An Empirical Study of the Effects of Managerial Discretion over the Extended Adoption of New UK Employers’ Pension Accounting Rules

by

Yong Li

A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Industrial and Business Studies

University of Warwick, Warwick Business School

October 2005
ACKNOWLEDGEMENTS

This thesis has become part of my journey towards the excellence that I aspire for in my life. I am indebted to my parents who provided me with education and endless love and support in every stage that I went through.

I am very grateful to my supervisor, Prof. Paul Klumpes, for his comments, encouragement and enduring interest. Without them, this thesis could not be realised in its current form. I am also very grateful to my original supervisor, Prof. Anthony Steele, who unfortunately passed away in 2003, for believing in this project since my first approach. I would also like to thank my second supervisor, Prof. Paul Stoneman, for his valuable comments and support.

My appreciation is extended to Prof. Keith Hoskin, Dr. Margaret Lamb and Mark Whittington who have kindly met with me to discuss my research.

The funding from Warwick Business School to undertake this research project is highly appreciated.

Finally, I want to thank all my friends at Warwick, whose support and encouragement were very important to the completion of this thesis.
ABSTRACT

On 30 November 2000, the Accounting Standards Board issued Financial Reporting Standard 17 (‘Retirement Benefits’, FRS 17) to supersede Statement of Standard Accounting Practice (‘Accounting for Pension Costs’, SSAP 24). It removed managerial discretion over the main actuarial assumptions used to estimate employers’ pension obligations, and required the recognition of pension assets and liabilities on a consistent ‘fair value’ basis. However, FRS 17 was only fully effective for reporting periods ending on or after 30 June 2005.

This thesis examines empirically how the prolonged period associated with the debate, promotion and implementation of FRS 17 interacted with various managerial pension choices. Evidence of these interactions can help discriminate among competing theoretical perspectives concerning employers’ long-term defined benefit pension obligations. This thesis draws upon these competing theoretical frameworks to develop and test hypotheses concerning the impact of pension accounting regulatory change on UK firms’ discretion over pension actuarial assumptions, termination and asset allocation during the period 1998-2002.

The empirical results support three major hypotheses. Firstly, the magnitude of expected rate of return on pension assets assumption used for financial reporting purposes is driven primarily by the UK firms’ balance sheet leverage. Secondly, firms’ defined pension benefits termination decision is inter-related with their pension financial reporting choices. Thirdly, the allocation of pension assets has been managed in a way to reduce firms’ cash contribution risks that stem from measuring both pension assets and liabilities on a ‘fair value’ basis. These findings imply managerial discretionary behaviour related to these choices is
consistent with the perspective that employer firms and their sponsored pension funds are an integrated economic entity, as is asserted by the new UK pension accounting rule (FRS 17).
DECLARATION

This is to declare that:

- I am responsible for the work submitted in this thesis.
- All verbatim extracts have been distinguished and the sources specifically acknowledged.
- During the writing-up of this thesis, a number of papers were prepared and presented at various seminars and accounting conferences, such as the Warwick Business School Accounting Group Seminar Series 2003, the Imperial College Accounting Group Seminar Series 2005, the British Accounting Association Doctoral Colloquium 2003, the British Accounting Association Annual Congress 2003, American Accounting Association Annual Meeting 2004, European Accounting Association Annual Congress 2005. The list of papers presented are as follows:

1. Klumpes, P., Y. Li, M. Whittington. 2005. “The Impact of UK Pension Accounting Change on Pension Terminations”. This paper has been amended and incorporated as Chapter 5 of this thesis. Of the content of this joint work in Chapter 5, I bore a particular responsibility for the empirics. An estimate of the extent of my contribution overall is 60 percent.

2. Li, Y., P. Klumpes. 2005. “Determinants of the Expected Rate of Return Assumption on Pension Assets: Evidence from the UK”. This paper is incorporated as Chapter 4 of this thesis. Of the content of this joint work in Chapter 4, I bore a particular responsibility for the hypothesis development and empirics.
An estimate of the extent of my contribution overall is 90 percent.

- This work has been written by me except in the aforementioned cases of collaborative research.
- This work has not previously been submitted within a degree programme at this or another institution.
# TABLE OF CONTENTS

1. INTRODUCTION ........................................................................................................... 1
   1.1. BACKGROUND .................................................................................................. 1
   1.2. MOTIVATION ................................................................................................. 3
   1.3. RESEARCH OBJECTIVES .................................................................................. 5
      1.3.1. PENSION ACTUARIAL ASSUMPTION CHOICES ............................................. 6
      1.3.2. PENSION TERMINATION DECISION .......................................................... 7
      1.3.3. PENSION ASSET ALLOCATION DECISION ................................................... 7
   1.4. CONTRIBUTION ............................................................................................... 8
   1.5. STRUCTURE OF THE THESIS ......................................................................... 9

2. INSTITUTIONAL BACKGROUND ................................................................................. 11
   2.1. INTRODUCTION ............................................................................................... 11
   2.2. HISTORICAL DEVELOPMENT OF UK LEGISLATION ON PRIVATE PENSIONS ................................................................. 13
      2.2.1. PRE-1995 .................................................................................................. 14
      2.2.2. THE 1995 PENSION ACT ......................................................................... 15
         2.2.2.1 Supervision ....................................................................................... 15
         2.2.2.2 Minimum Funding Requirement (MFR) ........................................... 16
         2.2.2.3 Information Disclosure (SORPs) ...................................................... 18
   2.3. COMPARISON WITH THE US LEGISLATION ............................................... 19
   2.4. EMPLOYERS' PENSION COSTS ACCOUNTING ............................................... 23
      2.4.1. INTERNATIONAL DIFFERENCES IN CURRENT PRACTICE ....................... 24
      2.4.2. INTERNATIONAL CONVERGENCE OF PENSION ACCOUNTING STANDARDS ............................................................................................................................. 28
   2.5. CONCLUSION ................................................................................................. 29

3. LITERATURE REVIEW .............................................................................................. 31
   3.1. INTRODUCTION ............................................................................................... 31
   3.2. THEORETICAL ANTECEDENTS ........................................................................ 33
   3.3. CHANGES IN UK PENSION COST ACCOUNTING .......................................... 35
      3.3.1. SSAP 24 .................................................................................................. 36
      3.3.2. FRS 17 .................................................................................................... 38
         3.3.2.1 Debate (1995-1997) ......................................................................... 39
3.3.2.2 Promotion (1998-1999) .................................................................42
3.3.2.3 Implementation (2000- ) ..............................................................43

3.4. EMPIRICAL PENSION ACCOUNTING RESEARCH ....................45
3.4.1. PENSION-RELATED ACCOUNTING CHOICES .....................................45
3.4.2. CORPORATE PENSION TERMINATION DECISION ..................................49
3.4.3. CORPORATE PENSION ASSET ALLOCATION DECISION .................52

3.5. DISCUSSION AND CONCLUSION ..................................................56

4. DETERMINANTS OF EXPECTED RATE OF RETURN ASSUMPTION .........................................................59
4.1. INTRODUCTION ....................................................................................59
4.2. BACKGROUND ...................................................................................62

4.3. DEVELOPMENT OF HYPOTHESES ...........................................65
4.3.1. CONTRACTING HYPOTHESIS ..........................................................65
4.3.2. SMOOTHING HYPOTHESIS ...............................................................66
4.3.3. PENSION ACCOUNTING RULE CHANGE AND OPPORTUNISTIC
DETERMINANTS .........................................................................................71

4.4. RESEARCH DESIGN ............................................................................71
4.4.1. ESTIMATION METHODOLOGY ..........................................................71
4.4.2. EMPIRICAL MODEL ...........................................................................74
4.4.3. PENSION ACCOUNTING RULE CHANGE AND OPPORTUNISTIC
DETERMINANTS .........................................................................................75

4.5. DATA AND DESCRIPTIVE STATISTICS ...........................................76
4.5.1. SAMPLE AND DATA ............................................................................76
4.5.2. DESCRIPTIVE STATISTICS ..................................................................78

4.6. EMPIRICAL ANALYSIS ........................................................................82
4.6.1. UNIVARIATE ANALYSIS ......................................................................82
4.6.2. MULTIVARIATE ANALYSIS .................................................................83
4.6.2.1 Regression Tests of Opportunistic Determinants .............................83
4.6.2.2 Changes in Opportunistic Determinants between the pre-FRS 17 and
FRS 17 Period .........................................................................................90
4.6.3. SENSITIVITY TESTS ..........................................................................96

4.7. SUMMARY AND CONCLUSION .........................................................97

5. PENSION REPORTING CHOICES AND DEFINED BENEFIT
PENSION TERMINATIONS ...........................................................................99
5.1. INTRODUCTION ....................................................................................99
5.2. BACKGROUND ...................................................................................102
LIST OF TABLES AND FIGURES

TABLE 2.1 COMPARATIVE INSTITUTIONAL FEATURES UNDERPINNING EMPLOYER SPONSORED PENSION PLANS IN THE UK AND USA ..........................20

TABLE 2.2 COMPARISON OF PENSION ACCOUNTING STANDARDS .....................26

FIGURE 3.1 LINKAGES BETWEEN THE DEVELOPMENT OF PENSION THEORETICAL PERSPECTIVES, PENSION ACCOUNTING REGULATION, REFORM LEGISLATION, AND EMPIRICAL RESEARCH...............................32

TABLE 4.1 SAMPLE SELECTION CRITERIA..........................................................78

TABLE 4.2 DISTRIBUTION OF KEY SSAP 24 ACTUARIAL ASSUMPTIONS ..............80

TABLE 4.3 FREQUENCY AND MAGNITUDE OF CHANGES IN THE ERR AND SGR UNDER SSAP 24 ........................................................................................................81

TABLE 4.4 DESCRIPTIVE STATISTICS OF EXPLANATORY VARIABLES ..........84

TABLE 4.5 PEARSON AND SPEARMAN CORRELATION MATRIX .......................85

TABLE 4.6 SEEMINGLY UNRELATED REGRESSION TESTS OF THE DETERMINANTS OF THE ERR ASSUMPTION.................................................................91

TABLE 4.7 REGRESSION TESTS OF CHANGES IN OPPORTUNISTIC DETERMINANTS BETWEEN THE PRE-FRS 17 AND FRS 17 PERIOD .........................94

TABLE 5.1 PREDICTIONS OF COMPETING HYPOTHESES.................................105

TABLE 5.2 UNIVARIATE TEST RESULTS FOR EXPLANATORY VARIABLES ..........116

TABLE 5.3 PEARSON CORRELATION MATRIX AMONG EXPLANATORY VARIABLES.........................................................................................................................117

TABLE 5.4 BIVARIATE PROBIT MODEL FOR PENSION TERMINATIONS AND ERR UPDATING ......................................................................................................119

TABLE 5.5 SENSITIVITY TESTS FOR CHANGE IN FUNDING RATIO ..................122

TABLE 6.1 VARIABLE DEFINITIONS ..................................................................138

TABLE 6.2 DISTRIBUTION OF PENSION ASSET COMPOSITION BY YEAR ..144

TABLE 6.3 THE DISTRIBUTION OF EQUITY INVESTMENTS ............................146

TABLE 6.4 DESCRIPTIVE STATISTICS ON THE REGRESSION VARIABLES BY YEAR..............................................................................................................147
TABLE 6.5 MEAN EQUITY INVESTMENTS BY QUINTILE OF THE INDEPENDENT VARIABLE IN EQ. (6.1) .................................................................150

TABLE 6.6 DETERMINANTS OF PENSION FUNDING AND ASSET ALLOCATION TO EQUITIES ......................................................................................................152

TABLE 6.7 SENSITIVITY TESTS OF ASSET ALLOCATION EQ. (6.1)..................155
1. INTRODUCTION

1.1. BACKGROUND

Over the past few decades, an ever-larger proportion of workers in many OECD countries appear prepared to accept long-term deferred compensation in the form of the employer-sponsored defined benefit pensions (Bodie, 1990). However, rising demographic pressure, economic and social dislocations associated with greater volatility in both labour and capital markets in recent years have put strains on these pension arrangements. Indeed one of the greatest challenges facing the UK economy now and increasingly in the decades ahead is to provide retirement income security in an environment characterized by a rising ratio of retired to working age population.

The accounting rules that govern the measurement and reporting of employers’ pension obligations and costs are a very important part of the regulatory structure that has been developed to govern the accountability of the pension industry and related participants. To meet the challenge for the greater accountability of corporate pension sponsorship and to enhance internationally comparable pension GAAPs, the UK Accounting Standards Board (ASB) decided to replace former GAAP (Statement of Standard Accounting Practice 24, ‘Accounting for Pension Costs’, hereinafter ‘SSAP 24’, issued in 1988) with Financial Reporting Standard No. 17, ‘Retirement Benefits’ (hereinafter ‘FRS 17’) in 2000.

SSAP 24 separated accounting and funding objectives of employers’ pension sponsorship. It merely required firms sponsoring defined benefit pension
plans to disclose actuarial assumptions underlying the ratio of conservatively-determined pension assets to liabilities in the notes to the financial statements. SSAP 24 also allowed considerable managerial discretion over valuation frequency (a minimum of once every three years), and the measurement of pension assets as well as the main actuarial assumptions used to estimate employers' pension costs and liabilities. There was also very limited disclosure of those main actuarial valuation assumptions used for financial reporting purposes.

New UK GAAP (FRS 17) takes a radically different approach by focusing primarily on the balance sheet impact of firms' pension exposures, measured using 'fair value' principles. However, UK companies adopting FRS 17 quickly found that their balance sheets became more volatile due to the need to report changes in the market values of pension fund assets, which in many cases were heavily invested in equities. This situation was exacerbated by rapidly declining stock prices, to the point where many of the FTSE 100 companies reported their large pension deficits. These net deficits have forced many UK sponsoring firms to make immediate cash contributions, terminate their defined benefit pension plans or close their defined benefit provisions to new employees.

Due to sustained industry pressure, in July 2002 the ASB indefinitely delayed fully implementing FRS 17. Consequently, UK firms are required to continue reporting pension assets and liabilities under both old UK GAAP (SSAP 24 - actuarial based valuation) and new UK GAAP (FRS 17 - market based valuation). The ASB deliberations require, as of the 2001 reporting year, UK sponsors have to disclose annually the difference between the value of assets

---

1 The Financial Times of July 28, 2003 claimed that efforts by UK companies to fill a £160 billion 'pension black hole' as revealed by FRS 17 would even 'hold back UK economic growth'.
and liabilities of their sponsored pension funds, measured using a standardized ‘fair value’ basis, alongside with the SSAP 24 disclosures in the footnote to their financial statements.

1.2. MOTIVATION

Accounting for the costs of pensions in the accounts of employer companies is a complex estimation process that involves material amounts, long duration, and future investment, mortality and inflation risk uncertainties that are subject to sophisticated actuarial inputs. Thereby the term of pension accounting has so far evolved to define a set of accounting problems that affect a range of measurement and reporting issues associated with contractual pension commitments made by employers to their employees (Klumpes, 2001, p. 30).

Most of the early US-based empirical research on pension accounting has focused on explaining how the capital market prices the unfunded pension liabilities (e.g. Feldstein and Seligman, 1981; Dhaliwal, 1986), and what constitutes the appropriate pension liability measure (e.g. Landsman, 1986). However, changes in legislative requirements, economic condition and the size of pension exposures in relation to market capitalization of sponsoring firms have placed increasing pressure for pension accounting regulation to safeguard the financial accountability of employer sponsors. In response to pressure for changes, the accounting profession’s concern has shifted to issues as to whether the ‘fair value’ approach is appropriate in measurement and reporting of pension assets as well as employers’ pension costs and liabilities.
In the UK the promulgation of FRS 17 culminated a broader debate within the UK actuarial profession as to whether pension fund valuation should remain grounded in traditional ‘discounted cash flow’ valuation approach or should be made more consistent with the ‘market-based’ valuation approach advocated by modern financial economics theory (Klumpes and Li, 2004). Traditionalists argued for a continuation of the cost-based methodology (i.e. cash-flow relationship of assets to liabilities based on long-term funding assumptions) then espoused under existing SSAP 24 (e.g. Day and McKelvey, 1963; Greenwood and Keogh, 1997). Opponents are in favour of valuation assumptions consistent with the principles of financial economics (e.g. Smith, 1996; Exley et al., 1997) as advocated in FRS 17.

The differences between SSAP 24 and FRS 17 draw attention to the potential for differences in long-term actuarial versus short-term corporate financial perspectives for employers’ pension reporting and corporate pension management decision. Further empirical research is needed to add to existing knowledge in the area of pension accounting through discriminating among alternative theoretical perspectives, which in turn bears direct applicability to pension accounting practices.

If fully implemented, FRS 17 requires the mandated recognition of pension plan assets and liabilities on sponsors’ balance sheets. Adoption of FRS 17 also increases the volatility of the income statement and the balance sheet. US pension GAAP (Statement of Financial Reporting Standards No. 87, ‘Accounting for Pension Costs’) avoids such financial statement volatilities by permitting fluctuations of net pension assets and liabilities values to remain unrecognized in the financial statements. Unlike SFAS 87, FRS 17 requires pension actuarial
gains and losses to be immediately written off and permits balance sheet recognition of excess pension surpluses. Consequently, FRS 17 explicitly recognizes the existence of the employers’ implicit option to terminate their defined benefit pension obligations.

The change of pension accounting rules from SSAP 24 to FRS 17 also reflects the international accounting standard setter’s move towards a comprehensive ‘fair value’ based accounting model in general. The International Accounting Standards Board (IASB) is currently deliberating whether IAS 19 (International Accounting Standard No. 19, revised 1998, ‘Employee Benefits’) should be made more consistent with FRS 17. Consequently, the prolonged delay in implementing FRS 17-style pension accounting in the UK affords an opportunity to conduct an empirical investigation that examines managerial discretionary behaviour related to various aspects of corporate pension management decision over an extended adoption period of new UK pension accounting rules.

1.3. RESEARCH OBJECTIVES

The overall aim of the thesis is to examine empirically how the prolonged period associated with the debate, promotion and implementation of FRS 17 interacted with various managerial pension choices. Evidence of these interactions can help discriminating among competing theoretical perspectives concerning employers’ long-term defined benefit pension obligations. Main research objectives of the thesis are divided into three areas.
1.3.1. Pension Actuarial Assumption Choices

Changes in actuarial valuation assumptions have effects on reported pension costs, cash flows and contracting costs of sponsoring firms with significant pension exposure. The traditional actuarial approach in pension accounting under SSAP 24 permitted employer sponsors with discretion to measure both pension assets and liabilities using expected rate of return on equity investment (ERR). In the late 1980s, there was concern that UK companies were using such discretion allowed by SSAP 24 to manipulate pension costs, in order to smooth corporate earnings (Whittington and McGeachin, 2003, p. 89).

FRS 17 radically reduced the flexibility formerly available to UK firms sponsoring defined benefit pension plans to manipulate the level of ERR assumptions. The first objective of this thesis is to investigate whether UK managers have used their discretion under SSAP 24 to determine the reported ERR assumption opportunistically, and whether UK firms have responded to the new pension accounting rule through their discretionary choices of the ERR assumptions for reporting purposes.

The empirical analysis identifies and examines some possible opportunistic and/or economic determinants associated with managerial discretion over the magnitude of reported key pension valuation assumptions during a period that covers both pre- and post- pension accounting rule change in the UK. It seeks to answer the question of whether pension reporting requirements prescribed by new pension accounting standard (FRS 17) have enhanced the comparability of pension costs among firms as they are intended.
1.3.2. Pension Termination Decision

An important issue in pension accounting is whether employer sponsored pension schemes are to be effectively treated as financial subsidiaries of the sponsoring firm or as distinct separate entities. To discriminate among differing perspectives, prior research focuses on employers’ propensity to terminate defined benefit pension plans with excess pension assets. However, the accounting implications of managing under-funded defined benefit pension plans has not attracted much attention from prior researchers. The second objective of this thesis is to examine whether economic decision concerning termination of under-funded defined benefit pension plans is primarily driven by corporate financial characteristics of the employer firm, or by fundamental characteristics of their sponsored pension funds.

The empirical analysis develops and tests alternative integration, separation and risk management explanations of sponsoring firms’ propensity to terminate under-funded defined benefit pension plans, and its inter-relationship with their discretionary ERR updating behaviour. It seeks to answer the question of whether the recognition of pension deficit as debt on sponsoring firms’ balance sheet as required under FRS 17 has influenced their decision to terminate sponsored defined benefit pension plans.

1.3.3. Pension Asset Allocation Decision

The adoption of ‘fair value’ approach in pension accounting, consistent with the corporate finance perspective, implies a short-term volatility mismatch between pension assets and liabilities. Prior empirical research on corporate pension asset allocation decision has yielded rather mixed results (e.g. Friedman,
1983; Bodie et al., 1987; Peterson, 1996; Frank, 2002) in discriminating among alternative theoretical perspectives. In the late 1990s, a new body of theoretical literature concerning pension asset allocation develops asset/liability models of portfolio management taking into account not only asset returns but also changes in pension liabilities and their covariance with asset returns (e.g. Sharpe, 1990; Blake, 2003). The third objective of this thesis is to provide further empirical knowledge into sponsoring firms’ pension asset allocation decision over a period of regulatory uncertainty about the development of pension accounting and funding rules.

The empirical analysis identifies and examines possible determinants associated with the firms’ choices over alternative asset categories (e.g. equity versus bonds). It seeks to answer the question of whether volatilities implied by FRS 17 on employer sponsors’ financial statements affect corporate pension asset allocation decision.

1.4. CONTRIBUTION

This thesis provides unique insights into the nature and impact of changing UK pension accounting policy regulation towards a ‘fair value’ approach. It contributes to existing knowledge of employers’ pension cost accounting through empirical investigation into the effects of pension accounting rule change and its inter-relationship with various managerial pension choices over an extended period associated with the debate, promotion and implementation of FRS 17.
This thesis also extends the literature which attempts to discriminate among competing theoretical perspectives concerning employers’ long-term pension obligations. It develops and tests hypotheses explaining UK firms’ discretion over pension actuarial assumptions, termination and asset allocation during an extended period associated with the debate, promotion and implementation of FRS 17 (1998-2002). Finally, this thesis identifies and recognizes some unresolved issues in prior empirical studies, such as the endogeneity between managerial pension actuarial assumption choices, pension funding and investment decision, and makes attempts to control for them in empirical design and testing.

1.5. STRUCTURE OF THE THESIS

The remainder of this thesis is organized as follows. Chapter 2 describes the development of UK legislative framework on private pension provisions, and the international differences in current practice of employers’ pension cost accounting. Chapter 3 provides a critical review of major theoretical perspectives on corporate pension sponsorship and explores their implications for interpreting the findings of prior pension-related empirical research.

Chapters 4 to 6 comprise the empirical part of the thesis. Chapter 4 presents an empirical study on the determinants of the expected rate of return on pension assets assumption as disclosed by UK sponsors. Chapter 5 examines the corporate decision to terminate their defined benefit pension plans and its potential linkage with the corporate pension financial reporting choices. Chapter 6 presents a related empirical study that focuses on pension asset allocation decision, and its inter-relationship with corporate pension funding and pension
reporting choices. Finally, Chapter 7 summarizes the findings of this thesis, outlines its potential limitations and suggests the scope of further research.
2. INSTITUTIONAL BACKGROUND

2.1. INTRODUCTION

The United Kingdom was one of the first countries in the world to develop formal private pension arrangements (beginning in the 18th Century) and was also one of the first to begin the process of systematically reducing unfunded state provisions (beginning in the 1980s) in favour of funded private provisions (Blake, 2001, p. 3). The majority of private pensions in the UK are employer sponsored pensions, often known as occupational pension schemes.\(^2\) As the work force industrialized and life expectancies extended, the UK government has encouraged the growth of privately-funded retirement savings in order to achieve a reduction in the cost of public old-age pensions and improve the adequacy of retirement income. As a result, the late 1980s witnessed a rapid growth in the membership of occupational pension schemes. Currently there are over 25 million members in the UK participating in over 90,000 occupational pension schemes.\(^3\)

There are two basic types of occupational pension schemes in the UK, defined benefit (DB) and defined contribution (DC) scheme. Historically the most common have been defined benefit (DB) pension schemes. The principal features that distinguish these two types of schemes are how members' benefits are measured and the relative risks borne by scheme members and sponsoring employers. Details for the differences between DB and DC schemes are

\(^2\) Occupational pension schemes are schemes arranged by and contributed to by the employer.

\(^3\) Available from data collected by the Pension Schemes Registry, which was set up by the UK government under the Occupational Pensions Regulatory Authority (replaced by the Pension Regulator on April, 2005) for tracing purposes and collecting a levy from pension schemes. See http://thepensionregulator.gov.uk/opraArchive/pensionSchemesUK/opraArchive_pensionSchemesUK.pdf.
summarized in Appendix A. In particular, employers face differential incentives and risks dependent upon whether their sponsored schemes are DB or DC in nature. For example, the employer sponsoring a DB scheme bears the risk that an individual will live longer in retirement or the investment return on his/her pension contributions will be lower than anticipated at the time when retirement benefits were determined.

Accounting for defined contribution pension plans is simple because they are always by definition fully funded. By contrast, defined benefit pension plans are not always fully funded and potential mismatch of pension assets and liabilities cause incentive problems to arise. This thesis focuses on defined benefit pension schemes provided by UK firms because employers’ pension accounting rules are primarily designed to regulate and safeguard accountability by employers sponsoring defined benefit pension schemes.

This Chapter briefly describes the relevant UK legislative framework covering occupational pension arrangements and compares it with the US legislation.\(^4\) It then briefly discusses the associated professional accounting rules governing the reporting of employers’ pension cost information in major accounting jurisdictions (i.e. UK, USA and international GAAP). The purpose of this Chapter is to provide an overview of the major institutional arrangements governing the accountability of sponsored pensions, which in turn have important implications on the development of employers’ pension cost accounting.

---

\(^4\) Regulation of defined benefit (DB) and defined contribution (DC) schemes differs significantly and this section focuses on legislation regulating defined benefit pension schemes as relevant to the thesis.
The remainder of this Chapter is organized as follows. Section 2.2 provides a brief description of UK legislation on occupational pensions with a focus on pension funding regulation. Section 2.3 compares the relevant UK pension institutional features with those in the USA. Section 2.4 examines the current accounting practices for employers’ pension costs (UK, USA and International GAAP). It provides a comparative analysis between the UK (SSAP 24 and FRS 17), the USA (Statement of Financial Accounting Standards No. 87, ‘Employers’ Accounting for Pensions’) and international pension accounting standard (International Accounting Standard No. 19, revised 1998, ‘Employee Benefits’). The proposed international convergence of pension accounting standards is also discussed. Section 2.5 concludes this Chapter.

2.2. HISTORICAL DEVELOPMENT OF UK LEGISLATION ON PRIVATE PENSIONS

Privately funded pensions (both occupational and personal) have been a success in the UK in terms of their coverage of the labour force on a voluntary basis (attaining 75 percent), asset size (amounting to 80 percent of GDP) and investment performance (Davis, 2001, p. 9). The success and growth of the employer pension sponsorship have also made private pension funds one of the most important institutional investors in the UK economy. This section briefly overviews the UK government’s pension reform legislation since the 1980s and describes the main features of legislation governing occupational pension schemes.5

---

5 The legal and regulatory arrangements which apply to employer sponsored pensions are subject to continual change. The relevant legislation and regulation discussed and analysed in this Chapter are extant as of December, 2002.
2.2.1. Pre-1995

Concerns about the state’s ability to pay for the state pension commitments coupled with demographic trends of an ageing population, resulted in a change of public policy in the 1980s, with an emphasis on the private sector provision of pensions (World Bank, 1994). During the 1980s, the UK government conducted a major study of the relationship between social security and pension funds in light of projected demographic changes. It proposed pension reform legislation to further encourage privately funded pensions (both occupational and personal), so as to reduce the burden of unfunded social security pensions.

The Social Security Act 1980 replaced the indexation of the basic pensions from earnings growth to the change in the retail price index. Further, the Social Security Act 1986 reduced the pension benefits of the State Earnings-Related Pension Scheme (‘SERPS’), and encouraged individual employees to opt out of SERPS\(^6\) into a funded private pension system. A smaller, but growing number of individuals have been covered by individual private pension arrangements, typically known as personal pensions or stakeholder pensions since its introduction in April 1988 (Disney and Whitehouse, 1992).\(^7\)

In December 1991, there was a notorious public scandal about Robert Maxwell’s looting of the Mirror Group pension funds. Over 18,000 Maxwell pensioners lost their pension entitlement because of his fraudulent theft of over £160 million pension assets during 1990-1991. In light of the increased public awareness about the lack of legislative framework governing those responsible

---

\(^6\) SERPS has been replaced by the State Second Pension (S2P) since 2003.

