/TA_{t-1,t}$, and $\Delta NDTS_{t-1,t}$ denote annual changes in market-to-book, firm size, past profitability, and non-debt tax shields respectively and,

$NeI/TA_{t-1,t}$ is the net equity issues from period $t-1$ to period t

To determine the explanation power of stock returns versus other determinants over different time horizons, similar pooled OLS-regression were run for one, two, three, four, five and ten years. Changes in the predictor variables were calculated from $t-a$ years to t. The regression equation 7.6.2 below was used for each time horizon tested. The (ADR_t), is the value to be explained. The implied debt-to-capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-a$ years to t.

$$ADR_t = \alpha + \beta_{IDRT} IDR_{t-a,t} + \beta_{ADR_{t-a}} ADR_{t-a} + \beta_{MTB} \Delta MTB_{t-a,t} + \beta_{LnTA} \Delta LnTA_{t-a,t} + \beta_{RE} \Delta RE_{t-a,t} + \beta_{NDTS} \Delta NDTS_{t-a,t} + \varepsilon \quad (7.6.2)$$

Where:

variables are as defined under equation 7.6.1, and subscripts $t-a,t$ denotes changes in the variables from year $t-a$ to year t.

Over long periods (i.e. more than one year), book values of equity may fluctuate due to changes in arbitrary accounting estimates such as depreciation and provision for doubtful debts. The book values of equity may also fluctuate as a result of changes in accounting profits. Such changes are likely to blur the effects of equity issues over long time horizons. Because long-term changes in book value of equity may not necessarily reflect net equity issues, the variable *NeI/TA* is left out of equation 7.6.2 above.

7.7 Results

7.7.1 Introduction

This chapter presents and discusses the evidence relating to the effects (both short- and long-term) of equity market timing and stock return movements on capital structure. First, evidence of equity market timing evidence and of any rebalancing of its effect is established. The long-term effects are also discussed. Secondly, the effects of stock returns on gearing are presented. Finally, the results of the 'all inclusive' model are presented and discussed.

7.7.2 *The effects of equity market timing on capital structure*

7.7.2.1. Do Managers practice equity market timing?

Three tests were carried out in relation to equity market timing. The first aimed at establishing whether managers practiced equity market timing. The second test examined whether equity market timing has any significant effect on capital structure changes, and the last considered the cumulative effects of equity market timing on gearing changes over time. Table 7.1 presents the evidence as to the existence of equity market timing practice in UK firms. Panel A reports the results of OLS-regressions of annual changes in annual net equity issues (NeI) on annual changes in market-to-book ratio, firm size, past profitability, and the natural logarithm of changes in share price, *Ln* (P_t / P_{t-1}) for 14 years from 1986 to 1999. The net equity issues are annual equity changes (net of changes in retained earnings) scaled by total assets at the end of the year. The first three regressors are annual changes in three of the most important capital structure determinants according to the results in both the cross-sectional, and the dynamics sections of this study so far.

The objective of the first test was simply to establish whether yearly net equity issues (NeI) are significantly positively related to stock returns, *Ln* (P_t / P_{t-1}). As column nine of panel A in table 7.1 reveals, every yearly coefficient shows a positive relation between (NeI) and $Ln(P_t / P_{t-1})$. The t-statistics in column ten also show that all but two, that is, twelve out of 14 (or 86 percent) of the coefficients are highly significant (most at 1% level). This consistent significant positive relationship between yearly (NeI) and yearly changes in stock returns is a proof that UK company managers practice equity market timing.

It may be that managers issue equity when the prices have risen as documented by Marsh (1982), Jung et al., (1996), and Hovakimian et al., (2001); or they repurchase their stocks at times when their equity valuation is low as reported by Rees (1996) and Rau and Vermaelen (2002), or they do both. Baker and Wurgler

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6 DYNAMICS: LONG-RUN TARGET RATIO ADJUSTMENT

6.1 Introduction

Most empirical studies on determinants of capital structure approach this issue on a static basis; mainly by using cross-sectional analysis to explore the relationship between the firm's gearing level and its hypothesised determinants. These studies normally use either one of the standard regression estimation techniques and rely on the significance of the regression coefficients to identify which of the hypothesised determinants influence the capital structure choices of companies. Alternatively, others have used a factor analytic technique to generate structural coefficients. These can be analysed in a similar way to conventional regression coefficients. As explained in chapter five, factor analytic technique allows more than one proxy per independent variable to be used in a single model.

The most common feature is that static models average the data variables and test them as if they occur at one point in time. Cross-sectional regressions therefore measure an 'average response' (Fama and French, 2003, 2). If managers adjust their capital structures, we would expect them to effect such adjustments in response to the changing firm specific and/or macro-economic factors having an impact on their environment. Standard cross-sectional methodologies ignore the capital structure adjustments and therefore fail to capture some important capital structure determinants, which can only be captured by looking at capital structure in a dynamic context. Nivorozhkin (2004), Welch (2004), and Kayhan and Titman (2003), among others, find that the dynamic models provide more insight into the behaviour of companies than simple static models. That being the case this chapter investigates the process of capital structure adjustment, the determinants and the speed of that adjustment process. Even if managers do not deliberately change their capital structure as some studies have claimed, it is still important to investigate what else drive the changes in corporate capital structure over time and how such changes are likely to impact on the value of such corporations.

This chapter is organised as follows: section two provides a review of previous research on capital structure dynamics. The section is mainly concerned with those studies that focus on the adjustments towards a long-run optimal capital structure, and on the speed of adjustment to this target debt ratio. Section three describes the two methodologies used in this chapter. Two methodologies (OLS-regression and Structural equation modelling) are used in the investigation of target capital structure adjustments and speed. Results are presented in section four, and section five summarises and concludes the chapter.

6.2 Previous works on capital structure adjustment process

Modigliani and Miller's (1958) irrelevancy proposition rests on the assumption of 'perfect capital markets'. While capital markets generally function well, they are not always perfect. This implies that the MM may not hold in certain instances. Most extensions to MM irrelevance propositions, and even extensions to Miller (1977) model have tried to identify instances and types of capital market imperfections, which may cause debt ratios to be relevant (or optimal). However, there is still no unified theory as to whether firms have optimal debt ratios and/or whether firms actually strive to maintain such ratios, if they exist at all.

Though there have been several US studies looking at dynamics of capital structure, in the UK such studies are still lacking. This study is therefore an addition to the very few studies looking at capital structure dynamics by using panel data from UK companies. This part of the study is a close relative to studies undertaken by Taggart (1977), Jalillvand and Harris (1984), Auerbach (1985), Shyam-Sunder and Myers (1999), Barnejee (2000), and Kayhan and Titman (2003) for the US, and the UK study undertaken by Ozkan (2001). Other similar studies include Drobetz and Fix (2003) which examines Swiss firms, and Nivorozhkin (2004) which considers the two transitional economies of Czech Republic and Bulgaria.

These studies emphasize the adjustments towards a firm's long-run target debt-equity ratio. Some also look at the existence of any adjustment costs, and others examine the speed of the adjustment process. For example, Taggart (1977) documents that despite divergent arguments, by that time (1977), there appeared to exist some consensus that the target debt ratio was determined by *corporate taxes*, *financial distress costs*, and *rationing by lenders*-and that this ratio is expressed in terms of market values (for example the ratio of market value of debt to the market value of equity).[25] Taggart's (1977) empirical model which is based on the interrelationships of balance sheet items, provides evidence that the speed of adjustment towards the long term target ratio tends to be relatively slow, and that this leads to a situation where liquid assets and short term debt are used by firms in order to meet the short-run financing needs which arise from temporary fluctuations.

Marsh (1982) used logit analysis to develop a descriptive model of the choice between equity and long-term debt. His model revealed that companies are heavily influenced by both market conditions and past history of security prices when they choose between debt and equity. Marsh (1982) contends that the existence of significant flotation costs and the need to minimize them, coupled with the costs of deviating from firms' target ratios, give rise to infrequent 'lumpy' issues, with debt ratios over time fluctuating around the target. The results of tests designed to confirm his model's predictive ability provide some evidence that companies in aggregate appear to make financing decisions as if they had a target level of debt in mind; and that these targets are influenced by *firm size*, *bankruptcy risk* and *asset composition*.

Marsh also stated that although firms try to maintain their debt ratios, market conditions force them to deviate behind these targets. While Taggart (1977) reports that both *the level* and *the structure of interest rates* are important

[25] The expression of debt ratios in terms of market values is also supported by Bennett and Donnelly (1993) in their cross-sectional study when they argue that theory (MM propositions) is prescribed in terms of market values. Section 4.7.3 discussed the pros and cons of using market and book values.

determinants of the level of long term debt issues in the USA, Marsh (1982) cites his earlier study (i.e. Marsh, 1977), which found that interest rates have a much weaker effect in capital structures of UK firms.

In their empirical investigation into the process of partial adjustment, Jalilvand and Harris (1984) allow the speeds of adjustment to vary across firms and over time, depending on firm size and capital market conditions. Their results suggest that firms adjust to long-term financial targets, and also that firm size, interest rate conditions, and stock price levels influence the speed of adjustment.

Perhaps to avoid the use of a constant target ratios used by both Marsh (1982), and Jalilvand and Harris (1984), Auerbach (1985) uses partial adjustment model in which target debt ratios are allowed to change over time. Auerbach (1985) finds that there is a rapid speed of adjustment, particularly for short-term debt towards the desired ratios of debt. Some more recent works in this area include, Shyam-Sunder and Myers (1999), which tests the relative explanatory power of target adjustment model against pecking-order predictions and find that the pecking-order model has much greater time-series explanatory power than a static trade-off model. In another study Barnejee (2000) utilises a capital structure adjustment model, which does not assume the observed capital structure to be the optimal, and proceeds to identify the factors affecting the target ratio and estimate e speed of adjustment to this target ratio.

In a survey of US chief financial officers (CFOs), Graham and Harvey (2001) document that 37% of firms have a flexible target debt ratio, 34% have somewhat tight target ratio, or range, and only 10% have a strict target ratio. These findings are consistent with both the static trade off theory, and the argument that target ratios may be flexible. Drobetz and Fix (2003) use a simple target adjustment model and find that firms adjust to long-term financial target. More recently, Kayhan and Titman (2003) have reported their findings that firms behave as if they have target debt ratios although their cash flows, investment needs, and stock price fluctuations result in transitory deviations from these targets. In Nivorozhkin (2004) dynamic adjustment model, gearing responds positively to firm size, and negatively to profitability, tangibility, and volatility.

Lack of capital structure dynamics studies that have used UK data is evidenced by the fact that since Marsh (1982) (the first to examine capital structure adjustment process in the UK), which analysed the choice of financing between debt and equity, there was no other study for almost twenty years. It is only recently that Ozkan (2001) reported additional evidence in this area. Ozkan (2001) estimates a partial adjustment model using the General Method of Moments (GMM), and focuses on the dynamics of capital structure and the nature of adjustment process.

Because Ozkan (2001) addresses some of the issues considered in this study, we shall consider his study in a more detail and highlight the differences between the two. Ozkan (2001) finds that firms have long-term leverage ratios and that they adjust to the target ratio relatively quickly. Consistent with the received wisdom, Ozkan finds that non-debt tax shields, liquidity, and growth opportunities, exert a negative impact on firms' gearing decisions, but finds only limited evidence to support the hypothesised positive effect by firm size. He also does not find a significant relationship between 'tangible assets' and gearing.

As discussed earlier, Ozkan (2001) seems to have perpetuated the confusion inherent in most previous similar studies that tested profitability as a determinant of capital structure. For example, he does not separate *past* from current profitability, and does not use *past profitability* to test the pecking order theory which is specified in terms of past profitability (i.e. retained earnings). Ozkan, therefore, finds results which are inconsistent with the underlying theory. Ozkan's findings are also inconsistent with the findings of many other previous empirical studies (see for example Bennett and Donnelly (1993), Rajan and Zingales (1995), Barclay *et al.*, (1999) and, Bevan and Danbolt (2002) to mention a few). Problems with profitability aside, Ozkan (2001) differs from this study in that Ozkan did not look at many other hypothesised determinants of capital structure such as industry classification, volatility of earnings (returns), probability of bankruptcy, free cash flow, and collateralizable assets. This study examines all these, as well as including those tested by Ozkan. For comparison purposes, table 6.1 summarises the salient features of selected previous capital structure dynamics studies.

Although both are UK studies, and both make use of panel data, this study also differs from Ozkan (2001) in terms of the methodologies adopted. While Ozkan (2001) uses GMM estimation, this study embarks on a comparison of the conventional OLS regression estimation against structural equation modelling (SEM) technique known as SEPath. As part of investigation into the dynamics of capital structure, this study also investigates the role of interest rates, tax rates, and other recent theories such as equity market timing (Baker and Wurgler, 2002), and stock returns (Welch, 2002, 2004) effects in capital structure. Ozkan does not venture into these areas.

6.2.1 *On the speed of adjustment to the target debt ratio*

Few studies have analysed the speed of capital structure adjustment. As mentioned earlier, Taggart (1977) found that the speed of adjustment towards the target ratio is rather slow and reported that both *the level* and *the structure of interest rates* are important determinants of the level of long-term debt issues. Jalilvand and Harris (1984) find that firm size, interest rate conditions, and stock price levels influence the speed of adjustment. In his partial adjustment model Auerbach (1985) found that there is a rapid speed of adjustment, particularly for short-term debt towards the desired ratios of debt.

Like Auerbach (1985) but contrary to Taggart (1977), Ozkan (2001) finds the speed to be relatively fast. These are some of the few contradictions this study aims to investigate. The hypothesis tested here is hypothesis 4.3.11. i.e. whether UK companies' capital structures confirm the existence of an optimal capital structure and if so how do these companies adjust towards their target debt ratio, and what factors do affect the adjustment and the speed of that process.

6.3 Empirical Analysis

6.3.1 *Introduction*

While the extensions to MM irrelevance propositions have succeeded to pinpoint (and even to verify) various imperfections in capital markets, which may make one debt to equity ratio preferable to any other (for example Jensen and Meckling, 1976; Myers, 1977; and De Angelo and Masulis, 1980), they have not been able to come up with a means of identifying the optimal debt ratio. In an attempt to model the process of capital structure adjustment, several empirical studies however, have attempted to come up with proxies for the unobservable target debt ratio.

Because the target ratio is unobservable Marsh (1982) suggests that we may look at past behaviour to approximate, albeit crudely, the target ratios a company had in mind when it was making financing decisions. This would imply taking some n- years average debt ratio as a proxy for the long run target ratio. It is noteworthy to mention here that there are problems associated with this approach. First, as argued by Jalivand and Harris (1984), there are no *a priori* reasons for the target ratios to be constant over time. As Marsh (1982) admits, target ratios themselves may change over time. Ideally, if its determinants change following changes in either a firm's operations and or the economic environment, the (unobservable) optimal debt ratio should also change over time. Changes in tax rates for example (see Jalilvand and Harris, 1984) and share price movement (see Taggart, 1977; Marsh, 1982; and Welch, 2002, 2004) are among the factors that may shift the optimal debt ratio for a firm.

Secondly, Jalilvand and Harris (1984) contend that the adjustment costs or constraints may prevent firms from complete adjustment to the long run target and instead forces them to follow a partial adjustment. If this argument is correct then a proxy taken by observing past behaviour may only capture the effects of this partial adjustment.

This study does not try to come up with some estimated constant (or even a changing) proxy for target debt ratio. Such proxies may not have theoretical support (Marsh, 1982; Jalivand and Harris, 1984), and may be fraught with measurement errors (Jalivand and Harris, 1984); this study simply examines the observed changes in the hypothesised determinants of the target ratio in relation to the observed changes in gearing ratios over time.[26] By focussing on changes, this study actually analyses the derivative of the optimal capital structure with respect to its likely determinants (see Givoly *et al.*, 1992). Using two alternative methods; conventional OLS regression estimates, and a factor analytic technique - SEM (SEPath), whose specifications are presented and discussed at length in chapter five this study proceeds to examine the capital structure adjustment process and factors influencing that process. The same panel data of 651 UK companies from 1985 to 2000 is used for the analysis in this chapter. This data was described in section 4.5 in chapter four.

The hypothesised determinants tested in this chapter are those that are strongly supported by, the theory and previous empirical works cited above, and also by survey studies such as that of Stonehill *et al.*, (1973), and Pinegar and Wilbricht (1989). The proxies (or indicator variables, as they are called in factor analysis) have been selected on the basis of close linkages between them and the attributes they are supposed to measure. The cross-sectional results from tests in chapter four have reinforced the choice of these determinants.

The use of changes in determinants to track the changes in gearing ratios seems more realistic than the use of some arbitrary constant or changing target ratio used by some previous studies like Marsh (1982) and Jalilvand and Harris (1984). The tests in the current study seek to establish if changes in such hypothesised determinants are persistently related to corresponding changes in gearing ratios in the manner prescribed by the theory. These determinants comprise all those determinants identified in the cross-sectional analysis part; in

[26] This links with the views of Marsh (1982), who argued that, "since target ratios are unobservable, we need to concern ourselves with their likely determinants" p.123.

addition, interest rate, and corporate tax rate have been added to the determinants. The effects of interest rate and corporate tax rate on gearing can only be meaningfully investigated in a dynamic context (see for example, Givoly, *et al*, 1992).

The period from 1985 to 2000 provides a suitable opportunity for tracking the relationship between capital structure adjustments and interest rates. As depicted in figure 6.1, in the UK the interest rate in January 1985 was 11.8%, and this rate rose to a maximum of 14.9% in October 1989 and stayed around this level up to early 1991 before starting to fall steadily. Between 1993 and 2000 the interest rate was never above 7.5 percent, and beyond 2001 the interest rate fell even further to 4 percent. These interest rate movements provides ample opportunity to test whether there is a significant relationship between the level of interest rates and companies' financing decisions.

This study also investigates the cumulative effects of equity market timing on capital structure, as well as the long-run impact of share price movement on capital structure. If such relationships are also confirmed by some prior empirical research, then that would constitute corroborating evidence that firms adjust their capital structures towards the (unobservable) target debt ratio. The confirmed determinants (among the tested ones) will be the determinants of that target ratio. The following sections specify the models that are used to test hypotheses.[27]

6.3.2 *Adjustments towards an optimal capital structure*

6.3.2.1 *Moving window regression model*

The moving window regression model is employed for testing hypothesis that UK companies adjust their capital structure towards an optimal target ratio in response to changes in factors, which influence capital structure. In this model

[27] Hypotheses 4.3.11 to 4.3.13 will be tested by using the models described in this chapter.

the following procedure is followed: in order to reduce measurement errors and contain the noise from yearly fluctuations all variables are smoothed by the use of three year moving averages. Only data from 1990 to 2000 is used for this model. The period 1985 to 1989 is omitted because for this period some of the firms in the sample do not have all the relevant data. The averages for the independent variables are defined as follows:

$$X_{i\bar{3}_t} = \left(X_{i_{t-3}} + X_{i_{t-2}} + X_{i_{t-1}}\right)/3. \quad (6.2.1).$$

And the averages for gearing measures are defined as:

$$Lev_{\bar{3}_t} = \left(Lev_{t-2} + Lev_{t-1} + Lev_t\right)/3. \quad (6.2.2)$$

As equations 6.2.1 and 6.2.2 show, for a start there is a lag of one year between the average for dependent variables and the average for independent variables. This lag is increased first to two years, and then to three years. Each number of lags has two windows (window I and window II). The windows simply separate the regressions relating to the earlier and later years of the 1990s. For example in table 6.2, window I regresses the change in gearing from 1991-93 average to 1994-96 average on the change in exogenous variables from the 1990-92 average to 1993-95 average. Window II regresses the change in gearing from 1994-96 average to 1997-99 average on the change in exogenous variables from the 1993-95 average to 1996-98 average. The independent variables' averages are calculated from 1990 to 1998. The dependent variable averages are calculated from 1991 to 1999 for the one-year lag case, and from 1990 to 2000 for the two-years lag case.

The lags between the independent variables and the dependent variable are used in order to relate gearing to the proxies (attributes) of independent variables obtaining earlier when the capital structure decision was made. For example, the smoothed proxies for independent variables for the first window are the differences between the averages for years 1993, 1994, and 1995, minus the averages for years 1990, 1991, and 1992. The dependent variable for this window is the difference between the average gearing for years 1994, 1995, and 1996 minus the average for years 1991, 1992, and 1993. Doing this for two windows per n-years' lag and applying the OLS-regression equation 6.2.3 below, generates the regression coefficients shown in table 6.2.

Table 6.4 shows the results of the pooled regressions for the moving window model, and finally tables 6.3 and 6.5 provide easy to follow summaries of the moving window regression for all windows and all years' lags as well as for the pooled regressions. The general regression model used in the moving window regression model is:

$$\Delta Lev_{\bar{3}_t} = \alpha + \beta_1 \Delta X_{1\bar{3}_t} + \beta_{\bar{2}} \Delta X_{2\bar{3}_t} + \beta_3 + \Delta X_{3\ \bar{3}_t} + \ldots + \beta_k \Delta X_{k\bar{3}_t} + \varepsilon \quad (6.2.3)$$

Where:

$$\Delta Lev_{\bar{3}_t} = Lev_{\bar{3}_t} - Lev_{\bar{3}_{t-3}}$$

$$\Delta X_{i\bar{3}_t} = X_{i\bar{3}_t} - X_{i\bar{3}_{t-3}}$$

$X_{i\bar{3}_t}$ is as defined in equation 6.2.1 and,

ε is the error term.

The OLS multiple regression model expressed by equation (6.2.3) is used to regress the changes (Δs) in smoothed dependent variables on the changes (Δs) in smoothed independent variables, which provides regression estimates for all the explanatory variables, for each of the moving windows, over the 1990 to 2000 period.

Best subset regression was used to select those determinants to be employed in the moving window model. Only those hypothesised determinants which explain significant variation in gearing in the cross-sectional analysis are used. In addition, interest rates and corporate tax rates are also included as independent variables. Earlier studies have suggested that the level and the structure of interest rates are important determinants of the level of long-term debt issues (See Taggart, 1977), but as stated earlier, Marsh (1977) found that the influence of interest rates on gearing is weaker in the UK than the USA. Because cross-sectional studies cannot provide us with evidence on the importance of taxes as a determinant of capital structure (see Marsh, 1982; and Givoly *et al.*, 1992), or interest rates, this study therefore uses this dynamic model to investigate whether changes in interest rates and corporate taxes have any impact on capital structure over time.

6.3.2.2 Investigating the speed of adjustment.

Equations 6.2.1, 6.2.2, and 6.2.3 are flexible enough to allow different manipulations depending on what is to be tested. For example the number of years for purposes of averaging (smoothing) can either be reduced to two or increased to 4 or five to change the number of windows. Alternatively, the number of years-lag between the dependent variables and independent variables can be increased and/or the overlap (with independent variables be removed). This flexibility has been deliberately designed to allow various tests of different hypotheses and robustness of the results. For example, the tests for the speed of adjustment towards target ratio will involve varying the number of years' lags and removing the overlapping years in order to be able to tell after how many years on average the changes in gearing occur in response to changes in hypothesised determinants.

6.3.3 *Use of SEM technique in the adjustment model*

Structural equation modelling (SEM) is also be used for purposes of investigating determinants of capital structure adjustments towards an optimal capital structure. This is be done by fitting the changes (Δ's) in the indicator variables over the period of study, into the measurement model in order to determine the factor loadings (see figure 6.2). The factor loadings estimated by the measurement model, together with the changes (Δ's) in gearing ratios over time, then form the inputs into the structural model. This process is repeated twice because of the number of the moving windows. The length of (number of years in) the windows and the number of years' lag is varied in order to investigate the speed with which the gearing ratios change following changes in the theorised determinants. This is the first attempt to use the structural equation modelling (SEM) in a study of capital structure adjustments and speed of adjustments. If using a number of indicator variables per latent attribute generates improved results (Chiarella *et al.*, 1992. p.145), then SEM should be able to explain more changes in gearing and the corresponding determinants than OLS-regression analysis.

6.4 Results of tests on target ratio adjustments

6.4.1 *Introduction*

If managers make intentional adjustments to their firms' capital structure in response to changes in the values of the theorised capital structure determinants then further evidence can be obtained from analysing capital structure changes in relation to those determinants. The results of tests conducted on capital structure changes in relation to determinants for the sample period (1985-2000) are reported in this section. This section presents and discusses the results from the tests, which consider capital structure in a dynamic context. The results are reported from two alternative methodologies designed to investigate how gearing responds to changes in its hypothesised determinants. These determinants comprise those factors which were found to influence gearing in the cross-sectional analysis, together with changes in both interest rates and corporate tax rate.

6.4.2 *Capital structure adjustment process*

6.4.2.1 *Moving window regression results*

Table 6.2 presents the results of OLS-regression of the changes in eight measures of gearing on corresponding changes in the determinants of capital structure. In the moving windows regressions, both the independent and the dependent variables are three-year averages of yearly data from 1990 to 2000. The averaging is done to remove the 'noise', which may result if yearly data are used as they are.

Table 6.2 has three panels, A, B, and C. In panel A, there is a lag of one year between the three years of independent variables and the three years of dependent variables. For example in window I of Panel A, the change in independent variable is the difference between the three years' average of 1993, 1994, and 1995, and the three years' average of 1990, 1991, and 1992. The dependent variable is the difference between the averages of gearing for three years 1994, 1995, and 1996, and that of 1991, 1992, and 1993. The changes in independent variables precede those of the dependent variables. Panels B and C follows the same approach but the number of years' lag between the independent and dependent variables is two and three respectively.

