A STUDY OF CAPITAL STRUCTURE IN THE U.K. HOTEL AND RETAIL INDUSTRIES

by

JULINDA NURI

A thesis submitted in fulfilment of the requirements for the award of PhD degree

2000
To the memory of my father

Asaf Nuri
Acknowledgements

It is difficult to name all those who have supported me, provided ideas and assistance of all kinds during this project. For this reason, I would like first to collectively thank the members of staff at the School of the Management Studies for the Service Sector as well as all PhD Researchers.

I would like to say a special thank you to Professor Simon Archer who provided academic inspiration and guidance during the three years of this study. I am very grateful to him for all the support he provided and for all those hours we spent discussing various aspects of these research.

I am also grateful to my friends whose friendship meant a lot to me. I would like to mention Aida Hallam, Edit Zsivas, Emma Brown, Sandro Amico, Ortenca Tomini, Alfred Kume and Raja Buchery.

A separate thank you goes to Abdullahtif Twigeri for all his support, help and encouragement.

And finally, my deepest gratitude goes to my mother and brother, whose love, support and encouragement have been very important to me in the past three years.

Thank You All
Abstract

Modigliani and Miller's (1958) irrelevance theory established the foundations of capital structure theory. They showed that, in a capital market free of taxes, transaction costs, asymmetric information, and other frictions, the value of the firm is independent of its capital structure choice. Most of the capital structure theory development that followed tested the irrelevance theory with more realistic assumptions regarding market frictions and information asymmetries.

The vast amount of empirical research into the extent and effects of bankruptcy costs and taxes on capital structure, as well as cross-industry and cross-country examination of observed capital structure, led to the mainstream view that firms act as if there is a unique, optimal capital structure that results from the trade-off between tax and agency cost benefits of increased debt use and the increased bankruptcy and agency costs that higher levels of debt entail.

As an alternative to the trade-off model, Myers (1977) put forward the Pecking Order hypothesis of capital gearing. This states that because of information asymmetry and different stock market reactions to debt and equity issues, firms follow a "pecking order" in their financing decisions, i.e. they would first prefer to use internal funds rather than issuing securities. If forced to resort to external financing they would use debt before equity.

Section one of this study undertakes a comprehensive review of the theoretical literature on capital structure to date, emphasising those theories that are more pertinent to the empirical study carried out in section two.

Another school of thought which tries to explain the use of debt is transaction cost economics (Williamson, 1975, 1996), which sees debt and equity as two
governance mechanisms, the choice between which is strongly dependent on asset specificity.

Empirical tests are carried out in this study using regression analysis to try to establish whether the capital structure of firms in the UK hotel and retail industries is better explained by a pecking order model or by a target adjustment model.

The last chapter presents an empirical analysis of different variables that are likely to influence the observed capital structure patterns. This panel data analysis assesses the role of size, earnings volatility, profitability, asset structure, non-debt tax shields, leasing and management contract (this latter is specific to the hotel industry) variables on gearing ratios.

The conclusions of the empirical study are that the industry data analysed are much better explained by the target adjustment model than the pecking order model. However, a number of independent variables appear to contribute to the "target adjustment effect" and the debt tax shield is just one of them.
# List of Contents

Acknowledgements iii
Abstract iv
List of Contents vi
List of Abbreviations xi
List of Appendixes xiii
List of Figures xiv
List of Tables xvi

## Chapter 1: Introduction and Objectives 1
1.1. Introduction 1
1.2. Research Objectives 3
1.3. The Structure of the Study 4
References 6

## Chapter 2: Modigliani's and Miller's Irrelevance Theory 7
2.1. Introduction 7
2.2. Modigliani's and Miller's Irrelevance Theory 9
2.2.1. Capital Market Imperfections and Capital Structure: Taxes 15
2.2.2. Capital Market Imperfections and Capital Structure: Financial Distress 17
2.3. Empirical evidence on Trade-off Theory and Optimal Capital Structure 21
2.4. Conclusions 26
References 28

## Chapter 3: Agency Theory and Capital Structure 31
3.1. Introduction 31
3.2. Origins of Agency Theory 33
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3. Agency Theory and Capital Structure</td>
<td>38</td>
</tr>
<tr>
<td>3.3.1. Agency Cost of External Equity</td>
<td>41</td>
</tr>
<tr>
<td>3.3.2. Agency Costs of Debt</td>
<td>44</td>
</tr>
<tr>
<td>3.3.2.1. Risk Shifting Incentive</td>
<td>44</td>
</tr>
<tr>
<td>3.3.2.2. The Underinvestment Incentive</td>
<td>46</td>
</tr>
<tr>
<td>3.3.2.3. Asset Liquidation and Payout Proceeds</td>
<td>48</td>
</tr>
<tr>
<td>3.3.2.4. Debt Financed Dividend Payments</td>
<td>48</td>
</tr>
<tr>
<td>3.3.3. Determination of Debt Equity Ratio</td>
<td>49</td>
</tr>
<tr>
<td>3.3.3.1. Effects of Scale of the Outside Financing</td>
<td>51</td>
</tr>
<tr>
<td>3.3.4. The Role of Monitoring and Bonding Costs</td>
<td>52</td>
</tr>
<tr>
<td>3.3.5. Bankruptcy and Reorganisation Costs</td>
<td>53</td>
</tr>
<tr>
<td>3.3. Empirical Research</td>
<td>59</td>
</tr>
<tr>
<td>3.4. Conclusions</td>
<td>62</td>
</tr>
<tr>
<td>References</td>
<td>64</td>
</tr>
</tbody>
</table>

Chapter 4: Asymmetric Information: Signalling and Adverse Selection, The Pecking Order Theory and Capital Structure

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1. Introduction</td>
<td>69</td>
</tr>
<tr>
<td>4.2. Asymmetric Information: Signalling and Adverse Selection</td>
<td>71</td>
</tr>
<tr>
<td>4.3. The Pecking Order Theory</td>
<td>77</td>
</tr>
<tr>
<td>4.4. Some Other Theoretical Treatments of Capital Structure</td>
<td>84</td>
</tr>
<tr>
<td>4.5. Empirical Research</td>
<td>88</td>
</tr>
<tr>
<td>4.6. Conclusions</td>
<td>94</td>
</tr>
<tr>
<td>References</td>
<td>96</td>
</tr>
</tbody>
</table>

Chapter 5: The Property Rights Theory and Capital Structure

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1. Introduction</td>
<td>100</td>
</tr>
<tr>
<td>5.2. The Property Rights Theory of the Firm</td>
<td>102</td>
</tr>
</tbody>
</table>
5.3. The Property Rights Approach to Financial Contracting 106
5.4. The Property Rights Approach to Financial Contracting – An Evaluation 110
5.5. Conclusions 116
References 117

Chapter 6: Transaction Costs Economics and Capital Structure 119

6.1. Introduction 119
6.2. Transaction Cost Economics 121
   6.2.1. Asset Specificity 122
   6.2.2. The Contractual Schema 123
6.3. Transaction Cost Economics Approach to Capital Structure 129
   6.3.1. Williamson’s Capital Structure Model 129
   6.3.2. Strategy, Asset Specificity, and Capital Structure 136
   6.3.3. Asymmetric Information and Brand Name Reputation 140
6.4. A Comparison Between Agency Theory and Transaction Cost Economics Approaches 143
6.5. Empirical Research in based on Transaction Cost Economics 147
6.6. Conclusions 149
References 150

Chapter 7: Literature Review Summary 154
References 165

Chapter 8: Data and Statistical Definitions 167
8.1. Introduction 167
8.2. Panel Data 169
   8.2.1. Data and Sample 171
8.3. Multiple Regression Model 174
Chapter 11. Determinants of Capital Structure 245
11.1 Introduction 245
11.2 Hypotheses on the Determinants of Capital Structure 246
11.3. Definitions of Variables 258
11.4. The Multiple Regression Models 263
11.5. Results and Analysis of the multiple Regression Tests 263
11.5. Conclusions 270
References 271

Chapter 12. Summary of Conclusions, Contributions, Limitations of Research and Suggestions for further Research 274
12.1. Summary of Conclusions 274
12.2. Contributions of the Study 276
12.3. Limitations of Research 276
12.4. Suggestions for further research 277
References 279

Appendixes A-1

Bibliography B-1
List of Abbreviations

ACF   Autocorrelation Function
AT    Agency Theory
AS    Asset Structure
BLUE  Best Linear Unbiased Estimator
CAPM  Capital Asset Pricing Model
CE    Capital Expenditures
CF    Cash Flow
CV    Coefficient of variation
Div   Dividend
DW    Durbin-Watson
EBIT  Earnings before Interest and Tax
ESS   Explained Sum of Square
FA    Fixed Asset
GLS   Generalised List Square
IID   Independently Identical Distributed
JM    Jensen and Meckling
LBOs  Leverage Buyouts
LTG   Long-term Gearing
MM    Modigliani and Miller
MSE   Mean Square of Errors
NE    Net Earning after Interest and Tax
NPV   Net Present Value
OLS   Ordinary List Square
POH   Pecking order Hypothesis
PV    Present Value
R&D   Research and Development
RSS   Residual Sum of Squares
SIC   Security Industry Code
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SML</td>
<td>Security Market Line</td>
</tr>
<tr>
<td>STDV</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>SUR</td>
<td>Seemingly unrelated Regression</td>
</tr>
<tr>
<td>TA</td>
<td>Total Asset</td>
</tr>
<tr>
<td>TAM</td>
<td>Target Adjustment Model</td>
</tr>
<tr>
<td>TCE</td>
<td>Transaction Costs Economics</td>
</tr>
<tr>
<td>TG</td>
<td>Total Gearing</td>
</tr>
<tr>
<td>TSS</td>
<td>Total Sum of Square</td>
</tr>
<tr>
<td>WACC</td>
<td>Weighted Average Cost of Capital</td>
</tr>
<tr>
<td>WC</td>
<td>Working Capital</td>
</tr>
</tbody>
</table>
List of Appendixes

Appendix 2.1. A - 1
Appendix 2.2. A - 5
Appendix 2.3. A - 6
Appendix 2.4. A - 7
Appendix 2.5. A - 9
Appendix 3 A - 10
Appendix 6 A - 18
List of Figures

Figure 2.1. MM’s Proposition 1 and 2 14
Figure 2.2. MM’s Firm Value with Corporate Tax 15
Figure 2.3. MM’s Cost of Capital with Corporate Tax 16
Figure 2.4. Optimal Gearing with Liquidation Costs 20
Figure 3.1. JM’s Perquisites Consumption Model 41
Figure 3.2. Total Agency Costs as a Function of the Ratio of Outside Equity to Total Outside Financing 50
Figure 3.3. Agency Costs Functions and Optimal Outside Equity as a Fraction of Total Outside Financing 52
Figure 3.4. Risk Shifting Payoffs of Debt and Equity: One Project A-10
Figure 3.5. Risk Shifting Payoffs of Debt and Equity: Two Projects A-11
Figure 3.6. Risk Shifting Payoffs when Shareholders choose Lower Valued Project A-12
Figure 3.7. Myers’ Underinvestment Problem A-15
Figure 5.1. A Summary of the Contracting Events at Time \( t = 0, 1, 2 \) under the Property Rights Approach. 104
Figure 5.2. A Sequence of Events at Time \( t = 0, 1, 2 \) of Financial Contracting under the Property Rights Approach 106
Figure 6.1. A Simple Contracting Schema 125
Figure 6.2. Governance Costs: Market and Hierarchy Instruments 127
Figure 6.3. Governance Costs: Market, Hierarchy and Hybrid Instruments 128
Figure 6.4. Financing Costs of Debt and Equity 133
Figure 6.5. Financing Costs of Debt, Equity and Dequity 134
Figure 6.6. Financing Costs of Debt, Equity with Increased Uncertainty 135
Figure 9.1. Cross-sectional Comparison of Dif and First Differences of LTG and TG for the Retail Sector 208
Figure 9.2. Cross-sectional Comparison of Dif and First Differences of LTG and TG for the Hotel Sector 209
Figure 9.3. Cross-sectional Comparison of Dif and First Differences of LTG and TG for the Retail and Hotel Sectors 209

Figure 10.1. Comparison of Regression Coefficients β 229

Figure 10.2. Comparison of R² of 229

Figure 10.3. Cross-sectional Comparison of LTG with the Sample Target Gearing – Retail and Hotel Sectors 230

Figure 10.4. Cross-sectional Comparison of TG with Sample Target Gearing – Retail and Hotel Sectors 231

Figure 10.5. Cross-sectional Comparison of LTG and TG with 13 Years Average Target – Retail Sector 231

Figure 10.6. Cross-sectional Comparison of LTG and TG with 13 Years Average Target – Hotel Sector 232

Figure 10.7. Cross-sectional Comparison of 3 and 5 years future moving Averages and the Sample Target Debt Level – Retail Sector 232

Figure 10.8. Cross-sectional Comparison of 3 and 5 years future moving Averages and the Sample Target Debt – Hotel Sector 233

Figure 10.9. Cross-sectional Comparison of Capital Expenditures and 3 years future moving average of LTG and TG – Retail Sector 237

Figure 10.10. Cross-sectional Comparison of Capital Expenditures and 3 years future moving average of LTG and TG – Hotel Sector 238

Figure 10.11. Cross-sectional Comparison of Capital Expenditures and 3 years future moving average of LTG and TG – Retail & Hotel Sectors 238

Figure 10.12. Cross-sectional Comparison of Capital Expenditures and Levels of LTG and TG – Retail Sector 239

Figure 10.13. Cross-sectional Comparison of Capital Expenditures and Levels of LTG and TG – Hotel Sector 239

Figure 10.14. Cross-sectional Comparison of Capital Expenditures and First differences of LTG and TG – Retail Sector 240

Figure 10.15. Cross-sectional Comparison of Capital Expenditures and First differences of LTG and TG – Hotel Sector 240
List of Tables

Table 3.1. Agency Theory Overview 34
Table 4.1. A Summary of Costs and Benefits of Debt, Identified by Different Studies 86
Table 6.1. A Comparison of Differences between TCE and AT 146
Table 9.1. Descriptive Statistics of First Lag Differences of LTG 203
Table 9.2. Descriptive Statistics of First Lag Differences of TG 204
Table 9.3. Descriptive Statistics of Variable “Dif” 204
Table 9.4. Regression Results of the Pecking Order Model for LTG 205
Table 9.5. Regression Results of the Pecking Order Model for TG 205
Table 9.6. Correlation Coefficients of POH “Dif” and first differences LTG and TG 208
Table 10.1. Descriptive statistics of LTG 220
Table 10.2. Descriptive Statistics for the TG 221
Table 10.3. Descriptive Statistics of the LTG Target Measures 223
Table 10.4. Descriptive Statistics of the TG Target Measures 224
Table 10.5. Regression Results of Trade-off Model; LTG & TG-13 Years Average 225
Table 10.6. Regression Results of Trade-off Model; LTG & TG-Sample Average 225
Table 10.7. Regression Results of Trade-off Model; LTG & TG-3 Years Prior Moving Average 226
Table 10.8. Regression Results of Trade-off Model; LTG & TG-5 Years Prior Moving Average 226
Table 10.9. Regression Results of Trade-off Model; LTG & TG-3 Years Future Moving Average 226
Table 10.10. Regression Results of Trade-off Model; LTG & TG-5 Years Future Moving Average 227
Table 10.11. Results of the Regression Test of Capital Expenditures and 3 Years Future Moving Average of LTG and TG 235
Table 10.12. Results of the Regression Test of Capital Expenditures and First Differences of LTG and TG 236

Table 11.1 Summary of the Determinants of Capital Structure and their Expected Signs 257

Table 11.2. Variable Definitions and Descriptive Statistics for the Retail Industry 261

Table 11.3. Variable Definitions and Descriptive Statistics for the Hotel Industry 262

Table 11.4. Correlation Matrix between variables - Retail Sector 263

Table 11.5. Correlation Matrix between variables - Hotel Sector 264

Table 11.6. Multiple Regression Results for LTG 264

Table 11.7. Multiple Regression Results for TG 265
Chapter 1

Introduction and Objectives

1.1. Introduction

Modern capital structure theory was born with the publication of Modigliani and Miller’s capital structure theoretical model in 1958. They showed that, in a capital market free of taxes, transaction costs, and other frictions, the choice of firm’s capital structure could not affect its market valuation—because investors could make or unmake any level of gearing they desired by borrowing or lending on personal account. Much of the history of capital structure theory during the past forty years has involved examining how robust the model is to more realistic assumptions regarding market frictions and the information sets available to managers and shareholders. The development of agency theory in the 1980s, coupled with detailed research into the extent and effects of bankruptcy costs during the 1980s, lead to a yet more detailed view of the utility of the basic M&M capital structure theory. Cross-industry and cross-cultural examination of observed capital structure patterns in US and other industrialised countries lead to the mainstream view that corporations act as if there is a unique, optimal capital structure for individual firms that results from the trade-off between the tax benefits of increasing gearing and increasing agency and bankruptcy costs that higher debt entails.

The mainstream model has not reigned unchallenged (Megginson, 1995, Chapter 7). Numerous researchers, particularly Myers, have pointed out real “blind spots” that the trade-off theory cannot explain. This is particularly true of the observed stock market reaction to gearing-increasing and gearing-decreasing transactions, which consistently yield stock price increases and
decreases respectively. As an alternative to the trade-off model, Myers (1977) put forward his Pecking Order hypothesis of corporate gearing. It predicts that firms will prefer internal financing to issuing securities, and if forced to resort to external financing will use debt before equity. This model explains some observed patterns in corporate finance, including the tendency of firms not to issue stock and their choice to hold large cash reserves and other forms of "financial slack".

Various signalling models of capital structure have also been proposed which suggest that managers use leverage to signal firm prospects to poorly informed outside investors (Ross, 1977). These models generally predict that the firms with the best earnings and growth prospects should employ the most gearing, which is the opposite of observed behaviour.

The property rights literature regards financial instruments as commitment devices and focuses on the control aspects of these instruments (Hart 1996, Chapter 5). These instruments are viewed as defining both the allocation of the control rights to the return streams and residual control rights.

Transaction cost economics explains the use of debt and equity as governance instruments rather than simply as financial instruments. These can be matched to the asset attributes of individual investment projects (transactions) in order to ensure the lowest cost of transacting (Williamson, 1996, chapter 12). Transaction cost economics sees asset specificity (the degree of non-redeployability) as the determining factor in the choice between equity and debt. It predicts that low specificity projects should be debt financed while equity should be used for funding high specificity projects.

The above mentioned theories and the models derived from them have identified several variables that are likely to explain the observed capital
structure patterns. Some of them are profitability, earnings volatility, growth opportunities, asset structure, non-debt tax shields, etc.

1.2 Research Objectives

This study starts a comprehensive review of the theoretical literature on capital structure, and then proceeds to a thorough empirical study to test models derived from these theories in a U.K. setting, with particular reference to capital structure in the U.K. retail and hotel industries. The thesis contributes to the explanation of the firm's financing decisions by combining different theories and econometric methods used by earlier empirical studies in this field.

Hotel and retail industries were chosen because it was felt that service industries tend to be left out of most of the capital structure studies, which concentrate mainly in what are known as mainstream industries. Hotel and retail firms exhibit different asset structures. Hotels tend to have large amounts of relatively less specific assets while that it is not the case for the retail industry. On the other side retail companies make extended use of the trade credits available to them which is believed to play a role in the amount of borrowing.

The primary objectives of this study are as follows:
1. To test how well the pecking order model explains the capital structure behaviour in the sample companies.
2. To test how well the trade-off model explains the capital structure behaviour in the sample companies.
3. To examine the spectrum of variables that are likely to explain the observed capital structure pattern in the U.K. hotel and retail industries in the light of the above mentioned models and other theories of capital structures.
This thesis contributes to the existing literature because it focuses on U.K. companies. There have been very few studies regarding capital structure in the U.K. industries, (Marsh, 1982 and Michaelas at al, 1999) and this is the first one undertaken for the service industries.

The research design tests the most frequently cited theories using econometric methods not used in previous studies. To the best of my knowledge this is the first study that contrasts two capital structure models in a UK setting. The data sample was selected by using those companies within these two industries which provided a full data set for the study period 1985 – 1997. This study is a contribution in the ever growing use of panel data in capital structure research.

1.3. The Structure of the Study

In Chapter 2 the study begins with a discussion of Modigliani and Miller's irrelevance theory with particular reference to the trade-off model that is derived from this theory. Chapter 3 discusses the alternative agency theory to capital structure, which stresses the role of the agency costs of debt and equity in financing decisions. Chapter 4 begins with a discussion of the asymmetric information problem related to debt and equity employment. The second part describes the pecking order approach to capital structure. Chapter 5 provides a general discussion of the property rights approach. Chapter 6 begins with a discussion of transaction cost economics and continues with its application to capital structure issues. Chapter 7 summarises the different schools of thought described in the previous chapters and establishes their use in the following empirical chapters. Chapter 8 describes the data used in this study and provides a general discussion of the statistical definitions and tools employed in the empirical research. The pecking order model and the empirical results obtained by its application in the U.K. retail and hotel industries data are dealt with in Chapter 9. Chapter 10 discusses the trade-off model and the empirical
conclusions reached by its application to the data. The explanatory variables
derived from the theories described in the previous chapters, and the results
concluded by the multiple regression analysis, are set out in Chapter 11.
Finally, Chapter 12 provides an overall discussion of the empirical outcomes
concluded in the previous chapters and makes suggestions for further research
in the area.
References


Chapter 2

Modigliani’s and Miller’s Irrelevance Theory

2.1. Introduction

One of the most contentious areas in the theory of business finance in the past forty years has been the theory of capital structure. The genesis of this controversy was the seminal contributions of Modigliani and Miller (1958) about the irrelevance of capital structure. The general academic view, after this, was that the optimal capital structure involves balancing the tax advantage of debt against the expected present value of financial distress costs (the so-called trade-off theory). Miller (1977) presented a new challenge by showing that the tax advantage of debt at the firm level is offset by the tax disadvantage at the personal level and by arguing that any residual tax advantage of debt would be arbitraged away. Most of the research that followed has attempted to reconcile Miller’s model with the trade-off theory of optimal capital structure. The main result of this work is that firm’s optimal capital structure will involve a trade-off between the tax advantage of debt and various gearing-related costs. The outcome of these extensions of Miller’s model is the recognition that the existence of an optimal structure is an empirical issue as to whether or not tax advantages and gearing-related costs are economically significant enough to influence the cost of corporate borrowing.

This chapter presents a review of the Modigliani and Miller (MM) capital structure analysis. It starts with the general discussion of the original Modigliani and Miller Irrelevance Theory in Section 2.2. Sections 2.2.1 and 2.2.2 introduce market imperfections, respectively taxes and financial distress, into the MM approach. A summary of main empirical work carried out on
different issues of optimal capital structure and trade-off theory is given in
Section 2.3. The main arguments discussed in the chapter are concluded in
Section 2.4.
2.2. Modigliani's and Miller's Irrelevance Theory

To understand the causes and consequences of capital market imperfections we first need to understand the nature of a world in which these problems do not exist. The key result is the "value irrelevance" proposition which states that: capital structure is irrelevant to firm value.

Modigliani and Miller (1958) show that under certain conditions capital structure is irrelevant to a firm value. A firm's value is the net present value of the stream of cash flows generated by its investments. Once the investment decisions have been made, financing decisions cannot affect firm value (Stiglitz, 1969; Fama, 1978). The project's cash flows and risk adjusted cost of capital are independent of how the funds are raised for the project. Another way to look at this is to quote Professor Miller (1963): "The value of irrelevance proposition holds that you cannot make yourself richer by taking money out of one pocket and putting it into another".

To prove their "value irrelevance" proposition MM make the following key assumptions:

1) **Asset ownership**: All physical assets are owned by corporations.

2) **Firm Growth**: There is no growth, or cessation, so all cash flows streams are perpetuities.

3) **Frictionless Exchange**: No taxes, transaction costs, agency costs or bankruptcy costs. Claims on cash flows can be exchanged without any payment to third parties. Firms and individuals can costlessly issue, purchase or exchange securities. Managers maximise overall firm value.
4) Symmetric Information and Homogeneous Expectations: Everyone has symmetric and costlessly available information. All agents are equally capable of using information. All agents agree about the future expected returns of all securities.

5) Risk Class: All firms can be divided into “equivalent return” classes such that the return on the shares issued by any firm in any given class is proportional to (and hence perfectly correlated with) the return of the shares issued by any other firm in the same class, (MM, 1958, p.266).¹

6) Competitive Capital Markets: All securities have perfect substitutes. No firm or individual has a monopoly on the supply of any security. Agents take security prices as given. No arbitrage opportunities exist. If two securities have the same payoffs across all possible states of nature then they must have the same price.

7) Complete Capital Markets: All possible individual consumption plans can be produced with the payoffs from combinations of existing securities, i.e. risky equity and risk-free debt. Both individuals and corporation can borrow or lend at the risk free interest rate.

8) Independence of Investment and Financing Decisions: Firms make financing decisions taking their investment decisions as given.

The logic of the MM argument relies heavily on the “no arbitrage argument”, i.e. the process of buying a good in one market at a low price, and than reselling it in another market where identical good is selling at a higher price.

¹ A question arises: Why did not MM use CAPM or another asset pricing model, to adjust for risk? The answer is that the CAPM had not been developed in 1958, and their article preceded the arbitrage pricing theory by almost two decades.
Arbitrage promises infinite profits, and therefore is a powerful force in ensuring that the law of one price (the same goods must sell within transactions costs of each other in two different markets) holds, in well functioning markets (Megginson, 1995, p. 317). Once "real" (production and investment) decisions have been made the capital market knows the value of those decisions. No change in how the resultant cash flows are to be divided will affect the overall value of the cash flows themselves. Assume that an optimal capital structure, which maximises firm value, exists. Define that as the ratio of debt to total firm value. Any change in gearing would have to lower firm value. If firm A chooses a non-optimal capital structure, it creates riskless arbitrage opportunities in the capital market. The firm's underlying cash flows are given by its investment decisions. Everyone has identical information and agrees about the nature of the firm's prospects. Everyone in the securities market operates as a price taker. Any other firm, financial intermediary or individual could make a riskless arbitrage profit by buying up firm's A original securities and issue new securities with claims to the same set of contingent cash flows. Any capital structure choice the firm makes can be offset by some other agent in the perfect capital market. No purely financial decision can affect its equilibrium market value. Fama (1976) shows that the two sufficient conditions for this are that no firm has a monopoly on the supply of a particular security and that managers maximise overall firm value. Since other firms can issue securities that are perfect substitutes in a perfect and competitive capital market, the arbitrage condition still holds. Perfect substitutes are defined as any securities that offer the same pattern of payoffs across all possible states of nature. Under the "no arbitrage" condition, two securities offering the identical payoffs would have to be priced identically.

Modigliani and Miller (1958) take uncertainty into account by using the notion of "risk class". This is any set of securities that have perfectly correlated returns. By definition this means they offer the same pattern of consumption
opportunities across all possible states of nature. The securities in the same risk class are perfect substitutes. When two firms have identical stochastic technologies and are facing the same identical demand functions, their returns will be perfectly correlated. Firms in a competitive industry environment are essentially in the same risk class. If firms with identical technologies differ only in terms of the scale of production, their relative values, will be proportional by that scalar. In a perfectly competitive capital market this is equivalent to saying that the firms in a given risk class have access to each others' technology. Also, members of a risk class must have access to the same project on the same terms. In other words, in a perfectly competitive capital market there can be no idiosyncratic firm effects on returns due to factors like managerial ability, unique assets or complementaries with other assets or projects.

The MM analysis was presented in three propositions. The first is the crucial one.

**Proposition 1: Irrelevance Proposition**

The central proposition made by MM is that the weighted average cost of capital (WACC) is independent of the debt equity ratio and equal to the cost of capital which the firm would have with no gearing its capital structure. In other words, the appropriate capitalisation rate for a firm is the rate applied by the market to an ungeared company in the relevant risk category. The arbitrage mechanism will operate to equalise the values of any two companies whose values are temporarily out of line with each other.

No distinction is made between short- and long-term debt and it is assumed that all borrowing is perpetual. The company is expected to deliver constant and perpetual annual earnings $E$. The overall rate of return that company must
achieve to satisfy the stakeholders (shareholders and debt-holders) is the weighted average cost of capital denoted $k_0$. This can be expressed as:

$$k_0 = k_e \times \frac{V_s}{V_0} + k_d \times \frac{V_B}{V_0} = \frac{E}{V_0} \Rightarrow V_0 = \frac{E}{k_0}$$

where: $k_e$ and $k_d$ - the respective rates of return required by shareholders and debt-holders  
$V_S$ and $V_B$ - the respective market value of shares and the value of outstanding debt in a company  
$V_0$ - the market value of the whole company.  
$E$ - annual net operating income

The WACC also equals $E/V_0$ since total operating income is composed of payments to shareholders, $k_e V_S$ plus payments to lenders, $iB$ ($i$ is the coupon rate on debt and $B$ the book value of debt).

The proof of the “irrelevance preposition”, which assumes that all firms and individuals can lend and borrow at the risk-free rate, relies on the substitutability of the shareholders' personal gearing for the firm's gearing (home-made gearing, see Appendix 2.1).

Under the MM’s Proposition I the value of the firm is:

$$V_{0G} = V_{0U} = \frac{E}{k_0} \tag{1}$$

Where: $V_G$ - market value of levered firm  
$V_U$ - market value of ungeared firm  
$E$ - Earnings before tax and interest

**Proposition 2: The behaviour of the equity cost of capital.**

Underpinning Proposition 1 is a statement about the behaviour of the relevant cost of capital concepts, in particular the rate of return required by shareholders, which is expressed in MM's second proposition. This states “the expected
yield of a share of equity is equal to the appropriate capitalisation rate, \( k_e \), for a pure equity stream in the class, plus a premium related to the financial risk equal to the debt-to-equity ratio times the spread between \( k_e \) and \( k_d \). This proposition can be written as follows:

\[
V_B \frac{V_B}{V_S} = k_{\text{eq}} = k_{\text{eu}} + (k_{\text{eu}} - k_d) \times \frac{V_B}{V_S}
\]

where \( k_{\text{eq}} \) and \( k_{\text{eu}} \) denote the returns required by the shareholders of a geared company and an equivalent ungeared company, respectively. The expression simply tells us that “the rate of return required by shareholders increases linearly as the debt/equity ratio is increased”. The relationship is shown in Figure 2.1.

Figure 2.1. MM’s proposition 1 and 2.

**Proposition 3: The cut-off rate for new investment**

MM’s third proposition states that “the cut-off rate for new investment will in all cases be \( k_0 \) and will be unaffected by the type of security used to finance the investment”. Proposition 1 states that the WACC, \( k_0 \), is constant and equal to the cost of equity in an equivalent ungeared company. Since \( k_0 \) is invariant to capital structure, it follows that despite how a project is financed, it must yield a return of at least \( k_0 \), the minimum rate required to satisfy shareholders (Pike and
Neal, 1999, chapter 11). (The arithmetical derivations of Propositions 1, 2 and 3 are given in Appendices 2.1, 2.2 and 2.3 respectively).

As stated earlier, MM propositions are based on some restrictive assumptions. Relaxation of these assumptions results in other theories to which reference is made later.

### 2.2.1. Capital Market Imperfections and Capital Structure:

**Taxes**

In 1963 Modigliani and Miller added corporate taxes to their model of corporate valuation, under which the value of the geared firm became sensitive to capital structure. In the presence of corporate taxes the value of the geared firm is: \( V_G = V_U + TB \), (the arithmetical derivation is shown in Appendix 2.4). The expression for the value of the geared firm comprises the value of an equivalent ungeared firm, \( V_U \), plus a premium derived by discounting to perpetuity the stream of tax savings which is applicable so long as the firm has sufficient taxable capacity, i.e. if \( E > IB \). The introduction of the term, \( TB \), the discounted value of the future tax savings, or the tax shield, is a major modification of MM's Proposition I. The firm's value now increases continuously with gearing, (see Figure 2.2).

![Figure 2.2: MM's firm value with corporate tax](image-url)
Whereas the required rate of return for shareholders is given by the formula:

\[ k_{eg} = k_{eu} + (k_{eu} - k_d) \frac{V_B}{V_S} \]

The return required by the geared company's shareholders is the sum of the cost of equity in an identical ungeared firm plus a financial risk premium related to the corporate tax rate and the debt / equity ratio. The premium for financial risk required by shareholders is lower in this case owing to the tax deductibility of debt interest, i.e. the debt interest burden is less exacting. This relationship is shown in Figure 2.3.

Debt, therefore, increases the firm's value and reduces the required rate of return on equity. This implies that the firm's values are maximised by using 100% debt financing.

However, Miller (1977) added personal taxes and returned to the original MM irrelevance proposition. In this instance, capital structure is irrelevant because in equilibrium marginal taxes insure that will be so. According to Miller the value of the firm is:

\[ V_g = V_u + \left[ 1 - \frac{(1 - T_c)(1 - T_p e)}{(1 - T_p d)} \right] B \]
MISSING PAGES ARE UNAVAILABLE
increases it. Hence the name “trade-off theory” according to which a firm’s optimal capital structure lies where the marginal benefits of tax shields equal the marginal cost of potential financial distress.

Let us denote the expected cost of financial distress by FD; then the value of a geared company is:

\[ V_g = V_u + (TB - FD) \]

This means that the financial manager should attempt to maximise the gap between the tax benefits and financial distress costs, i.e. (TB-FD), and that there exists an optimal capital structure where company value is maximised. Fig 2.4 shows this relationship.

The expected costs of financial distress rise with gearing, once the market starts to perceive a substantially increased risk of financial failure. The likelihood of FD being non-zero depends on the probability distribution of the firm’s earning prospects. For most companies the probability, \( p \), of financial distress will increase with the book values of debt, \( B \), so that the FD function increases with gearing. If \( d \) denotes the percentage discount on the pre-liquidation value in the event of a forced sale, the expected costs of financial distress are: \( FD = (pdV_g) \), and the value of the geared firm is:

\[ V_g = V_u + (TB - pdV_g) \]

This suggests that market imperfections can be exploited to raise company value so long as TB exceeds \( pdV_g \). In Figure 2.4 \( X^* \) represents the optimal gearing ratio where the marginal benefits of tax saving equal the marginal cost of financial distress. Bankruptcy costs increase faster than the tax shield beyond this point, implying a reduction in firm value from further gearing.
The above discussion presents two factors that affect the degree of leverage. Unfortunately, no formula exists yet to exactly determine the optimal debt level for a particular firm. This is because the expected bankruptcy costs (mainly indirect bankruptcy costs) cannot be expressed in a precise way, (Ross, Westerfield and Jaffe, 1999, chapter 16).
2.3. Empirical Work on Optimal Capital Structure

Baxter (1967) argued that excessive gearing is expected to increase the cost of capital, commencing from the point where the increased direct plus indirect cost of debt becomes greater than the debt’s tax advantages. A high degree of gearing increases the probability of bankruptcy and therefore increases the riskness of the overall earnings stream. He investigated the bankruptcy cases of three companies that had filed for receivership. The sales data from all three companies showed dramatic decline in sales immediately upon the filing of the reorganisation petition. In short, though it is impossible to generalise, there is evidence that bankruptcy has associated costs – those of an administrative variety, and often costs in form of reduction of net operating earnings. Therefore, excessive leverage which can trigger bankruptcy may indeed raise the cost of capital to a firm and reduce the total value of the firm.

The implication of this argument is that firms should not borrow beyond the point where the tax advantages of gearing equals the cost of debt and expected financial distress costs, giving rise to a value maximising capital structure.

Schwartz and Aronson (1967) used F-ratio or variance ratio test of statistical significance to show that financial structure varies among industries. In addition, they showed that the financial structure of firms across time is not random. Scott (1972) and Scott / Martin (1975) used F-ratio analysis (one way analysis of variance tests the null hypothesis that the difference among the population means of the various industrial classes sampled is zero) on common equity to total assets to show that the financial structure is homogeneous in an industry. An implication of these studies is that firms behave as if there exists an industry-related optimal or target capital structure.
DeAngelo and Masulis (1980) generalised Miller’s differential tax model by including other non-debt tax shields such as depreciation charges and investment tax credits. They stated that introduction of such non-debt tax shields leads to the conclusion that each firm has an unique interior optimal capital structure that maximises its value. This capital structure is determined only by the interactions of personal and corporate taxes as well as positive default (financial distress) costs.

Dammon and Senbet (1988) extended DeAngelo’s and Masulis’ work by scrutinising the firm’s investment decision. They disagreed with the existing literature on the relationship between debt and investment tax shields in the case of optimal investments by the firm. Dammon and Senbet showed that an increase in investment-related non-debt tax shields owing to the changes in the tax code did not necessarily lead firms to reduce their debt level. They hypothesised that, in cross sectional analysis, the fact that firms with higher investment tax shields do not necessarily have lower debt tax shields, unless all the firms use the same technologies, may explain the deviation from DeAngelo and Masulis’ results.

Bowen, Daley and Huber (1982) studied eighteen hundred firms in nine industries, classified using the 4 digit standard industry codes. The authors studied the common equity to total assets ratio and the long-term debt plus short-term debt to total assets ratio as proxies for capital structure. Using F-ratio analysis, the authors found that the firms in each industry have similar capital structures; and using the Spearman rank coefficient analysis, they found that the firm’s relative ranking to mean industry financial structure across time is stable. Finally using the Fisher exact probability test, the authors also concluded that the gearing of firms within an industry tends to converge to the industry’s average. The firms investigated in this study, therefore, aimed for a target capital structure.
Marsh (1982) developed a descriptive model of the choice between equity and long term debt financing based on both the theory (companies in need of new finance should issue equity if they are above their target debt level and debt if they are below) and existing empirical evidence. He tested his model using a logit analysis applied to a sample of 748 issues of equity and debt made by UK companies over the period 1959 - 1970.

First, he concluded that companies are heavily influenced by market conditions and the past history of security prices in choosing between equity and debt financing. Indeed, these factors appear to be far more significant in his model than, for example, other variables such as a company's existing capital structure. Second, this study provided evidence that companies do appear to make their choice of financing instruments as though they had target levels in mind for both long term debt ratio, and the ratio of short term debt to total debt. Finally, he concluded that the results are consistent with the notion that these target levels are themselves functions of company size, bankruptcy risk, and asset composition.

Altman (1984) divided the cost of financial distress into direct and indirect costs. He defined direct costs as lawyers', courts', accounts' and other administrative costs which can be directly measured; and indirect costs as lost sales, reduced managerial energies and higher costs of funds, which can only be estimated. In his study, Altman evaluated the effect of direct and indirect costs by studying a sample of twelve retail and seven industrial firms which went bankrupt over the period 1970 - 1978. He found that bankruptcy costs were not trivial. In many cases they exceeded 20% of the value of the firm measured just prior to bankruptcy and even in some cases measured several years prior. This suggested that capital structure should be set at a point where the marginal present value of tax benefits equals the marginal present value of financial distress costs.
Bradley, Jarrell and Kim (1984) developed a model that synthesises the modern trade-off theory of optimal capital structure. In the empirical testing of this model, the authors found that the volatility of a firm’s earnings had a negative relationship with gearing. In addition, they found a strong direct relationship between non-debt tax shields and the firm’s debt level.

Emery and Gehr (1988) stated that the use of a variety of instruments other than equity reduces the firm’s tax expense, i.e. the ratio of tax suffered by the firm and its investors to the firm’s pre-tax cash flows; in the aggregate this increases the value of the firm’s tax options. Therefore, it is possible for each firm to capture some of the value created by using multiple securities. For each firm, therefore, there exist a combination of bonds, warrants, preferred stock and common stock that makes up its optimal capital structure. This implies that it is possible for a firm to increase its value by incorporating instruments in its capital structure with returns that are not perfectly correlated with those of its existing securities.

Givoly, Hayn, Ofer and Sarig (1992) evaluated the response of firms to the U.S. 1986 Tax Reform Act. The results of that study support the tax-based theories of capital structure. Also, they found that there exists a substitution effect between debt and non-debt tax shields and that both personal and corporate tax rates affect capital structure.

Ashton (1989) reworked the MM (1958, 1963) and Miller (1977) arguments to fit capital structure within the U.K. tax system at the time. He argues that if there is a U.K. tax advantage of debt, it is likely to be much smaller than the traditional MM value and it is likely to be no more than 13% of the market value of the permanent debt. The tax advantage of debt is considerably less under the U.K. imputation system than it is under the U.S. classical system. This reduced tax advantage to debt arises because under an imputation system,
the withholding tax on the gross dividend can both be offset against the firm’s corporation tax ability and treated as a tax credit by the shareholder, thus reducing both corporate tax ($T_c$) and personal tax on equity ($T_{pe}$). The smaller tax advantages of debt in the U.K. would predict, in general, lower levels of debt in the U.K. than in the U.S.

Castanis (1983), discussed whether there is or there is not a negative relationship between observed gearing and historical failure rates across lines of business. He examined the relative stationary level of failure rates over time for 21 lines of business for 1940, 1950, 1960, 1970, and for 1972 through 1977. The author concluded that firms in lines of business that "tend" to have high failure rates also tend to have less debt in their capital structures. The empirical results are not consistent with the capital structure irrelevance model of Miller. The results are consistent with the thesis that ex ante default costs are large enough to induce the typical firm to hold an optimum mix of debt and equity.

Kwansa (1995) in his study of 10 restaurant firms that went bankrupt between 1980 and 1992 investigates the size of the indirect costs to firms that file for bankruptcy, to determine if this cost is substantial. Additionally, he investigates the trade-off between tax savings and indirect bankruptcy costs for its usefulness in signalling potential firm insolvency. One of the findings indicates that the indirect cost of bankruptcy is substantial in absolute terms. With regards to its significance as a proportion of firm value, the findings confirm the fact that the foregone profits represent a sizeable proportion of the firm’s value. The other finding was that generally the size of the indirect bankruptcy costs outweighs the size of the tax savings from debt use, the closer the firm is to filing for bankruptcy.
2.4. Conclusions

Modigliani and Miller (1958) have provided a starting point for the discussion of capital structure decisions of firms. On the basis of an arbitrage argument they have shown that in perfect market settings, and under a set of restrictive conditions (no transaction costs, no bankruptcy costs, no taxes, no asymmetric information and no agency problems), the financing decisions cannot be viewed as a source of value, i.e., value cannot be created by rearranging capital structure. From their theorem it follows that that the choice of capital structure is irrelevant. In an MM world, investment and financing decisions are completely separated. Their theorem is showed to hold under generalised uncertainty.

According to M&M (1963), in the presence of taxes and the tax deductibility of interest payments, and under the assumption that the debt is default-free, firms are expected to be financed entirely by debt. However, since borrowing increases the likelihood of bankruptcy, and bankruptcy is costly, an optimal capital structure represents a level that balances the tax advantages of debt against the different costs associated with financial distress. There have been many studies (some of which were described in the previous section) introducing different costs generated by the likelihood of bankruptcy. These costs may be either directly or indirectly related to the bankruptcy process. Many of these studies conclude that firms behave as though they have a target level (or optimal level) of capital structure in mind, which can be achieved by the trade-off of the tax advantages of debt and bankruptcy costs or other costs related to debt use.

Relaxing different subsets of the aforementioned assumptions results in different families of the theoretical models. Theoretical models that proceeded from the MM irrelevance theorem can be divided into three major groups:
models based on bankruptcy costs, models based on agency costs (costs associated with moral hazards and adverse selection), and models based on asymmetric information. A detailed discussion of the last two models and empirical research inspired by them, is provided in Chapter 3 and 4 respectively.
References


Chapter 3

Agency Theory and Capital Structure

3.1. Introduction

Observed contractual arrangements in finance are complex. Agency Theory (AT) tries to give an explanation of these contractual relationships by positing that capital structure is determined by agency costs, which arise from conflicting interests among parties to the corporate firm, such as management, capital contributors, employees, customers, suppliers, and the government. Unless these problems were resolved they would lead to sub-optimal allocation of resources within the organisation. The term "agency" derives from the fact that corporate decisions are delegated to agents who perform on behalf of other parties. Agency theory considers the firm as a nexus of contracts. The resolving of agency problems through contractual arrangements leads to the evolution of corporate finance.

Agency theory identifies two types of conflicts: a) conflicts between managers and shareholders, and b) conflicts between debtholders and equityholders. The former arise because managers hold less than 100% of residual claims, therefore they have the incentive to transfer firm resources to their own personal benefit. The latter conflicts arise because the debt contract gives equityholders an incentive to invest in a manner detrimental to the debtholders' interest because of the different risk-sharing characteristics of equity and debt.

The chapter is organised as follows: Section 3.2 describes the origins of agency theory. Section 3.3 gives a brief description of the agency theory approach to capital structure. It continues with the agency costs of external equity in Section 3.3.1. Section 3.3.2 deals with agency costs of debt, respectively the risk shifting incentive in Section 3.3.2.1, the underinvestment incentive in Section 3.3.2.2,
asset liquidation and payout proceeds in Section 3.3.2.3, and debt finance dividend payment in Section 3.3.2.4. The chapter continues with Section 3.3.3 in which the debt-equity ratio is determined based on an agency theory approach. The roles of monitoring and bonding costs as well as bankruptcy and reorganisation costs are discussed in Sections 3.3.4 and 3.3.5 respectively. Section 3.4 gives a summary of the empirical studies carried out based on the agency theory proposition. And finally Section 3.5 summarises the main highlights of the chapter.
3.2. Origins of Agency Theory

During the 1960s and 1970s, economists explored risk sharing among individuals or groups (e.g. Arrow, 1971; Wilson, 1968). This literature described the risk-sharing problem as one that arises when co-operating parties have different attitudes towards risk. Agency theory broadened the risk sharing literature to include the so-called agency problems that occur when co-operating parties have different goals and division of labour (Jensen & Meckling, 1976, Ross 1973).