\(^7\) See Whitehouse (1998) and Blake (2001) for an overview of the UK pension system.
for managing pension funds, the Pension Law Review Committee (Goode Committee) was established by the Government to review whether the existing pension laws could be improved. Subsequently, the Goode Report, published in 1993, proposed to strengthen the legislative backing of regulations governing funded pensions and to protect pension members' rights.

2.2.2. The 1995 Pension Act

It was not until the late 1990s that the UK government policy of funded pensions had undergone significant changes. Pension reform legislation became top of the UK government agenda after a number of significant cases of apparent abuses of the employer pension sponsorship (e.g. Maxwell scandal). These scandals raised alarm about the adequacy of the existing regulatory framework. Proposals on tightening the regulation of occupational pensions by the Goode Report were subsequently codified in the new Pension Act 1995. Designed to ensure the security of pension plan beneficiaries and protect their rights, the Pension Act 1995 established minimum standards for trustee fiduciary duties and pension fund reporting. In fact, the main features of the current UK regulatory framework on private pension provisions were established by the Pension Act 1995 (the 1995 Act).

2.2.2.1 Supervision

The 1995 Act established a new Occupational Pensions Regulatory Authority (OPRA)\(^8\) to enforce compliance with the new pension legislation. The overriding objectives of OPRA are to: (i) protect the rights of pension

\(^8\) The Occupational Pensions Regulatory Authority (OPRA) has been replaced by the Pensions Regulator effective from April, 2005.
participants; (ii) ensure that assets invested in occupational pension schemes remain safe.

In particular, OPRA has extensive powers in regulating the activities of employers and trustees in relation to the pension scheme. The 1995 Act requires every pension scheme to appoint an auditor and an actuary. It lays down in Section 48(1) the responsibilities of scheme auditors and scheme actuaries to report to OPRA if they have ‘reasonable causes’ to believe that there has been a breach of duty relevant to the scheme’s administration by the employer, trustees, administrator or a professional adviser.

2.2.2.2 Minimum Funding Requirement (MFR)

To ensure the adequacy of funding to schemes, the Goode Report (1993) recommended a minimum solvency standard for pension funds. The 1995 Act, under section 56(1), introduced the statutory Minimum Funding Requirement (MFR). The statutory ‘Minimum Funding Requirement’ (MFR) specifies a minimum funding basis for a defined benefit pension scheme and an associated schedule of necessary contributions, effective in April 1997.

Obligation to meet the statutory MFR requirement was dealt with in section 59 and section 60, which state that schemes must ensure that ‘the value of the assets of the schemes are not less than the amount of the liabilities of the scheme’. The detailed workings of compliance to statutory MFR requirement were set out in the Occupational Pension Schemes (Minimum Funding Requirement and Actuarial Valuations) Regulations 1996 (SI 1996/1536) and Guidance Note 27 (GN 27) from the Institute and Faculty of Actuaries.
Compliance with the statutory MFR requirement was based on an annual valuation by the scheme appointed actuary using market values for scheme assets and prescribed assumptions for scheme liabilities under GN 27. A ‘serious under-provision’ arises under the 1995 Act section 60(1) in the case where the scheme’s assets are less than 90 percent of its liabilities. The sponsoring employers with funds falling below 90 percent of the MFR are required to increase their cash contributions so as to eliminate the deficit within one year. A five year period was set for those falling in the region of 90 to 100 percent of the required MFR.\(^9\)

However, the MFR met with stringent criticism in the pension industry and the actuarial profession. The criticism was centred on its failure to take account of specific circumstances of individual schemes and to encourage an appropriate long-term investment strategy for meeting employer-specific pension commitments. The UK business press has cited minimum funding rules as one of regulatory burdens which discouraged employers’ long-term pension investment decision. In 2001, the UK government issued the Myners Review of Institutional Investments to address the growing criticism against MFR rules and its potential negative impact on pension investments. The Myners Review (2001) proposed to abolish the MFR and replace it with scheme-specific funding requirements.\(^10\)

\(^9\) This was amended by the Occupational Pension Schemes (Minimum Funding Requirement and Miscellaneous Amendments) Regulations 2002 (SI 2002/380).

\(^{10}\) In 2002 the Department for Work and Pensions (DWP) issued a Green Paper “Simplicity, security and choice: working and saving for retirement”. To ensure extra protection for scheme members’ retirement benefits, the pensions Green Paper (DWP, 2002) proposed to introduce some form of insurance or a centralized ‘clearing house’ arrangement when the employer becomes insolvent with under-funded defined benefit pension schemes. The pensions Green Paper (DWP, 2002) went further to propose a new pension regulator (Pension Protection Fund) whose objectives and resources focused on protecting the benefits of scheme members. The issue of the Green Paper 2002 began a new phase in UK pension legislation reform.
Pension funding legislation has been subject to continuous disputes because of the theoretical controversy over the ownership of any pension surpluses or deficits. UK legislation has so far permitted the share of pension surplus by employer sponsors through reducing or suspending contributions (i.e. contribution holidays). The Myners Review recommended a reduction of the tax penalty for recovery of surpluses and greater clarity in the ownership of surpluses by the sponsoring firm (Davis, 2001). Since the Myners Review report was published in 2001, considerable public attention was paid to the closure of defined benefit pension plans by UK sponsoring firms. In many cases, a defined contribution scheme was offered to new employees instead. This shift, together with an ageing population and maturing workforces, has put heightened strain on the privately funded pension system in the UK.

2.2.2.3 Information Disclosure (SORPs)

The 1995 Act, under section 41(1), requires trustees to provide annual audited pension fund financial report to scheme members. Information disclosed in pension fund financial reports is subject to the `Statement of Recommended Practice' (SORPs). The Accounting Standards Committee issued SORP 1 ‘Pension Scheme Accounts’ in 1986. As stated in the Explanatory Foreword to SORPs issued by the ASC in May 1986, SORPs are developed in the public interest and set out current best accounting practice.

11 The excess of pension assets to pension liabilities leads to pension surpluses and the reverse results in pension deficits.
12 On 11th February 2004, the UK government enacted the 2004 Pensions Act (the 2004 Act). The 2004 Act implemented the Green Paper proposals for pension reform published in December 2002 and subsequent public announcements made in 2003 about increasing protection for members’ benefits. In relation to occupational pension schemes, the Act proposed the replacement of the Minimum Funding Requirement (MFR) with a new “statutory funding objective.”
13 The primary aims in issuing SORPs are to narrow the areas of difference and variety in the accounting treatment of the matters with which they deal and to enhance the usefulness of published accounting information.
However, the Goode Committee's report recommended a review of SORP 1 on the grounds that 'the value of the annual report to members and other users could be improved if a review of its form and contents were undertaken.' In 1996 the ASB recognized Pension Research Accountants Group (PRAG) as the appropriate organisation to issue SORPs. A revision of SORP 1 was subsequently undertaken by PRAG with a view to updating the guidance incorporating developments in legislation and improving the usefulness of the pension fund annual report to scheme members. In July 1996 a revised Statement of Recommended Practice, 'Financial Reports of Pension Schemes', ('revised SORP') was issued by the Pension Research Accountants Group (PRAG). The pension fund annual financial report was subject to the revised SORP from years ending on or after 6 April 1997. The legal enforceability of SORPs was sanctioned by the 1995 Act.

2.3. COMPARISON WITH THE US LEGISLATION

The recent UK pension legislative developments outlined above mirror those affecting the US thirty years earlier. Both the UK and USA share common economic and social pressures for pension legislation reform. The US government legislation regulating private pensions was developed in the USA in 1974. Table 2.1 summarizes various aspects of the relevant institutional features governing occupational pensions in both countries, each of which are briefly discussed in more detail below.
TABLE 2.1

Comparative Institutional Features Underpinning Employer Sponsored Pension Plans in the UK and USA

<table>
<thead>
<tr>
<th>Employer-sponsored pension</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisory legislation</td>
<td>Pension Act 1995</td>
<td>ERISA 1974</td>
</tr>
<tr>
<td>Pension Funding Regulation</td>
<td>Minimum Funding Requirement, 1997; section 56</td>
<td>Minimum Funding Standards, 1974; section 302(f)</td>
</tr>
<tr>
<td>Regulations to mandate annual pension fund financial reporting</td>
<td>Pension Act 1995; section 41</td>
<td>ERISA 1974, section 103</td>
</tr>
<tr>
<td></td>
<td>FRS 17 (2000)</td>
<td></td>
</tr>
</tbody>
</table>

The Employee Retirement Income Security Act of 1974 (ERISA 1974) constitutes a far-reaching and controversial attempt to reform legislation of the private pension system (Stone, 1982). The first national uniform legislation for US private sector pension funds was instigated by the ERISA 1974. It established minimum standards for vesting, funding, investment and information disclosure for pension funds, and stimulated the subsequent development of employers' pension cost accounting standard by the FASB during the late 1980s (Stone, 1982).\(^{14}\)

In terms of its nature and far-reaching impact on private pensions, ERISA 1974 is similar to the Pension Act 1995 in the UK. One feature worth noting in

\(^{14}\) Stone (1982) points out that the Discussion Memorandum, Employers' Accounting for Pensions and Other Postemployment Benefits (FASB, 1981), for example, begins with an overview that cites several reasons why the FASB has undertaken this project. Included in the section on 'Reason for the Project' is a reference to the 'significant changes in laws and regulations, including the introduction of the Employer Retirement Income Security Act of 1974 (ERISA)'.

20
the UK is that the funded pensions are founded upon trust laws. Traditionally protection against insolvent employer is afforded through trust funds. The interests of beneficiaries are set out in the trust deeds. Trustees have a fiduciary duty under the Trustees’ Act 2001 to preserve the trust capital and to apply the capital and its income according the trust deeds (Blake, 2003). The Pension Act 1995 permits trustees’ greater power in safeguarding the schemes’ investments and solvency.¹⁵

The minimum funding standards set by the ERISA 1974 are more stringent than the equivalent UK Minimum Funding Requirements (MFR). Under ERISA 1974 section 302(f), a lien is imposed upon US employer sponsors that fail to meet minimum funding standards. The retirement benefits have to be paid up to the guaranteed levels, even if the sponsors’ plan contains insufficient funds. Furthermore, ERISA 1974 established the Pension Benefit Guaranty Corporation (PBGC), which guaranteed the payment of defined benefit pension benefits in case of insolvency of employer sponsors.¹⁶ Employer sponsors in the US could exchange their pension liabilities to PBGC plus 30 percent of firms’ assets if they are unable to meet their promises to workers. The PBGC plan termination insurance program has substantially influenced the financial nature of US firms’ unfunded pension obligations (Stone, 1982). A similar programme has not yet been implemented in the UK.¹⁷

¹⁵ With respect to other aspects of private pension systems in the UK, for example in terms of benefit design, UK total accrued benefit pensions are required to provide customer price inflation-linked increases both in deferment (i.e. between leaving service and retirement) and in retirement payment (Davis, 2001). In contrast, ERISA 1974 only mandates sponsoring firms to maintain the level of benefits accruing at which the fund can meet all its current obligations which is not indexed to earnings up to retirement.

¹⁶ See ERISA 1974 section 4002(a).

¹⁷ In March 2005, UK government established a new pension regulator (Pension Protection Fund), similar in nature with PBGC in the US, which guarantees defined benefit pension obligations.
ERISA 1974, under Section 103, requires annual financial reports to be submitted by all pension employer sponsors to the Department of Labour, which include summary financial statements of assets and liabilities. The 5500 Form is filed annually with the Internal Revenue Service within 210 days after the end of the plan year. It includes financial information about the plan and must be provided to plan participants upon request. The financial reporting of pension funds is also subject to the Statement of Financial Accounting Standards No. 36 (SFAS 36, Disclosure of Pension Information). However, unlike the equivalent UK standard SORP 1 (revised), US pension funds need only report pension assets available to settle accrued pension benefit obligations.

Professionally developed accounting standards (GAAP) provide an important source of regulated information about employer pension sponsorship. This is because employer sponsors are also subject to Generally Accepted Accounting Principles (GAAP) as promulgated by professional accounting standards setting bodies. Related pension information is provided in firms’ financial statements prepared by US employer sponsors under requirements of the Statement of Financial Accounting Standards No. 87 (‘Employers’ Accounting for Pensions’, SFAS 87), and Statement No. 132, (‘Employers’ Disclosures about Pensions and Other Postretirement Benefits’, SFAS 132).

The following section provides an overview of current pension accounting practices (UK, USA and international GAAP). It focuses on the international differences in measurement and valuation issues associated with employers’ pension cost accounting and concludes with a brief introduction of

---

18 Employers with fewer than 100 employees must file using Form 5500-C/R.
19 A chronology of the development of UK and international pension accounting standards since 1980s can be found in Appendix B.
the proposed international convergence of employers’ pension accounting standards.

2.4. EMPLOYERS’ PENSION COSTS ACCOUNTING

Professionally-developed pension accounting rules in both the US and UK are intertwined with pension regulations to enhance the accountability of employer sponsors. Most recently, the employers’ pension cost accounting rules are of growing economic significance given the fact that pension assets and liabilities are now important components of firms’ overall financial structure and strategy. This can be demonstrated from the pension footnote disclosure by British Telecommunications Group (hereinafter BT Group) at its accounting year end of 2002 upon adopting FRS 17.

BT group had an actuarial present value of plan benefits obligation of £29 billion at the end of 2002. With pension assets of about £27 billion at market value, the company had “unfunded” pension liabilities of £2 billion. The market value of pension assets of this public listed company amounted to about 60 percent of its total corporate assets and 128 percent of its shareholders’ funds. Furthermore, the pension liabilities of BT at the end of 2002 amounted to about 182 percent of its outstanding long-term corporate liabilities. The BT group’s pension exposure illustrates how the presence of large, unfunded pension liabilities can have potential effects upon the financial structure and corporate management of UK sponsoring firms.

At the time when FRS 17 was in effect, FTSE 100 companies employed 3.5 million pensionable workers in the UK, and incurred total annual pension
costs of over £3 billion in 2001, comprising 5 percent of their pre-tax profits (Lane, Clarke and Peacock, 2001). Pension assets for these companies at 2001 amounted to about £250 billion’s worth with a combined pension deficit of about £25 billion. Changes in the economic conditions, the nature of pension schemes themselves, and corresponding legislative reform all have caused the pressures in changes of employers’ pension accounting standards. The accounting profession began to recognize the importance of developing pension accounting standards that are consistent, comprehensive, and based on clear principles to enable financial reports to reflect the underlying economic reality of employers’ pension sponsorship (Tweedie, 2003, p. 719).

2.4.1. International Differences in Current Practice

Employers’ pension cost accounting rules (SSAP 24) differed significantly from those in the US and internationally. The issue of FRS 17 in 2000 has resulted in greater harmonisation of the UK pension accounting with both SFAS 87 and IAS 19 (revised 1998). However, significant differences in current practice still remain between UK, US and International GAAP. This section briefly reviews the international differences in the current practice of accounting for employers’ pension costs. Table 2.2 compares the key differences of SSAP 24, FRS 17, SFAS 87 and IAS 19, which are discussed in more detail below.  

As noted in Chapter 1, the adoption of ‘market-based’ approach of FRS 17 is intended to be consistent with the broader conceptual framework of UK ASB that financial statements should reflect at ‘fair value’ of the assets and

---

20 The International Accounting Standards Board (IASB) was formed in April 2001 as the successor body to the International Accounting Standards Committee (IASC), which was initiated as a private organisation back in 1973.
liabilities arising from an employer’s retirement benefit obligations and any related funding (ASB, 2000, para. 6).\(^2\) Both SFAS 87 and IAS 19 have previously adopted a measurement and valuation methodology to a large extent very similar to FRS 17. However, unlike FRS 17, SFAS 87 and IAS 19 allow the valuation of pension assets to be determined at market values that are subject to actuarial smoothing.

The valuation of pension liabilities is intrinsically more difficult than that of assets, because typically no market value is readily available. It is common practice in pension accounting to measure the pension liabilities by projecting forward the expected cash flows and discounting them at appropriate rate (i.e. discount rate). The discount rate is the accounting counterpart of the valuation rate of interest used by actuarial profession for pension funding purposes. SSAP 24 requires the discount rate to be an actuarially-determined rate reflecting the expected return on equity investment (Davies et al., 1994).

By contrast, under FRS 17 a good quality (AA rated) corporate bond rate of return is required as the discount rate, consistent with the ‘market-based’ valuation methodology. SFAS 87 and IAS 19 set out similar requirements for the assumed discount rate by reference to ‘rates of return on high-quality fixed-income investments currently available and expected to be available during the period to maturity of the pension benefits’ (SFAS 87, para. 44).

\(^2\) Chapter 3 develops a conceptual review of the UK pension accounting rule change from SSAP 24 in the context of theoretical perspectives concerning employers’ long-term pension obligations.
### TABLE 2.2
Comparison of Pension Accounting Standards

SSAP 24, FRS 17, SFAS 87 and IAS 19

<table>
<thead>
<tr>
<th></th>
<th>SSAP 24</th>
<th>FRS 17</th>
<th>SFAS 87</th>
<th>IAS 19</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asset Valuation</strong></td>
<td>Actuarial smoothed value</td>
<td>Market value</td>
<td>Market value -allows average smoothing</td>
<td>Market value -allows average smoothing</td>
</tr>
<tr>
<td><strong>Discount Rate Assumption</strong></td>
<td>Actuary’s best estimate over the long-term equity return</td>
<td>AA corporate bond yield</td>
<td>Fixed income securities yield</td>
<td>Fixed income securities yield</td>
</tr>
<tr>
<td><strong>Expected Return on Pension Assets Assumption</strong></td>
<td>Long-term expected return for all assets</td>
<td>Long-term expected return for each asset class</td>
<td>Long-term expected return for all assets</td>
<td>Long-term expected return for all assets</td>
</tr>
<tr>
<td><strong>Amortization of Actuarial Gains and Losses</strong></td>
<td>Spread over future working lifetime in profit and losses (P&amp;L)</td>
<td>Immediate recognition in STRGL</td>
<td>Spread over future working lifetime in profit and losses (P&amp;L)</td>
<td>Spread over future working lifetime in profit and losses (P&amp;L)</td>
</tr>
<tr>
<td><strong>Components of P&amp;L</strong></td>
<td>Consolidated figure based on actuarial judgement</td>
<td>Regular service cost +interest cost -expected return on assets + benefit improvement</td>
<td>Regular service cost +interest cost -expected return on assets + amortizations of actuarial gains/losses and benefit improvement</td>
<td>Regular service cost +interest cost -expected return on assets + amortizations of actuarial gains/losses and benefit improvement</td>
</tr>
</tbody>
</table>
The key component of periodic pension costs, 'regular cost', which is the operating cost of providing for pensions to employees in the absence of any complications arising from actuarial gains and losses, is not required to be disclosed under SSAP 24. By contrast, under provisions of FRS 17, SFAS 87 and IAS 19, the operating costs of providing retirement benefits to employees and related finance costs are disclosed, and charged to the profit and loss account, by using a uniform methodology which prescribes a set of standardized components.

These standardized components are considered to affect the changes in the net value of the pension funds during the reporting period. Specifically, 'regular service cost' is the actuarial present value of pension benefits allocated under the formula for employee services provided during the year. Since actual payments of benefits are delayed until retirement, each year's pension cost includes an 'interest cost' component, which measures the increase in the present value of the projected benefit obligation due to the passage of time. The difference between the 'expected return on plan assets' less the unwinding of 'interest cost' on the obligations is shown as finance income (see Table 2.2).

Included in the determination of pension costs are the gains and losses primarily resulting from differences between the actuarial valuation assumptions used to project pension costs and the actual experience. FRS 17 requires immediate recognition of such actuarial gains and losses in a Statement of Recognized Gains and Losses (STRGL). This approach in FRS 17 constitutes a significant departure from both SFAS 87 and IAS 19. The IAS 19 states that (i) actuarial gains and losses up to 10 percent of the greater of the gross value of the scheme assets and liabilities should not be recognised; (ii) the proportion of

22 Under UK GAAP, STRGL supplements the profit and loss account by reporting some of the recognized gains and losses.
actuarial gains and losses in excess of the 10 percent 'corridor' can be spread forward over the remaining service lives of the employees. The 'corridor method' in IAS 19 is very similar to that in SFAS 87. As a result, both SFAS 87 and IAS 19 effectively permit the smoothing of volatilities in annual pension costs recognized in employers' profit and loss account.

2.4.2. International Convergence of Pension Accounting Standards

Recently the International Accounting Standards Board announced to undertake improvement projects to achieve international convergence23 in pension accounting where practice is at present diverse and unsatisfactory. Of significance from a UK perspective is the fact that accounting standards (International Financial Reporting Standards, IFRS) developed by the IASB were endorsed by EU regulation back in 2001, and the UK government soon followed up by issuing a consultation paper proposing that IASB standards replace UK accounting standards. According to current plans, all EU listed companies must prepare their consolidated financial statements in accordance with IAS and IFRS standards from 2005 onwards.

FRS 17 and IAS 19 differ significantly in the use of the 'corridor method' to smooth volatilities arising from recognition of actuarial gains and losses in employers' profit and loss account. In 2000 the IASB issued limited revisions to revised IAS 19, 'Employee Benefits'. The minimum amendments made to IAS 19 allow companies that do not use the 'smoothing' mechanism to report actuarial gains and losses in the Statement of Changes in Equity. The current proposal for a longer-term project includes consideration of convergence with the

23According to Whittington (2005, p. 133), 'convergence' means reducing international differences in accounting standards by selecting the best practice currently available, or if none is available, by developing new standards in partnership with national standard setters.
UK’s FRS 17 with respect to the reporting of actuarial gains and losses in the income statement, thus eliminating the smoothing achieved by the ‘corridor’ and ‘amortisation’ method of current IAS 19 (Whittington, 2005, p. 133).24 These developments suggest that international pension GAAP is moving towards the FRS 17-style accounting rules.

2.5. CONCLUSION

Over a decade from the mid-1990s onwards, the UK government began to change pension legislation governing privately funded pensions. The analysis in this Chapter suggests that pension accounting regulatory changes following government pension policy reform in both UK and USA are in fact by-products of the legislation demanding greater accountability for pension funds, which reflect political concern over the adequacy and security of privately funded pensions.25

The dependence on employer sponsored pensions to provide secured retirement benefits for workers and the importance of pension funds as institutional investors have necessitated changing public pension policies. The review of institutional settings suggest that institutional features can affect the scope of pension accounting standards, and in turn stimulate the changes in

24Since the period analysed in this thesis, the IASB issued an amendment to IAS 19 in December, 2004. The IASB has decided to allow the option of recognising actuarial gains and losses in full in the period in which they occur, in a statement of recognised income and expense. This approach is similar to the UK standard FRS 17.

25It is reasonable to expect that the minimum funding requirement (MFR) as legislative-imposed solvency restrictions is also likely to have an impact on UK corporate pension management decisions. However, this thesis does not characterize it as a primary driver underlying managerial discretionary behaviour under investigation for two reasons. Firstly, MFR requirements primarily affect financial reports of pension funds, whereas FRS 17 affect pension accounting by employer sponsors. Secondly, as early as in 2001, government proposals to replace MFR were published, and MFR was eventually replaced in 2002. As a result, it is unlikely that MFR rather FRS 17 is driving managerial behaviour for the period (1998-2002) studied in this thesis.
accounting regulation of employers’ pension cost. The next Chapter of this thesis provides a conceptual overview of changes in UK pension accounting regulation and reviews the related empirical accounting research. The remaining Chapters develop and test hypotheses based on this framework for the inter-relationship of changing government pension policy regulation, financial reporting and management of pensions by corporate sponsors in the UK.
3. LITERATURE REVIEW

3.1. INTRODUCTION

The academic literature so far has illuminated several important topics in pension accounting research, which advanced our understanding of the nature of this important long-term compensation arrangement. The development of theoretical perspectives on employers’ pension commitments in turn brought to light the importance of existing and proposed accounting regulation for defined benefit pension plans. This Chapter explores the linkages between alternative theoretical perspectives on employers’ long-term pension commitments and the promulgation of new pension accounting rules in the UK. The purpose of this Chapter is to develop a theoretical framework for the remaining empirical part of the thesis, and evaluate relevant empirical studies into pension accounting.

Figure 3.1, which updates the one originally presented in Klumpes (2001, p. 32), illustrates the linkages between the development of theoretical perspectives on the pension contractual agreement, promulgation of new pension accounting rules, related hypothesis generation and testing, and the implications for future research. The rest of this Chapter is divided into sections according to the framework presented in Figure 3.1. Section 3.2 of this Chapter briefly summarizes the development of alternative theoretical perspectives on the nature and scope of pension commitments. Section 3.3 discusses how these theoretical concepts have been incorporated into the evolution of UK pension accounting rules. Section 3.4 reviews relevant empirical research which bears on alternative hypotheses that are implied by these theoretical perspectives. Section 3.5 critically evaluates their findings and motivates empirical studies in this thesis.
FIGURE 3.1 Linkages between the Development of Pension Theoretical Perspectives, Pension Accounting Regulation, Reform Legislation, and Empirical Research

- Development of Pension Theoretical Perspectives
  - Labor Economics Perspective 'Implicit Lifetime Contract'
  - Corporate Finance Perspective 'Spot Contract'
  - Insurance Perspective 'Complex Contingent Claims'

- Major UK Pension Reform Legislation: the Pension Act 1995 'Minimum Funding Requirement'

- Generation of Empirically Testable Hypotheses
  - Hypothesis concerning managerial actuarial assumption choices
  - Hypothesis concerning pension termination decision
  - Hypothesis concerning pension asset allocation decision

- Empirical Pension Accounting Research
  - Distinguishing among perspectives
  - Identification of unresolved empirical issues
  - Implication on accounting policy formulations
3.2. THEORETICAL ANTECEDENTS

In this section, major theoretical perspectives that offer distinct insights into the corporate pension sponsorship are reviewed. Each of the perspectives has motivated prior empirical researchers to develop and test competing explanations for corporate pension-related accounting choices and pension management decision. Stone (1982) examines three alternative theoretical frameworks from which various aspects of modern defined benefit pension arrangements can be analyzed and their implications for pension accounting, e.g., (i) pension as deferred wages (gratuity theory and deferred wage theory); (ii) pension as contingent claims (options pricing theory); and (iii) incentive effects of plan sponsorship (agency theory).

Klumpes (2001) delineates four theoretical perspectives that can be taken to understand the nature of pensions, e.g., (i) labour economics; (ii) corporate finance; (iii) insurance; and (iv) inter-generational equity. These perspectives need not be viewed as mutually exclusive theories of what constitutes the pension contract, but rather reflect distinct disciplinary insights on various dimensions of observable corporate pension decision that are affected by this phenomenon (Klumpes, 2001, p. 31). Since each of the above theoretical perspectives was reviewed in detail by Klumpes (2001), this section briefly overviews the three alternative theoretical antecedents that are relevant to this thesis in particular, e.g., (i) labour economics perspective; (ii) corporate finance perspective; (iii) insurance perspective.²⁶

²⁶ Inter-generational perspective is not pertinent to this thesis as it is only relevant to public sector pension schemes, while the focus of this thesis is private pension provisions. Inter-generational equity perspective suggests that inter-generational equity is a key dimension of pension arrangements between concerned parties. This concept is especially applicable in pension funding environments where the employer does not pre-fund the pension obligation and is effectively unable to do so because of fiscal stress (e.g. the public sector) or where pension commitments payable under the pension plan are frequently amended over time (Klumpes, 2001, p. 39).
Early economic theory perceived pension contracts as a form of discretionary gratuity paid for loyal and faithful service (Stone, 1984). The subsequently developed labour economics perspective depicts pension benefits as a form of 'deferred compensation'. Pension plans are viewed as labour market institutions designed to achieve efficiency in the long-term relationship between the employer and employee (Gustman et al., 1994). Such life-time contractual models of labour market assume that workers provide a time path of labour services to exchange in the form of long-term total compensation. In this context, there need be little or no relationship between this year's labour effort and this year's compensation. The central argument of the labour economics perspective is that the employer tacitly promises that the right to terminate the pension scheme will not be exercised. The plan's assets in excess of its accrued liabilities (i.e. pension fund surpluses) therefore belong to employees.

By contrast, the corporate finance literature views pension fund assets and liabilities as an integral part of the employer sponsor's own assets and liabilities (e.g. Black, 1980; Tepper, 1981). This integrated perspective requires managing the sponsoring firm's extended balance sheet, including both conventional assets and liabilities and its pension assets and liabilities, in the best interests of its shareholders. In contrast to the labour economics perspective, it assumes that companies can easily terminate their pension promises. Thus employer sponsors face incentives to alter the magnitude and even the existence of pension fund surpluses by exercising discretion over pension-related accounting choices (e.g. actuarial assumptions), pension funding (e.g. voluntary termination) and/or investment strategy (e.g. equities versus bonds).
The insurance perspective takes an alternative view (different from both labour economics and corporate finance perspectives) by examining the insurance elements inherent in both defined benefit and defined contribution funded pension schemes. Bodie (1990) views defined benefit pensions as retirement income insurance providing employees protection against longevity risk (the risk that they will outlive their assets); replacement rate risk (the risk that benefits will be too low to maintain their standard of living after retirement); risk from potential social security benefit cuts; investment risk (the risk that returns will be reduced due to poor investment performance); and the risk of having their benefits eroded by inflation. As a result, pensions offered under a defined benefit pension plan are better viewed as participating annuities that offer a guaranteed minimum nominal benefit, determined by the pension plan’s benefit formula (Bodie, 1990). The important implication from the insurance perspective is that the corporate pension obligations can be viewed, at least partially, as a complex implicit contingent claim by the employees on the pension plan sponsor (Klumpes, 2001, p. 37).