These alternative lags are deliberate, and serve two main purposes. First is the recognition that if managers do make adjustments in their capital structure, the decisions involving capital structure changes are made in response to the determinants whose changes precede the actual capital structure changes. Secondly, the comparative results from each panel may provide an indication as to the speed with which capital structure changes occur in response to changes in the underlying hypothesised determinants. Each panel has two windows; the windows simply move the regressions from earlier years to later years (i.e. from

1990 to 2000). Table 6.3 provides a summary of relationships from the results of moving windows regressions.

Table 6.4 shows the results of the moving window pooled regressions, which are similar to those in immediately preceding tables. The only difference is that for the pooled regressions, the regression is done on pooled data of all one-year lags, of all two-year lags, and of all three-year lags, regardless of window. This has the effect of increasing observations in order to discern more meaningful relationships. The pooling of observations doubles the observations from 651 to 1302. Table 6.5 presents a summary of relationships between the hypothesised determinants and gearing from the results of pooled regressions. Combining the results shown in tables 6.2, 6.3, 6.4, and 6.5 the following can be deduced from this analysis.

The determinants whose changes are strongly (significantly) related to corresponding changes in gearing are, non-debt tax shields, firm size, past profitability, cash holdings, and corporate tax rate, and to some extent interest rate. The relationship between changes in these six determinants and gearing is generally consistent in all lags (panels), all windows, and even in the pooled regressions results. This means that the relationship is not merely an artefact of a particular sub-period, neither is it only for a short-term or for a long-term. It seems that changes in gearing are a positive response to firm size, corporate tax rate, and interest rate, both in short- and long term.

Changes in gearing relate positively to changes in interest rates both in the short-term and in the long-term, except for long-term debt whose relationship with interest rates is insignificant. With the exception of a sharp fall in interest rates between 1991 and 1993, changes in interest rates did not have a significant impact on the level of gearing. Changes in gearing appear to respond negatively to non-debt tax shields, past profitability, and cash holdings. Though the relationship is not very strong, the evidence points towards a positive relationship between changes in corporation tax and changes in gearing.

Gearing appears to respond positively to current profitability in the short-term (within 1 to 3 years). Beyond that duration there appears to be no significant relation relationship between gearing and current profitability. Likewise changes in growth opportunities seem to influence gearing negatively only in the short-term (one to three years). Beyond that horizon, although there is still a significant relationship, but the relationship becomes consistently positive. Bevan and Danbolt (2003) use interactive annual dummies in their dynamic analysis and find a positive relationship between growth and gearing. Gearing also responds negatively to probability of bankruptcy (both in the short- and long-term). Although in the short-term business risk exhibits a negative relationship with gearing, there are virtually no consistent relationship between changes that occur in tangibility, and business risk. It may be argued that short- term changes (of between 1 to three years) in business risk are meaningless and gearing cannot be expected to respond to them, and that the short-term inverse relationship simply echoes their cross-sectional relationship.

The findings of a target ratio adjustment proven in this study are consistent with Ozkan (2001) who finds that non-debt tax shields, liquidity, and growth opportunities, exert a negative effect on firms' gearing decisions. The positive response relating to firm size and the negative response relating to past profitability supports the findings of Nivorozhkin (2004), but is not consistent with Ozkan's (2001) findings on these attributes. In addition, this study's findings relating to how gearing responds to corporation taxes, cash holdings, and to profitability, are also consistent with Panno (2003).

As panel A of table 6.2 and table 6.4 show, changes in determinants that occur around 1 to 2 years (one year lag), are more significant for short-term debt than for long-term debt. The tendency starts to fade in panel B of those tables, and certainly in panel C the situation reverses. The changes in the relevant determinants in panel C become more significant for long-term debt than for short-term debt. This observation is corroborated by the differences in the (adjusted) R-squared and even F-statistics relating to short-term debt and long-term debt between panels A and B of these tables. In the pooled regression results, while the R-squared for long-term debt rises (from 0.1% to 1.4%), that of short-term debt falls (from 8.0% to 4.2%).

The R-squared for short-term debt continues to fall even further in panel C, while that of long-term debt remains more or less stable. In fact while the R-squared of all other gearing measures fall as the variables are lagged for more and more years (by 2, 3 years) that of long-term debt rises to begin with and then stabilises. While this in itself suggests the existence of some capital structure adjustment activity it also indicates that as firms try to adjust their gearing in response to changes in their firm specific or macroeconomic environment, they adjust short term debt first (and faster) because it is flexible or convenient to do so than for long-term debt. The findings that firms adjust to the target ratio quickly are consistent with both Ozkan (2001) and Auerbach (1985), and are inconsistent with Taggart (1977). Nivorozhkin (2004) also finds that target leverage and speed of adjustment fluctuates over time, and that the direction of these changes is traceable to firm characteristics, the macroeconomic environment of the country, and the policies of financial intermediaries. Generally, the explanatory power of the target adjustment model used in this section is very low. This implies that the variables used as independent variables explain very little changes in gearing. The next section gives the results of the alternative target adjustment model which is used for the first time in the dynamics of capital structure by this study.

6.4.2.2 *Results of Structural Equation Dynamics Model*

It was pointed out earlier that structural equation modelling (SEM) recognizes that there may be more than one proxy for a hypothesized determinant of capital structure. To address this issue, SEM therefore includes more than one indicator for a latent variable in its measurement model. If more than one indicator per latent variable captures the relationship between the attributes and gearing in a cross-sectional analysis, then the technique might also work for changes in these variables. As part of the analysis of capital structure in a dynamic context, a dynamic version of SEM was generated by fitting the changes in indicator variables into the SEM's measurement model. The resulting factor loadings were then related to the changes in gearing ratios in the structural model. There is no previous study that has used structural equation modelling in the tests of capital structure dynamics. The previous two studies that employed SEM were limited to cross-sectional analysis.

The Structural Equation Model was used to test the relationship between changes in the theorised attributes versus changes in the eight measures of gearing between 1990 and 1999. As it was done under OLS-regression, structural equation modelling was applied to the different windows of the moving windows model. Figure 6.2 shows the measurement model matrices of the model used. To differentiate between this model and the one used for cross-sectional analysis, this model is referred to as 'structural equation-dynamics (SEM-DYNAMICS) model'. The tests were carried out in two windows. The tests were conducted such that the changes in gearing were related to changes in manifest variables that occurred one to three years prior to changes in gearing. Table 6.6 shows factor loadings for the indicator variables, and table 6.7 shows the estimates of the structural coefficients from the pooled SEM-DYNAMICS model. The pooled model uses the data for different windows in one model.

The SEM-Dynamics model's results summary box at the bottom of table 6.7 shows the statistics which can be used to assess the success of the iterations and the fit of the model. (The basic interpretation of these numbers was provided in section 4.13 of chapter four where the results of cross-sectional SEM were presented). The SEM-Dynamics summary box shows that the discrepancy function is 1.74, a little bit higher than the one for cross-sectional results. Both the maximum residual cosine (0.022) and maximum absolute gradient (0.000198) are close to zero. The ICSF and the ICS are equal and are close to zero. The boundary condition shows that there were four inequality constraints operating at convergence in the model. The right side statistics shows the *Chi*-square of 2265.4, the degree of freedom for the *Chi*-square statistic, and the probability level of 0.000 for *Chi*-square. The point estimate and the 90% confidence interval for the Steiger-Lind RMSEA statistic are also shown. The root mean square (RMS) standardized residual of 0.0937 is close to 0.05 which is required for the perfect fit. Generally, the summary box shows that the iteration was successful and the fit is good.

As table 6.7 shows, changes in gearing relate positively to changes in firm size, and changes in Z-score (the proxy for probability of bankruptcy). This implies that firm size is a positive determinant of gearing, and probability of bankruptcy is a negative determinant of gearing. Likewise, changes in gearing relate negatively to changes in non-debt tax shields, and to changes in current profitability. Other relationships are either insignificant or perverse. The changes in tangibility show a negative relation to changes in gearing, and changes in growth depict a positive relationship to changes in gearing, although the coefficient for market value gearing is insignificant. Excluding the effects of current liabilities, most of the coefficients for business risk show insignificant relationship. Changes in past profitability seem to have a positive impact on gearing.

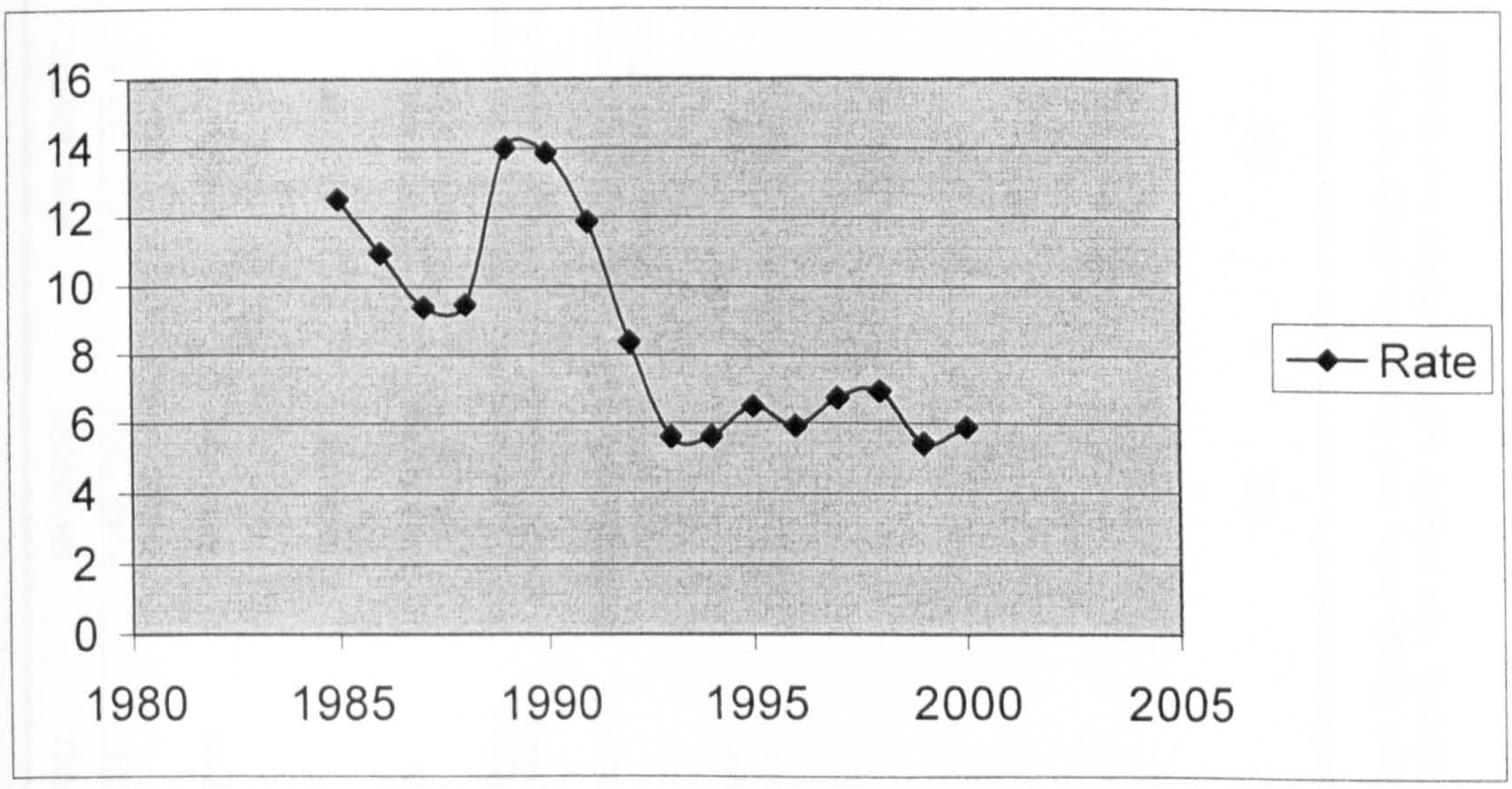
6.5 Summary and conclusion

The conventional regression model's results in this chapter have shown that changes in firm size and changes corporate taxes are positively related to changes in gearing. Changes in non-debt tax shields, past profitability, and cash holdings are negatively related to changes in gearing. Changes in other attributes do not have consistent relationship with changes in gearing. On the other hand it can be concluded that the SEM-DYNAMICS model in this chapter has confirmed the persistent negative relationship between gearing and both non-debt tax shields, and probability of bankruptcy. The model has also confirmed the positive relation between gearing and firm size. As for other determinants tested by the model, the results are either insignificant or perverse.

The two target-adjustment models' results have only provided support for firm size and corporate taxes, as positive determinants of gearing, and non-debt tax shields, past profitability and cash holdings, as inversely related to gearing. The results for other attributes are insignificant, mixed or perverse. Typical of previous similar studies, the explanatory power of these target adjustment models is generally low. This seems to imply that some important variable(s) which determine changes in gearing ratios have been left out of the models. The next chapter extends the analysis of capital structure dynamics by testing the effects of equity market timing and stock returns on capital structure. The chapter tries to disentangle the two effects in order to find out which one has a greater impact on gearing. The relative importance of all other determinants is also examined.

6.6. Appendix: Tables and Figures:

Figure 6.1: Average yearly interest levels 1985-2000



Source: Bank of England monthly interest rate database (2001)

Table 6.1: A Summary of selected previous capital structure dynamics studies in comparison to this study

	Taggart (1977)	*Marsh(1982)*	*JH (1984)*	*Auerbach (1985)*	*Ozkan (2001)*	*BW (2002)*	*Welch (2002)*	*This Study*
Sample period	1951-1972	1959-1974	1966-1978	1969-1977	1984-1996	1968-1999	1975-2000	1985-2000
No of Yrs	21	15	15	9	13	31	26	16
Sample size (firms)	62 obs.	856 obs.	108	143	390 (4132obs)	2839 obs.	Over 50,000	651 (9,486 obs)
No of Industries	-	-	-	-	-	-	-	28
Methodology	B/sheet ratios	Logit &Probit	OLS-regr, SUR	Δs in debt levels	GMM	OLS-regr	OLS-regr	SEM, OLS-regr Δs in debt levels
Strength	-	Examine issues of securities	Varying speed	Δs in debt levels, adj. for inflation	Latest UK Study.	Track timing Effects.	Track stock return effects	Δs in debt levels' SEM, Comparison
Weakness	Small sample	-	Small sample	Contradict Taggart (1977) on speed	Contradict Taggart (1977) on speed	Timing & stock return effects combined	Timing & stock return Effects combined	-
Findings	S/t debt absorb s/t changes	Firms have target ratio	Fin. decisions interdependent	Rapid adj. speed for s/t debt	Firms have target ratio	No target ratio, cum. timing effect	No target ratio, cum. Stock return effect	Stock return effects have stronger impact than equity market timing.
Target determinants					Liquidity, profit, Ndts, growth	-	-	Stock return, Past profit, timing, size, growth Ndts.
1.Corp. tax	YES	-	-	-	-	-	-	YES
2.Financial distress	YES	YES	-	-	-	-	-	YES
3.Rationing by lenders	YES	-	-	-	-	-	-	-
4. Firm size	-	YES	-	-	-	-	-	YES
5.Asset composition	-	YES	-	-	-	-	-	NO
Adj. process & Speed								
1.Interest rate	YES	-	YES	-	-	-	-	YES
2.stock price	YES	YES	YES			YES	YES	YES
3. Firm size	-	-	YES					
4. Speed	SLOW	-	-	RAPID	FAST	-	-	FAST (s/t debt)

The summary gives salient features of previous studies on capital structure adjustments towards long-term target ratio, and those that simply try to establish forces behind capital structure fluctuations. Marsh (1982) looked at securities issues, JH (1984) refers to Jalilvand and Harris (1984), 'BW (2002)' refers to Baker and Wurgler (2002), and 'Ndts' refers to non-debt tax shields. The last column summarises this study's features.

Table 6.2: Moving Windows OLS Regression Coefficients

	Gearing, R-sq (adj.), Fstat.	FA/TA	OIIT	MTB	LTA	SIGOI	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
	Panel A: Dependent variable lagged one year, N=651											
Window I	TLp/TA (BV) *R=17.5, F=10.7*	-0.27 (3.9)*	-0.03 (-3.5)*	0.03 (2.8)*	0.04 (2.0)*	0.67 (1.2)	-0.21 (-4.9)*	-0.17 (-0.98)	-0.01 (-0.54)	-0.11 (-5.3)*	0.03 (0.68)	1.0 (2.2)[a]
Window I	Dp/TA (BV) *R=5.2, F=3.4*	0.11 (2.2)[a]	-0.02 (-3.1)*	0.003 (0.44)	0.03 (1.97)[a]	0.003 (0.01)	-0.06 (-2.1)[a]	-0.05 (-0.43)	-0.01 (-1.16)	0.00 (0.03)	0.02 (0.83)	0.32 (0.96)
Window I	Dp/E (BV) *R=9.7, F=5.6*	0.12 (0.95)	-0.07 (-4.8)*	0.02 (0.87)	0.05 (1.3)	0.33 (0.3)	-0.28 (-3.4)*	-0.05 (-0.14)	-0.08 (-2.5)[a]	-0.02 (-0.64)	0.04 (0.58)	1.79 (2.0)[a]
Window I	LTD/TA (BV) *R=0.5, F=1.2*	0.04 (1.38)	-0.005 (-1.49)	-0.003 (-0.55)	0.01 (0.72)	0.003 (0.01)	-0.03 (-1.8)[b]	0.02 (0.24)	-0.004 (-0.58)	0.01 (0.68)	-0.02 (-1.32)	0.12 (0.62)
Window I	STD/TA (BV) *R=3.9, F=2.8*	0.05 (1.31)	-0.01 (-1.9)[b]	0.003 (0.49)	0.02 (2.01)[a]	-0.18 (-0.58)	-0.03 (-1.43)	0.10 (1.06)	-0.02 (-1.9)[b]	-0.01 (-0.72)	0.04 (1.78)[b]	-0.02 (-0.07)
Window I	CL/TA (BV) *R=18.2, F=10.9*	-0.3 (-5.6)*	-0.01 (-1.9)[a]	0.03 (2.7)*	-0.01 (-0.40)	1.29 (2.8)*	-0.01 (-2.7)*	-0.28 (-2.0)[a]	0.01 (0.48)	-0.11 (-6.6)*	-0.02 (-0.54)	1.08 (2.9)*
Window I	EBITD/I (BV) *R=20.0, F=8.3*	-0.74 (-0.86)	0.20 (1.95)[a]	0.72 (4.17)*	-0.53 (-2.1)[a]	17.8 (2.3)[a]	1.76 (3.16)*	3.83 (1.62)	0.06 (0.24)	0.6 (1.81)[b]	2.04 (4.08)*	2.6 (0.46)
Window I	Dp/CAP-MV *R=17.9, F=10.7*	0.13 (2.10)[a]	-0.05 (-7.1)*	-0.02 (-1.9)[b]	0.06 (3.43)*	-0.27 (-0.52)	-0.004 (-0.11)	-0.09 (-0.61)	-0.02 (-1.2)	-0.02 (-0.92)	0.05 (1.4)	0.87 (1.99)[a]
Window II	TLp/TA (BV) *R=17.1, F=10.3*	-0.29 (-3.6)*	-0.03 (-2.7)*	0.03 (2.38)[a]	0.004 (0.14)	1.45 (1.95)[a]	-0.32 (-5.5)*	0.27 (1.25)	0.01 (0.65)	-0.08 (-3.7)*	0.92 (2.55)*	0.86 (1.54)
Window II	Dp/TA (BV) *R=5.7, F=3.7*	-0.09 (-1.7)[b]	-0.03 (-2.9)*	0.006 (0.58)	0.03 (1.32)	0.37 (0.73)	-0.12 (-3.1)*	0.32 (2.14)[a]	-0.01 (-0.53)	-0.01 (-0.58)	0.41 (1.64)[b]	0.39 (1.01)
Window II	Dp/E (BV) *R=6.9, F=4.3*	-0.14 (-0.87)	-0.04 (-1.56)	-0.005 (-0.17)	0.13 (2.09)[a]	0.34 (0.23)	-0.62 (-5.4)*	0.95 (2.12)[a]	0.01 (0.20)	0.007 (0.17)	0.43 (0.60)	-1.53 (-1.36)
Window II	LTD/TA (BV) *R=0.0, F=0.81*	-0.02 (-0.51)	-0.001 (-0.20)	0.005 (0.91)	-0.01 (-0.90)	-0.33 (-1.14)	-0.03 (-1.43)	-0.06 (-0.77)	-0.007 (-0.73)	0.00 (0.02)	0.22 (1.56)	0.11 (0.52)
Window II	STD/TA (BV) *R=7.0, F=4.4*	-0.02 (-0.53)	-0.01 (-2.1)[a]	0.01 (1.02)	0.03 (1.90)[b]	-0.01 (-0.27)	-0.13 (-4.5)*	0.15 (1.41)	-0.01 (-0.96)	0.01 (1.04)	0.23 (1.32)	-0.08 (-0.28)
Window II	CL/TA (BV) *R=18.8, F=11.5*	-0.16 (-3.2)*	-0.01 (-1.28)	0.01 (1.64)[b]	-0.002 (-0.11)	0.50 (1.10)	-0.17 (-4.8)*	0.18 (1.39)	0.03 (2.29)[a]	-0.08 (-5.7)*	0.47 (2.18)[a]	-0.04 (-0.12)
Window II	EBITDA/I (BV) *R=8.6, F=2.9*	2.84 (1.98)[a]	0.23 (1.05)	0.32 (1.34)	0.89 (1.76)[b]	5.4 (0.37)	0.69 (0.72)	0.52 (0.12)	0.14 (0.38)	0.61 (1.56)	-25.2 (-3.65)	3.1 (0.37)
Window II	Dp/CAP-MV *R=12.8, F=7.7*	-0.02 (-0.43)	-0.04 (-4.5)*	-0.02 (-2.3)[a]	0.05 (2.39)[a]	-0.64 (-1.2)	-0.17 (-4.1)*	0.02 (0.13)	-0.01 (-0.81)	0.01 (0.71)	0.09 (0.37)	0.45 (1.11)

Window I regresses the change in gearing from 1991-93 average to 1994-96 average on the change in exogenous variables from the 1990-92 average to 1993-95 average. Window II regresses the change in gearing from 1994-96 average to 1997-99 average on the change in exogenous variables from the 1993-95 average to 1996-98 average. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses in columns 3 through 13 are corresponding t-statistics. R-sq (adj.) % and F-statistic are shown under each model (gearing measures) in column two.

Table 6.2: Continued...

Window	Gearing, R-sq(adj.), Fstat	FA/TA	OI/T	MTB	LTA	SIGOI	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
	Panel B: Dependent variable lagged two years, N=651											
Window I	TLp/TA (BV)	-0.15	-0.01	0.06	0.04	1.82	-0.01	-0.33	-0.01	-0.07	0.04	1.19
	R=9.3, F=5.6	(1.72)[b]	(1.10)	(3.82)*	(1.65)[b]	(2.49)[a]	(-0.28)	(-1.48)	(-0.62)	(-2.7)*	(0.87)	(1.94)[a]
	Dp/TA (BV)	0.07	-0.01	0.03	0.02	1.03	0.02	-0.23	-0.01	-0.01	0.02	0.44
	R=5.4, F=3.5	(1.44)	(-1.53)	(3.21)*	(1.56)	(2.44)[a]	(0.67)	(-1.7)[b]	(-1.32)	(-0.84)	(0.55)	(1.24)
	Dp/E (BV)	0.34	-0.03	0.03	0.06	1.08	-0.10	-0.28	-0.01	-0.02	-0.01	2.23
	R=4.7, F=3.1	(2.36)[a]	(-2.1)[a]	(1.4)	(1.56)	(0.89)	(-1.15)	(-0.76)	(-0.43)	(-0.47)	(-0.09)	(2.21)[a]
	LTD/TA (BV)	0.04	-0.01	0.02	-0.01	0.63	-0.02	-0.18	-0.007	0.003	-0.01	0.58
	R=3.8, F=2.7	(1.29)	(-2.3)[a]	(2.93)*	(-1.09)	(2.30)[a]	(-0.94)	(-2.1)[a]	(-0.80)	(0.32)	(-0.42)	(2.54)[a]
	STD/TA (BV)	0.04	-0.004	0.014	0.03	0.15	0.01	0.007	-0.01	-0.01	0.01	0.04
	R=3.2, F=2.4	(1.09)	(-1.10)	(2.10)[a]	(2.50)[a]	(0.47)	(0.61)	(0.07)	(-1.12)	(-0.80)	(0.57)	(0.14)
	CL/TA (BV)	-0.14	-0.001	0.01	-0.01	1.62	-0.03	-0.15	0.02	-0.04	0.01	0.92
	R=6.0, F=3.8	(-2.6)[a]	(-0.12)	(0.90)	(-0.53)	(3.49)*	(-1.01)	(-1.08)	(1.14)	(-2.2)[a]	(0.40)	(2.36)[a]
	EBITD/I (BV)	0.11	0.13	0.54	-0.19	17.9	0.76	3.6	0.20	0.61	2.23	-7.8
	R=4.9, F=2.3	(0.09)	(0.90)	(2.14)[a]	(-0.48)	(1.61)	(0.95)	(1.04)	(0.54)	(1.40)	(3.35)*	(-0.87)
	Dp/CAP-MV	0.12	-0.03	0.02	0.06	0.11	0.07	-0.03	-0.02	-0.03	0.02	0.54
	R=10.9, F=6.4	(2.04)[a]	(-4.7)*	(2.09)[a]	(3.37)*	(0.22)	(1.84)[b]	(-1.7)[b]	(-1.56)	(-1.42)	(0.50)	(1.27)
Window II	TLp/TA (BV)	-0.2	-0.01	0.04	-0.02	1.4	-0.17	0.18	0.01	-0.04	1.12	-0.01
	R=5.6, F=3.7	(-2.0)[a]	(-0.59)	(2.52)[a]	(-0.50)	(1.56)	(-2.4)[a]	(0.70)	(0.39)	(-1.57)	(2.59)*	(-0.02)
	Dp/TA (BV)	-0.07	-0.01	0.02	0.02	0.12	-0.16	0.28	-0.01	-0.02	0.4	-0.39
	R=4.6, F=3.1	(-1.16)	(-0.93)	(2.21)[a]	(0.74)	(0.22)	(-3.8)*	(1.72)[b]	(-0.50)	(-0.11)	(1.49)	(-0.96)
	Dp/E (BV)	-0.11	0.03	0.03	0.10	1.02	-0.62	0.50	-0.03	0.02	1.13	-3.11
	R=8.3, F=4.9	(-1.1)	(1.24)	(1.11)	(1.60)	(0.65)	(-5.3)*	(1.07)	(-0.55)	(0.49)	(1.50)	(-2.6)*
	LTD/TA (BV)	-0.03	-0.003	0.004	-0.004	-0.23	-0.06	-0.02	-0.005	0.001	0.24	-0.01
	R=1.0, F=1.4	(-0.88)	(-0.60)	(0.80)	(-0.33)	(-0.82)	(-2.5)[a]	(-0.28)	(-0.56)	(0.07)	(1.71)[b]	(-0.03)
	STD/TA (BV)	-0.04	-0.01	0.01	0.02	-0.43	-0.10	0.18	-0.01	0.01	0.28	-0.3
	R=4.1, F=2.9	(-1.00)	(-1.23)	(1.62)	(1.23)	(-1.09)	(-3.4)*	(1.55)	(-0.91)	(1.16)	(1.46)	(-1.01)
	CL/TA (BV)	-0.06	-0.005	0.01	-0.02	0.07	-0.1	0.18	0.02	-0.04	0.50	-0.1
	R=4.4, F=3.1	(-1.11)	(-0.63)	(1.02)	(-1.33)	(0.15)	(-2.3)[a]	(1.21)	(1.21)	(-2.6)*	(2.09)[a]	(-0.26)
	EBITD/I (BV)	1.9	0.41	-0.2	0.45	35.0	0.36	-2.7	0.70	1.0	-16.3	-4.2
	R=3.5, F=1.6	(1.16)	(1.64)[b]	(-0.67)	(0.78)	(2.15)[a]	(0.35)	(-0.56)	(1.60)	(1.88)[b]	(-1.9)[a]	(-0.45)
	Dp/CAP-MV	-0.03	-0.02	-0.004	0.03	-0.34	-0.16	-0.03	-0.02	0.01	0.26	-0.01
	R=5.1, F=3.4	(-0.48)	(-1.9)[b]	(-0.40)	(1.40)	(-0.59)	(-3.59)	(0.23)	(-1.06)	(0.79)	(0.94)	(-0.03)

Window I regresses t the change in gearing from 1992-94 averages to 1993-97 averages on the change in exogenous variables from the 1990-92 averages to 1993-95 averages. Window II regresses on the change in gearing from 1995-97 average to 1998-2000 averages on the change in exogenous variables from the 1993-95 average to 1996-98 average. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses in columns 3 through 13 are corresponding t-statistics. R-sq (adj.) % and F-statistic are shown under each model (gearing measures) in column two.