Specifically, agency theory is directed at the agency relationship, in which one party (the principal) delegates work to another (the agent), who performs that work. Agency theory attempts to describe this relationship using the metaphor of a contract (Jensen and Meckling, 1976).

Agency theory is concerned with resolving two problems that can occur in agency relationships. The first is the agency problem that arises when (a) the desires or goals of principal and agent conflict and (b) it is difficult or expensive for the principal to verify what the agent is actually doing. The problem here is that the principal cannot verify that the agent has behaved "appropriately". The second is the problem of risk sharing that arises when the principal and agent have different attitudes towards risk. The problem here is that the principal and the agent may prefer different actions because of the different risk preferences.

Because the unit of analysis is the contract governing the relationship between the principal and the agent, the focus of the theory is on determining the most efficient contract governing the principal-agent relationship given assumptions about people (e.g., self-interest, bounded rationality, risk aversion), organisations (e.g., goal conflict among members), and information (e.g., information is a commodity that can be purchased). Specifically, the question becomes: Is a behaviour oriented contract (e.g., salaries, hierarchical governance) more efficient than an outcome oriented contract (e.g., commissions, stock options, transfer of property rights, market governance)? Table 3.1 gives an overview of agency theory.
The agency framework is applicable in a variety of settings, ranging from macro-level issues such as regulatory policy to micro-level phenomena such as blame, impression management, lying and other expressions of self interest. Most frequently, agency theory has been applied to organisational phenomena such as compensation (e.g., Conlon and Parks, 1988; Eisenhardt, 1985), acquisition and diversification strategies (e.g., Amihud and Lev, 1981), board relationships (e.g., Fama and Jensen, 1983; Kosnik, 1987), ownership and financing structures (e.g., Jensen and Meckling, 1976; Argawal and Mandelker, 1987), vertical integration (Anderson, 1985), and innovation (Bolton, 1988).

From its roots in information economics, agency theory has developed along two lines: positivist and principal-agent (Jensen, 1983). The two streams share a common unit of analysis: the contract between the principal and the agent. They also share common assumptions about people, organisations, and information. However, they differ in their mathematical rigour, dependent variables and style.

Positivist researchers have focused on identifying situations in which the principal and agent are likely to have conflicting goals and then describing the governance mechanisms that limit the agent’s self-serving behaviour. Positivist research is less mathematical than principal-agent research. Also, positivist

Table 3.1 Agency theory overview (sources Esenhardt, 1989)

<table>
<thead>
<tr>
<th>Key Idea</th>
<th>Principal-Agent relationships should reflect efficient organisation and risk-bearing costs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of Analysis</td>
<td>Contract between principal and agent</td>
</tr>
<tr>
<td>Human Assumption</td>
<td>Self Interest</td>
</tr>
<tr>
<td></td>
<td>Bounded Rationality</td>
</tr>
<tr>
<td></td>
<td>Risk Aversion</td>
</tr>
<tr>
<td>Information Assumption</td>
<td>Information as a purchasable commodity</td>
</tr>
<tr>
<td>Contracting Problems</td>
<td>Agency (moral hazard and adverse selection)</td>
</tr>
<tr>
<td></td>
<td>Risk Sharing</td>
</tr>
<tr>
<td>Problem Domain</td>
<td>Relationships in which the principal and agent have partly differing goals and risk preferences (e.g., compensation, regulation, leadership, impression management, whistle-blowing, vertical integration, transfer pricing).</td>
</tr>
</tbody>
</table>
research has focused almost exclusively on the special case of the principal-agent relationship between owners and managers of large, public corporations. Three articles have been particularly influential. Jensen and Meckling (1976) explored the ownership structure of the corporation, including how equity ownership by managers aligns managers’ interests with those of owners. Fama (1980) discussed the role of efficient capital and labour markets as information mechanisms that are used to control the self-serving behaviour of top executives. Fama and Jensen (1983) described the role of the board of directors as an information system that the shareholders within large corporations could use to monitor the opportunism of top management.

From a theoretical perspective, the positivist stream has been most concerned with describing the governance mechanisms that address the agency problem. The positivist stream identifies two propositions regarding the governance mechanisms. One proposition is that outcome-based contracts are effective in curbing agent opportunism. The argument is that such contracts co-align the preferences of agents with those of the principal because the rewards for both depend on the same actions, and, therefore, the conflict of self-interest between principal and agent is reduced. For example, Jensen and Meckling (1976) described how increasing the firm ownership of the managers decreases managerial opportunism. The second proposition is that information systems also curb agent opportunism. The argument here is that, since information systems inform the principal about what agent is actually doing, they are likely to curb agent opportunism because the agent will realise that she or he cannot deceive the principal. For example, Fama (1980) described the information effects of efficient capital and labour markets on managerial opportunism, and Fama and Jensen (1983) described the information role that boards of directors play in controlling managerial behaviour.

At its best, positivist agency theory can be regarded as enriching economics by offering a more complex view of organisation (Jensen, 1983). However, it has
been criticised by organisational theorists as minimalist (Hirsch, Michaels and Friedman, 1987; Perrow, 1986) and by microeconomists as tautological and lacking rigour (Jensen, 1983). Nonetheless, positivist agency theory has ignited considerable research.

Principal-agent researchers are concerned with a general theory of the principal-agent relationship, a theory that can be applied to employer-employee, lawyer-client, buyer-supplier, and other agency relationships (Harris and Raviv, 1978). Characteristic of formal theory, the principal-agent paradigm involves careful specification of assumptions, which are followed by logical deduction and mathematical proof.

In comparison to the positivist stream, principal-agent theory is abstract and mathematical and, therefore, less accessible to organisational scholars. Indeed, the most vocal critics of the theory (Perrow, 1986; Hirsch et al., 1987) have focused their attacks primarily on the more widely known positivist stream. Also, the principal-agent stream has a broader focus and greater interest in general, theoretical implications. In contrast, the positivist writers have focused almost exclusively on the special case of the owner/CEO relationship in the large corporation. Finally, principal-agent research includes many more testable implications. The two streams are complementary: Positivist theory identifies various contract alternatives, and principal-agent theory indicates which contract is the most efficient under varying levels of outcome uncertainty, risk aversion, information and other variables.

Before proceeding into the analysis of the financial theory of agency, the following is a summary of the framework that characterises most of the economic research in this area. First, the analysis is based on a single period model. This is a limiting assumption, because ignores the implications of the outcomes of one period on the structure of contracts in future periods. The learning process of market participants, which is embedded in multiperiod analysis, gives rise to
“goodwill” and human capital, which affect the action of agents and mitigate agency problems to some extent. Second, the analysis is based on one agent and one principal. Except for the introduction of a minimum utility level that must be satisfied to attract agents, the analysis ignores the existence of markets and the implications of competition among principals and agents. Third, the analysis assumes that the manager’s preferences and alternatives of action are perfectly known to principals. Fourth, the analysis assumes that the end-of-period wealth of both parties is limited to the realised value of the firm under consideration. The possibilities of diversifying via the capital market, and thereby reducing the amount of risk that is shared, are generally ignored. Fifth, the analysis assumes that contracts are binding, which implies that any commitment in an enforceable contract is perfectly honoured.
3.3. Agency Theory and Capital Structure

A significant fraction of the effort of researchers has been devoted to models in which capital structure is determined by agency costs, i.e. costs due to the conflict of interests between different groups in a firm. Research in this area was initiated by Jensen and Meckling (1976) building on earlier work of Fama and Miller (1972).

Agency theory defines the firm as "...simply one form of legal fiction which serves as a nexus for contracting relationships and which is also characterised by the existence of divisible residual claims on the assets and the cash flows of the organisation which can generally be sold without permission of the other contracting individuals". (Jensen and Meckling (1976, p 311).

An agency relationship is defined as a contract under which one or more persons (the principals) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent. In other words, in any business relationship there are two parties, one of who is the agent (the manager, the decision-maker) and the other is the principal (investors, i.e., shareholders and debtholders). The agent in his decisions affects not only his own welfare but also that of the principal. If both parties to this relationship are utility maximisers it is expected that the agent will not always act in the best interest of the principal. The principal is ready to pay a reward to the agent in return for a certain appropriate action. Unfortunately, the principal cannot observe the agent's action in full detail. The principal can limit divergences from actions on his interest by establishing appropriate incentives for the agent and by incurring monitoring costs, design to limit the diverging activities of the agent. In a certain situations it will be beneficial for the agent to employ resources (bonding costs) to guarantee that he will not take certain actions which will be against the principal's interest. It is understandable that neither law nor contracts will give the principal perfect protection. The reason is
that the information is not perfect and costless, and that contracting is costly. Information is perfect if all the individuals assign a positive probability to the same future state of nature, and also all individuals know all possible strategies of the agent and their outcomes in every state, e.g. all individuals give the same market value to any strategy of the agent. Under perfect information and if costless of contracting, contracts would be written such as to describe exactly the actions, which would maximize the market value of all firms. Therefore, the contracts would also prescribe when to liquidate the firm and how to distribute the liquidation value.

Imperfect information usually implies that the managers are better informed than capital owners in both ex ante and ex post states of the world. Ex ante they know better the possible states of the world affecting the firm and the action that can be chosen, and therefore the state-dependent future cash flows of the action. Ex post, they are better informed of the actual state of the world and the realized action's outcome. These information imperfections, together with costly contracting, make it profitable to write incomplete contracts between managers and principals. But incomplete contracts offer the possibility for the manager to expropriate the principal by choosing non-Pareto efficient actions. Therefore, it is impossible to insure that the agent will make optimal decisions from the principal's point of view.

In their seminal paper Jensen and Meckling (1976) discuss agency costs as the key tool in evaluating alternative designs of principal-agent relations. They define agency costs as the sum of 1) monitoring expenditures by the principal, 2) the bonding expenditures by the agent and, 3) the residual loss i.e. the monetary equivalent of the reduction in the welfare of the principal as the result of the differences between the agent's decisions and those decisions which would maximize the welfare of the principal.

---

1 If the actions are Pareto-efficient, then any resultant benefit to the agent will not entail any disbenefit to the principal, and vice-versa.
Major insights into the problems of capital structure can be gained if they are understood in terms of principal agent theory. Many principals such as shareholders, bondholders, customers, etc., are dependent on an agent (or a group of them), and conflicts of interests arise. These conflicts of interest stem from the structure of the claims against the firm, which are respectively the fraction of the shares held by the "owner – manager", the amount of shares owned by non-owner managers, and the creditors' claims. This financing structure determines a kind of sharing rule, and conditions the actions that could be considered optimal from the agent’s point of view.

Considering the financing decision in this way omits the independence argument discussed by Modigliani and Miller (recall their main hypothesis that in a world of perfect markets capital structure does not matter). The outcomes of the firm are no longer independent of financing decisions, not only because of tax advantages but also for reasons of conflicts of interests, which may result in different optimal investment decision.

The main issues that the positive agency theory tries to address are:

a) To study the influences of the sharing rule in itself through a detailed analysis of agent’s actions if a certain capital structure is assumed and if the firm has already got the financing. This has to do with several wealth transfer mechanisms, which the agent might use to promote his own well-being at the expense of the principal’s welfare after he has received the money.

b) To devise a certain kind of framework which will enable us to identify the ultimate bearers of the losses resulting from the agency problems.

c) To devise different instruments which can be used to tackle these agency problems in different scenarios that might arise.

---

2 An “owner-manager” is a manager who has whole or partial ownership interests in the firm.
3.3.1. Agency Costs of External Equity

In their work Jensen and Meckling (1976) describe this situation: Imagine an owner-manager who derives utility from three sources: a) money (wages); b) the market value of the fraction of firm’s shares owned by him; and c) non-money related perquisites such as a luxury office, social prestige, etc. Assume that no debt is used. If the manager is the full owner of the firm he bears all the costs of these non-money related benefits. As the owner-manager’s fraction of the equity falls, his fractional claim on the outcomes falls and this will tend to encourage him to appropriate a larger amount of corporate resources in the form of perquisites. This also makes it desirable for the shareholders to expend more resources on monitoring his behaviour. Thus, the wealth costs to the owner of obtaining additional cash in the equity market rise, i.e., the price obtained for each fraction of equity falls as his fractional ownership falls.

The owner-manager’s tastes for wealth and perquisites are represented in Figure 3.1 by a system of indifference curves, \( U_1, U_2, \) etc. The indifference curves will be convex as long as the owner-manager’s marginal rate of substitution between perquisites and wealth diminishes with the increasing levels of the benefits.

![Figure 3.1. Jensen’s and Meckling’s perquisites consumption model](image-url)
For the 100 per cent owner-manager, this presumes that there are no perfect substitutes for these benefits available on the outside, i.e. to some extent they are job specific. For the fractional owner-manager this presumes the benefits cannot be turned into general purchasing power at a constant price.

When the owner has 100 per cent of the equity, the value of the firm will be $V^*$ where indifference curve $U_2$ is tangent to $VF$, and the level of perquisites consumed is $F^*$. If the owner sells the entire equity but remains as manager, and if the equity buyer can, at zero cost, force the old owner (now manager) to take the same level of perquisites as he did as owner, then $V^*$ is the price the new owner will be willing to pay for the equity.

We would not expect the new owner to be able to enforce the same behaviour on the old owner at no cost. If the old owner sells a fraction of the firm to an outsider, he, as manager, will no longer bear the full cost of any perquisites he consumes. Suppose the owner sells a share of the firm $(1 - \alpha)$, and retains for himself a share, $\alpha$. If the prospective buyer believes that the owner-manager will consume the same level of perquisites as he did as full owner, the buyer will be willing to pay $(1-\alpha)V^*$ for a fraction $(1-\alpha)$ of the equity. Given the outsider's claim of $(1-\alpha)$ on the equity, the cost to the owner-manager of consuming £1 of perquisites in the firm is no longer £1. Instead, it will be $\alpha \times £1$. If the prospective buyer actually paid $(1-\alpha)V^*$ for his share of equity, and if thereafter the manager could choose whatever level of perquisites consumption he liked, his budget constraint would be $V_fP_1$ in Figure 3.1 with a slope equal to $-\alpha$. Including the payment the owner receives from the buyer as part of the owner's post-sale wealth, his budget constraint, $V_fP_1$, must pass through $B$, since he can if he wishes to have the same wealth and level of perquisites consumption he consumed as full owner.

But if the owner-manager is free to choose level of perquisites, $F$, subject only to the loss in wealth he incurs as a part owner, his welfare will be maximised by
increasing his consumption of perquisites. He will move to point $A$ where $V_1P_1$ is tangential to $U_1$ representing a higher level of utility. The value of the firm falls from $V^*$ to $V^0$, i.e., by the amount of the cost to the firm of increased perquisites consumption, and the owner-manager's consumption of perquisites increases from $F^*$ to $F^0$.

The agency conflict that derives from the manager's tendency to appropriate perquisites out of the firm's resources for his own consumption is not the only or the most important conflict. It is likely that the most important conflict arises from the fact that as the manager's ownership falls, his effort to devote significant effort to creative activities such as searching out new profitable projects falls, i.e. he may shirk. He may in fact avoid such projects simply because it requires too much trouble or effort on his part to learn about them. Avoidance of these personal costs and the anxieties that go with them represent a source of on-job utility to him, and this shirking can result in the value of the firm being substantially lower than it otherwise could be.

In practice, it is possible by expending resources to alter the opportunity the manager has for receiving non-money related benefits. These methods include auditing, formal control systems, budget restrictions and the establishment of incentive compensation systems, which serve to bring the manager's interests closer to those of outside shareholders.
3.3.2. The Agency Costs of Debt

Jensen and Meckling (1976) in their paper (p.334) raise the question “Why don’t we observe large corporations individually owned with a tiny fraction of the capital supplied by the entrepreneur in return for 100% of the equity and the rest simply borrowed?” The reason they give for this are: 1) the incentive effects associated with highly geared firms, 2) the monitoring costs these incentive effects lead to and 3) bankruptcy costs. All these costs are simply particular aspects of the agency costs associated with the existence of debt claims on the firm. Some of the incentive effects associated with debt are:

3.3.2.1. Risk Shifting Incentive

The agency costs of debt are associated with the moral hazard problems than can arise after a loan has been made. Shareholders have the incentive to take actions, especially investment decisions that would make themselves better off and leave creditors worse off (to highlight the conflict of interest between lenders and borrowers we abstract from the problem of manager - shareholder conflict and the separation of ownership and control, and we also assume there are no taxes). It is assumed that the firm’s investment decision-makers are acting to maximise shareholders’ value rather than overall firm value. This is the equivalent of the shareholders making the investment decisions.

If the owner - manager has the right to decide which investment programme to undertake, and if after he decides this he has the opportunity to sell part or all of his claims on the expected returns in the form of either debt or equity, he will be indifferent between the investment opportunities. However, if the owner has the opportunity to first issue debt, then to decide which investment to take and then to sell part or all of his remaining equity claim in the market, he will not be indifferent between different investment opportunities. The reason is that by promising to take low variance projects, selling bonds and then taking a higher variance project he can transfer wealth from the “naive” bondholders to himself as equity holder. Once they receive a loan the shareholders have the incentive
to accept investment opportunities that lenders would consider to be too risky.

To demonstrate that shareholders may benefit by investing in high risk projects, the equity can be considered as Black-Scholes European call option to buy back the entire firm from the debtholders at maturity, at an exercise price equal to the principal amount of debt. As the level of risk increases the expected payoffs to shareholders increase, and the expected payoffs to debtholders decrease because of the default risk. In itself this would not affect the overall firm value. In the absence of other costs (agency costs, bankruptcy costs, transaction costs, etc.) this could mean just a redistribution of wealth between the two types of claimants.

Shareholders' upside gains are unlimited once the debt has been repaid. However, with limited liability, their downside losses are bounded. Debtholders recognise the shareholders' incentive to shift risk. Let us say that two projects A and B have the same risk adjusted expected returns (see Appendix 3). They must be worth the same in the market. While the shareholders would prefer the riskier project A, debtholders recognise this incentive and are willing to pay less for it. Project A will be accepted, but there is no loss in efficiency. The value of the project and therefore the overall value of the firm stay the same, (see Appendix 3, Figure 3.4). However, assume project A is worth less than project B and is also riskier than B. Given the choice between A and B shareholders may still have an incentive to choose A (see Appendix 3, Figure 3.5). Even though project A is riskier and lower valued, the value of equity may be large enough to give shareholders a larger expected payoff. Given the shareholders' incentives and the increased risk, the debtholders will be willing to pay less for project A. Shareholders will choose A, the riskier lower valued project. The higher valued less risky project B, is not chosen given the risk shifting incentive of decision-makers (see Appendix 3). The difference in value between two projects is a deadweight loss due to the risk shifting incentive (Barnea, Haugen and Senbet, 1985). This implies a negative relationship between the risk of a project and the ability to fund the project with debt.

3.3.2.2. The Underinvestment Incentive
If the firm were totally equity funded, shareholders would accept all positive NPV projects. However, when partially funded with debt the shareholders may have an incentive to reject some positive NPV investments (Myers 1977). A firm has two types of assets:

*Assets already in place:* These are sunk costs, irreversible investments that generate cash flows that are independent of any subsequent, discretionary investments the firm might make.

*Growth opportunities:* Their value is based on the firm's subsequent, discretionary investment decisions. In another word they are assets not yet in place.

Since the investment decision is discretionary and depends on conditions that arise in the future, growth opportunities can be thought of as providing the option to exercise profitable investment opportunities in the future. Then, if it appears to be unprofitable, the firm has no obligation to carry it out. A growth opportunity is like a call option on the set of assets to be put in place in the future. The discretionary investment decision is where to exercise the option to implement the investment. Its exercise price is the cost of implementing the investment. At expiration the firm will exercise the option if the value of the underlying assets exceeds the exercise price - the cost of the investment, (see Appendix 3).

For example research and development (R & D) expenditures purchase a call option on the right to produce and market a new product sometime in the future. The amount of R & D spending is the call premium. The new product is the underlying asset. Its value it is assumed to be uncertain. The size of the opportunity window - the length of time that the firm feels it can delay making a decision - is the time to expiration. The firm has the option to begin the production when the expected future cash flows exceed the cost of setting up production and marketing facilities. If the option is exercised it becomes dead. The strategy is implemented and new assets in place are purchased. Alternately,
at expiration, if the expected cash flows do not exceed the cost of investment, the option is allowed to expire unexercised. The assumption is that to own the option to carry out the strategy and produce a given product the firm has to have invested in previous R & D and marketing and reputation assets and to have developed the set of skills that would allow to production and distribution to begin.

Under the net present value (NPV) rule a firm would accept a project if the present value of the generated cash flows exceeded the present value of the cost of investment. Some positive NPV projects could generate enough proceeds to cover the basic cost of purchasing the required inputs and capital goods but still not generate enough cash flow to also pay the outstanding debt. The shareholders would not accept the project unless its expected proceeds would both cover the cost of investment and pay-off the debtholders, (Rule is: PV > I + B not PV > I, where PV - present value, I - investment and B - value of debt, see Figure 3.6, Appendix 3). Debt effectively increases the exercise price of the option to implement the growth opportunity. If the shareholders default, the assets accrue to the bondholders. In other words, all of the benefits of the positive NPV project would go to the debtholders. The shareholders would receive nothing. The shareholders have no incentive to exercise the option to implement some positive NPV projects.

Myers (1977) argues that when a firm's assets are largely made up of growth opportunities it would be difficult to fund the firm with debt because of the shareholders' incentive to underinvest. A wide variety of both tangible and especially intangible assets are essentially growth opportunities.
3.3.2.3. Asset Liquidation and Pay out Proceeds.

If there is no pay-out constraint (e.g. through law or debt covenants), shareholders may decide to liquidate the firm and take the proceeds as a dividend. They would still have to pay-off the creditors. However, provided \( I > B \) this could be preferable to making a further investment in order to keep the firm going. Of course, the shareholders will undertake this action only if the salvage value \( I \) of the assets sold is greater than the market value of their shares \( (V_s) \) and the creditors' claims \( B \) are worthless: \( V_s - B = I \) (see A3-17).

3.3.2.4. Debt Financed Dividend Payments (Milking the Property)

Shareholders may raise funds from new creditors by giving them the same or higher priority than the existing ones and use the funds to pay themselves dividends. The total market value of the firm will remain the same if the investment policy does not change and the signals of tax effects are not taken into consideration. The wealth is transferred from the old creditors to the shareholders.

An extreme of this strategy is to pay out extra dividends or other distributions in times of financial distress, leaving less in the firm for the debtholders. This is called "milking the property" a phrase borrowed from the real estate industry. The underinvestment strategy and that of "milking the property" (Ross, Westerfield and Jaffe, 1996), are very similar. In the former, the firm chooses not to raise new equity; the latter goes a step further, because equity is withdrawn through the dividend.

In the above description, each of the agency problems is presented in isolation; however, there are cases where these problems can be combined which complicates the situation even more. An example is the combination of problems...
2 and 4, where the project is financed first by the issuance of equity and an underinvestment problem may come up. Then a debt-financed dividend payment is made in the amount of the investment outflows, which would be funded with new debt. By this the shareholders will be able to capture more of the projects NPV. Based on this argument some researchers have argued that the underinvestment problem can be tackled by using all debt finance, but other studies have shown that this may lead in overinvestment or in the worse case in even more underinvestment.

Another range of problems arises in the case of funding future investment by the partial liquidation of the current firm's assets. In this case there is a combination of (1), (3) and (4).

3.3.3. Determination of the Debt / Equity Ratio

Jensen and Meckling (JM) in their paper give an analysis of the determination of the debt/equity ratio under the framework of the agency costs analysis. They name:

Si - inside equity, So - outside equity and, B - debt

The total market value of the equity is \( S = Si + So \), and the total market value (V) of the firm is \( V = S + B \).

They consider first the optimal ratio of the outside equity to debt \( So / B \). For this they keep constant the size of the firm as well as the amount of outside financing \( (B + So) \). \( V \) for a given size will depend on the agency costs incurred. They use as an index of size \( V^* \), the value of the firm at a given scale when agency costs are zero. Considering that a certain amount of financing \( (B + So) \) will be realized outside, the problem is to determine the optimal fraction \( E^* = So^* / (B + So) \) to be financed by outside equity.

From the owner - manager viewpoint, the optimal proportion of outside funds to be obtained from equity for a given level of internal equity is the value of \( E^* \),
which results in minimum total agency costs.

They define $A_{So}(E)$ as the total agency cost of outside equity and $A_B(E)$ as the total agency cost of debt. $A_T(E) = A_{So}(E) + A_B(E)$ is the total agency cost. Referring to the function $A_{So}(E)$ when $E = S_0/(B + S_0)$ is zero, the manager's incentive to exploit (acquiring perks, shirking, etc) the outside equity is zero, as the changes in the value of the total equity are the same as the changes in his own equity. As $E$ increases to 100% his incentive to exploit the outside equity increases, therefore the agency costs $A_{So}(E)$ increase.

The agency costs associated with the existence of debt, $A_B(E)$ are composed mainly of the value reductions in the firm and monitoring costs caused by the manager's incentive to reallocate wealth from debtholders to himself by increasing the value of his equity claim. They are at a maximum where all outside funds are obtained by debt, i.e. where $S_0 = E = 0$. As the amount of debt declines to zero these costs also go to zero as $E$ goes to 1 and his incentive to reallocate wealth from debtholders to himself falls. The reasons for this fall are: a) the total amount of debt falls, therefore it is more difficult to reallocate any given amount away from debtholders; and b) his share of each reallocation is reduced as $S_0$ increases and his share of the total equity $S_i / (S_i + S_0)$ falls.

Agency costs
(Measured in Units of Current Wealth)
The curve $A_T(E)$ represents the sum of agency costs from various combinations of outside equity and debt financing. The minimum total agency cost for a given size firm and outside financing will happen at some point as $A_T(E^*)$ with a mixture of both debt and equity.

### 3.3.3.1. Effects of the scale of outside financing

Again to study the effect of the scale of outside financing $(S_0 + B)$, JM keep the firm value $V^*$ constant. They define an index of the amount of outside financing to be:

$$K = \frac{S_0 + B}{V^*}$$

and consider two possible levels of outside financing $K_0$ and $K_1$ for a given scale of the firm such as $K_0 < K_1$.

As the amount of outside equity increases, the owner’s fractional claim on the firm falls. Therefore, he will be induced to take additional non-money related benefits from the firm as his share in the equity falls. This on the other side increases the optimal level of monitoring. Both these factors will cause the point of agency costs $A_{S_0}(E,K)$ to shift upwards as the fraction of outside financing, $K$, increases. This is represented in Figure 3.3 by the two curves representing the agency costs of equity, one for the low level of outside financing, $A_{S_0}(E, K_0)$ the other for the high level of outside financing $A_{S_0}(E, K_1)$.

The locus of the latter lies always above the locus of the former, except at the origin where they are both zero.
The agency costs of debt will similarly rise as the amount of outside financing increases. This means that the locus of \( A_B(E, K_1) \) for high outside financing, \( K_1 \), will lie above the locus of \( A_B(E, K_0) \), for low outside financing, \( K_0 \), since the total amount of resources which can be reallocated from the bondholders increases as the total amount of debt increases.

![Figure 3.3. Agency cost functions and optimal outside equity as a fraction of total outside financing, for two different level of outside financing.](image)

The net effect of the increased use of the outside financing given cost functions assumed in Figure 3.3 is: a) to increase the total agency costs from \( A_T(E^*, K_0) \) to \( A_T(E^*, K_1) \); and b) to increase the optimal fraction of outside funds obtained from the sale of outside equity. The locus point, \( A_T(E^*, K) \) where agency costs are minimised determines \( E^*(K) \), the optimal proportion of equity and debt to be used in obtaining outside funds as the outside funds \( K \) range from 0 to 100 percent.

### 3.3.4. The Role of Monitoring and Bonding Costs

In principle it would be possible for the bondholders, by the inclusion of different covenants in the contract provisions, to limit the managerial behaviour which
results in reductions in the value of the bonds. To completely protect the bondholders from the incentive effects, these provisions would have to be very detailed and cover most operating aspects of the firm. The costs involved in writing down such provisions, the costs of enforcing them and the reduction in the profitability of the firm would be important. All costs associated with such covenants are part of what is considered as monitoring costs.

The bondholders will engage in the writing of such covenants and in monitoring the actions of the manager to the point where the marginal costs to them are equal the marginal benefits they receive.

The manager has the incentive to take into account the costs imposed on the firm by covenants in the debt agreement, which directly affect the future cash flows of the firm since they reduce the market value of his claims. Because both external and internal monitoring costs are imposed on the manager, it is in his own interest that the monitoring is performed at the lowest cost possible.

3.3.5. Bankruptcy and Organization Costs

If there were no costs associated with bankruptcy, the total market value of the firm would not be affected by increasing the probability of its occurrence. It is possible to write contracts representing claims on a firm which depict the rights of the owners for all possible states of the world. Even if there were no antagonistic incentive effects in increasing debt use relative to equity, the use of debt would be constrained by the cost of defining and enforcing the bondholders’ claims. Experience has shown that bankruptcy and reorganization are not costless. Thus these costs will influence directly the potential debtholders, as their future claims will depend on the event of bankruptcy. Furthermore, the bankruptcy and reorganization costs claim a non-negligible percentage of the firm’s assets, ((the debt reconstruction costs of QMH amounted in £40m out of £850m of its assets, which is about 4% (The Economist, March 1997); Kwansa &
Cho (1995) found that the indirect costs of bankruptcy is “substantial in absolute terms”).

In summary the agency costs associated with debt consist of:

1) the opportunity wealth loss caused by the impact of the debt on investment decisions of the firm,
2) the monitoring and bonding costs and,
3) the bankruptcy and reorganization costs.

The above analysis deals with one period investment financing, ignoring the issues linked with multi-period financing decisions and reputation aspects. It is understandable that the expectations of the future sales of outside equity and debt will change the costs and benefits that the manager faces in making decisions which benefit himself at the expense of current share and bond holders. If he develops a reputation for such dealings, he can expect this to unfavorably influence the terms at which he can obtain future capital from outside resources. John & Nachman (1985) draw together some critical issues in examining the reputation phenomena. The paper synthesizes the reputation aspects of debt contracts and debt repayment, namely that in the presence of the correlated opportunities the firm’s first period action can reveal information about the second period opportunities. The paper also examines the underinvestment problem in an agency setting by introducing repeated play in a two-period model with correlated investment opportunities. The paper concludes that reputation incentives reduce the frequency of underinvestment in the first period so that this occurs in a lesser mode in the next period. The basic model is that of an agency relationship between inside and outside claimants in an underinvestment situation. They show that the repeating of this relationship a finite number of times does not improve the agency costs of the relationship. In other words, if the multi-period relationship simply involves replication of otherwise independent situations with no inter-temporal linkage, full agency costs of the one period
Another issue that the above analysis does not treat is the voting rights problem. It is assumed that all outside equity is non-voting. If this equity has voting rights then the manager will be concerned about its effect on his welfare of reducing his fractional ownership to the point where he loses control of the corporation. There are several issues linked with voting rights, such as contractual rights involved for both sides, the role of boards of directors, the coordination costs borne by debtholders in implementing policy changes. Voting rights are discussed extensively by Grossman & Hart (1988, One Share One Vote and the Market for Corporate Control); Harris & Raviv (1988, Corporate Control Contests and Capital Structure), Zingales (1995, What Determines the Value of Corporate Vote?); Franks & Nyborg (1996, Control Rights, Debt Structure, and the Loss of Private Benefits: The Case of UK Insolvency Code).

Harris & Raviv view financial leverage as an anti-takeover instrument because it affects the ownership distribution. Since common stock carries voting rights and debt does not, the debt-equity decision may affect the outcome of corporate votes and thus may partly determine who controls corporate resources.

In Harris and Raviv (1990) and Stulz (1990), managers disagree over an operating decision. In particular, in the Harris and Raviv managers are assumed to want always to continue the firm's current operation even if investors prefer the firm liquidation. In Stulz, managers are assumed to want always to invest all available funds even if paying out cash is better for investors, therefore creating an overinvestment conflict. In both cases, it is assumed that the conflict cannot be resolved through contracts based on cash flow and investment expenditures. Debt mitigates the problem in Harris and Raviv model by giving investors (debtholders) the option to force liquidation if cash flows are inadequate, whereas in Stulz, as in Jensen (1986), debt payments reduce free cash flow. The cost of debt in Stulz's model is that debt payment may more than exhaust free cash flow,
reducing the funds available for profitable investment (underinvestment).

The optimal capital structure in Harris and Raviv trades off improved liquidation decisions versus higher investigation costs. A larger debt level improves the liquidation decisions because it makes default more likely. In the absence of default, incumbent management is assumed not to liquidate the firm even if the assets are worth more in their next best alternative use. Following the default, however, investors control the liquidation decision, and they expend resources to obtain additional information pertinent to this decision. Since investors choose an optimal liquidation decision based on their information, default improves this decision. More frequent default, however, is more costly as resources are expended investigating the firm when it is in default.

Diamond (1989), and Hirshleifer and Thakor (1989) show how the managers or firms have an incentive to pursue relatively safe projects out of reputational considerations. Diamond's model is concerned with a firm's reputation for choosing projects that assure debt repayment. There are two possible investment projects: a safe, positive NPV project and a risky negative NPV project. The risky project can have one of two payoffs: success or failure. Both projects require the same initial investment, which must be funded by debt. A firm can be of three, initially observationally equivalent types. One type has access only to the safe project, one type has access only to the risky project and one has access to both. Since investors cannot distinguish the firms ex ante, the initial lending rate reflects their benefits about the projects chosen by firms on average. Returns from the safe project suffice to pay debtholders, but returns from the risky project allow payment only if the project is successful.

Because of the asset substitution problem, if a firm has a choice of projects, myopic maximisation of equity value would lead the firm to choose the risky project. However, if the firm can convince the lenders it has only the safe project, it will enjoy a lower lending rate. Since the investors can observe only
Ivuri Chapter 3: AT and Capital Structure

the firm's default history, it is possible for a firm to build a reputation for having only the safe project by not defaulting. The longer the firm's history of repaying its debt, the better is its reputation, the lower is its borrowing cost. Therefore, older, more, established firms find it optimal to choose the safe project, i.e. not to engage in asset substitution to avoid losing a valuable reputation. Young firms with little reputation choose the risky project. If they survive without default, they will eventually switch to the safe project. As a result, firms with long track records would have fewer default rates and lower costs of debt than those with brief histories. Although the amount of debt is fixed in Diamond's model, it is plausible that an extension of the model would yield the result that younger firms have less debt than older ones, other things equal.

Managers may also have an incentive to pursue relatively safe projects out of concern for their reputation. Hirshleifer and Thakor (1989) consider a manager who has the choice of two projects, each having two outcomes, success or failure. Failure means the same for both projects, but from the shareholder's point of view, the high - risk the high - return project yields both higher expected returns and higher returns if it succeeds. However, suppose that from the manager's reputation point of view, success in the two projects is equivalent, i.e. the managerial labour market can only distinguish success against failure. Thus the manager maximises probability of success while shareholders prefer expected return. If the safer project has a higher probability of success, the manager will choose it even if the other project is better for shareholders. This "play safe" behaviour of managers reduces the agency cost of debt. Thus, if managers are susceptible to such a reputation effect, the firm may be expected to have more debt than otherwise.

Jensen (1986) argued that since a firm's free cash can either be paid out as dividends to shareholders or retained by the firm, a conflict may arise between the concerned parties. Shareholders prefer to receive free cash as dividends while managers, whose compensation is tied to the firm's expansion, prefer to invest...
free cash in expanding the firm, sometimes beyond its optimal size. One way to reduce the free cash and overinvestment, is to increase the firm’s fixed obligations by increasing the use of debt financing.

Harris and Raviv (1990) presented a model based on the effect of the debt on the investors’ information about the firm in their ability to oversee managers. Managers prefer to perpetuate the firm’s existence even when it is in the best interest of the shareholders to liquidate. Furthermore, managers will not provide information that would lead investors to take control of the firm. Such conflict can be resolved by increasing the use of debt financing, since debtholders armed with the indentures of the loan agreement, will take over the firm in case of default. Therefore, increased use of debt financing provides investors with the option to liquidate or take control of the firm when it is in their best interest.

Maksimovic and Zechner (1991) argued that the characteristics of the projects’ cash flows are determined endogenously in an industry. So, capital structures that allow the firm’s shareholders to expropriate the bondholders’ wealth are not value-reducing in industry equilibrium in a reasonable setting. They also show that in the absence of taxes capital structure is irrelevant to individual firms. But with taxes capital structure becomes relevant.
3.4. Empirical Research

Chung (1993) examines the empirical relationship between firm’s assets characteristics and financial leverage, based on the hypothesis derived from the agency theory literature. His study includes 1449 firms (out of which 319 are in regulated industries) and covers a five year period (1980 – 1984).

In essence, his study showed that firms with large asset beta (ungeared beta) use less long- and short-term debt, which is consistent with the traditional notion that riskier firms would use less debt. The study also found an inverse association between firm’s non-systematic risk and long-term debt, i.e. a positive association between asset diversity and long term debt, which supports the joint hypothesis of managerial risk aversion and agency costs of debt arising from shareholder-debtholder conflict.

The firms with greater growth opportunities tend to use less debt, which is consistent with Myers’ under-investment hypothesis. Firms with a higher proportion of fixed assets tend to use more long-term debt, indicating that firms are matching maturities of their assets and liabilities. Finally, he concludes that regulation has a strong positive effect on the long-term debt capacity, which perhaps indicates lower agency costs of debt in regulated industries.

Fischer, Heinkel and Zechner (1989) examine empirically the terms of call provisions in a sample of 268 bonds. They show that in the absence of a call premium, equity holders have an incentive to recapitalise too early. This incentive arises from equityholders’ ability to transfer wealth from holders of a fixed coupon bond. This results in too frequent costly recapitalisation. Rational bondholders anticipate this behaviour and demand a higher coupon rate. They observe substantial variation in relative call premia across bonds, and find that bond risk significantly influences the chosen premium: the call premium increases with bond risk.
Kim and Sorensen (1986) attempt to empirically test for the presence of agency costs and their relation to the debt policy of the corporation. Using ANOVA and regression techniques on a sample of 168 firms (divided into three groups: low, medium and high inside ownership) for the years 1978, 1979, 1980, they found that firms with higher inside ownership have greater debt ratios than firms with lower inside ownership. This finding may be due to agency costs. Firms with high inside ownership (α) may issue debt so as to remain α firms because of costs of outside equity. Alternatively, more debt may be issued by high α firms because the agency costs of outside debt decline with ownership concentration. In addition, other regression results tend to confirm the theoretically optimal relationship put forward by Myers, that high growth firms use less debt rather than non-high growth firms, high operating risk firms use more debt and firm size appears to be uncorrelated the level of debt.

Agrawal and Knoeber (1996) examined seven control mechanisms which are used to control the agency problems between managers and shareholders. They are: insider shareholdings, institutional shareholdings, shareholdings by blockholders, the use of outsiders on the board of directors, debt financing, the external labour market for managers, and the market for corporate control.

They constructed a data set containing approximately 400 large firms. They found statistically significant relationships between firm performance, measured by Tobin’s q, and insider ownership, outside representation on the board of directors, debt financing, and corporate control activity. Greater insider ownership was positively correlated with performance, while more outsiders on the board, more debt financing, and greater corporate control activity were negatively correlated with performance. Except for board composition, their results were consistent with optimal use of each component.

Agrawal and Mandelker (1987) examined whether executive holdings of firm’s securities reduced agency problems between shareholders and management.
Specifically, they studied the relationship between stock and stock option holdings of executives and whether acquisition and financing decisions were made consistent with the interests of shareholders. In general, managers prefer lower risk acquisitions and lower debt financing. Their sample included 209 firms that participated in acquisitions and divestitures between 1974 and 1982. Consistent with agency ideas, executive security holdings were related to acquisition and financing decisions that were more consistent with shareholders' interests. That is, executive stockholdings appeared to co-align managerial preferences with those of the shareholders.

Friend and Hasbrouck (1988) re-examine in their paper the econometric relationship between the capital structure and theoretically relevant explanatory variables (asset structure, profitability, volatility, size) by adding in their analysis variables that measure one aspect of the special investment interests that insiders have in the continued viability of the corporation with which they are associated. By using such variables as the value of the maximum dollar investment in the stock of the company owned by a corporate insider and related measures of size of insiders' holdings, they investigate whether there is any systematic relationship between such insider holdings and the debt ratio, keeping constant other relevant variables. They found generally significant negative correlation between size of these holdings and the debt ratio, although these results were not completely uniform. This result was different from those found by other studies, i.e. a positive relationship between insiders ownership and financial gearing. They state that the larger the size of an insider's stock holdings the larger his special interest in the company and as a consequence the larger his desire to minimise capital structure and therefore the likelihood of financial distress. They found that using both shareholder and management optimisation variables, they still could explain only well under half of the variance of the debt ratio, with a relatively small proportion being explained by the specific management optimisation variables used. Their data covered the period 1974 – 1983.
3.5. Conclusions

The economic theory of agency focuses on contractual arrangements that provide an incentive to agents to invest the appropriate amount of efforts required by the objectives of the principal.

The financial theory of agency can be considered as an application of the economic theory of agency to contractual relationships in finance with the distinctive feature of an explicit consideration of financial markets (Barnea, Haugen & Senbet, 1985).

Agency problems that are considered in the financial literature originate from three sources. First, partial ownership of the firm by owner-managers may provide an incentive to consume perquisites beyond that which a sole owner would consume optimally. Second, the existence of debt financing under limited liability creates an incentive to shareholders to engage in high-risk activities that transfer wealth from debtholders to shareholders. Limited liability on previously issued debt may cause shareholders to forgo new profitable investments. Also, it may reduce the value of the firm when shareholder-debtholder disputes are resolved through the process of costly bankruptcy. Third, there is the problem of informational asymmetry. The problem arises when management, which is presumed to be acting in the interest of existing securityholders, attempts to raise additional capital from outsiders. Management possesses inside information on the future values of the firm, but it cannot convey the information to the market unambiguously because of a moral hazard problem. If management sells the securities to outsiders at undervalued prices, existing securityholders suffer a loss that can be viewed as an agency cost.

The agency problems of equity are associated with informational asymmetry and excessive perquisite consumption. The agency problems of debt are associated with these phenomena, as well as with risk incentive, investment incentive, and bankruptcy problems. The fixed nature of the debt claim, in conjunction with
limited liability, is the prime source of the risk incentive, investment incentive, and bankruptcy problems.

Agency theory has given rise to a whole body of research regarding the conflicts of interest between shareholders and debtholders, the role of management buyouts in reducing or / and resolving these conflicts, debt reconstructing, takeovers and acquisition models, growth opportunities.

Agency models have generated some interesting implications. These models predict that gearing is positively associated with:

a) firm value (Hirshleifer and Thakor (1989), Harris and Raviv (1990), Stulz (1990)),
b) default probability (Harris and Raviv (1990))
c) extent of regulation (Jensen and Meckling (1976), Stulz (1990))
d) free cash flow (Jensen 1986), Stulz (1990))
e) liquidation value (Williamson (1988), Harris and Raviv (1990))
f) managerial reputation (Hirshleifer and Thakor (1989))

and that gearing is negatively correlated with:

a) growth opportunities (Jensen and Meckling (1976), Stulz (1990))
b) interest coverage (Harris and Raviv (1990))
c) the cost of investigating firm prospects (Harris and Raviv (1990))
d) probability of reorganisation following default (Harris and Raviv (1990))
References


Ross, S., Westerfield, A. and Jaffe, J. (1998), Corporate Finance, Irwin McGrath-Hill, USA


Chapter 4

Asymmetric Information: Signalling and Adverse Selection, The Pecking Order Theory and Capital Structure

4.1 Introduction

The chapter discusses different theories of capital structure, which have been developed based on the asymmetric information argument, i.e. that managers have information that investors do not have. The main theories derived from this argument are the signalling model, the pecking order theory.

Signalling model is based on the idea that managers with favourable inside information about their firms have a clear incentive to somehow convey this information to outside investors, in order to increase the market value of shares. The rational of signalling models regarding debt is that debt can be used as a device to convey the inside information to the outsiders.

Pecking order approach differently focuses on the motivation of corporate managers, rather than on market valuation principles. The argument of the pecking order theory is based on the assumption that because of the information asymmetry the market would place a low value on common stock. Therefore, a way to avoid this underpricing is to use equity as last resort by using initially the retained earnings as a first source of financing followed by debt.

Section 4.2 provides discusses the asymmetric information issue and its use in the signalling models. Section 4.3 provides a general discussion of the pecking order theory. Section 4.4 summarises some other theories, which use the asymmetric information argument for explaining the debt use. Section 4.5 discusses the
empirical research carried out using the arguments discussed in the above mentioned chapters. Finally, Section 4.6 provides a summary of the main arguments analysed in the chapter.
4.2. Asymmetric Information: Signalling and Adverse Selection

All contributions to the asymmetric information approach share the common assumption that insiders of the firm have private information. They then discuss the implications of this assumption for the firm’s financial policy. The discussion developed from the earlier papers, which took managers’ incentives and even the firm’s real side (e.g., investment policies) as given, to more complex models and richer contractual structure.

An early contribution is the Ross (1977) paper on the “incentive signalling approach”, where he developed a signalling model of corporate capital structure based on asymmetric information problems between well-informed managers and poorly informed outside shareholders. This model and several ones that followed, (see John & Kalay (1982), John & Nachman (1985), John & Williams (1985), John & John (1993), John, Saunders & Senbet (1996), Narayanan (1988)), are based on the idea that corporate executives with favourable inside information about their firms have a clear incentive to somehow convey this positive information to outside investors, in order to increase the market price of shares. However, managers cannot simply announce that they have good news because every other manager has the incentive to do the same, and the market will be appropriately cautious towards any self-serving statement which can only be proved to be true as the time passes. One solution for this problem is for managers having “good news”, i.e. of high-value firms to signal it to the investors by taking some action that is prohibitively costly for the managers that have “bad news” i.e., of low-value firms to mimic. As defined in the economic literature, a signal is an action that imposes deadweight costs (higher probability of bankruptcy for low-value firms) on the signaler, in order to convey information about value to relatively poorly informed outsiders. The signal is credible if it is prohibitively costly for a weaker firm to attempt to mimic. Ross shows that it is
possible to design an incentive based compensation contract for managers of high value firms that will induce them to use a heavily leveraged capital structure for their companies. Less valuable companies are unwilling to assume so much debt because they are much more likely to fall into bankruptcy. Based on these assumptions, a separating equilibrium occurs where high value firms use more debt financing and less valuable companies rely more on equity. Investors are able to differentiate between high and low value firms by looking at their capital structure and are willing to assign higher valuations to highly levered firms. Since weaker firms are unwilling to mimic the stronger ones by borrowing extra debt, the equilibrium is enforced.