3.3. CHANGES IN UK PENSION COST ACCOUNTING

Understanding the differences in the nature and scope of pension commitments that are implied by each of these perspectives provides a conceptual basis to critically evaluate the existing UK pension accounting regulation. The evolution of employers’ pension accounting rules from SSAP 24 to FRS 17 reflects broader debates within professional accounting and actuarial literature concerning: (i) cost-based versus market based measurement of pension assets and liabilities; (ii) discretionary versus standardised pension actuarial discount assumptions; (iii) pension asset/liability disclosure versus recognition.
These controversies over aspects of pension accounting raise fundamental questions about the validity of differing underlying theoretical perspectives about the nature of pension liabilities. The evolution of competing pension theoretical perspectives in turn have implications on promulgating relevant accounting procedures that decide how various components constituting an employer’s pension commitments are to be measured and disclosed. The purpose of this section is therefore to review the changes in UK pension accounting rules in the context of competing theoretical perspectives concerning employers’ long-term pension liabilities.

3.3.1. SSAP 24

Prior to the 1980s, pension accounting in the UK was based on the cash contributions payable by employer sponsors to the schemes during each accounting period, when little was known about the economic relationship between alternative types of the labour markets and employers’ pension costs.27 Academic pension accounting research in the early 1980s explores the potential link between pension accounting problems and alternative models of the labour market (‘spot contract’ and ‘implicit lifetime contract’) from which a firm operates (e.g. Pesando and Clarke, 1983). Appendix C contains a brief review of their findings in terms of alternative measures of reported pension liabilities: (i) the projected benefit obligation (PBO); (ii) the accrued benefit obligation (ABO).

---

27 This cash flow accounting principle focuses only on whether a sponsoring firm is making sufficient cash contribution annually to match periodic benefit payments. However, it fails to take account of the effect that contribution levels may vary over longer periods of time in accordance with long-term actuarial valuation assumptions concerning future mortality, investment or longevity. Moreover, no accounting recognition was given to the annual pension cost arising during the years when the pension benefits were being accumulated.
These accounting measures of pension liabilities (PBO versus ABO) are dependent on the nature of labour market. According to Pesando and Clarke (1983, p. 745), the projected benefit obligation (PBO) with salary projection is the most consistent with the 'implicit lifetime contract' model. The Pesando-Clarke analysis thus provides important insights into the pension accounting debate during the 1980s as to what constitutes the appropriate measures of an employer sponsor's pension obligation.

Advances in labour economics literature, which view employer sponsored pensions as a form of deferred compensation, have important implications for understanding the subsequent development of employers' pension accounting rules. Pension accounting has evolved from recording periodic pension cash contributions to recognizing the need to accrue a liability for the funding of prior service costs. In 1988 the Statement of Standard Accounting Practice 24 (SSAP 24), 'Accounting for Pension Costs', issued by the predecessor body to the ASB, the Accounting Standards Committee (ASC), introduced the fundamental principle of accruals to UK pension accounting. Compared to the previous cash flow approach, SSAP 24 represents a significant improvement.

Consistent with the labour economics view that employers' pension obligations are implicit long-term commitments, SSAP 24 set out the accounting objective of 'requiring the employer to recognise the cost of providing pensions on a systematic and rational basis over the period during which the employer benefits from the employees' services' (SSAP 24, para. 16). Under SSAP 24, the 'regular cost' of sponsoring a pension scheme is a level percentage of the pensionable payroll (Davies et al., 1994). The 'regular cost' and valuation of scheme assets and liabilities were determined by actuarial estimation. Variations
from the regular cost arising from scheme deficiencies or surpluses, measured for reporting purposes, are deferred and gradually recognized over the remaining service life of employees (Davies et al., 1994). This approach smoothes the effects of surpluses and deficiencies and ensures that there are no volatilities in employer sponsors’ profit and loss account.

Just over two years after SSAP 24 was published, there were indications that employers’ pension accounting should be reconsidered by the Accounting Standard Board (ASB), because ‘the balance sheet dimension is inadequately addressed in SSAP 24’ (Paterson, 1990, p. 27). For example, a sponsoring firm taking a ‘contribution holiday’ as a result of a pension scheme surplus can sometimes show a pension liability on its balance sheet under SSAP 24. As a result, the effect of SSAP 24 approach on an employer’s balance sheet is not consistent with the underlying economic reality of employers’ pension sponsorship.

3.3.2. FRS 17

Over the period 1995 to 1999, the ASB issued two Discussion Papers, one Exposure Draft and eventually the Financial Reporting Standard 17 (FRS 17) in November, 2000. The accounting principles embodied in FRS 17 were founded solely on the ground of financial economics and explicitly endorsed the corporate finance view that employer firms and their sponsored pension funds are an integrative economic entity.
3.3.2.1 Debate (1995-1997)

The issue of pension scheme surpluses and solvency during the early 1990s, as noted in Chapter 2, prompted the reform of UK pension legislation. However, the subsequent introduction of the Minimum Funding Requirement (MFR) has been controversial, involving much heated debate both inside and outside the actuarial profession (Greenwood and Keogh, 1997).

During the mid-1990s, the UK actuarial profession debated on the most 'true and fair' approach to valuing corporate sponsoring firms' pension assets and liabilities (e.g. Dyson and Exley, 1995; Exley et al., 1997; Greenwood and Koegh, 1997; Gordon, 1999; Head et al., 2001). Since the early 1970s, the discounted cash flow method (DCF) was the most common practice in the UK for the valuation of both assets and liabilities by consulting actuaries in a pension fund valuation. According to Greenwood and Keogh (1997, p. 499), the traditional DCF method pursues the theme of the consistency of the valuation of both assets and liabilities as suggested by Day and McKelvey (1963). The assessed value of assets represents the discounted present value of the expected income and capital proceeds from the scheme's assets. The value of liabilities is discounted at a rate which is the expected long-term return on the equity-based portfolio of assets that are perceived as a match for the pension liabilities (Head et al., 2001, p. 104).

Traditionalists argued for a continuation of the cost-based valuation methodology (i.e. DCF method) then espoused under existing UK GAAP (SSAP 24). SSAP 24 permits employers' pension obligations measured by using long-term actuarial assumptions that project the present value of cash flows associated with both pension assets and liabilities. Arguments in support of the traditional method are: (i) it smooths the fluctuations that are inherent in market prices
over time since sponsors' pension obligation are long-term commitments; (ii) it places a value on asset cash flows and liability cash flows on a consistent basis (e.g. Greenwood and Keogh, 1997; Gordon, 1999).

Proponents of market based approach argued that valuation of pension assets and liabilities should be consistent with the principles of financial economics, i.e. based on ‘fair value’ principles28 as required for other types of corporate financial instrument accounting (e.g. employees’ stock option). Consistent with market-based approach, pension assets should be measured at their ‘fair value’ and pension liabilities should be discounted using market yield on index-linked government bonds (e.g. Smith, 1996; Exley et al., 1997).

The professional actuarial debate coupled with the increasing criticism of SSAP 24 prompted the Accounting Standards Board to review SSAP 24 with the publication of its 1995 Discussion Paper. The ASB acknowledged that in SSAP 24 ‘there are too many options available to the preparers of accounts, leading to inconsistency in accounting practice and allowing employers a great deal of flexibility to adjust results on a short-term basis’ (ASB, 1995). The 1995 Discussion Paper then considered two fundamentally different approaches to the measurement of pension surplus or deficiencies: actuarial basis of measurement and market basis of measurement. Two alternatives proposed by the 1995 Discussion Paper reflected the debate within the accounting profession as to the appropriate approach to the problem (Napier and Casson, 1997).

28 Alternative definitions of the accounting term ‘fair value’ can be found in different accounting jurisdictions (Horton and Macve, 2000). The FASB defines ‘fair value’ in relation to financial instruments as ‘the price at which an asset or a liability could be exchanged in a current transaction between knowledgeable unrelated willing parties’ (FASB, 2004). By comparison, the IASB defines ‘fair value’ as ‘the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm’s length transaction’ (IASB, 2004).
The ASB recognizes that 'the distinction between these two approaches is most evident in the selection of measurement assumptions used to estimate the pension cost, i.e. the basis of measurement' (ASB, 1995, para. 13). The SSAP 24 approach (i.e. actuarial basis measurement approach) in accounting for the cost of providing pension benefits is based on the emerging long-term expected outcome (ASB, 1995, para. 14). By contrast, the market basis measurement approach endorsed by FRS 17 values pension assets by taking the 'fair value' of the scheme’s assets and liabilities.

Nevertheless, the 1995 Discussion Paper concluded that 'the pension cost should be determined by using long-term estimates as the basis of actuarial assumptions.' Further emphasis was given in supporting the view that 'using compatible long-term assumptions to measure the surplus or deficiency results in better estimates of pension obligations than the market values, whilst having the characteristics of being objective and precise at a point in time' (ASB, 1995, para. 2.8.2). The discount rate assumption thus would be 'the rate of return on equity-based portfolio of scheme assets' (ASB, 1995, para. 7.2.5).

The stance then adopted by the ASB in favour of actuarial basis of measurement constitutes a significant disagreement to US and international accounting standard setters. In 1996 the International Accounting Standards Committee (IASC) issued an Exposure Draft 54 (ED 54) on employee benefits. ED 54 proposed that employers value pension plan assets at market values. Pension liabilities would be determined in line with actuarial assumptions. The most significant one is 'the rate used to discount post-employment benefit

---

29 Market values refer to either at actual fair values or market values subject to actuarial adjustments by discounting the expected future cash flows from the assets by a risk-adjusted interest rate (IASC, 1996, para. 96).
obligations (both funded and unfunded), which should be determined by reference to market yields at the balance sheet date on high quality fixed-rate corporate bonds’ (IASC, 1996, para. 75).

The disagreement among accounting standard setters in different jurisdictions over the appropriate discount rate assumption mirrors the debate within UK actuarial profession as to the move towards market-based actuarial valuation methodology. This broader debate among UK actuarial and accounting professions reflects that shifting emphasis on the corporate finance view on employers’ pension obligations has important implications on the subsequent UK pension accounting rule development.

3.3.2.2 Promotion (1998-1999)

During the late 1990s, the market-based valuation method has gradually gained its ground within UK actuarial profession (Head et al., 2001). In 1998 the International Accounting Standards Committee (IASC) issued the revised International Accounting Standard No. 19, ‘Employee Benefits’, which implemented most of its proposals published in the Exposure Draft 54 (IASC, 1998). It was against this background that the ASB issued a further 1998 Discussion Paper on aspects of accounting for pension costs under the pressure to harmonize with international accounting standards.

The ASB concludes that the actuarial approach of discounting the cash flows of liability using a discount rate based on the rate of return on the assets in the scheme needs to be refined (ASB, 1998, para. 1.23). However, the appropriate rate for current employees was expected to be ‘a rate that allows the
implicit recognition of change in the economy through the incorporation of some element of expected equity return' (ASB, 1998, para.1.24).

In November 1999, the Accounting Standards Board published a Financial Reporting Exposure Draft 20 (FRED 20) that proposed a new accounting standard on the treatment of pensions and other retirement benefits in the employer's accounts. FRED 20 proposed that the discount rate applied to the scheme liabilities to be the current rate of return on AA rate corporate bonds of equivalent terms and currency to the liability. The ASB states that market-based valuation approach is consistent with pension accounting practice internationally (i.e. SFAS 87, IAS 19). It is also in line with the increasing use of market values by the actuarial profession in the UK (ASB, 1999). In dealing with the volatilities inherent in the use of market values, the ASB claims that its proposed alternative approach has two advantages over the international practice: (i) the balance sheet shows the current deficits or recoverable surplus in the scheme; and (ii) the total profit and loss charge is more stable than it would be if the market value fluctuations were spread forward.30

3.3.2.3 Implementation (2000- )

Financial Reporting Standard 17 ('Retirement Benefits', FRS 17) was issued in November 2000, which implemented most of proposals in FRED 20. The Accounting Standard Board's (ASB) major objectives in effecting these changes as stated in the standard are to ensure that the 'fair value' approach is used in measuring pension assets and liabilities and to achieve the transparency and comparability in accounting for pension costs (FRS 17, para 1). Unlike

---

30 This is achieved through immediately recognizing the effects of the fluctuations in market values in the second performance statement, the statement of total recognized gains and losses (STRGL).
SFAS 87 and revised IAS 19, FRS 17 went further to require the net pension surplus or deficit recognition\textsuperscript{31} in the balance sheet (FRS 17, para. 37).

Apart from their implications on appropriate discounting assumptions, competing theoretical perspectives on employers' pension obligations also influence when and how pension surpluses and deficiencies should be recognised in the employers' accounts. The labour economic perspective implies that property rights of pension surpluses belong to employees. Trust monies should only be used for the beneficiaries. Any pension surpluses should not be returned to the employer sponsor. Consistent with the long-term labour economic perspective, the net pension surplus, defined as the excess of market value of plan assets over the projected benefit obligation (PBO), would not be shown on the employer's balance sheet. However, if net pension deficits arise (i.e. the PBO is greater than the market value of plan assets), it should be recognized on employer's balance sheet as the firm's liabilities. SSAP 24 does not address this issue in relation to appropriate accounting treatment of pension asset and liability on employer sponsor's financial statements.

By contrast, the corporate finance perspective implies that the net worth of the pension fund should be fully consolidated into the employer's balance sheet. Consistent with the integration perspective, the net pension surplus or deficit, defined as difference between the market value of plan assets and the accrued benefit obligation (ABO), should be recognized on the employer sponsor's balance sheet. With respect to the debate over the necessity of pension asset and liability recognition, FRS 17 approach is to require sponsoring firms recognize the net pension surplus or deficiency on their balance sheets. SFAS 87

\textsuperscript{31} FRS 17 defines the net pension surplus or deficit as the excess or shortfall of the value of the assets in the scheme over or below the present value of the scheme liabilities.
only requires the balance sheet recognition of net difference between the market value of plan assets and accrued benefit obligation (ABO). It thereby represents a compromise between the corporate finance and labour economics perspective, as espoused by FRS 17 and SSAP 24, respectively (Klumpes, 2001, p. 43).

3.4. EMPIRICAL PENSION ACCOUNTING RESEARCH

The previous section sheds theoretical insights into understanding the UK pension accounting rule development that has gone through phases of debate, promotion and implementation. In this section, prior empirical studies are reviewed to form a proper framework for the present studies in this thesis. According to Figure 3.1, three major areas of empirical research are being reviewed, namely (i) pension-related accounting choices; (ii) corporate pension termination decision; (iii) corporate pension asset allocation decision. The review of literature in this Chapter aims to highlight the linkage between empirical studies in each of the above areas and alternative theoretical perspectives that they implicitly or explicitly draw upon.

3.4.1. Pension-related Accounting Choices

An extensive body of early US-based empirical studies examine the market valuation of the pension liabilities (either measured as the PBO or ABO) by employing valuation models that assume pension liabilities are 'owned' by shareholders (e.g. Feldstein and Morck, 1983; Daley, 1984; Landsman, 1986; Dhaliwal, 1986). These studies generally find that unfunded pension obligations are considered to be value relevant by capital market. However, pension liabilities included in the financial statements are estimated values based on a
number of assumptions including mortality, employee turnover, disability rates, salary rates, retirement rates and investment performance. None of these studies attempt to control for the considerable scope available for managerial discretion over the actuarial valuation assumptions at which pension liabilities are calculated. Thus it is very difficult to draw any implications of their results for discriminating among alternative hypotheses concerning pension-related accounting choices.

The labour economics perspective implies that the rates used to discount pension assets and liabilities should be consistent with a long-term pension funding objective, i.e. are set independent of managerial short-term reporting objectives. By contrast, the corporate finance perspective implies that the discount rate chosen by a firm is systematically related to its financial condition and/or other managerial financial reporting incentives. A few US-based empirical studies have investigated managerial discretion over actuarial assumptions. Their findings are generally consistent with the corporate finance perspective (e.g. Bodie et al., 1987; Asthana, 1999; Godwin, et al., 1996; Amir and Gordon, 1996).

Godwin et al. (1996) provide evidence that managers increase discount rate in response to earnings decline, tightening debt covenants and dividend constraints. Their research design involves the transformation of effect on earnings by the changes in discount rate into an ordered measure as the dependent variable. Therefore they have not clarified the managerial motives underlying pension discount rate per se. In a more comprehensive study on firms’ actuarial choices (i.e. actuarial assumptions and cost methods), Asthana (1999) finds that managerial propensity to select a ‘liberal’ actuarial rate (e.g. a
high discount rate) is associated with sponsoring firms’ profitability, cash flows and debt capacity.

Amir and Gordon (1996) examine the discount rate in measuring the post retirement benefit other than pensions. They find that firms select the discount rate and health care cost trend rate to manage the accumulated post-retirement benefit obligation reported under SFAS 106 (FASB, 1990). Furthermore, they show that firms with relatively high leverage select more ‘liberal’ discount rates to minimize the probability of violating debt covenants. These findings in the US suggest some evidence of managerial opportunism being related to pension discount rate choices.

Another important actuarial assumption required for estimating periodic pension costs under US SFAS 87 is the expected rate of return assumption (hereinafter ‘ERR’). Only two empirical studies have explicitly examined managerial discretion over the ERR assumptions. Blankley and Swanson (1995) investigate whether companies manage earnings by manipulating various pension estimates. Specifically, they examine the reliability of the expected rate of return on pension assets for a sample of firms randomly selected from the 1990 Compact Disclosure database. Their results suggest no managerial manipulation of the ERR. They find that changes in the expected rate of return on plan assets (ERR) are infrequent and sponsoring firms have the tendency to adjust the assumption towards the actual rate of return on plan assets realized over the period 1990-1994.

By contrast, Amir and Benartzi (1998) present evidence consistent with corporate finance perspective in relation to managerial choices over the ERR
assumptions. They examine the correlation between the ERR and the composition of the pension investment portfolio, measured as the percent invested in equity (%Equity). Their evidence suggests that the ERR is only weakly related with the asset composition. Furthermore, only %Equity (not ERR) is correlated with future returns on pension assets. Amir and Benartzi (1998) therefore conclude that the FASB should consider the enforcement rather than elimination of disclosure of pension asset composition in financial statements prepared under SFAS 87.

Another strand of literature examines the managerial choice to switch actuarial cost methods. These methods belong to two broad categories: cost allocation method and benefit allocation method. Switching from cost allocation method to benefit allocation method could reduce the estimated amount of pension liabilities and annual pension costs. Consistent with corporate finance perspective, researchers documented evidence that managerial choices over actuarial cost methods are associated with financial statement considerations and reduction in pension funding (Ghiclas, 1990; VanDerhei and Joanette, 1988).

Klumpe and Whittington (2003) examine the incentives affecting UK firms’ decision to voluntarily switch to market-based actuarial pension valuation methods during the period prior to the release of FRS 17 (1996-1998). Compared to firms that continued to triennially update their pension funding position in accordance with SSAP 24, switching firms more frequently adjusted their footnote disclosure of pension funding ratios each year by showing updated market valuation assumptions of pension assets, and changed their pension liability discounting assumptions, similar to the manner that was subsequently required by FRS 17. Their findings suggest that UK firms’ propensity to switch
actuarial valuation method is associated with the characteristics of their sponsored pension plan, other than firms’ short-term funding needs or earnings characteristics.

3.4.2. Corporate Pension Termination Decision

The ownership over excess pension assets has been an extremely contentious issue. The labour economics perspective holds that the assets of the pension plan are distinct from the assets of the sponsoring firm, while the corporate finance perspective suggests that shareholders of the firm own the surpluses anyway as the pension assets are an integral part on the firms’ augmented balance sheets. In practice, pension legislations in both UK and USA permit pension surplus reversion to sponsoring firms, though some restrictions on the amounts can be reverted do apply.

Through termination of defined benefit pension plans, the surpluses may be recaptured by the employers. During the late 1980s, a large body of US-based empirical research has developed to explain why firms terminate pension funds with excess assets. Drawn upon explicitly labour economics and/or corporate finance perspective, these studies generate various (financing, financial distress, tax incentives, take-over, breach of implicit contract) hypotheses to explain firms’ decision to terminate their over-funded pension plans (e.g. Stone, 1987; Hamdallah and Ruland, 1986; Mittelstaedt, 1989; Thomas, 1989). In general, empirical evidence documented from the above studies seems to be providing stronger support to corporate finance perspective.

Hamdallah and Ruland (1986) compare a sample of firms terminating overfunded plans with a sample of firms continuing overfunded plans. They find
that smaller firms with higher financial leverage exhibit a greater tendency to terminate overfunded pension plans. Stone (1987) hypothesizes that excess pension assets are financial slack and terminations liquidate the accumulated financial slack to gaining access to less costly financing. Her findings suggest that firms which had low market valuation of cash flow and generated small proportion of its resources internally exhibit greater propensity to terminations.

Mittelstaedt (1989) and Thomas (1989) both examine several competing theories in explaining managerial decision to revert excess assets from overfunded pension plans. Mittelstaedt (1989) postulates that firms can reduce overfunding slowly by reducing required cash contributions to pension plans via changes in actuarial assumptions or methods. He examines whether managers’ decision to terminate and/or make slow withdrawal of excess assets via changing actuarial assumptions are motivated by financial weakening, tax considerations, or susceptibility to takeover. His results indicate that firms with severe financial weakening terminate pension plans. Firms with less severe financial weakening change their actuarial assumptions to reduce required cash contributions to pension plans.

Thomas (1989) draws upon competing theories in developing hypotheses on overfunded pension plan terminations. He postulates first that excess plan assets may represent financial slack (Stone, 1987; Myers and Majluf, 1984). Second, terminations may represent expropriation of wealth from employees resulting from the violation of implicit lifetime contracts to pay benefits that are vested later in an employee’s services. Third, terminations may also be driven by accounting or tax effect for firms undergoing financial weakening, and may represent attempts to transfer wealth from debtholders to shareholders.
In order to discriminate empirically among these alternative theoretical explanations, Thomas (1989) compares a sample of firms which terminated their pension plans obtained from PBGC against two other reference groups: a sample of firms making slow withdrawals characterized by changes in actuarial assumptions, and a sample of firms making no withdrawals (a control group). After partitioning between those firms which terminate after control changes and those terminating without control changes, Thomas (1989) conducts a time-series examination of cash flows for three years prior to the plan terminations. His results suggest that firms terminating pension plans without control changes suffered large and persistent declines in cash flows for several years before terminating their pension plans. This evidence is further supported by estimating a multinomial probit model with the dependent variable representing each category (i.e. termination, slow withdrawal, and no withdrawal). The coefficient on the cash flow variable was negative and highly significant, indicating that as cash flows decrease, the probability of termination increases.

Thomas (1989) concludes that empirical evidence suggests that over-funded plan terminations is most consistent with 'financial slack' hypothesis. As firms become more and more constrained for cash, they consider terminating the pension plan. Such terminations appear to be costly relative to other sources, such as dividend cuts, investments cuts, or changes in actuarial assumptions. Both Mittelstaedt (1989) and Thomas (1989) also find that firms draw on other sources of financial slack before drawing on over-funded pension plans, implying that plan terminations and contractions are more costly sources of capital. Only financially weak firms (i.e. firms that had exhausted other sources of capital) draw on over-funded pension plans.
This strand of research discussed so far only focuses on pension plan terminations with asset reversion. Haw et al. (1991) examine the financial characteristics (earnings, debt covenants, management incentive compensation, risk and financial structure) of firms that settle overfunded pensions without asset reversions. Settlements without asset reversions do not represent a source of financing opportunity as implied by ‘financial slack’ hypothesis. However, firms can include a portion of the deferred pension gain in net income in the year of the settlement. Therefore, settlements without asset reversions provide an opportunity to substantially boost net income. Haw et al. (1991) find evidence that firms experiencing an earnings decline or have restrictive debt covenants are more likely to settle overfunded pension plans, which indicate that settlement transactions are motivated by financial statement concerns.

Another relevant study by Amir and Ziv (1997) examines the renegotiation, curtailment and/or termination of non-pension benefits (mainly health care and life insurance). In December 1990, the FASB issued SFAS 106, which required companies to recognize non-pension obligations on the balance sheet. Since pre-funding of non-pension benefits was largely unrecognized for tax purposes, these obligations were mostly unfunded. Amir and Ziv (1997) find evidence that firms seek to keep long-term debts off the balance sheet through a variety of non-pension benefits related transactions (e.g. terminations) because contractual obligations are specified in terms of leverage ratio under the SFAS 106.

3.4.3. Corporate Pension Asset Allocation Decision

The extant theoretical insight on allocation of pension assets implies extreme all-bonds or all-equities strategy (Black, 1980; Tepper, 1981; Treynor,
1977; Sharpe, 1976; Harrison and Sharpe, 1983). The implicit assumption is that management acts exclusively in the best interests of shareholders with regard to managing the pension assets and funding its pension plan. Black (1980) and Tepper (1981) argue that the unique feature of pension funds lies in their role as a tax shelter. Firms can effectively earn a pre-tax rate of return on any assets held in the pension fund and pass these returns through to shareholders. To benefit from the tax arbitrage, all firms should follow all-bond investment strategy.

An alternative ‘pension put’ hypothesis (Sharpe, 1976; Treynor, 1977) argues that firms effectively own a put option to give the Pension Benefit Guaranty Corporation (PBGC) the plan assets plus 30 percent of the underlying firm’s value should firms be unable to meet the beneficiaries’ claims. As with any put option, the value of this put increases with the risk of the underlying asset. To maximize the value of put option to default, firms therefore should follow an all equities portfolio. However, simple and well-known empirical evidence does not support either of these extreme optimal asset allocation solutions.

Bicksler and Chen (1985) explain the prevalence of interior solutions in practice by taking into account of the market imperfections and the combined effects of the tax arbitrage and PBGC insurance factors. Although the pension scheme is insured, the employer may experience pension termination costs (e.g. large legal expense, poor labour relations, problems obtaining tax exempt status for a subsequent pension scheme, etc). These costs make defaulting on pension commitments costly to employers. There is also a possibility that in some years the sponsoring company may not have any taxable income to offset the interest it has to pay on the bonds issued. While such tax credits can be carried backwards
and forwards, this may result in a reduction in the present value of the tax reduction. Therefore, the marginal benefits from tax arbitrage decrease as pension funds switch most of their money into bonds. Bicksler and Chen (1985) argue that these market imperfections are responsible for the mixtures of bonds and equities that prevail in practice.

To date, very little empirical research has investigated economic determinants of the firms' pension asset allocation decision. Friedman (1983) conducted a very extensive empirical study with a large sample to address the question of whether corporate pension plans can be viewed as an integral part of the overall corporate financing decision. The empirical evidence from the pension asset allocation part of his research suggests that less profitable companies with higher leverage and higher earnings variability tended to hold less in equities.

Friedman (1983) finds no significant correlation between the funding level of pension plans and the asset allocation between equities and bonds. His results on asset allocation seem to suggest that firms manage their pension fund asset allocations to counterbalance the risks across firms that are stemming from product markets or financial structure. By contrast, Bodie et al. (1987) find that the proportion of assets allocated to equities is negatively related to the level of funding and positively related to the size of the company. In other words, underfunded plans tend to hold more equities and less fixed income securities. The negative correlation between funding and the proportion of assets allocated to equities provides some support to the ‘pension put’ hypothesis. Their findings on asset allocations taken together suggest that firms do not manage their sponsored pension funds as if they are entirely separate entities from the sponsor as implied
by alternative labour economics perspective (Friedman, 1983; Bodie et al., 1987).

Nevertheless, US-based empirical research during the 1990s provides no evidence supporting a tax arbitrage based pension investment strategy. Motivated by the inconsistency among theoretical and empirical studies, Frank (2002) re-examines the extent to which taxes affect a firm’s decision to allocate its defined benefit plan’s assets between equity and bonds within a simultaneous system of equations, which attempts to capture the joint corporate capital structure and pension asset allocation decision in such arbitrage strategy. Contrary to prior empirical research, Frank (2002) finds evidence consistent with firms trading off tax benefits and non-tax factors as described by Black (1980).