Table 6.2: Continued...

	Gearing, R-sq(adj.), Fstat	FA/TA	OIIT	MTB	LTA	SIGOI	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
	Panel C: Dependent variable lagged three years, N=651											
Window I	TLp/TA (BV) R=5.0, F=3.2	-0.08 (-0.99)	-0.06 (-0.70)	0.01 (0.90)	0.02 (0.88)	1.32 (1.91)[b]	0.07 (1.50)	-0.14 (-0.70)	-0.02 (-1.11)	-0.04 (1.78)[b]	-0.04 (-0.82)	1.54 (2.76)*
Window I	Dp/TA (BV) R=8.7, F=5.2	-0.004 (-0.07)	-0.00 (-0.01)	0.03 (2.68)*	0.02 (1.64)[b]	1.5 (3.44)*	0.08 (2.42)[a]	-0.36 (-2.58)*	-0.007 (-0.49)	-0.03 (-1.9)[b]	-0.004 (-0.12)	0.69 (1.86)[b]
Window I	Dp/E (BV) R=4.8, F=3.2	0.23 (1.58)	-0.002 (-0.11)	0.02 (0.90)	0.08 (1.96)[a]	0.46 (0.37)	0.20 (2.18)[a]	-0.25 (-0.65)	0.03 (0.91)	-0.05 (-1.09)	-0.09 (-1.00)	1.3 (1.27)
Window I	LTD/TA (BV) R=0, F=0.8	0.01 (0.49)	-0.001 (-0.36)	0.01 (1.43)	0.003 (0.44)	0.17 (0.74)	-0.00 (-0.02)	-0.11 (-1.50)	-0.004 (-0.53)	-0.004 (-0.49)	-0.005 (-0.31)	0.20 (1.06)
Window I	STD/TA (BV) R=3.7, F=2.6	0.02 (0.67)	-0.002 (-0.42)	0.006 (0.93)	0.01 (1.43)	0.32 (1.16)	0.04 (1.71)[b]	-0.14 (-1.6)[b]	-0.01 (-1.16)	-0.01 (-1.20)	-0.03 (-1.48)	0.46 (2.0)[a]
Window I	CL/TA (BV) R=0.5, F=1.2	-0.06 (-1.13)	0.001 (0.14)	-0.001 (-0.15)	-0.004 (-0.25)	1.13 (2.38)[a]	0.04 (1.08)	-0.05 (-0.36)	0.001 (0.05)	-0.004 (-0.23)	0.005 (0.15)	0.64 (1.63)[b]
Window I	EBITD/I (BV) R=13.6, F=4.6	-0.99 (-0.78)	0.34 (2.41)[a]	-0.004 (-0.02)	-0.41 (-1.11)	15.4 (1.46)	0.29 (0.39)	6.02 (1.79)[b]	0.46 (1.31)	0.48 (1.13)	3.7 (5.54)*	-8.5 (-0.98)
Window I	Dp/CAP-MV R=10.9, F=6.5	0.10 (1.73)[b]	-0.02 (-2.9)*	0.04 (3.72)*	0.04 (2.26)[a]	0.7 (1.40)	0.09 (2.64)*	-0.45 (-2.9)*	-0.007 (-0.48)	-0.03 (-1.8)[b]	0.03 (0.96)	0.93 (2.23)[a]
Window II	TLp/TA (BV) R=5.7, F=3.7	-0.15 (-1.7)[b]	0.002 (0.15)	0.03 (2.42)[a]	-0.05 (-1.55)	1.52 (1.87)[b]	-0.18 (-2.7)*	0.34 (1.43)	0.01 (0.56)	0.01 (0.59)	1.09 (2.73)*	-0.05 (-0.08)
Window II	Dp/TA (BV) R=3.4, F=2.5	-0.07 (-1.3)	-0.004 (-0.50)	0.01 (1.42)	-0.01 (-0.44)	0.28 (0.58)	-0.11 (-2.9)*	0.24 (1.70)[b]	-0.001 (-0.03)	-0.001 (-0.02)	0.52 (2.22)[a]	0.02 (0.06)
Window II	Dp/E (BV) R=1.7, F=1.7	-0.18 (-0.96)	-0.01 (-0.29)	0.07 (2.21)[a]	-0.05 (-0.68)	1.6 (0.96)	-0.28 (-2.1)[a]	0.57 (1.10)	-0.05 (-0.96)	-0.06 (-1.12)	0.71 (0.86)	-0.33 (-0.25)
Window II	LTD/TA (BV) R=3.8, F=2.7	-0.01 (-0.64)	-0.007 (-1.7)[b]	0.001 (0.28)	-0.01 (-1.02)	-0.19 (-0.86)	-0.06 (-3.3)*	-0.02 (-0.43)	-0.005 (-0.70)	0.007 (1.07)	0.32 (2.88)*	0.24 (1.39)
Window II	STD/TA (BV) R=0.9, F=1.4	-0.04 (-0.87)	0.002 (0.25)	0.01 (1.53)	-0.01 (-0.56)	0.21 (0.48)	-0.08 (-2.2)[a]	0.14 (1.08)	-0.00 (-0.02)	0.008 (0.57)	0.17 (0.79)	0.12 (0.34)
Window II	CL/TA (BV) R=0, F=0.8	-0.01 (-0.24)	-0.002 (-0.15)	0.02 (1.59)	-0.04 (-1.7)[b]	0.21 (0.38)	-0.03 (-0.69)	-0.1 (-0.57)	0.005 (-0.28)	0.007 (0.43)	0.49 (1.90)[b]	0.09 (0.23)
Window II	EBITD/I (BV) R=2.7, F=2.0	4.7 (0.83)	2.1 (2.44)[a]	-1.4 (-1.38)	-1.71 (-0.85)	13.9 (0.27)	2.9 (0.79)	-11.01 (-0.72)	1.99 (1.17)	4.36 (2.83)*	-8.57 (-0.36)	-43.9 (-1.22)
Window II	Dp/CAP-MV R=1.9,F=1.88	-0.08 (-1.02)	-0.014 (-1.1)	0.01 (0.82)	-0.04 (-1.45)	0.46 (0.68)	-0.11 (-2.1)[a]	0.12 (0.61)	-0.02 (-0.81)	-0.003 (-0.16)	0.95 (2.86)*	0.63 (1.21)

Window I regresses the changes in gearing from 1993-95 average to 1996-98 average on the changes in exogenous variables from the 1990-92 average to 1993-95 average. Window II regresses the change in gearing from 1996-98 average to 1999-2000 average on the change in exogenous variables from the 1993-95 averages to 1996-98 averages.. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses in columns 3 through 13 are corresponding t-statistics. R-sq (adj.) % and F-statistic are shown under each model (gearing measures) in column two.

Table 6.3: Summary of Relations in Moving Windows' OLS Regression Coefficients

	Proxies for hypothesized determinants of capital structure										
	FA/TA	OliT	MTB	LnTA	SIGOIS	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
Panel A: Dependent variable lagged one year, N=651											
Window I	+	-	-	+	-	-	-	-	-	+, -	+
Window II	-	-	-	+	+	-	+	+	-	+	+, -
Panel B: Dependent variable lagged two years, N=651											
Window I	+	-	+, -	+	+, -	+	-	NS	-	-	+
Window II	-	-	+	+	-	-	+	NS	-	+	-
Panel C: Dependent variable lagged three years, N=651											
Window I	+	-	+	+	+	+	-	NS	-	-	+
Window II	-	-	+	-	+	-	+	NS	-	+	NS
Overall Relation between changes in proxies and changes in gearing											
	mixed	-	- + +	+	mixed	- mixed	mixed	NS	-	mixed	+

Explanation: A plain -, or + sign denotes a significant negative or positive relationship respectively between hypothesised determinants and gearing. NS denotes insignificant relationship.

Interpretation: It is not possible to determine whether the dominant relationship between changes in tangibility and changes in gearing is positive or negative. The same problem applies to changes in SIGOIS (the proxy for business risk). The relationship between changes in Z-score (the proxy for the probability of bankruptcy) and changes in gearing is insignificant. There is a strong evidence of a positive relationship between changes in firm size and changes in gearing. There is also a strong evidence of a negative relationship between changes in non-debt tax shields, in cash holdings, in past profitability and changes in gearing. Changes in current profitability show both positive and negative relationship to changes in gearing. Growth opportunities start with a negative relationship in the short term, but in the long run, there is a positive relationship between growth and gearing. Changes in corporate tax exhibit a positive relationship to changes in gearing, while interest rate has mixed relationship.

Table 6.4: Moving window pooled regressions

Gearing, R-sq(adj.), Fstat	FA/TA	OlIT	MTB	LTA	SIGOIS	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
Panel A: Dependent variable lagged one year, N=1302											
TLp/TA (BV) *17.6, 20.29*	-0.28 (-5.2)*	-0.031 (-4.3)*	0.034 (3.69)*	0.05 (3.07)*	1.13 (2.4)[a]	-0.26 (-7.6)*	0.10 (0.74)	0.005 (0.37)	-0.09 (-6.4)*	0.03 (2.6)[a]	0.84 (2.3)[a]
Dp/TA (BV) *6.6, 7.34*	-0.001 (-0.03)	-0.02 (-4.1)*	0.005 (0.77)	0.04 (3.7)*	0.28 (0.89)	-0.09 (-3.9)*	0.15 (1.62)	0.01 (-0.79)	-0.005 (-0.52)	0.028 (3.90)*	0.27 (1.08)
Dp/E (BV) *9.5, 10.24*	-0.03 (-0.31)	-0.06 (-4.05)	0.01 (0.38)	0.11 (3.62)*	0.21 (0.24)	-0.45 (-6.6)*	0.50 (1.82)[b]	-0.02 (-0.97)	-0.01 (-0.41)	0.09 (4.66)*	-0.14 (-0.20)
LTD/TA (BV) *0.1, 1.08*	0.01 (0.46)	-0.003 (-1.13)	0.002 (0.49)	0.004 (0.62)	-0.16 (-0.88)	-0.04 (-2.5)*	-0.01 (-0.18)	-0.005 (-0.83)	0.001 (0.24)	-0.001 (-0.12)	0.07 (0.51)
STD/TA (BV) *8.0, 8.83*	0.008 (0.31)	-0.01 (-2.7)*	0.005 (1.05)	0.03 (4.16)*	-0.15 (-0.64)	-0.084 (-4.6)*	0.12 (1.69)[b]	-0.01 (-1.7)[b]	0.003 (0.45)	0.028 (5.3)*	-0.08 (-0.46)
CL/TA (BV) *17.4, 19.94*	-0.22 (-6.1)*	-0.01 (-2.0)[a]	0.018 (2.9)*	0.01 (1.13)	0.86 (2.7)*	-0.13 (-5.5)*	-0.01 (-0.10)	0.02 (2.13)[a]	-0.09 (-9.1)*	-0.001 (-0.08)	0.37 (1.52)
EBITD/I (BV) *9.8, 6.42*	0.35 (0.45)	0.18 (1.71)[b]	0.47 (3.19)*	-0.37 (-1.7)[b]	9.25 (1.27)	1.22 (2.39)[a]	1.11 (0.52)	0.17 (0.85)	0.82 (3.40)*	-0.61 (-3.8)*	6.8 (1.34)
Dp/CAP-MV *18.6, 21.6*	0.04 (1.00)	-0.05 (-8.3)*	-0.02 (-3.0)*	0.06 (5.0)*	-0.48 (-1.31)	-0.08 (-3.0)*	-0.05 (-0.48)	-0.01 (-1.12)	-0.001 (-0.05)	0.06 (7.5)*	0.62 (2.1)[a]
Panel B: Dependent variable lagged two years, N=1302											
TLp/TA (BV) *6.4, 7.16*	-0.18 (-2.7)*	-0.01 (-0.99)	0.05 (4.4)*	0.05 (2.4)[a]	1.63 (2.8)*	-0.09 (-2.2)[a]	-0.02 (-0.15)	0.001 (0.08)	-0.05 (-3.2)*	0.02 (1.45)	0.37 (0.84)
Dp/TA (BV) *4.9, 5.67*	-0.000 (-0.01)	-0.007 (-1.37)	0.02 (3.7)*	0.03 (2.9)*	0.60 (1.75)[b]	-0.07 (-2.6)*	0.03 (0.31)	-0.007 (-0.71)	-0.009 (-0.79)	0.03 (4.24)	-0.11 (-0.42)
Dp/E (BV) *6.7, 7.29*	0.08 (0.72)	-0.002 (-0.18)	0.03 (1.68)[b]	0.13 (3.9)*	0.89 (0.90)	-0.35 (-4.8)*	0.16 (0.56)	-0.006 (-0.19)	-0.001 (-0.04)	0.09 (4.5)*	-0.88 (-1.14)
LTD/TA (BV) *1.4, 2.3*	0.006 (0.29)	-0.005 (-1.7)[b]	0.009 (2.40)[a]	0.002 (0.35)	0.20 (1.02)	-0.04 (-2.7)*	-0.09 (-1.59)	-0.04 (-0.64)	0.001 (0.18)	0.002 (0.61)	0.18 (1.18)
STD/TA (BV) *4.7, 5.45*	-0.003 (-0.10)	-0.005 (-1.39)	0.01 (2.48)[a]	0.03 (3.91)*	-0.13 (-0.55)	-0.04 (-2.3)[a]	0.08 (1.16)	-0.008 (-1.04)	0.004 (0.53)	0.02 (4.48)	-0.21 (-1.08)
CL/TA (BV) *4.4, 5.1*	-0.09 (-2.4)[a]	-0.000 (-0.15)	0.009 (1.36)	-0.002 (-0.17)	0.89 (2.59)*	-0.06 (-2.45)	0.02 (0.19)	0.02 (1.87)[b]	-0.04 (-3.7)*	-0.01 (-2.3)[a]	0.29 (1.06)
EBITD/I (BV) *1.8, 1.8*	0.46 (0.47)	0.15 (1.25)	0.14 (0.77)	-0.16 (-0.61)	18.7 (2.11)	0.43 (0.69)	0.43 (0.16)	0.48 (1.70)[b]	0.93 (2.80)*	-0.13 (-0.70)	-2.16 (-0.35)
Dp/CAP-MV *10.6, 11.7*	0.04 (0.86)	-0.03 (-4.4)*	0.07 (0.96)	0.05 (4.34)*	-0.17 (-0.45)	-0.04 (-1.39)	-0.15 (-1.37)	-0.02 (-1.58	-0.03 (-0.31)	0.06 (7.67)	0.16 (0.56)

Table 6.4: Continued...

Gearing, R-sq(adj.), Fstat	*FA/TA*	*OIIT*	*MTB*	*LTA*	*SIGOIS*	*RE/TA*	*OI/S*	*Zscore*	*CACL*	*Intr.*	*Tax*
Panel C: Dependent variable lagged three years N=1302											
TLp/TA (BV) *2.9, 3.61*	-0.12 (-2.0)[a]	-0.002 (-0.34)	0.03 (2.69)[a]	0.02 (0.94)	1.4 (2.60)[a]	-0.04 (-1.19)	0.17 (1.09)	0.000 (0.01)	-0.02 (-1.05)	0.00 (0.38)	0.53 (1.28)
Dp/TA (BV) *3.4, 4.1*	-0.03 (-0.81)	-0.000 (-0.04)	0.02 (2.87)[a]	0.02 (2.27)[a]	0.97 (2.94)[a]	-0.01 (-0.36)	-0.04 (-0.47)	0.001 (0.09)	-0.02 (-1.5)	0.01 (1.24)	0.2 (0.84)
Dp/E (BV) *1.3, 2.1*	0.02 (0.15)	-0.005 (-0.30)	0.05 (2.45)[a]	0.03 (0.85)	1.26 (1.19)	-0.01 (-0.16)	0.16 (0.52)	0.001 (0.02)	-0.06 (-1.6)[b]	0.04 (1.72)[b]	0.39 (0.47)
LTD/TA (BV) *0.8, 1.7*	0.000 (0.03)	-0.003 (-1.05)	0.003 (1.08)	0.006 (1.20)	-0.006 (-0.04)	-0.03 (-2.4)[a]	-0.07 (-1.40)	-0.003 (-0.65)	0.002 (0.45)	-0.000 (-0.15)	0.15 (1.20)
STD/TA (BV) *1.4, 2.3*	-0.01 (-0.46)	-0.000 (-0.08)	0.01 (2.04)	0.005 (0.66)	0.27 (1.02)	-0.02 (-1.03)	0.03 (0.41)	-0.002 (-0.30)	-0.003 (-0.34)	0.01 (2.18)[a]	0.2 (1.13)
CL/TA (BV) *0.2, 1.1*	-0.04 (-0.92)	0.000 (0.09)	0.01 (1.21)	-0.01 (-0.53)	0.65 (1.81)[b]	0.03 (0.12)	-0.06 (-0.62)	0.004 (0.40)	-0.001 (-0.08)	-0.01 (-1.8)[b]	0.28 (1.01)
EBITD/I (BV) *5.2, 4.7*	2.5 (0.7)	1.16 (2.39)[a]	-1.0 (-1.45)	-1.2 (-1.27)	4.14 (0.13)	2.0 (0.90)	-4.8 (-0.51)	1.4 (1.36)	3.36 (3.21)	-2.7 (-3.9)[a]	-29.0 (-1.23)
Dp/CAP-MV *7.0, 7.8*	0.01 (0.20)	-0.02 (-2.5)[a]	0.02 (2.80)	0.02 (1.77)[b]	0.65 (1.55)	-0.001 (-0.02)	-0.12 (-0.92)	-0.01 (-0.66)	-0.02 (-1.32)	0.07 (7.1)[a]	0.62 (1.85)[b]

Explanation: The summary of the relationships between independent attributes and the measures of gearing used in the moving window pooled regressions is provided in table 6.5

Table 6.5: Summary of pooled regressions

	Proxies for hypothesized determinants of capital structure										
	FA/TA	OIiT	MTB	LnTA	SIGOIS	RE/TA	OI/S	Zscore	CACL	Intr.	Tax
Panel A: Dependent variable lagged one year											
	NS	-	-	+	-	-	+	-	-	+	+
Panel B: Dependent variable lagged two years											
	NS	-	+	+	+, -	-	-	-	-	+	+,NS
Panel C: Dependent variable lagged three years											
	NS	-	+	+	+	-	-	-, NS	-	+	+
Overall Relation between changes in proxies and changes in gearing											
	mixed	-	-, +	+	-, +	-	+, -	-,NS	-	+	+

Explanation: A plain -, or + sign denotes a significant negative or positive relationship respectively between hypothesised determinants and gearing. NS denotes insignificant relationship, and 'mixed' denotes cases where the relationship between changes in an attribute and changes in gearing are positive in some windows and negative in others.

Interpretation: It is not possible to determine whether the dominant relationship between changes in tangibility and changes in gearing is positive or negative. The coefficients show mixed relationship. The same problem applies to changes in SIGOIS (the proxy for business risk). The coefficients show an inverse relationship between SIGOIS and gearing in the short- term. In the long-term the relationship becomes positive. The relationship between changes in Z-score (the proxy for the probability of bankruptcy) and changes in gearing is negative in the short term and insignificant in the long term. There is a strong evidence of a positive relationship between changes in firm size and changes in gearing. There is also a strong evidence of a negative relationship between changes in non-debt tax shields, in cash holdings, in past profitability and changes in gearing. Changes in current profitability show both positive and negative relationship to changes in gearing. Growth opportunities start with a negative relationship in the short term, but in the long run, there is a positive relationship between growth and gearing. Changes in corporate tax and interest rates exhibit a positive relationship to changes in gearing.

Figure 6.2: SEM DYNAMICS Measurement model matrices

$$
\begin{bmatrix} \Delta FA/TA \\ \Delta LnInvInt \\ \Delta D/TA \\ \Delta OIiT \\ \Delta MTB \\ \Delta TQ \\ \Delta CE/TA \\ \Delta LnTA \\ \Delta SIGOI \\ \Delta SIGOIS \\ \Delta CVEB/TA \\ \Delta SIGP \\ \Delta RE/TA \\ \Delta RE/S \\ \Delta CACL \\ \Delta OI/S \\ \Delta EBITD/TA \\ \Delta Zscore \end{bmatrix}
=
\begin{bmatrix}
\lambda_{1,1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\lambda_{2,1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & \lambda_{3,2} & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & \lambda_{4,2} & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \lambda_{5,3} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \lambda_{6,3} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \lambda_{7,3} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & \lambda_{8,4} & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \lambda_{9,5} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \lambda_{10,5} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \lambda_{11,5} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \lambda_{12,5} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & \lambda_{13,6} & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & \lambda_{14,6} & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & \lambda_{15,6} & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & \lambda_{16,7} & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & \lambda_{17,7} & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & \lambda_{18,8}
\end{bmatrix}
*
\begin{bmatrix} \Delta\xi_1 \\ \Delta\xi_2 \\ \Delta\xi_3 \\ \Delta\xi_4 \\ \Delta\xi_5 \\ \Delta\xi_6 \\ \Delta\xi_7 \\ \Delta\xi_8 \end{bmatrix}
+
\begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \\ \delta_7 \\ \delta_8 \\ \delta_9 \\ \delta_{10} \\ \delta_{11} \\ \delta_{12} \\ \delta_{13} \\ \delta_{14} \\ \delta_{15} \\ \delta_{16} \\ \delta_{17} \\ \delta_{18} \end{bmatrix}
$$

These matrices represent equation $\Delta x = \Lambda\Delta\xi + \delta$. These matrices depict a constrained factor analysis in which additional restrictions are imposed on the parameters of the measurement model. A total of 126 restrictions have been imposed on matrix Λ of factor loadings. These restrictions are shown as factor loadings that are specified to equal zero. These restrictions are in accordance with theory predictions. For example, since $\Delta FA/TA$ is not theorised to be an indicator for changes in business risk, its factor loading on change in business risk is set to zero.