The main insights can be developed in a simpler version of Ross’s model. Consider two firms, A and B, with safe returns a and b at t = 1 where b < a. Denote the firms’ values at time t by $V_{tA}$ and $V_{tB}$, respectively, t = 0,1. Assume managers are subject to an incentive compensation scheme, M, and that they actually act to maximise M. It is given by:

$$M = (1+r)y_0V_0 + \begin{cases} V_t & \text{if } V_t \geq F \\ V_t - L & \text{if } V_t < F \end{cases}$$

where $V_0$ and $V_1$ are the respective values of the firm at time 0 and at time 1, and L denotes the penalty for the manager if the firm is bankrupt at time 1, $y_0$ and $y_1$ are fixed nonnegative weights, whereas r is the interest rate. Now denote by F the face value of debt and consider a critical level for F such that $b \leq F^* < a$. Then there exists a separating equilibrium in which investors use the level of debt as a signal to conclude that the firm is of type A whenever $F > F^*$ and of type B whenever $F \leq F^*$. Firms have face values of debt $F^A$ and $F^B$ such that $F^A > F^*$ and $F^B \leq F^*$. If a firm signals itself to be of type A and if it also sets $F^A \leq a$, so that it does not risk bankruptcy unnecessarily, then: $V_0 = V_0(F^A) = a / (1+r)$. Similarly a firm that gives type B signal by setting $F^B \leq b$ will have an initial value of $V_0(F^B) = b / (1+r)$. The compensation of the manager of the type A firm, then, will be given by $M^A = (y_0 + y_1)a$ and the compensation of the manager of type B firm will be $M^B = (y_0 + y_1)b$, and no manager has an incentive to deviate to the other.
firm's financial strategy. In order for this to happen, note that the manager of firm A would receive \( y_0 b + y_1 a \) if he deviated, which is clearly less than his equilibrium salary. Conversely, if the manager of firm B deviated, he would obtain \( y_0 a + y_1 (b - L) \). If:

\[
L > \frac{y_0}{y_1} (a - b)
\]

deviation to signal a higher type is not worthwhile. Hence, the manager of the higher return firm chooses a higher face value of debt. The manager of the lower value firm cannot imitate this because it would invoke a bankruptcy penalty \( L \) which is not compensated by the gain in the stock market's valuation at \( t = 0 \).

Ross acknowledges that financial signalling is only one possibility to communicate the firm's true value to the market. Another one would be a managerial contract which includes a liability of the manager \( L \) if profits fall short of the threshold level \( F^* \). Ross argues that such a liability may be more difficult (and expensive) to enforce than bonding via capital structure.

Although the signalling models are intuitively attractive, the observed patterns of capital structure suggest that they describe the actual behaviour poorly. As it has been shown in several studies, leverage ratios are negatively correlated with profitability in almost every industry - and not positively correlated as the signalling model suggests. The signalling model predicts that industries rich in growth options should use more debt than mature, tangible asset rich industries because growth companies have more severe information asymmetry problems and therefore, greater need to signal. In fact the opposite pattern is observed, tangible asset rich companies use far more debt than do growth companies arguably, because of the asset specificity problem, (discussed in Chapter 6).

On the other hand, the signalling model does explain the market reaction to security issues quite well. Typically, debt issues signal good news and are greeted with a positive share price response, and share issues signal bad news and
are met with a significant share price decrease (i.e., the market expects “dilution” of equity cash flows).

Leland and Pyle (1977) address a similar set of issues, but they consider the entrepreneurial firm and motivate capital structure choice by referring to the entrepreneur’s risk aversion. They consider an entrepreneur who has to raise $K$ in order to finance a project with end period return, $\mu + \varepsilon$. He can either issue riskless debt with face value $D$ or issue equity in the firm. He retains a fraction $\alpha$ of the equity. Assume the rate of interest on riskless debt is zero. Then the entrepreneur must raise:

$$ (1 - \alpha)(V(\alpha) - D) + D = K $$

where $V(\alpha)$ denotes the valuation of the firm by the market as a function of the fraction $\alpha$ retained by the entrepreneur. Hence, the higher the fraction of equity the entrepreneur retains the higher the amount of debt he has to raise. The entrepreneur is risk averse and maximises the expected utility of end of period wealth $Eu(W)$, which is given from:

$$ W = \alpha (\mu + \varepsilon - D) + (1 - \alpha)(V(\alpha) - D) $$

It can be shown that there exists a signalling equilibrium in which the amount of equity retained by the entrepreneur is increasing in the firm’s returns $\mu$ which are known to the entrepreneur but not to the market. Then the amount of equity $\alpha$ retained by the entrepreneur is regarded by the market as a signal of quality, and the valuation by the market increases in $\alpha$ c.f. “hostage posting” in transaction cost economics. No entrepreneur has an incentive to deviate from this equilibrium. He could choose a higher $\alpha$ in order to signal a higher value and obtain a higher valuation on the equity he sells. However, this would expose him to more of the specific risk of his project. Since entrepreneurs with better projects obtain a higher return on their fraction of retained equity, a higher $\alpha$ is less costly to them than entrepreneur with inferior projects. Hence, the signalling
equilibrium separates good and bad projects by the amount of retained equity. Leland and Pyle show that an entrepreneur’s willingness to invest in his own project can serve as a signal of project quality. They posit that: a) a project will be undertaken if, and only if, its true market value, given the expected return from the project, exceeds its cost. This implies that information transfer through signalling possesses a crucial efficiency property: the set of projects which are undertaken coincides with that set which would be undertaken if information could be communicated costlessly; b) an increase either in the specific risk of the project or in the risk aversion of the entrepreneur will reduce the entrepreneur’s equilibrium equity position, for any value of expected return at which the project is undertaken; c) an increase in the specific risk of the project results in lower expected utility for the entrepreneur, for any level of the expected return at which the project is undertaken. Thus projects which are “more distinct” (higher specific risk) from the market are relatively easier to signal, in the sense that they result in lower signalling costs in equilibrium; and d) for any level of expected return, greater project variance implies lower optimal debt, i.e., independent of possible bankruptcy costs, firms with riskier returns will have lower optimal debt levels.

In an informal discussion, Leland and Pyle relate their results to financial intermediation. In the market equilibrium, they say, entrepreneurs obtain fair terms of finance by communicating their project quality to the market by a high level of retained equity \( \alpha \). However, this way of communicating their private information is costly, since their utility is reduced by their exposure to the idiosyncratic risk of their project. Intermediaries (e.g., brokers in the venture capital markets) can be thought of as organisations which specialise in information acquisition and monitor entrepreneurs’ projects. They obtain knowledge about the projects at a cost and offer entrepreneurs better terms of finance than they would have received without the information. Their discussion shows that signalling equilibria are unsatisfactory, since they accept that the transmission of information is costly: separation happens because agents trade off
the signalling costs against the benefits of communicating the information differently (other than selecting the optimum level of $\alpha$). This always raises the question why this information cannot be communicated and verified more cheaply in a more direct way. The last question was taken up by literature on non-desipative signalling, which developed models of financial signalling that do not rely on sacrifices in the form of excessive risk exposure as in Leland and Pyle or penalties as in Ross.
4.3. The Pecking Order Theory

Myers and Majluf (1984) went beyond the focus of signalling models, which took the firm's investment policy as given, and analysed the interaction between financing and investment decisions in an environment with asymmetric information. They consider a firm which initially at \( t = 0 \) has assets in place and a growth option. The growth option is an investment opportunity which can be carried out at \( t = 1 \) and can be neither accelerated nor postponed. Returns are realised at \( t = 2 \). Returns are uncertain and are denoted by \( \bar{A} \) for the assets in place and by \( \bar{B} \) for the new investment (returns are net of investments). Realisations of these random variables are denoted respectively by \( A \) and \( B \). Their expected means are given as \( \mu_A \) and \( \mu_B \) respectively. At \( t = 0 \) there is symmetric information between managers and outside investors who all know the distribution of returns. At \( t = 1 \) managers, but not investors, learn the realisations \( A, B \) of the returns (i.e. the managers know the realisation \( B \), of \( B \), \textit{ex ante} at \( t = 1 \)), and update their values accordingly. Then managers decide whether to exercise the option to invest further. If they invest they have to raise an amount \( K \) in the financial markets, by issuing either debt or equity.

The important assumption driving the results is that managers maximise the value of the shares of existing shareholders, denoted by \( V \). They evaluate these shares given their private information, hence \( V \) will generally differ from the market's valuation of these shares, denoted by \( P \). Consider first the case of an equity issue. The value of the new equity issued at \( t = 1 \) is \( E \) and the total market value of the firm after issuing and investing the same amount raised is \( P + E \). If the option to invest is not exercised \( V = A \). If investment takes place, the total value of the firm is \( A + B \). Old shareholders receive a fraction \( P / (P+E) \) of this value, hence \( V = \{(P / (P+E)) (A +B)\} \). Since managers maximise the value of the stake owned by existing shareholders, they will invest if and only if:
Hence, managers invest if and only if the net present value of the project, $B$, exceeds a threshold which is strictly positive whenever $A$ is strictly positive. Specifically, if $B$ is positive but smaller than $(E/P)A$, the growth option will not be exercised. Hence, positive net present value projects are not realised. The intuition is that after the issue of new shares, old shareholders receive a share $P / (P + E)$ in the net present value of the new project $B$ in exchange for giving new shareholders a share $E / (E + P)$ in the returns on the assets in place. The assumption that managers maximise the value of the shares of old shareholders implies that managers invest if and only if the share that the existing shareholders receive in the new projects is worth more than the share they give up on assets in place. This is exactly reflected in the condition given above.

The important result implied by Myers and Majluf's analysis is known as the "pecking order theory" of financing. Their model is based on four assumptions about corporate finance behaviour: 1) Managers try at all costs to maintain a constant dollar-per-share dividend payment, and will neither decrease nor increase dividends in response to the fluctuations in current profits; 2) firms prefer internal financing (retained earnings and depreciation) to external financing of any sort, debt or equity; 3) if a firm must obtain external financing, it will chose the least risky security first; 4) as a firm is required to obtain external financing, it will work down the "pecking order" of securities, beginning with very safe debt, than progressing through more risky junior debt, convertible securities, preferred stock and finally common stock as the last resort.

This model focuses on the motivations of corporate managers, rather than on capital market valuation principles. Myers and Majluf make two key assumptions about corporate managers. First, they assume that the firm's managers know more about the company's current earnings and investment
opportunities than do outside investors and somehow they want to convey this information to the outsiders. Second, they assume that managers act in the best interests of the existing shareholders. The asymmetric information assumption implies that managers who develop or discover a marvellous new positive NPV investment opportunity are unable to convey that information to outside shareholders because the managers' statements will not be believed. After all, every management team has an incentive to announce excellent new projects in order to push up the firm's stock price, so that they can sell shares at an overestimated price. And, since investors are unable to verify these claims until long after the fact, they will assign a low average value to the stock of all firms and will buy new equity issues only at a large discount from their equilibrium values without the informational asymmetry. Corporate managers understand that, and sometimes will refuse positive NPV projects if this would mean issuing new equity, since this would give away to much of the project's value to the new shareholders at the expense of the old. So we have a situation where investors cannot trust managers, so they place a low value on common stock, and managers are forced to forego good investment opportunities because they cannot credibly convey their private information to the existing shareholders. Myers and Majluf's answer to this problem is for corporations to retain sufficient financial slack to fund positive NPV projects internally. Financial slack is defined as firm's cash and marketable securities holdings, as well as unused risk free debt capacity. Firms with sufficient financial slack will never have to issue risky debt or equity securities in order to finance their investment projects, and they are thus able to solve or avoid asymmetric information problems between managers and shareholders.

Pecking Order Theory explains several observed patterns of behaviour. Knowing that new equity issues are "punished" by the stock markets, managers will issue shares only if they are either forced to do so by an earnings shortfall or are voluntarily acting against the interest of the existing shareholders in order to enrich themselves. Note also that when common stock is issued, this is normally
by means of a “rights issue” allowing existing shareholders to buy at a discount (or else sell their “rights” in the market. In either case, this explains to some extent why leverage decreasing actions are associated with share price declines (see Mikkelsen and Partch 1986). On the other hand, the leverage increasing announcements indicate that the managers are confident enough about the firm’s future earnings power that they can increase corporate debt levels without impairing the firm’s ability to service its investment internally. Therefore, the stock market reacts positively to leverage increasing announcements (similar to the AT argument from asymmetry information).

Unfortunately, the Pecking Order Theory cannot explain all the capital structure regularities observed in practice. It suffers in comparison with the trade-off theory in its inability to explain how taxes, bankruptcy costs, security issuance costs, and an individual firm’s investment opportunity set influence the company’s actual debt ratio. The theory ignores significant agency problems that can easily arise when the firm’s managers accumulate so much financial slack that they become immune to the market discipline (Megginson 1995, chapter 7). This can happen when a firm does not need to raise external funds, and therefore cannot be penalised by the market through a low security price, and has accumulated so much financial slack that its managers are immune to forced removal via a hostile acquisition.

Myers and Majluf’s analysis has subsequently been criticised and extended. Two discussion should be mentioned here. Dybvig and Zender (1991) discuss the role of the specific assumption about managerial incentives by explicitly introducing a managerial contract negotiated between the old shareholders, at \( t = 0 \), and managers. They observe that the managers’ incentives in the Myers / Majluf model amount to maximising the share price at the end of the second period. However, when shareholders choose the capital structure and negotiate the incentive contract with managers at \( t = 0 \), they maximise the value of the firm at this point in time, which under the assumption of all equity financing amounts to
maximising the share price at $t = 0$. From the point of view of initial shareholders, it is optimal to give managers incentives which induce them to implement all and only positive net present value projects. If managers are risk neutral, this can be achieved by giving them a linear compensation contract which is contingent on total cumulative earnings at $t = 2$, and does not depend on the stock price, in particular not on the price at $t = 1$. Such a contract cannot be ruled out, since it is contingent on exactly the same variables as financing contracts, whose payoffs depend on second period earnings (one theme of their article is that optimal contracting is independent of financing because using market prices one cannot improve on contracts that already exploit the public information on which the market prices are based). Myers and Majluf obtain a different result only because they make managers arbitrarily interested in the stock price at an intermediate date, $t = 1$. However, when managerial contracts are optimally chosen the first best investment rule is implemented. On the basis of this argument Dybvig and Zender show that the capital structure and dividend payout policy are irrelevant in a model with endogenous investment and asymmetric information if managerial contracts can be chosen independently of financing contracts. However, the assumption that managers are risk-neutral is quite a strong one.

Another criticism of Myers and Majluf's results was formulated by Brennan and Kraus (1987) who considered a wider range of financing possibilities. Their results contrast also with the earlier literature on signalling, because they show that signalling with the capital structure can be costless. Brennan and Kraus consider a market in which firms who have private information about their future income streams issue securities. Managers are interested in minimising financing costs, based on their private information. This implies that they prefer to issue those securities which are valued higher by the market. The authors show that a separating equilibrium in this market has the property that all the claims are priced according to the 'lemons principle', namely, the market prices each security under the supposition that is issued by that firm for which it is worth least
and that the supposition is correct. They give an example in which a firm can be either in a good or a bad state and show that each firm reveals its type costlessly. In the good state, the existing debt of the firm is assumed to be riskless. Then the firm retires debt and issues equity. In the bad state debt would be risky and accordingly have a lower value. In this state the firm would retire all the debt and issue equity. This is an equilibrium because the firm has never an incentive to deviate from this strategy and all securities are fairly priced since the stock market learns the state from the financing method chosen. In the good state, the firm does not finance only with equity, because the market would conclude that the bad state has occurred and the shares issued would be underpriced. Conversely, in the bad state, the firm does not retire all debt, because the market would conclude that the state is good and overvalue debt, causing a loss for the firm. Hence, in this equilibrium all firms obtain fair terms of finance and no firm has an incentive to mimic another type. As a consequence, all and only positive net present value projects are implemented, contradicting Myers and Majluf's results.

The literature which puts asymmetric information at the core of capital structure theory analysed financing methods as a way to communicate the private information of company insiders to the markets for financial instruments. The earlier papers concluded that asymmetric information leads to efficiency losses, because credible communication of private information requires deviations from the optimal allocation of risk or optimal investment policy. The criticisms discussed above have shown that the costly signalling and adverse selection results are somewhat fragile, since moderate changes in the contractual framework (introduction of optimal managerial contracts or more complex financing arrangements) can reduce or eliminate these costs, and the claim that these alternatives cause higher transaction costs is not convincing. Moreover, the asymmetric information approach to financial contracts focuses exclusively on income streams and does not even raise the question of control rights associated with securities. Hart (1991) remarks that a simple and common institution such as senior debt cannot be understood from an asymmetric information point of view.
view, an argument which could most probably be extended to voting rights of equity shares.

Nonetheless, the Pecking Order Theory of capital structure seems to explain certain aspects of observed corporate behaviour better than some other models, and this particularly true of corporate financing choices, i.e. what type of securities firms choose to issue, and market response to the type of security issues.
4.4. Some Other Theoretical Treatments of Capital Structure

Grossman and Hart's (1982) bonding theory of capital structure relies on the notion that equity finance gives the manager more scope for consuming perquisites than debt finance. However, in their model the benefit of debt finance is not related to the fraction of inside equity held by the manager and the notion of asset substitution is absent. They assume that the owner-manager can consume the funds intended for investment if creditors cannot exercise control over the firm, which they do only if bankruptcy occurs. If managers do not seek high profits, the probability that the corporation will go bankrupt increases. If the benefits managers receive from the firm are lost in the event of bankruptcy, managers may prefer to maximise profits or come close to it rather than to risk sacrificing their perquisites. Thus, the managers trade off the utility of consuming some of the wealth and the probability of being bankrupt. Therefore, issuing debt rather than equity gives managers an incentive to invest more funds so as to avoid bankruptcy. In this sense, the capital structure acts as a bonding device. Grossman and Hart combine an agency problem similar to Jensen and Meckling (1976) (consumption of perquisites) with a signalling equilibrium, in which the debt level signals the unobservable production decision taken by managers.

Jensen (1986) expanded on the issue of management's deviations from optimal investment policies and perquisite consumption raised in Jensen and Meckling (1976). He pointed out that managers tend to use cash available in the firm for investing in new projects, and prefer investment in negative net present value projects over passing on excess funds ("free cash flow") to shareholders. Hence, in mature industries where firms generate large cash flows, but have only few growth opportunities, managers tend to overinvest and diversify into industries in which they have little knowledge. By issuing debt in exchange for stock, managers are bonding their promise to pay future cash flows in a way that cannot be accomplished by simple dividend increases. Jensen calls this the "control hypothesis" for debt creation. Debt creation, without retention of the proceeds of
the issue, enables managers to effectively bond their promise to pay out future cash flows. Thus, debt can be an effective substitute for dividends. He continues with some evidence in the use of free cash flow theory in explaining financial restructuring, leveraged buyouts and "going private" transactions (equity buybacks).

Harris and Raviv (1990) developed a theory of debt based on the idea that assets have alternative uses outside the firm, but managers are reluctant to give up control. Suppose the firm has stochastic income $x$ at $t = 1$ and its assets have value $L$ and $V$ outside and inside the firm, respectively. Outsiders do not learn $x$ or $V$ and managers resist liquidation in order to realise a higher outside value if $L > V$; hence, they do not disclose the relevant information. Debt with face value $D$ serves to increase firm value because it forces control into the hands of outsiders whenever $x < D$. Then the firm defaults and outsiders investigate the firm. They incur investigation costs and learn $V$ and $x$. They then decide whether to continue or liquidate the firm. Since liquidation is more likely to be the optimal policy in lower states, standard debt is an optimal contract and the optimal debt level trades off the costs of investigating the firm against the gains from an improved liquidation decision.

Myers (1977) identified another cost of debt finance for firms which have growth opportunities. Suppose a firm is levered and has promised $F$ to creditors. It has an investment opportunity which has a present value $V$ and requires an initial outlay $I$. It will be impossible to finance this project if $V - F > I > V$ because shareholders cannot recover their initial outlay $I$ if they finance the project as a part of the return goes to debtholders. Hart (1991) has criticised Myers because he does not explain why firms use senior debt to begin with: the tax savings to which he refers can also be obtained with subordinate debt. Hart and Moore (1989) have extended this analysis and combined it with Jensen’s (1986) notion of overinvestment from free cash flow. By extending the theory in a dynamic setting, they derive an optimal maturity and seniority structure of debt from the
need to control simultaneously the overinvestment problem (Jensen) and underinvestment (Myers).

The common point of the agency approach to capital structure and the property rights theory is in that they both emphasise conflicts of interests and the way in which the contractual set up of the firm aids conflict resolution. The following table gives an overview over the kind of conflicts considered which lead to costs and benefits from debt, and identifies the trade off which determines the optimal capital structure.

<table>
<thead>
<tr>
<th></th>
<th>BENEFITS OF DEBT</th>
<th>COSTS OF DEBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jensen and Meckling</td>
<td>Increase the managers equity share and limit diluting private benefits (perquisites)</td>
<td>Risk shifting (asset substitution)</td>
</tr>
<tr>
<td>(1976)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jensen (1986)</td>
<td>Limit diluting private benefit (overinvestment)</td>
<td>Unspecified</td>
</tr>
<tr>
<td>Grossman and Hart</td>
<td>Gives entrepreneurs the incentive to use borrowed funds for investment</td>
<td>Loss of control rents (consumption of borrowed funds)</td>
</tr>
<tr>
<td>(1977)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myers (1977)</td>
<td>Tax benefits</td>
<td>Underinvestment in growth opportunities</td>
</tr>
<tr>
<td>Hart and Moore (1989)</td>
<td>Limit Overinvestment</td>
<td>Underinvestment</td>
</tr>
<tr>
<td>Harris and Raviv (1990)</td>
<td>Generates information about profitability</td>
<td>Investigation costs</td>
</tr>
<tr>
<td>Stulz (1991)</td>
<td>Reduce free cash (overinvestment)</td>
<td>Underinvestment</td>
</tr>
</tbody>
</table>

Table 4.1. A summary of costs and benefits of debt identified by different studies

Managers, equity holders, and bondholders have potentially conflicting views about the optimal production plan of the firm between which the optimal combination of securities in the capital structure strikes a balance.

Conflicts of interest are analysed from an incentive point of view, where incentives are determined by income streams which are shared between managers and outside investors. The analysis of these conflicts of interest resembles, then, a principal-agent model in which capital structure assumes the role of a profit-contingent compensation scheme for the agent, again raising the question of why a direct incentive contract for the manager is not chosen. The formal literature
following Jensen and Meckling reviewed here has neglected the allocation of control rights as one dimension of securities and corporate capital structure. From this point of view, the agency literature shares the shortcomings of the asymmetric information literature discussed above. Fama and Jensen (1983) have, however, discussed the issues of corporate governance, control rights and the structure of decision making. These papers give a more extensive discussion of property rights and the structures of decision making in a corporation.
4.5. Empirical Research

Donaldson (1961) conducted a survey of how the managers choose their sources of funds. His findings were:

1) Firms prefer to use internally generated funds to finance projects. Such generated funds represent the accumulation of retained earnings, depreciation and depletion expenses.

2) Dividend payout ratios are determined based on expected future earnings and cash flows. That is, the payout ratio is set such that the expected retaining earnings cover the expected investments, under normal conditions.

3) Dividends are sticky. Managers hold dollar dividend payout constant in the short-run. In addition, they avoid reducing dividends whenever possible.

4) Whenever a firm has retained earnings in excess of what is needed for planned investments, it will invest these funds in marketable securities, rather than increasing the dividend.¹

5) In cases where firms need external sources of funds to finance an investment, debt is preferred to equity. Firms use equity financing only as a last resort.

Baskin (1989) suggested that the pecking order hypothesis appears to describe corporate practice. He used regression-based econometrics to distinguish between the pecking order behaviour and the static optimal capital structure (trade-off) theory. A sample of 378 firms from the 1960 Fortune 500 that were still available in COMPUSTAT in 1984 was used. The results confirmed the basic pattern of correlation that is consistent with the pecking order theory, and it was shown that the small positive serial correlation in debt financing disappears once the effect of profitability, growth and dividend policy are controlled for. The alternative theory of static optimal capital structure seems to have little power in explaining corporate behaviour.

¹ More recently share repurchases have become quite common as a use of excess funds, especially in jurisdictions which allow "treasury stock" to be sold.
Norton (1991) used a survey instrument designed to examine the motivations, behaviour and beliefs that guide capital structure decisions of small firms. Only 110 out of 405 such survey instruments received from small, high-growth corporations, were usable. The survey questions were derived from various strands of the theoretical financial literature on capital structure. The results showed that, contrary to mainstream financial theory, factors dealing with bankruptcy costs, agency costs and information asymmetry have little effect, if any, on the capital structure policy of such firms. In fact, he concluded that these factors "...are a concern only to firms living on the edge, e.g. large firms experiencing financial problems or firms with an inadequate track record". The responses showed that financial officers in the sample followed a "pecking order" when choosing their sources of funds. In financing assets, internally generated cash was used as much as possible and in the cases where external financing is needed, debt is used to raise funds and equity instruments are issued as a last resort.

Griner and Gordon (1995) used subsets of Fortune 500 companies in each of the years 1985 to 1988 to test the pecking order and managerial hypotheses, i.e. managers who have a small ownership stake in the firm use internal cash flows to undertake a level of capital expenditures higher than that which would maximise the wealth of current shareholders. The bivariate analysis of capital expenditures and internal cash flows confirmed the prediction of both theories that internal cash flow is an important determinant of capital expenditure levels. The analysis also showed an inverse curvilinear association between capital expenditures and insider ownership. The multivariate analysis confirmed that internal cash flow is an important determinant of capital expenditure levels. However, the most important finding was that there no association between capital expenditures and insider ownership, in any of the years, after controlling for other determinants of capital expenditures. The conclusion was that the reliance on internal cash flow is not caused by conflicts between managers and existing shareholders, but rather is a consequence of information asymmetries between managers and potential new
shareholders. Hence, using internal cash flows is, ceteris paribus, wealth maximising for existing shareholders when compared to issuing debt. (However, that would not explain the use of cash flow rather than debt).

Adedeji (1998), in his study of 224 U.K. firms over the period 1993 - 1996, concludes that there is a negative relationship between the dividend payout ratio and investment. He also concludes that there is a positive association between the dividend payout ratio and gearing. However, there is no significant correlation between gearing and investments. Although investments have a positive influence on gearing, the opposite does not hold. The results are similar to the previous evidence on pecking order theory, asymmetric information and dividend policy.

A very important empirical research particularly relevant to the empirical study of this research is that of Shyam-Sunder and Myers (1999) where they tested the static trade-off model against the alternative of the pecking order model of corporate financing in their study of 157 firms over the 1971 - 1989 period.

They based their pecking order model on the idea that when a firm's cash flows are inadequate for its real investment and dividend commitments, the firm issues debt. Equity is never issued, except possibly when firms can only issue junk debt and costs of financial distress are high. According to their model the firms borrowing behaviour would depend on the amount of deficit or surplus of available cash flows. They calculated this deficit/surplus as the difference between operating cash flows and dividend, capital expenditures, net increase in working capital and the current portion of long-term debt. Finally they regressed the first differences in debt (the amount of debt issued or retired) against the deficit/surplus in cash flows.

Their static trade-off model was based on the idea that managers seek optimal capital structure. Random events would bump them away from it, and they
would than have to work gradually back. If the optimum debt ratio is stable, we would see mean reverting behaviour. They target adjustment model stated that changes in the debt ratios are explained by the deviations of the current ratio from the target. The proxy target debt ratio they used was the historical mean of the debt ratio for each firm.

They concluded that the pecking order is an excellent first order descriptor of corporate finance behaviour. The target adjustment model, when tested separately seems to perform well. When the two models are tested jointly, the coefficients and the significance of the pecking order change hardly at all, whereas the performance of the target adjustment model degrades. The strong performance of the pecking order does not occur just because firms fund unanticipated cash needs with debt in the short run. Their results suggest that firms plan to finance the deficit with debt.

They tested the statistical power of their test through a Monte Carlo simulation on hypothetical data. They found that the target adjustment model appear to explain financing decisions when underlying behaviour is purely pecking order. Based on this result they concluded although there is mean reversion in the sample companies' debt ratios, but that does not mean that companies were issuing and retiring debt to move toward an optimal target debt ratio. Mean reversion in debt ratios can generate spuriously good fits, and significant coefficients for target-adjustment models, even when the mean reversion has nothing with optimal debt ratios, but simply reflects pecking order financing coupled with cycles or mean-reversion in financial deficits or surpluses.

The effect of the financing decision on securities' prices was also evaluated by Krasker (1986). He confirmed the results founded by Myers / Majluf by allowing the firm to vary the size of the investment. He found that the larger the stock issue the worse the price effect on existing common stock.
Mikkelson and Partch (1986) analysed the stock price effects of various types of financing events undertaken by a set of 360 companies in the period 1972 through 1982. On average they found a negative, statistically significant stock price response to the announcement of common stock and convertible debt offerings. The average price reaction to the announcement of preferred stock, straight debt, private placements of debt and term loans is small and non-significant at the 0.10 level. The average price response to the announcement of credit agreements is positive.

Cheung & Krinsky (1994) investigated the alleged underpricing in initial public offerings (IPOs) caused by the information asymmetry between the investment banker and the issuer. They reported that their results in general failed to support the IPO underpricing hypothesis. When the underpricing was asserted it appeared to be a short run phenomenon (that might mean that "stags" in IPOs get their profits quickly).

Shah (1994) investigated the effect of pure capital structure in firms and found that leverage increases and decreases convey qualitative different information. Leverage increases appear to lower the investors' assessment of the risk of the firm's stock but not their expectations of cash flow. Leverage decreases appear to lower the investors' assessment of cash flows but not their assessment of risk. He also concluded that increases in leverage do not explain the information content or the information asymmetry of the issue.

Beatty, Riffe and Welch (1997) assess the future net capital expenditures for a broad cross-section of COMPUSTAT firms from 1973 - 1989. They explore three general categories of factors expected to influence investment: external equity financing, internally generated accounting information and tax incentives. They find that external financing and information play a role in that both positive stock returns and equity issues indicate future increases in investments.
Accounting information about internal sources and uses of funds is also important in the investment decision.

Davies and Brucato (1987) examined the role that property rights play in explaining differences in economic behaviour in the Australian Banking Industry for the period 1962 - 1978. This industry is characterised by firms with distinctly different forms of ownership: those with non-transferable public ownership by taxpayers and those with transferable private ownership. The results of their analysis of these ownership differences support the general implications of property rights analysis. They found first, that the management of publicly owned banks prefers less risk, which leads to a lower expected return on assets, when managing the bank's assets. This conclusion is supported by the lower percentage of commercial loans and higher percentage of Australian public securities the publicly-owned bank holds relative to the private banks. Second, private banks show greater profitability than the publicly-owned bank. The results of the equations showing greater profits per assets and profits per deposit for the private banks as well as the finding showing higher net earnings per employee support this conclusion.
4.6 Conclusions

The main predictions of the asymmetric information and signalling theories concern stock price reactions to issues and exchange of securities, the amount of leverage and whether firms observe a pecking order for security issues.

Stock Price Effect of Security Issues:


Stock Price Effects: replacement of debt with equity and vice-versa.

Debt: Increasing Offers: Constantinides and Grundy (1989) predict a positive stock price reaction that is larger, the larger the exchange.

Equity: Brennan and Kraus (1987) predict a positive stock price reaction.

Is there a Pecking Order?


No: Brennan and Kraus (1987), Noe (1988) dispute the pecking order results in models similar to that of Myers and Majluf. Other signalling models, such as Ross (1977), Leland and Pyle (1977), and Heinkel (1982) do not obtain a pecking order result.

Leverage

correlation between leverage and firm value, while Leland and Pyle (1977) predict a positive correlation between value and the proportion of equity held by insiders.
References


Chapter 5

The Property Rights Theory and Capital Structure.

5.1. Introduction

The view held by proponents of the property rights approach is that a firm can be defined by its non-human assets and the allocation of property right to these assets. Property rights can be defined as the rights to return streams and the rights to make strategic decisions in contingencies not explicitly contracted upon (Grossman and Hart, 1986). Property rights include the right to determine how assets are used (control rights), the rights to the cash flows generated by these assets (return rights) as well as the right to sell these rights (Alchian and Demsetz, 1972).

State-contingent control rights are important in financial contracting; one party may be in control when the firm is doing well, while another takes over in financial distress. According to the recent property rights research, property rights to corporate assets are specified in the firm’s financial contracts. The firm’s capital structure here refers to both the composition of different types of financial contracts (e.g., debt and equity) and the distribution of these contracts among investors (e.g., between an entrepreneur and an external investor). The property rights literature regards financial instruments as commitment devices and focuses on the control aspects of these instruments. These instruments are viewed as defining both the allocation of rights to the return streams and residual control rights.

A brief description of the property rights approach and its application to capital
structure is given in Sections 5.2 and 5.3 respectively. Section 5.4 provides a
general evaluation of property rights approach. The main topics discussed in this
chapter are summarised in Section 5.5.
5.2. The Property Rights Theory of the Firm.

The key question addressed by the property rights approach to the theory of the firm is: what defines the boundaries of the firm? That is, why are some transactions carried out through the market and contracts relating to particular transactions, and why are the others carried out within the organisation? This question can be traced back at least to Coase's (1937) seminal article. He observed that the market transactions involve costs of haggling and bargaining over the terms of the contract. These transaction costs can be reduced by making both parties to a contract part of the same organisation in which a central authority gives instructions about the transactions to be carried out. These savings would be particularly significant for economic relationships which are repeated. On the other hand, concentrating many transactions in one firm and subsuming them under the authority of one central body leads to inefficiencies due to errors and the rigidities of large organisation. The optimal size of the firm is then decided from this trade-off. This analysis has been criticised (Hart, 1989) because it does not answer the question of when and why the cost of supervising the execution of instruction by central authorities, and the friction internal to the firm, results in lower costs than the bargaining over contracts in the market. The same question has been posed by Williamson in his TCE treatment (see Chapter 6).

Grossman and Hart (1986), Hart and Moore (1990) and Hart (1996) took this analysis a step further to build a theory, which explains the existence as well as the boundaries of the firm from the overriding principle. Their firm for this theory is defined as a collection of specific non-human assets. Since the aim is to develop a theory of ownership and control over assets, the definition does not include human assets over which, absent slavery, no control or ownership can be transferred. Ownership is defined as the residual right of control over these assets, where “residual” refers to all the rights which have not been specifically transferred in any other contract. This concept is related to the assumption that
contracts are incomplete, in the sense that they do not specify all decisions and trades of the contracting parties for all future contingencies. Specifying such a contract would be very costly, and generally would only specify trades and decisions for some events and will allocate the right to make decisions for all other events in a summary way to one party, who is than said to exercise residual rights control. The theory does not distinguish between ownership and control.

As a consequence, agents will reassess the situation at a latter date and negotiate the terms of trade for those contingencies, for which no prior contract was specified (or even re-negotiate an initial contract if it exists): incomplete contracts lead to ex post bargaining between the contracting parties.

In order to develop these concepts, consider a highly stylised economy with two assets, denoted A and B, and two agents, denoted 1 and 2. At date \( t = 0 \) a contracting opportunity between these two agents arises. Both agents have to undertake relationship-specific investments, which are assumed to be entirely in human capital. These are denoted by \( h_i \), \( i = 1, 2 \) and are not contractible in the following sense: both agents can observe each other’s investment. However, no third agent, say a court, can observe them. Therefore, no contract contingent on \( h_i \) can be enforced, in particular, no compensation payment between the two agents can depend on it. The investment costs are given by a function \( C_i(h_i) \). At date \( t = 1 \), all uncertainty is resolved and agents take further decisions and execute trades. The decisions required by each agent at \( t = 1 \) are summarised in some vector \( d_i \). These decisions are also not contractible at time \( t = 0 \), since they are too complicated to be specified for all states. However, at \( t = 1 \), uncertainty is resolved and contracts are not contingent. Hence assume that all elements of \( d_i \) are contractible at \( t = 1 \). Then contracts are signed and executed, the surplus is realised and shared. This sharing of surplus is part of the re-negotiation of the initial contract which takes place at \( t = 1 \). Events are summarised in the following time-line:
In order to interpret the results of this model, it is important to understand the interaction between the bargaining outcome at $t = 1$ and incentives for investment.

Bargaining over the surplus generated by a trade takes place between all parties which are essential, in the sense that they can stop these trades from taking place if they withdraw their asset. This explains the focus on specific assets. Non-specific assets are readily available on the market. They are fungible and give their owners no bargaining power, whereas specific assets are not easily substituted and give their owners bargaining powers. ((Grossman and Hart's, (1986, p 710) give the example of an insurance agent)). However, the share of surplus an agent can obtain in bargaining will directly influence his incentives to undertake relationship specific investments.

This leads to the conclusion that, as a rule, agents whose investments are important for a trade should be also given the specific assets, since this gives them a stronger *ex post* bargaining position and hence better incentives to invest. On the other hand, agents whose investment is less important for a trade should not be given ownership over assets which give them bargaining power. They would extract parts of the surplus and dilute the incentives to other agents whose investments are more important.

The last insight is crucial for understanding why the theory provides a criterion for the limits of the firm. If activities which require investments by two agents,
say, are grouped under one owner, then the incentives of the other agent are reduced and he will invest less than if he had at least one of the assets. The main results of this analysis are: 1) complementary assets should be owned together; 2) independent activities should be grouped in different firms; and 3) if only one agent makes important, non-verifiable investments, he should also own the assets. Hence, the boundaries of the firm are given by the trade-off between the gains from co-ordination (agents who make specific investments cannot be held up by others who are less important), and the costs of large organisations and bureaucracies (the lower incentives to invest for a non-owner agent).
5.3. The Property Rights Approach to Financial Contracting

The previous analysis has motivated the incompleteness of contracts by referring to unforeseen contingencies and states, which are difficult to describe *ex ante*. However, the model is non-stochastic and there is no further reference to different states of the world. This leaves to spot contracts at $t = 1$ the filling of gaps in the original contract and the sharing of the surplus arising from any trade taking place. This was sufficient for giving answers about the question on the limits of the firm and on the optimal degree of integration (e.g., vertical integration). A further and important aspect of ownership and contracting is the incorporation of new information, which is of particular importance for the analysis of financial contracts. This aspect of the property rights theory is better understood in a framework with an explicit stochastic structure in which at least some of the variables (e.g., money income, payments to creditors) are verifiable.

Aghion and Bolton (1992) discuss a model of this kind in which they show how securities can implement such a contingent control structure. They consider an environment in which an entrepreneur (manager), who has no wealth of his own, has to raise an amount $K$ in order to finance a project, which also requires an action $a$. This action cannot be specified in a long-term contract. At a latter date, $t = 1$, first period profits $y_1$ are realised and the project can be either in a good or in a bad state $\theta$. The state $\theta$ is not verifiable and hence no contract can be written on it, but first period income $y_1$ is correlated with the state. Then the action is taken by the party who is in charge and finally second period income $y_2$ is realised. The sequence of events is displayed in Figure 5.2.

<table>
<thead>
<tr>
<th>$t = 0$</th>
<th>$t = 1$</th>
<th>$t = 2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment and Initial Contract</td>
<td>Realisation of State $\theta$ and Profits $y_1$</td>
<td>Action $a$ is taken</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Realisation of Profits $y_2$</td>
</tr>
</tbody>
</table>

Figure 5.2. Sequence of events at time $t = 0, 1, 2$ of financial contracting under the property rights approach.
The entrepreneur suffers a utility loss $l$ which depends on action $a$. Actions differ in terms of private utility loss, and since only the entrepreneur cares about private utility loss, there could be a conflict as to the choice of action. For example, the entrepreneur may prefer action plan \{a_2, a_2\}, i.e., to always take a low private utility loss action $a_2$. The external investor, on the other hand, may prefer $\{a_1, a_1\}$. In this case the two parties have directly conflicting interests. Both the investor and the entrepreneur are risk neutral. Assume the second period profits satisfy the following:

$$E(y_2 | a_2; \theta_g) - l(a_2) > E(y_2 | a_1; \theta_g) - l(a_1)$$  \hspace{1cm} (i)
$$E(y_2 | a_2; \theta_g) < E(y_2 | a_1; \theta_g)$$  \hspace{1cm} (ii)

$$E(y_2 | a_2; \theta_b) - l(a_2) < E(y_2 | a_1; \theta_b) - l(a_1)$$  \hspace{1cm} (iii)
$$E(y_2 | a_2; \theta_b) < E(y_2 | a_1; \theta_b)$$  \hspace{1cm} (iv)

where: $E(y_2 | a_2; \theta_g)$ and $E(y_2 | a_2; \theta_b)$ are the expected values of security benefits associated with action $a_i$ in good and bad states ($\theta_g$ and $\theta_b$), respectively. The term $l(a_i)$ represents the private utility loss associated with action $a_i$. Condition (i) says that total benefits (the sum of monetary returns and utility loss) are higher for action $a_2$ than for $a_1$ for good states of nature, while the reverse is true in bad states of nature (condition (iii)). According to conditions (ii) and (iv) action $a_1$ always produces higher monetary returns, whereas action $a_2$ always results in lower private utility loss, i.e., $l(a_2) < l(a_1)$.

The overall surplus is maximised if action $a_1$ is taken in the bad state and $a_2$ is taken in the good state. However, outside investors always prefer action $a_1$ since they are only interested in monetary returns and not in the utility loss of the entrepreneur. Observe that the conditions imply that $l(a_1) > l(a_2)$, hence the entrepreneur would always choose $a_2$ and there is a complete conflict of interests.

Suppose now the project is financed with voting equity. Than outside investors have all the control rights at $t = 1$ and action $a_i$ is chosen in all states, thereby
imposing too high an utility loss on the entrepreneur. On the other hand, if the entrepreneur issues non-voting equity, he will always be in control and choose action \( a_2 \), since he is only interested in the utility loss, not in the monetary returns. Now, suppose for simplicity that \( y_1 \) and \( \theta \) are perfectly correlated such that \( y_1(\theta_b) < y_1(\theta_g) \), or that they are treated as such for contracting purposes, i.e. \( y_1 \) high is treated as a proxy for \( \theta_g \), etc. Then the optimal solution can be implemented by a debt contract which matures at \( t = 1 \) and has a face value of \( R_1 \) where \( y_1(\theta_b) < R_1 < y_1(\theta_g) \). Then the entrepreneur will be in control in the good state where he can pay back his debts and choose \( a_2 \). In the bad state he defaults and creditors take control and select action \( a_1 \). Hence, even though action is not contractible, it is implemented via a control structure, which allocates decision making rights to that party which has the appropriate incentives.

The important new aspect of the explicit stochastic structure of the model is that the optimal control structure is stochastic: in one state (here the bad state), control by an outsider (creditor) is optimal. In the other (good) state, control by an insider is optimal. This dominates any deterministic control structure. (c.f. Williamson's "dequity" but without the "selective intervention problem"). The key insight is that the security structure, (here standard debt plus equity owned by the entrepreneur), can implement such a stochastic control structure over the assets, and new information becoming available at date \( t = 1 \) is used optimally in the sense that the ownership of the firm, and hence the decision making structure, adjust optimally in the light of this information.

The property rights theory of the firm, and the related approach to financial contracting, analyse the questions of ownership and contract design. They start from the observation that contracts are incomplete: agents find it cheaper to allocate control rights in a summary way than to specify and monitor actions for all future contingencies. This implies that some actions remain unspecified, and the initial contract lays down only the procedure by which decisions are made in the future, and how parties to the contract resolve conflicting views about the
course of action. This situation poses two key problems. Firstly, investments and actions, which are relationship-specific, have to be protected and rewarded in the future, hence some initial contractual arrangement must be made. Secondly, actions have to be taken in the light of information, which arrives in the future. A complete contract would assign the optimal action to each state. However, if either the state or the action is too complex to be described ex ante, they cannot be part of the initial contract and the link between actions and states must be implemented in another way. The literature has analysed two ways in which incomplete contracts can provide for an optimal adaptation of decisions to a changed environment:

Stochastic control structures allocate control to agents according to some verifiable state; actions can then be taken by different agents in different states, thereby invoking optimal state contingent decisions. This is useful if the state can be described in the contract, but the action cannot.

Re-negotiation of the initial contract under terms which are part of the original contract; then even information which is not verifiable by a third party can be used, because the outcome of ex post bargaining depends on it. Re-negotiation design is useful if the action can be described in the initial contract, but the state cannot.

Hence, stochastic control structure (e.g., securities) and re-negotiation design are complementary means of linking actions and states.

The property rights theory looks at securities in this light: they are state contingent, in that they refer to stochastic variables (profits, payments to investors), and they allocate control rights which invoke future re-negotiations of the initial contractual structure.
5. 4. The Property Rights Approach to Capital Structure –
An Evaluation

The property rights research is still in its infancy and an evaluation of the usefulness of its theoretical apparatus may be considered premature. Furthermore the property rights approach has yet to formulate precise hypotheses for empirical testing. This explains the considerable lack of empirical research based on property rights approach.