Motivated by the passage of pension accounting standard SFAS 87, Amir and Benartzi (1999) investigate the possibility of a relation between firms’ pension accounting and investment choices during a post pension accounting regulatory change period (1988-1994) in the US. They contend that SFAS 87 provides managers the opportunity to choose between recognition and disclosure. In particular, they focus on the question of whether the recognition of additional minimum pension liability in accordance with SFAS 87 affects asset allocation decision. Indeed they find evidence that companies closing to a recognition threshold will make an economic decision of allocating more plan assets into fixed income investments. Uncovering existence of such relationship implies that SFAS 87 has potential economic consequences for firms, consistent with the corporate finance perspective.
A new body of theoretical research concerning pension asset allocation emerged in the late 1990s. These studies developed asset/liability or surplus return models of portfolio diversification taking into account not only asset returns and variances but also changes in pension liabilities and their covariance with asset returns. It is suggested that managers are concerned with maximizing the risk-adjusted pension surplus value of pensions (Sharpe, 1990; Leibowitz et al., 1994; Blake, 2003). Peskin (1997) suggests that companies can reduce pension costs and risks of sponsoring their pension promises by following such an asset/liability framework.

In summary, prior empirical research on corporate pension asset allocation has yielded rather mixed results. Inconsistency thus remains empirically on the extent pension funding affects asset allocation decision, and other economic factors from theoretical research that appear to be important in explaining firms’ pension asset allocation decision. Further empirical studies incorporating theoretical insights from modern pension investment theory in a UK institutional environment can help to shed further insights into corporate pension asset allocation decision.

3.5. DISCUSSION AND CONCLUSION

Tepper (1982) predicts that the trends in pension accounting regulation will be strengthening the link between employer pension sponsorship and corporate finance perspective. Two decades later his prediction certainly has been well supported by the passage of the new pension accounting standard FRS 17 in the UK. However, empirical pension accounting studies to date have not yet explained some important observed features with respect to employers’
pension commitments. Prior research has, to certain extent, failed to discriminate among theoretical perspectives to explain and predict corporate sponsors’ pension actuarial assumption choices, termination, asset allocation decision. For instance, the corporate finance perspective predicts that pension funds should pursue extreme funding policies: either maximum funding or investment entirely in taxable bonds, or minimal funding and investment entirely in stocks. However, existing empirical evidence does not support this prediction (e.g. Friedman, 1983; Bodie et al., 1987).

Moreover, a simplifying assumption adopted in much empirical pension accounting research is either firm’s pension accounting, funding or investment choices can be taken as exogenous, thus modelled in a single equation system. However, employer sponsors’ pension actuarial assumption choices, funding and investment decision can be jointly determined, and ignoring this simultaneity in single equation models may bias estimates of more complex relationships. Further empirical pension accounting research requires alternative econometric specifications and more sophisticated research design to model such managerial discretionary behaviour endogenously.

Also note that virtually almost all of the published empirical studies over the past two decades are premised on the effects of US-based SFAS 87 pension accounting standard. To date very little research has studied managerial pension choices outside the US.\textsuperscript{32} Although international pension accounting harmonization is in the foreseeable future, significant differences in pension

\textsuperscript{32} Scott (1994) examines voluntary disclosures by Canadian firms, where institutional pension disclosure rules are weaker than SFAS 87 and vary in scope across the provinces. Klumpes (2000) examines competing proprietary cost (corporate finance perspective) and political cost (labour economics perspective) hypotheses concerning Australian and UK pension fund managers’ motives underlying their voluntary disclosure decisions during 1991-1995.
accounting across OECD countries still remain. It is therefore important that future pension accounting research incorporates more accurate recognition of the institutional features into the research design.

Most importantly, the pension accounting debate has shifted from its earlier focus on what constitutes appropriate pension liability measure (e.g. corporate finance perspective implied ABO versus labour economics implied PBO) to what constitutes the appropriate approach in measuring both pension assets and liabilities. The traditional ‘cost-based’ actuarial valuation approach is seriously challenged and alternative ‘market-based’ valuation methodology was introduced both in theory and practice. Exley et al. (1997) assert that the adoption of ‘market-based’ approach appears now to be essential in many of the most critical areas in the field of defined benefit pension provision. Yet no empirical studies so far have investigated the impact of ‘fair value’ approach in pension accounting on corporate pension management decision.

This Chapter has reviewed the prior research literature in pension accounting pertinent to the thesis. It highlights the implications of various theoretical perspectives for defining the nature and scope of employers’ pension commitments and evaluates their impacts on both accounting standard setting activities and hypotheses testing developed by accounting researchers. The remainder of this thesis then draws from the theoretical framework developed in this Chapter to generate and test hypotheses concerning the impact of pension accounting regulatory change on (i) managers’ pension actuarial assumption choices; (ii) pension termination decision; and (iii) asset allocation decision by UK firms during the period 1998-2002.
4. DETERMINANTS OF EXPECTED RATE OF RETURN ASSUMPTION

4.1. INTRODUCTION

Pension accounting has evolved to incorporate complex actuarial procedures into standards setting (Fogarty and Grant, 1995). Despite the variations in pension accounting and reporting practices across OECD countries, determination of reported periodic pension cost and long-term pension obligations all heavily rely upon the actuarial input under Generally Accepted Accounting Principles (GAAP) for employers’ pension cost accounting.

Most recently, the Securities and Exchange Commission (SEC) in the US has undertaken an investigation into the potential corporate manipulation of the expected rate of return on pension assets assumption (hereinafter ‘ERR’), a key actuarial assumption underlying firms’ reported pension costs by major US corporations (The Economist, 2004). The US business press claims that managers have been exploiting their discretion over the ERR to inflate corporate earnings (e.g., USA Today, 2002; Fortune, 2002). For instance, General Motors sponsors a large defined benefit pension plan. Its earnings in 2003 would have dropped by over 25 percent, simply by a 1 percent reduction in its ERR assumption (Sarah, 2004).

Much of these public concerns relate to the apparently persistent high ERR assumptions reported by many firms, despite the economic reality of depressed equity markets. Similarly, there are concerns raised in the UK given the continuing wide cross-sectional variations in the ERR and other key actuarial
assumptions reported in employer sponsors’ annual reports (Lane, Clarke and Peacock, 2002; PricewaterhouseCoopers, 2002; Whittington and McGeachin, 2003).

Accounting standards for pension costs are meant to represent the economic reality of pension provisions and help all interested parties to understand the implications for a company that runs a pension scheme (Tweedie, 2003). Deficient accounting can be caused by unreliable actuarial estimates and can have the effect of limiting users’ understanding of economic substance of employer pension sponsorship (Fogarty and Grant, 1995). Further research is needed to examine the determinants of ERR assumptions by UK firms for a number of reasons. Firstly, the ERR has been a significant actuarial input in the total estimated pension costs, especially during the time when most of pension funds are maturing. Secondly, there are considerable cross-sectional variations between actuarial assumptions disclosed by UK sponsoring firms under SSAP 24. Thirdly, the adoption of the UK pension accounting standard (FRS 17) has heightened public attention towards the link between the related costs of employer pension sponsorship and other core components of corporate earnings.

This Chapter identifies and examines possible determinants associated with managerial discretion over the magnitude of reported ERR assumptions in a UK setting during a period from 1998-2002. Under former UK GAAP (SSAP 24), managers could exercise discretion opportunistically in selecting reported ERR assumptions for the estimated periodic pension cost amounts to manage the

33 The definition of the ERR assumption differs significantly between the US and UK reporting environment. The US GAAP (SFAS 87) requires the ERR to be based on the managerial best estimates of both historical returns and rate of returns available for reinvestment, whereas the discount rate should refer to the high-quality bond yields (Blankley and Swanson, 1995). Former UK GAAP (SSAP 24) leaves the determination of the ERR to managerial discretion. Most often in the UK the ERR assumption is also used as the discount rate in estimating pension liabilities.
balance sheet and/or the income statement. Consequently, two specific research questions are addressed: (i) do UK managers use their discretion under SSAP 24 to determine the ERR opportunistically? (ii) Have UK managers responded to the new pension accounting rule through their discretionary choices of the ERR assumption for reporting purposes?

The period 1998-2002 is of relevance to this study for a number of reasons. Firstly, it is a time frame covering both the pre- and FRS 17 transitional adoption period in the UK. Prior UK-based research finds evidence that managerial propensity to switch towards a market based actuarial valuation method is associated with reported corporate earnings during the pre-FRS 17 period (Klumpes and Whittington, 2003). Secondly, the UK corporate sponsors were subject to disclosure requirements under two sets of pension accounting rules (i.e. SSAP 24 and FRS 17), which provides an experimental setting that was not readily available for previous researchers investigating the similar issues.

This Chapter extends existing US-based research on managerial discretion over the expected rate of return assumption in two ways. Firstly, it tests competing opportunistic and economic explanations on managerial discretion over the expected rate of return assumptions within an institutional setting outside the US. Secondly, it is conducted during a period of the UK pension accounting regulatory change. The empirical investigation can help to shed further insights into the professional debate over the appropriateness of changes from a cost-based towards a market-based actuarial valuation approach (as endorsed under FRS 17) to pension cost accounting.
The empirical results confirm predictions that those UK firms sponsoring pension plans with tightening debt covenants select ERR opportunistically during the study period (1998-2002). In addition, the UK pension accounting regulatory shift from SSAP 24 to FRS 17 appears to have increased managerial opportunism in relation to the choice of the reported ERR. The evidence suggests that managerial propensity to manage leverage ratio appears to be stronger in the FRS 17 transitional adoption period (2001-2002). However, there is little evidence suggesting that management select the ERR opportunistically in order to smooth earnings during the study period (1998-2002).

The remainder of this Chapter is organised as follows. Section 4.2 provides the institutional background required for this study. Section 4.3 develops the hypotheses. Section 4.4 overviews the research design. Section 4.5 describes the sampling procedure, data and descriptive statistics. Section 4.6 reports the results of empirical analysis, while section 4.7 concludes this Chapter.

4.2. BACKGROUND

Chapter 3 suggests that the evolution of UK pension accounting rules reflects an on-going debate among accounting standard setters over the appropriate discount rate to measure employers’ pension liabilities. Employers’ pension costs and pension liabilities disclosed in the financial statements are all estimated values that are subject to a number of actuarial assumptions related to life and work life expectancy of the labour force (Davies et al., 1994). Indeed the actuarial estimation process is very complex and the selection of assumptions is open to debate.
The accounting profession has recognized that the discount rate assumption is of particular importance in estimating employers’ pension costs and liabilities. According to Winkelvoss (1993), pension liabilities and expenses are extremely sensitive to several key actuarial assumptions (e.g. discount rate, expected rate on plan assets, projected salary growth rate). For example, a 1 percent increase in the discount rate used in the calculation attributes a 20 percent decrease in pension benefit obligation.

Under SSAP 24, pension liabilities are determined on a discount rate that is based on the actuary’s estimate of the long term rate of return on equity investments. UK firms have the discretion to discount pension liabilities at the same rate as the expected return on pension plan assets. In the 1980s and early 1990s, the return on equity investments exceeded what was required for fully funding pension obligations, enabling many UK firms taking ‘contribution holidays’ (i.e. employers’ required cash contributions to sponsored pension funds are temporarily suspended). By applying various actuarial smoothing choices as permitted under SSAP 24, many UK sponsoring firms with substantial actuarial pension surpluses have the option to report a net amortized credit to their operating income.

Extensive survey evidence suggests that there has been continuing large cross-sectional variations in the main actuarial assumptions on sponsoring firms’ pension footnotes (Lane, Clarke and Peacock, 2001). Because of the considerable

---

34 More specifically, the financial reporting approach under SSAP 24 blurs the operating and financing components of regular pension costs. Different from SFAS 87 (FASB, 1985), compliance with SSAP 24 means both regular service costs and the difference between interest cost and the expected rate of return on pension assets are charged against operating income.

35 For a UK sponsoring firm whose regular cost of pensions exceeds the amortised credit, there will be a net pension charge to the income statement. The opposite is true for firms over-funded pension plans. There will be a net credit to the income statement, with the effect of an increase in earnings. The exact impact upon corporate net earnings depends on the scale of the amortised credit.
discretion permitted by SSAP 24 over the exercise of actuarial assumptions and their disclosures, the UK financial press has frequently alleged that reported pension costs may have been potentially managed by sponsoring UK firms.

Current UK GAAP (FRS 17) amended the requirements of SSAP 24 by mandating disclosure of specific set of main actuarial assumptions by reference to prescriptive requirements. In particular, FRS 17 prescribes the discount rate used to measure pension obligations by reference to AA rated corporate bond yield (FRS 17, para. 14). The corporate finance perspective implies that employers' pension obligation is in effect a form of corporate debt. Therefore the assumed discount rate should be an entity-specific discount rate that is based on the credit risk of the particular sponsor, reflecting the assumption that sponsoring firms can easily terminate their pension promises.

Compliance with the FRS 17 discount rate assumption has effectively increased employers' reported cost of funding pension liabilities, thus increasing the propensity of certain firms to alter their actuarial funding assumptions as disclosed under SSAP 24 for earnings management purposes (Financial Times, February 14, 2002). Relative to the cost-based valuation assumptions used to discount both assets and future benefit payments currently allowed under SSAP 24, the FRS 17 pension reporting requirements also increase volatilities in the size of the reported funding ratio. This will reduce the level of pension surplus that can be spread over long-term horizon under SSAP 24, and increase the pension costs that sponsoring firms charge annually against their earnings.
4.3. DEVELOPMENT OF HYPOTHESES

This section develops hypotheses concerning managerial incentives to exercise discretion over the magnitude of ERR reported by UK sponsoring firms. In particular, two important opportunistic strategies focusing on either leverage or earnings smoothing are examined (e.g. Miller and Skinner, 1998).

4.3.1. Contracting Hypothesis

Empirical evidence suggests that managers of financially distressed firms face incentives to avoid violating the restrictions imposed by accounting-based debt covenants (e.g. Smith and Warner, 1979; Leftwich, 1980). These contractual agreements restrict management’s choice of investing and financing decisions that transfer wealth from bondholders to stockholders and ultimately result in firm value reduction. A large volume of accounting choice literature finds evidence that increasing leverage levels are associated with managers’ opportunistic accounting choices (e.g., Dhaliwal, 1980; Press and Weintrop, 1990; Duke and Hunt, 1990).

Prior US-based research provides some evidence on managerial strategic attempts to manipulate actuarial assumptions in order to manage contents of financial statements. Feldstein and Morck (1983) find that firms select pension discount rate to reduce the level of total debt relative to total assets. Francis (1987) finds evidence that highly levered firms display a higher propensity to lobby against the FASB’s Preliminary Views on pension accounting, which was issued prior to the release of SFAS 87.
Prior empirical research has established that leverage ratios serve as reasonable proxies for the proximity to loan restrictions: book value of debt under GAAP is frequently restricted in public agreements and companies with higher leverage ratios are closer to technical default on their debt covenant restrictions (e.g. Duke and Hunt, 1990; Press and Weintrop, 1990). The choice to report a higher ERR, *ceteris paribus*, can influence the leverage ratios by lowering estimated pension expenses, and thus increase the denominator in traditional leverage ratios (e.g. debt-equity ratios). The leverage ratio (LEV) is calculated as total short-term plus long-term debt, scaled by shareholders’ equity adjusted for pension expenses. It is hypothesized that leverage will be positively related to the magnitude of reported ERR. The higher a sponsoring firm’s leverage ratio (i.e. the lower debt covenant slack), the more likely the firm’s manager is to select a higher ERR.

*Hypothesis 4.1: Ceteris paribus, the level of reported ERR is positively related to sponsoring firms’ leverage ratio.*

### 4.3.2. Smoothing Hypothesis

An alternative opportunistic explanation for why firm managers might seek to manipulate their ERR assumption is to smooth corporate earnings.\(^{36}\) Managerial incentives to smooth corporate earnings have long been established in both business press and academic literature (e.g. Healy and Wahlen, 1999).

---

\(^{36}\) Degeorge et al. (1999) examine whether managers manage to hit ‘targets’, where these targets include: (i) zero (to avoid reporting losses); (ii) last-year earnings, or (iii) analysts forecasts of earnings. This Chapter focuses only on earnings smoothing hypothesis because the smoothing mechanism, as a legacy in employers’ pension cost accounting, is explicitly reserved in order to dampen the volatility of corporate earnings (e.g. in SSAP 24, SFAS 87 and IAS 19). Furthermore, the wide latitude in managerial choices of actuarial rate estimates (e.g. ERR) being one of the powerful smoothing tools by managements has been under increasing scrutiny by business press and accounting academics.
The earnings management literature provides empirical evidence that persistent earnings are valued highly by investors and managers use their accounting discretion to reduce fluctuations in reported earnings in pursuit of smoothing earnings series (e.g. Dye, 1988; Givoly and Ronen, 1981; Miller and Skinner, 1998). The business press claims that managerial flexibility in determining actuarial rate estimates (e.g. ERR) is being used to smooth earnings. Anecdotal evidence suggests that using high ERR assumptions can significantly reduce UK firms' reported pension costs. For instance, a 1 percent increase in the expected rate of return assumption (ERR) on its own can reduce pension costs by typically 20-30 percent for UK firms (Lane, Clarke and Peacock, 2002).

These claims are embedded within the widespread belief that investors have been misled in recent years by current US pension accounting rule SFAS 87. In 2002, Standard & Poor’s (S&P) introduced the S&P ‘core earnings’ concept in which pension expense together with the executive stock option expense is eliminated from the reported corporate earnings in calculating the S&P ‘core earnings’. Gold (2000) suggests that SFAS 87 which overstates and smooths earnings produced upwardly biased valuation. Indeed Coronado and Sharpe (2003) find supportive evidence that US capital market participants are unable to discriminate between core and non-core (pensions’) sources of earnings.

However, earlier US research that examines cross-sectional variations in the ERR has yielded mixed evidence related to managerial opportunism (see Blankley and Swanson, 1995; Amir and Benartzi, 1998). In fact, there is very limited evidence documented on the managerial earnings smoothing incentive

---

37 For example, see Lane, Clarke and Peacock Annual Pension Accounting Survey (2001, 2002), and PriceWaterhouseCoopers Annual Survey of Actuarial Assumptions Survey (2002).
underlying the reported ERR assumptions. Klumpes and Whittington (2003) find evidence that UK corporate managers’ propensity to switch toward a market based actuarial valuation methodology (AVM) is sensitive to reported corporate earnings during the pre-FRS 17 period. The empirical analysis in this Chapter focuses on whether UK managers exercise discretion to smooth earnings by exercising discretion over the level of their reported ERR assumptions during both pre-FRS 17 and FRS 17 periods.

SSAP 24 required sponsoring firms to recognize a single regular pension cost figure (similar to the concept of operating component of pension costs under FRS 17, SFAS 87 and IAS 19) charged against sponsoring firms’ operating earnings. Therefore, it is predicted that if management wishes to smooth bottom line earnings in a year when operating earnings decrease (increase), then they could choose a relatively higher (lower) ERR to achieve the smoothing target. Following Miller and Skinner (1998) and Gordon and Joos (2004), the change in operating income deflated by beginning total assets adjusted for pension expenses is used as the proxy to test the earning smoothing hypothesis. It is hypothesized that the proxy for earnings smoothing (AROA) is negatively related to the level of the reported ERR.

_Hypothesis 4.2: Ceteris paribus_, the reported ERR level is negatively related to changes in reported operating earnings.

_Control Variables_

Notwithstanding opportunistic incentives for exercising discretion over the ERR assumption, there may be a number of non-opportunistic or economic determinants affecting the sponsoring firms’ choice over the reported ERR level.
Since any observed cross-sectional variation in UK firms’ choice of ERR assumptions may also be explained by real operational characteristics between firms and/or their sponsored pension plans, the empirical tests need to account for these factors.

One direct economic determinant associated with managerial discretion of ERR assumption is the sponsored pension plan’s asset allocation strategy, defined as the percentage of pension assets that are equity investments (%EQUITY). If firms use their best estimate of the ERR assumptions, then cross-sectional differences in the ERR should reflect the cross-sectional differences in the riskiness of the underlying investment portfolio of pension assets (Amir and Benartzi, 1998). A positive relation between the ERR and %EQUITY is expected because equity investments are expected to earn a higher premium than less risky asset categories.

SFAS 87 requires the ERR assumptions be the firms’ best estimates as to its long-run, average rate of earnings on pension investments (SFAS 87, para. 45). Blankley and Swanson (1995) argue that firms should consider both historical returns and rate of return expected to be available for reinvestment based on SFAS 87 requirement. By contrast, SSAP 24 does not make any specific guidelines on the reference benchmark of the ERR assumptions for UK sponsoring firms. The contemporaneous actual rate of return (ARR) is used to control for firm-specific pension investment performance. A negative relation between the ERR and ARR is expected because some mean reversion in ARR may arise over time, as compared with the ERR, an actuarial rate of return estimate based on long-term market conditions which is likely to remain constant.
over time. Moreover, firms with relatively stronger contemporaneous pension investment performance is unlikely to adjust their reported ERR assumptions.

Sponsored pension plans' specific characteristics may explain the cross-sectional variations in the reported ERR levels. A primary factor to be considered is the pension plan's demographic characteristic in terms of the maturity of the workforce participating in the pension plan (PRET). The argument is that variations in pension plan demographic characteristics potentially reflect cross-sectional differences in key actuarial assumptions (e.g. the ERR) in the estimation process. Pension plans with higher proportion of retired workers are likely to demand fixed periodic contributions from the sponsoring firm, hence reflecting a phase of maturity and even decline. By contrast, firms with younger pension funds have implicitly higher growth opportunities and thereby are able to make more powerful investment decision. It is expected that firms sponsoring relatively more mature pension plans will report relatively lower ERR assumptions, i.e. a negative relation between the ERR and PRET.

Pension fund size is included as a general control variable, which is measured as the natural logarithm of market value of total pension fund assets (LNSIZE).\(^{38}\) Pension fund size is associated with a number of factors, such as expected political visibility and risk, which may themselves be associated in unpredictable ways with accounting choices (e.g. Ball and Foster, 1982). Firms sponsoring relatively larger pension funds are more likely to make relatively higher ERR assumptions as firms with larger pension funds can make more powerful investment decision and have relatively larger pension assets as

---

\(^{38}\) Pension fund size (SIZE) is considered as a reasonable proxy for firm size because large firms normally sponsor relatively large pension plans. To mitigate multicollinearity problem, this study doesn't include firm size as a control.
‘cushion’ against poor investment performance. However, it is possible that LNSIZE can also be negatively associated with the reported ERR if firms with larger pension funds which earn relatively higher investment return opportunistically select lower ERR assumptions to avoid political costs. Therefore, there are no specific predictions made concerning the direction of its relation with the reported ERR.

4.3.3. Pension Accounting Rule Change and Opportunistic Determinants

During the extended adoption period of FRS 17, the flexibility over actuarial assumptions available to UK management under former UK GAAP (SSAP 24) was largely eliminated due to the more stringent assumptions required under FRS 17. Moreover, under transitional reporting requirements, disclosures under the new pension accounting rule (FRS 17) are available concurrently with disclosures in compliance with SSAP 24. Consequently, investors can assess the reasonableness of key actuarial assumptions by using the equivalent FRS 17 disclosures as a reference benchmark. If UK pension accounting regulatory change has acted as intended, then it is hypothesized that opportunistic incentives underlying the reported ERR level would be weaker during the FRS 17 transitional period relative to the pre-FRS 17 period.

4.4. RESEARCH DESIGN

4.4.1. Estimation Methodology

Chapter 3 suggests that most of prior research on managerial discretion over actuarial assumptions has investigated either the discount rate or expected rate of return assumption separately in a single equation framework (e.g. Godwin
et al., 1996; Amir and Benartzi, 1998). However, most often UK firms are provided with discretion to use a portfolio of actuarial assumptions under SSAP 24 for financial reporting purposes. Aside from the expected rate of return assumptions (ERR), the assumed salary growth rate (SGR) also plays an influential role in calculating pension cost and long-term pension liabilities in the UK setting. For instance, a pension plan paying retirees a given fraction of pay could show a smaller pension cost charge, if a lower rate of future salary increase is assumed (Lane, Clarke and Peacock, 2002).

It is therefore possible that the ERR and SGR may be determined in a joint process by managers, so as to achieve effectively their desired effects on balance sheet and/or income statement. Asthana (1999, p. 54) argues that firms' choice of the discount rate and projected salary growth rate are jointly distributed because adjustments to one actuarial variable may be offset by adjustments to another.³⁹ For example, managers who have chosen a relatively high expected rate of return assumption may consider the use of a low salary growth rate to further reduce reported pension costs.⁴⁰

³⁹ According to Asthana (1999, p. 47), actuaries contend that the interest rate assumption are determined from the joint process of selecting other actuarial estimates.

⁴⁰ Assuming the choice of a low ERR assumption is based on the maturing age profile of the sponsored pension fund.

To allow for the possibility that the ERR and SGR are jointly determined, Asthana (1999) employs a system of simultaneous equations with the actuarial choices as endogenous variables for the empirical analysis in his study. However, in this study the complete set of actuarial assumption choices available to UK managers is not directly observable by researchers. Only key actuarial rate assumptions, such as the expected rate of return, expected salary growth rate are
disclosed under SSAP 24.\textsuperscript{41} Therefore, this study is characterized by the limitation that opportunistic incentives may not be captured in any single actuarial assumption choice.

The simultaneous equations approach employed by Asthana (1999) does not control for any omitted variables from the specified system of equations model that affect managers' portfolio choices of actuarial assumptions. Consequently, it would lead to the correlated error terms across individual equations. By contrast, seemingly unrelated regressions method (SUR) provides efficient coefficient and standard error estimates of the multiple equations system with the presence of contemporaneous correlation in the errors across equations (Greene, 2000, p. 615).

In determining the appropriate empirical framework for this study, a Breusch-Pagan test using the Lagrange multiplier test statistics is made to test the null hypothesis that there is no contemporaneous correlation between errors across equations.\textsuperscript{42} The Breusch-Pagan test of independence on following system of equations (specified in section 4.4.2) indicates that the null hypothesis is rejected at less than 0.1 percent level (LM test statistics=41.11, p<0.001). This result suggests that error term of OLS estimates is subject to significant contemporaneous correlation across equations. Therefore SUR method is applied to the empirical analysis in this study.

\textsuperscript{41} SSAP 24 does not enforce the disclosures of the major actuarial assumptions that play a critical role in determining the annual pension cost charge in respect of defined benefit pension schemes (Davies et al., 1994). Many UK firms have opted to disclose only the spread between their key actuarial estimates. In some extreme cases, major actuarial assumptions are not even disclosed.

\textsuperscript{42} If the null hypothesis is not rejected, then ordinary least square (OLS) equation by equation is fully efficient.
4.4.2. Empirical Model

The primary empirical analysis evaluates whether proxies for managerial opportunistic behaviour are associated with the magnitude of reported ERR, after controlling for a range of explanatory factors posited by prior literature. The following system of equations using seemingly unrelated regression (SUR) is estimated:

\[ ERR_{it} = \alpha_0 + \alpha_1 LEV_{it} + \alpha_2 \Delta ROA_{it} + \alpha_3 \%EQUITY_{it} + \alpha_4 ARR_{it} + \alpha_5 PRET_{it} + \alpha_6 LNSIZE_{it} + \alpha_7 SGR_{it} + \epsilon_{1t} \]  

(4.1)

\[ SGR_{it} = \alpha_0 + \alpha_1 LEV_{it} + \alpha_2 \Delta ROA_{it} + \alpha_3 \%EQUITY_{it} + \alpha_4 ARR_{it} + \alpha_5 ERR_{it} + \alpha_6 LNSIZE_{it} + \epsilon_{2t} \]  

(4.2)

where ERR is the level of expected rate of return assumption as disclosed in the pension footnote for each firm-year observations under SSAP 24. SGR is the level of reported expected salary growth rate for each firm-year observations under SSAP 24; and LEV and ΔROA denote to opportunistic determinants of reported ERR level. The null hypothesis is that if management consider only their sponsored pension fund characteristics and pension asset investment portfolio to determine the long-term expected rate of return on pension assets, then none of the opportunistic proxies will be significant in the empirical model.

The seemingly unrelated regression (SUR) approach controls for the choice of one assumption to influence the choice of the other, therefore produces more efficient coefficient estimates in the presence of correlated error terms. A positive relation between the ERR and SGR is predicted since the expected rate of return and assumed salary growth rate should move together to some extent.
because they should incorporate managerial expectations of the same economic and/or operational environment.

In addition, to control for the possibility of omitted time-specific macroeconomic effects, year dummy variables are incorporated into the model. It is argued that firms in the same industry might employ similar actuarial rate assumptions (Ghicas, 1990). Therefore, industry dummy variables representing all industry sectors across the sample are included into the model to control for the industry effect on cross-sectional variations in actuarial assumptions.