Table 6.6: Pooled SEM-dynamics Factor Loadings for changes in proxies

Manifest Variables	ATTRIBUTES ξ_1 Δ Tang	ξ_2 Δ Ndts	ξ_3 Δ Grow	ξ_4 Δ Size	ξ_5 Δ Brisk	ξ_6 Δ Pprof	ξ_7 Δ Cprof	ξ_8 Δ Pbank
FA/TAn	0.13 (0.74)							
LnInvInt	2.6 (1.9)[b]							
D/TA		0.32 (2.9)*						
OIIT		5.2 (5.2)*						
MTB			1.8 (5.0)*					
TQ			4.2 (7.8)*					
CE/TA			0.62 (2.01)*					
LnTA				-0.63 (-3.6)*				
SIGOI					-2.6 (-1.64)[b]			
SIGOIS					15.8 (10.5)*			
CVEBITD					17.3 (10.8)*			
SIGP					2.3 (4.5)*			
RE/TA						18.9 (16.1)*		
RE/S						12.5 (14.2)*		
CACL						-0.01 (-0.04)		
OI/S							6.9 (7.6)*	
EBITD/TA							7.2 (7.6)*	
Zscore								2.5 (8.3)*

The table reports how the changes in manifest variables load on the attributes of interest (determinants of gearing). In the structural equation model, these factor loadings and the coefficients in table 6.7 are determined simultaneously. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses are corresponding t-statistics.

Table 6.7: Pooled SEM-dynamics: Estimates of the Structural Coefficients

GEARING MEASURES	ATTRIBUTES/FACTORS							
	ξ_1 Δ Tang	ξ_2 Δ Ndts	ξ_3 Δ Grow	ξ_4 Δ Size	ξ_5 Δ Brisk	ξ_6 Δ Pprof.	ξ_7 Δ Cprof.	ξ_8 Δ Pbank.
PANEL A: BOOK VALUE GEARING MEASURES, N = 1302								
TLp/TA (BV)	-2.6 (-1.47)	-0.69 (-0.57)	5.52 (7.27)*	-7.04 (-8.14)*	1.93 (5.18)*	1.12 (3.77)*	-1.01 (-2.38)*	2.05 (2.77)*
Dp/TA (BV)	-6.3 (-17.8)*	-0.95 (-0.91)	0.20 (0.30)	0.58 (0.37)	0.29 (1.13)	0.21 (1.03)	0.23 (0.77)	-0.18 (-0.32)
Dp/E (BV)	-4.6 (-1.5)	18.0 (18.2)*	4.8 (2.9)*	0.15 (0.05)	0.57 (0.75)	5.16 (8.0)*	-3.43 (-3.91)*	4.1 (2.7)*
LTD/TA (BV)	-1.49 (-1.07)	-2.59 (-2.85)*	6.25 (10.9)*	4.6 (5.8)*	-0.24 (-0.75)	0.82 (3.13)*	-1.16 (-3.0)*	2.61 (3.9)*
STD/TA (BV)	-4.5 (-6.8)*	-1.45 (-1.75)[b]	1.21 (2.09)•	2.14 (1.87)[b]	0.20 (0.63)	-0.36 (-1.41)	0.34 (0.93)	1.39 (2.72)*
CL/TA (BV)	-0.18 (-0.16)	-0.36 (-0.45)	1.15 (1.58)	-3.69 (-5.69)*	2.61 (5.57)*	2.4 (6.3)*	-1.16 (-2.19)*	7.5 (15.7)
EBITD/I (BV)	-2.02 (-1.33)	-0.51 (-0.34)	0.45 (0.28)	1.17 (0.77)	5.17 (2.71)*	-1.1 (-0.73)	7.12 (3.27)	-3.81 (-1.87)[b]
PANEL B: MARKET VALUE GEARING MEASURE, N = 1302								
Dp/CAP-MV	-2.29 (-5.35)*	-0.28 (-0.61)	0.05 (0.16)	1.55 (2.63)*	0.36 (1.7)[b]	0.27 (1.61)	-0.42 (-1.71)[b]	1.19 (3.9)*

The table reports the relationship between changes in attributes hypothesised to influence gearing and changes in eight different gearing ratios. Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. The numbers in the parentheses are corresponding t-statistics.

CHAPTER 7

7 DYNAMICS: EQUITY MARKET TIMING Vs STOCK RETURNS EFFECTS

7.1 Introduction

In its general meaning market timing refers to an approach that attempts to determine when to be in the market, when to be out of the market, and even when to go short on any asset. In relation to an investor, market timing may include switching between investing in bonds and stocks, or switching between stocks and risk-free treasury bills, or alternatively, switching among sectors. In the context of this thesis the focus is on equity market timing, particularly how and to what extent, that practice influences capital structure. In the process of timing the equity market, managers presumably look at the level of stock returns and expected movements in such prices. That being the case the effects of equity market timing behaviour and the effects of stock returns simultaneously impact on the gearing ratios.

This chapter makes attempts to disentangle the effects of equity market timing from the effects of stock returns in order to be able to determine which exerts the greatest influence on capital structure. Section two reviews theory and prior empirical research relating to equity market timing. Section three describes the empirical tests which suggest that UK firms practice equity market timing, as well as identifying the short and long-term effects of that practice on gearing ratios. Section four turns to the theory relating to stock returns effects on gearing ratios, and section five carries out empirical tests designed to establish the extent of stock returns effects on gearing. Finally, an 'all-inclusive' model is generated and tested in section six. This model puts in perspective the relative impact of stock returns, equity market timing behaviour, and selected firm-specific characteristics. Results are discussed in section seven, and the summary in section eight.

7.2 Equity Market timing and capital structure

Equity market timing has been defined as:

> "the practice of issuing shares at high prices and purchasing at low prices" (Baker and Wurgler, 2002, p. 1)

These timed issues can be seasonal equity issues (SEOs) (see Taggart, 1977; Marsh, 1982; and Jung et al, 1996), or they can be initial public offerings (IPO) as documented by Baker and Wurgler (2002), among others. Evidence of timed repurchases is provided by Rees (1996) and Rau and Vermaelen (2002) for the UK. Baker and Wurgler (2002) argue that equity market timing is an important aspect of real corporate policy and that managers practice equity market timing to take advantage of temporary fluctuations in the cost of equity relative to other sources of capital.

The evidence of the existence of equity market timing practice implies that firm managers do not believe in market efficiency. There is an extensive literature which shows that firms experience long-run underperformance following equity issues (see for example Loughran and Ritter (1995) and Spiess and Affleck-graves (1995)). It follows that if a firm's equity is overvalued in the market and that firm issues equity, any market undereaction to the equity issue maximises the wealth of existing shareholders (see Stein, 1995). Jung et al (1996) document that the markets do under react to equity issues and it is the undereaction which leads to a firm's long-run poor performance. This happens when the market corrects the overvaluation that existed when equity was issued. Therefore it seems managers engage in equity market timing for the benefit of existing shareholders. However, in fairly efficient capital markets we have there is little that can be gained from such timing attempts. Moreover, transaction costs are likely to reduce any potential benefits from such timing behaviour. Whether or not managers are able to increase value through market timing is still debatable (see Bevelander (2002), and Song (2003)).

Empirical analysis of equity market timing by UK firms is even more interesting because of the predominant use of rights issues in the UK. As pointed out earlier, if in the USA (and elsewhere) managers practice equity market timing in order to maximise the wealth of continuing shareholders (at the expense of new shareholders), then the reason for such practice in the UK (if the practice exists) ought to be a different one. This is because with rights issues new equity is issued to the same existing shareholders.

Jung et al (1996) addressed the question as to whether equity market timing is a first order condition in security issues. Baker and Wulger (2002), and Rajan and Zingales (1995) considered the influence of past stock returns in relation to equity market timing. These previous studies did not consider implied change in capital structure. This chapter uses net equity issues (NeI), and following Welch (2004), implied change in gearing ratios is also used to capture the impact of equity market timing on capital structure (while holding constant the effects of stock returns on gearing ratio).

Although empirical researchers have just recently shown keen interest in the relationship between market timing and capital structure (see Baker and Wurgler, 2002; Alti, 2003; Bevelander, 2002; and Kayhan and Titman, 2003), the possibility has been recognised in the literature for quite sometime. Back in 1970s Taggart (1977) indicated that equity issues tend to follow periods of market rises. In conclusion Taggart suggested that market timing might speed up or postpone a firms' adjustment to its target debt ratio. Taggart (1977) however, conceded that stock market timing considerations seemed somewhat questionable and called for further research in this area.

In the UK study Marsh (1982) cited two earlier unpublished PhD dissertations, Bodenhammer (1968) and Marsh (1977), which had indicated that managers and their financial advisers regarded equity market timing as extremely important. Marsh (1982) recognised that changes in stock prices do alter debt/equity ratios and this makes the observed equity market timing behaviour puzzling considering that equity is issued at times when the debt capacity has increased. Given the then prevailing 'tax-leverage related costs balancing' theory, an increase in debt capacity (the value of equity) might have been expected to an increase in debt.

Empirical investigations by Rajan and Zingales (1995) confirm their suspicion that the negative relationship between the market-to-book ratio and gearing is brought about by the tendency for firms to issue stock when their price is higher relative to earnings or book value. Perhaps recent empirical investigations into the ability of equity market timing to explain both cross-sectional and time series variations in capital structure, have been triggered by the studies of Loughran and Ritter (1995), and Spiess and Affleck (1995) indicating that firms issuing equity tend to under-perform in the longer-term.

The poor long-term performance following equity issue has been interpreted to imply that managers time their equity issues to coincide with periods when their stock price is overvalued (Jung *et al*, 1996, p. 168). The poor performance is consequently perceived to occur when the market corrects the overvaluation. The market undereaction maximizes the wealth of ongoing shareholders at the expense of entering and exiting ones. Equity-issuing firms that do not invest their issue proceeds are plagued by the worst abnormal returns. In contrast, debt-issuing firms do not experience such long-term abnormal returns (Stein, 1995; and Baker and Wurgler, 2002, and Jung *et al*, 1996).

Baker and Wurgler (2002) give a long list of studies providing evidence not only that seasoned equity issues (SEOs) and initial public issues (IPOs) coincide with market rise, but also that repurchases have coincided with low valuations. Over time researchers have tried to come up with a logical explanation for the observed market timing behaviour. Marsh (1982) among others, wondered whether the behaviour is due to managers' disbelief in market efficiency or whether managers just think that it is relatively easier to raise new equity finance when the stock price is high? Baker and Wurgler (2002) ascribe this behaviour to the intention to take advantage of short-term fluctuations in the cost of equity compared to the cost of other sources of finance, the explanation based on disbelief in market efficiency. Graham and Harvey (2001) also suggest that managers believe that they can raise equity capital under favourable terms during high valuations.

The support for equity market timing is however, not unanimous. Consistent with the findings of Graham and Harvey (2001), the results from a survey by Pinegar and Wilbricht (1989) indicate that although some managers perceive their firm's equity to be mispriced 'some of the time', such perceptions of market (in) efficiency appear to have little impact on financing decisions. In their empirical analysis Jung *et al* (1996) do not find any evidence that firms time equity issues to exploit temporary fluctuations in equity mis-pricing when they know that their firm will undergo long-term underperformance subsequently. Jung *et al* (1996) also argue that the market underreaction to equity issues could as well be associated with agency problems or even pecking order predictions.

It is therefore obvious here that the equity market timing debate has just begun and a lot of questions have to be addressed. The major impetus, however, for investigating equity market timing in this study, was provided by the results of two recent works, Baker and Wurgler (2002), and subsequently, Welch (2002, 2004). Baker and Wurgler (2002) find that capital structure is strongly related to past market values, the results they interpret as being consistent with the hypothesis that market timing has large and persistent effects on capital structure. Having failed to find an explanation for their results in all major extant theories of capital structure, i.e. trade off theory, pecking order or even managerial entrenchment, Baker and Wurgler (2002) come up with an alternative approach to determination of a company's capital structure. They contend that 'capital structure evolves as the cumulative outcome of past attempts to time the equity market' (p. 27).

Baker and Wurgler (2002) argue that there is no optimal capital structure as market timing decisions accumulate over time into the capital structure outcome.[28] On the face of it, this new theory appears to be a validation of Modigliani and Miller (1958) irrelevance proposition (MM). However, MM assumes the existence of frictionless capital markets where there would not be any advantage from the use of either debt or equity. Market timing on the other hand relies on the gains managers aim to get from opportunistically switching from debt to equity and vice versa.

Following Baker and Wurgler (2002), the other closely related study that examines the capital structure implications of equity market timing is Alti (2003). Alti (2003) agrees that the evidence relating to the tendency of firms to issue equity when its cost is temporarily low is convincing. Like this study, Alti (2003) also investigates the long-term impact of equity market timing on capital structure. Alti (2003) however follows a different approach by identifying market timers as firms that go public (make initial public offerings) in a hot issue market. Welch (2002, 2004) on the other hand argues that even if equity market timing practice exists, its effects on capital structure is insignificant compared to the effect of stock returns.

Another recent empirical study by Kayhan and Titman (2003) has also found that equity market timing has only a weak effect on observed capital structure. This study has supported Welch (2004) that stock returns have a stronger and persistent effect on capital structure. More on stock returns is discussed in the immediate following section. The contradictory findings between these recent studies regarding equity market timing require further empirical validation. To this end this study also tests the hypothesis *that equity market timing is of first-order consideration in the security issue consideration by UK corporations.*[29] This hypothesis is tested having regard to the competing hypothesis that share price movement have a larger impact on changes in capital structure than other factors like deliberate adjustments towards an optimal capital structure, and/or equity market timing as discussed in the next section.[30]

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[28] See Baker and Wurgler (2002) p.29.
[29] See hypothesis 4.3.12 in chapter four
[30] See hypothesis 4.3.13 in chapter four.

7.3 Cumulative effect of equity market timing practice

The hypothesis that *equity market timing is positively related to gearing and its cumulative effect is a major determinant of capital structure* is tested by using models specified in this section[31]. Although the theory of capital structure is specified in terms of market value of equity (Modigliani and Miller, 1958; Taggart, 1977, Bennett and Donnelly, 1993), the capital structure literature has so far entertained both the market value of equity and the book value of equity (Welch, 2002). After all, there is documented evidence that debt contracts are based on book values and that managers think in terms of book value when making financing decisions.[32] The measures used by Baker and Wurgler (2002) were driven by the market value of equity, consequently, the method, and especially the variables they use did not disentangle the effects of share price movement from those of pure market timing behaviour. It is not surprising that Welch (2002), who deals with share price movements and does not address market timing behaviour, argues that market timing behaviour does not have a significant impact on capital structure.

One may as well argue that timing behaviour and share price movements are inseparable since the timing is all about the price of stock. However, in order to be able to explore the extent to which market timing behaviour (equity issuing) alone influences capital structure over time, while controlling for the effects of share price movements on capital structure, it is necessary to make an attempt to separate the two. The use of net equity issues (NeI), and its cumulative effect for 2, 3, 4, 5, and 10 years in relation to the observed capital structure i.e. debt-to-equity ratio (in book values) may serve the purpose. The net equity issue provides an approximation (if not the exact) measure of the volume of shares involved in a given issue timing event. The net equity issues (NeI), refers to the annual equity changes net of changes in retained earnings. The NeI can

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[31] See hypothesis 4.3.12 in chapter four
[32] See section 4.7.3.

therefore serve as a qualitative measure of the timing behaviour, which explicitly controls for the effects of stock returns. The NeI is scaled by total assets.

Three tests have to be carried out here. The first one is designed to look for evidence that firms (managers) practice equity market timing. The relationship between net equity issues, (NeI) from period $t-1$ to period t and the stock return from period $t-1$ to t, $\ln\frac{P_t}{P_{t-1}}$ is assessed over the entire sample period. The following regression equation is run for each of the 14 years:

$$NeI/TA_{t-1,t} = \alpha + \beta_1 \Delta MTB_{t-1,t} + \beta_2 \Delta LnTA_{t-1,t} + \beta_3 \Delta RE/TA_{t-1,t} + \beta_4 Ln(P_t/P_{t-1}) + \varepsilon \quad (7.3.1)$$

where

NeI is the net equity issues from period $t-1$ to period t

$\Delta MTB_{t-1,t}$, $\Delta LnTA_{t-1,t}$, and $\Delta RE/TA_{t-1,t}$ denote annual changes in market-to-book, firm size, and past profitability respectively.

$Ln(\frac{P_t}{P_{t-1}})$ is the stock return from period $t-1$ to t, and

ε is the random error

The regression model specified above is run in order to establish whether there is a consistent positive relation between NeI and $Ln(\frac{P_t}{P_{t-1}})$ over the 14 years. The other regressors in the model have been included because both the cross-sectional tests and the analysis of capital structure dynamics in this study have revealed that these are among the most important determinants of capital structure. If equity market timing is an equally (or a more) important determinant of capital structure, then its influence should better be compared with the influence of other comparable determinants such as these other regressors. If managers practice equity market timing then a consistently higher positive relationship between NeI and $Ln(P_t/P_{t-1})$ is expected from this regression.

As Welch (2002) argues, managers may practice equity market timing without such practice significantly influencing corporate capital structures. The second test in this section therefore seeks to establish whether equity market timing influences corporate capital structures. Changes in two gearing measures are employed, change in book debt-to-equity ratio $(\Delta(D/E))$, and change in debt-to-capital ratio $(\Delta(D/(E+D))$ where equity is measured in market value. OLS-regression is run for both gearing measures on the same regressors as the ones used in equation 7.3.1 except that the natural log of stock returns is replaced by $NeI/TA_{t-1,t}$. Regression equations for the two gearing measures are specified below.

$$\Delta D/E_{t-1,t} = \alpha + \beta_1 \Delta MTB_{t-1,t} + \beta_2 \Delta LnTA_{t-1,t} + \beta_3 \Delta RE/TA_{t-1,t} + \beta_4 NeI/TA_{t-1,t} + \varepsilon \quad (7.3.2)$$

And,

$$\Delta D/(D+E)_{t-1,t} = \alpha + \beta_1 \Delta MTB_{t-1,t} + \beta_2 \Delta LnTA_{t-1,t} + \beta_3 \Delta RE/TA_{t-1,t} + \beta_4 NeI/TA_{t-1,t} + \varepsilon \quad (7.3.3)$$

Where variables are as described in equation 7.3.1

The third and last test under this section looks at whether managers bother to rebalance the effects of equity market timing during the year in which the timed equity issues are made as well as in subsequent years. Tests are conducted for 1, 2, 3, 4, 5, and 10 years. These tests also seek to establish the extent to which the cumulative market timing effects influence capital structure over time. OLS regression of observed yearly actual debt-to-equity ratio (ADE_t) on inert debt-to-equity ratio ($ID/E_{t-1,t}$) and a lagged debt-to-equity ratio (D/E_{t-1}) is used, i.e.

$$ADE_t = \alpha + \beta_{ID/E}(ID/E_{t-1,t}) + \beta_{D/E}(D/E_{t-1}) + \varepsilon \quad (7.3.4).$$

The actual debt to equity ratio ADE_t is the value to be explained, the inert debt ratio, $ID/E_{t-1,t}$ is the lagged debt to equity ratio grossed up by the net equity issue over the year. The inert debt-to-equity ratio is the debt to equity ratio that would occur if only net equity issues influence changes in the debt-to-equity ratio from year $t-1$ to year t. If managers rebalance their gearing following net equity issue (NeI) effects, the coefficient on the lagged debt to equity ratio D/E_{t-1} should be close to 1 (100%). If mangers do not rebalance their gearing, in which case net equity issues mechanistically drive gearing, then the coefficient on ($ID/E_{t-1,t}$) should be one (100%). To start with equation 7.3.4 is run for each of the 14 years from 1986 to 1999. The regressions are run first with intercept and then without intercept.

To determine the longevity of market timing influences on observed debt to equity ratios, the inert book debt-to-equity ratio $ID/E_{t-1,t}$, is adjusted for the number of periods from the observed period. The lagged debt to equity ratio is also lagged for the same number of period as the inert debt to equity ratio. The procedure generates the following regression equation:

$$ADE_t = \alpha + \beta_{ID/E}(ID/E_{t-a,t}) + \beta_{D/E}(D/E_{t-a}) + \varepsilon \qquad (7.3.5)$$

Where the variables are as described in equation 7.3.4, and $t-a$ denote the number of years' effect equity market timing has on the observed debt-to-capital ratio. Tests are carried out for the cumulative effects of net equity issues over two, three, four, five, and ten years. The pooled regressions are first run with intercept and then without intercept.

The results of tests in this section are to be compared with those of section 7.4 below to assess the extent to which equity market timing and stock returns determine observed gearing ratios. Although the comparison may be criticised on the basis that one set of tests uses book gearing and the other uses market gearing, there does not appear to be another way of separating the effect of equity market timing from stock price changes effects. Neither Baker and Wurgler (2002) nor Welch (2002) does this separation.

7.4 Stock returns as a major determinant of capital structure

Another, very recent theory is propagated by Welch (2002, 2004) who purports to show that firms do not adjust their capital structure in response to changes in stock prices. Welch contends that the lack of any deliberate internal corporate decision-making to rebalance capital structure as equity values change is what determines the observed capital structure. While Welch admits that it may be true that managers do time the market, as argued by Baker and Wurgler (2002), he argues that the effects of such behaviour on capital structure is of a second order magnitude and cannot be compared with the effect of share price movements.

Earlier, Taggart (1977) and Marsh (1982) reported that movements in security prices have effects on the capital structure. In another more recent study, Kayhan and Titman (2003) examine how cash flows, investment expenditure and stock price histories affect corporate debt ratios. Kayhan and Titman (2003) use a partial adjustment model to model a firm's capital structure as a function of a firm's past profitability, financial deficit, cumulative returns, and market timing activities that can lead to deviations from a firm's target capital structure. They find that stock returns have relatively strong effects on capital structure that persists for quite sometime. Unfortunately, no UK study investigates the impact of stock returns on capital structure.

The hypothesis tested here is; *do share price movements have a larger impact on changes in capital structure than other factors such as deliberate adjustments, and/or equity market timing?* Although this hypothesis does not completely contradict the immediate previous one, it reduces its importance, and it is only through an empirical investigation will it be possible to assess its validity.

While there are some previous UK studies on capital structure dynamics (see for example Marsh, (1982); and Ozkan (2001)), none of them has dealt with as broad number of determinants as the current study, and certainly none has tested the recently proposed theories about the cumulative effects of equity timing and share price movements on capital structure. A summary of the findings of selected previous studies on capital structure dynamics is given in table 6.1.

7.5 Stock returns and capital structure: Empirical tests

Following Welch, (2002, 2004), the hypothesis that share price movements have a larger impact on changes in capital structure than other factors like deliberate adjustments, and/or equity market timing, is tested by using the models that are specified in this section. Two variables are needed to be able to test these assertions:

(1) the actual (observed) debt ratio,

$$ADR_t = \frac{D_{p_t}}{CAP_{MV}} \qquad (7.4.1)$$

where:- D_{p_t} is the total loan capital in book value, plus preference capital at the end of year t.

CAP_{MV} is the total capital, defined as D_{p_t} plus the market value of equity, E_t, at the end of year t.

(2) the implied debt ratio,

$$IDR_t = \frac{D_{p_{t-1}}}{D_{p_{t-1}} + E_{t-1} * (1 + R_{t-1,t})} \qquad (7.4.2)$$

where: - $D_{p_{t-1}}$ and E_{t-1} are as defined above, and $R_{t-1,t}$ is the share price movement from $t-1$ to t.

One of the 12 measures of gearing calculated before in section 4.7.2, i.e. $D_p / CAP_p - MV$, is the actual debt ratio ADR_t used here. The implied debt ratio, IDR_t, which is the measure of the debt ratio if only the share price had changed from period $t-1$ to period t, is regressed with the observed debt ratio in order to ascertain the influence of share price on observed capital structure. As the available data does not go further back than 1985, and the calculation of the IDR_t requires the previous year's share price, the ADR_t, and IDR_t are calculated for 15 years from 1986 to 2000. To begin with ADR_t is regressed on IDR_t and the lagged debt-to-capital ratio, ADR_{t-1} for each of the 15 years. This is done not only to determine whether changes in share price have a significant influence on capital structure, but also to establish whether managers make any readjustment of their firms' gearing ratios following stock return movements. The regression equation for this test is specified as equation 7.4.3 below. Both the with intercept regressions and without intercept regressions are run.

$$ADR_t = \alpha + \beta_{IDR_{t-1,t}}(IDR_{t-1,t}) + \beta_{ADR_{t-1}}(ADR_{t-1}) + \varepsilon \qquad (7.4.3)$$

where

ADR_t and IDR_t are as defined by equations 7.4.1 and 7.4.2 respectively.

To determine the long-term effect of stock returns on gearing versus the readjustment of gearing, the observed debt to capital ratio (ADR_t) is regressed (with intercept and without intercept) on implied debt-to-capital ratio ($IDR_{t-a,t}$)

and a lagged debt-to-capital ratio (ADR_{t-a}) over different time horizons, i.e. 2-years, 3-years, 4-years, 5-years, and 10-years. The implied debt-to-capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-a$ years to t. The following equation is used.

$$ADR_t = \alpha + \beta_{IDR_{t-a,t}}(IDR_{t-a,t}) + \beta_{ADR_{t-a}}(ADR_{t-a}) + \varepsilon \qquad (7.4.4)$$

Where:

variables are as defined under equation 7.4.1, and 7.4 2 above, and $t-a$ denote the number of years' effect stock returns have on observed debt-to-capital ratio.

7.6 Stock returns vs. other determinants (all-inclusive model)

Recent prior research (see Welch, 2002, 2004) and results of tests in this study (see section 7.7.3) provides evidence that managers do not readjust their firms' capital structure to allow for the impact of stock returns on their gearing ratios. If this is the case, the implied debt ratio (see table 7.5 and table 7.6) is a better predictor of observed debt ratio than the previously obtaining debt ratio (i.e. the debt ratio before taking into account the stock return from $t-a$ years to year t. Evidence from the current study and that from Welch (2002, 2004) reveal that stock returns mechanistically drive the gearing ratios over time. On the other hand there has been considerable body of research (both cross-sectional and dynamic analysis) which shows that some firm-specific characteristics like tangibility, growth, non-debt tax shields, profitability, firm size etc., are the determinants of capital structure.[33] The key question to be asked at this point is; if stock returns mechanistically drive the gearing ratio, then what role do these firm-specific characteristics play in determining capital structure?