According to the property rights approach, an “ideal” theory of capital structure should:

- be submitted under a more general theory of the firm applicable to both closely held and widely held firms
- explain the role of financial instruments in mitigating conflicts
- explain why financial instruments are designed in a particular way and why they appear in certain combinations in the firm
- consider both return and control characteristics of financial instruments, at least both standard debt and equity
- explain why financial instruments and combinations of financial instruments are used in certain situations
- explain why certain investors hold certain instruments
- explain why financial instruments appear in particular patterns across industries and across countries
- explain why particular financial patterns seem to cluster together and how these clusters relate to the larger context
- allow for future renegotiations of contracts
- have normative implications for financial policies of individual corporations and for public policy

Property rights has gone some way towards meeting these criteria, however it still suffers from important deficiencies.
The theory of incomplete contracting still lacks a standardised framework for analysis. From a theoretical point of view, this theory does not provide an explicit model of contracting costs; it relies on, but does not model, bounded rationality. In addition, the recent property rights theory of the firm typically equates ownership with control and ownership of the firm with ownership of non-human assets. While equating ownership with control may be reasonable for the entrepreneurial firm, it misses important issues in the widely held firm. The definition of control as the right to make strategic decisions in contingencies not explicitly covered by contractual arrangements is rather simplistic. The property rights approach has had little to say about how control is exercised within the organisation. Like the agency literature, property rights is concerned with agency costs arising from conflicts of interests between investors. However, the property rights literature is distinct in that it provides a rationale for the use of the financial instruments beyond that of incentives. The incentive effect cannot be the only justification for concluding that capital structure matters; appropriate incentives could be achieved more inexpensively through a financial compensation scheme. Instead, the property rights literature regards financial instruments as commitment devices and focuses on the control aspects of these instruments. These instruments are viewed as defining both the allocation of rights to the return streams and residual control rights. Capital structure is determined by agency costs stemming partly from conflicts between investors and partly from the separation of ownership and control (Tirole, 1988). Through the allocation of control across investors and across states of nature, conflicts associated with moral hazard may be mitigated. In essence, agency costs are reduced by shifting the principal-agent relationship around in certain states.

Property rights literature views capital structure as a mechanism for the transfer of control from the management; each instrument is associated with a particular mechanism (Grossman & Hart, 1988). Equity makes possible a control transfer to a party outside the initial contract through a takeover. Debt ensures that control is transferred to external investors in low performance states.
(bankruptcy). Capital structure influences when and how control is transferred and the terms on which transfer occurs.

The property rights approach is still rather incomplete as a theory of capital structure, i.e., as a theory explaining why certain financial instruments are used and why they appear in particular combinations.

Most of the research based on the property rights approach generates capital structures where external finance comes from only one financial instrument, either all debt or all-equity. In Aghion and Bolton (1988), standard debt dominates equity unless the first-best is implementable under an all equity structure where the entrepreneur retains control. Grossman and Hart (1989) exclude debt from the analysis all together, concentrating on the allocation of votes among equityholders. In Hart & Moore (1989) there is no role for equity. The same is noticeable in Hart (1996), where the whole analysis of capital structure is made from a debt use point of view. It portrays equity in a rather rudimentary manner and gives the impression that equity financing is a residual of debt financing decisions. Aghion and Bolton (1992) are an exception by including voting and non-voting equity in their analysis (see the discussion in section 5.3). Furthermore, the property rights literature provides no clear understanding of the use of convertible securities.

Whereas traditional capital structure literature, as well as much of the agency literature on incentives, has been primarily concerned with the allocation of the return streams, the property rights approach tries to analyse both the rights to returns and control rights. However, most of the recent contributions in the property rights literature, with the exception of Hart & Moore (1989) and Hart (1996), have almost exclusively concentrated on the control aspect of financial instruments.

Most of the property rights literature, with exception of Hart (1996, Chapter 6)
model the financing problem of the closely held entrepreneurial firm with only one external investor. Even though several problems of external financing can be studied in such setting, the widely held firm introduces a great number of additional complications. In particular, models have to be developed which allow for the formal analysis of collective choice problems. In addition, the focus on the entrepreneurial firm leads into thinking that capital structure consists only of bilateral contracts without taking into account the interconnection between the parties to the firm's different contracts.

Diffused ownership and interconnections between contracts are particularly important for the understanding of debt finance and the control aspect of this instrument. Needless to say, if one includes taxes and trade creditors, one-creditor firms are rare in reality, to the extent that they exist at all. Multi-creditor situations give rise to new *ex-post* bargaining problems. The debtor may plot with one of the creditors in the expense of the other creditors. In general, the existence of more than one creditor tends to enhance the bargaining power of the debtor (Bolton & Scharfstein, 1990). Hellwig (1990) suggests that the multiplicity of investors may also be a commitment device; the inefficiencies associated with multilateral bargaining may weaken the incentives to renegotiate *ex-post*. A complete control theory of capital structure must also encompass the multi-creditor case as well as the case where both debt and equity are widely held.

Most of the models in this literature, again with Hart and Moore (1989) and Hart (1996) as exceptions, generate no renegotiation in equilibrium. This result is unsatisfactory since one of the most distinct features of debt contracts is that they are frequently negotiated. Another characteristic of these contracts yet to be modelled convincingly by the property rights literature is seniority (see Bolton and Scharfstein, 1996; and Hart and Moore, 1990 and Diamond (1991)). To understand why financial instruments appear in the particular combinations, both the issue of the security design and that of the seniority structure in the presence
of multiple investors must be addressed.

The financing models of the property rights approach (with exception of Hart 1996, p. 106) have been primarily concerned with the end game situations, i.e., situations where the relationship between the contracting parties ends after the last period of the game. To analyse this type of game may be appropriate when horizons are finite (most debt contracts are finite); unravelling from the end leads to the end game being played today. However, end game behaviour is not a good characterisation of many financing situations. In particular, the power of the threat not to refinance is likely to be underestimated in this context; when a relationship is about to terminate, this threat carries little danger.

Whereas the recent property rights approach may claim some success in explaining the design of individual securities, its record is less impressive in predicting observed capital structures. Unfortunately, comparative statistics are still few. Indeed, the hypotheses generated by this approach have so far not been sufficiently precise to allow for discriminating empirical testing. Furthermore, like much of the contracting literature, research in the property rights literature has proceeded by rationalisation of observed stylised facts (Hart, 1996, p141), rather than independent empirical testing. In the absence of such tests, the empirical significance of the approach has yet to be proved.

The property rights approach takes an agency perspective, but only a limited one as it is concerned only with conflicts of interests between managers and investors (Hart, 1996, p. 147), leaving aside the conflicts of interests that debt use can induce between firms investors, i.e. shareholders and debtholders.

At a general level, the property rights literature suggests that capital structure is related to the nature of the firm’s assets, e.g., their degree of liquidity. Furthermore, more profitable firms and those with a larger fraction of cash flows that are contractible should have lower debt levels; the need to free cash flow is
less important. Some attempts have been done to use the property rights approach in demonstrating how the choice of contracts is influenced by the nature of the underlying assets; when assets are easily diluted in bad states of nature, debt financing is more attractive than if such dilution were not possible (see Berglöf, 1994). The theory may be successful in explaining change in the capital structure over the life cycle of the firm, e.g., changes in the debt equity ratios as firms go from closely held to widely held and vice versa. However, the property rights approach is unlikely to predict exactly the debt equity ratio in a particular firm (in fact none of the theories discussed in the previous chapters can do that). The concept of control rights is not precise enough for this purpose; more structure must be added for models to generate testable hypotheses. The property rights approach may be viewed primarily as an interpretative tool and as a theoretical framework within which alternative explanations can be analysed and tested.
5.5. Conclusions

The property rights approach to capital structure bases the capital structure issue firmly into the theory of the firm.

The "nexus of contracts" approach introduced agency problems into the discussion, thereby focusing on conflicts of interest and introducing a scope for analysing control rights and ownership. However, the formal literature did not exploit the potential of this perspective and proceeded along familiar lines of conflict resolution through incentive schemes. The potential of the "nexus of contracts" perspective was taken up in capital structure theory by the property rights approach, because its focus on ownership and control rights provides the basis for analysing contracts between several parties linked to one organisation called "the firm". The property rights approach to capital structure emphasises control rights attached to securities. The shift in focus away from income streams has shed some light on the analysis of financial structure and security design. The analysis of financial contracting starts with an initial organisation design, which specifies the way in which control rights are allocated and how they can be transferred in the future. In relation to changes of the ownership structure, two procedures have received particular attention: creditor control if firms default on payments, and take-overs in which ownership is transferred by the acquisition of voting rights.

According to the property rights approach taxes, asymmetric information, and incomplete markets are all undoubtedly important influences on the choice of the firm’s capital structure. However, these factors alone cannot explain why debt has the feature that it is senior and that a failure to pay leads to a penalty in the form of bankruptcy, i.e., why debt is associated with a 'hard' budget constraint. Property rights claims to explain these facts.

The conclusion is that, although the agency approach may not be the whole story, its role in the property rights theory suggests that it is likely to be an essential part of any fully developed theory of capital structure.
References


Chapter 6

Transaction Cost Economics and Capital Structure

6.1. Introduction

The basis for a firm to sustain its competitive advantages is its ability to produce strategy, assets, technology skills and reputation that would be impossible or very difficult for its competitors to imitate. If a successful firm can be easily imitated, its competitive advantages and superior performance will soon disappear. Highly firm-specific assets often increase competitiveness; however, asset specificity increases transaction costs. (Williamson, 1988).

Transaction cost economics explains the use of debt and equity as governance instruments rather than simply financial instruments. These can be matched to the asset attributes of individual investment projects (transactions) in order to ensure the lowest cost of transacting.

In this chapter we discuss the Transaction Cost Economics (TCE) model and its implications for Capital Structure. The chapter starts with a general discussion of transaction cost theory in Section 6.2. In Section 6.2.1 we explain asset specificity and its ramifications for transaction cost economics. This is followed by a simple contractual schema in Section 6.2.2. Section 6.3.1 discusses how capital structure choices can be made under a TCE contractual framework. The effects of strategy and asset specificity on capital structure are discussed in Section 6.3.2. Section 6.3.3 discusses asymmetric information and brand name reputation. Section 6.4 gives a summary of commonalities and
differences between Transaction Cost Theory and Agency Theory. Section 6.5 gives a summary of some of the empirical studies based on the transaction cost theory, and Section 6.6 sets out some conclusions.
6.2. Transaction Costs Economics (TCE)

The transaction costs problem was first introduced by Ronald Coase in 1937 in his seminal article "The Nature of the Firm". He posed the question: when do firms produce to their own needs and when do they procure from the market? Although Coase's vertical integration problem was the subject of public policy scrutiny in the years to follow, there was little conceptual development for about 35 years. Williamson (1964, 1971, 1975, 1985 and 1996) and Klein, Crawford, and Alchian (1978) were the first to successfully work out a TCE approach to economic organisation.

TCE adopts a contractual approach to the study of economic organisation. It supports and develops the view that economising over the sum of production and transaction costs is the core problem. Transaction cost economics is concerned with the governance of contractual relations in transactions between two parties.

In his TCE theory, Williamson pairs the assumption of bounded rationality, (i.e. human beings are limited in knowledge, foresight, skill and time), with a self-interest seeking assumption (opportunism). As Coase (1984) pointed out, the concept of the man as rational utility maximiser should be abandoned. Williamson (1985) argues that the "contracting man" differs from the "maximising man" in two aspects, bounded rationality and opportunism (opportunism = self-interest thus guile, Williamson 1975). Both these concepts help to distinguish between feasible and infeasible modes of contracting. Thus:

1) Incomplete contracting: The condition of bounded rationality prevents the agents from engaging in ex ante comprehensive contracting. All contracts within the feasible set are incomplete, and therefore, the ex post consequences of contracts are of particular importance. The notion of complete ex ante comprehensive contracts is a fiction.
2) **Contract as promise.** It is convenient to assume that the agents will reliably fulfil their obligations. The efforts to investigate the reliability of economic agents and furthermore, given the presence of opportunism, *ex post* measures to deter it, take on a different economic importance. (Williamson, 1996, p.56)

TCE analysis deals with frictions that arise when contractual hazards appear as the result of bilateral dependency, leakage, strategising etc. It involves an examination of the comparative costs of planning, adapting, and monitoring task completion under different governance structures, by making "the transaction" its central unit of analysis. Governance structures can be matched to transactions in a manner that leads to the lowest cost of transacting (Williamson, 1979, p. 245).

Williamson identifies three main dimensions, which TCE in its present form uses to describe transactions. They are: 1) the frequency with which they occur; 2) the degree and type of uncertainty; 3) the condition of asset specificity; and probably 4) the ease of measurement should be added. Of these four, asset specificity has the greatest economic significance for examining the governance of contractual relations. (Williamson, 1991, p. 80)

### 6.2.1. Asset Specificity

Asset specificity refers to the degree to which an asset can be re-deployed to alternative uses without sacrifice of its value. Asset specificity can take many forms. It not only involves complex *ex ante* incentive responses but, above all, it gives rise to complex *ex post* governance structure actions, and it makes possible the use of TCE analysis in the study of economic organisation in all its forms.
Without pretending to be comprehensive, TCE recognises six types of asset specificity:

1) site specificity - where sites are located close together so to economise on inventory and transport expenses;
2) physical asset specificity - such as specialised machinery that is used to produce a component;
3) human asset specificity - in the form of skills, knowledge, experience that are accumulated from a learning-by-doing process;
4) dedicated assets - which are customer specific investments;
5) brand name capital - specific investments that are connected with customer loyalty and reputation
6) temporal specificity - caused by temporal restrictions

These types of specificity differ in their organisational consequences.

6.2.2 The Contractual Schema

TCE recognises the fact that the terms upon which an initial bargain will be struck depend on whether bids can be derived from more than one supplier, but stresses that the study of contracting should include ex post features. TCE argues that the condition of large numbers bidding at the start, does not necessarily imply that a large numbers bidding condition will be obtained thereafter. Assume that decision makers are opportunistic and bounded rationally and they operate under conditions of uncertainty. Uncertainty may be of a state-contingent kind, i.e. rising from random acts of nature and unpredictable changes in consumer behaviour; it may be due to a lack of communication, i.e. one decision maker having no way of finding out decisions made by others; or it may be a behavioural uncertainty, i.e. strategic nondisclosure, disguise or distortion of information. The combination of bounded rationality with uncertainty means that traders face conditions of incomplete contracting. It would be too difficult or simply impossible to
specify *ex ante* actions of all future parties under all possible future scenarios. Whether the *ex post* competition at the renewal interval is fully efficacious or not depends on whether the good or service in question is supported by durable investments in specific human or physical assets. Unforeseen contingencies and opportunistic behaviour will have no effect on asset values if these assets are easily re-deployed in other uses. But if there are no such specialised investments, there are no winners. Although they may continue to supply for a long time, they are merely matching competitive bids from other rivals. However, rivals cannot be presumed to operate on the basic of parity once specific investments have taken place. The parity does not exist any more, as the winners enjoy advantages over non-winners. The contractual asymmetry between the winning and the non-winning bidder exists because economic values will be sacrificed if the ongoing supply relation were to be terminated. Therefore, it is obviously in the interest of the parties to work things out rather than terminate the ongoing contract. Hence, a shift from a large number contracting to bilateral dependency happens (Williamson, 1996, p.60).

Assume that a product or service is supplied by either of two technologies, one being the general purpose technology and the other the special purpose technology. The latter requires more investments in specific assets. Denote $k$ as a measure of asset specificity. Transactions that invest in general purpose assets have $k = 0$, whereas for transactions investing in special purpose asset $k > 0$. As the assets are specialised to the particular needs of the parties, terminating prematurely this transaction will mean losing productive values. Therefore, the parties have the incentive to device safeguards ($S$) to avoid the above. An $S = 0$ means no safeguards are provided, and an $S > 0$ indicates that safeguards are in place. Figure 6.1 shows three states of nature that could result from the combination of different states of $k$ and $S$. The technology ($k$), contractual / governance safeguards ($S$) and price ($p$) are interactive and are determined simultaneously.
Williamson distinguishes two dimensions of TCE: one deals with measurement problems, while the other deals with the governance of contractual relations. His discussion is concerned with the latter.

Williamson posits that markets and hierarchies are alternative mechanisms for governing contractual relationships. The firm's problem is to choose a governance structure that will minimise both production costs and transaction costs. The latter are not dependent on the competitive market price of the goods and services exchanged, but they arise in the form of setting up, running and monitoring costs as well as re-negotiation due to the shifts in the alignment. In other words, the question is: which governance structures are best suited to organise which transactions in order to have maximum economising? Given the level of asset specificity, market and internal organisation (hierarchy) instruments differ in their benefits and resources. The benefits represent the property rights over the return stream generated from the assets. The resources available are in the form of control rights over managerial actions. When the level of asset specificity is low, market procurement has the advantage over internal organisation as the market has high incentive characteristics, they limit bureaucratic distortions better, and each party to a non specific transaction can
go its own way at little cost to the other. As the asset specificity deepens, hierarchy becomes the favourite instrument. The reason for this is that the high powered incentives of markets are difficult to adapt in comparison to the authoritative nature of hierarchy. Governance instruments differ in two aspects 1) the type and degree of adaptability and 2) the use of incentive and control mechanisms.

Williamson (1996, Chapter 3) lays out a simple model of how the costs of market and hierarchy mechanisms change as the asset specificity changes.

He considers the main decision faced by any organisation “to make or buy”. The important element to be taken into consideration in this scenario is the control of the production costs and governance costs (bureaucratic and adaptation costs). As the bilateral dependency between the parties increases, although the intense incentives of the market induce a better control of production costs, they reduce the ease of adaptation and therefore increase its cost. For a fixed level of output let $H(k)$ and $M(k)$ denote respectively the bureaucratic cost of the internal governance (hierarchy) and the corresponding market cost, where $k$ corresponds to a certain level of asset specificity. Assuming that the same level of asset specificity is chosen by each instrument i.e. at every $k$, the following comparative cost relations can be drawn:

$H(0) > M(0)$ and $M' > H'$. The former reflects the fact that bureaucratic costs vary inversely with incentive intensity and the latter inequality shows the comparative disability of markets to adapt. Let us denote $\Delta G = H(k) - M(k)$ As shown in Figure 6.2 these expressions create a two part region. For $k < k'$ the market is the preferred supply mode. At $k_a$, $\Delta G(k_a) > 0$ as $H(k_a) > M(k_a)$. For $k > k'$ the hierarchy form is preferred because the high powered incentives of the market impair the comparative ease with which adaptive, sequential adjustments of disturbances are carried out. At $k_b$, $\Delta G(k_b) < 0$ as $H(k_b) < M(k_b)$. 
Let consider a hybrid mechanism between a market and a hierarchy. The hybrid would combine the incentive power and the lower administrative cost of the market with the administrative control and low bargaining costs of the hierarchy. The hybrid would allow elective intrusion, i.e. when things are going well use the market, otherwise use hierarchy to realign the contract. Let us denote by \( Y(k) \) the governance cost function for the hybrid mechanism where \( Y(0) = M(0) \) and \( Y_k = H_k > 0 \). In comparison to the market and hierarchies, hybrids have weaker administrative power and less direct intervention than hierarchies, however, they also have weaker incentives and negotiated adaptation than markets. Hence, \( M(0) < Y(0) < H(0) \) and \( M_k > Y_k > H_k \) (this depends on the value of \( k \), only true if \( k < k^* \)).

As it can be seen from Figure 6.3 the exchange points become \( k^* \) and \( k^{**} \). For any value of \( k \) between 0 and \( k^* \) the market should be used, for \( k \) between \( k^* \) and \( k^{**} \) the hybrid is preferred and for \( k > k^{**} \) the hierarchy should be used.
The basic idea of Williamson's model is that the benefits of a more administrative (discrete, hierarchical) organisational structure increase as the asset specificity deepens. For investments made in highly specific assets, in order to increase the firm's competitive advantages, the use of a more intrusive regime to govern those assets will increase their relative benefits.

The simple contracting schema and the above mentioned model can be applied across a wide range of contracting issues. The following section shows how the TCE model is applied capital structure issues.
6.3 Transaction Cost Economics Approach to Corporate Finance

6.3.1. Williamson's Capital Structure Model

Williamson (1996) applies transaction cost economics to asset financing. In the agency theory capital structure models (e.g., Jensen and Meckling, 1976; Myers, 1977 and Titman, 1984) the debt-holders fully anticipate the ex post contracting misalignments that could occur and build those problems into the amount they would be willing to pay for debt ex ante. These models mainly assume complete contracting. Many moral hazard problems can be mitigated with different contractual devices ex ante - call provisions, managerial ownership, debt covenants, dividend constrains etc. When the parties cannot fully anticipate all possible future contingencies, the moral hazard problems become even worse. The firm must find a governance structure that is suited to deal with unanticipated mal-adaptations and incentive misalignments after they occur. The question is given the degree of asset specificity, which governance mechanism is best suited to adapt to unanticipated circumstances? What is the appropriate tool to govern the ownership, use and disposition of the assets?

Williamson's model operates at the transaction level rather than firm level. He focuses on debt and equity as governance devices rather as simply different types of contingent claims on cash flows. Do the characteristics of the assets themselves, i.e. their asset specificity, make them more or less suitable for debt or equity financing?

In his TCE rationale for corporate finance, Williamson initially assumes that there are only two forms of finance, debt and equity. Investments can be financed by either but not both of them. Assume also that projects are
arranged, from least to most, in terms of their asset specificity, e.g. general purpose building, general purpose equipment, special purpose building or special purpose machinery.

Debt, as a relatively simple rule based governance mechanism, is suited to assets whose value would not be affected by autonomous action by any of the parties. Equity, a more adaptive discretionary mechanism, is more suited to situations of long term mutual dependency. When the specificity is high both the costs of autonomous action and the benefits of co-ordinated effort are high.

Debt is a finite-lived, pre-emptive claims governed by a set of simple verifiable rules whereby 1) fixed interest payments must be made at regular intervals, 2) the business must continuously meet certain liquidity tests, 3) principal must be repaid at the loan expiration date, and 4) in the event of a default the debt-holders will exercise their pre-emptive claims against the asset in question. "If everything goes well, interest and principal will be paid on schedule. But debt is unforgiving if things go poorly" (Williamson, 1996, p 184). The failure to meet the obligations leads to liquidation. As the degree of asset specificity deepens, the value of the pre-emptive claim declines monotonically. If the firm is liquidated, there could be losses from forced selling in imperfect factor markets. For highly firm-specific assets, no secondary markets may even exist. By definition, the greater its specificity the less is the asset value in the next best use. It would be difficult to use debt to finance assets that are costly to re-deploy to other firms. The loss in value increases the lender’s risk exposure. Therefore, the terms of the contract would be adjusted adversely.

This can be extended beyond problems associated with liquidation. Bankruptcy reorganisation can be interpreted as a costly re-negotiation of the terms of debt contract. The greater the expected bargaining costs and / or control loss during the reorganisation, the more costly it is to govern the use of an asset with debt.
It is easier to govern the use and disposition of an easily re-deployable asset with a simple, inflexible, rule-based device like debt. Why pay the added cost to keep flexibility when the net benefits are so small? If unanticipated circumstances did arise, the value of the asset would be unaffected by the identity of the owner. Since it would be costless to re-deploy an asset from one owner to another, why use anything more complex than a simple pre-emptive claim to govern the transfer of control? When asset specificity is low the parties are not locked in a long-term relationship of bilateral dependency and there are few benefits from co-ordination among the parties. The parties can act autonomously without affecting the value of the asset. In this sense the debt is a market like mechanism.

Confronted with the prospect that asset specific investments will be financed on adverse terms, the firm might respond by forgoing some of the asset specificities in favour of a greater asset re-deployability. This would sacrifice some of the competitive advantages that these specificities offer. This might be avoided by creating a new governance structure instrument to which providers of finance would attach confidence, therefore the specific assets could be saved.

If debt were the only funding device available, asset specificity would provide a strong incentive to invent an alternative governance mechanism that would be less rule-based and more flexible. When asset specificity is high governance structures should allow for more direct co-ordination, control, monitoring, and discretionary intervention. Suppose that this instrument is called equity, and has the following characteristics: a) equity holders have the right to claim both residual earnings and asset liquidation value, b) it lasts for the duration of the firm, c) it could create a board of directors. This entity is elected by the pro-rata votes of those who hold tradable shares to represent their interests. The board is directly involved in monitoring the performance measures on a timely
basis, in reviewing the decisions, in hiring and/or replacing the management, in management compensation, in the appraisal of important investment and operating proposals before they are implemented and in disposal of assets. (Fama and Jensen, 1983).

"The board of directors thus "evolves" as a way by which to reduce the cost of capital for projects that involve limited re-deployability. Not only do the added controls to which equity has access have better assurance properties, but equity is more forgiving than debt. Efforts are therefore made to work things out and preserve values of a going concern when mal-adaptation occurs." (Williamson, 1996, p. 185)

Whereas the governance structure of debt is seen as a very market-like type that allows for autonomous adaptation, equity is much more intrusive and similar to administration. It is a "hierarchy-like" mechanism more suited to situations that need more internal control, co-ordination and intervention.

Let us express the cost of debt and equity as a function of asset specificity (k) respectively D_k and E_k. Both these costs are increasing functions of asset specificity. A switch-over from D(0) < E(0) to D' > E' > 0 will happen. Being a rule-governed relation the set up costs of debt are relatively low. Equity finance has higher set up costs, as it is a much more complex governance instrument which allows intrusive involvement in the oversight of a project; that is why D(0) < E(0). Although both costs of debt and equity increase as the specificity of the underlying assets rises, the cost of debt financing increases more rapidly. As the likelihood of liquidation increases the expected loss in value from non-redeployability increases. A rule governed regime will sometimes force liquidation or otherwise force the firm to compromise value enhancing decisions that a more adaptable regime, such as equity finance, could implement, therefore D' > E' > 0.

Beyond some level of asset specificity, k', it is cheaper to fund the project by using equity, (See Figure 6.4). For k ≥ 0
$D_k = \frac{\partial D(k)}{\partial k} > 0$ and $D(0) > 0$

$E_k = \frac{\partial E(k)}{\partial k} > 0$ and $E(0) > 0$

$D_k > E_k$ and $D(0) < E(0)$ if $k > k'$

Figure 6.4. Financing costs of debt and equity

The conclusion is that highly deployable assets will be financed by debt, whereas equity is preferred as the assets become highly non-redeployable. Let $k'$ be the value of $k$ for which $E_k = D_k$. The optimal choice is to use debt for $k < k'$ and equity finance for $k > k'$.

In comparison to other theories of capital structure which seek a special rationale for debt use, the TCE approach states that debt is the natural financial instrument and equity appears as the financial instrument of the last resort.

Williamson than suggests: why not create a new financial instrument - governance structure called "dequity", denoted $DE_k$? Let this instrument include all the constraining features of debt. When, however, these constraints impede the value maximising activities, the board of directors can temporarily remove the constraints, therefore to permit the firm to pursue a value
maximising action. The constraints are thus the norm from which selective relief is permitted. In other words: use a set of simple rules until an unanticipated circumstance arises for which violating those rules would increase value. If this were feasible, DE would be an increasing function of k such that DE(0) = D(0) and DE' = E'. The former reflects the fact that dequity is not burdened by the bureaucratic cost of equity, and the latter that selective relief from the rules is permitted making dequity superior over both debt and equity.

Whether dequity would work as described depends on the plausibility of selective intervention. This is in the hands of managers and here as elsewhere the "promise to behave responsibly" lacks credibility, as those who enjoy discretion can be expected to use it in their favour. Therefore it is nor clear if the intervention is benefiting dequity-holders or the managers, (See Figure 6.5).

If the selective intervention is a fiction, i.e. predictably breaks down, this would add costs such that D(k) > δ(k) > E(k) and D(0) < δ(0) < E(0). The net benefits of more direct intervention and more co-ordinated governance mechanism increase as the asset specificity deepens. For projects for which asset
specificity is from 0 to \( k^* \), debt is the best means of finance i.e. the lowest cost governance mechanism. Between \( k^* \) and \( k^{**} \), dequity is the preferred mechanism, whereas for the high asset specific investments i.e. beyond \( k^{**} \) equity is the cheapest governance tool.

Another question is: how does the value of \( k' \) change as uncertainty changes? An increase in uncertainty would increase both debt and equity cost functions, \( D_k \) more than \( E_k \), therefore the level of asset specificity for which equity would be preferred over debt will decrease. (See Figure 6.6).

The main reasons for the shift are that the increased uncertainty imposes maladaptation more often and consequentially, and rule-governed systems are under greater pressures under such circumstances, as compared to a discretionary system. From the lender's point of view, the level of risk exposure of any investment is reduced if the loan can be secured with collateral. If an asset has a low level of specificity it can easily be used as collateral which in turn reduces the effective cost of borrowing.
There are several intangible assets that are often argued to be sources of competitive advantages: e.g., product reputation, brand recognition and customer loyalty, firm specific human capital and knowledge, research and development. They enhance the firm's uniqueness and make it difficult for competitors to imitate a successful strategy. Asset specificity increases firm value but also makes it difficult to re-deploy the asset to other uses in case of financial distress.

6.3.2 Strategy, Asset Specificity and Capital Structure

The Modigliani and Miller proposition, that capital structure is irrelevant to firm value, has important implications for strategy research. First, managers seeking to maximise firm value need only be concerned with "real" decisions. Since financing decisions cannot affect firm value they can and should be made completely separate from the decision whether to invest. Managers should focus on production operations and investment opportunities. All security holders, no matter what their type of claim, would unanimously agree that the firm should accept all non-negative NPV projects. Second, the firm faces no funding constraint. Any firm can raise money in capital markets to fund any non-negative NPV projects. Whether funded with internally generated funds, or externally with newly issued debt or equity, the value of the project would be the same. Third, in the absence of synergy or joint production, all projects will be seen as basically independent of each other. Decision makers need only be concerned with the risk-adjusted required rate of return on each project separately. Total firm value would simply be the sum of individual projects' values. There would be no incentive to merge any two firms. Their post merger value would be the sum of their pre-merger values. Decision makers can ignore the impact of financial decisions only when those decisions would not affect the firm value.
In a Modigliani and Miller environment, strategy would essentially be irrelevant. With symmetric information, perfect, competitive and complete capital markets, and no bankruptcy, agency or transaction costs, no firm could gain or maintain a competitive advantage. However, competitive strategy helps to create the conditions under which capital structure matters for firm value. Sustainable competitive advantage is attainable only in an environment in which it is too difficult and/or too costly for competitors to imitate a successful strategy. If competitors have equal access to the technology, factor markets and capital markets, they will purchase the assets necessary to imitate a successful strategy and drive rents to zero.

The capital structure models assume the existence of real options, but do not investigate closely their origin. From a strategy point of view, the importance of real options is that they embody the assets that provide the basis for firm-level competitive advantage. The principal question is how real options are generated. The growth options that enhance a firm’s competitive advantage are highly specific. This creates problems regarding the concept that firms in the same industry fall into the same risk class. It is expected that when two firms have identical stochastic technologies and are facing identical demand functions, their returns will be perfectly correlated. Firms operating in a perfectly competitive industry are essentially in the same risk class.

The distinction between assets in place and real options is conceptually useful but probably unrealistic. Myers (1977) points out that the values of a firm’s existing assets are often affected by its subsequent investments. In other words, some real options may not be separable from their underlying assets. For example, when the firm undergoes learning-by-doing its unit cost decreases with cumulative production. This implies that firms can gain a competitive cost advantage by increasing market share. In a real option framework, experience effects are options associated with the existing assets. If the market share
leader is already operating at full capacity, learning effects give it the right but not the obligation to operate at lower cost than their competitors. Experience effects lower the exercise price on the option to increase capacity and output. When the effects are firm specific the options will be firm specific. It would be difficult for other firms to reproduce the particular set of “experiences” unless they could reproduce the historical path taken by the market leader. Even if followers expand rapidly they may be facing competitive conditions different from the first mover. While the first mover may have had an open field, followers face an aggressive, leading competitor that is trying to build an even greater market share.

Two firms operating in the same industry may have identical physical assets and technology and still have very different portfolios of real options. They may have different complementary physical or intangible assets. For example, differences in managerial knowledge and experience may make it less costly for one firm to enter a related product than other (Penrose, 1956).

Some real options are “compound options” - options to purchase options in the future. An example is the so called “time to build” model (Majd and Pindyck, 1987). Assume that a plant must be built in stages and is not productive until completed. At the completion of one “stage”, the firm has bought the option to continue to the next stage, delay or possibly abandon the project. This notion of “time to build” captures the idea that decision making is a sequential, adaptive process. Decision makers try to fit their resources to the environment given the level of uncertainty and information they have at a point of time. Even firms with access to the same technology may be at different stages of “building” their strategy. They may have very different sets of options. Even though they have access to the same path, a firm that has already committed resources may face higher opportunity cost of delay than a firm just considering beginning the process.
Some real options were bought with earlier investments in R&D and advertising. R&D expenditures are often used as examples of real options. The R&D outlays purchased the right to market some new product in the future. *Ex ante* there may not be an underlying asset on which the firm is purchasing an option. Expenses that were made for one purpose may have generated options that were totally unanticipated at the time the investment was made. It is impossible to use standard option pricing models to evaluate such R&D investments. There is no idea what the underlying assets will be, let alone what stochastic process their value will follow. The innovation changes both the production opportunity set and the consumption opportunity set in non-anticipatable ways. This makes it difficult, if not impossible, to evaluate some growth options.

By their very nature they are likely to be very firm specific. They are not likely to be traded very easily in factor markets. The factor markets for real options are likely to be imperfect if they exist at all. It may be very difficult for outsiders to know the true value of a real option because they may not know the real values of complementary assets. Even insiders may not know the option’s true value. The most valuable complementary assets may be owned by other firms. There are several key points. First, real options can exist because of the imperfections, gaps in factor and product markets. When these growth opportunities are firm specific, this enhances a firm’s competitive advantages. Second, firm-specific assets (growth options) retain their value only as long as the firm continues operating. If the firm liquidates, those options have less value in their next best use in another firm. This can impose costs on stakeholders. Some profitable opportunities may not be implemented if shareholders expect that the proceeds will be needed to pay the existing debt.

In agency models, the debt-holders recognise the shareholders’ incentives *ex ante* and reduce the amount they are willing to pay for the debt, the
shareholders ultimately bearing the agency costs. The extent of these losses can be reduced if the debt-holders have a credible method of monitoring the firm’s behaviour. For example, debt covenants are monitoring mechanisms designed to mitigate these agency costs (Smith and Warner, 1979). However, to monitor effectively debt-holders need to know the firm’s set of investment opportunities and to be able to observe and evaluate the firm’s investment decisions. The more firm-specific and intangible the firm’s growth opportunities, the more difficult it is for lenders to identify and evaluate the firm’s growth opportunities. This makes it difficult for them to assess the extent of the risk-shifting and underinvestment problems. The more intangible and firm-specific a firm’s growth opportunities are, the greater the extent of potential agency problems and the less effective are “solutions” which require an outsider to be able to observe either behaviour or outcomes. Therefore we would expect a negative relationship between leverage and the extent to which a firm’s assets consist of firm specific, intangible growth opportunities (Long and Malitz, 1985).

6.3.3 Asymmetric Information and Brand Name Reputation

Since highly firm specific assets lose value in liquidation, anything that increases the likelihood of liquidation would decrease the value of such assets. Klein and Leffler (1981) (see Appendix 6) look at the asymmetric information between producers and customers about product quality. The firm purposely invests in highly firm-specific assets so as to provide quality assurance to their customers. If they produce poor quality goods they will lose their customers. The firm’s specific assets would lose value.

Their model assumes that low quality products are cheaper to produce. This gives the firm an incentive to earn profits by misrepresenting poor quality products as being of high quality and charging a high quality price. Customers
base their product quality expectations on the firm’s previous period production. They all find out at period t what the quality was in period t-1. Once a customer discovers that the firm has produced poor quality goods, he will no longer purchase from that firm. Manufacturers face a trade-off. They can reap a one-time profit at the expense of losing an infinite stream of future earnings. The firm has to decide whether the short-term gains outweigh the present value of the future income. The basic set up is analogous to an infinitely repeated prisoner’s dilemma game, in which there is a sequence of two moves in every play of the game. In equilibrium, purchasers believe that the firm will continue to produce the same quality products. Producers manufacture goods at the product quality level the customers expect. However, for the producer to make the high quality goods he must receive a premium price above the marginal cost of producing the high quality goods. The size of price premium needed to induce a producer to make high quality products increases with the discount rate. The key is that the firm’s reputation generates added value.

This premium will attract new firms into this market segment until there are no more profits from entry. To offset the positive NPV of future profits, the firms must incur losses (sunk costs) when they enter. One way to do this is by investing in firm-specific assets such as brand name and reputation. These assets would lose value if the firm produced low quality products. The firm safeguards its reputation by purposely investing in assets that would lose value if it “defected” and tried to take advantage of its customers (c.f. hostage posting to support credible commitment, Williamson, 1996, Ch 5).

What assures high quality supply is the capital loss due to the loss of future business if low quality is produced. Since the imputed value of the firm’s brand name capital is determined by the firm’s expected quasi-rents on future sales, this capital loss from supplying quality lower than promised is represented by the depreciation of the firm’s specific assets. The expenditures on brand name capital assets are therefore similar to collateral that the firm losses if it supplies output of less than expected quality and in equilibrium the premium stream provides only a normal rate of return on this collateral asset. (Klein and Leffler, 1981)
This model depends strongly on the potential loss of the infinite stream of future income. The model would be explained in reverse if there were finite number of future periods. In the last period the firm has no incentive to provide high quality therefore there is no value to maintaining reputation in the next to the last period.

A financially troubled firm has a strong incentive to lower product quality. If the firm is liquidated, all future stream cash flows cease to exist and reputation has no value. As the likelihood of bankruptcy rises, the value of reputation decreases. As leverage increases, there is less incentive to make firm specific (sunk cost) investments which are needed to deliver the basis for good quality.

Titman and Maksimovic (1991) stress that this also reduces the incentive to make discretionary expenditures for maintenance of already existing assets, for example in industries where safety is the main quality dimension. High levels of leverage and the increased probability of financial distress can change the attitudes of both consumers and regulators. Consumers would have the incentive to switch to other suppliers, and regulators would have a stronger incentive to monitor safety. They argue that there is a negative relationship between gearing and the firm's incentive and / or ability to produce high quality products or at least the possibility of financial distress. Firms that anticipate bankruptcy have an incentive to lower their quality, and firms already in financial distress would want to cut costs and reduce quality in order to avoid bankruptcy in the short term. This could be seen as a form of "cashing in" or "milking" of reputational assets in order to alleviate financial distress in the short term.
6.4. A Comparison Between Agency Theory and Transaction Cost Economics

Agency theory and transaction cost economics approaches are likely to provide two routes for the integration of strategic management and finance. While some believe that these disciplines are based on very different paradigms, others think that the differences are overstated. The agency theory view of debt has had a strong influence on strategic management research. On the other hand, others have suggested that transaction cost theory is a powerful viewpoint from which to examine capital structure (Balakrishnan and Fox, 1993).

Transaction cost theory and agency theory share similarities across different dimensions. The notion of managerial discretion in the context of opportunism, self-interest and bounded rationality are common dominant assumptions. This behavioural attitude, analysed in the presence of uncertainty, leads to consideration of conflicts that arise from a divergence of goals between the contracting parties (Jensen and Smith, 1985). The focus is on the incentive systems and governance mechanisms that work towards economic efficiency in the presence of these conflicts. The result is the set up of an efficient contracting mechanism that serves to minimise both agency and transaction costs. Both theories differ from the standard neo-classical theory, which considers the firm as a production function, whereas TCE sees it as a governance structure and AT as a nexus of contracts. Both assume risk neutrality of investors and managers. Both maintain that the board of directors arises endogenously as a means of control.

Notwithstanding these similarities, several conceptual differences exist between the transaction cost and agency theories.
Market characteristics: Transaction cost theory assumes that optimal contracts cannot be written owing to bounded rationality; therefore it is based on the assumption that markets may fail (Rumelt, at al. 1991). Agency theory, on the other hand, adopts the assumption of market efficiency and seeks to find the optimal contract for the exchange.

Determination of relevant costs: In agency theory, the focus is on the relevant contracting action before the incentive scheme is introduced (Williamson, 1990). Therefore, the agency costs are determined ex-ante as the incentive systems are established into the contract. In transaction cost theory ex ante costs arise from the set up and running costs of alternative governance systems (Williamson, 1996, Chapter 7). However, the impossibility of drafting complete contracts owing to bounded rationality implies that the likelihood of opportunism still exists. Therefore, the ex post contracting action becomes more relevant to the contracting parties. Thus, although transaction costs have ex ante and ex post components, the emphasis is primarily on the situation after the transaction is entered into, with a specific governance structure. As governance structures, debt and equity are associated with different levels of ex ante and ex post costs and benefits. Agency theory defines agency costs as the sum of the monitoring expenditure of the principal, the bonding expenditure by the agent and the residual loss, which reflect an ex ante incentive alignment. Transaction cost theory emphases the ex post costs which are: a) mal-adaptation costs when transactions drift out of alignment; b) dispute costs rising when efforts to correct ex post misalignment are made, c) the setting up and running costs of governance structures; and d) bonding costs of ensuring effective commitments.

Assumptions about governance properties: In agency theory, the incentive alignment ability of debt arises from the power available to debtholders in case of default. The transaction cost reasoning also assigns the same governance properties to debt; however, equity is considered a more powerful governance
instrument than debt, chiefly because debt is less interfering than equity. As long as the firm is meeting its contractual obligations, debt-holders are unable to influence managerial actions. On the other hand, equity-holders are able to continuously monitor and evaluate managerial decisions through the board of directors. Hence, both debt-holders and equity-holders are able to influence managerial actions, although to differing degrees. While the transaction cost logic of capital structure recognises the difference, the agency perspective does not make this distinction.

Assets under governance: According to agency theory, the free cash flow available in a company gives rise to conflicts between shareholders and managers (the appropriation of perquisites) that could be resolved via the choice of finance. On the other hand, in transaction cost theory appropriate financing solves conflicts arising from the resources of the firm. The differences between the two perspectives can be considered in terms of the governance of free cash flows versus the governance of resources. TCE assumes that the Board of Directors is effective from the shareholders’ point of view; an assumption that is treated as problematic in the Corporate Governance literature.

The unit of analysis: Whereas transaction cost theory has the transaction as the central unit of analysis, agency theory considers the individual agent in that role.

Focal Cost Concern: While agency theory has the residual loss as the focus of concern, transaction cost theory, has the cost of mal-adaptation as its central focus.

Contractual Focus: Because of ex ante and ex post differences, while agency theory is little concerned with dispute resolution, the avoidance of disputes and
the mechanisms for solving them are essential to transaction cost theory (Williamson, 1996, p. 176).

Table 6.1 gives a summary of main differences between transaction cost theory and agency theory perspectives.

<table>
<thead>
<tr>
<th>Differences</th>
<th>Transaction Cost Perspective</th>
<th>Agency Theory Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Market Characteristics</td>
<td>Capital markets can fail</td>
<td>Capital markets are perfect</td>
</tr>
<tr>
<td>2. Determination of relevant costs</td>
<td>After the contract is established</td>
<td>Before the contract is established</td>
</tr>
<tr>
<td>3. Assumption about governance properties</td>
<td>Debt and Equity both have governance abilities with equity being more powerful</td>
<td>Debt has governance abilities</td>
</tr>
<tr>
<td>4. Asset under governance</td>
<td>Firm resources</td>
<td>Free cash flow</td>
</tr>
<tr>
<td>5. The unit of analysis</td>
<td>Transaction</td>
<td>Individual</td>
</tr>
<tr>
<td>6. Focal cost concern</td>
<td>Misalignment</td>
<td>Residual loss</td>
</tr>
<tr>
<td>7. Contractual focus</td>
<td><em>Ex post</em> governance</td>
<td><em>Ex ante</em> alignment</td>
</tr>
</tbody>
</table>

Table 6.1. A comparison of differences between TCE and AT approaches.  
6.5. Empirical Research in Transaction Costs Economics.

Economists' initial pessimism about the prospect of deriving testable implications from transaction cost reasoning has turned out to be untrue. Theoretical advances beginning in the 1970s spurred a profusion of empirical research, although much empirical research is required to examine the effect of financial strategies on firm performance.

Balakrishnan and Fox (1993) investigate simultaneously the importance of unique, firm specific characteristics and industry characteristics in determining the capital structure of the firm. Evidence from their study of 295 mining and manufacturing firms over a ten year period, strongly suggests that firm specific assets and skills are by far the most important determinants in explaining the observed cross sectional variations in capital structure. Structural characteristics of industries and / or the notion of large inter-industry differences in risk are not nearly as important as the firm-specific assets or the management of risk and its implications. The relationships between leverage and certain determinants of capital structure, such as tax shields and business risk, are also affected by specific effects.

Long and Malitz (1985) examined the effect of the type of investments a firm makes in its financing decisions. Their survey of the aggregate financing practices of over 500 firms supports their hypothesis that R&D and advertising, as intangibles, have little value in cases of financial distress, while investments in plant and equipment support creditors in case of default. They conclude that it is the tangibility of the firm's assets and investments, and not profitability, which is the more important determinant of capital structure.

Transaction cost economics has found an extensive application in the study of leveraged buyouts (LBOs). TCE posits that LBOs are more likely to happen in
firms that have low asset specificity. Several studies have examined the relationship between LBO occurrence and R&D as a representative of asset specificity. Research evidence does support the notion that firms with a lower level of asset specificity are more likely to undergo an LBO. R&D intensive industries and firms rarely undergo LBOs (Kaplan, 1989; Smith, 1991). Long and Ravenscraft (1993) also found that LBOs are usually targeted towards “low tech” firms. Opler and Titman (1993) also found that firms with high R & D expenditures are less likely to go through a LBO. These results suggest that it is in firms with non-unique assets that debt is the efficient form of governance.