4.4.3. Pension Accounting Rule Change and Opportunistic Determinants

Further tests are undertaken to establish whether there are any changes in the coefficient estimates of the proxies for opportunistic incentives in the specified SUR regression function between the pre-FRS 17 and FRS 17 transitional period. An indicator variable (CHANGE) is constructed, which is coded 1 for FRS 17 period (2001-2002) and 0 for pre-FRS 17 period (1998-2000). The test is performed through the interaction of the opportunistic proxy variables LEV and ΔROA with indicator variable CHANGE. The following augmented systems of equations with the CHANGE dummy indicator and interaction terms LEV*CHG and ΔROA*CHG are estimated using SUR regression:

\[
ERR_{it} = \alpha_0 + \alpha_1LEV_{it} + \alpha_2ΔROA_{it} + \alpha_3%EQUITY_{it} + \alpha_4ARR_{it} + \alpha_5PRET_{it} + \alpha_6LSIZE_{it} + \alpha_7SGR_{it} + \alpha_8CHANGE + \alpha_9LEV*CHG_i + \alpha_{10}ΔROA*CHG_i + \epsilon_{it}
\]

(4.3)
\[ SGR_{it} = \alpha_0 + \alpha_1 LEV_{it} + \alpha_2 \Delta ROA_{it} + \alpha_3 PRET_{it} + \alpha_4 LNSIZE_{it} + \alpha_5 ERR_{it} \]
\[ + \alpha_6 CHANGE_{it} + \alpha_7 LEV * CHG_{it} + \alpha_8 \Delta ROA * CHG + \epsilon_{2t} \]

(4.4)

4.5. DATA AND DESCRIPTIVE STATISTICS

4.5.1. Sample and Data

The main sample period consists of accounting years 1998-2002. This sample period was chosen because Exposure Draft 20 (FRED 20) was issued in 1999 and FRS 17 was subsequently issued in year 2000. Mandatory phased-in transitional disclosure in compliance with FRS 17 commenced in year 2001. Hence, this period witnessed major changes in the pension regulatory environment in the UK, which had significant implications on UK corporate pension reporting and funding decision.

The sample data used in this study were obtained from three resources. First, the expected rate of return on pension assets (ERR) and assumed salary growth rate (SGR) were primarily hand-collected from pension footnote disclosure from UK sponsoring firms’ annual reports. Second, the detailed pension plan data were hand collected from the professional publication ‘Pension Funds and Their Advisers’ (PFTA), which contains an alphabetical list of 2500 UK pension funds sponsored by UK companies and organizations with 500 employees or more. The PFTA book provides information on pension fund size, annual contribution, pension asset allocation, fund expenditure and participants.

---

43 UK firms are required to disclose their pension asset composition in footnote disclosure on their annual reports under FRS 17 in 2002, the third transitional implementation year after FRS 17 was issued.
in defined benefit and/or defined contribution plans by their employer sponsors. Third, the relevant accounting data of corresponding plan sponsors were collected from UK-domiciled DATASTREAM database.

The initial sampling procedure identified companies as those being constituents of the FTSE 350 index during the study period from year 1998 to year 2002. The FTSE 350 index was chosen as the focus of the study because FRED 20 and FRS 17 are likely to have major impacts on large firms whose pension exposure matters for the overall financial condition of the firm. It was not feasible to include every publicly traded company sponsoring defined benefit plans because most of data of this study required hand-collection from the above identified resources.

FTSE 350 index companies that meet the following criteria during the period 1998-2002 are then included into the initial sample: (i) included in ‘Pension Fund and Their Advisers’ publication for the study period (1998-2002); (ii) sponsor at least one defined benefit pension plan or defined benefit pension plan in nature; (iii) public listed companies. Financial firms were excluded from the sample because the characteristics of financial firms differ greatly from non-financial firms. As indicated in Table 4.1, an initial sample of 521 firm-year observations was obtained following the above sampling criteria.

The lack of availability of key actuarial rates disclosed under SSAP 24 reduced the initial sample down to 422 firm-year observations. After deleting observations not covered by Datastream (26), with missing variables (74) and

---

44 Companies comprising the FTSE 350 index during the study period 1998-2002 can be obtained from the monthly publication European FTSE monthly review.
### TABLE 4.1

Sample Selection Criteria

<table>
<thead>
<tr>
<th>Selection Criterion</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FTSE350 companies included in Pension Fund and Their Advisors Book</td>
<td>179</td>
<td>178</td>
<td>147</td>
<td>154</td>
<td>148</td>
<td>806</td>
</tr>
<tr>
<td>2. Sponsoring defined benefit pensions</td>
<td>168</td>
<td>165</td>
<td>131</td>
<td>139</td>
<td>136</td>
<td>739</td>
</tr>
<tr>
<td>3. Non-financial institutions</td>
<td>121</td>
<td>122</td>
<td>90</td>
<td>94</td>
<td>94</td>
<td>521</td>
</tr>
<tr>
<td>4. Key actuarial rates available</td>
<td>82</td>
<td>84</td>
<td>84</td>
<td>86</td>
<td>86</td>
<td>422</td>
</tr>
<tr>
<td>5. Covered by Datastream</td>
<td>77</td>
<td>79</td>
<td>79</td>
<td>81</td>
<td>80</td>
<td>396</td>
</tr>
<tr>
<td>6. After Deleting Missing Variables</td>
<td>60</td>
<td>65</td>
<td>66</td>
<td>67</td>
<td>64</td>
<td>322</td>
</tr>
<tr>
<td>7. After Eliminating Outliers</td>
<td>54</td>
<td>57</td>
<td>59</td>
<td>57</td>
<td>54</td>
<td>281</td>
</tr>
</tbody>
</table>

The 281 firm-year observations in the sample are associated with 63 firms belonging to 15 industries. Industry sectors represented are: Beverage & Tobacco (3), Building & Construction (9), Business & Support Services (7), Chemicals (3), Retail (8), Electronics & Engineering (3), Food Manufacturing (4), Healthcare & Pharmaceuticals (7), Industrial & Manufacturing (6), Leisure & Entertainment (3), Publishing & Media (3), Real Estate (1), Telecommunications (2), Transport (3), Utilities (4).

outliers (41), the final sample comprises 281 firm-year observations from fiscal years 1998 through 2002 as shown in Table 4.1.  

#### 4.5.2. Descriptive Statistics

Panel A of Table 4.2 reports the sample distribution of ERR in each of the five years (1998-2002). The ERR assumption varies significantly across UK firms. The distribution of ERR ranges from a low of 5.00 percent to a high of 10.00 percent over the five year period. The mean reported ERR by sample sponsoring firms during the study period is 7.55 percent (ranging from 8.32 percent in 1998 to 6.58 percent in 2002. Over half sponsoring firms use an ERR that is in the range of 8.00 to 10.00 percent in 1998. But in 2002, half of

---

45 The outliers were identified by plotting dependent variable against each independent variable (Besley et al., 1980).
sponsoring firms have used an ERR that falls into the range of 5-6 percent, a decrease of approximately 3.5 percent.

Panel B of Table 4.2 provides the distribution of SGR reported by the sample firms in each of the five years (1998-2002). The mean SGR decreased steadily with a size of approximately 0.5 percent each year over the study period (1998-2002). Cross-sectional variations of the SGR assumptions are also significant across the sample firms, ranging from a high of 8.00 percent to a low of 3.00 percent. Majority of UK firms have used an SGR that is in the range of 6.00 to 8.00 percent in 1998; but an overwhelming 60 percent of firms have chosen an SGR below 4.00 percent in 2002. The persistent decrease in the SGR as revealed in panel B, Table 4.2 is certainly not a favourable trend from current and future employees' perspective.

Table 4.3 presents the percentage of firms changing ERR and SGR respectively and the mean rate change by each of the five years (1998-2002). Approximately 20-25 percent of sample firms have changed their actuarial rate assumptions. With regard to both ERR and SGR, a greater percentage of firms in the sample made changes in 2002 than in the earlier years, although smaller in their magnitude. For instance, the percentage of firms changing the ERR assumptions holds relatively steady from 1998 to 2001, in the 20 percent range, before increasing to 25.66 percent in 2002. However, the magnitude of change has decreased from approximately 0.5 percent to 0.2 percent.
### TABLE 4.2

**Distribution of Key SSAP 24 Actuarial Assumptions**

**Panel A:**

**Expected Rate of Return on Pension Assets (ERR)**

(Percent of Firms in Specified ERR Range)

<table>
<thead>
<tr>
<th>Range of ERR</th>
<th>1998 (n=54)</th>
<th>1999 (n=57)</th>
<th>2000 (n=59)</th>
<th>2001 (n=57)</th>
<th>2002 (n=54)</th>
<th>ALL (n=281)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.00-5.99%</td>
<td>0.00</td>
<td>4.17</td>
<td>20.83</td>
<td>29.17</td>
<td>45.83</td>
<td>5.14</td>
</tr>
<tr>
<td>6.00-6.99%</td>
<td>3.08</td>
<td>10.77</td>
<td>23.08</td>
<td>31.54</td>
<td>31.54</td>
<td>27.84</td>
</tr>
<tr>
<td>7.00-7.99%</td>
<td>11.65</td>
<td>18.45</td>
<td>19.42</td>
<td>24.27</td>
<td>22.33</td>
<td>22.06</td>
</tr>
<tr>
<td>8.00-8.99%</td>
<td>29.10</td>
<td>26.12</td>
<td>14.93</td>
<td>5.97</td>
<td>3.73</td>
<td>28.69</td>
</tr>
<tr>
<td>9.00-10.00%</td>
<td>28.95</td>
<td>13.16</td>
<td>5.26</td>
<td>0.00</td>
<td>0.00</td>
<td>16.27</td>
</tr>
</tbody>
</table>

Mean: 8.32
Std. Error: 0.76
Median: 8.50

**Panel B:**

**Expected Salary Growth Rate (SGR)**

(Percent of Firms in Specified SGR Range)

<table>
<thead>
<tr>
<th>Range of SGR</th>
<th>1998 (n=54)</th>
<th>1999 (n=57)</th>
<th>2000 (n=59)</th>
<th>2001 (n=57)</th>
<th>2002 (n=54)</th>
<th>ALL (n=281)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00-3.99%</td>
<td>0.00</td>
<td>3.03</td>
<td>9.09</td>
<td>27.27</td>
<td>60.61</td>
<td>7.08</td>
</tr>
<tr>
<td>4.00-4.99%</td>
<td>5.23</td>
<td>11.76</td>
<td>20.92</td>
<td>30.72</td>
<td>30.72</td>
<td>32.83</td>
</tr>
<tr>
<td>6.00-6.99%</td>
<td>28.35</td>
<td>23.62</td>
<td>13.39</td>
<td>4.72</td>
<td>3.15</td>
<td>27.25</td>
</tr>
<tr>
<td>7.00-7.99%</td>
<td>29.63</td>
<td>11.11</td>
<td>3.70</td>
<td>0.00</td>
<td>0.00</td>
<td>11.59</td>
</tr>
</tbody>
</table>

Mean: 6.05
Std. Error: 0.79
Median: 6.00

The percentage of firms that has changed their expected salary growth rate (SGR) assumptions stays around 20 percent of the sample during 1998-2001. But this increased to 24.68 percent in 2002. The size of the decrease ranges from approximately 0.50 percent to 0.27 percent in 2002. The matched pair t-test result suggests that mean rate changes for both ERR and SGR by year 2002 is statistically different than previous years.
<table>
<thead>
<tr>
<th>Year</th>
<th>% of Firms</th>
<th>Expected Rate of Return</th>
<th>Salary Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean Rate Chg.</td>
<td>% of Firm Increase</td>
</tr>
<tr>
<td>1998</td>
<td>20.39</td>
<td>-0.46</td>
<td>10.39</td>
</tr>
<tr>
<td>1999</td>
<td>19.08</td>
<td>-0.45</td>
<td>5.06</td>
</tr>
<tr>
<td>2000</td>
<td>17.11</td>
<td>-0.61</td>
<td>5.06</td>
</tr>
<tr>
<td>2001</td>
<td>17.76</td>
<td>-0.45</td>
<td>11.11</td>
</tr>
<tr>
<td>2002</td>
<td>25.66</td>
<td>-0.19**</td>
<td>16.25</td>
</tr>
</tbody>
</table>

1 matched pair t-test for mean rate changes in the ERR and SGR by year

* significant at 10%; ** significant at 5%; *** significant at 1% for one-tailed test
4.6. EMPIRICAL ANALYSIS

4.6.1. Univariate Analysis

The sample is partitioned into two sub-samples, one that chose the ERR above the sample median (high-ERR), and the other chose the ERR below the sample median (low-ERR). Table 4.4 presents descriptive statistics on all the explanatory variables for the pooled sample and between high-ERR and low-ERR sub-samples. T-tests are performed for differences in means and Wilcoxon rank sum tests are performed for differences in medians among two sub-groups.

Beginning with the contracting cost hypothesis H4.1, the univariate test results indicate that the sub-group of firms that chose higher ERR above the median (n=131) have significantly higher leverage ratios than sub-group of firms that chose lower ERR below the median (n=150). In terms of economic determinants, the high-ERR sub-sample has statistically significant higher percentage of equity investments in asset composition (%EQUITY). In addition, high-ERR sub-sample firms sponsor smaller pension plans than low-ERR sub-sample. This evidence suggests that firms with larger pension funds appear to report lower ERR assumptions to avoid political visibility costs. Taken together the univariate test results are consistent with hypothesis H4.1. But no evidence is found to be supportive of the earnings smoothing hypothesis H4.2.

46 The rationale behind partitioning sample into high rate group and low rate group is that a firm might not choose the reported ERR and SGR independently in each individual year and the managers may select the level of the ERR based on history. Therefore, dividing the sample by the size of reported ERR may help detecting the bias of coefficient estimates if a serial correlation between the ERR exists.
Since the multicollinearity inflates the standard errors in multivariate regression analysis, Table 4.5 reports Pearson product-moment and Spearman correlations for the pooled sample and between high-ERR and low-ERR sub-samples. LEV and ΔROA are correlated with PRET and LNSIZE respectively for the high-ERR sub-sample. But this correlation is not observed for the low-ERR sub-sample. VIF test results (not reported) indicate that collinearity should not impair the coefficient estimates in the empirical model.

4.6.2. Multivariate Analysis

4.6.2.1 Regression Tests of Opportunistic Determinants

To test hypotheses on managerial opportunism related to ERR (H4.1 and H4.2), the system of equations as specified in section 4.4.2 is estimated. Panel A, Table 4.6 contains results from estimating the ERR equation (4.1) using SUR regression on the pooled sample and on each of the five years during the study period 1998-2002. Consistent with hypothesis H4.1, the coefficient on leverage proxy (LEV) in the Eq. (4.1) for the contracting incentive factor is of the predicted sign and highly significant at less than 0.001 level (with White t-statistics of 4.69 in the pooled sample, suggesting highly levered firms systematically report higher ERR. Furthermore, its coefficient is reliably significantly positive at 0.05 percent level in each five individual year (1998-2002). Further the coefficients on earnings smoothing proxy (ΔROA) are not significant at conventional statistical levels of significance in the pooled sample and each year, but are of negative signs as expected.
TABLE 4.4

Descriptive Statistics of Explanatory Variables

<table>
<thead>
<tr>
<th></th>
<th>All Observations (N=281)</th>
<th>High-ERR Sub-sample (n=131)</th>
<th>Low-ERR Sub-sample (n=150)</th>
<th>Tests of Equality of Means and Medians High-Low Matched-Pairs t-test</th>
<th>Wilcoxon¹ rank-sum test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Std. Mean</td>
<td>Dev.</td>
<td>Median</td>
<td>Std. Mean</td>
<td>Dev.</td>
</tr>
<tr>
<td>LEV</td>
<td>0.63</td>
<td>0.92</td>
<td>0.45</td>
<td>0.70</td>
<td>1.20</td>
</tr>
<tr>
<td>ΔROA</td>
<td>0.01</td>
<td>0.03</td>
<td>0.01</td>
<td>0.01</td>
<td>0.04</td>
</tr>
<tr>
<td>ARR</td>
<td>9.36</td>
<td>23.58</td>
<td>0.00</td>
<td>7.48</td>
<td>26.02</td>
</tr>
<tr>
<td>PRET</td>
<td>0.47</td>
<td>0.23</td>
<td>0.45</td>
<td>0.45</td>
<td>0.23</td>
</tr>
<tr>
<td>LNSIZE</td>
<td>6.09</td>
<td>1.29</td>
<td>6.25</td>
<td>5.90</td>
<td>1.15</td>
</tr>
<tr>
<td>%EQUITY</td>
<td>66.24</td>
<td>16.09</td>
<td>70.00</td>
<td>68.41</td>
<td>16.08</td>
</tr>
</tbody>
</table>

¹Value of Z-statistic
** significant at 5%; *** significant at 1% for one-tailed test

Variable definitions:

- LEV = firms' leverage ratio defined as total short-term plus long-term debt, scaled by shareholders' equity adjusted for pension expenses;
- ΔROA = change in operating earnings deflated by beginning year total assets adjusted for pension expenses;
- %EQUITY = the percentage of the sponsored pension plan investment portfolio invested in equities;
- ARR = contemporaneous actual rate of return on pension fund investment;
- PRET = percentage of vested members over total number of vested and non-vested members;
- LNSIZE = natural logarithm of market value of pension assets.
### TABLE 4.5

Pearson and Spearman Correlation Matrix

<table>
<thead>
<tr>
<th>Panel A: All observations (n=281)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>ERR</td>
</tr>
<tr>
<td>LEV</td>
</tr>
<tr>
<td>ΔROA</td>
</tr>
<tr>
<td>%EQUITY</td>
</tr>
<tr>
<td>ARR</td>
</tr>
<tr>
<td>PRET</td>
</tr>
<tr>
<td>LNSIZE</td>
</tr>
<tr>
<td>SGR</td>
</tr>
</tbody>
</table>
TABLE 4.5 (continued)

Pearson and Spearman Correlation Matrix

Panel B: High-ERR sub-sample (n=131)

<table>
<thead>
<tr>
<th>Variable</th>
<th>ERR</th>
<th>LEV</th>
<th>ΔROA</th>
<th>%EQUITY</th>
<th>ARR</th>
<th>PRET</th>
<th>LNSIZE</th>
<th>SGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR</td>
<td>0.144</td>
<td>-0.050</td>
<td>0.150</td>
<td>-0.071</td>
<td>-0.212</td>
<td>-0.212</td>
<td>0.684*</td>
<td></td>
</tr>
<tr>
<td>LEV</td>
<td>-0.028</td>
<td>-0.041</td>
<td>-0.131</td>
<td>-0.052</td>
<td>0.274*</td>
<td>0.127</td>
<td>-0.033</td>
<td></td>
</tr>
<tr>
<td>ΔROA</td>
<td>-0.052</td>
<td>0.050</td>
<td>0.191</td>
<td>0.055</td>
<td>-0.205</td>
<td>-0.328*</td>
<td>0.059</td>
<td></td>
</tr>
<tr>
<td>%EQUITY</td>
<td>0.111</td>
<td>-0.186</td>
<td>0.166</td>
<td>-0.054</td>
<td>-0.427*</td>
<td>-0.102</td>
<td>0.179</td>
<td></td>
</tr>
<tr>
<td>ARR</td>
<td>-0.088</td>
<td>-0.069</td>
<td>0.105</td>
<td>0.0555</td>
<td>-0.049</td>
<td>-0.131</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>PRET</td>
<td>-0.207</td>
<td>0.281*</td>
<td>-0.135</td>
<td>-0.414*</td>
<td>-0.079</td>
<td>0.565*</td>
<td>-0.265*</td>
<td></td>
</tr>
<tr>
<td>LNSIZE</td>
<td>-0.184</td>
<td>0.244*</td>
<td>-0.152</td>
<td>-0.153</td>
<td>-0.117</td>
<td>0.571*</td>
<td>-0.411*</td>
<td></td>
</tr>
<tr>
<td>SGR</td>
<td>0.666*</td>
<td>-0.192</td>
<td>0.038</td>
<td>0.121</td>
<td>-0.029</td>
<td>-0.287*</td>
<td>-0.394*</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 4.5 (continued)

Pearson and Spearman Correlation Matrix

Panel C: Low-ERR sub-sample (n=150)

<table>
<thead>
<tr>
<th>Variable</th>
<th>ERR</th>
<th>LEV</th>
<th>AROA</th>
<th>%EQUITY</th>
<th>ARR</th>
<th>PRET</th>
<th>LNSIZE</th>
<th>SGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEV</td>
<td>0.139</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AROA</td>
<td>0.018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%EQUITY</td>
<td>-0.106</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARR</td>
<td>-0.093</td>
<td>-0.059</td>
<td>0.223*</td>
<td>0.182</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRET</td>
<td>-0.091</td>
<td></td>
<td>-0.096</td>
<td>-0.305*</td>
<td>-0.237*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LNSIZE</td>
<td>-0.136</td>
<td>-0.278*</td>
<td>-0.127</td>
<td>-0.279*</td>
<td>-0.037</td>
<td>0.536*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SGR</td>
<td>0.460*</td>
<td>-0.178</td>
<td>0.050</td>
<td>-0.019</td>
<td>0.046</td>
<td>0.071</td>
<td>0.057</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 4.5 (continued)

1Lower (upper) diagonal: Pearson and Spearman correlation coefficients.
Significant at 1% level for one-tailed test.
Variable definitions:

\[ ERR = \text{the expected rate of return on pension assets assumption as reported under SSAP 24;} \]

\[ SGR = \text{the expected salary growth rate assumption as reported under SSAP 24;} \]

\[ LEV = \text{firms' leverage ratio defined as total short-term plus long-term debt, scaled by shareholders' equity adjusted for pension expenses;} \]

\[ \Delta ROA = \text{change in operating earnings deflated by beginning year total assets adjusted for pension expenses;} \]

\[ %EQUITY = \text{the percentage of the sponsored pension plan investment portfolio invested in equities;} \]

\[ ARR = \text{contemporaneous actual rate of return on pension fund investment;} \]

\[ PRET = \text{percentage of vested members over total number of vested and non-vested members, a proxy for the maturity of pension plans;} \]

\[ LNSIZE = \text{natural logarithm of market value of pension assets.} \]
In contrast to the opportunistic variables, none of the coefficients on economic determinants (ARR, PRET and %EQUITY) are found to be statistically significant at conventional level. The coefficients of ARR (proxy for the pension fund investment performance) and PRET (proxy for the maturity of pension plan) are only of the predicted negative sign. The empirical proxy for the pension investment strategy (%EQUITY) fails to explain the cross-sectional variations in reported ERR with an insignificant coefficient and unexpected negative sign in the pooled regression. In particular, the signs on coefficient of %EQUITY have changed between positive and negative in separate cross-sectional regression each year. In years 1998 and 2002, the coefficients of %EQUITY have positive signs as expected, suggesting firms with higher percentage of equity investments report higher ERR. However, the coefficients of %EQUITY have negative signs during 1999-2001, suggesting that a higher percentage of equity in asset composition is associated with the lower reported ERR during that period.

Panel B, Table 4.6 presents results from estimating the SGR equation (4.2) using SUR regression on the pooled sample and on each of the five years during the study period 1998-2002. This evidence suggests that highly levered firms also systematically report lower SGR (see panel B, Table 4.6). The coefficient of the expected salary growth rate (SGR), is of predicted positive sign and highly significant (at 0.0001 level) for each individual year regression, and for the pooled regression. Lastly, coefficients on the year dummy variables are statistically significant (not reported), indicating unobserved specific year factors also play an important role in explaining the level of reported ERR.
4.6.2.2 Changes in Opportunistic Determinants Between the pre-FRS 17 and FRS 17 Period

Table 4.7 reports findings on the further test on whether opportunistic determinants in relation to the reported ERR have changed over the pre-FRS 17 and FRS 17 transitional periods. As discussed in section 4.4.3, the system of equations is augmented with indicator intercept terms (CHANGE) and interactive variables (ΔROA*CHG, LEV*CHG). The coefficient on the contracting cost incentive proxy (LEV) is significant at 0.01 level (0.124, White t-statistics of 3.52). In addition, the coefficient on the interaction variable (LEV*CHG) is significantly positive (0.258, White t-statistics of 2.84), suggesting that the sample firms exhibit stronger propensity to adjust the level of reported ERR opportunistically during the FRS 17 transitional period. There is weak evidence on the ERR being used to smooth earnings during the pre-FRS 17 period. The coefficient on earnings smoothing proxy (ΔROA) is significant at 5 percent level (-2.287 with a White t-statistics of -2.06). In addition, the coefficient on the interaction variable (ΔROA*CHG) is not statistically significant (2.417, White t-statistic 1.28).

Taken together, the evidence suggests that the contracting cost incentives underlying managers' choice over the reported ERR appear to be stronger in FRS 17 transitional period than in pre-FRS 17 period. This result is inconsistent with the prediction in section 4.3. One possible explanation can be that FRS 17 requires that net pension surpluses and deficits to be recognized at UK sponsoring firms' balance sheets. Investors and creditors are likely to perceive any unfunded pension liabilities as being equivalent to debt, when they are provided with the FRS 17 pension disclosure information. Consequently, the leverage indicator becomes a more important opportunistic incentive underlying managerial ERR choices during the FRS 17 period.
TABLE 4.6

Seemingly Unrelated Regression Tests of the Determinants of the ERR Assumption

Panel A: ERR Equation

\[ ERR_{it} = \alpha_0 + \alpha_{it} LEV_{it} + \alpha_{it} \Delta ROA_{it} + \alpha_3 \% EQUITY_{it} + \alpha_4 ARR_{it} + \alpha_5 PRET_{it} + \alpha_6 \text{LNSIZE}_{it} + \alpha_7 \text{SGR}_{it} + \varepsilon_{it} \]  

(4.1)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pred. Sign</th>
<th>Pooled (n=281)</th>
<th>1998 (n=54)</th>
<th>1999 (n=57)</th>
<th>2000 (n=59)</th>
<th>2001 (n=57)</th>
<th>2002 (n=54)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEV</td>
<td>+</td>
<td>0.154***</td>
<td>0.223**</td>
<td>0.259**</td>
<td>0.236**</td>
<td>0.389***</td>
<td>0.332**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.69)</td>
<td>(2.51)</td>
<td>(2.60)</td>
<td>(2.35)</td>
<td>(3.11)</td>
<td>(2.60)</td>
</tr>
<tr>
<td>\Delta ROA</td>
<td>-</td>
<td>-1.509*</td>
<td>-1.219</td>
<td>-0.753</td>
<td>-0.913</td>
<td>-0.589</td>
<td>-1.196</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-1.66)</td>
<td>(-0.58)</td>
<td>(-0.51)</td>
<td>(-0.34)</td>
<td>(-0.27)</td>
<td>(-0.40)</td>
</tr>
<tr>
<td>% EQUITY</td>
<td>+</td>
<td>-0.001</td>
<td>0.003</td>
<td>-0.000</td>
<td>-0.007</td>
<td>-0.008</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.53)</td>
<td>(0.70)</td>
<td>(-0.01)</td>
<td>(-1.44)</td>
<td>(-1.94)</td>
<td>(0.31)</td>
</tr>
<tr>
<td>ARR</td>
<td>-</td>
<td>-0.001</td>
<td>-0.001</td>
<td>0.000</td>
<td>-0.005</td>
<td>-0.002</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.81)</td>
<td>(-0.52)</td>
<td>(0.03)</td>
<td>(-1.02)</td>
<td>(-0.53)</td>
<td>(-1.29)</td>
</tr>
<tr>
<td>PRET</td>
<td>-</td>
<td>-0.034</td>
<td>0.275</td>
<td>-0.191</td>
<td>-0.989**</td>
<td>-0.474</td>
<td>-0.667</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.18)</td>
<td>(0.82)</td>
<td>(-0.52)</td>
<td>(-2.34)</td>
<td>(-1.17)</td>
<td>(-1.70)</td>
</tr>
<tr>
<td>LNSIZE</td>
<td>?</td>
<td>-0.022</td>
<td>0.044</td>
<td>0.084</td>
<td>0.104</td>
<td>-0.070</td>
<td>-0.013</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.65)</td>
<td>(0.74)</td>
<td>(1.43)</td>
<td>(1.51)</td>
<td>(-0.93)</td>
<td>(-0.19)</td>
</tr>
<tr>
<td>SGR</td>
<td>+</td>
<td>1.053***</td>
<td>1.019***</td>
<td>1.101***</td>
<td>1.138***</td>
<td>1.127***</td>
<td>0.881***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(33.13)</td>
<td>(18.72)</td>
<td>(18.20)</td>
<td>(14.64)</td>
<td>(12.17)</td>
<td>(9.76)</td>
</tr>
<tr>
<td>Intercept</td>
<td>+</td>
<td>1.921***</td>
<td>1.382**</td>
<td>1.242*</td>
<td>1.603**</td>
<td>2.559***</td>
<td>2.942***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5.34)</td>
<td>(2.30)</td>
<td>(1.84)</td>
<td>(2.36)</td>
<td>(3.92)</td>
<td>(4.74)</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td></td>
<td>0.792</td>
<td>0.792</td>
<td>0.753</td>
<td>0.681</td>
<td>0.525</td>
<td>0.424</td>
</tr>
</tbody>
</table>
### TABLE 4.6 (continued)