[33] Among these research studies are Rajan and Zingales (1995), Bennett and Donnelly (1993), Bevan and Danbolt (2002), Titman and Wessels (1988), and Harris and Raviv (1991) taking a cross-sectional approach. Studies on the dynamics of capital structure, which also identify these firm-specific characteristics, include Jalilvand and Harris (1984), Auerbach (1985), Ozkan (2001), and Bevan and Danbolt (2003).

There is a need to assess whether stock returns are the major determinant of gearing, or indeed whether stock returns mechanistically drive the gearing ratio, and to determine the relative explanation power of stock returns versus other documented determinants. To do this the observed (actual) debt-to-capital ratio ($(D/(D+E)$ with equity measured in market value) is regressed on the implied debt-to-capital ratio $IDR_{t-1,t}$, the lagged debt equity ratio, ADR_{t-1}, changes in market-to-book ratio, natural log of total assets, retained earnings, non-debt tax shields, and on net equity issues *(NeI/TA)* for each year from 1985 to 1999.

Prior tests under both the cross-sectional as well as dynamic analyses in the current study have revealed that the selected firm-specific characteristics are the most important determinants of capital structure. Changes in predictor variables are changes from $t-1$ years to year t. NeI/TA is the ratio of net equity issue (net of retained earnings) over the year. Equation 7.6.1 below is used:

$$ADR_t = \alpha + \beta_{IDR_{t-1}} IDR_{t-1,t} + \beta_{ADR_{t-1}} ADR_{t-1} + \beta_{MTB} \Delta MTB_{t-1,t}$$
$$+ \beta_{LnTA} \Delta LnTA_{t-1,t} + \beta_{RE} \Delta RE_{t-1,t} + \beta_{NDTS} \Delta NDTS_{t-1,t} + \beta_{NeI} NeI/TA_{t-1,t} + \varepsilon \quad (7.6.1)$$

Where

ADR_t and IDR_t are as defined by equations 7.4.1 and 7.4.2 respectively.

$\Delta MTB_{t-1,t}$, $\Delta LnTA_{t-1,t}$, $\Delta RE/TA_{t-1,t}$, and $\Delta NDTS_{t-1,t}$ denote annual changes in market-to-book, firm size, past profitability, and non-debt tax shields respectively and,

$NeI/TA_{t-1,t}$ is the net equity issues from period $t-1$ to period t

To determine the explanation power of stock returns versus other determinants over different time horizons, similar pooled OLS-regression were run for one, two, three, four, five and ten years. Changes in the predictor variables were calculated from $t-a$ years to t. The regression equation 7.6.2 below was used for each time horizon tested. The (ADR_t), is the value to be explained. The implied debt-to-capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-a$ years to t.

$$ADR_t = \alpha + \beta_{IDRT} IDR_{t-a,t} + \beta_{ADR_{t-a}} ADR_{t-a} + \beta_{MTB} \Delta MTB_{t-a,t} + \beta_{LnTA} \Delta LnTA_{t-a,t} + \beta_{RE} \Delta RE_{t-a,t} + \beta_{NDTS} \Delta NDTS_{t-a,t} + \varepsilon \quad (7.6.2)$$

Where:

variables are as defined under equation 7.6.1, and subscripts $t-a,t$ denotes changes in the variables from year $t-a$ to year t.

Over long periods (i.e. more than one year), book values of equity may fluctuate due to changes in arbitrary accounting estimates such as depreciation and provision for doubtful debts. The book values of equity may also fluctuate as a result of changes in accounting profits. Such changes are likely to blur the effects of equity issues over long time horizons. Because long-term changes in book value of equity may not necessarily reflect net equity issues, the variable *NeI/TA* is left out of equation 7.6.2 above.

7.7 Results

7.7.1 Introduction

This chapter presents and discusses the evidence relating to the effects (both short- and long-term) of equity market timing and stock return movements on capital structure. First, evidence of equity market timing evidence and of any rebalancing of its effect is established. The long-term effects are also discussed. Secondly, the effects of stock returns on gearing are presented. Finally, the results of the 'all inclusive' model are presented and discussed.

7.7.2 The effects of equity market timing on capital structure

7.7.2.1. Do Managers practice equity market timing?

Three tests were carried out in relation to equity market timing. The first aimed at establishing whether managers practiced equity market timing. The second test examined whether equity market timing has any significant effect on capital structure changes, and the last considered the cumulative effects of equity market timing on gearing changes over time. Table 7.1 presents the evidence as to the existence of equity market timing practice in UK firms. Panel A reports the results of OLS-regressions of annual changes in annual net equity issues (NeI) on annual changes in market-to-book ratio, firm size, past profitability, and the natural logarithm of changes in share price, $Ln\ (P_t / P_{t-1})$ for 14 years from 1986 to 1999. The net equity issues are annual equity changes (net of changes in retained earnings) scaled by total assets at the end of the year. The first three regressors are annual changes in three of the most important capital structure determinants according to the results in both the cross-sectional, and the dynamics sections of this study so far.

The objective of the first test was simply to establish whether yearly net equity issues (NeI) are significantly positively related to stock returns, $Ln\ (P_t / P_{t-1})$. As column nine of panel A in table 7.1 reveals, every yearly coefficient shows a positive relation between (NeI) and $Ln(P_t / P_{t-1})$. The t-statistics in column ten also show that all but two, that is, twelve out of 14 (or 86 percent) of the coefficients are highly significant (most at 1% level). This consistent significant positive relationship between yearly (NeI) and yearly changes in stock returns is a proof that UK company managers practice equity market timing.

It may be that managers issue equity when the prices have risen as documented by Marsh (1982), Jung et al., (1996), and Hovakimian et al., (2001); or they repurchase their stocks at times when their equity valuation is low as reported by Rees (1996) and Rau and Vermaelen (2002), or they do both. Baker and Wurgler

(2002) report four different kinds of studies that document evidence of equity market timing. One such evidence is when managers admit to practicing equity market timing in anonymous surveys. The evidence that firms practice equity market timing is consistent with the findings of Bevelander (2002), Alti (2003), and Kayhan and Titman (2003).

7.7.2.2. Does the practice of equity market timing impact on capital structure?

Having established that managers do practice equity market timing, panels B and C of table 7.1 report the results as to whether the practice has any significance influence on gearing ratios. Panel B reports the results of regressions of annual changes in book debt-to-equity ratio on the same regressors used in panel A for the same period, 1986 to 1999 except that the natural log of stock returns has been replaced with net equity issues from $t-1$to $t, (NeI/TA_{t-1,t})$. The objective here is to establish whether annual changes in book debt-to-equity ratio are significantly negatively related to $NeI/TA_{t-1,t}$ as this will prove that equity market timing has a significant impact on gearing.

Columns nine and ten of panel B in table 7.1 show that the relationship between annual changes in book debt-to-equity ratio and $NeI/TA_{t-1,t}$ is persistently negative and highly significant. This relationship is consistent with a significant positive relationship between (NeI) and share price changes reported in panel A, because of the definitions of gearing used.

As these results show, equity market timing practice has a significant impact on annual changes in gearing. Panel C provides evidence also provides evidence that a consistent significant negative relationship between market gearing ratio and $NeI/TA_{t-1,t}$ hold for market value gearing measure. The findings of this study support those of Alti (2003), and Kayhan and Titman (2003) who also report that equity market timing has a significant impact on gearing.

7.7.2.3. *How long lasting are the effects of equity market timing on capital structure?*

Having established that equity market timing practice exists in the UK in table 7.1 (panel A), and that this practice impacts on annual changes in capital structure (panel B and C), additional evidence is still needed as to how long the effects of equity market timing last on capital structure. Table 7.2 presents the results of regressions of long-term horizon changes in NeI, book and market gearing ratios, on corresponding changes in the same regressors used in table 7.1. The aim is to find out whether the evidence on equity market timing established so far (from table 7.1), persists for more than one year. In addition to the pooled one-year results, table 7.2 gives pooled results for 2, 3, and 5 years pooled regressions. The NeI results for 9 years and all the results from regressions where gearing ratios are dependent variables are not pooled. Pooled regressions use all observations, regardless of year, in one regression. Pooled regressions are used here in order to iron out the cases where the results become an artefact of relationship between the variables, which were obtaining at a particular sub-period. The results therefore become representative of the whole sample period.

The expected significant positive relationship between the natural log of stock returns and net equity issues (NeI) is only exhibited over the 3-year horizon as panel A shows. Over the five-year horizon the relationship is negative but insignificant. Over the 9-year horizon the relationship between NeI and stock return is significantly negative at 5% level.

The relationship between net equity issues, $NeI/TA_{t-1,t}$ and book gearing in panels B and C of table 7.2 show that equity market timing significantly influences gearing ratios. Subsequent tests attempt to separate the effects of equity market timing from stock return effect on gearing.

7.7.2.4: Do firms rebalance the effects of equity market timing?

Tables 7.3 and 7.3A present regression results of observed yearly actual debt-to-equity ratio (ADE_t) on inert debt-to-equity ratio ($ID/E_{t-1,t}$) and a lagged debt-to-equity ratio (D/E_{t-1}) for each of the 14 years from 1986 to 1999. Table 7.3 show the 'with intercept' regressions while table 7.3A show the 'without intercept regressions. The tests were designed to test if managers make any adjustments to their firms' gearing (i.e. by issuing more debt) subsequent to their equity market timing issues, which increase their firm's debt carrying capacity. For easy identification, the coefficients for the constant, the inert debt-to-equity ratio ($ID/E_{t-1,t}$) and that of the lagged debt-to-equity ratio are expressed in percentages. The persistent positive constant for each year indicates that the firms that constituted the sample had a marginal increase in debt-to-equity ratio over the sample period.

If managers always follow a policy of readjusting their gearing following net equity issue (NeI) effects, the coefficient on the lagged debt to equity ratio, D/E_{t-1} should be 1 (i.e.100%) while that on the inert debt ratio should be zero. On the other hand, if managers do not make any readjustments to their firm's gearing ratios at all, then the coefficient on ($ID/E_{t-1,t}$) should be 1 (100%) and that on the lagged debt-to-equity ratio should be zero. If managers do not rebalance the effects of equity market timing, then the net equity issues *(NeI)* will mechanistically drive the gearing ratio.

A comparison of the coefficients in columns three and four indicates that in general, the inert debt to equity ratio ($ID/E_{t-1,t}$) is a better predictor of the observed debt to equity ratio (ADE_t) than the lagged debt to equity ratio, (D/E_{t-1}) by far. It is only in 1988 when the coefficient for the inert debt ratio is not higher than that of the lagged debt ratio. The coefficients relating to the years 1986 to 1988 (3 out of 14 years) are not representative of the general picture because in those years some of the sampled firms did not have relevant data. This had the effect of reducing the number of observations for the tests as the last column in table 7.3 reports. In fact even in 1988 where the magnitude of the coefficients does not differ much, the t-statistic for the $ID/E_{t-1,i}$ coefficient, is slightly higher than that on the lagged debt-to equity ratio. It is important to emphasize here that although the coefficients for the lagged debt-to-equity ratio are statistically significant, their economic significance is negligible.

The pooled regression's coefficient for the inert debt ratio is 78.8 percent, while the corresponding coefficient for the lagged debt ratio is 17.8 percent. If F-M statistic is calculated for the 11 years (1989 to 1999) when all the sample firms had data for every year, the coefficient for inert debt-to-equity becomes 86 percent, while that of the lagged debt-to-equity becomes 12 percent. This confirms Baker and Wulger (2002) that managers do not readjust their firm's capital structure back to their previous (assumed optimal) gearing ratios after the effects of equity market timing. However, the evidence only relates to annual changes, and it may be more appropriate to look at whether managers make adjustments to their firm's capital structure after several years. Although in tables 7.3 and 7.3A both the coefficients for pooled regressions as well as the F-M statistics for the without intercept regressions are slightly higher than those generated by the with intercept regressions, the differences are negligible.

Table 7.4 reports the results for the pooled regressions designed to capture the cumulative effects of equity market timing for 1, 2, 3, 4, 5, and 10 years. These regressions were aimed at establishing whether managers rebalance their firm's capital structure in the long-term (i.e. after more than one year). As columns three and four of table 7.4 show, both the 1-year pooled regression results and the 1-year F-M statistics confirm that during the first year managers do not readjust their firms' gearing following an increase in their debt carrying capacity brought about by the effects of equity market timing. This is the case because the inert debt ratio, $IDR_{t-a,i}$ is the major predictor of the actual (observed) debt ratio. The 1-year pooled regressions show that up to almost 94% of the variation in capital structure can be explained by the failure on the part of managers to adjust their firms' gearing following their equity market timing.

Both the pooled regression results and the F-M statistics show that the inert debt ratio continues to dominate the prediction of the actual debt ratio for up to four years. The pooled regression coefficients in table 7.4 show that the signs of readjustment only starts to emerge in year five when the coefficient for the inert debt ratio falls sharply from 70.8% (in 4-year horizon) to 10.7% while that of lagged debt ratio emerges from being negligible to 38%. By the tenth year the situation is the opposite of what is observed in years 1 to 4, as the inert debt ratio ceases to be a better predictor of actual debt ratio.

It is noteworthy to mention that between years 1 to 2 the model's explanatory power falls drastically (by more than a half) from 94 per cent to a mere 45 per cent. This probably reflects the possibility that although managers practice equity market timing, the effect of that timing does not go far beyond one year. Alternatively the fall in the explanatory power may reflect the fact that the book values are influenced by accounting estimates such as depreciation and possibly the revaluation of fixed assets. This implies that even though the inert debt ratio is still a better predictor of actual debt ratio, there are other equally important determinants of the book gearing. Subsequently the R-squared falls gradually from 45% (over a 2-year horizon) down to 21% (over a 5-year horizon), beyond which, the inert debt ratio ceases to be a better predictor of actual debt ratio. Despite the weaknesses of book gearing, the results give sufficient insight into the effects of equity market timing (with the effects of stock returns on gearing held constant).

The relationship between equity market timing and capital structure can therefore be summarised as follows: equity market timing affects gearing annually through net equity issues, these annual fluctuations are not immediately rebalanced by managers. As a result, net equity issues mechanistically drive book gearing ratio. The inert (book) debt-to-equity ratio, which is the lagged (preceding year's) debt-to-equity ratio grossed up by the net equity issue over the year, becomes a good predictor of the observed (actual) book-gearing ratio in any given year.

As for the long-term effects, equity market timing influences book gearing for up to about four years. From five years and beyond, the rebalancing from other influences takes effect and by the tenth year equity market timing has ceased to influence gearing. The longer term effects (beyond one year), however, should be interpreted with caution. As explained above, the changes in book equity beyond one year may not be reliable.

Despite using a different approach, Alti (2003) also finds that although market timing significantly affect capital structure, the practice has a short-term effect on gearing which does not last beyond two years as active reversal occurs quickly. Like this study, Alti (2003) findings do not support Baker and Wurgler (2002) that capital structure is largely the cumulative outcome of past attempts to time the equity market. A related study by Kayhan and Titman (2003) also report that market timing behaviour has only a weak effect on observed debt ratios. Both Alti (2003) and Kayhan and Titman (2003) have questioned the methodology used by Baker and Wurgler (2002), arguing that the historical market-to-book (MTB) ratios may simply be due to the noise in current MTB ratio.

7.7.3 The impact of stock returns on gearing

7.7.3.1 Do managers rebalance their gearing?

This section reports the results of two tests; one examines whether managers rebalance the impact of stock returns on capital structure, and the other looks at the longevity of the impact of stock returns on gearing (i.e. how long it takes for managers to start rebalancing that impact). The section also attempts to compare the results reported in this section with those of the immediately preceding section, in order to ascertain the extent of the impact and the longevity of both equity market timing and stock returns on capital structure. The aim of these tests is to reach a verdict on whether it is the stock returns effect and not the equity market timing behaviour that drives the capital structure movement as Welch, (2002, 2004) argues.

It is obvious that, other things being equal, fluctuations in share price will impact on the market value gearing ratios even if managers do not time the equity market to undertake equity issues (and/or repurchases). For this reason this possibility is not tested. After all, the results on panel C in table 7.1 and panel C in table 7.2 that were discussed in the preceding section also revealed that in the process of timing the market, changes in share price contribute in driving both book and market gearing ratios. This section reports the outcome of the tests as to what extent stock returns impact upon gearing. In doing so the results also reveal whether managers subsequently rebalance the effects of such impact, and how long (years) does it take for such rebalancing (if any) to take place.

Tables 7.5 and 7.5A report the results of yearly regressions of the actual (observed) debt-to-capital ratio, ADR_t on implied debt-to-capital ratio $IDR_{t-1,t}$ and a lagged debt-to-capital ratio ADR_{t-1} for each of the 15 years from 1986 to 2000. The actual debt-to-capital ratio, ADR_t, which is the value to be explained, is the ratio of the book value of debt divided by the book value of debt plus the market value of equity $(D/D+E)$. The implied debt-to-capital ratio is the lagged debt to capital ratio in which the market value of equity is grossed up by the stock return movement from $t-1$ years to t. This ratio measures what should be the debt-to-capital ratio if only stock returns are allowed to influence gearing from the period $t-1$ to t.

The coefficients for the constant, for the inert debt to capital ratio, and that of a lagged debt-to-capital ratio are expressed in percentages. If managers follow a policy of rebalancing their gearing following the stock returns effect, the coefficient on ADR_{t-1} should be 1 (i.e. 100 percent) while that on IDR_t should be zero. If managers do not rebalance their gearing at all, then the coefficient on

IDR_t should be 1 (i.e.100 per cent) and that on ADR_{t-1} should be zero. It may be argued that a middle ground outcome is possible, in cases where stock returns changes gearing, and managers make limited efforts to issue more debt (not necessarily to return to their firm's previous capital structure). In this case we would expect both coefficients to be of comparable magnitude over time.

Columns three and four of table 7.5 reveal that in each of the 15 years from 1986 to 2000, the implied debt-to-capital ratio IDR_t is a better predictor of the observed debt-to-capital ratio, ADR_t than the lagged debt-to-capital ratio ADR_{t-1}. The two last rows show the Fama-MacBeth (F-M) statistics and the pooled regression results. (F-M) report relevant column averages. Fama and French (2002) argue that panel regressions ignore both the cross-correlations problem and the auto-correlations in regression residuals and are therefore inflated. In the spirit of Fama and MacBeth (1973), they propose estimating year-by-year cross-sectional regressions and deriving the t-statistics from these yearly cross-sectional statistics. These yearly averages are referred to as Fama-MacBeth statistics (see Welch, 2002, 2004; Hovakimian, *et al.*, 2004; and Drobetz and Fix, 2003). A tables 7.4, 7.6 and 7.8 reveal, the results and the conclusion in this study do not change when F-M statistics are calculated.

Pooled regressions use all observations, regardless of year, in one regression. The pooled regression shows that the coefficient on IDR_t is 80.4% (83.5% for the without intercept regressions) and that on ADR_{t-1} is only 5.0 per cent (10.0% for the without intercept regressions). The F-M statistic corroborates the pooled regression as the statistics reveal that on average the implied debt to capital ratio has a coefficient of about 70 percent, while the lagged debt to capital ratio coefficient is only about 14 percent (23.7% for the without intercept regressions).

It is important to emphasize that although in many years the coefficients on ADR_{t-1} are statistically significant (as evidenced by their corresponding t-statistics in column seven); compared to the coefficients of IDR_t, their economic significance is negligible (i.e. 80% vs. 5%). Further, in some of the years (i.e. seven out of 15) the coefficients on ADR_{t-1} are not statistically significant from zero while those of the inert debt ratio are all highly significantly different from zero. Therefore, not only are the coefficients on ADR_{t-1} economically insignificant generally, they are not statistically significantly different from zero for about 47% of the sample period (i.e. in seven out of 15 years). The coefficients in tables 7.5 and 7.5A provide strong evidence that generally managers do not make readjustment in their firm's gearing following stock returns movements.

Table 7.6 report on the longevity of share price effects on gearing. The table shows multiple OLS-regressions of observed debt-to-capital ratio (ADR_t) on implied debt-to-capital ratio ($IDR_{t-a,t}$) and a lagged debt-to-capital ratio (ADR_{t-a}). The actual debt-to-capital ratio, (ADR_t) is the value to be explained. The implied debt-to-capital ratio is the lagged debt-to-capital ratio grossed up by the stock return movement from $t-a$ years to t.

In all horizons (i.e. from 1 to 10 years) and in both with intercept and without intercept regressions, the coefficients on inert debt ratio, $IDR_{t-a,t}$ dominate those of the lagged debt ratio, ADR_{t-a} in the prediction of the observed debt-to-capital ratio. Although in table 7.6 the explanatory power decreases from 2-years towards 10-years, it is clear that up to ten years the implied debt-to-capital ratio is still a dominant predictor of the actual debt ratio than the lagged debt ratio. Over a 10-year horizon there seems to be some signs of rebalancing. For years one to five the coefficients on the lagged debt ratio are negligible. It is in the tenth year where the coefficient on the lagged debt ratio rises to 18.7%. However, the coefficient on implied debt ratio still dominates at 25.1%. The regressions that were run without intercept and the F-M statistics show similar results.

An alternative market gearing measure (debt-to-equity ratio, with equity measured in market value) was also used; the results are not reported because they were similar to those in tables 7.5, 7.5A and 7.6. The implication here is that managers do not rebalance the gearing, and it takes a long time for signs of rebalancing to appear. It may also be that it is the passage of time (about 10 years) and not deliberate readjustment which brings about changes in gearing from many other (some unknown) influences that reduces the intensity of stock returns effect (and equity market timing) on gearing. Section 7.7.4 report the results of tests designed to identify these other important factors.

7.7.3.2 Equity market timing vs. stock returns

Comparing tables 7.1, 7.2, 7.3, 7.3A, and 7.4 on one hand, and tables 7.5, 7.5A and 7.6, on the other hand it is obvious that equity market timing is practised by managers (tables 7.1, and 7.2). Because managers do not rebalance their gearing, equity market timing exerts a dominant influence on book gearing ratios of firms for up to about four years (tables 7.2, 7.3, 7.3A and 7.4). Movements in stock returns influence gearing, and the failure of making any readjustments in gearing on the part of managers renders the effects of stock return to mechanistically drive gearing for a long time, even for up to about 10 years (tables 7.5, 7.5A and 7.6).

While it is possible to separate and test the effect of equity market timing (from stock returns effect) by using net equity issues *(NeI)*, such a test has to use the book value of equity. The book value of equity does not provide a reliable measure for analysing long-term changes in gearing.[34] Nevertheless, this separation makes it possible to test the effects of equity market timing while controlling for the stock return effects.

Tests on the effect of stock returns on gearing must use the market value of equity, and the market value may inherently include the effects of past equity market timing on gearing. This is because in timing the equity market, managers rely on stock returns movements. In order to test for the effects of stock returns

[34] As mentioned earlier, accounting estimates such as depreciation and revaluation of fixed assets may also bring about some changes in the book value of equity.

(only) on gearing, the net equity issues have to be held constant, while only allowing the tests to capture the effect of stock returns on gearing ratio. By using such a separation procedure it has been possible to generate tables 7.3,7.3A and 7.4 for the effects of equity market timing, and tables 7.5,7.5A and 7.6 for the effects of stock returns.

The coefficients, (adjusted) R-squared, and statistical significance in tables 7.3,7.3A, 7.5, and 7.5A show that within a period of one year equity market timing and stock return exert significant impact on gearing ratios. However, over a long-time horizon as shown in table 7.4 and table 7.6, the statistical significance (coefficients and R-squared), consistency, and the longevity of the impact from stock returns surpass those of equity market timing. Partly the differences could be due to the book equity not being a reliable measure for analysing long-term changes in gearing. It could also be due to the fact that stock return effects are continuous over time while managers do not issue or retire equity (time the market) on a continuous basis (i.e. they only issue equity when they need to raise funds, which may be once in a while).

7.7.4 Stock returns vs. other determinants of capital structure

In order to reach a conclusion as to whether stock returns is the major determinant of gearing or indeed whether stock returns mechanistically drive the gearing ratio, an 'all-inclusive model' was used. Multiple OLS-regressions were run of debt-to-capital ratio ($(D/(D+E)$ with equity measured in market value) on the implied debt-to-capital ratio $IDR_{t-1,t}$, the lagged debt equity ratio, ADR_{t-1}, and annual changes in market-to-book ratio, natural log of total assets, retained earnings, non-debt tax shields, and on net equity issues *(NeI/TA)* for each year from 1986 to 1999. The inclusion of these variables in one regression enables us to pick their independent effect on gearing ratios. Regressions were run first with intercept and then without intercept. Tables 7.7 and 7.7A report the results. In each year the coefficient for the inert debt ratio (the lagged debt-to-capital ratio grossed up by the stock return movement from $t-1$ years to t) dominates all other predictors in explaining the actual (observed) debt-to-capital ratio.

After stock returns effects, the changes in *retained earnings* (past profitability) and net equity issues, *NeI/TA*, (a proxy for market timing behaviour) almost tie for the second position as most important determinants of gearing. *Firm size* ranks fourth in terms of importance. After accounting for stock return, equity market timing, past profitability, and firm size the remaining predictors (the lagged debt-to-capital ratio, the changes in market-to-book ratio, and changes in non-debt tax shields) seem to explain very little variation in debt-to-capital ratio. Although these other determinants are statistically significant, compared to stock returns, their economic significance is negligible. On average, the models used to generate tables 7.7 and 7.7A show that the independent variables employed in the models explain between 80% to 88% of the variation in the observed debt-to-capital ratio. This is a big improvement in explanatory power compared to the explanatory power of 41% and 18% for the cross-sectional and the traditional dynamics studies respectively.