Gordon (1988) looked at the capital structure of 279 firms categorised by Rumelt typology of diversification strategy: single business, dominant business, related and unrelated diversification. He found that the determinants of leverage vary significantly among the different types. Both size and significance levels of parameters vary for different types of diversification. For all types of diversification, profitability was inversely related to gearing. Firm size and capital intensity were insignificant. For both related and unrelated firms, earnings volatility was negatively related to debt. Among unrelated diversified firms, sales growth was positively related to debt.
6.6. Conclusions

Transaction Cost Economics has positioned itself in the centre of the economics of organisation. From Williamson (1975) onwards, TCE has made important progress both in conceptualisation and in empirical testing. The key concepts of TCE are of a technical (asset specificity), of a human (bounded rationality) and a behavioural nature (opportunism). The general strategy out of which TCE works can be summarised as follows: After having characterised the transactions and distinguishing between them in terms of asset specificity, the potential governance structures are discussed in terms of transaction cost minimising capabilities.

TCE regards debt and equity as governance structures, rather than as financial instruments, that can be matched to the transactions in order to minimise the transaction costs. The degree of asset specificity is considered as the determining factor in matching transactions to the respective governance structures, i.e., debt and equity. Williamson argues that when the asset specificity of a project is low to moderate, debt is the best financing instrument. As the asset specificity becomes greater, equity ought to be used.

The limited empirical research carried out generally supports the TCE approach. Different studies have found a negative relationship between asset specificity and gearing. The majority of studies conclude that intangible assets are negatively correlated with debt. Many LBOs studies support the notion that firms with a low level of asset specificity are more likely to undergo an LBO.

Future empirical research is required to address the TCE issues in more detail. The relationships between firm resources, the governance of these resources, and financial lenders need to be better delineated in order to examine the implications for strategic management.
References


Chapter 7

Literature Review Summary

As seen from the previous chapters, the determination of an optimal capital structure has been one of the most contentious issues in the finance literature since Modigliani and Miller introduced their capital structure irrelevance prepositions in their seminal article in 1958.

What MM did not discuss in that article were the practical applications of this theory for individual firms or how well the theory explained observed facts, such as corporate leverage ratios and market reactions to security issues. As Miller (1988) states: “Scepticism about the practical force of our invariance preposition was understandable given the almost daily reports in the financial press, then as now, of spectacular increases in the value of firms after changes in capital structure. But the view that capital structure is irrelevant or that “nothing matters” in corporate finance is far from what we ever said about the real-world applications of our theoretical propositions. Looking back now, perhaps we should have put more emphases on the other, upbeat side of the “nothing matters” coin: showing what doesn’t matter can also show, by implication, what does”.

Much of the financial literature over the past four decades has revolved around different theories that try to explain just exactly what does matter in determining capital structure.

Many interesting questions have been raised over the years: Is there really an optimal capital structure for any individual firm or industry? Does that ratio stay constant over time? Why have corporate leverage ratios not fluctuated in tune with changes in the corporate tax rate? How can one explain the sudden
run-up in leverage in the U.K. during the 1980s? Why do leverage-altering transactions have such consistent effects on a firm's stock price? Although most of the literature on the topic points to the existence of optimal capital structures, no one theory has emerged to explain all these phenomena. Research from Taggart (1977), Javiland and Harris (1984) and others suggests that managers do pursue a target debt ratio. Campbell (1988) showed that market reactions to leverage-altering transactions, such as convertible bond and equity-for-debt swaps, were related to whether the transaction moved the firm closer to or farther away from industry norms. That is why, according to Myers and Majluf (1984), "a full description of corporate financing and investment behaviour will no doubt require telling several stories at once."

**Tax advantage of debt**

MM Preposition 1 stated that capital structure was irrelevant in a world without taxation. Latter they argued that introducing corporate taxes into the model created tax shield benefits to debt that could, in the limit, lead to an optimal capital structure for any company of 100 per cent debt financing. One factor that could help explain the relatively low observed levels of debt was the differential treatment of equity and debt income on the personal level. The corporate advantage of interest deductibility was partially offset by the personal tax disadvantage of interest payments (see Chapter 2). The advantages of debt would be completely eliminated if a) the personal equity tax were eliminated, b) the personal interest income tax equalled the marginal corporate rate, and c) there were full loss offsets at corporate level. Loss offsets can potentially limit the expected value of debt's tax benefits to a firm. Non-debt tax shields such as net operating loss deductions, foreign tax credits and investment tax credits, may eliminate the benefit from debt-generated tax shields from being cashed in. Insufficient taxable income along with limits in carrybacks and carryforwards may also reduce the value of interest deductions to a firm. Empirical research has concluded that for reasons of these kinds the after-tax
cost of debt varies widely across industries, which in turn might help to explain the variation in capital structure among industries.

**Probability of financial distress**

Business risk is one of the two determinants of the costs of financial distress according to Myers (1984). The multiplication of the costs of financial distress by the probability of financial distress (not just bankruptcy, because indirect costs can be incurred even if a firm recovers) results in the expected cost of financial distress. In this static approach to obtaining their optimum leverage ratio, companies should balance these costs against the tax benefits of debt (see chapter 2).

The variability of cash flows is at the heart of business risk. The greater the fluctuations in a company's cash flows, the greater the chance it will be unable to meet its obligations in any given period. Firms with steadier cash flows will be able to support higher debt levels than riskier firms, all other things equal.

One of the biggest determinants of the cost of financial distress is the tangibility (in other words asset non-specificity, see Chapter 2 and 6) of a company's underlying assets. Many tangible assets tend to retain their value even in bankruptcy, so tangible asset-intensive firms can support higher levels of debt at lower costs because there is little risk to bondholders that the assets that support their claims will be worthless. Overall, there is fairly consistent evidence to support the relationship between asset intangibility (specificity), liquidation costs and financial leverage. Studies such as those of Titman and Wessels (1988), Williamson (1988) and Harris and Raviv (1990) generally find that leverage increases with the proportion of fixed assets and non-debt tax shields, and decreases with proportion intangible assets, as evidenced by advertising expenditures, R&D outlays, and high market to book value ratios.
Agency costs

Agency problems result when members of one group of stakeholders (such as managers) place their own interests before the interest of the group they represent (shareholders). How well a company controls the losses of value associated with agency problems (either through incentive schemes, monitoring or covenants) can have a dramatic impact on its capital structure and value.

Manager - shareholder conflict. The two primary areas where the managers fail to represent the best interest of shareholders are under-leveraging and overspending.

Managers may be unwilling to leverage the firm to its optimal level because the added debt may increase the total risk. They could have a substantial amount of company-specific human capital tied up in the success of the company (such as their wealth, reputation, future earnings and so on), a risk they as managers cannot diversify away. As a result, they may avoid additional debt that would increase the value of the company, in favour of greater job security.

Overspending can also be a problem in a business with an abundance of free cash flow. Managers have the incentive to spend that cash on “perks”. Some of the steps that can be taken in order to align the managers’ interests with those of the shareholders are: executive compensation in incentive plans, equity owned by managers, investment bankers on the board, equity owned by large institutional investors. These conditions help persuade or force the managers to adopt a riskier, more leveraged capital structure when appropriate. Higher debt levels by themselves can serve as disciplinary or “bonding” forces by reducing the free cash flow available for perks, and they force management to work harder to meet higher interest payments.
Shareholder – bondholder conflict: After a bond issue is carried out, shareholders have an incentive to maximise their wealth at the expense of debt-holders in one of the following ways:

- increase in dividend rate (by reducing investment or, at the extreme, liquidating the firm);
- claim dilution (by issuing new debt of equal or higher priority than the old issue);
- asset substitution (floating bonds for low-risk projects and then using the funds for high risk projects instead); and
- underinvestment (rejecting positive NPV projects if the benefits would accrue only to the debt-holders).

This phenomenon is more pronounced when a large portion of the value of the firm may comprise future growth investment opportunities, which may be selected in intangible assets such as goodwill. The threat of bankruptcy can have a severe impact on the value of these growth opportunities because the managers may reject positive NPV projects for the above mentioned reasons, or because they decide that they need the cash to keep the firm solvent.

Debt-holders can protect themselves against such wealth appropriations by drafting bond covenants as part of the original floating agreement. These covenants can limit the firm in terms of its production / investment policy, dividend payout rate, financing options, and performance bonding activities. Despite the low drafting costs, bond covenants have many indirect costs. Several empirical studies based on the hypothesis of costly contracting have stated that the opportunity costs of bond covenants are significant in terms of limiting production, investment and financing decisions. (See Chapter 3).
Asymmetric information

Another key assumption inherent to the validity of MM Preposition 1 is the homogeneity of expectations. This means that all the market participants are assumed to have equal information about the future states of the nature, and to interpret this information in the same way. This is not, however, a safe assumption. New security issues illustrate this point. The potential purchaser of a new security has less information about the prospects of the firm than the management, and management is more likely to issue securities when the market price of the firm’s traded securities is higher than the management assessment of their value. Sophisticated investors revise their estimate of the value of the firm if management announces a new security issue; furthermore, the larger the disparity in information, the greater the revision in expectations and the larger the negative price reaction to the announcement of a new issue.

The information gap has at least two potential consequences for the capital structure debate. The first is the possible existence of a “pecking order” firms may follow when financing new projects. The second involves the various signals companies can send to the market with different financial transactions.

According to the Pecking Order Hypothesis (POH), if a company insider believes that the company’s stock is underpriced in the market, he will hesitate to issue new stock, even for a positive NPV project. Underpricing the equity may lead new buyers to gain more than the NPV of the new project, at the expense of the current shareholders. The company would much rather finance the project with retained earnings and riskless debt, both of which are believed not to be undervalued. Lacking the available internal funds or ability to issue riskless debt, the company may finance the project with risky debt or preferred stock. Both these securities can be mispriced, but not to the extent that common stock would be. The firm will issue equity only as a last resort. Any equity issue will generally come soon after the release of important financial
information when information asymmetry, and therefore also the mispricing, is considered to be the smallest.

According to the POH, the desire of firms to use internal funds first may lead companies to under-use leverage in a desire to gain financial slack. As a result, managers may place a value on available funds and the ability to issue riskless debt, foregoing some debt tax shields to maintain that slack. (See Section 4.3)

According to signalling models, the market interprets high leverage ratios as signs of higher company quality. Moreover, increases in the dividend payout rate are taken as a sign of permanently increased earnings, capable of supporting higher dividends into the future. On the contrary, cuts in dividends and leverage reducing measures, such as stock issues, will have a negative impact on the firm's stock value (See Section 4.4).

Information asymmetry problems along with agency costs have been used to explain levels of debt, insider ownership and dividend payouts. Jensen, Solberg and Zorn (1992) argue that these factors are related to each other, both directly and indirectly, through the operating characteristics of the firm. According to their model, companies attempt to minimise the costs associated with information asymmetry and mis-aligned incentives by jointly optimising debt, dividend and insider ownership policies. This leads to a modified pecking order theory, although it is generally acknowledged that the pecking order is by no means a complete explanation for firm's financial policy.

Although commonly accepted as a sound explanation for stock price reaction to new equity issues, the pecking order theory is not consistent with all empirical observations. For example it predicts a monotonically decreasing pattern regarding the drop in stock prices, i.e. the drop should be greatest for an equity issue, less for issues of convertible debt, and least for straight debt. This pattern has not been found in empirical studies.
According to the property rights theory, the firm is defined by its non-human assets and the allocation of property rights to these assets. Property rights are defined as the rights to return streams and the rights to make strategic decisions in contingencies not explicitly contracted upon. According to Hart (1996), property rights to corporate assets are specified in the firm's financial contracts. The property rights literature regards financial instruments as commitment devices and focuses on the control aspects of these instruments. These instruments are viewed as defining both the allocation of rights to the return streams and residual control rights (see Chapter 5).

Transaction Cost Economics. This approach attempts to explain the use of debt and equity as governance instruments. These can be matched to the asset attributes of individual investment projects (transactions) in order to ensure the lowest cost of transacting. The degree of asset specificity is considered as the determining factor in matching transactions to the respective governance structures, i.e. debt and equity. According to Williamson (1996, ch. 12), when the asset specificity of a project is low to moderate, debt is the best financing instrument (i.e. it entails lower transaction costs). As the asset specificity increases, equity ought to be used. Many studies have found a negative relationship between asset specificity and gearing. TCE, like the property rights approach, tries to offer an explanation for gearing levels from a strategic management point of view, but there is a need for further deliberations especially regarding the definition and measurement of asset specificity (see Chapter 6).

Product/Input market forces attempt to explanation the observed capital structure patterns by trying to determine a link between debt levels and strategic variables.

Some models try to explore the connection between capital structure and strategy (Brander and Lewis, 1986), whereas other models consider the effects
of gearing on the customer/supplier relationships (Titman (1984), Sarig (1988) and Perroti and Spier (1993)). The fundamental idea behind the former models is that the gearing changes the pay-off to equity, and company managers quite often have incentives only to maximise their firms’ equity value. Debt forces oligopolists to undertake a more aggressive output strategy, which leads to all the producers being worse off than they would be if all firms had pure equity financing. These models show that debt capacity is an increasing function of industry’s price elasticity of demand and a decreasing function of the discount rate.

The second major product/input market force model links capital structure to customers and suppliers of inputs via product markets. Customers suffer losses when a firm goes bankrupt. For durable and unique goods manufacturers the costs are greater in terms of customers’ lost access to the product. Titman (1984) showed how leverage forces a company always to follow an optimal strategy of only liquidating when the net benefits of liquidation out-weigh the loss to customers. Sarig (1988) showed how debt can be used to strengthen the stockholder’s bargaining power when negotiating with input suppliers. Perroti and Spier (1992) examine the conditions where firms may use short-term strategic debt-for-equity swaps to extract concessions from workers when negotiating wages.

Capital structure has an important impact on the market for corporate control through mergers, acquisitions, and other corporate restructuring. The 1980s saw a dramatic increase in the level of this activity in the U.K. The market has started to heat up again with 1995 being one of the record years, a trend which is well set to continue. The debt versus equity decision has an impact on the eventual distribution of voting rights and cash flows, and solving resource allocation problems.
The last four decades have seen much development in the literature available on the capital structure debate. MM Preposition 1 guided subsequent researchers by proving that capital structure could be irrelevant under a very strict set of assumptions. The perfect capital markets they assumed led to a wide variety of research on the effects of somewhat-less-than-perfect capital markets. Absence of taxes was considered versus differential corporate, personal equity and personal debt income taxes with varying non-debt tax shields and carryback/carryforward provisions. Absence of bankruptcy costs was modelled versus different costs and probability of financial distress. Assumptions of no agency cost were compared to the difficulty of aligning manager goals with firm goals and shareholders interests with debt-holders interests. Similar reasoning applies to the assumption of perfect information in a market where in which the asymmetric information is present.

Out of these theoretical and empirical treatments of capital structure, two models appear to come across strongly. One of them is the target debt level model based on the trade-off between advantages and disadvantages of the use of debt. These trade-offs are influenced by several variable, most notably the tax advantages of debt, the risk of bankruptcy and the reduction of agency costs.

In any event, the forces examined in the literature review chapters help, in varying degrees, to determine the corporation's optimal capital structure.

The second of these models is that of the pecking order. It would seem that corporations do make intentional short-term decisions that may move them farther away from their leverage targets, or as Shyam-Sunder and Myers (1999) put it “changes in debt ratios are driven by the need for external funds, not by attempt to reach an optimal capital structure.” It is believed that a pecking order exists, because there will be times when companies do not want to
subject themselves to the regulatory discipline or the asymmetrical information (leading to mispricing) of the market.

There is much room for improvement in the explanatory power and predictive ability of capital structure theory. It is apparent that a more comprehensive testable model could be developed, where all the factors mentioned in this literature recapitulation are integrated, with the relative influences of each factor allowed to vary over time with changes in the business climate.

The empirical literature section that proceeds examines some of these issues. It particularly tries to answer the question whether the gearing ratio of the UK hotel and retail industries follows a pecking order approach or a target debt level alternative.

After a description of the data and the statistical tools used to analyse these data in Chapter 8, Chapter 9 tests a pecking order model similar to that in Shyam-Sunder and Myers (1999) one based on the asymmetric information arguments presented in Chapter 4. Chapter 10 tests a target debt level model based on some of the arguments discussed in Chapter 2. It also compares the results produced by both these mutually exclusive tests. Chapter 11 identifies some of the variables which according, to different theories and previous empirical research on capital structure (Chapters 2, 3, 4 and 6) are identified as important factors that influence the capital structure behaviour. This study takes also into account some factors which are specific to the industries under study.
References


Chapter 8

Data and Statistical Definitions

8.1 Introduction

Three types of data may be available for empirical analysis: time series, cross-sectional, and pooled data.

In pooled data there are elements of both time series and cross-sectional data. Therefore attention should be paid to problems that come from both time series (i.e. stationarity) and cross-sectional (i.e. heterogeneity) aspects.

Panel data used in empirical financial research are usually non-experimental and come mainly from secondary sources such as financial databases, like Datastream, COMPUSTAT, Extel etc. Several statistical packages can be used in order to analyse the data. The E-View statistical package is used in this research.

Regression analysis is one of the most commonly used methods in empirical financial studies. It aims to estimate the average value of one variable on the basis of the fixed values of another variable (single regression analysis) or several variables (multiple regression analysis). Several aspects have to be taken into consideration during the regression analysis, such as: heteroscedasticity, multicollinearity, and robustness of the model.

Section 8.2 discusses the nature of panel data and their advantages and limitations. Section 8.2.1 describes the data and the samples used in this research. Section 8.3 discusses the multiple regression model. Fixed and
random effect models are described in Section 8.3.1. Section 8.4 gives an overview of the heteroscedasticity problem and the way to deal with it. Section 8.5 talks about multicollinearity and ways to limit it. Section 8.6 describes the stationarity problem in time-series data. The chapter concludes with Sections 8.7 and 8.8, which give a brief description of some statistical definitions and the way E-View performs the regression calculations.
8.2. Panel Data

Panel data, pooled cross-sectional and time-series, are used to empirically examine the hypotheses formulated hereafter.

Hsiao (1986) points out that panel data sets for economic research possess several major advantages over conventional cross-sectional or time series data sets. First, they usually give the researchers a large number of data points, increasing the degrees of freedom, variability and efficiency, and reducing collinearity among explanatory variables. The large number of data points is very important when using financial accounting data, which are published only annually. Second, and more important, longitudinal data allow a researcher to analyse a number of important economic questions that can not be addressed using pure cross-sectional and pure time-series data sets. Panel data are better able to study the dynamics of adjustments and are able to identify and measure effects that are simply not detectable in pure cross-sectioned or pure time series data (Baltagi, 1995). Panel data provide a dynamic picture of the samples’ financing behaviour.

Panel data control better for individual heterogeneity. Panel data allow for the fact that individuals, firms, countries are heterogeneous. Time series and cross-sectional data not controlling for this heterogeneity run the risk of yielding biased results.

Panel data allow us to construct and test more complicated behavioural models than do purely cross-sectional or time series data. Also, fewer restrictions can be imposed in panels than in a purely time series study.

Panel data are usually gathered for micro-level units, like individuals, firms, and households. Many variables can be more accurately measured at the micro
level, and biases resulting from aggregation over firms or individuals are eliminated.

Limitations of panel data include:

*Design and data collection problems:* These include problems of coverage (incomplete account of the population of interest).

*Distortions or measurement errors:* Measurement errors may arise because of inappropriate information, misrecording of data.

*Selectivity problems:* in the form of self-selectivity nonresponse or attrition.

*Short time series dimension:* Typical panels cover annual data covering a short span of time for each individual. Increasing the number of years is not without cost either. This increases the chances that fewer firms with have data available for the extended period.

Panel data testing is very popular in product placement and marketing research, as well as in studies concerned with the labour force. Econometric testing in finance is mainly carried out using time series or cross sectional data. The availability of long time series or disaggregated price data partially explains this phenomenon. Very little empirical work for testing capital structure has been done using panel data. Early studies, which have used panel data in finance, have mainly concentrated on dividends. In finance, empirical testing relies on firm specific samples limited to stock market quoted firms. A sample of exclusively quoted firms is non-random, since firms may receive a stock market listing if they satisfy specific criteria, and even some of those that do choose to remain unquoted. Two capital structure studies that use panel data are Kim (1997) and Michaelas at al. (1999).
8.2.1. Data and Sample

Most of the data used in this study are gathered from secondary sources. The main source of information has been the Extel database. It provides financial information for 10460 companies, 3642 of which are U.K. firms. The database contains published accounts data as well as stock prices. The time span of data availability varies among firms and ranges from 16 years to 1 year in some cases. For very few of them the data go back to the year 1983, but the most common cut off date is the year 1985. The database is composed of two parts: Company Analysis and Equity Research. The former contains published accounts data while the latter contains stock market data. The database provides also information about the status of the company (dead or alive), their addresses and contact numbers. During the data extraction process it was realised that there were many missing data, i.e. data that according to the status of the company and the life span of the database should have been there but they were not. There was a discrepancy among the companies that appeared in Company Analysis and those in Equity Research, which made it difficult to extract all the necessary variables. In order to have as complete as possible data sample two other financial databases, Fame and Datastream, were used. Fame provided some of the missing data for the last five years, while Datastream was used mainly for calculating the missing shareholders’ equity figure (see variable definition in section 9.4). In a few cases hard copies of companies’ financial statements were used to complete the set of data or to make certain clarifications.

Primary 4 digit SIC codes were used as the initial criteria of selection of the sample for both industries. They are:

- 6410 Food Retailers 55 companies
- 6420 Confectionery / newsagent/ off-license 30
- 6430 Dispensing and other Chemists 9
Only companies with a full set of data for the 13-year (1985 – 1997) period were then selected. The number of companies was reduced from 243 to 134 retail companies and from 65 to 22 hotel firms. Most of the retail firms belonged to more than one classification. They were included in the classification which appeared as their first line of business. Because of the fact that very few retail companies were left in some of the aforementioned classifications they were regrouped in similar lines of businesses. SIC 6450 (Retail Distributing of Clothing) 6460 (Retail of Footwear and Leather Goods and 6470 (Retail Fabrics and Textiles) were joined in one compact group giving a total number of 33 companies. SIC 6420 (confectionery / newsagent / off license) and 6430 (dispensing and other chemists) were also joined together giving a total number of 21 companies. The following is the final classification for the retail companies:

- Clothing and footwear: 33
- Food retailers: 31
- Retail household goods and hardware: 27
- Mixed retailers: 22
- Confectionery / News Agent / Dispensing / Chemists/ Off-license: 21

The main reason why the initial number of firms was reduced so drastically was that many companies had only a few years' data. Some of them had "died", or were young companies, or were taken over. Some others were
excluded because the chosen industries, i.e., hotel and retail industries, appeared only as their 5th or 6th line of business and it was considered that it was important for the outcome of the tests that groups had to be as homogenous as possible.

The tests are carried out on the overall sample of 134 retail firms as well as on the specific portfolios created in order to see if there was any line of business influence among retail firms. These differences are expected to be very small as the companies still belong to the same industry and face similar business risk. The grouping of some of the retail firms might look somewhat arbitrary, especially the newsagent / chemists etc grouping. A careful investigation of their line of businesses was made looking at all the SIC classifications to which these firms belonged and making sure that the grouped firms were as similar as possible as well as making sure that the portfolios were big enough in order for them to contain the necessary number of observations for the statistical tests to be robust.

The reason why 1985 was selected as the cut-off year was that 10 years of data were deemed necessary in order to draw sound statistical conclusions from the tests described in the following sections. Taking into account the fact that some of the variables are calculated as averages or standard deviations of three years, an initial 13 years period of raw data was needed in order to produce a 10 year period for the dependent and independent variables.

The above mentioned selection of companies and time span has resulted in 1729 and 273 observations for the retail sector and hotel sector respectively.

Two companies Queen Moat House from the hotel sector and John Lewis Partnership from Mixed retailing were excluded as outliers. The former showed extreme figures as the result of the deep financial difficulties they experienced
in the early nineties, and it was very difficult to calculate the market value of equity.

8.3. The Multiple Regression Model

Regression analysis was first developed by Francis Balton in the latter part of the 19th century. The term regression persists to this day to describe statistical relations between variables. Regression analysis is the statistical methodology for predicting the values of one or more variables from a collection of predictor (explanatory) variables.

The single regression equation is of the following format

\[ Y_i = \alpha + \beta_1 X_{i1} \]

Panel data regression differs from a regular time series or cross section in that it combines both in a double subscript on its variables, i.e. \( X_{it} \).

\[ Y_i = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_t X_{it} + u_i \]  

With \( i \) denoting a cross-sectional category such as households, individuals, firms, etc., and \( t \) denoting time. Thus, \( i \) subscript denotes the cross-sectional dimension whereas \( t \) denotes the time-series dimension.

\( Y_i \) is the dependent variable and \( X_{i1}, X_{i2} \ldots X_{it} \) are the explanatory variables. \( \alpha \) is the constant and \( \beta_1, \ldots, \beta_t \) are the slopes of the explanatory variables. The error terms are assumed to have the properties:

- \( E(u_i) = 0 \)
- \( \text{Var}(u_i) = \sigma^2 \) and
- \( \text{Cov}(u_i, u_j) = 0 \) for \( i \neq j \)

These relationships state that the error terms are assumed to have a normal distribution with mean 0 and constant variance \( \sigma^2 \), and that error terms must be
independent. Most of the panel data applications utilise a one-way error component model for the disturbances, with

\[ u_{it} = \mu_i + v_{it} \]

where \( \mu_i \) denotes the unobservable individual specific effect and \( v_{it} \) denotes the remainder disturbance. Note that \( \mu_i \) is not time variant and it accounts for any individual specific effect that is not included in the regression. The remainder disturbance \( v_{it} \) varies with individual and time and can be thought of as the usual disturbance in the regression.

In matrix notion equation (i) can be expressed as:

\[
\begin{bmatrix}
Y_1 \\
Y_2 \\
\vdots \\
Y_i
\end{bmatrix} =
\begin{bmatrix}
\alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_n X_{in} + u_1 \\
\alpha + \beta_1 X_{i21} + \beta_2 X_{i22} + \ldots + \beta_n X_{in} + u_2 \\
\vdots \\
\alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_n X_{in} + u_i
\end{bmatrix}
\]

After division and addition of the matrices we have:

\[
\begin{bmatrix}
Y_1 \\
Y_2 \\
\vdots \\
Y_i
\end{bmatrix} =
\begin{bmatrix}
1, X_{i1}, X_{i2}, \ldots, X_{in} \\
1, X_{i21}, X_{i22}, \ldots, X_{in} \\
\vdots \\
1, X_{i1}, X_{i2}, \ldots, X_{in}
\end{bmatrix} \times
\begin{bmatrix}
\beta_0 \\
\beta_1 \\
\beta_i
\end{bmatrix} +
\begin{bmatrix}
u_1 \\
u_2 \\
\vdots \\
u_i
\end{bmatrix}
\]

Multiple regression models can be presented as:

\[
Y = X \times \beta + u \quad (ii)
\]

One of the objectives of regression analysis is to develop an equation that will allow the researcher to predict the response for given values of the predictor variables. Thus, it is necessary to fit the model in (ii) to the observed \( Y_i \) corresponding to the known values \( X_{i1}, X_{i2}, \ldots, X_{in} \). That is, the value of the
regression coefficient $\beta$ and the error variance $\sigma^2$ consistent with the available data have to be determined.

8.3.1. Fixed and Random Effects Models

A simple way to take account of heterogeneity across individuals and/or through time is to use variable intercept models. The basic assumptions of such models are that, conditional on the observed explanatory variables, the effects of all omitted variables are driven by three types of variables: individual time-invariant, period individual-invariant, and individual time-variant variables. The individual time-invariant variables are variables that are the same for a given cross sectional unit through time but they vary across cross-sectional units. Examples of these are attributes of individual-firm management, ability, etc. The period individual-invariant variables are variables that are the same for all cross-sectional units at a given point in time but that vary through time. Examples of these are prices, interest rates, and widespread optimism or pessimism. The individual time-variant variables are variables that vary across cross-sectional units at a given point in time and also exhibit variations through time. Examples of these variations are a firm’s sales, profits, and capital stock.

The variable intercept model assumes that the effects of numerous omitted variables are each individually unimportant but are collectively significant and possess the property of a random variable that is uncorrelated with all other included and excluded variables. On the other hand, because the effects of the remaining omitted variables either stay constant through time for a given cross-sectional unit or are the same for all cross-sectional units at a given point in time, or a combination of both, they can be absorbed in the intercept term of a regression model as a means to explicitly allow for individual and/or temporal heterogeneity contained in the temporal cross-sectional data.
Chapter 8: Data and Statistical Definitions

The variable intercept model can provide a useful specification for fitting regression models using panel data.

The fixed effects estimation method treats the unobservable specific effects $\mu_i$ as fixed constants. In this case the $\mu_i$ are assumed to be fixed parameters and the remaining disturbances stochastic, with $\nu_{it}$ independent and identically distributed. The $X_{it}$ are assumed independent of the $\nu_{it}$ for all $i$ and $t$. The fixed effects model is an appropriate specification if we are focusing on specific sets of firms, and our inferences are restricted to the behaviour of these sets of firms. Thus the value of the dependent variable for the $i$th unit at time $t$, $y_{it}$, depends on $K$ exogenous variables, $(x_{i1t} \ldots x_{iKt}) = x'_{it}$, that differ among individuals in a cross section at a given point in time and also exhibit variation through time, as well as on variables that are specific to the $i$th unit and that stay constant over time. The model is:

$$ y_{it} = \alpha_i + \beta'x_{it} + u_{it} \quad i = 1, \ldots, N $$
$$ t = 1, \ldots, T $$

where $\beta'$ is a $1 \times K$ vector of constants and $\alpha_i$ is a $1 \times 1$ scalar constant representing the effects of those variables peculiar to the $i$th individual in the more or less the same fashion over time. The error term, $u_{it}$ represents the effects of the omitted variables that are peculiar to both the individual units and time periods. It is assumed that $u_{it}$ can be characterised by an independently identically distributed (IID) random variable with mean zero and variance $\sigma^2_u$.

Random effects models treat the individual specific effects $\mu_i$ like $u_{it}$, that is, as random variables. It is standard practice in the regression analysis to assume that the large number of factors which affect the value of the dependent variable, but which have not been explicitly included as independent variables, can be appropriately summarised by a random disturbance. When numerous individual units are observed over time, it is sometimes assumed that some of the omitted variables will represent factors peculiar to both the individual units
and time periods for which observations are obtained, whereas other variables will reflect individual differences that tend to affect the observations for a given individual in more or less the same way over time. Still other variables may reflect factors peculiar to specific time periods, but affecting individual units more or less equally.

In the random effects model $\mu_i$ can be assumed random. In this case $\mu_i \sim \text{IID}(0, \sigma^2_j)$, $v_{it} \sim \text{IID}(0, \sigma^2_v)$ and the $\mu_i$ are independent of $v_{it}$. In addition, the $X_{it}$ are independent of the $\mu_i$ and $v_{it}$ for all $i$ and $t$. The random effects model is an appropriate specification if we are drawing $n$ individuals randomly from a large population.

The issues of whether to treat unobserved heterogeneity as random with a common mean and constant variance covariance matrix, or as fixed and different have aroused significant interest among econometricians and have paramount importance in panel data modelling (Mátyás and Sevestre, 1996).

Whether to treat the effects as fixed or as random is a question with no easy answer. It can make a surprising amount of difference in the estimates of the parameters in the cases in which $T$ is small and $N$ large. When only a few observations are available for different individuals over time, it is exceptionally important to make the most efficient use of the data across individuals to estimate that part of the behavioural relationship containing variables that differ substantially from one individual to another, in order that the smaller amount of information over time can be used to best advantage for estimation of the common part of the relationship studied (Hsiao, 1986).

To decide on an appropriate structure for analysis, namely random effects versus fixed effects, it appears that consideration should be given to: a) the objectives of the study; and b) the context of the data, the manner in which they are generated, and the environment from which they came.
When the objective is to make inferences about the population characteristics and the sample observations are random selections from the relevant population, a random effects model is appropriate. By contrast, choice of a fixed effects model implies that our interest centres on the outcome of an individual unit. Hence, whether the particular sample can be realistically considered as a random sample from the population is irrelevant. In another situation the objective may be to learn about the mean outcome of a specific factor over the population of other factors. In this case, the analysis is more appropriately conducted in terms of a mixed fixed and random effects framework.

Thus, the situation to which a model applies and the inferences based on it are the deciding factor in determining whether we should treat effects as random or fixed. When inferences are going to be confined to the effects in the model, the effects are more appropriately considered fixed. When inferences will be made about a population the effects from which those observations included in the data are considered to be a random sample, then the effects should be considered random.

In a hypothesis-testing framework, formal statistical testing procedures are based on one implication or another of the random effects formulation relative to the fixed effects formulation. One formal statistical analysis is Breuch and Pagan (1979) where they exploit the fact that the effects of introducing a random coefficient of variation is to give the dependent variable of the $i$th unit a different variance, therefore introducing a particular heteroscedasticity formulation, and suggest a Lagrange multiplier test for heteroscedasticity.
8.4. Heteroscedasticity

One of the important assumptions of the classical linear regression model is that the variance of each disturbance term $u_i$, conditional on the chosen values of the explanatory variables, is some constant number equal to $\sigma^2$. This is the assumption of homoscedasticity, that is, equal variance. Symbolically,

$$ E(u_i^2) = \sigma^2 \text{ for } i = 1, 2, \ldots, n $$

In contrast when conditional variance of $Y_i$ increases as $X$ increases, that is, the variances of $Y_i$ are not the same, hence, there is heteroscedasticity (Gujarati, 1995). Symbolically, $E(u_i^2) = \sigma_i^2$

The problem of heteroscedasticity is likely to be more common in cross sectional than in time series data. In cross sectional data, one usually deals with members of a population at a given point in time, such as firms, industries, etc. Moreover these members may be of a different size such as small, medium, large firms. In time series data, on the other hand, the variables tend to be of similar orders of magnitude because one generally collects the data for the same entity over a period of time.

8.4.1. The Generalised Least Squares Method

Ideally we would like to devise the estimating scheme in such a manner that observations coming from populations with greater variability are given less weight than those coming from populations with smaller variability. Unfortunately the usual Ordinary Least Squares (OLS) method does not follow this strategy and therefore does not make use of the "information" contained in the unequal variability of the dependent variable $Y$. It assigns equal weight or importance to each observation. But a method of observation, known as Generalised Least Squares (GLS), takes such information into account
explicitly and is therefore capable of producing estimators that are BLUE (Best Linear Unbiased Estimator).

The procedure of transforming the original variables in such a way that the transformed variables satisfy the assumption of the classical model and then applying OLS to them is known as the method of generalised least squares. In short the estimators obtained are known as GLS estimators and these are estimators that are BLUE.

In GLS the weighted sum of residual squares (RSS) is minimised with
\[ w_i = \frac{1}{\sigma_i^2} \] (\( \sigma_i^2 \) is the heteroscedastic variance) acting as the weights, but in OLS the unweighted or (what amounts to the same thing) equally weighted RSS is minimised.

**Detection of Heteroscedasticity:** As with multicollinearity described in the following section, the question is how does one know that the heteroscedasticity is present? There are no hard-and-fast rules for detecting heteroscedasticity, only a few rules of thumb. Some of the informal and formal methods for detecting heteroscedasticity are as follows:

1. **Nature of the problem:** Very often the nature of the problem under consideration suggests whether heteroscedasticity is likely to be encountered. In cross-sectional data involving heterogeneous units, heteroscedasticity may be the rule rather than the exception.

2. **Graphical method:** If there is no a priori or empirical information about the nature of heteroscedasticity, in practice one can perform the regression analysis on the assumption that there is no heteroscedasticity and than do a “postmortem” examination of the residual squares \( u_{it} \) to see if they exhibit any systematic pattern (Gujarati (1996)).
3. Formal methods include the Park test, Spearman’s rank correlation test, Goldfeld Quandt test, Breusch-Pagan-Godfrey (BPG) test and White’s general heteroscedasticity test.

White’s general heteroscedasticity test: Unlike the Goldfeld-Quandt test, which requires reordering of observations with respect to X variables that caused heteroscedasticity, or the BGP test which is sensitive to the normality assumption, the general test of heteroscedasticity proposed by White does not rely on the normality assumption and is easy to implement.
8.5. Multicollinearity

Multicollinearity originally meant the existence of a "perfect" or exact linear relationship among some or all explanatory variables of a regression model. For the k variable regression involving explanatory variables \( X_1, X_2, \ldots, X_k \), an exact linear relationship is said to exist if the following condition is satisfied:

\[
\lambda_1 X_1 + \lambda_2 X_2 + \ldots + \lambda_k X_k = 0
\]

where \( \lambda_1, \lambda_2, \ldots, \lambda_k \) are constants (partial slope coefficients) such that not all of them are zero simultaneously.

Today however the term multicollinearity is used to in a broader sense to include the case of perfect multicollinearity as described above, as well as the case where the \( X \) variables are intercorrelated but not perfectly so, as follows:

\[
\lambda_1 X_1 + \lambda_2 X_2 + \ldots + \lambda_k X_k + \nu_i = 0
\]

where \( \nu_i \) is a stochastic error term.

There are several sources of multicollinearity. As Gujarati (1995) notes, multicollinearity may be due to the following factors:

1. The data collection method employed, for example, sampling over a limited range of the values taken by the regressors in the population.
2. Constraints on the model or in the population being sampled.
3. Model specification, for example, adding polynomial terms to a regression model, especially when the range of the \( X \) variable is small.
4. An overdetermined model. This happens when the model has more explanatory variables than the number of observations.

**Theoretical consequences of multicollinearity.**

Christopher Achen (1982) remarks: "Beginning students of methodology occasionally worry that their independent variables are correlated - the so called multicollinearity problem. But multicollinearity violates no regression assumption. Unbiased, consistent estimates will occur, and their standard errors will be correctly estimated. The only effect of
multicollinearity is to make it hard to get coefficient estimates with small standard errors. But having a small number of observations also has that effect, as does having independent variables with small variances. Thus "What should I do about multicollinearity?" is a question like "What should I do if I don't have many observations?" No statistical answer can be given.

**Practical consequences of multicollinearity:**

In case of near or high multicollinearity, one is likely to encounter the following consequences:

1. Although meeting the BLUE criterion, the OLS (Ordinary Least Squares) estimators have large variances and covariances, making precise estimation difficult.
2. Because of consequence 1, the coefficient interval tends to be much wider, leading to the acceptance of the "null hypothesis $H_0$" mode too readily (type error 2).
3. Also because of consequence 1, the $t$ ratio of one or more coefficients tends to be statistically insignificant.
4. While the $t$ ratio of one or more coefficients is statistically is insignificant, $R^2$, the overall measure of goodness of fit, can be very high.
5. The OLS estimators and their standard errors can be sensitive to small changes in the data.

**Detection of Multicollinearity**

How does one know that multicollinearity is present in any given situation, especially in models involving more than one explanatory variable? Here it is useful to bear in mind that multicollinearity is a question of degree and not of kind. The meaningful distinction is not between the presence and the absence of multicollinerity, but between its various degrees.
Since multicollinearity refers to the condition of the explanatory variables that are assumed to be non-stochastic, it is a feature of the sample and not of the population. Therefore we do not test for multicollinearity but can, if we wish, measure its degree in any particular sample (Kmenta, 1986)

Since multicollinearity is essentially a sample phenomenon, arising out of the largely non-experimental data that are collected in most social sciences, there is no unique method of detecting it or measuring its strength. What exists are some rules of thumb, some formal, some informal, but rules of thumb all the same. They are:

1. High $R^2$ but few significant t ratios. If $R^2$ is high, say in excess of 0.8, the $F$ test in most cases will reject the hypothesis that the partial slope coefficients are simultaneously equal to zero, but the individual t tests may indicate that none or very few of the partial slope coefficients are statistically different from zero.

2. High pair-wise correlations among regressors. Another suggested rule is that if the pair-wise or zero-order correlation coefficient between two regressors is high, say, in excess of 0.8, then multicollinearity is a serious problem. The problem with this criterion is that, although high zero-order correlations may suggest collinearity, it is not necessary that they be high to have collinearity in any specific case.

3. Examination of partial correlation. Because of the problem just mentioned of relying on zero-order correlation, it is suggested that one should look at the partial correlation coefficients.

4. Auxiliary regressions. Since multicollinearity arises because one or more of the explanatory variables are exact or approximately linear combinations of the other regressors, one way of finding out which X variable is related to other
X is to regress each of $X_i$ on the remaining X variables and compute the corresponding $R^2$. Each of these regressions is called an auxiliary regression, auxiliary to the main regression of $Y$ on the X's.

Instead of formally testing all auxiliary $R^2$ values, one may adopt Klien's rule of thumb, which suggests that multicollinearity may be a troublesome problem only if the $R^2$ obtained from an auxiliary regression is greater than the overall $R^2$, that is, that obtained from the regression of $Y$ on all the regressors.

**Remedial measures**

What can be done if multicollinearity is serious? As in the case of detection, there are no infallible guides because multicollinearity is essentially a sample problem. However, one can try and follow these rules of thumb, the success depending on the severity of the collinearity problem.

1. *A priori* information. This could be obtained from previous empirical work in which the collinearity happens to be less serious or from the relevant theory underlying the field of study.

2. Combining cross-sectional and time series data. A variant of the extraneous or *a priori* information technique is the combination of cross-sectional and time series, knowing as pooling the data.

3. Dropping a variable and specification bias. When faced with severe multicollinearity, one of the simplest measures is to drop one of the collinear variables. But in dropping a variable from the model we may be committing a specification bias. Specification bias arises from incorrect specification of the model used in the analysis. Hence the remedy may be worse than that the disease in some situations because, whereas multicollinearity may prevent precise estimation of the parameters of the model, omitting a variable may seriously mislead us as to the true value of the parameters.
4. Transformation of variables. For example the use of first differences regression. Although the levels of $X_2$ and $X_3$ may be highly correlated, there is no \textit{a priori} reason to believe that their first differences will also be highly correlated.

5. Additional or new data. Since multicollinearity is a sample feature, it is possible that in another sample involving the same variables collinearity may not be so serious as in the first sample. Sometimes simply increasing the size of the sample may attenuate the collinearity problem. Obtaining additional or "better" data is not always easy.

Of course, which of these rules will work in practice will depend on the nature of the data and severity of the collinearity problem.
8.6. Stationary Stochastic Process

Any time series data can be thought of as being generated by a stochastic or random process; and a concrete set of data can be regarded as a realisation of a particular stochastic process. The distinction between the stochastic process and its realisation is similar to that between population and sample in cross-sectional data. Just as the sample data are used to draw inferences about a population, in time series the realisation is used to draw inferences about the underlying stochastic process. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed.

One simple test of stationarity is based on the so-called auto-correlation function (ACF). The ACF is defined as the fraction of covariance at lag \( k \) over variance \( \sigma^2 \). It lies between -1 and 1 like any other correlation coefficient. The statistical significance of any ACF can be judged by its standard error. It is shown that that if a time series is purely random, (that is, it exhibits white noise) the sample auto-correlation coefficients are approximately normally distributed with zero mean and variance \( 1/n \), where \( n \) is the sample size.

An alternative test of stationary is the unit root test. If we run the regression

\[ Y_t = \rho Y_{t-1} + u_t \]

where \( u_t \) is a stochastic error term with zero mean, constant variance \( \sigma^2 \) and is unautocorrelated, and find \( \rho = 1 \), than we say that the stochastic variable \( Y_t \) has a unit root. In time series econometrics, a time series that has a unit root is known as a random walk. And a random walk is an example of a non-stationary time series.
8.7. Statistical Definitions

The coefficient of determination $r^2$ (two-variable case) or $R^2$ (multiple regression) is a summary measure that tells how well the sample regression line fits the data.

$$R^2 = \frac{\text{ESS}}{\text{TSS}}$$

(ESS - explained sum of squares, TSS - total sum of squares)

Some of the properties of $r$ are as follows:

1. It can be positive or negative.
2. It lies between $-1$ and $+1$.
3. It is symmetrical in nature.
4. It is independent of the origin and scale.
5. Zero correlation, i.e., $r = 0$ does not necessarily imply independence.
6. It is a measure of linear association or linear dependency.

The T-test is a test of significance approach. A test of significance is a procedure by which sample results are used to verify the validity or invalidity of a null hypothesis.

The F-test is a measure of the overall significance of the estimated regression. It is also a test of significance of $R^2$.

The Standard Error is simply the standard deviation of the $Y$ values about the estimated regression line and is often used as a summary of the "goodness of fit" of the estimated line.

The Durbin Watson (DW) statistics is the ratio of the sum of squares differences in successive residuals to the RSS (Residual Sum of Squares). It is one of the most frequently used tests for serial correlation. As a rule of thumb,
if DW is found to be 2 in an application, one may assume that there is no first-order correlation, either positive or negative.

8.8. E-View Statistical Package

As mentioned above, E-View is the statistical package used in this research.

E-View does not weight observations in pooled estimation by default, but there is the option of estimating weighted versions of the specifications. There are three options:

- No-weights: all observations are given equal weight
- Cross-section weights: GLS using estimated cross-section residual variances weighted within cross-sections.
- SUR: analogue or seemingly unrelated regression GLS using an estimated cross-sectional residual covariance matrix.

E-View can estimate covariances that are robust with respect to general heteroscedasticity. This form of heteroscedasticity is more general than cross-sectional heteroscedasticity since the variances across sections are allowed to differ across time.

White's heteroscedastic consistent covariance estimates may be computed in E-View for pooled specifications (except for SUR combined with random effects estimation as described below). This variance estimator is robust with respect to heteroscedasticity within each cross-section, but does not account for the possibility of contemporaneous correlation across cross-sections.

E-View allows one to perform coefficient tests on the estimated parameters of the pool equation, such as the Wald test.
The explanatory variables can be:

- **Common coefficients**: variables that are to have the same coefficient across all cross-section members of the pool.