Seemingly Unrelated Regression Tests of the Determinants of the ERR Assumption

Panel B: SGR Equation

\[
SGR_{it} = \alpha_0 + \alpha_{LEV}LEV_{it} + \alpha_{\Delta ROA}\Delta ROA_{it} + \alpha_{PRET\text{ }PRET_{it}} + \alpha_{LNSIZE}LNSIZE_{it} + \alpha_{ERR}ERR_{it} + \varepsilon_{2i} \quad (4.2)
\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pred. Sign</th>
<th>Pooled (n=281)</th>
<th>1998 (n=54)</th>
<th>1999 (n=57)</th>
<th>2000 (n=59)</th>
<th>2001 (n=57)</th>
<th>2002 (n=54)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEV</td>
<td>-</td>
<td>-0.145***</td>
<td>-0.215**</td>
<td>-0.191**</td>
<td>-0.210**</td>
<td>-0.317***</td>
<td>-0.327***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-4.77)</td>
<td>(-2.53)</td>
<td>(-2.41)</td>
<td>(-2.45)</td>
<td>(-2.94)</td>
<td>(-2.48)</td>
</tr>
<tr>
<td>(\Delta ROA)</td>
<td>+</td>
<td>1.459*</td>
<td>0.964</td>
<td>0.695</td>
<td>0.584</td>
<td>0.643</td>
<td>0.893</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.74)</td>
<td>(0.48)</td>
<td>(0.53)</td>
<td>(0.26)</td>
<td>(0.35)</td>
<td>(0.29)</td>
</tr>
<tr>
<td>PRET</td>
<td>-</td>
<td>0.037</td>
<td>-0.189</td>
<td>0.164</td>
<td>0.659**</td>
<td>0.340</td>
<td>0.709</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.22)</td>
<td>(-0.64)</td>
<td>(0.50)</td>
<td>(1.97)</td>
<td>(0.98)</td>
<td>(1.75)</td>
</tr>
<tr>
<td>LNSIZE</td>
<td>?</td>
<td>0.012</td>
<td>-0.062</td>
<td>-0.079</td>
<td>-0.093</td>
<td>0.071</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.44)</td>
<td>(-0.20)</td>
<td>(-1.51)</td>
<td>(-1.60)</td>
<td>(1.12)</td>
<td>(0.21)</td>
</tr>
<tr>
<td>ERR</td>
<td>+</td>
<td>0.898***</td>
<td>0.949**</td>
<td>0.889***</td>
<td>0.834***</td>
<td>0.807***</td>
<td>0.951***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(33.14)</td>
<td>(19.05)</td>
<td>(18.20)</td>
<td>(14.64)</td>
<td>(12.17)</td>
<td>(19.76)</td>
</tr>
<tr>
<td>Intercept</td>
<td>?</td>
<td>-1.800***</td>
<td>-1.225*</td>
<td>-0.948</td>
<td>-1.044</td>
<td>-1.732***</td>
<td>-2.161***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-4.50)</td>
<td>(-2.38)</td>
<td>(-1.47)</td>
<td>(-1.64)</td>
<td>(-2.68)</td>
<td>(-2.64)</td>
</tr>
<tr>
<td>Pseudo (R^2)</td>
<td></td>
<td>0.799</td>
<td>0.797</td>
<td>0.767</td>
<td>0.694</td>
<td>0.499</td>
<td>0.391</td>
</tr>
</tbody>
</table>
TABLE 4.6 (continued)

*Fixed-effects year dummy variables are included in the equation (4.1) and (4.2), but not presented.
*Industry dummy indicator variables are included in estimating equation (4.1) and (4.2) for the pooled sample, but not presented.
*White-t statistics based on heteroskedastic-consistent standard errors in parentheses (White, 1980).
* significant at 10%; ** significant at 5%; *** significant at 1%

Variable definitions:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR=</td>
<td>the expected rate of return on pension assets assumption as reported under SSAP 24;</td>
</tr>
<tr>
<td>SGR=</td>
<td>the expected salary growth rate assumption as reported under SSAP 24;</td>
</tr>
<tr>
<td>LEV=</td>
<td>firms’ leverage ratio defined as total short-term plus long-term debt, scaled by shareholders’ equity adjusted for pension expenses;</td>
</tr>
<tr>
<td>ΔROA=</td>
<td>change in operating earnings deflated by beginning year total assets adjusted for pension expenses;</td>
</tr>
<tr>
<td>%EQUITY=</td>
<td>the percentage of the sponsored pension plan investment portfolio invested in equities;</td>
</tr>
<tr>
<td>ARR=</td>
<td>contemporaneous actual rate of return on pension fund investment;</td>
</tr>
<tr>
<td>PRET=</td>
<td>percentage of vested members over total number of vested and non-vested members;</td>
</tr>
<tr>
<td>LNSIZE=</td>
<td>natural logarithm of market value of pension assets.</td>
</tr>
</tbody>
</table>
### TABLE 4.7

Regression Tests of Changes in Opportunistic Determinants between the pre-FRS 17 and FRS 17 Period

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pred. Sign</th>
<th>ERR Equation (4.3)</th>
<th>Pred. Sign</th>
<th>SGR Equation (4.4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$LEV$</td>
<td>+</td>
<td>0.124***</td>
<td>-</td>
<td>-0.116***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.52)</td>
<td></td>
<td>(-3.57)</td>
</tr>
<tr>
<td>$\Delta ROA$</td>
<td>-</td>
<td>-2.287**</td>
<td>+</td>
<td>2.132**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-2.06)</td>
<td></td>
<td>(2.07)</td>
</tr>
<tr>
<td>$%EQUITY$</td>
<td>+</td>
<td>-0.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.44)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$ARR$</td>
<td>-</td>
<td>-0.006</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.70)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$PRET$</td>
<td>-</td>
<td>-0.084</td>
<td>-</td>
<td>0.077</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.45)</td>
<td></td>
<td>(0.45)</td>
</tr>
<tr>
<td>$LNSIZE$</td>
<td>-</td>
<td>-0.004</td>
<td>+</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.15)</td>
<td></td>
<td>(-0.05)</td>
</tr>
<tr>
<td>$SGR$</td>
<td>+</td>
<td>1.064***</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(37.18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$CHANGE$</td>
<td>-</td>
<td>-0.095</td>
<td>+</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-1.06)</td>
<td></td>
<td>(0.55)</td>
</tr>
<tr>
<td>$LEV^{*CHG}$</td>
<td>?</td>
<td>0.258***</td>
<td>?</td>
<td>-0.237***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.84)</td>
<td></td>
<td>(2.81)</td>
</tr>
<tr>
<td>$\Delta ROA^{*CHG}$</td>
<td>?</td>
<td>2.417</td>
<td>?</td>
<td>-2.165</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.28)</td>
<td></td>
<td>(-1.24)</td>
</tr>
<tr>
<td>$ERR$</td>
<td></td>
<td></td>
<td></td>
<td>0.914***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(37.18)</td>
</tr>
<tr>
<td>$Pseudo. R^2$</td>
<td></td>
<td>0.7964</td>
<td></td>
<td>0.8020</td>
</tr>
</tbody>
</table>
TABLE 4.7 (continued)

*Fixed-effects year dummy variables are included in the system of equations (4.3) and (4.4), but not presented.
Industry dummy indicator variables are included in estimating the same above system of equations for the pooled sample, but not presented.
White-t statistics based on heteroskedastic-consistent standard errors in parentheses (White, 1980).
* significant at 10%; ** significant at 5%; *** significant at 1%

Variable definitions:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANGE =</td>
<td>dummy variable coded as 0 for the pre-FRS 17 period (1998-2000) and 1 for the FRS 17 period (2001-2002);</td>
</tr>
<tr>
<td>LEV*CHG =</td>
<td>LEV variable interacting with CHANGE dummy variable;</td>
</tr>
<tr>
<td>ΔROA*CHG =</td>
<td>ΔROA variable interacting with CHANGE dummy variable;</td>
</tr>
<tr>
<td>ERR =</td>
<td>the expected rate of return on pension assets assumption as reported under SSAP 24;</td>
</tr>
<tr>
<td>SGR =</td>
<td>the expected salary growth rate assumption as reported under SSAP 24;</td>
</tr>
<tr>
<td>LEV =</td>
<td>firms’ leverage ratio defined as total short-term plus long-term debt, scaled by shareholders’ equity adjusted for pension expenses;</td>
</tr>
<tr>
<td>ΔROA =</td>
<td>change in operating earnings deflated by beginning year total assets adjusted for pension expenses;</td>
</tr>
<tr>
<td>%EQUITY =</td>
<td>the percentage of the sponsored pension plan investment portfolio invested in equities;</td>
</tr>
<tr>
<td>ARR =</td>
<td>contemporaneous actual rate of return on pension fund investment;</td>
</tr>
<tr>
<td>PRET =</td>
<td>percentage of vested members over total number of vested and non-vested members;</td>
</tr>
<tr>
<td>LNSIZE =</td>
<td>natural logarithm of market value of pension assets.</td>
</tr>
</tbody>
</table>
4.6.3. Sensitivity Tests

Sensitivity tests are conducted to examine the robustness of the main results relating to managerial propensity to manage leverage ratio via the use of reported ERR assumptions. The validity of the multivariate analysis relies on the identification and measurement of the opportunistic and operational determinants of the reported ERR assumption. The absences of support for the earnings smoothing hypothesis potentially follows from the choice of a weak proxy for earnings smoothing in the regression analysis. To check this possibility, the first sensitivity test is performed by substituting earnings smoothing proxy (ΔROA) with an earnings management variable, SMPROFT, which takes the value of 1, if a firms’ change in earnings is between 0 and 0.01 percent of market value, and 0 otherwise. Following Burgstahler and Dichev (1997), it is assumed that SMPROFT identifies potential earnings management situations. If so, a positive coefficient on SMPROFT would suggest that managers boost earnings by an increase in the reported ERR assumptions. Un-tabulated results however show the coefficient on SMPROFT is not significant.

Following Mittelstaedt et al. (1995), the second sensitivity test construct industry-adjusted independent variables\(^{47}\) and use these variables to re-estimate Eq. (4.1) and Eq. (4.2) using SUR regression method. The use of industry-adjusted independent variables serves as an alternative control for the industry effects on cross-sectional variations of the reported ERR assumptions. Results from using industry-adjusted independent variables yield qualitatively consistent results as tabulated in Table 4.7.

\(^{47}\) Industry adjusted variables are defined as (the non-industry-adjusted variable less the industry median for the variable) / the industry inter-quartile range for the variable.
4.7. SUMMARY AND CONCLUSION

The shift from SSAP 24 to FRS 17 radically reduced the flexibility formerly available to UK firms sponsoring defined benefit pension funds to manipulate the level of ERR assumptions underlying pension reporting. This Chapter sheds light on this issue by examining whether UK managers use the flexibility provided to manipulate magnitude of the expected rate of return on pension assets assumptions (ERR) opportunistically during the study period 1998-2002, a time frame covering both pre- and post- pension accounting regulatory change in the UK.

Consistent with the contracting cost hypothesis H4.1, corporate managers appear to have exercised discretion to the reported ERR under former UK GAAP (SSAP 24) opportunistically to manage leverage ratio during the study period (1998-2002). Moreover, evidence is found that managerial incentives to manage leverage ratio appear to be stronger over the FRS 17 transitional period. The empirical analysis in this Chapter provides insight to the effects of pension accounting regulatory shifts on managerial opportunism related to the actuarial assumption choices during an extended period of accounting regulatory uncertainty. Contrary to hypothesis H4.2, there is little evidence in support of UK management using the reported ERR to smooth earnings.

This study also controls for the endogeneity of UK firms’ discretion over the ERR assumptions with other key pension actuarial rates, such as the expected salary growth rate (SGR). Contrary to prior US-based study (Asthana, 1999), this study finds no evidence supporting that managers align their key actuarial rate assumptions (ERR and SGR) to manage the content of financial statements. Furthermore, it is also plausible to assume that sponsoring firms’ pension
accounting policy may interact with their other key pension management decision undertaken by employer sponsors, such as pension funding policy, plan terminations and asset allocation policy. For instance, firms can shift more pension assets allocated to bonds in order to avoid the potential financial statement volatility inherent with full adoption of FRS 17. These empirical issues are examined further in Chapter 5 and Chapter 6.
5. PENSION REPORTING CHOICES AND DEFINED BENEFIT PENSION TERMINATIONS

5.1. INTRODUCTION

The empirical evidence presented in Chapter 4 implies that reported pension actuarial assumptions can be exploited by UK sponsoring firms as opportunistic reporting tools to manage the balance sheet leverage. However, the accounting implications of managing under-funded defined benefit pension plans has not attracted much attention from prior researchers. Some prior US-based studies sought to explain managerial discretion over pension-related accounting choices, such as apparent cross-sectional variations in actuarial discount rate assumptions in terms of managerial opportunism (e.g. Ghicas, 1990; Godwin et al., 1996). Other studies identified a linkage between managerial propensity to terminate over-funded pension plans and transfers of wealth between shareholders and employee participants of those plans (e.g. Thomas, 1989; Mittelstaedt, 1989; Stone, 1987; Hamdallah and Ruland, 1986).

Until recently, pension accounting traditionally separated pension funding and accounting by allowing a variety of income smoothing devices (e.g. SSAP 24), and most pension plans appeared to be over-funded. Indeed, there were no studies available in literature seeking to explore the potential linkage between managerial discretion over pension actuarial rate assumptions and pension plan termination decision, since the sponsoring firm was assumed to own the pension fund surplus anyway (e.g. Daley, 1984; Landsman, 1986).
Recent pension accounting changes in the UK setting provide an opportunity to distinguish among competing theoretical explanations for firms’ pension termination decision, and how these may be inter-related to their pension accounting policy for a number of reasons. Firstly, the extreme volatility in equity values, increased longevity, tax changes and reduced inflation resulted in many UK firms sponsoring severely under-funded pension plans. Secondly, new pension accounting rule (FRS 17) prohibits the former practice of spreading pension costs and instead requires pension net surpluses or deficits (based on fair market valuation of assets and estimation of pension liabilities using a standard corporate bond rate) to be recognised on the balance sheet. Thirdly, new pension legislation (the 1995 Act) has imposed minimum funding rules (MFR) that requires employers to fully fund severely under-funded pension plans on the basis of market-based valuation and funding calculations.

Consequently, many UK firms with defined benefit pension plans, which had previously been able to take ‘contribution holidays’ enabling the erosion of the excess pension surpluses, were suddenly required to make significant cash contributions to make up the funding shortfall as revealed under FRS 17. Moreover, the potential linkage between pension funding and accounting policy through the need to consolidate unfunded pension obligations with other long-term corporate debt raises the possibility that short-termist management of corporate financial policy might conflict with long-term funding to defined benefit retirement plans.

This Chapter empirically tests alternative explanations of the inter-relationship between UK firms’ pension termination decision, and their corporate financial and pension accounting policy within a volatile economic and regulatory
environment. Prior US-based literature has advanced competing explanations for pension funding and corporate financial decisions: under an integration hypothesis, these decisions are jointly determined, while a competing separation hypothesis suggests that they are not. Aside from the above competing explanations from prior US-based literature, an alternative risk management hypothesis is considered for the potential inter-relationship between firms' pension termination decision and their pension-related accounting policy. This hypothesis is made empirically testable by UK firms' voluntary adoption of 'market-based' actuarial valuation approach, which was subsequently endorsed by the new pension accounting rule (FRS 17).

Specifically, those firms voluntarily adopting the 'market-based' valuation method regularly update reported ERR assumptions in their pension footnote disclosures. By contrast, firms following the traditional 'cost-based' actuarial valuation approach report 'sticky' ERR assumptions in their footnote disclosures. It is predicted that such ERR-updating firms are less likely to terminate their defined benefit pension plans than firms using 'sticky' ERR assumptions.

The results from an industry matched-pair sample of 80 firms in the period 1998-2002 are consistent with the above hypothesis. A statistically significant association is observed between firms' termination decision and their discretion to regularly adjust reported ERR assumptions. This evidence suggests that economic decisions made on long-term employment relationships are indeed not independent of the financial reporting environment. In addition, as the integration hypothesis predicts, it is found that the need to reduce increased contracting costs

48 The term 'termination decision' in this thesis refers to firms' decision to close their sponsored defined benefit pension schemes to new employees and/or the closure of sponsored defined benefit schemes to both old and new employees.
is associated with pension terminations. Therefore the results from this Chapter provide some support for the view that FRS 17 provides motivation for firms to instigate the termination of UK defined benefit pension plans.

The remaining part of this Chapter is organized as follows. Section 5.2 provides the institutional background. Section 5.3 develops hypotheses that differentiate empirical relationships implied by competing explanations on plan terminations. Section 5.4 describes the methodology, sampling procedure and data used in this study. Section 5.5 presents the empirical results. Finally, section 5.6 provides a summary and concludes this Chapter.

5.2. BACKGROUND

This section explains the institutional background required to understand competing incentives faced by UK firms to terminate their under-funded defined benefit pension plans. Prior to the issuance of FRS 17, there was a relatively benign environment in the UK for corporate sponsored pension plans. Similar to the US environment, during the mid-1980s many pension funds enjoyed surpluses which in turn led to asset reversions.

In the UK, any reversion of surpluses to UK sponsoring firms is restricted by the Finance Act 1986 (Schedule 13, part 2), which required the reduction of the surplus of assets over liabilities to not more than 5 percent (Blake, 2000). However employers could still have access to surpluses by reducing benefits, and
by reducing or suspending contributions (a contribution ‘holiday’) for up to five years.\textsuperscript{49} Any surplus returned to the employer is taxed at a higher rate.

The number of employers taking refunds from schemes has in practice been relatively low. Over the period 1987-1988 to 2000-2001, 293 schemes took refunds, at a value of £1.2 billion. By contrast, a more common practice in the UK has been for employers to suspend or temporarily reduce their contributions. Over the same period, 2,881 schemes reported a reduction or suspension of employers’ contributions with a value of £18.57 billion. Only £1.13 billion of surplus was used to reduce employee contributions or give employees a contribution holiday.\textsuperscript{50}

UK firms now have significant pension deficits because, with hindsight, they held a relatively large proportion of equity investments during the 1990s, despite the increasingly mature pension funds. This asset allocation strategy appeared to have enabled many firms to reduce their pension cash contributions and thereby increase reported profits during the long equity bull market of the 1990s. However negative returns from equity investments and severe pension deficits as made transparent by FRS 17 disclosures revealed that many pension funds went into severe deficit.

The new UK pension GAAP, when fully implemented, prescribes the method by which pension liabilities and assets are to be valued for reporting purposes. Under FRS 17, actuaries are required to measure the value of a pension fund’s pension promises using a set of prescribed assumptions, and adjust those values to make them consistent with current conditions in investment markets.

\textsuperscript{49} The assumption that pension fund surpluses belong to the employer has recently been restricted in the UK by the provisions of the Pensions Act 1995, which imposes statutory limitations on the ability of employers to revert pension surpluses.
\textsuperscript{50} Inland Revenue statistics, available from http://www.hmrc.gov.uk/stats/pensions/p_t08_1.htm#4.
The surplus or deficit must be valued annually, using market prices for its investments and the AA corporate bond rate to discount its pension obligations. The net figure is then to be recorded in the employer’s balance sheet as an asset or liability.

The survey evidence suggests that FTSE 100 firms in 2001 disclosed an overall surplus of £5 billion under FRS 17. However it is estimated that if these companies had all reported in mid-July 2002, they would have disclosed a combined deficit of £25 billion, mostly due to the fall in equity markets (Lane, Clarke and Peacock, 2002). According to the survey by the Government Actuary’s Department (GAD), in 1995 around 4.7 million private sector employees were offered defined benefit pension schemes (GAD, 2000). However, this figure has fallen to 3.8 million by 2000, with nearly one quarter of defined benefit schemes frozen or winding up (GAD, 2003). The UK financial press has been replete with allegations that under-funded pension deficits revealed by the new accounting rules has ‘caused’ many UK firms to terminate their pension arrangements in order to avoid a credit rating downgrade (e.g. The Sunday Telegraph, February 2, 2003).

Consequently under such a radically changing pension reporting environment, at least some UK firms face incentives to jointly consider their pension accounting policy, such as manipulating the ERR assumptions under SSAP 24, with other pension-related decision, such as switching to a ‘market-based’ actuarial valuation approach, in order to mitigate the adverse impact of reporting large unfunded pension liabilities on their balance sheets.
5.3. DEVELOPMENT OF HYPOTHESES

Two competing hypotheses are advanced in prior literature to explain why firms might terminate their over-funded pension plans (Alderson and Chen, 1986; Moore and Pruitt, 1990). The integration hypothesis implies that termination merely constitutes a liquidation of the financial slack, which was stored as a form of excess pension assets when firms experience financial difficulty. The separation hypothesis implies that a termination constitutes a breach of implicit contracts and results in a windfall gain (loss) to the sponsoring corporation.

In light of the UK setting, a risk management hypothesis is developed by postulating an interaction between firms' accounting discretion over the ERR assumption and their propensity to pension terminations. Table 5.1 provides a brief overview of each hypothesis and their predictions concerning the pension termination decision.

| TABLE 5.1 | Predictions of competing hypotheses |
| --- | --- | --- |
| **Integration hypothesis** | **Separation hypothesis** | **Risk management hypothesis** |
| Determined primarily by financial characteristics of corporate sponsor in termination year | Determined primarily by pension plan characteristics in years prior to termination | Determined by the interaction of pension funding policy and corporate finance policy |
| Termination decision | Inter-relationship between discretion over ERR assumption and termination decision | Termination is conditional upon firms' corporate finance policy |
| No systematic relation between discretion over ERR assumption and termination | | Termination is conditional upon firms' discretion over ERR assumption |


5.3.1. Integration Hypothesis

The integration hypothesis states that the assets of the pension fund are inseparable from the assets of the firm which sponsors a defined benefit plan. This hypothesis is consistent with the corporate finance perspective, which implies that the firm effectively owns the pension plan. According to this integrated balance sheet approach, the firm's pension benefit obligations are money-fixed liabilities of shareholders. FRS 17 appears to adopt the integration hypothesis by requiring UK firms to recognise any pension plan surplus or deficit on their balance sheet.

Prior US literature explains pension terminations as being induced by existence of excess pension assets as a form of financial slack (e.g. Stone, 1987). However, this explanation is not applicable to the current economic environment faced by UK sponsoring firms. By contrast, most UK corporate sponsors are likely to report pension deficits under FRS 17 or from their latest triennial actuarial valuation, given the deflated capital market and their large equity exposure. Were FRS 17 fully adopted, unfunded pension liability would be required to be recognized as balance sheet debts. Although FRS 17 has no first order cash flow effects, the above statements imply that the adoption of FRS 17 has indirect cash flow effects. One implied cost is the increased contracting cost associated with moving a firm closer to debt-covenant restrictions due to the FRS 17 reporting approach. As a result, relative to former UK pension GAAP (SSAP 24), terminating pension plans in the current UK pension accounting environment has the effect of reducing sponsors' reported pension costs and future pension accruals, thus reduce firms' proximity to technical violation of accounting-based debt covenants.
During pre-FRS 17 period, a typical UK firm’s leverage ratio can be simply determined by its non-pension long-term debt as reported in its balance sheet, since the pension funding was actuarially determined and accounting is effectively separated from funding. Much of the prior research uses the traditional leverage ratio as a proxy for the existence and tightness of accounting-based debt covenants (i.e. higher debt ratios are associated with covenant tightness). However, adopting FRS 17 implies that UK firms face incentives to reduce their unrecognized unfunded pension obligations on their balance sheets together with other non-pension debts. Therefore an empirical proxy ‘pension leverage’ ratio (PENLEV) was constructed to take into account the tightness of the accounting-based covenants prior to adoption of FRS 17 and the magnitude of the FRS 17 effect on covenant tightness. PENLEV is calculated as the total long-term debts adjusted for pension liabilities (as disclosed under FRS 17) over total tangible assets. UK firms with higher pension adjusted leverage face stronger incentives to terminate their sponsored pension plans.

*Hypothesis 5.1: Ceteris paribus, firms that terminate their defined benefit pension plans have higher pension adjusted leverage than other firms prior to terminations.*

5.3.2. Risk Management Hypothesis

FRS 17 also requires adopting firms to measure reported pension assets and liabilities using ‘fair value’ principles on a yearly basis. The adoption of ‘fair value’ pension accounting increases the volatility risks of the sponsoring firms’ pension exposure since the market value of pension assets is now driven by short-term fluctuations in investment returns. Adoption of FRS 17 implies that employer firms are required to reflect changes in the market values of pension assets as they
occur rather than smoothing out the fluctuations over many years as was permitted under SSAP 24. UK firms thus face incentives to mitigate the risks of reporting volatile pension surpluses or deficits that stem from measuring both pension assets and liabilities on a ‘fair value’ basis. This motivation is referred to as risk management.

One potential financial reporting tool available for mitigating such pension risks is the firms’ accounting flexibility over reported ERR assumptions under SSAP 24. Firms that regularly update their ERR assumptions are likely to be more ‘confident’ that can tolerate relatively greater volatility risks implied by adopting ‘fair value’ pension accounting. This argument is corroborated by prior evidence which suggests firms switching to the ‘market-based’ valuation approach are those sponsoring larger, better-funded schemes during period 1994-1997 (Klumpes and Whittington, 2003). It is therefore postulated that firms regularly updating their ERR assumptions would exhibit less propensity to terminate their pension plans.

*Hypothesis 5.2: Ceteris paribus,* firms that voluntarily updated their ERR assumptions exhibit less propensity to terminate their defined benefit pension plans than other firms prior to terminations.

5.3.3. Separation Hypothesis

The separation hypothesis holds that the assets of the pension plan are distinct from the assets of the sponsoring firm. This hypothesis assumes that workers have partly funded their own pensions through acceptance of lower current remuneration in exchange for future pension benefits (Cooper and Thomas, 2002). By assumption, the firm cannot use the assets placed in a pension fund for other corporate financing purposes. Contrary to the predictions implied
by integration hypothesis H5.1 and risk management hypothesis H5.2, the separation perspective predicts that firms’ pension termination decision are not associated with either their proximity to violation of debt covenant constraints or by reference to managerial discretion over the reported ERR assumptions. Consequently, this study treats the separation hypothesis as merely a null against the hypothesis H5.1 and H5.2.

5.4. RESEARCH DESIGN

5.4.1. Sample and Data

It is plausible to assume that industry-related variables have effects on firms’ discretion upon their actuarial assumptions and pension termination behaviour. For example, firms from the same industry may be offering comparable pension benefits to remain competitive in the labour market. Moreover, firms from the same industry might typically employ work forces with similar maturity and assume similar mortality and turnover assumptions. In discriminating between the alternative hypotheses developed in the previous section, it is necessary to control for the effects of systematic intra-industry differences upon corporate financing, pension funding and termination behaviour. The approach to match experimental and control group on variables that are believed to influence dependent variable, has proved to be useful to mitigating the above concern in the experimental design.

Harrison (1977) matched on industry, systematic risk, and fiscal year-end in his study of discretionary versus non-discretionary accounting changes. Ghicas (1990) used industry-matched pair design to control for some industry-related
variables affecting pension liabilities in his investigation on the determinants of actuarial cost method changes for pension accounting and funding. Prior accounting research suggests that the use of control samples is particularly effective for assessing the sensitivity of corporate reactions to accounting events (Abdel-Khalik and McKeown, 1978; Brown, 1980; Harrison et al., 1983). Therefore samples of industry-matched ERR updating and non-updating firms are employed in order to discriminate among competing hypotheses and assess the posited inter-relationship between firms' pension accounting choices and their termination decision.

Criteria were established to obtain two groups of industry-matched pair firms. First, a systematically different approach in determining ERR assumption had to exist between the two groups. In this case, firms chose to update their ERR assumptions regularly, a methodology subsequently endorsed by new UK GAAP (FRS 17), can easily be distinguished from those relying on traditional or ‘sticky’ ERR assumptions that were permitted by old UK GAAP (SSAP 24). Second, pension exposure had to be a significant factor in a firm’s financial position. In this case, pension liabilities needed to be in excess of 5 percent of the total market value of the firm as at balance sheet date. The first requirement is important because the hypotheses assume that firms updating their reported ERR assumptions regularly can be easily distinguished from firms using ‘sticky’ ERR assumptions. The latter criterion is required because pension exposure must be a material component of the firms’ value.