To determine the longer horizons' explanation power of stock return versus other determinants, similar pooled OLS-regression were run for one, two, three, four, five and ten years. Changes in the predictor variables were calculated from $t-a$ years to t. Table 7.8 reports the results of this 'all inclusive model'. For example in table 7.8, the row for the 2-years pooled regression report the results for changes from $t-2$ years to t. Because long-term changes in book value of equity may not necessarily reflect net equity issues, the variable *NeI/TA* is left out of this regression. All coefficients are expressed in percentages. Both the pooled regression results and the F-M statistics show that the dominance of implied debt ratio, $IDR_{t-a,t}$ as a predictor of the actual debt ratio can still be seen for up to five years. Actually more than 60% of the variation in capital structure can be explained by this dominance for up to three years. Even over a ten-year horizon, the pooled regression results show that more than 34% of the variation in capital structure is explained by the dominance of stock returns.

Although the coefficient on the implied debt ratio, $IDR_{t-a,t}$, in table 7.8 falls gradually from year one to year ten, it is clear that no any other determinant tested here exerts a larger enough impact to counter (or to match) the effect of stock return for up to five years. The relative importance of the other determinants is also made clear by table 7.8. (Past) profitability emerges to be the second after stock return. Although the coefficients on these other determinants are equally statistically significant, but compared with stock returns effect, their economic impact on gearing (excluding profitability) is negligible. After stock returns, the lagged debt-to-capital ratio follows, and then profitability follows, and then firm size, growth opportunities, and lastly non-debt tax shields. The without constant regressions and the F-M statistics show that over a ten-year period the forces of re-adjustment start to be dominant. This show that firms take a long time (about 10 years) to start rebalancing the effects of stock returns on capital structure.

The results of this study confirm the findings of Welch (2004) that stock returns have a mechanistic effect on debt equity ratios over a long time. The results partly support Kayhan and Titman (2003) that stock returns have relatively strong effects on capital structure that persists for quite some time. This study's findings however, contrast Kayhan and Titman (2003) who find that the effects of stock returns partially reverses, and that over a long periods of time (5-10 years) firms make financial choices that move them towards their target debt ratios. In this study, such rebalancing starts from the tenth year.

7.8 Summary and Conclusion

From the results presented above it appears that finally the most important determinant of gearing (measured in market value) has been confirmed to be stock returns.[35] This is because; a comparison of explanatory power of prior cross-sectional studies reveals that their models explain relatively little variation in capital structure. To start with, in the cross-sectional part of this study (in

[35] See Taggart (1977) and Bennett and Donnelly (1993) for arguments in favour of using market value gearing measures in capital structure empirical research.

chapter four) the OLS regression model explains about 41% of variation in the market value gearing ratio. This is typical of the explanatory power of similar studies like Fan *et al* (2003) for country level regressions, Bennett and Donnelly (1993), Rajan and Zingales (1995), Boyle and Eckhold (1996) and Fama and French (2002) to mention a few. The book value R-squared is normally lower than that of the market value. Drobetz and Fix (2003) report R-squared of 13% to 15% for book value gearing and 30% to 47% for market value gearing.

The pattern of explanatory power for studies that have focused on the dynamics of firm-specific determinants of capital structure is not different either. For example, the market value gearing model for the moving window pooled regression on changes in the firm-specific characteristics in this study has adjusted R-squared which ranges from 7% to 18.6%. Other similar studies on the dynamics of capital structure (see for example, Bevan and Danbolt, 2003) report similar explanatory power.

The incorporation of stock returns proxy ($IDR_{t-a,t}$), and net equity issues ($NeI/TA_{t-a,t}$) in a dynamic model, pushes up the R-squared for pooled regression to 78% (up to 85 % in some of the years) in table 7.7 When net equity issues are excluded from the model the pooled regressions have (adjusted) R-squared of 73%, 70%, and 66% for changes over one year, two years, and three years respectively (see table 7.8). Even over ten-years changes, the model explain over 34% of variation is capital structure.

The pattern of explanatory power described above, provides overwhelming evidence in support of stock returns as the major determinant of capital structure. There is also undisputed evidence of the persistency of stock returns impact on gearing. All this implies that by ignoring the effects of stock returns in prior studies' models, the models could not explain much variation in capital structure as the models in table 7.7, 7.7A and table 7.8 do.

The empirical analysis in this chapter has provided evidence that UK managers practice equity market timing, and that the practice has a significant impact on gearing ratios. However, compared to stock returns effects, the effects of equity market timing on capital structure are less important. The all-inclusive model has generated results which show that is the most important of all hypothesised determinants tested in this thesis. Stock returns effects mechanistically drive gearing ratios, for more than ten years. Although other determinants like equity market timing, profitability, firm size, growth opportunities and non-debt tax shields are statistically consistently related to changes in gearing, they have negligible economic effect. The next chapter provides a summary of findings the whole thesis, and then discusses whether the findings of this study can be explained by any of the extant capital structure theories, before reaching a conclusion.

7.9. Appendix: Tables and Figures:

Table 7.1: Evidence of equity market timing practice

Determinants of annual change in net equity issues and gearing, and their components. Regressions of changes in NeI, book and market gearing on annual changes in market-to-book, firm size, profitability, and $Ln(P_t / P_{t-1})$. i.e. Panel A:

$$NeI = \alpha + \beta_1 \Delta MTB_{t-1,t} + \beta_2 \Delta LnTA_{t-1,t} + \beta_3 \Delta RE/TA_{t-1,t} + \beta_4 Ln(P_t / P_{t-1}) + \varepsilon$$

		$\Delta MTB_{t-1,t}$		$\Delta LnTA_{t-1,t}$		$\Delta RE/TA_{t-1,t}$		$Ln(P_t / P_{t-1})$		R-sq (adj.)%
Years	N	β_1	t	β_2	t	β_3	t	β_4	t	
Panel A: The Dependent variable is Net Equity issues divided by total assets (NeI/TA)										
1986	395	-0.03	-2.09a	0.15	8.65*	-0.43	-6.7*	0.015	1.14	36.4
1987	405	-0.08	-5.3*	0.13	7.33*	-0.56	-13.5*	0.04	4.27*	43.2
1988	405	-0.13	-6.85*	0.10	4.27*	-0.38	-5.7*	0.07	4.54*	26.1
1989	408	-0.11	-7.81*	0.10	4.25*	-0.33	-5.9*	0.09	4.74*	26.7
1990	547	-0.08	-6.31*	0.06	3.29*	-0.40	-10.8*	0.09	5.78*	27.8
1991	553	-0.05	-4.38*	0.10	5.76*	-0.28	-6.0*	0.03	2.73*	18.2
1992	538	-0.07	-5.2*	0.18	10.1*	-0.32	-9.11*	0.06	5.22*	29.9
1993	545	-0.12	-7.7*	0.12	4.96*	-0.49	-10.1*	0.09	5.01*	26.7
1994	560	-0.03	-3.61*	0.18	9.33*	-0.35	-8.16*	0.02	2.72*	22.3
1995	564	-0.07	-6.68*	0.14	6.76*	-0.26	-6.68*	0.04	3.27*	20.9
1996	549	-0.01	-0.81	0.15	7.67*	-0.46	-12.6*	0.01	0.81	35.9
1997	541	-0.03	-2.45a	0.06	3.59*	-0.26	-7.71*	0.03	1.99a	12.9
1998	536	-0.09	-7.4*	0.04	1.73b	-0.26	-8.32*	0.07	3.8*	17.9
1999	525	-0.10	-7.88*	0.08	3.12*	-0.38	-10.5*	0.12	6.13*	25.2
Panel B: The Dependent variable is the change in book gearing (Debt to Equity, D/E)								$NeI/TA_{t-1,t}$		
1986	387	-0.01	-0.4	0.1	4.7*	-0.15	-1.7b	-0.2	-3.1b	5.6
1987	391	-0.01	-0.17	0.1	6.2*	-0.16	-3.7b	-0.16	-4.2	9.8
1988	399	-0.01	-0.9	0.29	9.0*	-0.32	-3.5b	-0.46	-6.4*	21.4
1989	386	-0.01	-0.3	0.35	6.6*	-0.45	-3.8a	-0.64	-6.2*	15.1
1990	541	0.01	0.5	0.32	8.3*	-0.75	-8.4*	-0.82	-8.5*	20.3
1991	554	-0.01	-0.75	0.19	5.4*	-0.58	-5.2*	-0.71	-7.5*	12.7
1992	578	-0.04	-1.9a	0.19	4.5*	-0.75	-8.8*	-0.8	-8.2*	16.2
1993	565	-0.0	-0.01	0.08	2.2a	-0.49	-5.8*	-0.4	-5.3*	6.8
1994	570	-0.01	-0.5	0.12	2.8a	-0.71	-6.3*	-0.77	-7.3*	10.8
1995	566	0.04	1.99a	0.32	7.0*	-0.71	-7.7*	-0.93	-9.5*	18.6
1996	560	0.06	2.9*	0.21	5.9*	-0.66	-7.8*	-0.73	-8.4b	16.4
1997	546	0.02	1.4	0.17	4.8*	-0.9	-12.5*	-0.63	-6.8*	20.8
1998	529	-0.03	1.75b	0.46	9.2*	-1.13	-14.8*	-1.2	-11.4*	36.5
1999	531	-0.01	-0.4	0.43	8.8*	-0.65	-8.7*	-0.47	-5.8*	20.2
Panel C: The Dependent variable is the change in market gearing, i.e. (D/E+D)								$NeI/TA_{t-1,t}$		
1986	407	-0.04	-2.7*	0.10	4.8*	-0.32	-4.13*	-0.25	-4.2*	10.9
1987	413	-0.07	-5.8*	0.08	5.1*	-0.24	-5.0*	-0.23	-5.3*	14.2
1988	420	-0.07	-6.1*	0.15	8.1*	-0.42	-7.6*	-0.38	-9.7*	31.4
1989	418	-0.04	-5.2*	0.15	7.9*	-0.23	-5.0*	-0.30	-8.1*	24.2
1990	566	-0.06	-6.8*	0.11	7.0*	-0.23	-5.7*	-0.19	-4.5*	17.4
1991	571	-0.06	-5.5*	0.03	1.97*	-0.47	-8.97a	-0.17	-8.9*	16.4
1992	597	-0.09	-7.6*	0.11	5.1*	-0.29	-6.7*	-0.26	-5.1*	13.9
1993	591	-0.09	-9.4*	0.03	1.99a	-0.13	-3.2*	-0.09	-2.9*	14.0
1994	592	-0.06	-7.2*	0.04	1.97a	-0.27	-5.3*	-0.28	-5.8*	12.9
1995	591	-0.07	-7.9*	0.12	5.6*	-0.25	-5.5*	-0.24	-5.1*	15.7
1996	574	0.04	5.7*	0.04	3.0*	-0.16	-5.1*	-0.17	-5.2*	10.8
1997	585	-0.05	-6.4*	0.10	5.7*	-0.34	-8.5*	-0.25	-5.4*	19.9
1998	557	-0.06	-7.8*	0.12	6.9*	-0.14	-5.5*	-0.19	-5.4*	17.9
1999	563	-0.05	-6.9*	0.15	7.1*	-0.20	-6.2*	-0.07	-2.1a	18.3

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. While the four independent variables used in panel A explain a significant proportion of yearly new equity issues (*NeI*) (i.e. 13% to 43%), those used in panel B explain about 5% to 36% of variation in book gearing. The variables explain between 10% to about 24% variation in market gearing In panel A there is a consistent significant positive relationship between *NeI* and stock returns. In Panels B and C there is a consistent significant negative relationship between (both book and market) gearing and net equity issues. The results confirm that managers practice equity market timing, and that the practice has significant effects on gearing.

Table 7.2: Long term changes in net equity issues, gearing vs. changes in stock returns

OLS regressions of long-term horizon changes in *NeI*, book and market values of gearing on corresponding changes in market-to-book, firm size, profitability, and $Ln(P_t / P_{t-a})$. Panel A reports pooled regression coefficients for the following equation: $NeI/TA = \alpha + \Delta MTB_{t-a,t} + \Delta LnTA_{t-a,t} + \Delta RE/TA_{t-a,t} + Ln(P_t / P_{t-a}) + \varepsilon$. In Panel B and C, the dependent variables are the book gearing and market gearing respectively, and the natural log of stock returns is replaced by net equity issues, $NeI/TA_{t-a,t}$.

Horizon		$\Delta MTB_{t-a,t}$		$\Delta LnTA_{t-a,t}$		$\Delta RE/TA_{t-a,t}$		$Ln(P_t / P_{t-a})$		R-sq (adj.)%	F
Years	N	β_1	t	β_2	t	β_3	t	β_4	t		
Panel A: The Dependent variable is Net equity issues (NeI/TA):											
1yr Pooled	7003	-0.09	-10.9*	0.13	12.9*	-0.43	-14.8*	0.05	8.4*	33.8	534
1yr F-M	14	-0.1	-5.3	0.1	5.8	-0.4	-8.7	0.1	3.7*	26.4	-
2yrs Pooled	5859	-0.05	-3.7*	0.1	6.5*	-0.36	-9.4*	0.04	4.0*	31.7	442
3 yrs Pooled	5458	-0.07	-4.6*	0.14	8.7*	-0.33	-8.5*	0.04	3.48*	29.4	385
5 yrs Pooled	1613	-0.05	-3.1*	0.16	11.5*	-0.25	-6.31*	0.01	1.15	30.1	185
'a = 9yrs	495	-0.01	-1.33	0.18	15.9*	-0.22	-5.5*	-0.01	-2.21•	37.2	74.1
Panel B: The Dependent variable is change in book gearing i.e. Debt to Equity ratio (D/E):											
		$\Delta MTB_{t-a,t}$		$\Delta LnTA_{t-a,t}$		$\Delta RE/TA_{t-a,t}$		$NeI/TA_{t-a,t}$			
'a=3yrs	547	-0.04	-1.74	0.23	6.7*	-1.0	-10.1*	-1.0	-9.7•	21.8	38.9
'a =5yrs	546	-0.05	-2.3•	0.2	7.3*	-0.8	-9.8*	-0.8	-8.8*	20.8	36.8
'a = 9yrs	481	-0.01	-0.2	0.2	8.6*	-0.7	-9.5*	-0.5	-5.6*	22.4	35.5
Panel C: The Dependent variable is change in market gearing (D/E+D) with equity measured in market value.											
		$\Delta MTB_{t-a,t}$		$\Delta LnTA_{t-a,t}$		$\Delta RE/TA_{t-a,t}$		$NeI/TA_{t-a,t}$			
'a = 3yrs	577	-0.09	-8.2*	0.08	5.1*	-0.45	-10.2*	-0.29	-6.4*	25.0	48.9
'a = 5yrs	568	-0.08	-8.5*	0.06	5.6*	-0.34	-9.5*	-0.22	-6.2*	24.5	47.0
'a = 9yrs	522	-0.06	-7.0*	0.07	6.3*	-0.32	-8.8*	-0.2	-5.0*	20.9	35.3

Coefficients that are significantly different from zero at 1%, 5% and 10% are marked with *, 'a', and 'b' respectively. Columns nine and ten are the columns of utmost interest for these regressions. In panel A the columns show the regression coefficients and their corresponding t-statistics for the regressor $Ln(P_t / P_{t-a})$. In panel A the 1, 2, and 3-years horizons depict significant positive coefficients. This relationship falls short of being significant over the five year horizon, and over the 9-year period the relationship between the natural log of stock returns and net equity issues (NeI/TA) not only turns negative; it actually becomes significantly negative. In panels B and C the there is a significant negative relationship between changes in gearing and net equity issues ($NeI/TA_{t-a,t}$).

Table 7.3: Evidence of non-rebalancing of equity market timing effects

OLS regressions of observed yearly actual debt to equity ratio (ADE_t) on inert debt-to-equity ratio ($ID/E_{t-1,t}$) and a lagged debt-to-equity ratio (D/E_{t-1}):

i.e. $ADE_t = \alpha + \beta_{ID/E}(ID/E_{t-1,t}) + \beta_{D/E}(D/E_{t-1}) + \varepsilon$

Year	con.	$\beta_{ID/E}$	$\beta_{D/E}$	t_c	$t_{ID/E}$	$t_{D/Et-1}$	R-sq (adj.)%	N
1986	3	38.2	35.0	0.75	16.8	10.4	70.2	430
1987	5	44.2	35.9	0.89	16.2	8.6	71.1	429
1988	8	41.3	50.0	1.49	13.2	11.9	74.5	421
1989	6	98.1	4.5	3.76	131.6	4.67	98.7	411
1990	5	81.1	18.4	1.53	74.9	13.6	96.3	577
1991	0.1	103.0	0.7	0.16	132.9	2.63	98.3	391
1992	6	83.6	12.6	2.36	91.1	13.4	97.7	613
1993	4	84.5	12.2	1.8	87.8	12.9	97.5	606
1994	3	87.3	11.0	1.42	94.6	12.2	97.9	605
1995	4	90.2	8.7	2.34	142.5	14.5	98.9	610
1996	4	89.8	9.5	2.18	91.5	9.5	98.2	609
1997	4	88.6	9.8	2.07	116.1	12.2	98.2	604
1998	5	80.6	16.7	1.38	66.6	12.2	95.1	571
1999	7	85.3	12.7	1.96	73.0	10.8	95.8	568
Pooled	2	78.8	17.8	1.85	194.8	41.8	93.8	8370
F-M	5	78.3	17.0	1.7	82.1	10.7	92.0	14

Explanation: All coefficients for the inert debt-to-equity ratio ($ID/E_{t-1,t}$) and that of the lagged debt-to- equity ratio are statistically significant. These coefficients and those for the constant are expressed in percentages. The constant indicates that the firms comprising the sample had a marginal increase in debt to equity ratio over the sample period. The actual debt to equity ratio ADE_t is the value to be explained, the inert debt ratio $ID/E_{t-1,t}$, is the lagged debt to equity ratio grossed up by the net equity issue over the year. If managers rebalance their gearing following net equity issue (NeI) effects, the coefficient on the lagged debt to equity ratio D/E_{t-1} should be 100%. If mangers do not rebalance their gearing ratios, in which case gearing is mechanistically driven by net equity issues, then the coefficient on ($ID/E_{t-1,t}$) should be 100%. Fama-MacBeth statistics (F-M) report relevant column averages. Pooled regressions use all observations, regardless of year, in one regression.

Interpretation: In almost all cases (all except 1988) the inert debt to equity ratio ($ID/E_{t-1,t}$) is a better predictor of the observed debt to equity ratio (ADE_t) than the lagged debt to equity ratio (D/E_{t-1}). This confirms that managers do not readjust their firm's capital structure back to their previous (assumed optimal) gearing ratios after the effects of equity market timing.

Table 7.3A: Evidence of non-rebalancing of equity market timing effects: Without intercept regressions

Without intercept OLS regressions of observed yearly actual debt to equity ratio (ADE_t) on inert debt to equity ratio ($ID/E_{t-1,t}$) and a lagged debt equity ratio (D/E_{t-1})

i.e. $ADE_t = \beta_{ID/E}\,(ID/E_{t-1,t}) + \beta_{D/E}\,(D/E_{t-1}) + \varepsilon$

Year	con.	$\beta_{ID/E}$	$\beta_{D/E}$	t_c	$t_{ID/E}$	$t_{D/Et-1}$	R-sq (adj.)%	N
1986	-	35.7	43.7	-	16.7	12.4	81.8	427
1987	-	44.9	36.7	-	17.3	8.9	81.3	429
1988	-	42.9	50.8	-	14.6	12.1	84.1	421
1989	-	99.0	5.4	-	138.5	5.5	99.2	411
1990	-	81.4	19.0	-	76.8	14.5	97.7	577
1991	-	103.1	0.7	-	159.4	2.6	99.0	391
1992	-	84.1	13.1	-	93.1	14.2	98.6	613
1993	-	84.8	12.7	-	89.3	13.7	98.4	606
1994	-	87.6	11.3	-	97.1	12.8	98.7	605
1995	-	90.6	9.0	-	146.7	15.2	99.3	610
1996	-	90.1	10.0	-	92.6	10.2	98.8	609
1997	-	89.0	10.2	-	119.2	13.1	98.9	604
1998	-	81.0	17.2	-	70.0	12.9	97.1	571
1999	-	85.9	13.3	-	76.2	11.6	97.6	568
Pooled	-	79.0	18.0	-	201.5	43.1	96.0	8370
F-M	-	78.6	18.1	-	86.2	11.4	95.0	14

Both the pooled and the F-M statistics show higher coefficients and the R-sq (adj.) is also higher than it is for the with-intercept regressions. However, the differences are very small.

Table 7.4: Cumulative effect of equity market timing on gearing ratio

Pooled regression results and Fama-Macbeth (F-M) statistics for long-term effects of equity market timing on gearing:

i.e. $ADE_t = \alpha + \beta_{ID/E}(ID/E_{t-a,t}) + \beta_{D/E}(D/E_{t-a}) + \varepsilon$

Horizon	con.%	$\beta_{ID/E_{t-a,t}}$ %	$\beta_{D/E_{t-a}}$ %	t_c	$t_{ID/E_{t-a,t}}$	$t_{D/E_{t-a}}$	R-sq (adj.)%	N
With constant								
1-year Pooled	2.0	78.8	17.8	1.85	194.8	41.8	93.8	8370
2-year Pooled	9.3	81.8	-9.5	21.5	16.2	-1.95	45.0	7719
3-year Pooled	12.7	72.3	-4.8	22.4	12.9	-1.3	37.1	7068
4-year Pooled	13.1	70.8	-12.2	23.7	12.6	-2.29	29.0	6417
5-year Pooled	15.0	10.7	38.2	23.2	3.79	13.98	21.1	5766
10-yrs Pooled	24.2	-30.8	71.1	12.0	-2.1	4.2	9.3	2325
1-year F-M	0.5	78.3	17.0	1.7	82.1	10.7	92.0	14
2-year F-M	9.3	83.7	-11.1	7.2	5.6	0.1	46.6	13
3-year F-M	10.6	73.1	-10.7	8.1	5.0	-1.0	36.6	12
4-year F-M	11.9	74.3	-11.9	8.6	5.3	-1.1	30.3	11
5-year F-M	14.4	67.4	-12.7	8.3	5.8	-0.8	26.0	10
10-year F-M	20.4	-28.1	65.2	5.2	-1.9	0.9	8.7	3
Without constant								
1-year Pooled	-	79.0	18.0	-	201.5	43.1	96.0	8370
2-year Pooled	-	99.5	-16.0	-	16.4	-2.7	67.4	7719
3-year Pooled	-	57.5	33.1	-	17.2	9.7	59.0	7068
4-year Pooled	-	79.0	-0.0	-	13.2	-0.02	50.9	6417
5-year Pooled	-	21.5	51.1	-	7.2	17.7	45.0	5766
10-yrs Pooled	-	22.3	53.7	-	3.1	6.6	35.4	2325

For basic description, see table 7.3. This table reports results of OLS regressions using debt-to-equity ratio lagged for 'a' years. All the 1, 2, 3, and 4-year horizons' pooled regression coefficients indicate that the lagged debt to equity ratio is not a good predictor of the observed debt to equity ratio. From the fifth year the signs of rebalancing starts to be evident and by the fifth year the pooled regression coefficient on the inert debt ratio has ceased to be a better predictor of the observed gearing ratio.

Table 7.5: Stock returns as a determinant of gearing

OLS regressions of observed yearly actual debt to capital ratio ADR_t on implied debt to capital ratio $IDR_{t-1,t}$ and a lagged debt equity ratio ADR_{t-1}. The ADR_t is the value to be explained. The inert debt to capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-1$ years to t. i.e. $ADR_t = \alpha + \beta_{IDR_{t-1,t}}(IDR_{t-1,t}) + \beta_{ADR_{t-1}}(ADR_{t-1}) + \varepsilon$

With intercept regressions:

Year	con. %	$\beta_{IDR_{t-1,t}}$ %	$\beta_{ADR_{t-1}}$ %	t_c	$t_{IDR_{t-1,t}}$	t_{ADRt-1}	R-sq (adj.)%	N
1986	2.0	64.6	21.2	4.1	6.36	2.2	73.6	436
1987	2.9	78.2	4.4	5.3	7.33	0.48	63.7	439
1988	2.6	85.3	-0.5	5.4	7.09	-0.05	63.0	438
1989	3.6	67.9	21.9	5.8	4.49	1.5	56.1	439
1990	2.9	60.2	14.7	5.4	16.9	4.9	61.5	581
1991	3.0	53.4	30.8	5.8	10.2	4.5	70.7	624
1992	2.6	79.8	5.9	5.2	14.2	1.0	75.3	627
1993	1.6	74.3	14.2	3.3	13.8	2.4	78.5	627
1994	2.6	89.7	-0.3	4.7	15.9	-0.59	76.2	628
1995	2.6	61.4	15.5	5.4	10.2	2.3	69.2	627
1996	1.7	62.3	24.6	4.2	9.1	3.7	73.0	617
1997	3.0	58.1	18.6	6.5	7.8	2.5	63.0	619
1998	3.5	49.4	33.2	6.9	6.6	4.0	62.3	618
1999	3.6	74.5	5.5	6.2	13.3	0.83	67.7	625
2000	2.8	85.4	-5.0	4.4	12.3	-0.7	71.6	366
Pooled	2.3	80.4	5.0	19.5	58.5	3.7	73.3	9021
F-M	2.7	69.6	13.6	5.2	10.4	2.0	68.4	15

The coefficients for the constant, implied debt to capital ratio and that of a lagged debt to capital ratio are expressed in percentages. If managers follow a policy of rebalancing their gearing following the stock return effect the coefficient on ADR_t should be 100 percent. If managers do not rebalance their gearing at all, then the coefficient on IDR_t should be 100 percent. In all cases (every year), the coefficient for the inert debt-to-capital ratio is closer to 100% than the coefficient for the lagged debt-to-capital ratio. Pooled regressions use all observations, regardless of year, in one regression. (F-M) report relevant column averages. The pooled regression coefficient shows that on average over 80% of variation in debt-to-capital ratio is predicted by the implied debt-to- capital ratio. The lagged debt to capital ratio explains only 5 percent. In some years the coefficient for the lagged debt-to-capital ratio is negative, in other years it is positive. However, compared to that of the implied debt-to-capital ratio, the coefficient for the lagged debt-to-capital ratio is negligible. These results suggest that managers do not rebalance the gearing (yearly) to take into account stock returns effects.