- **Cross section specific coefficients**: variables with different coefficients for each member of the pool.

E-View allows four options for dealing with intercepts:

- **None**: No intercept \( \alpha_{it} = 0 \)
- **Common**: Identical intercepts for all pool members \( \alpha_{it} = \alpha \) over time and cross-sectionally.
- **Fixed effects**: Different intercepts estimated for each pool member cross-sectionally but held constant over time
  \[ \alpha_{it} = \alpha_{i}, \ E(\alpha_{i} \epsilon_{it}) \neq 0 \]
- **Random effects**: Treats intercepts as random variables across pool members: \( \alpha_{it} = \alpha + u_{i}, \ E(u_{i} \epsilon_{it}) = 0 \)

The fixed effects estimator allows \( \alpha_{i} \) to differ across cross-section units by estimating a different constant for each cross-section. E-View computes "fixed effects" by subtracting the "within" cross-section mean from each variable and estimating OLS using the transformed data which are the deviations from cross-section means.

The random effects model assumes that the term \( \alpha_{it} \) is the sum of a common constant \( \alpha \) and a time invariant cross-section specific random variable \( u_{i} \) that is uncorrelated with the residual \( \epsilon_{it} \).

Cross-section weighted regression is appropriate when the residuals are cross-sectionally heteroscedastic and contemporaneously uncorrelated (E-View, Users Guide, p. 732).
Because of the above mentioned characteristics that E-View displays, particularly in dealing with heteroscedasticity and multicollinearity of panel data analysis, it was considered as the most appropriate package to be used in carrying out the statistical analysis of this research.
8.9. Conclusions

This chapter describes the type of data used in the following empirical research. The data used in this research come from secondary resources such as Extel and Datastream databases. The study uses 13 years of accounting data from 1985 to 1997, during which the databases provided full sets of accounts. The number of quoted companies in each industry under study, i.e. Retail and Hotel industries, are: 133 companies in the Retail industry and 21 companies in the Retail industry.

This chapter discussed the advantage of using panel data as well as the problems that might arise as the result of pooling together time series and cross-sectional data, (i.e. stationarity and heterogeneity respectively).

Regression analysis was considered as the best method to carry out the empirical research in this study. Several aspects connected with regression analysis such as: multicollinearity, heteroscedasticity and robustness of the model, were discussed in this chapter.

Finally the chapter discussed some of the characteristics of E-View statistical package which is used to carry out the regression analysis in this research.
References


Chapter 9

Do Firms Follow a Pecking Order Approach?

9.1. Introduction

This study tests the hypothesis that firms follow a pecking order approach in their choices of financing sources. The hypothesis has generally been formulated in terms of a pecking order in using the funds available to the firms by starting with internal equity, continuing with debt as a second resort and using external equity only as a final source of funding (Myers and Majluf (1984). The main argument behind this formulation is the presence of information asymmetry, which causes a mispricing for the external financing. The mispricing is more severe for equity issues which makes them the last source of financing.

The pecking order hypothesis translates into an empirical hypothesis which associates gearing levels very closely with the retained earnings, dividend policy and investment opportunities.

Section 9.2 provides a general discussion of the pecking order hypothesis and findings from different studies. Section 9.3 discusses the pecking order model. Definitions of variables used in the model are provided in Section 9.4. A summary of results from testing the model and a discussion of them are provided in Section 9.5. Section 9.6 concludes the chapter.
9.2. Do Firms Follow a Pecking Order Approach?

This study is an empirical investigation of the firm's choice of financing sources. A firm in need of cash has three major sources of funds. These sources are: internally generated funds, debt and external equity.

Firms are usually able to generate funds by retaining earnings plus depreciation, and selling marketable securities.

Mayers and Majluf (1984) argued that the information asymmetry that exists between a firm's managers and the market necessitates a pecking order when choosing among the available resources of funds. According to the pecking order theory, internally generated funds are the firm's first choice. Firms prefer to use internal equity to pay dividends and implement growth opportunities. The use of the internal funds avoids the problems associated with external financing such as having covenants that impose restrictions on the firm's future financial decisions in the case of a debt issue, or having to underprice the firm's stock in case of a stock issue. However, the free use of internal equity financing may be limited, as the managers hesitate to cut dividends.

The pecking order theory also suggests that when external financing is needed, firms prefer to raise debt before external equity ((Donaldson, 1961), Myers (1984) and Myers and Majluf (1984)). There are two different views in the literature about why firms prefer to raise debt before external equity. Donaldson (1961) suggests that internal equity is preferred because firms want to avoid flotation costs, which usually accompany external financing. He also suggests that firms prefer debt to external equity because the flotation cost (i.e. transaction costs of flotation) of debt is usually less than that of external equity.
Myers and Majluf (1984) disagree with the view that firms prefer internal equity to debt because of the flotation costs. Conventional finance theory would not consider internal equity as "cheaper" than debt. If it is cheaper, this is presumably because of agency costs as discussed in the earlier chapters (e.g., underinvestment and asset substitution problems). They argue that the net benefits of debt financing, in terms of the trade-off between non-debt tax shields and financial distress, are likely to outweigh flotation costs. Myers and Majluf argue that managers rely on internal funds because they want to maximise existing shareholders wealth. They suggest that sale of new shares is not in the interests of the existing shareholders because it usually leads to a decrease in the market price of the existing shares (Adedeji, 1998). Evidence observed by Marsh (1982) and Mikkelsen and Partch (1986) is consistent with this suggestion.

Myers and Majluf also argue that firms prefer debt to external equity, if they require external financing, because the issue of risk free debt will not have any impact on the value of the existing shares. It is further argued that even if debt is risky, the impact of its issue on the value of existing shares will be less than that of an issue of new shares. The value of debt is less sensitive to private information than the value of equity therefore; even risky debt is preferred to equity.

Despite their differences, the explanations of both Donaldson and Myers and Majluf lead to the same conclusion, namely that firms relate their profitability and growth opportunities to their long term target dividend payout ratios in order to minimise the need for external financing. A number of testable propositions follow from this conclusion. One of them is that profitability has a negative influence on financial leverage, since a firm that can generate more earnings will borrow less, other things being equal. Highly profitable firms may be more able to use internally generated funds than others since high
profitability is usually associated with high cash inflow (this is tested in Chapter 11).

The relationship between gearing and dividend payout ratio on one hand or investment on the other is not very clear, as they both depend on the firms' response to a shortage of earnings. If firms respond to earnings shortages by borrowing both to pay dividends and to finance growth opportunities, then the dividend payout ratio and investment should have a positive influence on gearing. By contrast, if firms respond to earnings shortages by reducing or postponing investment, while borrowing to pay dividends in the short term because of the reluctance to cut dividends, financial gearing may have a positive relationship with the dividend payout ratio and a negative relationship with the level of investment. Furthermore, if over time the earnings shortage persists, firms will be forced to adjust their dividend payout ratio to the new level of earnings.

The suggestion of the pecking order theory that only a shortage of internal funding makes firms use external financing is questionable because it contradicts some other theories and ignores the effects of various institutional factors that encourage or discourage the use of debt.

Myers' (1977) argument that firms should not use risky debt to finance growth opportunities in order to avoid the underinvestment problem is relevant. In this case, firms will not follow a pecking order and would prefer external equity to debt. De Angelo and Masulis' (1980) suggestion that there is an inverse relationship between gearing and the amount of non-debt tax-shields substituted for debt indicates that firms with a low level of non-debt tax-shields may prefer to use debt before internal equity in order to obtain the tax advantages of debt.
The degree of encouragement given to firms to use debt by various institutional arrangements is an important factor because it can change the pecking order and, therefore, the relationship between financial gearing, investment and dividend payout ratio. Some of these institutional arrangements that can influence firms' decisions to use internal or external financing are the interest rate, the relationship between creditors and firms, and the likelihood of Government intervention if there is a financial crisis (Adedeji (1998)). For example, a different relationship between investment and earnings will be expected to exist among British firms compared with German or French firms. Germany is known for its system of bank intermediation, and France for its Government intervention, though this only applies to larger firms and less than in the past e.g. bail-out of the bank Credit Lyonnais.

The tax system is an important factor that may encourage firms to use debt financing to greater or lesser extent. Since the imputation tax system that has existed in the U.K. until very recently does not encourage the use of debt as much as the classical system in the U.S., the relationship between investment and financial gearing in the U.K. may be different from that observed in the U.S.
9.3. The Pecking Order Model

If financial gearing, earnings, dividends and investments are interrelated, financial gearing (FG) should be a function of the cash flows generated by the firm, its dividend payout ratio and investments.

\[ FG = f(\text{Earnings, Dividends, Investments}) \]

In its simplest form the pecking order of corporate financing would be:

\[ \text{NE} = \text{Div + CE + WC + Dif} \]
\[ \text{Dif} = \text{NE} - (\text{Div +CE + WC}) \]

where \( \text{NE} = \) Earnings after interest and tax
\( \text{Div} = \) Dividends
\( \text{CE} = \) Capital Expenditures
\( \text{WC} = \) Working Capital Change
\( \text{Dif} = \) Difference which can be positive (surplus) or negative (deficit)

If \( \text{Dif} > 0 \) i.e., \( \text{NE} > \text{Div + CE + WC} \) the firm has a surplus of funds so it retires debt, and if \( \text{Dif} < 0 \) the firm has a deficit so issues debt.

In a strict pecking order model, as long as safe debt can be issued there is no need to go down the pecking order and issue stock.

The model to be tested is:

\[ D_t - D_{t-1} = \alpha + \beta \ Dif_{it} + u_{it} \]

Where \( \beta \) is the pecking order coefficient and \( D_t - D_{t-1} \) is the amount of debt issued or retired depending on the sign of Dif. In order for \( D_t - D_{t-1} = \text{Dif} \), we would expect \( \alpha = 0 \) and \( \beta = 1 \). The above equation does not include equity because the pecking order model will issue or retire equity only as a last resort. The pecking order does not depend on the sign of Dif. In principle a firm can become a net lender if the surplus persists (Shyam-Sunder and Myers (1999)).
The pecking order models for long and total gearing variables would be:

\[ \text{LTG}_i - \text{LTG}_{i-1} = \alpha + \beta \text{Def}_i + u_i \]

and \[ \text{TG}_i - \text{TG}_{i-1} = \alpha + \beta \text{Def}_i + u_i \]
9.4. Definition of Variables

There is a general agreement among academics that the book value of debt can be used as a substitute for the market value of debt. It can be very difficult to calculate the market value of debt, and studies have shown that there is normally very little difference between the market value of debt and its book value. Auerbach (1985) calculated the market value of debt by using its book value and transforming it using assumptions about the initial age structure of such debt, the maturity of new issues, and the coupon rate on such issues. These data are not readily available in the secondary data sources, which makes it very difficult to calculate the market value of debt from the book value.

Long term debt is the total company’s debt payable after one year. This includes long-term bank loans and other long-term liabilities repayable beyond one year. Total debt is the sum of long-term debt and short-term debt. Short-term debt is defined as the portion of the company’s total debt payable within a year. This includes bank overdrafts and the current portion of bank loans.

As defined above, variable $\text{Dif} = \text{NE} - (\text{Div} + \text{CE} + \text{WC})$.

Net earnings are the operating earnings after interest and taxes. Another measure that could be used instead of net earnings is the operating income before interest and taxes. The two figures are correlated and comparison of the results would give an indication of the effect of interest and taxes on the borrowing decision.

There is no figure for capital expenditures in the available database, therefore, the first lagged difference of net fixed assets can be used as a proxy for capital expenditures. Alternatively, if depreciation is added to both sides, operating cash flow (OCF) may be used and the first lag difference of gross fixed assets
can be the proxy for capital expenditures. This would clearly give the same results.

Working capital is the first lagged difference between current assets (minus cash) and current liabilities.

Another variable that should ideally be taken into account in the "Dif" equation is the current portion of loans repayable in the year \( i \), i.e., this should be excluded from the working capital calculations. These data are not available in the database, and so are excluded from the calculation and will be taken into consideration in the discussion and analysis section. (Under the assumption that firms have not issued new debt, the difference between the long-term debt at \( t-1 \) and \( t \) can be used as a proxy for the current portion of loans payable. This was tried, but the results were not very different from the case when this was not included in the equation.)

Therefore,

\[
\text{Dif}_{it} = \text{NE}_{it} - (\text{Div}_{it} + \text{CE}_{it} + \Delta \text{WC}_{it})
\]

\[
\text{Dif}_{it} = \text{NE}_{it} - [\text{Div}_{it} + (\text{FA}_{it} - \text{FA}_{it-1}) + (\text{WC}_{it} - \text{WC}_{it-1})]
\]

Tables 9.1, 9.2 and 9.3 describe the statistical properties of variables First Difference of Long Term Gearing (LTG), Total Gearing (TG) and "Dif" for the hotel and retail data sets respectively.

<table>
<thead>
<tr>
<th>First Difference LTG</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing and footwear retailers</td>
<td>0.57</td>
<td>0.00</td>
<td>-354.50</td>
<td>308.90</td>
</tr>
<tr>
<td>Food retailers</td>
<td>11.10</td>
<td>0.00</td>
<td>-498.00</td>
<td>951.70</td>
</tr>
<tr>
<td>Household Goods &amp; Hardware</td>
<td>-0.46</td>
<td>0.00</td>
<td>-504.00</td>
<td>339.30</td>
</tr>
<tr>
<td>Mixed retail business</td>
<td>2.06</td>
<td>0.00</td>
<td>-201.50</td>
<td>364.60</td>
</tr>
<tr>
<td>Confection/Newsagent/Chemists</td>
<td>4.86</td>
<td>0.00</td>
<td>-116.00</td>
<td>291.90</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>3.69</td>
<td>0.00</td>
<td>-504.00</td>
<td>951.70</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>25.28</td>
<td>0.02</td>
<td>-337.00</td>
<td>2367.00</td>
</tr>
</tbody>
</table>

Table 9.1 Descriptive statistics of first lag difference of long-term gearing
### Table 9.2 Descriptive statistics of first lag difference of total gearing

<table>
<thead>
<tr>
<th>First Difference TG</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing and Footwear Retailers</td>
<td>1.35</td>
<td>0.00</td>
<td>-341.90</td>
<td>365.40</td>
</tr>
<tr>
<td>Food Retailers</td>
<td>17.89</td>
<td>0.33</td>
<td>-323.00</td>
<td>1031.10</td>
</tr>
<tr>
<td>Household Goods &amp; Hardware</td>
<td>-1.38</td>
<td>0.00</td>
<td>-419.50</td>
<td>343.70</td>
</tr>
<tr>
<td>Mixed Retail Business</td>
<td>3.82</td>
<td>0.00</td>
<td>-445.10</td>
<td>364.30</td>
</tr>
<tr>
<td>Confection/Newsagent/Chemists</td>
<td>7.74</td>
<td>0.00</td>
<td>-235.50</td>
<td>461.80</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>6.00</td>
<td>0.00</td>
<td>-445.10</td>
<td>1031.10</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>39.14</td>
<td>0.69</td>
<td>-391.00</td>
<td>4291.00</td>
</tr>
</tbody>
</table>

### Table 9.3 Descriptive statistics of variable “Dif”

<table>
<thead>
<tr>
<th>“DIF”</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing and Footwear Retailers</td>
<td>-12.60</td>
<td>-0.69</td>
<td>-594.22</td>
<td>441.10</td>
</tr>
<tr>
<td>Food Retailers</td>
<td>-31.71</td>
<td>-1.73</td>
<td>-1576.50</td>
<td>1352.60</td>
</tr>
<tr>
<td>Household Goods and Hardware</td>
<td>-2.27</td>
<td>-0.02</td>
<td>-1889.77</td>
<td>1889.90</td>
</tr>
<tr>
<td>Mixed Retail Business</td>
<td>-9.26</td>
<td>-0.13</td>
<td>-694.60</td>
<td>692.46</td>
</tr>
<tr>
<td>Confection/Newsagent/Chemists</td>
<td>-3.38</td>
<td>-0.56</td>
<td>-569.90</td>
<td>606.20</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>-12.66</td>
<td>-0.36</td>
<td>-1889.77</td>
<td>1889.90</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>-63.11</td>
<td>-2.60</td>
<td>-6657.00</td>
<td>2196.00</td>
</tr>
</tbody>
</table>
9.5. Results and Analysis of the Pecking Order Tests

The regression model seeks to explain if the firms follow a pecking order approach in their choice of financing sources.

The results of the pooled data fixed effects cross section regression, using the above described model for long and short term gearing, are shown in tables 9.4 and 9.5 respectively.

| Pecking Order | LTG |  |
|---------------|-----|--|---|---|---|
| Test          | β   | t-stat. | R² | Adj. R² | D - W |
| Clothing      | -0.03 | -5.15* | 0.10 | 0.08 | 2.04 |
| Food          | 0.00  | -1.33  | 0.05 | 0.03 | 2.31 |
| Hardware      | -0.02 | -5.41* | 0.14 | 0.11 | 2.28 |
| Mixed         | -0.01 | -1.58  | 0.08 | 0.06 | 2.11 |
| News /Chemist | -0.01 | -1.89  | 0.07 | 0.05 | 2.27 |
| Hotel Industry| -0.06 | -0.68  | 0.06 | 0.05 | 1.83 |

* - significant at 2.5 per cent level of probability
** - significant at 5 per cent level of probability
*** - significant at 10 per cent level of probability

Table 9.4 Regression results of the pecking order model for LTG

| Pecking Order | TG |  |
|---------------|----|--|---|---|---|
| Test          | β   | t-stat. | R² | Adj. R² | D - W |
| Clothing      | -0.27 | -6.58* | 0.11 | 0.08 | 2.20 |
| Food          | 0.001 | -1.38  | 0.07 | 0.05 | 2.13 |
| Hardware      | -0.01 | -8.36* | 0.07 | 0.05 | 2.23 |
| Mixed         | -0.11 | -9.23* | 0.22 | 0.18 | 2.00 |
| News /Chemist | -0.08 | -4.70* | 0.13 | 0.10 | 2.40 |
| Retail Industry| -0.02 | -8.35* | 0.10 | 0.06 | 2.23 |
| Hotel Industry| -0.04 | -2.62  | 0.07 | 0.07 | 2.03 |

Table 9.5 Regression results for the pecking order model for TG
As can be seen from the above tables most of the coefficients for the retail sector are significant at the 2.5 per cent level or better.

As explained in Section 8.8, p191, there are no figures for the intercept as we have used the fixed effects cross section estimator.

Tables 9.4 and 9.5 indicate that in general the slopes for long-term gearing are small and they have negative values. The only exception is food retailing which has a very small positive slope coefficient of 0.001. Clothing retailing has the largest slope coefficient of -0.27 which still is far from what can be expected if a pecking order approach holds true.

The coefficients of determination are not high and they vary from 5% (food retailing, LTG) to 22% (mixed retailing, TG) for the retail sector and 6% and 7% for the hotel sector. The total gearing performs slightly better than the long-term gearing but figures are very close. These results indicate that the debt behaviour of companies in both sectors does not follow a pecking order approach.

Durbin-Watson statistics are all around the required level of 2.

The results are somewhat different from the conclusions of other studies, especially Shyam – Sunder & Myers (1999) which found high coefficients of determination.

The simplicity of the model, and the fact that the current portion of loans payable is missing from the calculation of ΔWC, might be a contributing factor to the low explanatory power of the model, but could not all alone count for the big difference between the R²'s and the small β (slope coefficients) of the two studies. It is clear from the data shown in table 9.4, 9.5, that firms in both retail
and hotel sector do not follow a pecking order approach in their financing strategies.

As can be seen from Figures 9.1, 9.2 and 9.3, there is very little correlation between Dif and the difference in the level of borrowing for both LTG and TG. The graphs show clearly that the deficit in funds available is not always associated with the same size of borrowing (e.g. years 1988, 1989, 1996 retail sector and 1988, 1996 hotel sector). There are years when companies have borrowed (1987) when under Shyam-Sunder and Myers model they could have acted as net lenders, i.e. they pay off the debt when there is a surplus of funds (positive correlation coefficient). Moreover, the size of the deficit seems to have no predictive power for the decision to borrow.

Table 9.6 shows that the correlation coefficients between Dif and the first differences of borrowing are very small. The only exceptions are Clothing and Mixed retailing with respective coefficients of -0.41 and -0.42 (long-term gearing) and 0.43 and 0.45 (total gearing). But when we look at the coefficients for the whole sample (Ret + Hot) they are very small (respectively 0.06 for LTG and -0.03 for TG). This gives further support for the results of the regression tests, namely that the pecking order approach does not seem to explain the debt behaviour of companies in both sectors.

One of the possible reasons for this is that firms that have ready access to the capital markets do not follow the pecking order when choosing the type of security to offer. Therefore, a better defined test would be the one where the equity issues are included, as the assumption that firms will issue equity only as a last resort does not seem to hold.
### Table 9.6. Correlation coefficients of POH Dif and first differences of LTG and TG

<table>
<thead>
<tr>
<th>Correlation Coefficients</th>
<th>D11 &amp; Dif</th>
<th>D12 &amp; Dif</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>-0.42</td>
<td>-0.43</td>
</tr>
<tr>
<td>Food</td>
<td>-0.06</td>
<td>-0.27</td>
</tr>
<tr>
<td>Hardware</td>
<td>-0.10</td>
<td>0.02</td>
</tr>
<tr>
<td>Mixed</td>
<td>-0.41</td>
<td>-0.65</td>
</tr>
<tr>
<td>News</td>
<td>-0.23</td>
<td>-0.27</td>
</tr>
<tr>
<td>Retail</td>
<td>-0.02</td>
<td>-0.06</td>
</tr>
<tr>
<td>Hotel</td>
<td>0.25</td>
<td>0.31</td>
</tr>
<tr>
<td>Ret + Hot</td>
<td>0.06</td>
<td>-0.03</td>
</tr>
</tbody>
</table>

Figure 9.1. Cross-sectional comparison of Dif and first differences of LTG and TG for the Retail Sector (D11 – LTG first difference, D12 – TG first difference)
Figure 9.2. Cross-sectional comparison of Dif and first differences of LTG and TG for the Hotel Sector (D11 – LTG first difference, D12 – TG first difference)

Figure 9.3. Cross-sectional comparison of Dif and first differences of LTG and TG for the Retail and Hotel Sectors. (D11 – LTG first difference, D12 – TG first difference)
9.6. Conclusions

This chapter develops a simple model that synthesizes the pecking order theory of capital structure.

Using a fixed effects general least squares model, we estimate the regression coefficient for the year to year difference of long-term and total gearing levels by using as a regressor a calculation of deficit (surplus) of funds available for investment.

We found that the slope coefficients are all significant, mostly negative but very small which means that most of the firms exhibit some PO behaviour (i.e. borrow when deficit and pay back debt when surplus). But the explanatory power of the model is poor, i.e. the coefficients of determination do not support the pecking order hypothesis. This is true for both long and total gearing with total gearing having a higher explanatory power. The only sectors for which the model performed moderately well are hardware and mixed retailing.

The model is simple. It suffers from some variable calculation problems which stem from the unavailability of certain raw data, in particular that for capital expenditures which had to be estimated, and the inability to separate out the current portion of long term debt from trade credit which distorts the calculation of the working capital and working capital difference. Trade credit plays an important role in the financing of the companies in the sample, especially for the retail sector. For this reason, the result obtained from the model using LTG are in principle more meaningful than those from the model using TG. This is because gross working capital may normally be financed either by trade credit or by short-term debt (STD), i.e. short term credit is a substitute for short term debt. Thus the difference in gross working capital will be part of "Dif", but may be financed by either trade credit or STD, rather than by LTD. However, it is the model using TD that has greater explanatory
power. This may be because trade credit tends to be a fixed proportion of gross WC in the short term, while TG captures more "pecking order effects" than LTG.

The results of the regression model, despite its simplicity, show clearly that the pecking order approach is not the driving force in the debt policy of the sample companies. This questions the fundamental assumption of the pecking order approach that companies will issue equity only as a last resort.
References


Chapter 10

Do Firms adjust towards a Target Debt Level?

10.1. Introduction

The search for a theory of optimal capital structure has dominated the finance literature during the past 40 years. Numerous studies have been carried out to test the hypothesis that there is an optimum. The hypothesis has generally been formulated in terms of an optimum trade-off between the benefits and costs of debt. The most discussed trade-off is that between the tax-advantages of debt and the costs of financial distress. A value maximising firm would equate benefits and costs at the margin. In order to do so, that firm must aim at the optimum or the target. Note that the terms “trade-off model” or “target adjustment model” are used interchangeable in the literature and in this chapter.

The static trade-off theory translates into an empirical hypothesis that predicts that actual debt ratios move towards a target or optimum debt level. If the move is upwards, i.e. from a lower level of gearing to a higher one towards the target, it is considered a positive adjustment and if the move is downwards i.e. from a higher gearing level to a lower one towards the target, it is considered a negative adjustment.

Section 10.2 provides a general discussion of the target adjustment argument and the support given to it by different studies. Section 10.3 discusses the target adjustment model. Definitions of variables used in the model are provided in Section 10.4. A summary of results from testing the model and a discussion of them, are provided in Section 10.5. Section 10.6 concludes the chapter.
10.2. Do Firms adjust towards a Target Debt Level?

The question "Is there an optimum debt level?" has occupied a centre place in the corporate finance research. The optimum debt level represents the debt level that maximises firm value. This optimum requires a trade-off between the benefits of debt use and the costs associated with it: for example the trade-off between tax-advantages of debt and bankruptcy costs (see Chapter 2), or the trade-off between the reduction of free cash flow agency problems and the increase of underinvestment problems (see Chapter 3). In an empirical framework, the trade-off argument predicts that firms adjust (increase or decrease) their actual debt ratios towards a target debt level. This means that the debt financing decisions are not residuals of other financing, investment, and strategic decisions.

There is evidence in favour of the static trade-off and optimal capital structure argument. Several authors have documented evidence of strong industry effects in debt ratios which is interpreted as evidence of optimal ratios (see Schwartz and Aronson (1967), Scott (1972), Ferri and Jones (1979), Bradley et al. (1984), Balakrishnan and Fox (1993)). Bradley et al. (1984) gives a review and synthesis of some of the earlier theoretical treatments of optimal capital structure, and concludes that their findings also support the trade-off theory.

Other studies provide more direct evidence that firms adjust toward a target debt ratio. Taggart (1977), Marsh (1982), Auerbach (1985) and Opler and Titman (1994) find mean reversion in debt ratios or evidence that firms appear to adjust toward debt targets.

Practitioners seem to support this concept as well. As it can be seen from the following quotation, some companies seem to try to keep their debt level around a target level.
“The main policy of the group in the mitigation of the financial risk is to maintain gearing of around 50%. It is thought that this level of gearing will allow us to enter the recession reasonably safe from potential breaches of banking covenants and withdrawal of facilities. Consequently when gearing is below 50% we feel able to borrow further funds for investment. At present our gearing is clearly below this level and this positions us well for opportunistic acquisitions if prices of trading units fall”, (Stakis Annual Report and Accounts 1998)
10.3. The Trade-off Model

The static trade-off model has managers seeking an optimal capital structure. Random events would shift them away from it, and they would then have to work their way back. If the optimum debt ratio is stable we should see mean-reverting behaviour.

The simple form of the target adjustment model states that changes in the debt ratio are explained by deviations of the current debt ratio from the target. The regression specification is:

$$G_{it} - G_{it-1} = \alpha + \beta (G^*_i - G_{it-1}) + u_{it}$$

where $G^*_i$ is the target debt level for firm $i$ at time $t$, and $\beta$ the target adjustment coefficient. The hypothesis would be that $0 < \beta < 1$. The inequality shows that there is an adjustment coefficient ($\beta > 0$) and that there are costs associated with this adjustment ($\beta < 1$).

The targets are unobservable; therefore a proxy must be used. The most common proxy used in the previous studies is the average debt ratio over the study period, for each firm. Another alternative is the average debt ratio for the whole industry sample over the entire study period, which could be considered as an industry average. As mentioned before, a number of studies have found the existence of a relationship between the debt level and the industry average. They have concluded that firms try to keep their debt levels around the industry debt level. Jalilvand and Harris (1984) report that the use of a three years moving average does not changes their results.

Two variables are used to measure deviation from the target debt ratios, first focusing on long term debt and second on total debt (long-term debt plus short-term debt). The reason why we use the second variable is to see the
contribution of short-term debt in the target debt level. The ratio of short-term
debt will vary between companies because of differences in both asset
composition and firm size. The two variables allow us to examine the
influence of the maturity structure of debt in the target debt ratios. The
respective models for the long-term debt and total debt are:

\[ \text{LTG}_t - \text{LTG}_{t-1} = \alpha + \beta_L (\text{LTG}_t^* - \text{LTG}_{t-1}) + u_t \]

\[ \text{TG}_t - \text{TG}_{t-1} = \alpha + \beta_T (\text{TG}_t^* - \text{TG}_{t-1}) + u_t \]

Where \( \beta_L \) and \( \beta_T \) are the target adjustment coefficients for long term gearing
and total gearing respectively.
10.4. Definition of Variables

10.4.1. Dependent Variables

The financial gearing ratio is usually measured by the ratio of long term debt to total capital. Market gearing, a measure of financial gearing, is measured as market value of debt divided by the sum of the market value of debt and market value of equity.

For the purpose of measuring financial gearing, market value of equity (MVE) is defined as the number of shares outstanding multiplied by the stock price at the balance sheet date. In order to avoid the effect of financial statement publication on the average of the stock price formation, the average stock price for the four weeks prior to the balance sheet date was used to calculate the market value of equity.

Two other measures are used to measure financial gearing. They are long-term and short-term debt scaled by the book value of total assets (TA) or total sales (TS).

\[
\begin{align*}
LTG &= \frac{\text{LTD}}{\text{MVE}}; \quad \frac{\text{LTD}}{\text{TA}}; \quad \frac{\text{LTD}}{\text{TS}} \\
TG &= \frac{\text{TD}}{\text{MVE}}; \quad \frac{\text{TD}}{\text{TA}}; \quad \frac{\text{TD}}{\text{TS}}
\end{align*}
\]

There is contradictory evidence about the use of the market value of equity or book value of equity. Some of the previous studies have used the book value of equity, arguing that although the theory of capital structure suggests that debt ratios should be measured in market value terms management prefers to use the book value. Myers (1977) argues that market values incorporate the present value of future growth opportunities. Debt issued against these values
can distort future real investment decisions. However, most of the finance literature supports the concept that the market value is a more accurate measure because it presents the present value of the firm’s equity as a going concern, as reflected in the stock market of the publicly traded firms; that is, it reflects the present value of the firm’s expected future cash flows.

The two dependent variables used for this study are defined as the ratios of (a) the book value of long-term debt and (b) the book value of total debt, to the market value of equity.

\[
\text{LTG} = \frac{\text{Book value of long-term debt (LTD)}}{\text{Market value of equity (MVE)}}
\]

\[
\text{TG} = \frac{\text{Book value of total debt (TD) (long-term + short term debt)}}{\text{MVE}}
\]

Tables 10.1 and 10.2 give descriptive statistics for LTG and TG respectively.

<table>
<thead>
<tr>
<th>Long-term gearing</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing and footwear retailers</td>
<td>0.23</td>
<td>0.07</td>
<td>0.00</td>
<td>2.81</td>
</tr>
<tr>
<td>Food retailers</td>
<td>0.20</td>
<td>0.08</td>
<td>0.00</td>
<td>3.36</td>
</tr>
<tr>
<td>Household Goods &amp; Hardware</td>
<td>0.14</td>
<td>0.03</td>
<td>0.00</td>
<td>1.90</td>
</tr>
<tr>
<td>Mixed retail business</td>
<td>0.14</td>
<td>0.02</td>
<td>0.00</td>
<td>2.9</td>
</tr>
<tr>
<td>Confection/Newsagent/Chemists</td>
<td>0.12</td>
<td>0.06</td>
<td>0.00</td>
<td>0.72</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>0.17</td>
<td>0.05</td>
<td>0.00</td>
<td>3.36</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>0.28</td>
<td>0.20</td>
<td>0.00</td>
<td>3.35</td>
</tr>
</tbody>
</table>

Table 10.1 Descriptive statistics of long-term gearing
Chapter 10: Trade-off Hypothesis

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing and Footwear Retailers</td>
<td>0.40</td>
<td>0.22</td>
<td>0.00</td>
<td>3.22</td>
</tr>
<tr>
<td>Food Retailers</td>
<td>0.39</td>
<td>0.18</td>
<td>0.00</td>
<td>4.27</td>
</tr>
<tr>
<td>Household Goods &amp; Hardware</td>
<td>0.28</td>
<td>0.11</td>
<td>0.00</td>
<td>1.94</td>
</tr>
<tr>
<td>Mixed Retail Business</td>
<td>0.32</td>
<td>0.10</td>
<td>0.00</td>
<td>3.29</td>
</tr>
<tr>
<td>Confection/Newsagent/Chemists</td>
<td>0.29</td>
<td>0.19</td>
<td>0.00</td>
<td>2.03</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>0.34</td>
<td>0.16</td>
<td>0.00</td>
<td>4.27</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>0.50</td>
<td>0.37</td>
<td>0.00</td>
<td>4.17</td>
</tr>
</tbody>
</table>

Table 10.2. Descriptive statistics of total gearing

The data shows that both sectors are not highly geared, especially as regards the long-term gearing. The comparison between table 10.1 and 10.2 mean figures shows the contribution of short-term debt use. In some cases it contributes for half of the total gearing figure, and as expected is higher for the retail sector than the hotel sector. One of the reasons might be the fact that the retail sector has more working capital to be financed by the use of the credit terms offered. In line with our expectations, the hotel sector has a higher gearing level than that of the retail sector. The hotel sector can absorb more debt due to the greater fixed asset intensity.

10.4.2. Independent Variables

The proxy target debt level is usually calculated as the historical average debt level over the study period. However, the hypothesis that the target debt levels would remain the same over a period as long as 13 years may be questionable. Instead, firms might aim at a short to medium term target, which can be measured as a three or five years' prior or future moving average, depending on whether companies is assumed to be backward or forward looking in setting their target debt ratios.
The use of the three years prior is based on the argument that companies set their target debt level based on past experience. The alternative argument is that companies set their targets looking to the future, i.e., they decide where they want to be in the future and adjust their debt levels accordingly.

There are thus six measures that are used as the target debt level for both long-term and total gearing. They are:

- $T_1 =$ thirteen years average of LTG (TG) for each company.
- $T_2 =$ industry sample average of LTG (TG) over the study period (1985 – 1997).
- $T_3 =$ three years moving average prior to the year $t$ for LTG (TG), (1985 – 1995), for each company
- $T_4 =$ five years moving average prior to year $t$ for LTG (TG), (1985 – 1993), for each company
- $T_5 =$ moving average of future three years from year $t$ for LTG (TG), (1985 – 1995), for each company
- $T_6 =$ moving average of future five years from year $t$ for LTG (TG), (1985 – 1993), for each company

Tables 10.3 and 10.4 give descriptive statistics for $T_1$, $T_3$, $T_4$, $T_5$, and $T_6$. The descriptive statistics for $T_2$ are given in tables 10.1 and 10.2.

As the data show, the mean figures for all target measurements are similar, increasing slightly as the target period is reduced, and the TG figures are almost twice as big as the LTG figures.

The reason why the medians are much lower than the means is that the gearing ratio has lower bound of zero and no upper bound.
<table>
<thead>
<tr>
<th>Long term Gearing</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>13 years Average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.17</td>
<td>0.10</td>
<td>0.00</td>
<td>1.56</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.28</td>
<td>0.23</td>
<td>0.00</td>
<td>0.96</td>
</tr>
<tr>
<td><strong>3 years prior moving average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.16</td>
<td>0.07</td>
<td>0.00</td>
<td>3.05</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.28</td>
<td>0.20</td>
<td>0.00</td>
<td>2.15</td>
</tr>
<tr>
<td><strong>5 years prior moving average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.17</td>
<td>0.08</td>
<td>0.00</td>
<td>3.03</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.29</td>
<td>0.22</td>
<td>0.00</td>
<td>1.73</td>
</tr>
<tr>
<td><strong>3 years future moving average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.18</td>
<td>0.07</td>
<td>0.00</td>
<td>3.04</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.30</td>
<td>0.21</td>
<td>0.00</td>
<td>2.15</td>
</tr>
<tr>
<td><strong>5 years future moving average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.18</td>
<td>0.08</td>
<td>0.00</td>
<td>3.04</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.29</td>
<td>0.22</td>
<td>0.00</td>
<td>1.73</td>
</tr>
</tbody>
</table>

Table 10.3. Descriptive statistics for the long-term gearing target measures.
<table>
<thead>
<tr>
<th>Total Gearing</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>13 years Average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.34</td>
<td>0.24</td>
<td>0.00</td>
<td>2.26</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.50</td>
<td>0.51</td>
<td>0.00</td>
<td>1.21</td>
</tr>
<tr>
<td><strong>3 years prior moving average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.33</td>
<td>0.18</td>
<td>0.00</td>
<td>3.78</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.51</td>
<td>0.41</td>
<td>0.00</td>
<td>2.58</td>
</tr>
<tr>
<td><strong>5 years prior moving average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.35</td>
<td>0.21</td>
<td>0.00</td>
<td>3.84</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.53</td>
<td>0.42</td>
<td>0.00</td>
<td>2.07</td>
</tr>
<tr>
<td><strong>3 years future moving average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.35</td>
<td>0.20</td>
<td>0.00</td>
<td>3.85</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.53</td>
<td>0.43</td>
<td>0.01</td>
<td>2.58</td>
</tr>
<tr>
<td><strong>5 years future moving average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail industry</td>
<td>0.36</td>
<td>0.22</td>
<td>0.00</td>
<td>3.84</td>
</tr>
<tr>
<td>Hotel industry</td>
<td>0.53</td>
<td>0.42</td>
<td>0.01</td>
<td>2.07</td>
</tr>
</tbody>
</table>

Table 10.4. Descriptive statistics for the total gearing target measures
10.5. Results and Analysis of the Static Trade-off Hypothesis

The regression model seeks to explore to what degree the gearing ratio of sample firms moves towards a proxy target gearing level.

The results of the pooled fixed effects cross section regression are shown in tables 10.5, 10.6, 10.7, 10.8, 10.9 and 10.10.

<table>
<thead>
<tr>
<th>13 years company</th>
<th>LTG</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>0.51</td>
<td>9.5*</td>
<td>0.55</td>
<td>0.51</td>
<td>2.17</td>
<td>0.52</td>
<td>6.33*</td>
<td>0.47</td>
<td>0.42</td>
<td>2.01</td>
</tr>
<tr>
<td>Food</td>
<td>0.52</td>
<td>10.60*</td>
<td>0.30</td>
<td>0.24</td>
<td>1.87</td>
<td>0.49</td>
<td>9.65*</td>
<td>0.28</td>
<td>0.21</td>
<td>1.91</td>
</tr>
<tr>
<td>Hardware</td>
<td>0.35</td>
<td>8.44*</td>
<td>0.22</td>
<td>0.16</td>
<td>2.16</td>
<td>0.39</td>
<td>9.21*</td>
<td>0.30</td>
<td>0.24</td>
<td>2.03</td>
</tr>
<tr>
<td>Mixed</td>
<td>0.43</td>
<td>9.93*</td>
<td>0.33</td>
<td>0.27</td>
<td>2.07</td>
<td>0.55</td>
<td>8.28*</td>
<td>0.50</td>
<td>0.45</td>
<td>1.92</td>
</tr>
<tr>
<td>News /Chemist</td>
<td>0.47</td>
<td>9.21*</td>
<td>0.29</td>
<td>0.23</td>
<td>1.91</td>
<td>0.57</td>
<td>10.53*</td>
<td>0.39</td>
<td>0.34</td>
<td>1.85</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>0.48</td>
<td>9.02*</td>
<td>0.30</td>
<td>0.26</td>
<td>2.21</td>
<td>0.50</td>
<td>9.90*</td>
<td>0.32</td>
<td>0.37</td>
<td>1.86</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>0.46</td>
<td>8.33*</td>
<td>0.24</td>
<td>0.17</td>
<td>2.15</td>
<td>0.48</td>
<td>8.69*</td>
<td>0.25</td>
<td>0.18</td>
<td>1.97</td>
</tr>
</tbody>
</table>

* - significant at 2.5 per cent level of probability
** - significant at 5 per cent level of probability
*** - significant at 10 per cent level of probability

Table 10.5 Regression results of trade-off model: LTG & TG – 13 years average for each company

<table>
<thead>
<tr>
<th>Industry (sample)</th>
<th>LTG</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>0.54</td>
<td>9.28*</td>
<td>0.62</td>
<td>0.59</td>
<td>1.83</td>
<td>0.53</td>
<td>6.65*</td>
<td>0.48</td>
<td>0.43</td>
<td>1.97</td>
</tr>
<tr>
<td>Food</td>
<td>0.52</td>
<td>10.09*</td>
<td>0.24</td>
<td>0.17</td>
<td>1.71</td>
<td>0.42</td>
<td>9.23*</td>
<td>0.26</td>
<td>0.23</td>
<td>2.26</td>
</tr>
<tr>
<td>Hardware</td>
<td>0.28</td>
<td>7.35*</td>
<td>0.19</td>
<td>0.12</td>
<td>2.21</td>
<td>0.39</td>
<td>10.21*</td>
<td>0.30</td>
<td>0.23</td>
<td>2.03</td>
</tr>
<tr>
<td>Mixed</td>
<td>0.34</td>
<td>8.33*</td>
<td>0.25</td>
<td>0.18</td>
<td>2.02</td>
<td>0.55</td>
<td>4.28*</td>
<td>0.50</td>
<td>0.45</td>
<td>1.95</td>
</tr>
<tr>
<td>News /Chemist</td>
<td>0.31</td>
<td>6.80*</td>
<td>0.13</td>
<td>0.06</td>
<td>1.82</td>
<td>0.33</td>
<td>7.62*</td>
<td>0.19</td>
<td>0.12</td>
<td>1.79</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>0.42</td>
<td>8.44*</td>
<td>0.33</td>
<td>0.27</td>
<td>1.85</td>
<td>0.34</td>
<td>9.60*</td>
<td>0.29</td>
<td>0.23</td>
<td>2.11</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>0.47</td>
<td>8.32*</td>
<td>0.24</td>
<td>0.17</td>
<td>2.15</td>
<td>0.48</td>
<td>8.69*</td>
<td>0.25</td>
<td>0.18</td>
<td>2.07</td>
</tr>
</tbody>
</table>

Table 10.6 Regression results of trade-off model: LTG & TG – sample (industry) average
### Table 10.7 Regression results of trade-off model: LTG & TG - 3 years prior moving average

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>0.77</td>
<td>5.57*</td>
<td>0.83</td>
<td>0.81</td>
<td>2.29</td>
<td>0.75</td>
<td>8.32*</td>
<td>0.50</td>
<td>0.46</td>
<td>2.32</td>
</tr>
<tr>
<td>Food</td>
<td>0.72</td>
<td>11.97*</td>
<td>0.65</td>
<td>0.61</td>
<td>2.16</td>
<td>0.68</td>
<td>9.22*</td>
<td>0.59</td>
<td>0.54</td>
<td>2.25</td>
</tr>
<tr>
<td>Hardware</td>
<td>0.69</td>
<td>9.76*</td>
<td>0.64</td>
<td>0.61</td>
<td>2.39</td>
<td>0.67</td>
<td>10.77*</td>
<td>0.71</td>
<td>0.68</td>
<td>2.39</td>
</tr>
<tr>
<td>Mixed</td>
<td>0.74</td>
<td>8.47*</td>
<td>0.71</td>
<td>0.67</td>
<td>2.33</td>
<td>0.80</td>
<td>5.16*</td>
<td>0.80</td>
<td>0.80</td>
<td>2.26</td>
</tr>
<tr>
<td>News/Chemist</td>
<td>0.69</td>
<td>6.70*</td>
<td>0.61</td>
<td>0.57</td>
<td>2.24</td>
<td>0.74</td>
<td>9.75*</td>
<td>0.69</td>
<td>0.66</td>
<td>2.07</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>0.73</td>
<td>6.24*</td>
<td>0.74</td>
<td>0.71</td>
<td>2.27</td>
<td>0.70</td>
<td>5.18*</td>
<td>0.64</td>
<td>0.60</td>
<td>2.26</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>0.68</td>
<td>7.44*</td>
<td>0.64</td>
<td>0.59</td>
<td>2.49</td>
<td>0.70</td>
<td>7.13*</td>
<td>0.59</td>
<td>0.54</td>
<td>2.43</td>
</tr>
</tbody>
</table>

### Table 10.8 Regression results of trade-off model: LTG & TG - 5 years prior moving average

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>0.67</td>
<td>16.68*</td>
<td>0.74</td>
<td>0.71</td>
<td>1.90</td>
<td>0.55</td>
<td>9.27*</td>
<td>0.44</td>
<td>0.43</td>
<td>1.86</td>
</tr>
<tr>
<td>Food</td>
<td>0.55</td>
<td>13.31*</td>
<td>0.49</td>
<td>0.42</td>
<td>1.87</td>
<td>0.62</td>
<td>10.31*</td>
<td>0.49</td>
<td>0.42</td>
<td>2.05</td>
</tr>
<tr>
<td>Hardware</td>
<td>0.45</td>
<td>10.15*</td>
<td>0.42</td>
<td>0.34</td>
<td>2.18</td>
<td>0.44</td>
<td>6.40*</td>
<td>0.60</td>
<td>0.54</td>
<td>2.26</td>
</tr>
<tr>
<td>Mixed</td>
<td>0.65</td>
<td>9.38*</td>
<td>0.63</td>
<td>0.58</td>
<td>2.05</td>
<td>0.74</td>
<td>7.19*</td>
<td>0.73</td>
<td>0.69</td>
<td>1.99</td>
</tr>
<tr>
<td>News/Chemist</td>
<td>0.58</td>
<td>10.27*</td>
<td>0.47</td>
<td>0.40</td>
<td>1.92</td>
<td>0.60</td>
<td>8.55*</td>
<td>0.62</td>
<td>0.57</td>
<td>2.03</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>0.60</td>
<td>7.88*</td>
<td>0.60</td>
<td>0.54</td>
<td>1.97</td>
<td>0.61</td>
<td>9.59*</td>
<td>0.59</td>
<td>0.53</td>
<td>2.01</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>0.45</td>
<td>8.58*</td>
<td>0.40</td>
<td>0.32</td>
<td>2.06</td>
<td>0.45</td>
<td>7.97*</td>
<td>0.36</td>
<td>0.27</td>
<td>2.20</td>
</tr>
</tbody>
</table>

### Table 10.9 Regression results of trade-off model: LTG & TG - 3 years future moving average

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>0.78</td>
<td>35.57*</td>
<td>0.83</td>
<td>0.82</td>
<td>2.29</td>
<td>0.76</td>
<td>29.91*</td>
<td>0.77</td>
<td>0.75</td>
<td>2.37</td>
</tr>
<tr>
<td>Food</td>
<td>0.73</td>
<td>21.97*</td>
<td>0.66</td>
<td>0.62</td>
<td>2.16</td>
<td>0.68</td>
<td>19.21*</td>
<td>0.60</td>
<td>0.54</td>
<td>2.25</td>
</tr>
<tr>
<td>Hardware</td>
<td>0.69</td>
<td>19.76*</td>
<td>0.65</td>
<td>0.61</td>
<td>2.39</td>
<td>0.67</td>
<td>21.73*</td>
<td>0.71</td>
<td>0.68</td>
<td>2.39</td>
</tr>
<tr>
<td>Mixed</td>
<td>0.74</td>
<td>19.33*</td>
<td>0.71</td>
<td>0.68</td>
<td>2.41</td>
<td>0.80</td>
<td>27.46*</td>
<td>0.82</td>
<td>0.80</td>
<td>2.21</td>
</tr>
<tr>
<td>News/Chemist</td>
<td>0.69</td>
<td>16.71*</td>
<td>0.62</td>
<td>0.57</td>
<td>2.25</td>
<td>0.74</td>
<td>19.75*</td>
<td>0.69</td>
<td>0.66</td>
<td>2.07</td>
</tr>
<tr>
<td>Retail Industry</td>
<td>0.74</td>
<td>25.26*</td>
<td>0.73</td>
<td>0.70</td>
<td>2.28</td>
<td>0.75</td>
<td>35.72*</td>
<td>0.73</td>
<td>0.70</td>
<td>2.24</td>
</tr>
<tr>
<td>Hotel Industry</td>
<td>0.69</td>
<td>17.44*</td>
<td>0.64</td>
<td>0.59</td>
<td>2.49</td>
<td>0.70</td>
<td>17.12*</td>
<td>0.62</td>
<td>0.58</td>
<td>2.43</td>
</tr>
</tbody>
</table>
As can be seen from the above tables, the slope (β) coefficients are all significant at 1%. This result suggests that our sample is not biased towards firms operating above their optimal debt ratio for most of the sample period. If there were such a sample bias, then contrary to the results shown in the above tables we should have found negative constants and low explanatory power. The coefficients for the 13 years and sample targets are rather small, mostly under 0.5, which would imply that there are some costs and constraints associated with the adjustment which increase as the time lag of adjustment is increased, resulting in a smaller partial adjustment towards the target when there is a long term target debt level than with a medium to short term target. By contrast all coefficients for short and medium term targets (i.e. three and five years prior and future targets) are in the range of 0.7 and 0.9, which indicates that in a short and medium time-scale period an almost full mean-reverting process occurs.