Accordingly, the control sample was matched in the following industries: telecommunications, financial services, electrical manufacturing, steel, utilities, extraction, consumer goods, food manufacturing, travel and entertainment. All
firms included in the sample must (i) have complete, relevant financial, accounting and actuarial data available on UK domiciled Datastream over the entire study period 1998-2002; (ii) sponsor pension funds for which complete and relevant data is available over the corresponding period (hand-collected by the authors); (iii) are in continuous existence during the study period; and (iv) had issued equity capital that was actively traded in UK capital markets during 1998-2002; and (v) have been in continuous existence for at least 10 years.

Restricting the sample to the above criteria and limited availability of detailed UK pension fund data reduce the sample size down to the total of match-paired 80 firms, covering the above industry classifications. The study period (1998-2002) was chosen because it represents the period during which firms can voluntarily switch toward a 'market-based' actuarial valuation method (i.e. updating their ERR assumptions), as later endorsed by new pension GAAP (FRS 17). All pension plan terminations occurred during the extended adoption period (i.e. when FRS 17 was in transitional implementation in 2001-2002).

5.4.2. Research Methodology

Most of prior termination studies have examined either firms’ decision to terminate over-funded plans (e.g. Thomas, 1989; Mittelstaedt, 1989) or managerial discretion over actuarial assumptions (such as the discount rate) and/or actuarial cost method (e.g. Godwin et al., 1996; Ghicas, 1990) as two distinctive decision and modelled them as discrete outcomes in a single equation framework. To extend prior literature, this study examines firms’ decision to terminate their defined benefit pension plans, and its potential linkages with their pension reporting choices. Recall evidence in Chapter 4 suggests that UK managers adjust the level of their reported ERR assumptions due to the financial statement concern
over the balance sheet leverage. It is plausible to assume that the incidences of pension plan terminations are not independent of corporate pension reporting discretion over the actuarial assumptions (e.g. the frequency of updating reported ERR assumptions). Ignoring such potential linkage can lead to biased parameter estimates in the empirical analysis.

As opposed to estimating two separate probability equations, this study employs a bivariate probit model that explicitly accounts for the endogeneity of two potentially related corporate decisions (Greene, 2000). To capture firms' discretion over the frequency of adjustments made to their ERR assumptions, one categorical variable was constructed (1 is coded for discretionary behaviour of regularly updating reported ERR assumptions during the study period, and 0 otherwise). Firms' propensity to terminate their sponsored DB plans is constructed as another categorical variable (1 is coded for the decision to terminate, and 0 otherwise). The bivariate probit model can be written in terms of two probit equations of the sponsoring firms' termination decision (denoted by \( T_i=1 \) if terminate, 0 otherwise) and their discretion to adjust the ERR assumptions regularly (denoted by \( S_i=1 \) if update, 0 otherwise). The null hypothesis of exogeneity of the two discrete outcomes can be defined as the absence of correlation between the error terms across two probability equations and subject to a Wald test (Greene, 2000).

This model allows for the explicit correlation between these two discrete outcomes and can be written as below:

\[
T_i^* = \beta X_{it} + \varepsilon_{it} \quad (5.1) \quad T_i=1 \text{ if } T_i^*>0, \ 0 \text{ otherwise}
\]

\[
S_i^* = \beta X_{is} + \varepsilon_{is} \quad (5.2) \quad S_i=1 \text{ if } S_i^*>0, \ 0 \text{ otherwise}
\]
where Eq. (5.1) represents the decision to terminate sponsored defined benefit pension plans or not; and Eq. (5.2) represents the discretion to update the ERR assumptions regularly or not. It is assumed that both $\varepsilon_u$ and $\varepsilon_v$ are normally distributed with means of 0 and standard deviation of 1, and the $\rho$ is the correlation between these two disturbance terms. If a Wald test shows $\rho$ is insignificant, then no endogeneity bias is present and the two models can be estimated separately as binomial probits. However, if $\rho$ is significant and the log-likelihood of the bivariate estimate is significantly less than the joint binomial probit log-likelihoods, then indeed $T_i$ and $S_i$ are endogenous processes (Greene 2000, p. 849). Eq. (5.1) and Eq. (5.2) are simultaneously estimated using maximum likelihood, producing unbiased estimates of parameter coefficients $\beta$ and $\rho$.

**Control Variables**

In testing the validity of the alternative integration, risk management and separation hypotheses, this study also controls for variables posited by prior literature in explaining pension terminations. The stock funding ratio measures the ratio of the pension plan's total assets to its total promised benefit obligations (SFUND). This measure, which represents that accumulation of both past funding practices and deviations in past investment performances, is required to be disclosed under SSAP 24 in terms of the relationship of the actuarial value of assets to liabilities. Under FRS 17, the stock funding ratio is expressed in terms of the relationship between assets to liabilities, calculated on a 'fair value' basis. Thus the stock funding ratio reflects the accumulated effects of pension flows (contributions and benefit payouts) in the past and is sensitive to a range of reported actuarial assumptions. It is expected that firms with a lower stock funding ratio would exhibit higher propensity to terminate their pension plans.
The flow funding ratio measures whether an employer has set aside enough money each year to meet that year's requirement, where required contributions are determined by adding together that year's normal cost of benefit payments and the amount, if required, to amortize past unfunded liabilities. Flow funding ratio (FFUND), which utilizes pension flows (contributions and benefit payments) to assess the funded status of pension plans, is considered as an alternative proxy for the financial strength of pension fund. It is expected that firms with lower flow funding ratio would be more likely to terminate their pension plans.

Pension plan maturity is the percentage of retired workers to current active members (PRET), which can be used to proxy for the current working capital needs of sponsored pension funds. Older funds with more retired workers are likely to demand non-trivial periodic contributions to meet the high level of anticipated fund outflows. They are likely to exhibit slower growth and slower profitability than other funds. By contrast, younger funds have implicitly higher proportion of younger workers and growth opportunities. It is expected that firms with higher percentage of retired workers to current active members will be more likely to terminate their pension plans because this will significantly reduce the volatility of required contributions.

One explanation frequently offered in prior US-based literature on terminations is that firms build excess pension assets which accumulate at the pre-tax rate, and liquidate the 'financial slack' via terminations when firms require funds to finance positive NPV projects. This study argues that the existence of significant pension deficits, rather than surpluses, in the current UK economic environment imply a negative association between termination decision and firms'
investment opportunities. Following Ghicas (1990), this alternative explanation is controlled for by developing an empirical proxy, the rate of undertaking new investments (RUNI). RUNI is expected to be negatively associated with firms’ pension plan termination decision.

5.5. EMPIRICAL EVIDENCE

Section 5.5.1 reports results from related independent sample t-tests and Mann-Whitney U tests for the sample. Section 5.5.2 reports the results from estimating a binary logistic model for the entire sample (hypothesis H5.1 and H5.2). Identical logistic regressions are performed for the 40 firms that elect to regularly update their ERR assumptions in comparison to the 40 industry-matched pairs that utilize ‘sticky’ assumptions (H5.3). Section 5.3 reports the corroborative results from the sensitivity tests.

5.5.1. Univariate Analysis

Table 5.2 reports descriptive statistics and related independent sample t-tests and Mann-Whitney U tests for terminating and non-terminating firms among the industry match-paired sample. All variables are reported in the last actuarial valuation year prior to terminations. Both parametric and non-parametric tests reveals that SFUND and PENLEV are systematically different (p-value<0.05) between terminating and non-terminating firms. The mean stock funding ratio as disclosed under SSAP 24 for the set of sample firms terminating their DB pension plans is 1.00, whereas the same figure for sample firms continuing their DB pension plans is 1.22. This evidence suggests that terminating firms appear to have less pension assets available to meet their defined benefit pension liabilities.
than do non-termination firms. The 'pension adjusted leverage' of terminating firms is also statistically significant higher than non-terminating firms. The univariate test results indicate that the difference between terminating and non-terminating firms is statistically significant for their reported funding ratio and 'pension adjusted leverage ratio'.

### TABLE 5.2

Univariate Test Results for Explanatory Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
<th>Termination Sub-sample (n=33)</th>
<th>Non-Termination Sub-samples (n=47)</th>
<th>Matched pair t-test</th>
<th>Mann-Whitney U-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>PRET</td>
<td>(1)&gt;0</td>
<td>0.480</td>
<td>0.470</td>
<td>0.422</td>
<td>0.330</td>
</tr>
<tr>
<td>FFUND</td>
<td>(1)&lt;0</td>
<td>0.759</td>
<td>0.570</td>
<td>1.159</td>
<td>0.750</td>
</tr>
<tr>
<td>SFUND</td>
<td>(1)&lt;0</td>
<td>1.001</td>
<td>1.100</td>
<td>1.213</td>
<td>1.090</td>
</tr>
<tr>
<td>PENLEV</td>
<td>(1)&gt;0</td>
<td>1.287</td>
<td>0.490</td>
<td>0.456</td>
<td>0.360</td>
</tr>
<tr>
<td>RUNI</td>
<td>(1)&gt;0</td>
<td>0.029</td>
<td>0.115</td>
<td>0.059</td>
<td>0.013</td>
</tr>
</tbody>
</table>

*** Significant at the 0.01 level of significance (one-tailed)
** Significant at the 0.05 level of significance (one-tailed)
* Significant at the 0.1 level of significance (one-tailed)

- **PRET** = percentage of retired workers to current active members;
- **FFUND** = pension fund contributions / pension fund expenditures;
- **SFUND** = stock funding ratio disclosed under SSAP 24;
- **PENLEV** = long term debts adjusted for pension liabilities/total tangible assets;
- **RUNI** = (capital expenditures + acquisitions + R&D)/total assets.
### TABLE 5.3
Pearson Correlation Matrix among Explanatory Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>SWITCH</th>
<th>PRET</th>
<th>FFUND</th>
<th>SFUND</th>
<th>PENLEV</th>
<th>RUNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWITCH</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRET</td>
<td>0.148</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FFUND</td>
<td>-0.168</td>
<td>-0.339*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFUND</td>
<td>0.100</td>
<td>0.177</td>
<td>-0.152</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>PENLEV</td>
<td>0.227</td>
<td>-0.028</td>
<td>0.084</td>
<td>0.030</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RUNI</td>
<td>0.054</td>
<td>-0.077</td>
<td>0.144</td>
<td>-0.026</td>
<td>0.121</td>
<td>1</td>
</tr>
</tbody>
</table>

*** Significant at the 0.01 level of significance (two-tailed)
** Significant at the 0.05 level of significance (two-tailed)
* Significant at the 0.1 level of significance (two-tailed)

- **PRET** = percentage of retired workers to current active members;
- **FFUND** = pension fund contributions / pension fund expenditures;
- **SFUND** = stock funding ratio disclosed under SSAP 24;
- **PENLEV** = long term debts adjusted for pension liabilities/total tangible assets;
- **RUNI** = (capital expenditures+ acquisitions+ R&D)/total assets; 
- **SWITCH** = firms update their ERR assumptions frequently were coded as 1; 0 otherwise.
Since multicollinearity inflates the standard errors and can lead to biased coefficient estimates in multivariate regression analysis, the Pearson product-moment correlations are reported in Table 5.3.

### 5.5.2. Multivariate Analysis

Table 5.4 presents results from estimating a bivariate probit model to test our competing integration, risk management and separation hypotheses. The first column displays estimates of the termination equation (5.1) and the second column displays estimates of the ERR updating equation (5.2). The dependent variable in Eq. (5.1) is the decision to terminate (1 is coded for termination and 0 is coded for non-termination), while the discretion over regularly updating the ERR assumption is likewise identified as a dummy variable SWITCH (1 is coded for regular updating of ERR during the study period and 0 otherwise) in Eq. (5.2).

Table 5.4 reveals that pension characteristic variables are generally poor predictors of propensity to terminate pensions. Neither PRET, measured by the ratio of pensioners to plan members, nor the flow funding ratio (FFUND) and stock funding ratio (SFUND) are statistically significant at conventional level. Therefore, empirical evidence is not supportive of the implications of labour economics perspective. By contrast, there is much stronger support for the implications of the integration hypothesis. The coefficient of PENLEV ('pension leverage ratio') is significant at less than 5 percent level. Consistent with the hypothesis H5.1, its positive sign means that firms with higher pension adjusted leverage exhibit higher propensity to terminate their DB pension plans. This evidence suggests that firms seek to mitigate the adverse effect of reporting unfunded pension liabilities through terminating their sponsored pension plans.
### TABLE 5.4

Bivariate Probit Model for Pension Terminations and ERR Updating

<table>
<thead>
<tr>
<th>Variable</th>
<th>Termination (Eq. 5.1) (n=80)</th>
<th>ERR-Updating (Eq. 5.2) (n=80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PENLEV</td>
<td>+</td>
<td>0.025</td>
</tr>
<tr>
<td>SFUND</td>
<td>-</td>
<td>1.385</td>
</tr>
<tr>
<td>FFUND</td>
<td>-</td>
<td>0.058</td>
</tr>
<tr>
<td>PRET</td>
<td>+</td>
<td>0.458</td>
</tr>
<tr>
<td>RUNI</td>
<td>-</td>
<td>0.854</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>+</td>
<td>1.847</td>
</tr>
</tbody>
</table>

\[ \rho_a \]

Chi-square 28.91  P<0.01

\( \rho \) is the disturbance correlation

***Significant at the 0.01 level of significance (two-tailed)

**Significant at the 0.05 level of significance (two-tailed)

*Significant at the 0.10 level of significance (two-tailed)

Variable definitions:

- **SWITCH**: firms update their expected rate of return on pension assets assumptions were coded 1; 0 otherwise;
- **PRET**: percentage of retired workers participating in the pension plan pension fund contributions/(pension fund expenditures+ pension fund contributions);
- **SFUND**: pension funding ratio disclosed on footnotes;
- **FFUND**: pension fund contributions/(pension fund expenditures+ pension fund contributions);
- **PENLEV**: long-term debts adjusted for pension liabilities / beginning year total tangible assets;
- **RUNI**: (capital expenditures + acquisitions + R&D)/ beginning year total assets;
- **TERMIN**: firms that have terminated their sponsored DB plans were coded as 1; 0 otherwise.

The estimate of \( \rho \), the correlation between the two probability equations, is -0.405, with a Wald statistic for the test of null hypothesis that \( \rho \) equals 0 is 4.088 (p-value < 0.05). So the null hypothesis \( \rho \) equals to 0 can be rejected. Thus, this evidence is supportive of the risk management hypothesis H5.2. The termination behaviour appears not to be independent of managerial discretion over their ERR.
assumptions. Specifically, sample firms updating their ERR assumption more regularly exhibit less propensity to terminate pensions than firms using ‘sticky’ ERR assumptions.

Using a chi-square test, the overall model is significant at 1 percent level. Taken together, the results from estimating the bivariate probit model indicate that UK employer sponsors’ decision to terminate their under-funded pension plans are related to the increased contracting costs caused by the potential adverse financial reporting effect of FRS 17. In addition, sponsoring firms’ propensity to terminate their DB pension plans is inter-related with their pension reporting choices, i.e. discretion to regularly update reported ERR assumptions.

5.5.3. Sensitivity Tests

The evidence in Table 5.4 is based on pension fund and firm financial characteristics during the pre-FRS 17 period (i.e. 1998 to 1999). However, during the subsequent extended adoption period (i.e. when FRS 17 was in transitional implementation in 2001-2002), UK firms were also required to report by footnote their pension funding ratios calculated in accordance with FRS 17. As discussed in Chapter 2, the reported stock funding ratio under SSAP 24 is calculated as the actuarial value of assets divided by the actuarial value of liabilities determined in accordance with ‘best estimate’ firm and fund-specific parameters. By contrast, FRS 17 requires the application of mark-to-market valuation of assets and discounting of pension liabilities using standardised AA corporate bond rates. Sensitivity tests that examine whether mean changes between SSAP 24 and FRS 17 stock funding ratios, vary systematically between terminating and non-terminating firms over the period 2001-2002, can be conducted to directly corroborate the major findings.
Table 5.5 reports, separately among matched ERR-updating and ERR-sticky firms, the mean SSAP 24 and FRS 17 stock funding ratios for terminators and non-terminators respectively, and their mean differences. For ERR-updating firms, where the adoption of market-based actuarial valuations will result in significant variations in reported funding ratios, statistically significant lower SSAP 24 pension funding ratios are expected for terminators relative to non-terminators. The risk management hypothesis H5.2 therefore implies that the mean change in differences between SSAP 24 funding ratios and FRS 17 funding ratios would be statistically significant lower for non-terminators than terminators.

Results in Table 5.5 suggest that for ERR-updating firms, the mean $\Delta$(SSAP 24-FRS 17) stock funding ratio for terminators is statistically significant higher than that of non-terminators. This evidence is consistent with H5.2. By contrast, for ERR-sticky firms significant variations in reported stock funding ratios between terminators and non-terminators will only occur upon adoption of FRS 17. Results in Table 5.5 show no systematic difference in mean $\Delta$(SSAP 24-FRS 17) stock funding ratio between terminators and non-terminators found for ERR-sticky firms, consistent with this prediction.
### TABLE 5.5

Sensitivity Tests for Change in Funding Ratio

<table>
<thead>
<tr>
<th>Termination status</th>
<th>Mean SSAP 24 funding ratio</th>
<th>Mean FRS 17 funding ratio</th>
<th>Mean change in funding ratio Δ(SSAP 24 – FRS 17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All firms (n=80)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NON-TERMINATING</td>
<td>1.132</td>
<td>1.059</td>
<td>0.048</td>
</tr>
<tr>
<td>TERMINATING</td>
<td>1.047</td>
<td>0.958</td>
<td>0.069</td>
</tr>
<tr>
<td>p-value for two sample tests of the null hypothesis that ΔFund_{nontrm} &gt; ΔFund_{term}</td>
<td>0.019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERR-updating firms (n=40)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NON-TERMINATING</td>
<td>1.127</td>
<td>1.052</td>
<td>0.071</td>
</tr>
<tr>
<td>TERMINATING</td>
<td>1.052</td>
<td>0.979</td>
<td>0.139</td>
</tr>
<tr>
<td>p-value for two sample tests of the null hypothesis that ΔFund_{nontrm} &gt; ΔFund_{term}</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERR-sticky Firms (n=40)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NON-TERMINATING</td>
<td>1.139</td>
<td>1.064</td>
<td>0.062</td>
</tr>
<tr>
<td>TERMINATING</td>
<td>1.024</td>
<td>0.941</td>
<td>0.082</td>
</tr>
<tr>
<td>p-value for two sample tests of the null hypothesis that ΔFund_{nontrm} &gt; ΔFund_{term}</td>
<td>n.s.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mean SSAP 24 funding ratio** is defined as the ratio of the actuarial value of pension assets to the actuarial value of pension liabilities, discounted at an equity-linked discount rate.

**Mean FRS 17 funding ratio** is defined as the ratio of the market value of pension assets to the value of pension liabilities using an AA corporate bond discount rate.

**Mean change in funding ratio** is the difference between the mean SSAP 24 funding ratio and the mean FRS 17 funding ratio.

***Significant at the 0.01 level of significance (two-tailed)**

**Significant at the 0.05 level of significance (two-tailed)**

*Significant at the 0.10 level of significance (two-tailed)**
Table 5.5 also shows that the mean stock funding ratios are also always higher for non-terminating firms relative to terminating firms. The mean reported SSAP 24 stock funding ratio is higher than the equivalent FRS 17 stock funding ratio for all firms, reflecting the impact of smoothing practices on actuarial-based valuations during a period of declining equity markets.

5.6. CONCLUSION

This Chapter contributes to existing pension termination literature in a number of ways. Firstly, it examines whether economic decision concerning terminating defined benefit plans are primarily driven by financial conditions affecting the employer sponsor, or by fundamental characteristics of their sponsored pension fund, in an economic environment where the liquidation of financial slack explanation is generally not applicable. Secondly, it then explores whether such decision is inter-related with firms’ pension accounting policy by estimating a bivariate probit model in which the corporate pension accounting discretion as a binary discrete outcome is allowed to be endogenously determined in the termination probability equation. This modelling approach represents an improvement on the existing binary logistic models in pension termination literature, relying only on single-equation estimation. Thirdly, it also corroborates main results through analysing pension funding ratios calculated under both new (FRS 17) and old UK pension GAAP (SSAP 24).

By forcing UK employers to immediately recognize the impact of their pension funding decision on their balance sheet, FRS 17 challenged the traditional view that pension accounting is primarily intended to help employer sponsors spread their pension costs over time. This Chapter investigates the potential inter-
relationship between UK firms’ pension accounting choices and pension termination decision during a period of regulatory uncertainty and changing accounting rules. Specifically this Chapter examines whether UK firms faced incentives to alter their chosen ERR assumptions to facilitate or mitigate their propensity to terminate their defined benefit pension plans. The rationales for exercising this discretion are characterized in terms of discriminating between competing separation, risk management and integration hypotheses of the termination decision and the inter-relationship between discretion over ERR assumptions and pension termination decision.

Consistent with the risk management hypothesis, it is found that firms’ termination decision are inter-related with their propensity to regularly update their ERR assumption. These main results hold even after controlling for other variables which prior researchers associate with pension plan termination decision. These results are also corroborated by further sensitivity tests based on differing UK GAAP funding ratios. In addition, empirical evidence suggests that firms’ propensity to terminate their under-funded pension plans are associated with increased contracting costs caused by the anticipated adoption of FRS 17.

However, pension accounting standards permit management to exercise considerable discretion over alternative pension accounting practices and actuarial funding choices, which may well be endogenous with their funding and investment policies (Klumpes, 2001, p. 31). The results in Chapter 4 and Chapter 5 did not control for the possibility that management may seek to limit the impact of their pension exposure by exercising discretion over their pension funding and investment policy. In Chapter 6, the complicating effects of the endogenous
relation between the ERR assumptions, pension funding, and differences in pension investment policy will be explored further.
6. PENSION ASSET ALLOCATION DECISION

6.1. INTRODUCTION

The growing size of pension plans' assets and liabilities in relation to the market capitalisation of sponsoring companies raises the possibility that firms' overall financial position and prospects may not only influence its strategy for funding their pension liabilities, but also its allocation of pension assets among alternative investment categories. Chapter 4 and Chapter 5 examine independently the potential linkages between corporate financial characteristics, the managerial propensity to exercise discretion over pension actuarial assumptions, and plan termination decision. Evidence is found that firms' decision to terminate sponsored defined benefit pension plans is inter-related with their related pension financial reporting choices. This finding implies an integration of pension and corporate financial decision and suggests a view of pension obligations consistent with the theoretical rationale endorsed in FRS 17, i.e. the pension liability of the firm sponsoring a defined benefit plan is part of the firm's financial liability. Similarly, within a corporate finance framework, companies may invest pension assets in a way so as to mitigate, or to compound, the leverage and other risk-determining characteristics of their business.

However, the firm's choice over alternative asset categories, such as equities versus bonds, is not well understood. Theoretical research prior to the 1990s has developed competing hypotheses to explain pension asset allocation decision from a corporate financial perspective (Black, 1980; Tepper, 1981; Treynor, 1977; Sharpe, 1976; Harrison and Sharpe, 1983). The tax-based Black-Tepper hypothesis implies that firms with over-funded pension plans should
invest in the most heavily taxed assets (such as bonds) to maximize their tax-
savings because over-funded plans are less likely to default on their pension
promises (Black, 1980; Tepper, 1981). The 'pension put' hypothesis (Sharpe,
1976; Treynor, 1977) implies that firms with under-funded pension plans should
invest more in riskier assets (such as equities) to maximize the value of the 'put
option' to default. However, both hypotheses lack consistent empirical support
from the scant volume of research on pension asset allocation (Friedman, 1983;
Bodie et al., 1987; Peterson, 1996; Amir and Benartzi, 1999; Frank, 2002).

Bodie et al. (1987) cautioned that further empirical research remains to be
filled before a clear picture of these important corporate pension decisions can
emerge. The objective of this Chapter thus is to seek empirical regularities in the
UK firms' management of their pension fund asset allocation and its inter-
relationship with their pension funding and pension-related accounting policy
over the period 1998-2002, during which new pension accounting standard (FRS
17) was issued and transitional compliance was in effect. It is important to
undertake such an empirical investigation in the UK for a number of reasons.

Firstly, the UK pension fund investment strategy has evolved
substantially over the past decades. With respect to asset allocation, it has moved
through a period in which equities have been the predominant asset within the
pension fund investment portfolio. Trustees and plan sponsors started to attach
greater importance to the risk-taking part in their pension management. Changes
in asset allocation strategy are taking place. Secondly, there is an accounting
dimension to this topic. Pension earnings which hold a growing proportion of

---

51 Pension Benefit Guaranty Corporation insures US firms' pension liabilities in full in the event
of default. The PBGC has a claim on 30 percent of the market value of the firms' assets. The
PBGC's insurance of pension benefits provide the firm a 'put' option: it can shed its pension
liabilities by giving the PBGC the assets in the scheme plus one-third of the firms' assets.
total reported corporate earnings are contended as being decoupled from pension risks under the traditional pension accounting framework (Gold, 2000). The ‘transparent fair-value’ pension reporting standard FRS 17 issued in 2000 is likely to alter perception of risk in equity allocation strategy. Thirdly, a new body of theoretical research concerning pension asset allocation emerged in the late 1990s (Sharpe, 1990; Leibowitz, et al., 1994; Blake, 2003). These studies developed asset/liability or surplus return models of portfolio diversification taking into account not only asset returns and variances but also changes in pension liabilities and their covariance with asset returns. Further empirical knowledge is also needed to test the validity of the above new theoretical insights.

In contrast to the previous empirical research which has focused on testing either tax-based ‘Black-Tepper’ argument or ‘pension put’ effect on asset allocation, the study in this Chapter develops and tests the hypothesis that UK sponsors have managed their asset allocation with attempt to mitigate their pension exposure to potential volatility risk of the financial statements and/or cash flows during a period of accounting regulatory uncertainty. Using cross-sectional data on a panel of firms for the study period 1998-2002, the empirical evidence suggests that the relationships among asset allocation, pension funding and related pension reporting choices are, for most part, consistent with the corporate risk management objective of hedging the cash contribution risks that stem from measuring pension assets and liabilities at a ‘fair value’ basis.

Controlling for the endogeneity among asset allocation, pension funding and the expected rate of return assumption choices, evidence is also found that the percentage of assets invested in equities is increasing with the pension
funding level, and decreasing at an increasing rate as the funding level reaches one specific point. In other words, the effect of pension funding on asset allocation exhibits a non-linear relationship.

The rest of this Chapter proceeds as follows: Section 6.2 provides the institutional background required for the study and situates this study in the context of past research. Section 6.3 develops hypotheses. Section 6.4 describes the research methodology, variable specification, data and descriptive statistics. Results are presented in section 6.5, and concluding remarks in section 6.6.

6.2. BACKGROUND

The funding of a defined benefit pension plan, whether in response to the regulatory requirements or the dictates of sound financial management, leads to the accumulation of assets dedicated to the payment of plan benefits and administrative expenses. Pension plan assets and their capacity to generate future investment earnings are the primary source, at any given time, of benefit security, i.e. the assurance that accrued rights of the plan participants will ultimately be honoured. For example, if the assets of a fully funded defined-benefit plan are invested such that they earn a 6 percent of return in a stable economic environment, on the average, about 70 percent of the plan’s benefits will be paid out of investment earnings and only 30 percent will have to be contributed by sponsors (McGill and Grubbs, 1989).

Productive deployment of pension plan assets directly reduces costs of funding a defined benefit pension plan. Prior empirical research also established that the asset allocation is the main determinant of the investment performance of
a pension fund (Blake et al., 1999; Brinson et al., 1991; Ibbotson and Kaplan, 2000). Thus the decision to allocate plan assets among different investment vehicles has been a very important decision for employer sponsors. During the last four decades, UK employer sponsors have invested the majority of their assets in equities. Davis (1991) observes that the UK firms have maintained a substantially higher equity proportion than USA, Canada, Japan and Germany.

Corporate strategic asset allocations in the UK have evolved since the 1980s. Recent years have seen rapid changes occurring in both the legislative and accounting regulation for final salary pensions in the UK. The case of Boots Group provides a perspective over the asset allocation decision undertaken by employer sponsors during a period of regulatory uncertainty. In November 2001, the Boots group announced that its £2.3 billion pension fund, one of the UK’s 50 largest funds with 72,000 members, had switched 100 percent of its pension assets from equity into long-dated high-quality bonds. Duration-matching by investing in fixed income investment products such as bonds can effectively reduce the likelihood of the accumulated assets falling short of the long-term pension liabilities (Blake, 2003).

---

52 McGill and Grubbs (1989) identify four important objectives for investment policy of defined benefit pension plans. Firstly, rate of return objective: this can be qualitative or quantitative. Secondly, risk tolerance: this is the amount of portfolio risk that sponsoring firm is willing to take. Assuming that managers are rational and invest on the efficient frontier, increased portfolio risk implies greater expected return on asset. Thirdly, liquidity requirements: these depend on the specific needs of pension plans. Plans with more aged participants will need more cash for benefits payments and may choose to invest in short term instruments while plans with younger participants have a longer investment horizon and may choose to invest in long-term instruments. Fourth, diversification: this is to safeguard the interests of beneficiaries.