Table 7.5A: Stock returns as a determinant of gearing: Without intercept regressions

OLS regressions of observed yearly actual debt to capital ratio ADR_t on implied debt to capital ratio $IDR_{t-1,t}$ and a lagged debt equity ratio ADR_{t-1}. The ADR_t is the value to be explained. The implied debt-to-capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-1$ years to t.

i.e. $ADR_t = \beta_{IDR_{t-1,t}}(IDR_{t-1,t}) + \beta_{ADR_{t-1}}(ADR_{t-1}) + \varepsilon$

Without intercept regressions:

Year	con. %	$\beta_{IDR_{t-1,t}}$ %	$\beta_{ADR_{t-1}}$ %	t_c	$t_{IDR_{t-1,t}}$	$t_{ADR_{t-1}}$	R-sq (adj.)%	N
1986	-	65.1	27.0	-	6.3	2.8	84.1	436
1987	-	70.3	19.9	-	6.4	2.2	76.8	439
1988	-	88.2	6.9	-	7.1	0.6	77.7	438
1989	-	78.7	25.7	-	5.0	1.7	74.3	439
1990	-	54.2	25.2	-	15.1	8.9	78.1	574
1991	-	50.7	47.8	-	9.8	6.9	83.7	615
1992	-	76.9	17.9	-	14.0	3.1	86.0	623
1993	-	74.4	18.4	-	13.7	3.2	87.1	627
1994	-	89.9	2.1	-	15.6	0.44	85.1	628
1995	-	47.6	33.8	-	7.5	4.9	79.0	618
1996	-	56.5	38.1	-	7.4	5.3	83.7	618
1997	-	62.2	23.7	-	9.9	3.8	81.5	620
1998	-	53.9	41.1	-	6.4	4.5	77.7	611
1999	-	74.9	19.1	-	12.9	2.7	80.2	607
2000	-	81.1	8.5	-	11.6	1.2	81.8	360
Pooled	-	83.5	10.0	-	59.8	7.3	83.4	9021
F-M	-	68.3	23.7	-	9.9	3.5	81.1	15

For basic description, see table 7.5. This table reports results of OLS regressions without intercept. Though the R-sq (adj.) is a little bit higher than in the with intercept regressions, the differences in the coefficients are negligible.

Table 7.6: The Longevity of stock returns effects on gearing (Pooled regressions)

Multiple OLS-regressions of observed debt-to-capital ratio (ADR_t) on implied debt-to-capital ratio ($IDR_{t-a,t}$) and a lagged debt-to-capital ratio (ADR_{t-a}). The (ADR_t) is the value to be explained. The inert debt to capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-a$ years to t.

i.e. $ADR_t = \alpha + \beta_{IDR_{t-a,t}}(IDR_{t-a,t}) + \beta_{ADR_{t-a}}(ADR_{t-a}) + \varepsilon$

Horizon	con.%	$\beta_{IDR_{t-a,t}}$ %	$\beta_{ADR_{t-a}}$ %	t_c	$t_{IDR_{t-a,t}}$	$t_{ADR_{t-a}}$	R-sq (adj.)%	N
With constant								
1-year Pooled	2.3	80.4	5.0	19.5	58.5	3.7	73.3	9021
2-year Pooled	3.8	60.9	8.4	19.8	23.2	3.4	51.8	7254
3-year Pooled	5.8	56.6	3.6	22.7	2.54	0.16	42.5	7068
4-year Pooled	5.0	47.7	8.9	21.7	21.9	4.2	38.2	6417
5-year Pooled	6.3	44.1	11.3	19.7	19.5	4.5	30.0	5301
10-years	9.2	25.1	18.7	8.6	4.6	2.3	17.9	1768
1-year F-M	2.7	69.6	13.6	5.2	10.4	2.0	68.4	15
2-year F-M	3.9	59.3	14.7	6.4	9.6	2.7	53.3	14
3-year F-M	4.6	57.7	14.3	6.7	3.8	4.8	46.9	13
4-year F-M	5.4	44.2	14.4	7.8	7.5	2.8	36.6	12
5-year F-M	6.3	35.1	21.5	8.2	7.5	3.9	35.2	11
10-year F-M	9.0	27.1	19.3	8.8	8.1	3.7	19.8	3
Without constant								
1-year Pooled	-	83.5	10.0	-	59.8	7.3	83.4	9021
2-year Pooled	-	66.4	16.9	-	24.3	6.8	69.3	7254
3-year Pooled	-	59.1	18.3	-	19.9	2.3	63.2	7068
4-year Pooled	-	53.9	21.1	-	23.5	9.7	59.8	6417
5-year Pooled	-	49.7	29.1	-	20.8	11.6	55.6	5301
10-years	-	30.8	21.3	-	12.0	9.8	30.4	1768

The coefficients for the constant, implied debt-to-capital ratio ($IDR_{t-a,t}$), and that of a lagged debt-to-capital ratio are expressed in percentages. The coefficients on inert debt ratio, $IDR_{t-a,t}$, are closer to 1 (100%) than those of lagged debt ratio, ADR_{t-a}. This shows that the implied debt ratio is a better predictor of the observed debt ratio. Up to 2 years horizon the non-action by managers explains about 52% of the variation in gearing. Generally, the coefficients and the R-sq (adj.) from the without intercept regressions are higher than those from with intercept regressions.

Table 7.7: Determinants of yearly changes in debt-to-capital ratio from 1986 to 1999

OLS regressions of observed yearly actual debt to capital ratio ADR_t on implied debt to capital ratio $IDR_{t-1,t}$, lagged debt equity ratio ADR_{t-1}, changes in market-to-book ratio, natural log of total assets, retained earnings, non-debt tax shields, and on net equity issues *(NeI/TA)* over the year. The ADR_t is the value to be explained. The inert debt to capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-1$ years to t. Changes in variables are changes from $t-1$ years to t. NeI/TA is the net equity issue (net of retained earnings) over the year. Results as per the following equation:

$$ADR_t = \alpha + \beta_{IDR_{t-1}} IDR_{t-1,t} + \beta_{ADR_{t-1}} ADR_{t-1} + \beta_{MTB} \Delta MTB + \beta_{LnTA} \Delta LnTA + \beta_{RE} RE + \beta_{NDTS} NDTS + \beta_{NeI} NeI + \varepsilon$$

With intercept regressions:

Year	Con.	Regression coefficients							R-sq (adj.)	N
		$IDR_{t-1,t}$	ADR_{t-1}t	ΔMTB	$\Delta LnTA$	$\Delta RETA$	$\Delta NDTS$	NeI/TA		
1986	1.9	92.2	2.2	-0.9	13.3	-8.3	-0.2	-22.4	78.4	300
1987	1.4	93.2	3.6	-4.2	10.8	-28.9	0.3	-25.5	75.3	335
1988	0.6	82.8	14.6	-3.5	15.9	-36.9	0.0	-41.6	78.2	339
1989	4.1	53.3	36.6	-3.8	12.3	-20.8	0.6	-48.3	81.7	281
1990	1.0	63.6	16.5	-1.0	13.5	-27.8	-1.4	-24.8	74.6	453
1991	1.0	71.4	24.4	-1.7	11.4	-35.3	0.8	-25.6	85.6	442
1992	1.8	78.4	13.2	-5.9	14.1	-23.2	0.7	-12.6	79.1	417
1993	1.1	72.2	18.4	-3.8	10.1	-11.1	0.7	-6.0	83.1	413
1994	1.2	94.7	-0.7	-1.9	3.6	-11.7	1.1	-13.2	80.3	440
1995	1.1	66.4	14.8	-3.4	13.3	-17.2	-1.3	-26.1	77.8	469
1996	0.2	90.0	6.3	-0.5	14.5	-9.6	-0.1	-9.5	85.1	472
1997	1.6	58.9	24.4	-1.4	14.5	-9.6	-0.1	27.0	71.2	489
1998	1.1	76.4	12.6	-2.4	17.8	-11.4	-3.6	-16.3	77.2	442
1999	1.2	95.4	-6.7	-1.6	21.5	-7.6	-1.7	-1.1	76.8	441
Pooled	1.8	80.3	6.3	-3.1	12.4	-18.7	-0.1	-16.8	77.8	8370
F-M	1.4	77.8	12.9	-2.6	13.3	-18.6	-0.3	-17.6	78.9	14

Explanation: The dependent variable is the observed debt-to-capital $((D/(D+E))$ ratio, with equity measured in market value. The second column shows the constant. All coefficients are expressed in percentages. All coefficients for pooled regression are statistically significant at 1%.

Interpretation: In all cases the coefficient for the implied debt-to-capital ratio dominates all other predictors in explaining the actual (observed) debt-to-capital ratio. The pooled regression coefficient for the implied debt ratio is 80.3% while that of the lagged debt-to-capital is only 6.3%. This shows that even after taking into account other determinants of capital structure, stock returns still dominate as the most important determinant. Clearly there is no readjustment following stock returns effects. The effects of other important determinants are also put in perspective.

Table 7.7A: Determinants of yearly changes in debt-to-capital ratio from 1986 to 1999: Without intercept regressions

OLS regressions of observed yearly actual debt to capital ratio ADR_t on implied debt to capital ratio $IDR_{t-1,t}$, lagged debt equity ratio ADR_{t-1}, changes in market-to-book ratio, natural log of total assets, retained earnings, non-debt tax shields, and on net equity issues *(NeI/TA)* over the year. The ADR_t is the value to be explained. The implied debt to capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-1$ years to t. Changes in variables are changes from $t-1$ years to t. NeI/TA is the net equity issue (net of retained earnings) over the year. Results as per the following equation:

$$ADR_t = \alpha + \beta_{IDR_{t-1}} IDR_{t-1,t} + \beta_{ADR_{t-1}} ADR_{t-1} + \beta_{MTB} \Delta MTB + \beta_{LnTA} \Delta LnTA + \beta_{RE} RE + \beta_{NDTS} NDTS + \beta_{NeI} NeI + \varepsilon$$

Year	Con.	Regression coefficients							R-sq (adj.)	N
		$IDR_{t-1,t}$	ADR_{t-1}t	ΔMTB	$\Delta LnTA$	$\Delta RETA$	$\Delta NDTS$	NeI/TA		
1986	-	94.1	0.06	-0.08	13.0	-7.0	-0.07	-22.0	88.2	300
1987	-	92.3	-3.1	-4.3	10.6	-29.0	0.2	-26	85.6	335
1988	-	83.0	13.6	-3.5	15.7	-37.0	-0.06	-41.8	87.7	339
1989	-	50.0	40.5	-4.7	10.5	-23.0	0.1	-49.5	87.8	281
1990	-	65.6	17.2	-1.0	15.9	-25.6	-1.8	-25.0	86.6	453
1991	-	70.4	28.5	-2.6	13.3	-32.2	-1.2	-25.5	92.6	442
1992	-	84.3	13.0	-4.4	17.3	-20.1	-1.3	-10.4	88.9	417
1993	-	75.4	18.4	-3.2	12.1	-9.3	-0.6	-5.5	90.6	413
1994	-	100.3	-2.6	-1.5	6.1	-10.1	1.6	-12.6	88.5	440
1995	-	67.8	16.2	-3.7	15.9	-16.0	-1.2	-27.4	87.7	469
1996	-	90.8	6.2	-0.4	14.9	-9.2	-0.1	-9.3	91.9	472
1997	-	65.2	23.9	-1.0	17.0	-31.6	-0.1	-26.3	84.5	489
1998	-	80.1	13.1	-2.4	20.1	-11.9	-3.4	-17.3	89.1	442
1999	-	96.4	-3.3	-1.7	23.0	-6.6	-2.0	-0.5	88.8	441
Pooled	-	85.3	6.6	-2.8	15.7	-14.1	-0.0	-16.0	82.3	8370
F-M	-	79.7	13.0	-2.5	14.7	-19.2	-0.7	-21.4	88.5	14

Explanation: The dependent variable is the observed debt-to-capital ($(D/(D+E)$ ratio, with equity measured in market value. All coefficients are expressed in percentages. All coefficients for pooled regression are statistically significant at 1%.

Interpretation: In all cases the coefficient for the implied debt-to-capital ratio dominates all other predictors in explaining the actual (observed) debt-to-capital ratio. The pooled regression coefficient for the inert debt ratio is 85.3% while that of the lagged debt-to-capital is only 6.6%. This shows that even after taking into account other determinants of capital structure, stock returns still dominate as the most important determinant. There hardly any readjustment following stock returns effects within one year. The effects of other important determinants are also put in perspective.

Table 7.8: Long-term stock returns effects vs. other determinants

Multiple OLS-regressions of observed debt to capital ratio (ADR_t) on implied debt to capital ratio ($IDR_{t-a,t}$), a lagged debt to capital ratio (ADR_{t-a}), and changes in market-to-book ratio, firm size (LnTA), past profitability (RE/TA), and non-debt tax shields. I.e. equation:

$$ADR_t = \alpha + \beta_{IDRT} IDR_{t-a,t} + \beta_{ADR_{t-a}} ADR_{t-a} + \beta_{MTB} \Delta MTB_{t-a,t}$$
$$+ \beta_{LnTA} \Delta LnTA_{t-a,t} + \beta_{RE} \Delta RE_{t-a,t} + \beta_{NDTS} \Delta NDTS_{t-a,t} + \varepsilon$$

Horizon	*Con.*	*Regression coefficients*						*R-sq (adj.)*	*N*
		$IDR_{t-a,t}$	ADR_{t-a}	ΔMTB	$\Delta LnTA$	$\Delta RETA$	$\Delta NDTS$		
With constant									
1-yr Pooled	1.8	80.7	5.4	-2.5	9.9	-12.7	-0.1	72.7	8370
2-yr Pooled	1.9	63.7	14.8	-2.3	6.5	-17.3	-1.3	70.2	7812
3-yr Pooled	3.9	58.2	15.4	-4.7	3.8	-17.2	-3.7	65.7	7068
4-yr Pooled	4.1	51.3	15.0	-3.5	6.2	-22.1	-0.1	46.0	6417
5-yr Pooled	5.1	44.7	20.1	-2.2	6.6	-11.7	1.5	41.6	5301
10-yr Pooled	5.4	38.4	25.9	-2.1	5.3	-12.7	-0.4	34.3	1302
1-yr F-M	1.0	76.6	12.7	-1.8	10.5	-12.2	-0.3	77.3	14
2-yr F-M	0.7	66.2	17.5	-1.1	4.4	-20.2	-0.5	71.9	13
3-yr F-M	3.1	55.7	15.8	-2.9	3.0	-17.4	-3.3	66.3	12
4-yr F-M	4.5	46.0	16.5	-6.3	6.1	-20.1	-0.7	46.1	11
5-yr F-M	5.2	42.7	20.9	-1.9	6.6	-11.3	0.7	41.9	10
10-yr F-M	5.3	29.3	32.3	-2.4	4.5	-13.6	-0.1	30.4	2
Without constant									
1-yr Pooled	-	85.5	6.0	-2.4	13.1	-8.1	-0.0	83.2	8370
2-yr Pooled	-	71.7	7.0	-5.6	7.0	-17.8	-1.1	81.8	7812
3-yr Pooled	-	68.0	15.5	-17.7	9.8	-14.4	-1.4	80.0	7068
4-yr Pooled	-	59.6	17.8	-3.2	10.4	-18.0	-0.6	69.9	6417
5-yr Pooled	-	51.0	28.0	-2.7	9.5	-11.4	-0.6	66.8	5301
10-yr Pooled	-	25.2	47.2	-3.2	7.3	-12.0	-0.0	57.6	1302

Explanation: The dependent variable is the actual (observed) debt-to-capital ($(D/(D+E)$ ratio, with equity measured in market value. All coefficients are expressed in percentages. Changes in the predictor variables are from $t-a$ years to t. For example 2-years pooled row report the results for changes from $t-2$ years to t. The (ADR_t) is the value to be explained. The implied debt-to-capital ratio is the lagged debt to capital ratio grossed up by the stock return movement from $t-a$ years to t. Because long-term changes in book value of equity may not necessarily reflect net equity issues, the variable NeI/TA is left out of this table.

Interpretation: The dominance of implied debt ratio, $IDR_{t-a,t}$ as a predictor of the actual debt ratio is evident from year one up to year five. Although the coefficients on the implied debt-to-capital ratio decreases as we go from year one to ten, and that on the lagged debt-to-capital increases, in all cases up to a 5-year horizon it is evident that the implied debt-to-capital ratio is still a better predictor of the observed debt-to-equity ratio. Both the F-M coefficients and the without intercept pooled regression coefficients show that after a ten-year horizon the signs of readjustment start to appear. However, the with intercept regression coefficients still show that the implied debt-to-capital ratio is still a good predictor even over a ten-year horizon.

CHAPTER 8

8 SUMMARY AND CONCLUSION

8.1 Introduction

This final chapter provides a summary of the whole thesis. First, this summary reviews the motivation, the research objectives, the data and methodologies used in this study. The summary of major findings is then provided. This summary does not only give the results and their interpretation, but also discusses the theoretical implications of these findings. One of the issues considered is whether the existing major capital structure theories can explain the findings of this study. This theoretical linkage is followed by an outline of the contributions this study has made to the research on capital structure determinants. Suggestions of avenues for future research conclude the chapter.

8.2 Motivation

The dearth of empirical studies on the determinants and on the dynamics of capital structure in the UK provided the major motivation for this study. Contradictory findings from previous studies worldwide also provided additional motivation. The study was therefore driven by the quest for understanding how managers go about making capital structure decisions.

It may well be argued that the inconclusiveness of capital structure theory is as a result of the use of different methodologies, different approaches, and the measuring of variables in different ways by different researchers. To this end this study used two different methodologies on the same data set, and attempted to refine the measurement of variables. The use of available secondary data was considered appropriate because it is the most objective approach compared to theoretical modelling and surveys.

8.3 Research Objectives

The study had the following objectives: (i) to analyse capital structure decisions within a dynamic context by examining both the determinants of capital structure adjustment process and the speed of adjustment over a period of 16-years. (ii) To compare the relative merits of conventional capital structure regression models against Structural Equation Modelling (SEM), a factor-analytic technique, relatively new to capital structure research. (iii) To provide additional evidence on the importance and significance of determinants of capital structure in UK corporations by refining the proxies for theoretical attributes and using multiple gearing ratios in order to try to capture more accurately the cause and effect of the theories that predict different relationships between firm attributes and different measures of gearing. (iv) To empirically explore the validity of some the theoretical determinants, which have not been previously tested empirically in the context of the UK e.g. probability of bankruptcy, and the role of cash holdings and free cash flow. (v) To make an attempt to separate past profitability from current, in order to disentangle the testing of the pecking order hypothesis (Myers, 1984; and Myers and Majluf, 1984) from the signalling theory (Ross, 1977), and from free cash flow hypothesis (Jensen, 1986). (vi) To disentangle the effect of equity market timing from that of stock returns on capital structure and assess their relative importance as determinants of capital structure.

8.4 Data and Methodology

This study has used data relating to a panel of 651 U.K listed companies. The sample period covered a period of 16 years from 1985 to 2000 (inclusive), and resulted into 9,486 firm-year observations. The data source was DataStream International. Two methodologies (Conventional regression and Structural equation modelling (SEM)) were used to analyse the variables computed from the data, both cross-sectionally and in a dynamic context. The results from these methodologies were analysed and compared in order to establish their relative merits. Investigations into industry influence employed an independent approach from those of the cross-sectional and the dynamic parts. Particularly this industry influence analysis employed a combination of cross-sectional OLS-regressions, standard ANOVA using industry dummy variables, and non-parametric tests (Kruskal Wallis test for ranks). In all its analyses the study used multiple measures of gearing in order to capture different relationships between the determinants of gearing and different types of debt as predicted by some theories.

8.5 Summary of Findings

The findings of this study add to a growing body of evidence, which relates to the determinants of capital structure and its dynamics. The first set of empirical tests was investigating industry influence on capital structure. On other cross-sectional determinants of capital structure, first the study introduces a measure of probability of bankruptcy in empirical research on determinants of capital structure, and confirms the theory that (at least in the short-term) the probability of bankruptcy determines gearing policy of a firm by acting as a deterrent for the use of excessive debt levels.

Secondly, in order to increase the explanatory power of some independent variables and thereby explore a more meaningful relationship between gearing and theorised attributes, the study splits past profitability from future profitability. This separation of past- from future profitability, though recognized in literature has not been attempted by most previous empirical studies, resulting in ambiguous results and confusing interpretations and conclusions (see sections 2.6.2.8, 4.8.8, and 4.9). In so doing the study uncovers very strong evidence in favour of pecking-order predictions and signalling theory of capital structure. Thirdly, this study also tests both uniqueness of a firm and cash-holdings as determinants of capital structure in the U.K.

In order to fully address the major research question in this study, some of the analyses of capital structure decisions were carried out in a dynamic context. Tests were conducted using both OLS-regression and structural equation modelling (SEM), and these tests investigated whether companies adjust their capital structure in response to certain firm specific (or macroeconomic) factors towards their target ratio. Factors affecting the adjustment process were investigated in order to find out, not only the determinants of capital structure adjustment, but also the speed with which such adjustments are effected. This part also looked at some recent theories of capital structure such as equity market timing by Baker and Wurgler (2002) and others, that 'capital structure is largely a cumulative outcome of past attempts to time the equity market', and that in this theory, there is no optimal capital structure, so market timing decisions accumulate over time into the capital structure outcome.

Another hypothesis tested is that put forward by Welch (2002, 2004) who argues that firms do not adjust their capital structure in response to stock returns movement. According to Welch, this lack of any deliberate internal corporate decision-making to rebalance capital structure is what determines the observed capital structure. While Welch admits that it may be true that managers do time the market, he argues that such behaviour's effect on capital structure is of the second order in magnitude and cannot be compared with the influence of share price movements.

Industry influence

Contrary to previous studies such as Ferri and Jones (1979), and Cherry and Spradley (1989), this study's findings show a strong significant industry effect. The significant industry effect in gearing lends support for the findings of Bradley *et al.* (1984), Bennett and Donnelly (1993), Mackay and Phillips (2002), and Fan *et al.* (2003), among others, that firms in one industry have similar capital structures, and firms in different industries have different levels of gearing.

Also contrary to Bennett and Donnelly (1993), and Ferri and Jones (1979), the study also confirms that gearing is significantly negatively related to business risk at both firm level and industry level. The results show significant evidence that, taken together, business risk and production technology play a significant role, explaining over 40% of the differences in industry gearing. Supporting Bowen et *al.* (1982) but contradicting Ferri and Jones (1979), the differences in industry gearing ratios are found to persist over a long time indicating that managers try to maintain their gearing levels to what they deem acceptable and possibly optimal levels.

Cross-sectional determinants

Cross-sectionally, the results are indicative of very strong evidence that past profitability, cash holdings, non-debt tax shields, and growth/investment opportunities are negatively related to gearing. There is also some evidence that business risk and probability of bankruptcy are negatively related to gearing. Taken together, the findings on past profitability and cash holdings support the pecking-order hypothesis that profitable firms, which are likely to have accumulated cash reserves, use these internal funds to finance their investments (or build financial slack over time) and thereby shun debt financing. The findings on non-debt tax shields, business risk, and the related probability of bankruptcy are in line with the existence of an optimal level of debt that firms try to balance their leverage related costs and benefits (trade-off theory). Evidence relating to growth or investment opportunities supports the agency-based theories, which extend the MM's irrelevance propositions.

Size is also found to exert a very strong positive influence on gearing. This may be due to the suggestion that larger firms are not as likely to go bankrupt as small firms and hence not reluctant to use debt. Alternatively, this may also be due the easy access larger firms have to (cheaper) capital markets. Consistent with the signalling theory, current profitability, which is used to proxy for future profitability, is found to be positively related (in the short-term) to gearing. The results on signalling suggest that firms use more short-term debt than long term-debt as signalling device. Consistent with many previous studies, but contrary to the underlying theory this study finds weak evidence that tangibility is a positive determinant of capital structure. If the ratio of fixed assets over total assets (FA/TA) is a good proxy for tangibility then, tangibility is not as important in the U.K. as other factors discussed here.

This study also confirms Myers (1977) predictions that agency problems make growth firms to avoid long-term debt and resort to short-term borrowing, which they probably rollover to replicate long-term financing. The results however, do not support Jensen (1986) free cash flow hypothesis. Jensen (1986) argued that for mature companies with low growth opportunities (but which generate large amounts of cash flows), the substitution of equity for debt (through repurchasing equity by using the excess cash) commits managers to heavy debt-servicing thereby act as a deterrent from wasting shareholders' money and also motivate managers to be more efficient. For this reason Jensen predicted that these *(mature) low-growth* cash-rich firms would have higher gearing, implying a *positive relation between free-cash flow and gearing.*

As for the structural equation model (SEM) results, gearing is found to be significantly negatively related to non-debt tax shields, business risk, and probability of bankruptcy; while size, and tangibility are significantly positively related to gearing. These findings are consistent with the theory and with most of previous studies findings. The SEM results, which are inconsistent with the theory, are those relating to growth opportunities (positive and significant), and past profitability (positive and significant). Current profitability is significantly negatively related to market value and income gearing measures, while it exhibits a significant positive relation with other capital gearing measures (except long-term debt where there are no significant results). These structural equation-modelling (SEM) results also show that fewer findings are inconsistent with the theory, and tests have produced more significant results than previous studies that used structural equation modelling (SEM).