As explained in Section 8.8, p191, there are no calculations for the intercept because we have used a fixed effect cross-section estimator. When the estimator is calculated using the random effects-no weighting method, the intercepts were very close to zero and the explanatory power fell slightly. This confirms again the non-bias argument mentioned above.
The regression coefficients, $R^2$ and adjusted $R^2$, are lower for the 13 years average target and sample average in comparison to the 5 years and 3 years moving average (prior or future) (See Figures 10.1. and 10.2). The latter has the highest regression coefficient and $R^2$ for both long-term and total gearing. This confirms the expectation that the target adjustment behaviour is expected to be observed more in a shorter-term framework. From a capital structure perspective 13 years is a relatively long time in the life of a company; the effect of different micro and macro developments such as the interest rate, the changes in the tax regime and the condition of the economy can make it difficult to maintain a long term target debt ratio over such a period. It is rather surprising, however, that the sample (industry) target variable does not show as strong explanatory power as the 3 and 5 years moving averages. Most researchers consider that the industry average is a good proxy for the target debt ratio. One reason might be that the average used in this study is calculated as a sub-sample average rather than as a whole industry average, i.e. low $R^2$ due to the small sample size, at least for the hotel sector.

The $R^2$s are in general lower for total gearing in comparison to long-term gearing. This can help to explain the role of short-term debt in the gearing behaviour. It can be argued that firms are more interested in keeping the long term gearing around a target level rather than short-term debt, while the latter is more likely to be the residual of other decisions. The level of long-term gearing is directly correlated to the likelihood of bankruptcy and strategic decisions. Short-term debt is used more for working capital expenditures of a short-term nature, or as “bridging” finance used while longer term sources of funds are found.
The results of the present study are similar to those found from other studies like Auerbach (1985), Bradley, Jarrell and Kim (1984) and Shyam – Sunder and Myers (1999). The main difference in the model used in this chapter is that it does not control for other variables such as non-debt tax shields and bankruptcy costs that are factors that are hypothesised to influence the optimum capital structure. The main purpose of this simple regression model was to see only the one-to-one relationships between the year-to-year differences in the gearing level and the difference between the gearing level and the target level. We wanted to demonstrate that
when firms change the year-to-year gearing level they change *towards the target level*, following a partial adjustment pattern.

The results from the target regression models clearly suggest that firms follow a partial adjustment pattern, especially as regards short and medium term targets. Figures 10.3 and 10.4, 10.5, 10.6, 10.7 and 10.8 show clearly that the average cross-sectional debt levels fluctuate around the targets. This is true for both sectors, for long and short term gearing level.

Figure 10.3 Cross-sectional comparison of LTG with the sample target gearing – Retail and Hotel sectors
(Ret and Hot Av – 13 year average for the Retail and Hotel industries)
Figure 10.4 Cross-sectional comparison of TG with the sample target gearing – Retail and Hotel sectors

Figure 10.5 Cross-sectional comparison of LTG and TG with 13 years average target – Retail sector
Figure 10.6. Cross-sectional comparison of LTG and TG with 13 years average target - Hotel sector

Figure 10.7. Cross-sectional comparison of 3 and 5 years future moving averages with the sample target debt level - Retail sector
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00

Figure 10.8 Cross-sectional comparison of 3 and 5 years future moving average and the sample target debt level - Hotel sector

10.5.1. Addressing the spuriousness issue

Shyam-Sunder and Myers (1999, p. 239) argue that “...fluctuations in the sample companies’ capital expenditures are positively serially correlated, and their operating earnings are cyclical. Since dividends are “sticky”, and not used as a short-run offset to net funds requirements, the companies tend to have string of years with financial deficits, followed by string of surplus, or vice versa. Under the pecking order, debt ratio climbs in deficit years and falls in surplus years. When the average debt ratio, measured ex-post, is taken as the target, the pecking order debt ratios show mean-reversion. Thus the target adjustment models generate a misleading good fit. The target adjustment model’s fit to actual data falls apart when a three-or-five-year rolling average is used the debt target. In other words, the model seems to work for this sample only because of the apparent mean reversion generated by use of an ex-post historical average debt ratio”.

233
One can argue that mean reversion in debt ratios can generate spurious good fits, and significant coefficients for target adjustment models, even when the mean reversion has nothing to do with optimal debt ratios but simply reflects cycles or mean reversion in financial deficit or surpluses. The “spuriousness” argument asserts that data that are in fact driven by pecking order (PO) behaviour may also look as though they were being driven by target adjustment behaviour (where the target is the company average for the study period, Shyam-Sunder and Myers 1999, p. 240). If this were the case in our sample periods, a surplus of funds (a positive difference) should not be followed by an increase in borrowing as it was according to the data in Chapter 9. There was clearly little correlation between the level of deficit / surplus and the debt issues / retirement; therefore, it is difficult to say that the trade-off results are a spurious outcome of a PO behaviour.

Shyam-Sunder and Myers’ argument was directed at a version of the trade-off model that uses the company average for the study period as the proxy for the target. This version has poor explanatory power in the test in this study (Table 10.5).

This study uses a more “realistic” proxy for the target debt level, namely a short – medium run target (3 to 5 years). The $R^2$s of the 3-year moving average (prior and future) are very high and similar. The $R^2$s of the 5-year moving average prior are significantly lower, but somewhat better for 5 years moving average (future). In fact, the $R^2$s for the 3 years moving average are so high as to imply a high degree of mean reversion. It seems that the target is equally well proxied by the mean of \{t-3, t-2, t-1\} as by the mean of \{t+1, t+2, t+3\}. This is interesting, as it suggests that the targets may be relatively stable for as long as 7 years. To what extent the better fit of the 3-year model compared to the 5 year model (in terms of $R^2$) may be attributed to the greater number of moving averages (only 3 years lost rather than 5) is not clear.
Another argument to be put forward is that, if there is a cyclical trend in capital expenditures, it makes sense to suggest that in order to invest heavily firms will increase the level of gearing (which the POH would predict); but the reformulated POH as described by Shyam-Sunder and Myers (p. 233) is not a mechanical process. They are considering simultaneously the borrowing for investment and the change in the target debt level. As shown in Table 10.11, the regression coefficients, when CE is regressed against the proxy target gearing level (3 years moving average of the actual gearing level), are in the range of 14% and 23% which indicates that the capital expenditure cycle and the borrowing behaviour are positively related, but not nearly as strongly as would be expected under a POH formulation.

| CE  | LTG |  |  |  |  
|-----|-----|-----|-----|-----|-----|
|     |     |     |     |     |     |
| Retail | 0.37 | 12.6 | 0.20 | 0.14 | 1.96 |
| Hotel | 0.76 | 4.91 | 0.14 | 0.08 | 1.97 |
| Ret + Hot | 0.09 | 6.25 | 0.19 | 0.13 | 1.91 |

Table 10.11 Results of the regression test: for Capital Expenditures (CE) and 3 years future moving average of LTG and TG

This suggests that the independent variables in the POH formulation are an influence for at least this set of data, but they are only an influence and cannot explain much of the debt behaviour of our sample companies. What we may have is that capital expenditure may influence the companies to move away from the target, but the firms would not be out of the target range for a substantial amount of time, as shown from our regression results in Tables 10.7, 10.8, 10.9 and 10.10. Therefore, the POH has very little explanatory power, but a hybrid of POH and the Target Adjustment Model (TAM) might be a plausible alternative that could explain the observed capital structure behaviour better than either TAM and POH alone.
As it can be seen from Figure 10.9, 10.10 and 10.11, there is very little correlation between the cross sectional average of capital expenditure levels and the 3 years future target moving average. The same is true when the level of capital expenditure is compared with the 5 years moving average target.

These results are further confirmed from the comparison of the level of capital expenditure and either the level of gearing or the first differences of the level of gearing, as shown in Figures 10.12, 10.13, 10.14 and 10.15 and Table 10.12.

<table>
<thead>
<tr>
<th></th>
<th>CE</th>
<th>LTG</th>
<th></th>
<th>CE</th>
<th>TG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>t-stat</td>
<td>R^2</td>
<td>Adj R^2</td>
<td>D-W</td>
</tr>
<tr>
<td>Retail</td>
<td>0.07</td>
<td>4.11</td>
<td>0.23</td>
<td>0.17</td>
<td>1.86</td>
</tr>
<tr>
<td>Hotel</td>
<td>0.05</td>
<td>2.53</td>
<td>0.15</td>
<td>0.09</td>
<td>1.79</td>
</tr>
<tr>
<td>Ret + Hot</td>
<td>0.06</td>
<td>3.75</td>
<td>0.22</td>
<td>0.16</td>
<td>1.86</td>
</tr>
</tbody>
</table>

Table 10.12 Results of the regression test: for Capital Expenditures (CE) and first differences of LTG and TG

The same pattern of little or no correlation appears, especially for the retail sector. This is very pronounced in the first part of the study period, 1985 - 1990, followed by a deep dive of capital expenditure in the years 1991 and 1992 which coincides with the economic recession that the U.K. economy went through in that period. The correlation coefficients between capital expenditures and the first differences of LTG and TG vary from almost 0% for the retail sector to about 30 % for the hotel sector. The results for the hotel sector might be not as conclusive as for the retail sector, due to the small number of companies in the sample (21 hotel companies in comparison to 133 retail companies). As can be seen from Table 10.12, similar to the results in Table 10.11, the regression coefficients (i.e. the slopes) and the coefficients of determination are small, confirming even further that PO variables are an influence but only an influence. The following plots show that the relationships between CE and levels, first differences and proxy target of LTG.
and TG are weak. The relationship seems to be especially weak for the retail sector during the first part of the study period, i.e. 1985 - 1990, where there seem to be no correlation at all between CE and the level, the first difference and the three years moving average target of LTG and TG. The hotel sector exhibits a mixed behaviour.

The regression results shown in Tables 10.10 and 10.11 and the following plots clearly demonstrate that Shyam-Sunder-Myers proposition that mean reversion in debt ratios can generate spuriously good fits, even when mean reversion has nothing to do with optimal debt ratios, but simply reflects pecking order financing, does not seem to hold for this set of data.

Another statistical argument in favour of the non-spuriousness of our results is that of Granger and Newbound. They suggest that an $R^2 > d$ (Durbin-Watson) is a good rule of thumb to detect whether the estimated regression suffers from spurious regression. In our case all Durbin-Watson coefficients are around two, higher than all the $R^2$'s, which indicates that the results are not spurious.

Figure 10.9. Cross-sectional comparison of capital expenditures (CE) and 3 years moving average of LTG and TG – Retail Sector
Figure 10.10. Cross-sectional comparison of CE and 3 years moving average of LTG, TG – Hotel Sector

Figure 10.11. Cross-sectional comparison of CE and 3 years moving average of LTG and TG Retail and Hotel sectors together
Figure 10.12 Cross-sectional comparison of CE and levels of LTG and TG – Retail Sector

Figure 10.13 Cross-sectional comparison of CE and levels of LTG and TG – Hotel Sector
Figure 10.14 Cross-sectional comparison of CE and first differences of LTG and TG – Retail Sector

Figure 10.15 Cross-sectional comparison of CE and first differences of LTG and TG – Hotel Sector
10.6 Conclusions

This chapter develops a simple model that synthesises the modern trade-off theory of optimal capital structure.

The empirical section investigates the cross sectional behaviour of first lag differences of firm's leverage ratios over a period of 13 years, for 143 firms.

Using a fixed effect general least squares model, we estimate the regression coefficient for year to year differences of long-term and total gearing by using 13 years average, sample average, 3 years (prior and future) moving average and 5 years (prior and future) moving average as explanatory variables.

We found that all regression coefficients are significant and positive, and that all explanatory variables explain a high percentage of the year to year differences.

The short to medium term explanatory variables i.e. 3 and 5 years moving average prior to or after the year $t$, perform better than the two other target proxies (i.e. the industry average and the 13 year targets), the future 5 years is the best performer, thus suggesting that firms aim for a medium-term target debt level rather than a long-term target debt level. Intuitively, it could indeed seem to be difficult in today's fast changing economic environment to maintain a long-term target debt level. The easy access to capital markets makes this adjustment faster and less costly making a short to medium run partial adjustment more plausible.

The issue of spuriousness, i.e. that data which are in fact driven by pecking order behaviour also look as though they were being driven by target adjustment behaviour, was addressed. From different tests, it is clear that for
this set of data this is not a real issue (see Figure 10.14, and 10.15 and Tables 10.11 and 10.12).

The results strongly support the target adjustment hypothesis, i.e. firms in the UK hotel and retail industries adjust their debt levels towards a short to medium-term target debt level.
References


Chapter 11

Determinants of Capital Structure

11.1. Introduction

The models tested in Chapters 8 and 9 are based on assumption sets of underlying independent variables. This chapter uses a stepwise multiple-regression approach to test the explanatory power of these sets of variables rather than testing these models itself. In other words chapter 10 seeks to show how much of the explanatory power of the models is captured by the associated variables underlined in the theory.

Because some of the explanatory variables support more than one theory the first part of the regression analysis tests the aggregate explanatory power of all identified variables. The second part runs multiple regression tests using sub sets of variables, based on the model they mostly support, i.e. trade-off and pecking order model. A separate set of variables was created based on the asset specificity argument of TCE.

Some of the variables identified by the capital structure theory and tested by previous studies are: profitability, volatility of earnings, non-debt tax shields, size, asset structure, etc.

Section 11.2 starts with a detailed discussion of the hypotheses that are to be tested in this chapter. Definitions of variables is provided in Section 11.3. Section 11.4 sets out the multiple regression equations used in this chapter. Results and analysis of the multiple -regression model are provide in Section 11.5. The main conclusions of the chapter are summarised in Section 11.6.
11.2. Hypotheses on the Determinants of Capital Structure

The following are the hypotheses developed in the light of the trade-off model, pecking order model and other existing theories on the determinants of capital structure

**H. 1. Cost of Financial Distress (Earnings Volatility):** A number of papers have been able to show that a unique debt/equity ratio will exist if bankruptcy costs are not zero (Kim, 1977). The bankruptcy costs are losses the firm faces either when it cannot pay back creditors, or when it is close to not being able to pay them: but they are specific to debt financing. In a model where bankruptcy is costless, the variance of earnings will not affect the debt/equity ratio (see Scott, 1976, Castanis, 1983). If there are no bankruptcy costs, firms may issue risky debt with a higher interest rate, but higher interest rates do not limit debt issuance except in the extreme cases (Stiglitz and Weiss, 1980) where the lender refuses to take up debt because of the default risk. With positive bankruptcy costs, a larger variance in earnings implies a lower debt/asset ratio. Since increasing the area under the tails of the earnings distribution also increases the probability of bankruptcy. The expected value of bankruptcy costs is what really matters. This is the product of size of bankruptcy costs multiplied by the probability of bankruptcy. The larger the expected value of bankruptcy costs, the more an increase in earnings volatility decreases the debt/equity ratios. Thus a negative coefficient of variation of earnings variance may indicate the existence of bankruptcy or financial distress costs, and its magnitude measures their importance in determining the optimal capital structure.

Many prior regressions have found a significant negative coefficient on risk (i.e. volatility of earnings) when measuring debt/equity ratios (e.g. Bradley, Jarrell and Kim (1984), Friend and Lang, (1988)). The present study uses the coefficient of variation and standard deviation of Earnings Before Interest and
Taxes (EBIT) over the previous 5 years as well as the coefficient of variation and standard deviation of Cash Flows over the previous 5 years.

H. 2. Asset structure (moral hazard/asset specificity): Intuitively, a positive impact of the fixed asset ratio on the debt/equity ratio is expected, due to the fact that debt is used more readily if there are durable assets to act as collateral for the debt. Companies with a high fixed asset ratio tend to use more long-term debt. In anticipating a management incentive to underinvest or increase risk, creditors find it easier to monitor investment decisions if the investments are in tangible assets such as plant and equipment rather than in intangible assets. Creditors would know whether and how much the firm invested, as well as being more able to evaluate the risk of the investment, since the results are tangible and therefore observable in a relatively short time span. Thus any problematic changes in the investment policy could be identified in time to prevent further erosion of value. In the worst case of default the asset could be sold to provide some of the money to be paid to the creditors.

For this reason the type of the investment opportunities a firm has may affect considerably the amount of debt a firm can support. Firms that have tangible investments can support more debt than firms have intangible and unobservable growth opportunities. It is the tangible assets which generally have a well defined market value and can be sold in the case of default, which provide the basic security for the debt holders. It is much harder for a firm to cash in on intangible assets because these assets have a market value only as part of a going concern. Thus, such intangible assets provide little or no security at all for creditors, therefore they can not support much debt. This is TCE argument about asset specificity (Williamson, 1996, p. 184).

There are conflicting theories regarding the relationship between the fixed asset ratio and the gearing ratio. Myers and Majluf (1984) argued that capital structure mitigates inefficiencies in the firm’s investment decisions that are
caused by information asymmetry. If the investors are less informed than the firm's insiders, equity may be mis-priced and an underinvestment problem may occur. Debt whose value is less sensitive to the private information is preferred to equity. Even risky debt may be preferred to equity. Firms with high tangible non-specific assets that can be used as collateral may be less subject to severe information asymmetries and use less debt. Therefore, according to Myers and Majluf, the gearing ratio and fixed asset ratio will show a negative relationship, which is the opposite of the TCE argument.

Grossman and Hart (1982) suggested that higher debt levels reduce the optimal consumption level of perquisites because of the increased threat of bankruptcy. The costs associated with this agency relation may be higher for firms where assets are less collateralisable; because monitoring capital outlay on such investments is more difficult. Firms with low collateral value of their assets would have high agency costs. High debt helps to reduce agency costs by reducing the managers' consumption of perks and increasing managers' ownership. Therefore, to Grossman and Hart, gearing ratio and asset structure will also show a negative relationship. This would apply only to firms in which managers hold a significant equity stake, so that substituting debt for equity would increase their equity stake and reduce perquisites and shirking.

Jensen and Meckling (1976) and Myers (1984) argue that the debt/equity ratio is determined by costs. Conflicts between debt holders and equity holders arise because the presence of debt gives the shareholders the incentive to underinvest or take on riskier projects so as to expropriate wealth from debtholders. If the debt can be supported by collateral, the borrower may be restricted to using the funds for a specific project. Since no such guarantee is used for projects that can not be collateralised, creditors may require more favourable terms and induce the firms to use more equity rather than debt financing. Therefore, according to Jensen, Meckling and Myers (1984), the debt/equity ratio and fixed asset ratio will show a positive relationship.
Williamson (1996) argues that asset specificity (in other words, the degree of non-redeploybility) determines the capital structure. The greater the degree of asset specificity the more costly it is to redeploy the assets to their next best use, i.e. the more value they lose when redeployed. This would limit the ability to use such an asset as collateral and increase the lenders’ risk exposure. He concludes that for investment where the underlying asset is easily redeployable, or has low asset specificity, debt should be used; by contrast, as the asset specificity increases, equity becomes the preferred form of financing. Therefore, a positive relationship between the gearing and fixed asset ratios should be expected.

Titman (1984) describes a model where greater asset specificity, represented by R&D expenses to sales, is associated with a reduction in the debt asset ratio.

The three variables that can be considered under the asset structure argument are the net property, plant, and equipment to a three year average of total assets; the ratio of R&D expenses to sales; and advertising expenses to sales.

**H. 3. Tax Effects:** DeAngelo and Masulis (1980) show how firms with greater non-debt tax shields will issue less debt. They argue that tax shields from depreciation and investment tax credits are substitutes for the tax benefits of the debt financing. These firms have less need for the tax deductions provided by debt, and thus issue less debt relative to equity. They argue that the presence of the non-debt tax shields affects the extent to which the corporation can gain from the substitution of debt for equity. Because the higher debt/equity ratio increases the probability that the non-debt tax shields will be lost through the insufficiency of the taxable profits, they hypothesise that firms with fewer non-debt tax shields would employ more debt in their capital structure. Bradley, Jarrell and Kim (1984) also showed that the debt/equity ratio is inversely related to the level of non-debt tax shields through theoretical proof as well as
simulation results. Depreciation over total assets is used as a measure of non-debt tax shields.

**H.4. Profitability:** Jensen (1986) and Williamson (1988) describe debt as a bonding or discipline device to ensure that the managers pay out profits in the form of interest rather than build empires. In Jensen's model, companies with free cash flow, or high profitability, would be most subject to takeover and increased gearing (leveraged takeovers). Thus, once these takeovers have occurred, more profitable firms will have a higher debt/equity ratio. Alternatively, the pecking order hypothesis of Myers and Majluf (1984) suggests that information asymmetry causes firms to prefer internal financing when it is available. Under Myers and Majluf's model, firms will finance new projects first with internal funds, then with low risk debt and only issue equity as a last resort. The model explains well why more profitable firms in the past have generally had a high level of retained earnings and they borrowed less not because they have low target gearing ratios, but because they are not forced to go to the capital markets to raise funds. Less profitable firms in the past issue more debt because they did not have sufficient internal funds for their capital investment programme.

A number of prior studies have tested the effect of profitability on firm gearing, including Friend and Lang (1988), and Kester (1986) who find a significant negative relationship between profitability and debt/equity ratios. The measure of profitability used in the regression equation is the average profitability over the past three years. The study uses the ratio of earnings before interest and tax divided by sales or by total assets, or operating income divided either by sales or by total assets.

**H. 5. Growth opportunities:** Intuitively, a positive relationship exists between gearing and growth options because of the heavy requirement for capital.
However, high growth firms tend to use less debt despite the rapid expansion and heavy requirements for capital.

Firms holding valuable growth opportunities tend to borrow less than firms holding mostly tangible assets. Growth opportunities are capital assets that add value to a firm but can not be collateralised and do not generate current taxable income. For these reasons firms that have tangible investments that are easy to monitor can absorb more debt than firms more of whose value consists of growth opportunities. Therefore there is a negative relationship between debt and growth opportunities. Long and Malitz (1985) found a significant negative relationship between debt and rates of investment in advertising and R&D. Advertising or R&D expenses to total sales can be used as proxies for growth opportunities.

According to Jensen (1986), growth firms with plenty of good investment opportunities are expected to have low debt levels relative to firms in mature, slow growth cash rich industries. Firms with high growth opportunities, which have more flexibility in their choice of future investment, have a tendency to invest sub-optimally so as to benefit the firm’s equityholders at the expense of the debtholders. Equity holders may benefit from investing in very risky projects, even if they are value decreasing for the firm as a whole. An important factor that influences the optimal debt equity ratio is the agency cost of debt used to finance growth opportunities. High growth firms have a tendency to have high agency costs of debt because of the asset substitution effect. High growth opportunities should thus be found inversely correlated to debt levels. In the absence of R&D and advertising expenditures figures in the data set, the sales growth or total intangible asset growth are used as indicators of growth opportunities in this study. The problem in using total asset growth is that it counts for growth in both tangible and intangible assets. A more accurate measure used in this study is the growth of the difference between
total assets and fixed assets, which will amount only for the growth in intangible assets.

H. 6. Size: The following three theories indicate a conflicting relation between size and the leverage ratio. Intuitively, large firms are more diversified and less prone to bankruptcy because they have relatively more product lines and divisions than small firms. Therefore, large firms have higher debt capacity and are able to be more highly geared.

The asymmetric information theory of Myers and Majluf (1984) can explain an inverse relation between firm size and the leverage ratio. Size may also be a proxy for information asymmetries between inside and outside investors, which are likely to be less severe for large companies. If small firms are required to finance new projects by issuing equity, underpricing may be so severe that the new investors capture more than the net present value of the new project, resulting in a net loss to the existing shareholders. The underinvestment can be avoided if the small firms can finance the new project via internal funds or low risk debt. Since small firms tend to have more severe informational asymmetries, debt financing will be more preferred to equity for small firms because debt financing involves no undervaluation. Therefore, small firms would prefer to have higher debt ratio than large firms.

The cost of issuing debt and equity is also related to the firm size. In particular, small firms face relatively higher costs than larger firms in issuing new equity, because issuing costs are semi-variable in nature and thus larger firms face proportionally lower costs. In addition, smaller firms obtain less favourable prices because they are relatively less well known to equity investors. Small firms also pay somewhat more to issue long-term debt, because they are relatively unknown to lenders and are expected to carry more risk, but the effects are less than in the case of equity issue.
Kester (1986), Titman and Wesels (1988), (1990) produced empirical findings indicating that leverage is negatively correlated to firm size. However, their findings were not statistically significant. Marsh (1982) found that there was a positive relationship between debt and firm size. His findings were statistically significant. He found that smaller firms are less likely to issue debt and carry less debt. His study uses natural log of sales and of total assets as indicators of size. The logarithmic transformation of sales or total assets reduces the outlier effect, making extremely large or small firms less influential.

H. 7. Leasing: Intuitively firms with a heavy usage of capital leases are expected to have relatively low debt levels.

Short-term cancellable leases are known as operating leases. In this case the lessor bears the risk of obsolescence. Long-term, non-cancellable leases are called financial or capital leases. Operating leases are useful when firms want to use the assets for only a relatively short time or where the lessor has some control over the obsolescence rate.

Many hotel firms tend to lease rather than buy buildings, land or equipment. Leasing is seen often as a cheap means of financing for many small hotel firms. It offers long-term financing on a flexible, piecemeal basis, with lower transaction costs than bond issues or medium term bank finance.

There are theories in finance suggesting that capital leases and long-term debt are substitutes, so that an increase in capital lease should lead to a compensating decrease in long-term debt. (Miller and Upton (1976). Lewellen at al. (1976), Myers and Majluf (1984), Idol, Lewis and Schallheim (1980). Ross, Westerfield and Jaffe ((1996), p. 638) state: "If a firm leases, it will not use as much debt as it would otherwise. The benefits of debt capacity will be lost, particularly the lower taxes associated with interest expenses". Bowman
J. Nuri Chapter 11: Determinants of Capital Structure

(1980) produced an empirical finding that capital leasing and debt are close substitutes.

According to TCE, the owner or lessor of general-purpose assets can redeploy these assets more effectively than could the owner or lessor of more specialised assets. In this case, leasing is arguably the least-cost form of finance for general purpose assets.

The few empirical studies about lease-debt relationship use capital lease as a measure to represent leasing in the regression equation. Only Graham at al (1998) argue that the operating lease is the "true" tax advantage lease recognised by Internal Revenue Service (IRS) in USA. Operating leases produce tax shields since 100% of lease payments are tax deductible (true in U.K. as well). This may or may not be true of capital leases depending on tax regime (e.g. it is not the case in U.K.). Whether leases are considered as substitutes for debt or as non-debt tax shields should not affect the results.

In published financial statements, leases are classified as capital leases (in the balance sheet) and operating leases (off balance sheet but disclosed in the footnotes).

Capital lease rather than operating lease is an appropriate measure to represent leasing. Operating leases are short and cancellable during the contract period as the discretion of the lessee, while the capital lease can not be cancelled or can be cancelled only with a penalty. Capital lease figures will be used as a leasing variable for this study. Capital leases are expected to be negatively correlated to long-term debt/equity ratio.

Ang and Peterson (1984) found out that there was a significant positive relationship between capital leasing and long-term debt. Their empirical findings suggest that leasing and debt are complements rather than substitutes.
Greater use of debt is associated with greater use of leasing. According to the complementary assertion, firms with a high level of long-term debt are expected to have high levels of leasing. This could also be because firms with a high level of gearing are more motivated to use off-balance sheet financing, but the capital leases have had to be accounted for in the balance sheet since FAS - 13.

**H. 9: Dividend:** Firms with high a dividend pay-out ratio are more likely to use debt financing to fund their investments. Donaldson (1961) found that managers prefer to keep dividends stable across time. As dividends are sticky, they become a "pseudo fixed expense". Although dividend payout ratios are controlled by the managers, decreasing them sends a pessimistic signal to the capital markets. Increases in dividend payout ratios potentially increase the need for external financing. Firms prefer debt to equity when going to capital markets for funds (pecking order theory). Also, the issuance of equity, unlike debt, would increase the dividend burden on the firm.

**H. 8. Management Contracts:** The management contract variable is an important and unique element of the hotel industry. One significant effect of the recession at the end of the 1980s and beginning of the 1990s was the growth in the number of management contracts. Management contracts provide an attractive method for hotel groups to bring in steady incomes without adding heavily to fixed asset investment and hence their level of debt. With a management contract, the firm has complete control over the standards and quality of each property and is responsible for the day-to-day operation. The management contract has been replacing franchising in popularity among the major hotel chains. Hotel chains have found that taking up management contracts is a relatively low cost method of expansion. With little investment or no liability for loss, the management companies are able to escape with little loss even if the property fails. The following citation taken from hotel companies’ annual reports confirms the general trend of the nineties where
hotel firms see themselves more as management firms rather than owner operator.

_Forte Report and Accounts (1998)_

"At present the preferred method by which Forte will expand its hotel network is not entirely clear. Judging from the importance that it attaches to the Meridian brand and the attempt being made to reduce its indebtedness through asset sales, however, it seems more likely that the company will move towards the operational and management side of the hotel business, rather than become an expanding owner operator. _To do otherwise would be to go against the trend in the international hotel industry._ Forte is a company where growth by acquisition and merger has formed a central part of its development since its first hotel was opened. In some of the regions where growth is more likely to accrue, growth by obtaining more management contracts, joint ventures and leases also remains a strong possibility."

_Radisson Reports and Accounts (1998)_

"Radisson is best described as a mixture of owner manager, management company and franchiser, although it describes itself as "primarily a _franchise and management_ organisation". It believes that franchising is the best way to achieve its growth ambitions."

_Hilton Reports and Accounts (1998)_

"Hilton International is a mixed company with equity participation in some of its properties, leases and management contracts. The primary methods of growth within Hilton’s existing market segment will be to seek ownership, _additional management contracts_ and direct management arrangements, much as currently the case."

_Marriott Corporation (1987)_

The four key elements of Marriott’s financial strategy were:

- _Manage rather than own hotel assets;_
- Invest in projects that increase the shareholders value;
- _Optimise_ the use of debt in the capital structure; and
- Repurchase undervalued shares.

In the 80's Marriott developed more than $1 billion worth of hotel properties, making it one of the ten largest commercial real estate developers in US. After development, the company sold the hotel assets to limited partners while retaining operating control as the general partner under a long-term management contract."
The management firms are expected to have a low financial gearing ratio because they do not need the heavy capital investment that is required to the independent hotel firm. Also, they have higher asset specificity (management skills and brands being intangible assets) which is difficult to fund by debt.

A management company dummy variable is coded as 1 if there is a management contract and 0 otherwise.

Table 11.1 gives a summary of the variables hypothesised above and their expected relationship with gearing.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Expected Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1. Earnings Volatility</td>
<td>Negative</td>
</tr>
<tr>
<td>H2. Asset Structure</td>
<td>Positive</td>
</tr>
<tr>
<td>H3. Tax Shields Effect</td>
<td>Negative</td>
</tr>
<tr>
<td>H4. Profitability</td>
<td>Negative</td>
</tr>
<tr>
<td>H5. Growth Opportunities</td>
<td>Positive / Negative</td>
</tr>
<tr>
<td>H6. Size</td>
<td>Negative</td>
</tr>
<tr>
<td>H7. Leasing</td>
<td>Positive / Negative</td>
</tr>
<tr>
<td>H8. Dividend</td>
<td>Positive</td>
</tr>
<tr>
<td>H9. Management Contract (hotel sector only)</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Table 11.1 Summary of the determinants of capital structure and their expected signs
11.3. Definition of Variables

The dependent variable long term gearing and Total gearing are measured as in the two previous chapters:

\[ LTG = \frac{\text{book value of long term debt}}{\text{market value of equity}} \]
\[ TG = \frac{\text{book value of total gearing}}{\text{market value of equity}} \]

The explanatory variables are measured as follows:

1) Earnings volatility (EV) can be calculated as the standard deviation (STDV) of Earnings Before Interest an Taxes (EBIT), of operating income before depreciation or of cash flows (CF).

Another measure of volatility is the coefficient of variation (CV). Coefficient of variation is a relative measure of dispersion. The coefficient of variation, given by the symbol CV, measures the scatter of the data relative to the mean. It is computed by \( \frac{\sigma}{\mu} \), where \( \sigma \), \( \mu \) are the respectively the variance and mean of a set of data.

Earnings volatility: This study uses two measures of earnings volatility. They are:

\[ EV_1 = \text{STDV of EBIT over 5 years} \]
\[ EV_2 = \text{CV of EBIT over 5 years} \]

2) Asset Structure (AS) is calculated as the ratio of gross property (P), equipment (E) and plant (P1) over the 3 years average of total assets (TA).

\[ AS = \frac{(P + E + P1)}{\text{3 years average of TA}} \]

3) Non-Debt Tax Shields (TS) is calculated as the ratio of the Depreciation (D) over TA.

\[ TS = \frac{D}{TA} \]
4) Profitability (PROF): This study uses two measures of profitability. They are:

\[ \text{PROF}_1 = \frac{\text{EBIT}}{\text{Sales}} \]
\[ \text{PROF}_2 = \frac{\text{CF}}{\text{Sales}} \]

5) Growth Opportunities (GO) is measured by:

\[ \text{GO}_1 = \text{Sales Growth} = \frac{(S_t - S_{t-1})}{S_{t-1}} \]
\[ \text{GO}_2 = \text{Intangible asset growth} = \frac{(\text{TA} - \text{FA}) \text{ growth}}{([\text{TA}_t - \text{FA}_t] - [\text{TA}_{t-1} - \text{FA}_{t-1}]) / (\text{TA}_{t-1} - \text{FA}_{t-1})} \]

6) Size (S) is measured by:

\[ S_1 = \ln \text{ of Sales} \]
\[ S_2 = \ln \text{ of TA} \]

7) Leasing is represented by capital lease (CL).

\[ \text{CL} = \text{(capital lease commitments)} / \text{TA} \]

Capital leases will be in the balance sheet as leasing obligations

8) Dividend (DIV) is measured as:

\[ \text{DIV} = \text{Dividend payout ratio} = \frac{\text{Dividend}}{\text{Retained Earnings}} \]

9) Management Contract (MC) is measured by a dummy variable 1 for firms making extensive use of management contracts.

Some of the independent variables can be calculated in a number of ways. Since the hypothesis has nine variables to test, there would be \(2^9 = 512\) possible regression models. Since earnings volatility, profitability, growth and size are measured in more than one way it would be a difficult task to run all these regression equations. \(R^2\), the coefficient of multiple determination when there are \(p\) independent variables in a regression model could be used to eliminate some of the variables. The \(R^2\) will be maximum when all potential variables
are included in the regression model. The reason to use $R^2_p$ criterion is to find the point where adding more independent variables is not worthwhile because it leads to a very small increase in $R^2$. Often this point is reached when only a limited number of independent variables are included in the regression model. Clearly, the determination of where diminishing returns set in is often a subjective one.

An automatic search procedure that develops sequentially the subset of independent variables to be included in the regression is helpful to find a best subset of independent variables. The forward stepwise regression procedure is probably the most widely used of the automatic search methods. $R^2$ and $MSE_p$ (Mean Square Error) criteria are used to identify the best subset of independent variables in this study. $R^2$ is a ratio of sums of squares:

$$R^2_p = \frac{RSS_p}{TSS} = 1 - \frac{ESS_p}{TSS}$$

The denominator is constant for all possible regressions. $R^2$ varies inversely with the ESS. $ESS_p$ can never increase as additional independent variables are included in the model.

MSE can be written as a function of $R^2_p$. It is defined as:

$$MSE_p = \frac{1 - R^2_p}{n-1} (TSS)$$

Since TSS is constant, regardless of $p$, then MSE is inversely related to $R^2_p$. When MSE criteria is used the aim is to find a few subsets for which $MSE_p$ is at the minimum or so close to the minimum that adding more variables is not worthwhile.

However a subset of independent variables are just the starting point. $R^2$, F-test and t-statistics are good criteria to select the best regression models among subsets of independent variables. The coefficient of determination $R^2$ as defined in Chapter 7 is the percentage of the total variation in the dependent
variable that is explained by the regression equation. The higher the coefficient of determination, the greater the explanatory power of the regression equation and the better the prediction power. The F-ratio is used to test the overall indication of the "goodness to fit" of the regression equation. The F-ratio is used to test the significance of the entire model, not to test individual variables. The t-test is used to examine the significance of the individual regression coefficient. A highly significant F-ratio would suggest that the results of the equation have not happened by chance.

Tables 11.2 and 11.3 give a summary of the variable definitions and the descriptive statistics for the dependent and independent variables used in this study for the retail and hotel industries respectively. The selection of the dependent variables was made following the above mentioned procedures.

There was no increase in $R^2$ when we used Cash Flows / Sales as a measure of profitability. The same could be said for $GO_2$ intangible asset growth and $S_2$ (ln of total assets). Therefore there were not included in the final regression models:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Variable Definition</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>StDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTG</td>
<td>Long term debt / market value of equity</td>
<td>0.14</td>
<td>0.10</td>
<td>0.00</td>
<td>1.56</td>
<td>0.32</td>
</tr>
<tr>
<td>TG</td>
<td>Total debt / market value of equity</td>
<td>0.34</td>
<td>0.24</td>
<td>0.00</td>
<td>2.26</td>
<td>0.48</td>
</tr>
<tr>
<td>EV$_1$</td>
<td>STDV of EBIT</td>
<td>14.58</td>
<td>2.5</td>
<td>0.00</td>
<td>26.60</td>
<td>0.30</td>
</tr>
<tr>
<td>AS</td>
<td>(Plant + Equip + Plant) / total assets</td>
<td>0.42</td>
<td>0.4</td>
<td>0.00</td>
<td>0.99</td>
<td>0.19</td>
</tr>
<tr>
<td>TS</td>
<td>Depreciation / total assets</td>
<td>0.04</td>
<td>0.035</td>
<td>0.00</td>
<td>0.43</td>
<td>0.03</td>
</tr>
<tr>
<td>PROF$_1$</td>
<td>EBIT / Sales</td>
<td>0.20</td>
<td>0.10</td>
<td>-0.05</td>
<td>0.60</td>
<td>0.15</td>
</tr>
<tr>
<td>GO$_1$</td>
<td>Sales growth</td>
<td>0.15</td>
<td>0.08</td>
<td>-0.86</td>
<td>24.57</td>
<td>0.57</td>
</tr>
<tr>
<td>S$_1$</td>
<td>Ln of sales</td>
<td>4.90</td>
<td>4.60</td>
<td>-0.43</td>
<td>9.54</td>
<td>1.70</td>
</tr>
<tr>
<td>CL</td>
<td>Capital lease / total assets</td>
<td>0.40</td>
<td>0.00</td>
<td>0.00</td>
<td>0.96</td>
<td>0.89</td>
</tr>
<tr>
<td>DIV</td>
<td>Dividend / retained earnings</td>
<td>0.63</td>
<td>0.35</td>
<td>-10.27</td>
<td>12.83</td>
<td>6.00</td>
</tr>
</tbody>
</table>

Table 11.2. Variable definitions and descriptive statistics for the retail industry
### Table 11.3. Variable definitions and descriptive statistics for the hotel industry

<table>
<thead>
<tr>
<th>Variables</th>
<th>Variable Definition</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>StDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTG</td>
<td>long term debt / market value of equity</td>
<td>0.28</td>
<td>0.23</td>
<td>0.00</td>
<td>0.96</td>
<td>0.34</td>
</tr>
<tr>
<td>TG</td>
<td>Total debt / market value of equity</td>
<td>0.50</td>
<td>0.51</td>
<td>0.00</td>
<td>1.21</td>
<td>0.52</td>
</tr>
<tr>
<td>EV₁</td>
<td>STDV of EBIT</td>
<td>34.09</td>
<td>4.1</td>
<td>0.00</td>
<td>27.13</td>
<td>20.42</td>
</tr>
<tr>
<td>AS</td>
<td>(Plant + Equip + Plant) / total assets</td>
<td>0.67</td>
<td>0.78</td>
<td>0.00</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>TS</td>
<td>Depreciation / total assets</td>
<td>0.02</td>
<td>0.02</td>
<td>0.00</td>
<td>0.15</td>
<td>0.02</td>
</tr>
<tr>
<td>PROFI</td>
<td>EBIT / Sales</td>
<td>0.18</td>
<td>0.09</td>
<td>-0.07</td>
<td>0.65</td>
<td>0.20</td>
</tr>
<tr>
<td>GO₁</td>
<td>Sales growth</td>
<td>0.21</td>
<td>0.08</td>
<td>-0.89</td>
<td>9.83</td>
<td>0.96</td>
</tr>
<tr>
<td>S₁</td>
<td>Ln of sales</td>
<td>4.62</td>
<td>4.41</td>
<td>-1.41</td>
<td>8.81</td>
<td>2.31</td>
</tr>
<tr>
<td>CL</td>
<td>Capital lease / total assets</td>
<td>0.05</td>
<td>0.00</td>
<td>0.00</td>
<td>0.93</td>
<td>0.13</td>
</tr>
<tr>
<td>DIV</td>
<td>Dividend / retained earnings</td>
<td>0.30</td>
<td>0.29</td>
<td>-8.46</td>
<td>40.67</td>
<td>2.97</td>
</tr>
<tr>
<td>MC</td>
<td>Dummy variable (1 if MC)</td>
<td>0.30</td>
<td>0.25</td>
<td>0.00</td>
<td>0.50</td>
<td>0.45</td>
</tr>
</tbody>
</table>
11.4. The Multiple Regression Models

For the retail industry the following regression models are found to be the best ones to test the above hypothesis:

\[
LTD_R = \alpha + \beta EV_1 + \beta_2 AS + \beta_3 TS + \beta_4 PROF_1 + \beta_5 GO_1 + \beta_6 S_1 + \beta_7 CL + \beta_8 DIV + \epsilon_t
\]

\[
TD_R = \alpha + \beta EV_1 + \beta_2 AS + \beta_3 TS + \beta_4 PROF_1 + \beta_5 GO_1 + \beta_6 S_1 + \beta_7 CL + \beta_8 DIV + \epsilon_t
\]

For the hotel industry the following regression models are found to be the best to test the above hypothesis

\[
LTD_H = \alpha + \beta EV_1 + \beta_2 AS + \beta_3 TS + \beta_4 PROF_1 + \beta_5 GO_1 + \beta_6 S_1 + \beta_7 CL + \beta_8 DIV + \beta_9 MC + \epsilon_t
\]

\[
TD_H = \alpha + \beta EV_1 + \beta_2 AS + \beta_3 TS + \beta_4 PROF_1 + \beta_5 GO_1 + \beta_6 S_1 + \beta_7 CL + \beta_8 DIV + \beta_9 MC + \epsilon_t
\]

11.5. Results and Analysis of the Multiple Regression Results

The correlation matrix between the above mentioned independent variables for the retail and hotel sector are given in Table 11.4 and 11.5 respectively.

<table>
<thead>
<tr>
<th>Variables</th>
<th>EV₁</th>
<th>AS</th>
<th>TS</th>
<th>PROF₁</th>
<th>GO₁</th>
<th>S₁</th>
<th>CL</th>
<th>DIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV₁</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>+0.18</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS</td>
<td>-0.06</td>
<td>+0.42</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROF₁</td>
<td>-0.33</td>
<td>+0.21</td>
<td>+0.52</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO₁</td>
<td>-0.16</td>
<td>+0.13</td>
<td>+0.41</td>
<td>+0.60</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₁</td>
<td>-0.08</td>
<td>+0.25</td>
<td>+0.63</td>
<td>+0.12</td>
<td>+0.35</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td>-0.035</td>
<td>-0.10</td>
<td>+0.20</td>
<td>0.11</td>
<td>+0.09</td>
<td>+0.18</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>DIV</td>
<td>-0.10</td>
<td>+0.09</td>
<td>+0.15</td>
<td>0.60</td>
<td>+0.10</td>
<td>+0.15</td>
<td>-0.01</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 11.4. Correlation matrix between variables - Retail Sector
### Table 11.5. Correlation matrix between variables - Hotel Sector

<table>
<thead>
<tr>
<th>Variables</th>
<th>EV₁</th>
<th>AS</th>
<th>TS</th>
<th>PROF₁</th>
<th>GO₁</th>
<th>S₁</th>
<th>CL</th>
<th>DIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV₁</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>+0.20</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS</td>
<td>-0.08</td>
<td>+0.40</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROF₁</td>
<td>-0.31</td>
<td>+0.23</td>
<td>+0.50</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO₁</td>
<td>-0.19</td>
<td>+0.15</td>
<td>+0.39</td>
<td>+0.50</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₁</td>
<td>-0.10</td>
<td>+0.23</td>
<td>+0.59</td>
<td>+0.10</td>
<td>+0.37</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td>-0.03</td>
<td>-0.02</td>
<td>+0.20</td>
<td>0.11</td>
<td>+0.09</td>
<td>+0.16</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>DIV</td>
<td>-0.08</td>
<td>+0.12</td>
<td>+0.55</td>
<td>0.65</td>
<td>+0.13</td>
<td>+0.09</td>
<td>-0.02</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 11.6 and 11.7 give a summary of results of the regression analysis using the above mentioned models.

### Table 11.6. Multiple regression results for long term gearing

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cloth.</th>
<th>Food.</th>
<th>Hardw.</th>
<th>Mixed</th>
<th>News / Chemist</th>
<th>Retail Sector</th>
<th>Hotel Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV₁</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AS</td>
<td>-0.08</td>
<td>-0.01</td>
<td>0.00</td>
<td>0.02</td>
<td>0.07</td>
<td>-0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>TS</td>
<td>0.10</td>
<td>-0.02</td>
<td>-0.13</td>
<td>-0.36</td>
<td>3.57</td>
<td>0.11</td>
<td>-0.38</td>
</tr>
<tr>
<td>PROF₁</td>
<td>-0.17</td>
<td>-1.11</td>
<td>0.08</td>
<td>0.15</td>
<td>-0.38</td>
<td>-0.36</td>
<td>-0.17</td>
</tr>
<tr>
<td>GO₁</td>
<td>-0.01</td>
<td>-0.01</td>
<td>0.11</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.06</td>
</tr>
<tr>
<td>S₁</td>
<td>-0.02</td>
<td>-0.22</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.02</td>
<td>-0.09</td>
</tr>
<tr>
<td>CL</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.03</td>
<td>0.00</td>
<td>0.26</td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>DIV</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>MC</td>
<td>(-0.36)</td>
<td>(-1.97)</td>
<td>(-12.09)</td>
<td>(3.04)</td>
<td>(-0.44)</td>
<td>(-15.90)</td>
<td>(-2.39)</td>
</tr>
</tbody>
</table>

| R²        | 0.33   | 0.64  | 0.47   | 0.68  | 0.73           | 0.50          | 0.63         |
| Adjust. R²| 0.24   | 0.60  | 0.40   | 0.62  | 0.68           | 0.43          | 0.59         |
| F-stat    | 19.13  | 65.31 | 27.03  | 38.37 | 54.52          | 27.17         | 26.95        |
| D-W statistics | 1.10 | 0.85  | 1.01   | 1.27  | 1.38           | 1.12          | 1.15         |
| No. of obs. | 297   | 328   | 279   | 168   | 189            | 1423          | 228          |

* - the variable is significant at 2.5 % level of probability or better
** - the variable is significant at 5 % level of probability
*** - the variable is significant at 10 % level of probability
Table 11.7. Multiple regression results for long term gearing

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cloth.</th>
<th>Food.</th>
<th>Hardware</th>
<th>Mixed</th>
<th>Nwes / Chemist</th>
<th>Retail Sector</th>
<th>Hotel Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV&lt;sub&gt;1&lt;/sub&gt;</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>-2.19**</td>
</tr>
<tr>
<td></td>
<td>(-1.75**)</td>
<td>(4.81*)</td>
<td>(-3.24*)</td>
<td>(0.98)</td>
<td>(1.02)</td>
<td>(4.3*)</td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>0.21</td>
<td>0.00</td>
<td>0.23</td>
<td>0.24</td>
<td>0.00</td>
<td>0.00</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>(-2.27)</td>
<td>(-2.92)</td>
<td>(3.30)</td>
<td>(4.58*)</td>
<td>(0.63)</td>
<td>(-3.4*)</td>
<td>(3.98*)</td>
</tr>
<tr>
<td>TS</td>
<td>0.79</td>
<td>0.07</td>
<td>0.63</td>
<td>-3.08</td>
<td>6.51</td>
<td>0.31</td>
<td>-3.24</td>
</tr>
<tr>
<td></td>
<td>(18.82*)</td>
<td>(0.34)</td>
<td>(0.64)</td>
<td>(3.80*)</td>
<td>(5.95*)</td>
<td>(4.60*)</td>
<td>(-2.37**)</td>
</tr>
<tr>
<td>PROF&lt;sub&gt;1&lt;/sub&gt;</td>
<td>-0.84</td>
<td>-0.87</td>
<td>-0.60</td>
<td>-0.75</td>
<td>-0.97</td>
<td>-0.75</td>
<td>-0.36</td>
</tr>
<tr>
<td></td>
<td>(-5.46*)</td>
<td>(-7.90*)</td>
<td>(-6.76*)</td>
<td>(-2.9*)</td>
<td>(-5.05)</td>
<td>(-1.69**)</td>
<td>(-9.32*)</td>
</tr>
<tr>
<td>GO</td>
<td>0.03</td>
<td>-0.02</td>
<td>0.04</td>
<td>-0.03</td>
<td>-0.03</td>
<td>-0.01</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>(0.91)</td>
<td>(-2.46**)</td>
<td>(1.86**)</td>
<td>(-0.57)</td>
<td>(-1.75**)</td>
<td>(-1.69**)</td>
<td>(-0.92)</td>
</tr>
<tr>
<td>S&lt;sub&gt;1&lt;/sub&gt;</td>
<td>-0.01</td>
<td>0.05</td>
<td>0.00</td>
<td>0.05</td>
<td>0.01</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(-0.52)</td>
<td>(6.51)</td>
<td>(-0.40)</td>
<td>(1.53)</td>
<td>(0.93)</td>
<td>(26.00*)</td>
<td>(2.59**)</td>
</tr>
<tr>
<td>CL</td>
<td>0.00</td>
<td>0.58</td>
<td>-0.03</td>
<td>-0.00</td>
<td>-0.39</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(2.27)</td>
<td>(4.61)</td>
<td>(-4.34)</td>
<td>(-0.04)</td>
<td>(-1.76)</td>
<td>(0.62)</td>
<td>(-2.19*)</td>
</tr>
<tr>
<td>DIV</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(2.27**)</td>
<td>(-0.25)</td>
<td>(-4.53*)</td>
<td>(2.24**)</td>
<td>(0.31)</td>
<td>(-12.33*)</td>
<td>(-7.23*)</td>
</tr>
<tr>
<td>MC</td>
<td>0.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(5.08*)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>R&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Adjust R&lt;sup&gt;2&lt;/sup&gt;</th>
<th>F-stat</th>
<th>D-W Statistics</th>
<th>No. of obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TG</td>
<td>0.60</td>
<td>0.54</td>
<td>49.61</td>
<td>1412</td>
<td>297</td>
</tr>
<tr>
<td>Food</td>
<td>0.61</td>
<td>0.56</td>
<td>57.57</td>
<td>297.00</td>
<td>328</td>
</tr>
<tr>
<td>Hardware</td>
<td>0.52</td>
<td>0.46</td>
<td>34.12</td>
<td>10.00</td>
<td>279</td>
</tr>
<tr>
<td>Mixed</td>
<td>0.85</td>
<td>0.82</td>
<td>102.07</td>
<td>101.13</td>
<td>176</td>
</tr>
<tr>
<td>Nwes / Chemist</td>
<td>0.83</td>
<td>0.80</td>
<td>102.07</td>
<td>297.00</td>
<td>189</td>
</tr>
<tr>
<td>Retail Sector</td>
<td>0.65</td>
<td>0.61</td>
<td>102.07</td>
<td>297.00</td>
<td>1412</td>
</tr>
<tr>
<td>Hotel Sector</td>
<td>0.67</td>
<td>0.62</td>
<td>50.91</td>
<td>297.00</td>
<td>297</td>
</tr>
</tbody>
</table>

* - the variable is significant at 2.5% level of probability or better
** - the variable is significant at 5% level of probability
*** - the variable is significant at 10% level of probability

The regression model seeks to explain the determinants of long-term gearing and total gearing by examining a number of important variables. As can be seen from tables 11.6 and 11.7, that the coefficients of determination are relatively high. They vary from 33% (LTG - clothing) to 85% (TG - mixed). This means that the chosen explanatory variables explain a considerable percentage of the long-term gearing and total gearing variations. An exception is Clothing Retail, which has a low R<sup>2</sup> for the LTG. They are almost half of the figures for TG. This might indicate that firms in the clothing sector do not use very much long-term debt.

If we compare both industries, their R<sup>2</sup> is above 50% for both LTG and TG. However LTG performs better for the retail sector while TG is almost the same for both of them. Another thing to be noticed is that TG has a higher R<sup>2</sup> than
LTG for both sectors, which indicates to some extent the role of short-term
debt in the total gearing ratio.

The adjusted $R^2$, which is the $R^2$ adjusted for the degrees of freedom, is also
high although lower than $R^2$ itself.

The F statistics are all significant which confirms the significance of the entire
model.

All Durbin-Watson coefficients are under 1.5 which indicates the present of
multicollinearity. This will be addressed latter in this chapter.

Although there is no test for heteroscedasticity the condition was taken into
account during the data analysis by controlling for White heteroscedasticity.

From tables 11.6 and 11.7 it is clear that none of the coefficients of the
independent variables is large for the long-term gearing. The largest is
profitability which is significant and with the expected sign. Earnings volatility
and growth display the expected signs but a robust conclusion can not be drawn
as not only their coefficients are very small but also they are insignificant. Size
and leasing have the expected signs and they are both significant confirming
that size is positively correlated to long term gearing while leasing is negatively
correlated. Asset structure and dividends are both negatively correlated to long
term gearing while non-debt tax shields are positively correlated. All three of
them display the opposite of the expected signs. One would expect that asset
structure and dividends would be positively correlated to gearing while non-
debt tax shields would be negatively correlated.

By looking at the hotel sector, it is noticeable that most of variables have the
expected sign: earnings volatility (-); asset structure (+); non-debt tax shields
(-); profitability (-); growth (-); size (+); leasing (-). The only exceptions are dividends and management contracts which both have a different sign from the expected one, respectively (-) and (+). All of them with the exception of dividend are significant, with some of the t-statistics significant at the 2.5% level of probability. Non-debt tax shields has the highest coefficient followed by asset structure.

The retail sector again displays mix results regarding the signs, the size and the significance of the variables for total gearing. For example, volatility has a positive sign and it is significant but it has a coefficient of almost zero. The same can be said for most of the variables. They display the opposite of the expected sign and some of the coefficients are very small. The only exceptions are profitability (-), size (+) and growth (-), two of them are significant at the 10% level and one at 2.5%. Profitability has also the highest coefficient.

The model again performs much better for the hotel sector. Most of the coefficients are larger, with the right sign and are significant compared to the retail sector. Earnings volatility (-); asset structure (+); tax shields (-); profitability (-); growth (-); size (+); and leasing (-) all display the expected signs and are significant with exception of size. Similarly to the long term gearing, both dividend and management contracts display the opposite of the expected sign and they are both significant.

The variable with the highest coefficient is again non-debt tax shields of -3.24. From the above discussion, it is clear that the model has a high explanatory power as whole and all F - statistics are significant. The retail sector displays mix results regarding the size, the signs and the significance of the coefficients. It is a common feature for both industries that most of the coefficients are small (some of them near to zero). The most important variable for the retail sector for both long-term gearing and short term gearing is profitability. This is not a
surprise retail firms are known to rely in the operating incomes because of the credit facilities they have.

By contrast, the model hotel sector displays a more rigor behaviour by having most of the coefficients in the right sign, significant and one of them large in size. Non-debt tax shields is the variable that has the highest coefficient for both long and short term gearing. This result again is not surprising as the hotel firms have much more tangible assets than retail firms. It is a bit surprising the signs of the management contract variable as it was expected to be negatively related to gearing.

The fact that the model is robust as a whole but most of the coefficients are small indicates that the multicollinearity is present. This is confirmed by the low value of the Durbin – Watson figures.

One way to limit the effect of the multicollinearity is to run the regression equations with sets of limited number of variables by grouping them together based on the underlying theories.

The tests showed that by grouping the variables together, the Durbin-Watson statistics improved but not for all sectors in the level required in order to conclude that the multicollinearity is limited.

The results showed that when tested for Profitability and Dividend for both sectors the profitability variable explained about of 30% and 27% of the regression for long-term gearing of the retail and hotel sectors respectively, while they explained only 32% and 29% of total debt. Taking into account that the coefficients of determination for the whole set of variables were 50% and 65% it can be concluded that the profitability variable is an important one, especially for the retail industry. The same could be concluded for the total gearing.
The second subset of variables was based on the trade-off theory. They were volatility, non-debt tax shields and size. The results showed again that non-debt-tax shield is the determinant variable with the highest explanatory power for both retail and hotel industries at 0.26 and 0.24 level. Volatility again shows the right sign but the regression coefficient is small at 0.004. Size as before has a positive sign but the regression coefficient (0.028) is still small.

The third subset contained variables that have asset specificity as their underlying theory. They are: asset structure, leasing and management contracts. All their regression coefficients are slightly higher than their corresponding values in the overall multiple regression equation (see Table 10.6 and 10.7). Their overall explanatory power is 0.07 with leasing and management contract having the highest regression coefficients for the retail and hotel industry respectively.
11.6. Conclusions

The tests carried out in this chapter investigated the explanatory power of different variables which are most likely to influence the models described in chapters 9 and 10. Some other variables are drawn from the current theory of corporate finance.

Using a stepwise multiple regression tests we estimated the regression coefficients initially for all independent variables identified from the trade-off model, pecking order model and other capital structure theories. On the second stage we tested for subsets of independent variables which were composed of variables that best explained a certain model or theory.

The test showed that the variables identified explain a relatively large amount of debt behaviour. Most of the coefficients were small but significant at 5% level. The signs were in the expected direction for most of the variables tested on the hotel’s data sample. The retail sample gave a mixed picture regarding signs of the variables.

The same could be said for the regression results from the variable subsets. They in general confirmed the results concluded by the overall regression test by pronouncing even more the role of profitability and non-debt tax shields as the main explanatory variables for the retail and hotel industries respectively.
References


Donaldson, G. (1961), Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity, Boston: Division of Research, Graduate School of Business Administration, Harvard University


Chapter 12

Summary of Conclusions, Limitations of Research and Suggestions for Further Research

12.1 Summary of Conclusions

This first study of the capital structure of the hotel and retail industries in U.K. showed that they are not very highly geared. As shown in Chapter 10, the gearing ratio varies from 17% for long-term gearing to 30% for total gearing for the retail sector, and from 30% for long term gearing to 50% for total gearing for the hotel sector. The gearing ratios for the U.K. hotel and retail industries are not as high as the corresponding gearing ratios in U.S. (recall that Kim's (1996) study found a gearing ratio of over 60% for the hospitality industry in U.S.). One of the reasons for this difference might be the different tax treatment that debt receives in the two countries. As was expected, the hotel sector has a higher gearing ratio in comparison to the retail sector.

The empirical tests carried out in Chapter 10 have shown that the trade-off model explains the capital structure in the U.K. hotel and retail industries well when the proxy target is calculated as the sample mean or the 13 years average, and indeed very well when the target level of debt is considered as a short to medium term (3-5 year) target. All the coefficients of determination for this test were significant and explained between 50 to 90 per cent of gearing level changes. These results are similar to those found by De Angelo and Masulis (1980), Dammon and Senbet (1988), Bradley, Jarrel and Kim (1984), Ashton (1989) and Kwansa (1995).
By contrast, the explanatory power of the pecking order model is much weaker. The coefficients of determination are low. The regression coefficients are small but with the right sign. Only in two of the sub-sectors of the retail industry did the data show a moderate level of support for the pecking order model. There seem to be no correlation between the surplus/deficit of funds and the debt levels and first differences (see Figure 9.1–9.3).

The issue of spuriousness, as defined by Shyam-Sunder and Myers (1999), that data that are in fact driven by pecking order behaviour may look as though they were being driven by target adjustment behaviour, was addressed, and from several tests and calculations it was concluded that this was not the case for this set of data. The pecking order variables had a positive relationship with changes in the level of gearing, but only a weak one, especially for the retail sector. The low level of correlation observed between capital expenditure and changes in gearing levels might indicate that a "hybrid" model in which pecking order variables (and in particular capital expenditures) were combined with target adjustment variables could better explain the firms' capital structure behaviour.

Taking into consideration the trade-off model and other variables suggested by the capital structure literature, several variables were selected in order to examine their explanatory power. The tests showed that the identified variables explained 50% and 65% of the long-term and total gearing for the retail sector and 65% and 67% of the of the long-term and total gearing levels for the hotel sector, respectively. Profitability was the most important factor for the retail sector followed by non-debt tax shields. Non-debt tax shields, management contracts and profitability were the most important factors for the hotel sector. The overall explanatory power of this test is comparable with those concluded by other similar studies. The surprising fact is that individual variables, apart from the above-mentioned ones, tended to have low
explanatory power. Hence it is not clear which of these variables are the most significant in determining firms' capital structure.

This study extends empirical work on capital structure by utilising extensive panel data on U.K. retail and hotel industries. The panel character of the data permits the use of statistical techniques that reduce the model specification bias or omitted variable bias.

12.2. Contributions of the study

This study is the first extensive study of capital structure in the U.K. service sector industries. Its findings hopefully contribute towards a better understanding of firms' capital structure behaviour in an U.K. setting. It is a further contribution towards the limited amount of capital structure research that is based on U.K. data.

For the first time, a combination of different capital structure models was applied in a U.K. setting with the aim of showing how well these different models fit the data and trying to throw more light on the debate as to whether the Target Adjustment Model or Pecking Order Model has greater explanatory power.

Further more, this study is a further contribution to the small but ever growing research literature involving the use of panel data.

12.3 Limitations of the research

The primary limitation of this study is the lack of complete data availability, partly due to the limited number of publicly traded hotel and retail firms but primarily due to the incomplete data sets provided by financial databases. The
available databases did not provide information for certain variables and had missing data for some of the variables that were present. Difficulties were encountered in collecting information about the market value of equity, as some of the companies in the sample are not publicly traded.

12.4. Suggestions for further research

Given the scarcity of research into the issue of capital structure in the U.K., further research is suggested to examine the phenomenon.

An area of research would be to apply the models described in this research with data sets gathered from other industries in the U.K. so as to see if the results show any industry differences.

Further research is also suggested on the consequences of applying the models described in this research on data from the same industries but from different countries, to see to what extent the findings of the present study are applicable in other countries and to what degree are they peculiar to the U.K hotel and retail industries.

Despite the much better performance of the target adjustment model in comparison to the pecking order model, one must not oversimplify the complexities of the firm's capital structure decision. By expanding the works of Taggart (1977), Marsh (1982), Jalilvand and Harris (1984), Auerbach (1985) and Shyam-Sunder and Myers (1999) one could seek a more comprehensive explanation of how firms manage their capital structure. Issues of security timing and agency theory variables have to be incorporated in the target adjustment or pecking order models. Some thoughts regarding such a hybrid theory are set out below.
Dominant approaches of capital structure theory and empirical research assume that managers mechanistically follow a certain approach ignoring the fact that managers might make a conscious choice to follow either a pecking order or a target adjustment approach. If so, we need to know what factors motivate such a choice. This may call for extensive questionnaire/interview type research aiming at ascertaining the views and practices of financial managers and thereby creating a linkage between theory, empirical research and practice. There is a relative scarcity, particularly in U.K., of such studies in long-term financing and capital structure decisions of firms.
References


Appendix 2

Mathematical Derivation of Modigliani and Miller Propositions

Key Definitions in MM’s Proposition Analysis:

- $V_0$ - the market value of the firm
- $V_S$ - the market value of shares in the company
- $V_B$ - the market value of debt
- $B$ - the book value of debt
- $k_e$ - the rate of return required by shareholders
- $k_d$ - the rate of return required by debtholders
- $i$ - the coupon rate on debt
- $iB$ - interest payments
- $E$ - earning before interest and taxes
- $D$ - dividend

Appendix 2.1: Derivation of MM’s Proposition I

Under the MM proposition 1 the value of the firm is irrelevant of its capital structure:

$$V_0 = S_S + V_B = E / k_0$$

where: $k_0$ is the overall rate of return that the firm must achieve to satisfy all stakeholders. This is given by the average cost of capital.

$$k_0 = (k_e V_S / V_0) + (k_d V_B / V_0) = (k_e V_S + k_d V_B) / V_0$$

Given that: $D = k_e V_S$ and $i = k_d V_B$ we have,

$$k_0 = (D + i) / V_0 = E / V_0$$
In order to prove the above equilibrium MM consider two firms, U and G, that belong to the same risk class and have the same level of expected operating profit $E$. Furthermore, assume that the required rate of return of the risk class $\rho$ is $k_0$. Firm U has no debt outstanding. Geared firm G, on the other hand has both debt and equity outstanding. Suppose first that the value of the geared firm, $V_G$, to be larger than that of the ungeared one, $V_U$. Consider an investor holding $s_G$ worth of shares of firm G, representing a fraction $\alpha$ of the total outstanding stock $S_G$. The return from this portfolio, denoted $Y_G$ will be a fraction $\alpha$ of the income available for the shareholders of company G, which is equal to: $E_G - k_dB_G$ (where $k_dB_G$ is the interest charge). Taking into account earning homogeneity, $E_G = E_U = E$, the return from the geared firm can be written as:

$$Y_G = \alpha(E - k_dB_G).$$

Now suppose the investor sells his $\alpha S_G$ worth of company G shares and buys instead an amount $s_U = \alpha S_G + \alpha B_G = \alpha(S_G + B_G)$. He could do this by using the amount $\alpha S_G$ realised from the sales of his initial holding in company G, and by borrowing the amount $\alpha B_G$, pledging his new holdings in company U as collateral. His fraction of the shares and earnings in company U is: $s_U/S_U = \alpha(S_G + B_G)/S_U$. Taking into account the allowance for interest payment on his personal loan $\alpha B_G$, and that $V_U = S_U$, the return from the new portfolio, $Y_U$, is:

$$Y_U = [(\alpha(S_G + B_G))/S_U]E - \alpha \alpha B_G = \alpha V_G/V_U - k_d\alpha B_G$$

From the two return equations it is clear that $Y_U > Y_G$ as long as $V_G > V_U$ ($V_G/V_U > 1$). So, that it pays owners of shares in firm G to sell their holdings, thereby depressing $S_G$ and therefore $V_G$; and to buy shares of firm U, thereby increasing $S_G$ and hence $V_G$. Therefore, MM conclude that geared firms can not master a premium over ungeared firms because the investors have the opportunity of creating the same gearing in their portfolio by borrowing directly on personal account (homemade gearing).
MM consider the opposite, that the market value of the geared firm is lower than the value of the ungeared firm, \( V_G < V_U \). Suppose an investor holds initially \( s_U \) shares in firm U, representing a fraction \( \alpha \) of the total stock \( S_U \). The return from this holding is:

\[
Y_U = \alpha E
\]

Suppose that the investor exchange this holding for another portfolio with the same value \( s_U \), which is compound of \( s_G \) shares from firm's G stock and \( b \) dollars of bond. The respective values of \( s_G \) and \( b \) are:

\[
s_G = (S_G/V_G)s_U \Rightarrow s_G/S_G = s_U/V_G
\]

\[
b = (B_G/V_G)s_U
\]

The return from the new portfolio is composed of a fraction, \( s_G/S_G \), of the total return to stockholders of firm G, which is \( (E - k_d B_G) \) and the return from the bonds which will be \( k_d b \). Thus the return from the portfolio, \( Y_G \), can be written as follows:

\[
Y_G = s_G/S_G (E - k_d B_G) + k_d b
\]

Substituting for \( s_G/S_G \) and \( b \),

\[
Y_G = s_U/V_G (E - k_d B_G) + k_d(B_G/V_G)s_U
\]

Factoring for \( s_U/V_G \) we have

\[
Y_G = s_U/V_G (E - k_d B_G + k_d B_G)
\]

\[
Y_G = s_U/V_G E
\]

since \( s_U = \alpha S_U \), and \( S_U = V_U \) than:

\[
Y_G = \alpha V_U/V_G E
\]
By comparing \( Y_U \) and \( Y_G \) it can be seen that \( Y_G > Y_U \) as long as \( V_G < V_U \) (\( V_U/V_G > 1 \)). Hence it pays the holders of firm U's shares to sell these holdings and buy a mixed portfolio composed of a fraction of the shares of firm G.

The creation of a mixed portfolio of stock of a geared firm and of bonds, may be considered as an undertaking which "undoes" the gearing. It is this possibility of undoing gearing which prevents the value of geared firm of being persistently less than that of ungeared firm, or in other words, prevents the average cost of capital from being consistently higher for geared than for nongeared firms in the same risk class. Since it is already shown that arbitrage prevents \( V_G \) being larger than \( V_U \), it can be concluded that in equilibrium \( V_U \) must be equal to \( V_G \).
Appendix 2.2: Derivation of MM's Proposition II

Proposition II states: "The expected value of a share of equity is equal to the appropriate capitalisation rate, $k_e$, for a pure equity stream in the class, plus a premium related to financial risk equal to the debt/equity ratio times the spread between $k_e$ and $k_d$." (MM, 1958, pp.271)

Given that:

$V_s = \frac{(E - iB)}{k_e} \Rightarrow k_e = \frac{(E - iB)}{V_s}$ and $E = k_o V_0 = k_o(V_s + V_B)$

Substituting for $E$ we have,

$k_e = \frac{k_o(V_s + V_B) - iB}{V_s}$

$k_e = \frac{(k_o V_s + k_o V_B - iB)}{V_s}$

Taking into consideration that $V_B = B$ and dividing by $V_s$ each of the terms in the bracket we have,

$k_e = k_o + \frac{k_o V_B}{V_s} - \frac{i B}{V_s}$

Factoring $V_B/V_s$,

$k_e = k_o + (k_o - i)V_B/V_s$

Since Proposition I argues that $k_o$ equals the rate of return required by shareholders in an equivalent ungeared company, $k_o = k_{eu}$, and so long as book and market value of debt are the same, ensuring that $i = k_d$, than the above expression can be written:

$k_e = k_{eu} + (k_{eu} - k_d)V_B/V_s$

The above equation shows that, the return required by shareholders is a linear function of the debt/equity ratio.
Appendix 2.3: Derivation of MM’s Proposition III

MM’s third proposition states that “the cut-off rate for investment will in all cases be k_o, and will be unaffected by the type of security used to finance the investment”.

Consider a firm whose initial value is:

\[ E_0 = V_0k_0 = (V_{S0} + V_{B0})k_0 \quad V_0 = E_0/k_0 \]

The firm considers an investment outlay LI, which will generate a perpetual return, R, for each £ invested. Giving \( E_1 = (E_0 + RI) \), the new value of the firm, after the investment is accepted is:

\[ V_1 = E_1/k_0 = (E_0 + RI)/k_0 = E_0/k_0 + RI/k_0 = V_0 + RI/k_0 \]

If the project is debt-financed the value of the debt is \( V_{B1} = (V_{B0} + I) \).

Substituting this in the expression \( V_1 = V_{S1} + V_{B1} \), the new share value is:

\[ V_{S1} = (V_1 - V_{B1}) = V_1 - (V_{B0} + I), \]

Substituting for \( V_1 \) we have:

\[ V_{S1} = V_0 + RI/k_0 - V_{B0} - I \]
\[ V_{S1} = (V_0 - V_{B0}) + RI/k_0 -I \]
\[ V_{S1} = V_{S0} + RI/k_0 -I \]
\[ V_{S1} - V_{S0} = I (R/k_0 -1) \]

As I > 0, the expression in the right hand site will be greater than zero only if R > k_o. Therefore it can be concluded that a firm should only undertake investments which rate of return is equal or higher than k_o, the weighted average cost of capital, which according to Proposition I is independent of the gearing ratio.
Appendix 2.4. MM Proposition with Corporate Taxes

Corporate tax is applied to the stream of earnings after deducting interest charges. The value of a geared company's shares is the capitalised value of the after-tax earnings stream, i.e. \((E-iB)(1-T)\) (T is the rate of tax on corporate earnings):

\[
V_S = \frac{((E-iB)(1-T))}{k_{eg}}
\]

The cost of debt, \(k_d\), equates the coupon rate \(i\) based on the assumption that the book and market value of debt are the same \((B = V_B)\). Therefore we can write:

\[
V_B = B \text{ or } V_B = \frac{iB}{i}
\]

The overall firm value will be:

\[
V_0 = V_S + V_B = \frac{((E-iB)(1-T))}{k_{eg}} + \frac{iB}{i}
\]

The post-tax annual expected earning stream, noted \(E_T\), is composed of the earning distributed to the shareholders plus the interest paid on the outstanding debt:

\[
E_T = (E-iB)(1-T) + iB
\]

\[
E_T = E(1-T) - iB + iBT + iB
\]

\[
E_T = E(1-T) + iBT
\]

The first element in the last equation is the net income of a ungeared firm will receive, whereas the second element is the tax benefit gained by the debt interest shield. The total value of a geared company, \(V_g\), can be calculated by discounting the first element at the cost of equity of an ungeared firm, \(k_{eu}\), while the second is discounted at the cost of debt, \(I\):

\[
V_g = \frac{E(1-T)}{k_{eu}} + \frac{iBT}{i}
\]

\[
V_g = V_u + TB
\]
The last expression tells that the value of a geared company is equals the value of an equivalent ungeared company plus a premium derived by discounting to perpetuity the stream of interest tax-savings.

Proposition II can be modified to reflect the corporate tax. According to Proposition II the cost of capital for shareholders is:

\[ k_{eg} = k_{eu} + (k_{eu} - k_d) \frac{B}{V_S} \]

Given that:

\[ V_S = \frac{(E - iB)}{k_e} \Rightarrow k_e = \frac{(E - iB)(1-T)}{V_S} \text{ and } E = k_0 V_0 = k_0(V_S + V_B) \]

Substituting for E we have,

\[ k_e = \frac{[k_0(V_S + V_B) - iB](1-T)}{V_S} \]

\[ k_e = \frac{(k_0 V_S + k_0 V_B - iB)(1-T)}{V_S} \]

Taking into consideration that \( V_B = B \) and dividing by \( V_S \) each of the terms in the bracket we have,

\[ k_e = \frac{(k_0 + k_0 \frac{V_B}{V_S} - iV_B/V_S)(1-T)}{} \]

Factoring \( V_B/V_S \),

\[ k_e = \frac{[k_0 + (k_0 - i)](1-T)V_B/V_S}{V_S} \]

Since Proposition I argues that \( k_0 \) equals the rate of return required by shareholders in an equivalent ungeared company, \( k_0(1-T) = k_{eu} \), and so long as book and market value of debt are the same, ensuring that \( i = k_d \), than the above expression can be written:

\[ k_{eg} = k_{eu} + (k_{eu} - k_d)(1-T) \frac{B}{V_S} \]
Appendix 2.5: Miller’s revision of MM theory allowing for personal taxation

Miller’s model is based on valuing the combined flows of income to corporate shareholders after allowing for their personal tax positions. These flows comprise the flow of shareholder’s income taxed at the marginal rate of tax on equity income, \( t_e \), plus the flow of lenders interest payments, taxed at their marginal rate of tax on interest payments, \( t_B \):

\[
[(E-iB) (1-T) (1-t_e)] + [(1-t_B) (iB)]
\]

With zero retention, this equals the net-of-tax cash flow into the firm and its appropriation into interest and dividend.

The value of the geared company is calculated by discounting the stream of equity income at the appropriate risk adjusted rate and discounting the stream of tax savings at the cost of debt:

\[
V_g = V_u +[1 - ((1-T)(1-t_e))/(1-t_B)]B
\]
Appendix 3

3.1 Risk Shifting

Barnea, Haugen and Senbet (1985), to demonstrate the proposition that shareholders may benefit by investing in high risk projects, consider the equity as a European-type call option to buy back the entire firm from the debtholders at maturity, at an exercise price equal to the principal amount of the debt. Debtholders can be viewed as buying the assets of the firm and issuing the call option (equity) in these assets. In the framework of the option pricing model, the value of this call option increases with the variance of the cash flows of the underlying assets, therefore shareholders will increase the market value of equity, at the expense of debtholders, by selecting high-risk projects. Assume that the firm has issued bonds, which have a face value £m at maturity. The firm has only investment opportunity - Project A. Assume the shareholders choose Project A, the risk adjusted value of the firm is $V(A)$, as shown in Fig 3.4.

![Figure 3.4 Risk Shifting Payoffs of Debt and Equity: One Project](image-url)
In Figure 3.4 the curved line A is the relationship between the value of the Equity in the firm and the value of Project A given that it has variance $\sigma_A^2$. The value of the firm's equity is the line segment S(A). The value of the debt is the firm's total value less the value of the equity, $V(A) - V(S)$. This is the line segment D(A).

Assume now that the firm has another investment opportunity as well, Project B. It is riskier than A but has the same risk adjusted set of payoffs, $\sigma_A^2 < \sigma_B^2$ and $V(A) = V(B)$. The value of the riskier investment is given by curve B. The overall value of the firm is independent of investment opportunity choice since both projects have the same value as shown in Figure 3.5.

Because of the higher risk, the value of the equity would be higher. Shareholders would prefer Project B over Project A. In Fig. 3.5 the value of the equity would be the line segment S(B) while the value of debt is the line segment D(B). However, rational debtholders recognise the investment alternatives and shareholders' risk incentives. Thus, they offer a price for the debt that reflects the distribution of wealth given adoption of the high-variance project. In any case, since both projects command the same value, no cost is incurred by either party.

Figure 3.5. Risk Shifting Payoffs of Debt and Equity: Two Projects
Now assume that project B is not only riskier but it is also worth less than A, \( V(A) > V(B) \) and \( \sigma^2_A < \sigma^2_B \), as shown in Fig. 3.6. Given the choice between projects A and B shareholders will still choose project B, even though it has a lower total value, since \( S(B) > S(A) \). Given the principal amount of the debt (the exercise price), the price of debt is \( D(A) \) if priced in accordance with the adoption of the higher value-lower risk project A, but it is \( D(B) \) if priced with the presumption that the lower value-higher risk project B is adopted. If bondholders have no means of neutralising the shareholders' incentive for risk shifting, they would presume that the lower value-higher risk project will be adopted, and therefore offer price \( D(B) \). Different from the previous case, the price reflects not only the higher risk, from which equity holders benefit, but also the inferiority of the project in terms of current value. If shareholders subsequently wish to finance project A, they will lose, since the bond price will go up to \( D(A) \) from \( D(B) \), and the stock price will decline from \( S(B) \) to \( S(A) \) accordingly. Thus, they are forced to adopt the lower value-higher risk project with the smaller value. This difference in value is a deadweight loss (an agency cost), rather than a redistribution of wealth between shareholders and debtholders.

![Fig. 3.6. Risk Shifting Payoffs when Shareholders' Choose Riskier Lower Valued Project](image-url)
3.2. Underinvestment Problem

The value of a firm's assets $V$ consists of $V_a$ the value of assets already in place, and $V_g$ the value of the option to invest in assets not yet in place, $V = V_a + V_g$. Assets already in place are sunk costs - irreversible investments. By assumption, their value would be unaffected by any subsequent, discretionary investments. On the other hand, the growth opportunities create value by giving the firm the flexibility to create new assets in place in the future. By definition, a growth opportunity is an option over an investment whose value is affected by subsequent, discretionary investment decisions. They represent the firm's right, (not an obligation), to undertake profitable (positive NPV) investments at some future date. To be exercised, these options require further discretionary investments. An option will not be exercised unless its value exceeds its exercise price. As shown in the following simplified Myers' model, the shareholders have no incentive to exercise the option to invest in some positive NPV projects, because the resultant value of the firm would not be enough to also repay the debtholders.

**Myers' Model**

Assume that the only asset is a growth opportunity and there are three periods, $t = 0, 1, 2$. At $t = 0$, a firm owns an investment opportunity whose true value, $V$, will become known at $t = 1$. At that time the firm has to decide whether to invest $I$ in the assets that will generate cash flows that will be realised at $t = 2$.

How will the firm decide to exercise the investment at $t = 1$? In a wholly equity funded firm the NPV criteria would be the main decision tool. Shareholders would maximise the value of their equity when they accept any project where $V \geq I$. $V$ is the present value of the proceeds and $I$ is the present value of the cost. The equity holders actually own a call option on exercising the growth
opportunity. They would exercise the option to create new assets in place as long as the project’s revealed present value \( V \) is no less than the cost of investment \( I \), the exercise price. Hence, the value of the growth option at \( t = 1 \) is like the value of a call option at expiration. Let \( C_g \) be the value of the growth opportunity when the firm is entirely equity funded:

\[
C_g(V,T,I) = C_g(V,0,I) = \max(0,V-I)
\]

where \( T \) represents the point of time \((0, 1, 2)\).

However, when the firm has debt in its financial structure, this changes shareholders’ payoffs and incentives. The firm raises part of its capital by issuing zero-coupon bonds at \( t = 0 \), that mature at \( t = 2 \). The loan must be repaid out of the realised proceeds of the investment opportunity. The value of the growth opportunity is revealed at \( t = 1 \), prior to maturity. With limited liability and lender priority, the shareholders receive nothing unless the debtholders are paid first. For the shareholders to have the incentive to exercise the growth option, the project’s proceeds should exceed the cost of investment by at least the amount of the face value of the debt.

\[
V \geq I + D
\]

\[
C(g/d)(V,T,I+D) = C(g/d)(V,0,I+D) = \max(0,V-I-D)
\]

where \( C(g/d) \) is the value of the growth option when the firm is partially debt funded, and \( D \) the debt outstanding.

In some states of the world, the value of the growth option may be greater than the cost of the investment, but not greater than the cost of the investment plus the face value of debt. In this case the shareholders have the incentive not to exercise the option. They essentially default on the loan by letting the option die unexercised. The existence of outstanding debt eliminates the shareholders’ incentive to accept every project that has a positive NPV for the firm. This underinvestment creates a deadweight loss as shown in figure 3.7.

Let \( V \) equal the value of the firm at \( t = 0 \). Let \( S \) be the set of all possible states of world and \( s \) is an element of the set \( S \), \( s \in S \). \( V(s) \) is the value of the firm given
the state \( s \) occurs.

![Diagram of Myers' Underinvestment Problem](image)

**Fig. 3.7 Myers' Underinvestment Problem**

The states of the world will be ranked based on the realised value of \( V \), e.g. \( V(s_2) > V(s_1) \), etc. Let \( q(s) \) be the equilibrium price $1 delivered at \( t = 1 \) if and only if the state \( s \) occurs. \( x(s) \) is a binary decision variable of value 1 if the decision is made for the investment to be carried out and 0 if otherwise. The value of the firm at time zero is:

\[
\int_{0}^{s} q(s)x(s)(V(s) - I)ds
\]

In an all equity firm the shareholders would accept all projects for which \( V > I \). Let \( s_a \) be the state of the world such that \( V(s_a) = I \). Shareholders would accept the project for all states of the world \( s \geq s_a \) and reject the option for all \( s < s_a \). So \( x(s) = 1 \) for all \( s \geq s_a \) and \( x(s) = 0 \) for all \( s < s_a \). The value of all equity firm at \( t = 0 \) is:

\[
V = \int_{s_a}^{0} q(s)x(s)(V(s) - I)ds
\]

When the firm issues debt that comes due after the investment decision must be made, the value of the partially debt financed firm at \( t = 0 \) is \( V^* \)

\[
V^* = \int_{s_a}^{0} q(s)(V(s) - I - B)ds + \int_{s_a}^{0} q(s)\min[B, V(s)]ds
\]
The term on the right hand side is the present value of the payoffs to shareholders. The second term is the present value of the payoffs to debtholders. Define $s_b$ as the break-even point, $V(s_b) - I = B$. With limited liability shareholders would receive nothing until the creditors are repaid. So the shareholders exercise their option on the project only for values of $s$ greater than $s_b$. In other words:

$$x(s) = 1 \quad \text{for} \quad V(s) - I \geq B$$

$$x(s) = 0 \quad \text{for} \quad V(s) - I < B$$

$V(s_b) > V(s_a)$ when $B > 0$

When $V(s) - I < B$ but $V(s) - I > 0$, positive NPV projects would be rejected. In other words some profitable investments opportunities would be rejected simply because the firm has debt outstanding when the opportunities must be exercised.

The value of the ungeared firm will be greater than the value of the levered firm.

$$V^* = \int_{s_a}^{\infty} q(s)[V(s) - I - B]ds + \int_{s_a}^{\infty} q(s) \min[B, V(s)]ds$$

$$V^* = \int_{s_a}^{\infty} q(s)[V(s) - I - B]ds + \int_{s_a}^{\infty} q(s)Bds$$

$$V^* = \int_{s_a}^{\infty} q(s)[V(s) - I]ds < V$$

There is a dead weight loss, $V^L$. This is the triangle ABC in Fig 3.7.

Since $s_a < s_b$, $V$ can be written as the sum of $V^*$ and $V^L$

$$V = \int_{s_a}^{s_b} q(s)[V(s) - I]ds + \int_{s_b}^{\infty} q(s)[V(s) - I]ds$$

$$V^L = V - V^*$$

$$V^L = \int_{s_a}^{s_b} q(s)[V(s) - I]ds$$

Myers (1977) points out that this sort of incentive problem exists whenever there is outstanding debt and the decision makers have the discretion to expend cash.
flows. The model works in a similar way when the existing assets embody the option to abandon (sell-off) a project. This is like a put option on the existing asset. In each period the decision maker has the option to continue the project for one more period or sell the assets for their salvage value. He/she will continue the project if its value exceeds the salvage value of the asset. The firm essentially invests the amount of the salvage value for one period. The salvage value is essentially the opportunity cost of continuing the project for one more period. In all equity funded firms the shareholders would liquidate when \( V(s) < I \), where \( I \) is the salvage value and \( V(s) \) is the value as an ongoing project.

An incentive compatibility problem arises if the firm has debt outstanding. The shareholders have a strong incentive to sell-off assets and distribute the proceeds to themselves as a dividend whenever \( V(s) - B < I \). This increases the number of states of the world in which assets would be sold. If shareholders liquidate they receive \( I \). If they keep the project as an ongoing business they only get \( V(s) - B \). Myers points out that one can not legally liquidate assets immediately before default. This would leave the leaving lenders "holding an empty bag".

In both underinvestment and the risk shifting agency models, creditors recognise the shareholders’ incentives and therefore are willing to pay less than they would otherwise pay for the debt. The shareholders end up bearing the ultimate cost for the incentive problems. John and Kalay (1984), argue that at least some of these costs can be offset by using debt covenants which impose dividend constraints. However there is still a "deadweight loss" in the value of the firm.
Klein and Leffler’s (K&L) Reputation Model

There are two quality type goods, high (H) and low (L) quality. The production and marginal costs of high quality good are higher than the respective ones of low quality product. Let denote $r$ the interest rate for the period, and $R = 1 / (1+r)$ the discounting factor where $r \geq 0$. $Q$ is the level of output for the period. To simplify the model let assume that $Q$ is a unit. Let denote $C(H)$ and $C(L)$ the respective costs of high and low quality goods, where:

$$C_H(Q) > C_L(Q)$$

A firm that produces the high quality product gains the present value of the infinite stream of one period profits:

$$PV_H = (P - C_H(Q)) / r$$

where $P$ is the selling price.

A firm that produces low quality products can claim that produces high quality product only once. The true quality is always exposed in the next period. It can charge the high quality price and receive only a one period profit.

$$PV_L = (P - C_L(Q)) / (1 + r)$$
Bibliography


J. Nuri


Euromonitor (1988), Retail Development in the UK: Attitudes to and Policies for Changes in the Retail Structure to the 1990s, Euromonitor Publication, London:

E-Views Users Guide (1997), Quantitative Micro Software,


J Nuri Bibliography