A comparison between the two parallel methodologies used in this study reveal that the methods produce similar results for determinants like non-debt tax shields, size, business risk, and probability of bankruptcy. One of the major differences appear on the results for tangibility where structural equation modelling produces a clear evidence of a positive relation between tangibility and gearing while OLS-regression produces a mixture of both positive and negative relation depending on the measure of gearing. This however, is a feature of many previous studies that used traditional OLS-regressions. As discussed in the results, and taking the two methodologies together, a possible reason could be that one proxy (FA/TA), may not be a perfect proxy for collateralizability.

Like the two previous structural equation modelling (SEM) studies, this study's results for growth opportunities are perverse (positive and significant). The traditional OLS-regressions in general show a significant negative relation with gearing, which is consistent with the theory. The final verdict for the comparison of the two methodologies in the cross-sectional analysis should therefore be that the traditional OLS-regression performs as well as (in some cases better than) the structural equation modelling (SEM) if proxies for exogenous variables are selected in accordance with the underlying capital structure theories.

In some cases however, a single proxy (used in OLS-regressions) may not capture the cause-and-effect relationship between the attribute of interest and gearing. There may also be a possibility that the many manifest variables (used as proxies for an exogenous variable) in structural equation modelling (SEM) methodology may blur the relationship between an attribute and gearing. The selection of variables of interest (independent variables for OLS-regression), and manifest variables for structural equation modelling (SEM) is a critical stage for both methodologies.

Adjustment to target ratio

The evidence relating to the dynamics of capital structure from OLS-regressions show that among the determinants of capital structure, past profitability, non-debt tax shields, and firm size (in that order) are the strongest determinants of capital structure both in the short-term (one to five years) and in the long-term (beyond five years). Gearing responds positively to changes in firm size, and changes in corporate tax rate both in the short and long-term. Changes in gearing relate positively to interest rate both in the short-term and in the long-term, except for long-term debt whose relation with interest rate is insignificant.

Gearing responds negatively to past profitability, non-debt tax shields, and cash holdings, again both in the short-term and long-term. In the short-term gearing responds positively to current profitability, and negatively to growth opportunities.

In the longer term (beyond five years) there exists a positive relationship between gearing and growth opportunities. It may be by that time the growth opportunities, which were there, might have already been utilised or might have expired. These tests of changes of capital structure in relation to changes in hypothesized determinants do not give any consistent meaningful relation between tangibility, probability of bankruptcy, and business risk. While the results indicate the existence of some capital structure adjustment activity, they also indicate that as firms try to adjust their gearing in response to changes in their firm specific or macroeconomic environment, they adjust short term debt first (and faster) because it is flexible or convenient to do so than for long-term debt.

As part of the comparison of the two methodologies in this study, structural equation modelling (SEM) was also used to investigate the changes in capital structure in relation to a large number of theorised determinants. In this case the SEM-DYNAMICS model used a relatively large number of proxies per determinants in order to avoid being straight jacketed to use only one proxy per determinant as in the case of traditional OLS-regression. The SEM-DYNAMICS model has confirmed the persistent negative relationship between gearing and both non-debt tax shields, and probability of bankruptcy. The model has also confirmed the positive relation between gearing and firm size. As for other determinants tested by the model, the results are either insignificant or perverse.

Equity market timing and capital structure

The analysis on the impact of equity market timing on capital structure revealed that equity market timing affects gearing annually through net equity issues (and through price changes). Despite an obvious increase in debt capacity, managers do not immediately rebalance these annual fluctuations. As a result, net equity issues mechanistically drive gearing, and the inert debt-to-equity which is the lagged (preceding year's) debt to equity ratio grossed up by the net equity issue over the year becomes a good predictor of the observed (actual) gearing ratio in any given year. As for the long-term effects, equity market timing influences book gearing for up to four years. From five years and beyond, the rebalancing from other influences takes effect and by the tenth year equity market timing has ceased to influence gearing.

Stock returns and capital structure

Movements in stock returns influence gearing, and the failure of making any readjustments in gearing on the part of managers renders the effects of stock return to mechanistically drive market gearing for a long time (up to 10 years). The separation of the effects of equity market timing from stock returns effects on gearing has made it possible to compare the relative impacts they exert on gearing. Statistical significance shows that within a period of one year equity market timing and stock return exert the same level of impact on gearing ratios. Over a long-time horizon however, the statistical significance, consistency, and the longevity of the impact from stock returns surpass those of equity market timing. The differences could be due to the book equity not being a reliable measure for analysing long-term changes in gearing, or due to the fact that stock return effects are continuous over time while managers issues equity (time the market) only when they need to raise funds.

The most important determinant of gearing ratios

To determine whether stock return is the major determinant of gearing and to determine the relative explanation power of stock returns versus other determinants (firm-specific characteristics like tangibility, growth, non-debt tax shields, profitability, firm size etc.), an 'all-inclusive' model was employed. The actual (observed) debt-to-capital ratio was regressed on the implied debt-to-capital ratio, $IDR_{t-1,t}$, the lagged debt equity ratio, ADR_{t-1}, changes in market-to-book ratio, natural log of total assets, retained earnings, non-debt tax shields, and on net equity issues *(NeI/TA)*. This model was tested for each year from 1986 to 1999. The results showed overwhelming evidence that stock return is the persistent major determinant of gearing ratio. This implies that by ignoring the effects of stock returns in prior studies the models employed could not explain much variation in capital structure as the models in this study do. It could also be the reason for contradicting and perverse results in prior capital structure empirical research.

8.6 Discussion

8.6.1 Introduction

Having documented and discussed the results of tests carried out in this study; in this section the question being addressed is to whether (and to what extent) the existing theories of capital structure can explain the findings in this study. The major theories considered here are the trade-off theory, the pecking order predictions, managerial entrenchment theory, and equity market timing theory. An attempt is then made to reconcile these theories with the stock returns effect explanation.

8.6.2 The trade-off theory.

Holding the firm's investment decision constant, the trade-off theory states that there is an optimal capital structure. This level of gearing can be attained by balancing the costs (potential bankruptcy costs and agency costs of both debt and equity) and benefits (present value of interest tax shields and the disgorgement of free-cash flow) arising from using debt. The theory implies that firms should be adjusting their gearing following changes in the costs and benefits.

As discussed in the previous chapter, and then summarised in the previous section of this chapter, our cross-sectional results relating to determinants such as industry effects, non-debt tax shields, growth opportunities, firm size, business risk, and probability of bankruptcy, lend some support for the trade-off theory. Consistent with this theory, the industry effect was found to be persistent over time. However, our moving window dynamic analysis reveals that it is only changes in past profitability, non-debt tax shields, and firm size, which are consistently significantly related to changes in gearing in the hypothesised manner. Other hypothesised determinants do not support the trade off theory in the long run. For example, changes in growth opportunities, changes in business risk, and changes in probability of bankruptcy support the theory in the short run but not in the long run. We also find a weak positive relationship between changes in corporate tax rates and changes in gearing. However, the results of the final chapter which show that firms do not rebalance their gearing following an increase in their debt carrying capacity cannot be reconciled with the trade off theory.

8.6.3 *The pecking order theory*

In the pecking order model posited by Myers (1984) there is no optimal gearing ratio. According to this model, the existence of asymmetric information (managers having superior information about their company's prospects and value of securities than outside investors) implies that raising external finance is costly. Specifically, outside investors interpret managers' actions to signal corporate strategies and the state of a firm's finances. In this setting, if managers issue equity, the issue suffers from *adverse selection* problem because outside investors perceive equity issues as being overvalued. These investors therefore discount the firm's stocks. This stigmatisation of equity causes the stock price to fall.

As managers are aware of potential price discounts, they may pass (forgo) profitable investments if they must be financed by risky securities. In Myers (1984) and Myers and Majluf (1984) view, the costs of issuing risky securities like equity are higher than the net effect of the costs and benefits implied by the static trade off theory. Because of this, these authors do not see that the optimal gearing ratio is relevant. Or as Baker and Wulger (2002) put it, the cost of deviating from the optimal gearing ratio is insignificant in comparison with the cost of issuing risky external finance.

As a result of the efforts to avoid these distortions, in the financing of new projects, firms follow a pecking order (financial hierarchy). First, firms start with internal funds (retained earnings), then with risk less debt, and then risky debt. Finally, as a last resort, firms may be forced to use outside equity. In the absence of new investment opportunities firms retain their earnings and build financial slack. This slack ensures financial flexibility and enables the firm to avoid having to raise external equity in the future.[36]

Under the pecking order theory, gearing is therefore a result of cumulative requirements for external financing. Successive profitable firms will therefore be less geared because they do not need outside financing. The corollary to this is that less profitable firms will be highly geared because they cannot retain enough earnings to fund their new investments, and hence debt financing is first in their pecking order whenever such investment opportunities arise.

The relationship between (past) profitability and gearing in the 'all-inclusive' model in this study is significantly negative for each of the 16 years (1985-2000) considered. This relationship seems to support the pecking order predictions about capital structures. However, in evaluating the pecking order theory, it is not only the negative relationship between retained earnings and gearing which is sufficient to support it. The other equally important issue is the pecking order predictions about the issuing of securities by firms to cover internal funds deficit (see Fama and French, 2003; Frank and Goyal, 2003; Baker and Wurgler, 2002; Shyam-Sunder and Myers, 1999; and Fama and French, 2002). This prediction stipulates that a firm, which is short of internal funds, will first issue debt finance for which asymmetric information problem is negligible; and it is only under duress that firms will issues external equity.

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[36] Financial slack can also bring about agency problems such as empire building (see Jensen, 1986; and Jensen and Meckling, 1976).

Both the two pecking order predictions have to hold for pecking order theory to be the only (or the major) explanation of the observed negative relationship. This is so because there could be alternative explanation for the negative relationship between the measure of profitability and gearing.[37] In addition to the studies cited earlier that confirm, and those that have results that are inconsistent with pecking order capital structure predictions, there are also other studies (discussed below) whose findings do not support pecking order predictions about security issues.

Baker and Wurgler (2002) report about a study whose findings suggest that the probability of raising external finance is unrelated to the internal funds deficit, and that firms that could have obtained debt more easily and cheaply, often choose to issue equity. Fama and French (2003) consider how often and under what circumstances firms issue and repurchase equity over a period of thirty years (1973 to 2002). They find that the year by year equity decision of more than half of their sample of over 4,000 firms, issue or retire equity each year. Between 54% (1973-1982) and 72% (1993-2002) of the sample firms make such equity issues. More importantly, Fama and French report that these issues are done by large and not typically by firms under duress as prescribed by pecking order predictions.

Galpin (2004) uses transaction costs and costs that arise due to asymmetric information to test pecking order predictions about security issues. He finds that equity issues are less negatively related to profitability than debt issues. Galpin's estimates of transaction costs of debt increase steadily from about 50% to 140% of the costs of equity during the period from 1973 to 2002. On the basis of these findings Galpin (2004) concludes that the lack of relationship between information asymmetry and the relative equity and debt transaction costs is strong evidence against pecking order theory.

[37] There could be a mechanistic relationship between a proxy for profitability and gearing even if a firm's financing does not follow a pecking order. This possibility is picked up and discussed at length in subsequent paragraphs.

The pecking order predictions about security issues rest on both the cost of issuing new securities (i.e. transaction costs and the costs that arise because of symmetric information), and on the financial hierarchy that these costs bring about. While the findings of Galpin (2004) contradicts the pecking order predictions regarding costs of issuing securities, those of Fama and French (2003), Frank and Goyal (2003), and those reported by Baker and Wurgler (2002) are inconsistent with the pecking order predictions regarding financing hierarchy. These findings seem to violate central predictions of the pecking order theory, and imply that the theory does not describe the way that managers access external financing.

Taking these findings into account it may be argued that the observed negative relationship between profitability and gearing in this study may as well be as a result of a mechanistic relationship between profitability and the measures of gearing. This is because a firm's market value of equity increases due to profitability. The retained (or even operating) profit figure in the numerator of the proxy for profitability is therefore highly positively correlated with the market value of equity, which is the (or part of) denominator in the market value gearing measure.[38] Through revaluation of fixed assets, the same effect can be true of book value of equity. This mechanistic relationship may exist even without deliberate efforts by firms to avoid equity and/or debt. The relationship arises and could persist due to a firm's performance (profitability) which impacts directly on the market value of a firm.

8.6.4 *Managerial entrenchment theory*

One of the explanations of capital structure differences across firms and countries is that agency conflicts influence capital structures (Jensen and Meckling, 1976; and Jensen, 1986). Zwiebel (1996) argue that one of the problematic aspects of these agency cost theories of capital structure is their

[38] Titman and Wessels (1988) found that the coefficients for 'profitability' attribute were large and had high t-statistics for market gearing, but those relating to book gearing were insignificant.

reliance on a "discipliner", who is present *ex-ante* and absent *ex-post*, to impose optimal debt and deal with dynamic inconsistencies that follow subsequently. Zwiebel contend that the assumption of an external discipliner conflicts with the common perception of gearing choices because managers make gearing decisions and reverse them without any apparent extraordinary external force. In response to this shortcoming Zwiebel (1996) suggest a moral hazard dynamic model in which managers voluntarily choose debt to credibly constrain their own future empire building.

In Zwiebel's model, managers choose capital structure at the beginning of each period in a manner that maximises their ability to empire-build subject to ensuring sufficient efficiency to prevent control contests from an ever-present raider. In this way debt restricts managerial empire building because its use increases the threat of bankruptcy and the associated loss of entrenchment. Nevertheless, managers find the use of debt to be valuable because it serves as a voluntary self-constraint sufficient to prevent takeover challenges. In Zwiebel's (1996) model, a dynamically consistent theory of capital structure and dividend obtains in which managerial optimality rather than shareholder optimality is the determinant of capital structure.

Empirically, Jong and Veld (2001) test Zwiebel's (1996) model and find that managers restrict their use of debt when it has the largest disciplining power. This allows them to over invest. According to Baker and Wurgler (2002), in Zwiebel's (1996) model, high valuations and good investment opportunities facilitate equity finance, but also allow managers to become entrenched. Baker and Wurgler (2002) then argue that this has a market timing flavour because managers may refuse to raise debt to rebalance in the future. Though this study does not test the managerial entrenchment theory, as we discuss elsewhere in this thesis (see the following section), our findings show that, compared to stock returns, the effects of equity market timing on gearing have insignificant economic role on the determination of gearing. Further, it seems obvious that the overwhelming evidence of non-rebalancing of the stock returns effects on gearing is inconsistent with the deliberate choosing (managerial optimality) of the capital structure each period by managers in Zwiebel's managerial entrenchment model.

8.6.5 *Equity market timing*

As discussed at length in chapter seven, in relation to capital structure, equity market timing theory says that capital structure evolves as a cumulative outcome of past attempts to time equity market mainly because the effects of equity market timing on capital structure are not subsequently rebalanced. The results of tests in chapter seven revealed that UK managers practice equity market timing, and that market-timing effects have a statistically significant effect on capital structure. However, the tests directed at disentangling the effects of equity market timing from those of stock returns have shown that equity market timing is not a major determinant of capital structure and its effects are economically negligible in comparison with the effects of stock returns on capital structure.

8.6.6 *Stock returns as a major determinant of capital structure*

Among the theories discussed above, no single theory explains the major findings in this study. These findings are that as stock returns increase the market value of firms and consequently their debt carrying capacity; firms do not seem to adjust their gearing by issuing more debt. Quite the opposite happens, managers practice equity market timing consistently; the practice, which has a significant impact on gearing. However, the economic impact of equity market timing on gearing is negligible in comparison to stock returns impact.

Stock returns, profitability, and net equity issues (*NeI*) (the proxy for equity market timing) are all negatively related to gearing. Profitability and equity market timing appears to have the same (or comparable) levels of impact on gearing. These two determinants together, rank second in the order of importance after stock returns in explaining variations in gearing ratios. Profitability may be reinforcing the dominance of stock returns. Apart from the mechanistic relationship between profitability and stock return discussed earlier, the long-horizon tests (up to ten years), show that stock returns and profitability maintain their importance while the importance of other determinants such as firm size diminishes with time. Firm size (a positive determinant of gearing), lagged-debt-ratio (a positive determinant of gearing, and a proxy for adjustment), growth opportunities (a negative determinant), and non-debt tax shields (a negative determinant), in that order of importance, follow as significant determinants of gearing.

The plausible explanation of the findings in this study, which characterises how in general firms go about making financing decisions, is as follows. Stock returns mechanistically drive gearing because firms do not adjust their gearing following the increased debt capacity. Firm performance (profitability) increases stock returns and hence reinforces stock returns' effect.[39] Through net equity issues, (*NeI*), equity market timing also impacts negatively on gearing ratios. The effects of stock returns, profitability, and equity market timing are not re-balanced by managers. Because stock returns remains the most important determinant of gearing for up to a ten-year horizon, the signs of rebalancing of capital structure (shown by the coefficient for the lagged debt ratio) may simply be due to fluctuations in stock returns, and not due to any deliberate re-balancing of capital structure. As discussed in the next two sections, these findings imply that companies issue debt for other reasons not for purposes of moving towards (or maintaining) the optimal debt ratio.

8.6.7 *Some evidence supporting this study's findings*

There are other studies, which have reported results similar to some of the findings in this study although most of them did not reach at the same conclusion as our conclusion presented in the next section. Using US company data, Baker and Wulger (2002), report that managers do not rebalance the

[39] Note that this is an alternative explanation of the negative relation between profitability and gearing to that provided by the pecking order predictions about capital structure.

effects of equity market timing. Again using US company data Welch (2002, 2004) report that managers do not rebalance the effects of stock returns.

Pinegar and Wilbricht (1989) report the results of a survey of 176 firms from the Fortune 500 list. Their results show that financial planning principles (such as financial flexibility, high debt rating, financial independence etc), investment decisions, and dividends are more important in governing managers financing decisions than are specific capital structure theories, which managers consider less binding. The findings of Graham and Harvey (2001) that firms are concerned about financial flexibility and credit ratings when issuing debt support this view. Graham (2000) also document that despite not being threatened by bankruptcy, large firms do not take advantage of interest tax shield which they would have otherwise got if they would have used more debt.

Also consistent with this study's findings, Wald (1999) report that profitability was the single most important firm characteristic influencing capital structure in the UK, USA, Germany, France and Japan. Hovakimian *et al* (2004) also report that profitable firms do not seem to be offsetting the accumulated leverage deficit by issuing debt. They further document that the probability of equity issue increases with high stock returns. Hovakimian *et al* (2004) then conclude that the importance of stock returns in studies of corporate financing choices is unrelated to target leverage.

8.7 Implications

A number of important observations are worth noting in this thesis. First, it is evident that in general, UK firms do not re-adjust their gearing following stock return movements. Secondly, because the effects of firm-specific characteristics (tangibility, profitability, growth opportunities, firm size), and the impact of both corporate taxes and interest rates are relatively trivial, the stock return mechanistically drives the capital structure ratio. Thirdly, it is surprising that when share prices have risen (and the firm's debt capacity has increased) firms issue more equity instead of more debt. Lastly, although there is evidence that profitability is an important determinant of capital structure as the pecking order theory predicts, and also that equity market timing practice has a significant influence on gearing, stock return is the most important determinant of capital structure.

These observations have several implications. First, they imply that either there is no optimal capital structure or at least that if there is an optimal capital structure; firms do not strive to adjust their capital structure towards the associated optimal level of debt. The use (or the issues) of debt finance by companies would therefore exist for other reasons such as easy accessibility (as confirmed by our findings on firm size), relationship with debt financiers, and may be, managerial bias. The use of debt would not be for purposes of attaining an optimal level of gearing. This would suggest that theories that advocate a degree of optimisation such as the static trade-off theory are not valid.

The findings of this study also lead to the reconsideration of prior empirical studies that tested firm-specific characteristics such as tangibility, firm size, non-debt tax shields, growth opportunities, etc, as hypothesised determinants. It appears that these studies focused on attributes, which are not the major determinants of capital structure. Both the cross-sectional studies as well as prior studies that used dynamic models revealed that the determinants they examined explained little variations in gearing measures. This is an indicator that something was missing in their analysis.

Finally, there is a need to reconcile the findings of this study with the documented consistent relationships between gearing and some of the firm-specific characteristics (or proxy variables) used in prior empirical research. The reconciliation will require an elaborate empirical analysis, which is not attempted by this study. However, it appears that the consistent relationship between these proxy variables and gearing exists because of their mechanistic relationship with stock return (as in the case of profitability discussed earlier). Alternatively, as argued by Welch (2004) these firm-specific characteristics have allowed firms to experience different market values of equity, which in turn, determine capital structure.

The results of stock returns and equity market timing analysis in this chapter also imply that the evidence regarding the existence of industry effects in chapter five does not arise from deliberate effort by UK firms to maintain an optimal capital structure. The observed industry influence evidence is likely to be a result of different industries having different asset mix needs in their operations. Different asset mix needs may therefore give rise to different levels and sources of financing. For example, industries that need huge investment in fixed assets are likely to be forced to use debt financing consistently.

Typical of cross-sectional studies in chapter five the industry influence analysis' R-sq (adj.) range from 5% to 40%. Also typical of target ratio adjustment studies that use firm-specific characteristics, the R-sq (adj.) of the dynamic models investigating target ratio adjustment in chapter six range from 7% to 18%. These levels of explanatory power are far below the explanatory power of models that incorporate stock returns and equity market timing (i.e. R-sq (adj.) of between 70% and 92%). These results lead to a conclusion that although industry effect and firm-specific determinants are statistically significant, compared to stock returns, they have negligible economic effects on changes in capital structure.

The fact that Welch (2002, 2004) reports similar results for the US environment shows that this is not a feature peculiar to the UK. This means the results cannot wholly be explained by differences in institutional or legal environment as discussed in chapter four. However, Welch (2002, 2004) results indicate nearly a perfect lack of readjustment by US managers with no signs of readjustment even after ten years. His implied debt ratio regression coefficients for the cumulative effect of stock returns for years 1, 3, 5, and 10, years are 101.4, 94.4, 86.9, and 70.8. These are comparatively higher than those reported for UK companies in table 7.6.2 in this study. The differences could be due to the fact that Welch (2002, 2004) uses over 50,000 observations, while the observations relating to stock returns effect in this study, ranges from 281 in some years to 9021 for the pooled data. Both results, however, show that stock returns are a dominant factor and mechanistically drive gearing ratios even for more than ten years.

8.8 Contributions of this study

The study makes a number of contributions to an understanding of the determinants of capital structure determinants and the methodologies employed in testing of theoretical propositions as follows: (1) it is the first study to use the Structural Equation Modelling (SEM) technique in the analysis of capital structure dynamics. (2), it makes a comparison (probably the first of its kind) of two alternative methodologies (conventional regression and structural equation modelling) on a single set of data in order to determine their relative merits in explaining the determinants of capital structure. (3) The thesis attempts to find explanation for contradictory and perverse results in previous similar studies by employing more appropriate proxies and the use of eight measure of gearing. (4) The study makes an attempt to separate the influences of equity market timing behaviour from that of stock returns movement on capital structure dynamics. This separation has enabled the study to document the extent of the effects of both stock returns, and equity market timing on capital structure probably for the first time by using UK Company data (5) In relation to the UK, the study documented results from tests of some hypothesised determinants such as uniqueness, cash holdings (and free cash flow), and probability of bankruptcy. Prior empirical research in the UK does not indicate if these had been investigated before.

8.9 Suggestions for future research

This study has documented strong evidence that managers of UK companies practice equity market timing. Baker and Wurgler (2002) argue that managers do this in order to take advantage of short-term fluctuations in the cost of equity relative to other sources of finance. This argument implies that managers do not believe in market efficiency. The results of a survey of managers by Pinegar and Wilbricht, (1989) are inconsistent with Baker and Wurgler (2002) argument. This survey shows that although managers perceive that their firm's equity may be overvalued or undervalued 'some of the time', there is no relation between such perceptions and their financing decisions.

Moreover, Jung et al (1996) also do not find any evidence that managers time equity issues to exploit short-term fluctuations in the cost of equity. They also argue that managers do not do this because they know their equity will suffer long-run underperformance subsequently. It may be worthwhile to investigate why companies issue more equity during high valuations despite the increase in debt-carrying capacity. This line of research is likely to shed some light into the reasons why those managers do not rebalance their capital structure subsequently.

Contrary to Baker and Wurgler (2002), but consistent with Welch (2002, 2004), this study also finds that stock returns has stronger effect on capital structure than equity market timing. Stock return is actually the most important determinant of gearing to the extent of driving the gearing ratios for more than ten years. Like in the case of equity market timing, managers do not subsequently rebalance the effect of stock returns, as the trade off theory of capital structure would suggest.

The overwhelming effect of stock returns on capital structure is a matter of concern for all recent works that have covered this area[40]. Does the non-rebalancing of stock returns and equity market timing effects imply that managers do not care about capital structure? Does it mean there is no optimal capital structure? If firms were actually adjusting their gearing towards a target ratio, then one would expect these firms to issue debt in order to offset the accumulated deviation from that target which has been caused by stock returns. If optimal capital structure exists, then there still remain a question as to why managers do not rebalance their gearing following an increased debt capacity arising from the effects of stock returns and equity market timing? Perhaps the

[40] See Welch (2004) and Kayhan and Titman (2003).

investigation into this managerial behaviour is another avenue for future research.

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