53 Under 1995 Pension Act, pension trustees have a fiduciary duty to preserve the trust capital and to apply the capital and its income in order to protect plan beneficiaries. Pension plan members can sue for compensation if they suffer loss as a result of negligence by trustees. However, pension trust law is very flexible as well, which enables the trust deed to be drawn up in virtually any way that suits the sponsor (Blake, et al., 1999). This thesis therefore investigates the asset allocation from the corporate sponsor’s perspective.

54 The bonds are a close match for the maturity and indexation of UK pension liabilities, which has a weighted average maturity of 30 years and 25 percent are inflation-linked.
However, patterns of defined benefit pension plan asset allocation in the UK and USA have been relatively invariant over the last several years. The average equity allocation for a typical UK sponsor in 2002 was 73 percent (Urwin, 2002). US researchers contend that the actuarial smoothing in valuation of pension assets and liabilities has contributed to the high equity allocations by sponsors (e.g. Gold, 2000; Coronado and Sharpe, 2003). It is also claimed in the UK that the ‘fair value’ approach as espoused by FRS 17-style pension accounting standard would lead corporate sponsors to shift their asset allocation in favour of fixed income securities, in order to shield themselves against the potential volatility onto their financial statements (e.g. Financial Times, March 20, 2004).

6.3. DEVELOPMENT OF HYPOTHESES

Recent years have seen changes in both economic and regulatory environments in the UK in which sponsoring firms are operating and managing their pension plans. Specifically, new pension accounting rule endorsed the corporate finance perspective that firms and their sponsored pension plans are in effect an integral economic entity. It is reasonable to assume that changes are likely to occur in the management of asset allocation by plan sponsors.

Prior empirical research on corporate pension asset allocation has yielded rather mixed results. Inconsistence thus remains empirically on the extent pension funding, and other economic factors from prior research that appear to be important in explaining pension asset allocation decision. Chapter 3 suggests that further empirical research in a setting of changing UK pension accounting regulation can help to shed further insights into corporate pension asset
allocation decision. Consequently two hypotheses are introduced to test factors that are likely to affect asset allocation decision by UK sponsors during an extended FRS 17 adoption period, when the asset/liability framework has gained importance for corporate pension asset investment strategy.

### 6.3.1. Financial Reporting Risk

The release of new UK pension accounting rule (FRS 17) may alter the nature or perception of risks of employers' pension exposure. It was a common assumption that pending adoption of FRS 17 would expose UK sponsoring firms to significant balance sheet volatility (Veysey, 2004). Under FRS 17, the pension deficits or surpluses are required to be recognized on the corporate balance sheets once they arise. By contrast, SSAP 24 allows any surpluses or deficits to be spread over the employees' future working time, typically 15 years.

If sponsoring firms were forced to recognize their past funding practices on a 'fair value' basis onto their financial statements, i.e. as required under FRS 17-style pension accounting rules, then the desired positioning of the firm's consolidated pension balance sheet may not be attainable solely through actions executed to their long-term pension obligations, such as altering the level of reported ERR assumptions and/or plan terminations. Consequently plan sponsors are exposed to risks of having potentially volatile financial statements. However, managers can mitigate such financial reporting risk by choosing a different mix of equities and bonds. Investing in bonds has the advantage of obtaining a high correlation between assets and liabilities, which reduce the risk-adjusted pension surplus risk (e.g. Blake, 2003).
Following Bergstresser et al. (2003), a sensitivity measure (PENRISK) is constructed to capture variation in firms’ pension exposure to the potential financial reporting risk. PENRISK is calculated as the natural logarithm of the ratio of market value of pension assets to total net assets in a firm year.\textsuperscript{55}

\textit{Hypothesis 6.1:} \textit{Ceteris paribus}, the percentage of assets invested in equities decreases as firms’ exposure to the potential financial reporting risk increases.

\subsection*{6.3.2. Contribution Risk}

Risky assets, such as equities, are characterized by their volatile returns. Finance theory suggests that higher risk of equity investment is awarded by the higher return it generates (Markowitz, 1952; Sharpe, 1964). However, if the volatile return on the pension assets translates into changes in the required cash contribution, then risky assets will translate into more risky required contributions to the pension plan (Blake, 2001). Culp (2001) suggests that the main concern of ‘cash flow risk’ managers is to minimize the volatility of changes in cash flows. With respect to the corporate pension management, one of the important factors that directly links the firm with its sponsored pension plans is the cash contribution (Peskin, 1997). Friedman (1983) finds some evidence that firms have incentives to time their pension contributions so as to smooth the reported earnings. It is indeed the sense of timing that makes the cash flow-based

\textsuperscript{55} Bergstresser et al. (2003) suggest that such a sensitivity measure collapses the influence of outliers and brings the distribution of the ratio closer to that of a normally distributed random variable.
theories of value-enhancing risk management distinct from value based theories (Culp, 2001).56

UK firms face strong incentive to hedge the riskiness of their cash flow stream of pension contributions for two reasons: firstly, minimum funding requirements (MFR) subject plans with deep deficits (less than 90 percent) to accelerated cash contributions in order to make up the funding shortfall.57 Secondly, prospects of adopting the FRS 17-style pension accounting standard imply that sponsors are required to recognize their funding position using 'fair value' approach on an annual basis. Investors and other interested parties are becoming more aware of the relative magnitude and potential risks that the defined benefit pension sponsorship imposes on the overall financial condition of the firms on a timely basis. Thirdly, prior to FRS 17, firms’ pension liabilities are not reported on financial statements. Shareholders and investors may judge the firm’s performance by its reported earnings rather than by more comprehensive flow measures. Coronado and Sharpe (2003) find that market failed to distinguish between pension and operating earnings and capitalize them similarly. To certain extent, adoption of FRS 17 is similar in nature to a statutory increase in funding level for UK sponsors.

By matching pension assets with liabilities, i.e. allocating plan assets into bonds, sponsoring firms can effectively reduce the volatility of their pension contributions, thus achieve to hedge their cash contribution risks. If the incentive is strong for sponsors to minimize the volatility of pension contributions, then it

56 Culp (2001) argues that value risk managers are concerned about the value of the firm, either at a specific point in time (e.g. when debt must be retired) or over regular intervals (e.g. monthly changes in value).
57 As noted in Chapter 2, effective in April 1997, legal restrictions were imposed on the ability of employer sponsors to under-fund UK pension funds through the introduction of a ‘Minimum Funding Requirement’ (‘MFR’). UK firms with MFR funding ratios below 90 percent were required to make immediate cash contributions to their sponsored pension funds.
would be observed that firms with both extremely over-funded and under-funded plans invest in bonds because such extreme over-funding and under-funding afford less flexibility to adjust the timing of pension contributions than do firms with moderate funding levels. Pension plans with greater deficits are subject to the MFR requirement to make deficit-reduction contributions and those with greater surpluses have to conform to the tax regulations.\textsuperscript{58} By contrast, pension contributions are fairly predictable for moderate funding levels, but less predictable when funding levels become more extreme. This discussion leads to the second hypothesis:

\textit{Hypothesis 6.2: Ceteris paribus, the percentage of assets invested in equities increases as the funding level increases up to a specific point, then decreases as the funding level increases beyond this point.}

The contribution risk hypothesis thus predicts a nonlinearity relationship between variations in funding level and pension asset allocation, thus provides an alternative explanation for the conflicting results from prior studies on the effect of pension funding on asset allocation. Amir and Benartzi (1999) find some empirical evidence on such a nonlinear relationship between pension funding and asset allocation. However, their study does not control for the potential endogeneity between pension funding and asset allocation.

In Chapter 4, evidence is found that firms with higher leverage exhibit greater propensity to select relatively higher ERR assumptions during the period 1998-2002. However, the research design does not provide a way to control for the possibility that the ERR assumptions can also be used by sponsors to manage

\textsuperscript{58}UK corporate sponsors of defined benefit pension plans with a funded status in excess of 105 percent were subject to taxation at a rate of 35 percent.
the level of pension funding, and subsequently their required cash contributions made to the plan. The former pension accounting standard SSAP 24 permitted UK sponsoring firms to discount pension liabilities at the same rate as the expected rate of return on pension assets (ERR) assumptions. This accounting flexibility thus provides incentives for UK firms to mitigate the contribution risk to fund the benefit obligations through exercising discretion to their ERR assumptions. This discussion leads to the third hypothesis:

\textit{Hypothesis 6.3: Ceteris paribus, the percentage of assets invested in equities increases as the level of ERR assumption increases.}

\section*{6.4. RESEARCH DESIGN}

\subsection*{6.4.1. Empirical Model}

Accounting researchers have recognized the importance of analyzing the potential endogeneity in the choices made by firms along different dimensions (e.g. Beatty et al., 1995; D'Souza, 1998). Treating endogenous variables as exogenous, or excluding relevant choice variables, leads to biased and inconsistent parameter estimates. Prior pension research has not taken into account of the simultaneity of pension asset allocation, funding and related financial reporting choices.\textsuperscript{59} Causality is therefore unclear, and the same cross-sectional results can be rationalized by a variety of explanations.

\textsuperscript{59} Mitchell and Smith (1994) employs simultaneous equations model approach to investigate pension funding in the US public sector. They attempt to control the simultaneity between the required per worker annual contribution (REQ), actual pension plan funding in the public sector (ACT) and average worker compensation package (AVEPAY).
It is possible that corporate pension asset allocation policy is conditional upon firms' long-term pension funding and their discretionary ERR choices. Corporate sponsors can exercise the discretion in the level of ERR assumptions to mitigate their contribution risk, and also increase the allocation of equities in their pension fund investment portfolio to justify the high level of the ERR assumptions. The empirical analysis in Chapter 5 provides evidence that corporate pension termination decision is indeed not independent of firms' pension reporting choices. Consequently, this study employs a simultaneous equations model to control for the simultaneity and accurately identify the impact of pension funding on the pension asset allocation decision.

The hypotheses concerning corporate pension asset allocation decision are tested by employing a simultaneous model with three equations: asset allocation, funding and pension actuarial assumption choices. It is based on the assumption that sponsors can adjust their asset allocation, funding and related pension reporting choices simultaneously. Specifically, the system of simultaneous equations is specified as follows:

\[
\%\text{EQUITY}_t = \alpha_0 + \alpha_1 \text{FUND}_t + \alpha_2 \text{FUNDSQ}_t + \alpha_3 \text{PENRISK}_t + \alpha_4 \text{ERR}_t + \Phi'_X X' + \gamma + \varepsilon_t \\
(6.1)
\]

\[
\text{FUND}_t = \beta_0 + \beta_1 \%\text{EQUITY}_t + \beta_2 \text{ERR}_t + \Phi'_X X' + \gamma + \varepsilon_t \\
(6.2)
\]

\[
\text{ERR}_t = \delta_0 + \delta_1 \%\text{EQUITY}_t + \delta_2 \text{FUND}_t + \Phi'_X X' + \gamma + \varepsilon_t \\
(6.3)
\]

where \% EQUITY is the percentage of equity invested by corporate sponsors, FUND is the reported stock funding level and ERR is the level of reported
expected rate of return on pension assets assumptions.\cite{footnote60} \textit{FUNDSQ} is the squared value of \textit{FUND}. \textit{PENRISK} is the sensitivity measure of firms’ pension exposure to reporting risk. \(X_{1i}, X_{2i} \) and \(X_{3i} \) are a vector of predetermined control variables in three respective equations; \( \gamma_t \) represents dummy variables for years 1998-2002. Eq. (6.1), (6.2) and (6.3) model pension asset allocations, pension funding and ERR reporting choices respectively. \( \varepsilon_{it}, \varepsilon_{it} \) and \( \varepsilon_{it} \) are error terms.

<table>
<thead>
<tr>
<th>TABLE 6.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable Definitions</strong></td>
</tr>
</tbody>
</table>

\( \%EQUITY= \) percentage of pension fund portfolio invested in equities;  
\( \text{FUND}= \) reported funding status under SSAP24;  
\( \text{FUNDSQ}= \) the squared value of \textit{FUND};  
\( \text{ERR}= \) expected rate of return on pension assets assumption;  
\( \text{PENRISK}= \) natural logarithm of the ratio of market value of pension assets to total net assets;  
\( \text{LEV}= \) firms’ leverage ratio defined as total short-term plus long-term debt, scaled by shareholders’ equity adjusted for pension expenses;  
\( \text{PROF}= \) mean of return on shareholders’ equity over the preceding 10 years;  
\( \text{STDCF}= \) standard deviation of operating cash flows (earnings before extraordinary items plus depreciation expenses) over the preceding 10 years deflated by the book value of equity;  
\( \text{TAXST}= \) total reported taxes minus the change in deferred taxes over the preceding year deflated by beginning year total assets;  
\( \text{PRET}= \) percentage of vested members over total number of vested and non-vested members, a proxy for the maturity of pension plans;  
\( \text{LNSIZE}= \) natural logarithm of market value of pension assets;  
\( \text{ARR}= \) contemporaneous actual rate of return on pension fund investment;  
\( \text{SGR}= \) salary growth rate assumption;  
\( \text{MKRTN}= \) contemporaneous actual rate of return on a weighted market portfolio with an equivalent asset mix;  
\( \text{RUNI}= \) (capital expenditures+ acquisitions+ R&D)/total assets;  
\( \Delta \text{ROA}= \) changes in operating earnings deflated by beginning total assets adjusted for pension expenses.

\footnote{\cite{footnote60} FUND is the same variable as \textit{SFUND} variable used in Chapter 4, which measures the ratio of the pension plan’s total assets to its total promised benefit obligations.}
Table 6.1 summarizes the definitions of regression variables. The asset allocation regression (Eq. 6.1) is to provide empirical evidence on the hypothesis H6.1, H6.2 and H6.3, while controlling for a range of economic determinants posited by prior research. The ‘pension put’ hypothesis (Sharpe, 1976; Treynor, 1977) implies that firms for which the pension ‘put’ option is more valuable (that is, more in the money) will hold more of the most risky assets, presumably equities, and vice versa. The ‘put’ option is likely to be more valuable for under-funded plans, for unprofitable companies or firms with higher variability in their cash flows, or firms with more debt. The ‘pension put’ hypothesis is controlled for by using three proxies (LEV, PROF, and STDCF) consistent with prior literature (e.g. Friedman, 1983; Bodie et al., 1987; Frank, 2002).

Firstly, LEV (long-term debt divided by total tangible assets) is a proxy for leverage. Higher leverage implies less debt covenant slack, higher probability of financial distress; and firms with higher leverage are likely to invest more in equities. Secondly, PROF (mean return on shareholders equity over the preceding ten years) is a proxy for long-term profitability. Less profitable firms are less likely to fulfil the fixed payments of retirees’ benefits and thus more likely to invest more in equities to maximize the value of the option to default (Sharpe, 1976). Thirdly, STDCF (standard deviation of operating cash flows over the preceding 10 years deflated by the book value of equity) is a proxy for firm risk. Firms with higher variability in their cash flows are likely to invest more in equity to maximize the ‘pension put’. Friedman (1983) finds a negative relation between firm risk, measured as income variability, and the percentage of assets invested in equities. He proposes a ‘risk offsetting story’ to interpret his finding. The argument is that risky firms tend to offset the risks by investing in less risky assets in their pension plans, such as bonds.
To control for the tax-based 'Black-Tepper' hypothesis, TAXST (total reported taxes minus the change in deferred taxes over the preceding 10 years deflated by beginning year total assets) is included as a proxy for firm's average tax rate. Firms with higher tax rate would gain more by investing the assets in fixed income securities. In addition to the above control variables, the maturity of the pension liabilities may be an important determinant affecting the asset allocation decision by UK sponsors in the current economic environment when most of funds gradually mature and demand non-trivial fixed benefit payments. Firms with mature pensions may wish to invest more assets in bonds so as to achieve better asset/liability matching, thus reduce the likelihood of the assets falling short of obligations.

Prior US-based studies find the plan demographics influences asset allocations (e.g. Amir and Benartzi, 1999; Friedman, 1983). PRET, measured as the percentage of vested member over total number of vested and non-vested members, is included to control for the maturity of pension plan. Finally, MKRTN (contemporaneous actual rate of return on a weighted market portfolio with an equivalent asset mix) is included to control for the argument that UK pension fund asset management is also partially driven by the herding behaviour, that is UK pension funds often benchmark their investment performance against other funds' performance and relevant market indices (Klumpes and Whittington, 2003).

The pension funding regression (Eq. 6.2) adopts the empirical framework employed by Francis and Reiter (1987) to explain corporate pension funding strategy, while controlling for the endogeneity among asset allocation (%EQUITY) and ERR assumption choices (ERR). The corporate finance
perspective holds the prediction that firms should over-fund their pensions because tax arbitrage enables firms to earn a tax-free rate of return on investment (Black, 1980; Tepper, 1981). Firms with a higher average tax rate are more likely to have a higher funded status. Thereby TAXST is included to control for the tax incentive for high level funding.

The ‘financial slack’ effect has emphasized the pension fund’s usefulness as a source of corporate liquidity or as a store of temporarily excess corporate funds (Myers and Majluf, 1984). Such slack could be kept in the form of either liquid assets, unused debt capacity or pension assets. Financial slack hypothesis predicts that the firms should over-fund its pensions to build excess assets which can accumulate at the pre-tax rate and be used when firms require funds to finance positive NPV projects. The proxy for the rate of undertaking new investments (RUNI), measured as the sum total of capital expenditure, acquisitions and R&D expenditure divided by total assets, controls for the ‘financial slack’ hypothesis of high level funding. Sharpe (1976) argues that ‘pension put’ is of greatest value to under-funded pension plans, therefore risky firms should under-fund their pensions to maximize the ‘put option’ value. Therefore, STDCF is included as a proxy to control for the firm risk to control for the ‘pension put option’ incentive of low level funding.

The ERR regression (Eq. 6.3) replicates the empirical model developed in Chapter 4 to explain cross-sectional variations in reported ERR levels. In addition, Eq. (6.3) includes the level of funding as an additional endogenous variable. Finally, Bodie et al. (1987) find a negative association between the size of the pension plan and the percentage of bonds allocated in the pension
portfolio. So a general control variable is included, plan size (LNSIZE), in all three equations (Eq. 6.3, Eq. 6.2, Eq. 6.3).

### 6.4.2. Estimation Methodology

There are several different estimation methods available for simultaneous-equations systems (Greene, 2000, p. 652). In general, ordinary least squares (OLS) method is not a desirable estimator if the equation to be estimated is one of a system of simultaneous structural equations. OLS would yield biased and inconsistent estimates of the system parameters because it ignores the distinction between explanatory endogenous and exogenous variables by applying least squares to each equation of the model separately (Greene, 2000). Therefore a Hausman specification test is performed on the equation system specified in section 6.4.1 to check the existence of endogeneity (Hausman, 1978). The result indicates that the exogeneity of asset allocation decision (%EQUITY) can be rejected at 5 percent level.

Wooldridge (2002) suggests that extensions of the least squares technique, such as two-stage least squares (2SLS) or three-stage least squares (3SLS) method, can be used to simultaneous-equations estimation. 2SLS is an appropriate technique when some of the right hand side variables are correlated with error terms, and there is neither heteroskedasticity nor contemporaneous correlation in the residuals. 3SLS is appropriate when explanatory variables are correlated with the error terms, and there is both heteroskedasticity and contemporaneous correlation in the residuals (Wooldridge, 2002). The F-test applied on the elements of the diagonal of the error covariance matrix of the simultaneous-equation system (specified in section 6.4.1) rejects the null hypothesis of homoskedasticity in the residuals at 1 percent level. A further
Breusch-Pagan test rejects the null hypothesis that there is no cross-equation contemporaneous correlation between errors. As a result, 3SLS is applied as the appropriate estimator for this study.

6.4.3. Sample and Data

The main constraint on the sample size is the availability of detailed pension asset composition.61 The proprietary asset allocation data are hand-collected from the professional publication ‘Pension Fund and Their Advisers’ book (‘PFTA’). The sample period consists of period over 1998-2002. During this period UK sponsors were subject to both legislative-imposed minimum funding solvency restrictions and differential pension accounting regulatory requirements. To be included in the sample, the sponsor firstly had to be a publicly listed FTSE 350 firm that sponsors at least one defined benefit pension scheme with complete pension asset allocation data available. Secondly, to increase the power of empirical tests, firms with more than 5 percent of their pension assets as ‘unclassified’ are deleted.62 Finally, firms with missing data required for analysis are deleted.

Following the above criteria, the complete asset allocation data can only be obtained between 60 to 70 firms per year. After eliminating outliers, the final sample comprises 279 firm-year observations. All the data used for this study is collected from the financial statements of the sample firms, Datastream and ‘PFTA’ book.

61 Frank (2002) also noted the obstacle to investigating DB investment policy is obtaining the asset allocation data necessary to compute percentage of bonds invested by pension funds.
62 Amir and Benartzi (1999) and Frank (2002) deleted firms with 5 percent of the assets that are ‘unclassified’ in their studies respectively.
### 6.4.4. Descriptive Statistics

#### TABLE 6.2

**Distribution of Pension Asset Composition by Year**

<table>
<thead>
<tr>
<th>Asset category</th>
<th>1998 (n=53)</th>
<th>1999 (n=56)</th>
<th>2000 (n=58)</th>
<th>2001 (n=55)</th>
<th>2002 (n=57)</th>
<th>ALL (n=279)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK Equity</td>
<td>54.54%</td>
<td>54.27%</td>
<td>51.65%</td>
<td>50.64%</td>
<td>44.20%</td>
<td>51.06%</td>
</tr>
<tr>
<td>OS Equity</td>
<td>18.19</td>
<td>18.26</td>
<td>18.36</td>
<td>22.77</td>
<td>20.60</td>
<td>19.64</td>
</tr>
<tr>
<td>UK Fixed Interest</td>
<td>7.95</td>
<td>8.37</td>
<td>8.64</td>
<td>8.02</td>
<td>12.48</td>
<td>9.09</td>
</tr>
<tr>
<td>OS Fixed Interest</td>
<td>2.57</td>
<td>2.52</td>
<td>2.37</td>
<td>2.26</td>
<td>1.53</td>
<td>2.25</td>
</tr>
<tr>
<td>Index Bonds</td>
<td>4.60</td>
<td>4.57</td>
<td>5.55</td>
<td>5.52</td>
<td>5.00</td>
<td>5.05</td>
</tr>
<tr>
<td>Property</td>
<td>3.23</td>
<td>3.03</td>
<td>3.07</td>
<td>2.01</td>
<td>3.04</td>
<td>2.88</td>
</tr>
<tr>
<td>Cash</td>
<td>5.95</td>
<td>5.68</td>
<td>4.56</td>
<td>2.87</td>
<td>2.86</td>
<td>4.38</td>
</tr>
<tr>
<td><strong>Total Equity</strong></td>
<td><strong>72.73</strong></td>
<td><strong>72.53</strong></td>
<td><strong>70.01</strong></td>
<td><strong>71.21</strong></td>
<td><strong>64.80</strong></td>
<td><strong>70.26</strong></td>
</tr>
<tr>
<td><strong>Total Bonds</strong></td>
<td><strong>15.12</strong></td>
<td><strong>15.46</strong></td>
<td><strong>16.56</strong></td>
<td><strong>15.80</strong></td>
<td><strong>19.01</strong></td>
<td><strong>16.39</strong></td>
</tr>
</tbody>
</table>

Table 6.2 presents the descriptive statistics on the distribution of pension asset composition in the sample. At the end of 1998, sponsoring firms allocate 72.73 percent of their assets to equities and 15.12 percent to fixed income securities. On average, the sample UK firms invest significantly more in equities than in bonds. This evidence is consistent with the pension asset allocation of relevant population. UK firms on average invest about 49-59 percent of their total pension funds in domestic equities and an additional 16-22 percent in international equities (Urwin, 2002). The allocation to equities dropped nearly 8
percent in 2002 for the sample firms and an increase of nearly 4 percent allocated to bonds. Overall the sample pension asset allocation displays a slow trend toward a greater percentage of bonds among the overall pension asset composition during the study period (1998-2002).

The dependent variable in the descriptive analysis is the percentage of pension assets allocated to equities (%EQUITY). Panel A of Table 6.3 presents the cross-sectional distribution of %EQUITY by year. %EQUITY varies significantly across the firms with a standard deviation of 13.66 for the pooled sample. To examine the frequency of asset allocation revisions, changes in %EQUITY are calculated over one, two and three years. Most firms maintain a constant allocation to equities (Table 6.3, panel B). Over a one-year period, more than 80 percent of the firms remained within 5 percentage points of their beginning allocation to equities. Over a three-year period, 80 percent of the firms decreased their allocation to equities by less than 12 percent, or increased it by less than 7 percent. Given the stability of equity allocation over the five year study period (1998-2002), this study focuses on cross-sectional differences in asset allocation rather than time-series changes.

Table 6.4 provides means and standard deviations for the regression variables required for estimating Eq. (6.3) by year. The average SSAP 24 funding ratio gradually declined from 1.144 in 1998 to 1.086 in 2002, reflecting the fall of the equity return since 2000. Over the same period, the maturity of pension plans increased by nearly 22 percent. The sensitivity measure of firms’ exposure to financial reporting risk has increased gradually over the period 1998-2002 as expected. It is also observed that firms’ profitability (PROF) exhibits a declining trend but the LNSIZE exhibits stability over the entire sample period.
<table>
<thead>
<tr>
<th>Quintile of Equity Investments</th>
<th>1998 (n=53)</th>
<th>1999 (n=56)</th>
<th>2000 (n=58)</th>
<th>2001 (n=55)</th>
<th>2002 (n=57)</th>
<th>ALL (n=279)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (less equities)</td>
<td>35.00</td>
<td>37.00</td>
<td>30.00</td>
<td>30.00</td>
<td>28.78</td>
<td>28.78</td>
</tr>
<tr>
<td>2</td>
<td>70.00</td>
<td>69.00</td>
<td>68.71</td>
<td>66.71</td>
<td>62.42</td>
<td>67.05</td>
</tr>
<tr>
<td>3</td>
<td>75.00</td>
<td>72.62</td>
<td>75.00</td>
<td>74.40</td>
<td>69.25</td>
<td>73.00</td>
</tr>
<tr>
<td>4</td>
<td>77.00</td>
<td>77.40</td>
<td>80.00</td>
<td>80.25</td>
<td>78.24</td>
<td>78.00</td>
</tr>
<tr>
<td>5 (more equities)</td>
<td>88.00</td>
<td>91.00</td>
<td>91.00</td>
<td>90.00</td>
<td>89.96</td>
<td>91.00</td>
</tr>
<tr>
<td>Mean</td>
<td>72.41</td>
<td>71.73</td>
<td>71.50</td>
<td>70.43</td>
<td>66.40</td>
<td>70.33</td>
</tr>
<tr>
<td>STD</td>
<td>9.91</td>
<td>11.74</td>
<td>14.18</td>
<td>14.19</td>
<td>15.68</td>
<td>13.66</td>
</tr>
<tr>
<td>t Test for Quintiles 5 versus 1</td>
<td>-5.85***</td>
<td>-11.96***</td>
<td>-14.36***</td>
<td>-8.93***</td>
<td>-6.96***</td>
<td>-18.13***</td>
</tr>
</tbody>
</table>

**Panel B**

The distribution of changes in equity investments

<table>
<thead>
<tr>
<th>Statistic (N)</th>
<th>Annual Changes (120)</th>
<th>2-Year Changes (80)</th>
<th>3-Year Changes (51)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-1.36%</td>
<td>-2.86%</td>
<td>-4.70%</td>
</tr>
<tr>
<td>Std. deviation</td>
<td>6.75</td>
<td>9.86</td>
<td>11.30</td>
</tr>
<tr>
<td>Minimum</td>
<td>-42.68</td>
<td>-42.66</td>
<td>-38.66</td>
</tr>
<tr>
<td>10th percentile</td>
<td>-6.00</td>
<td>-11.84</td>
<td>-11.68</td>
</tr>
<tr>
<td>Median</td>
<td>0.00</td>
<td>-1.00</td>
<td>-3.09</td>
</tr>
<tr>
<td>90th percentile</td>
<td>4.02</td>
<td>5.17</td>
<td>6.33</td>
</tr>
<tr>
<td>Maximum</td>
<td>22.00</td>
<td>22.00</td>
<td>22.00</td>
</tr>
</tbody>
</table>

*Equity investment is the percentage of the pension assets allocated to equities*
### TABLE 6.4

Descriptive Statistics on the Regression Variables by Year

<table>
<thead>
<tr>
<th>Variable (N)</th>
<th>Statistics</th>
<th>1998 (n=53)</th>
<th>1999 (n=56)</th>
<th>2000 (n=58)</th>
<th>2001 (n=55)</th>
<th>2002 (n=57)</th>
<th>ALL (n=279)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUND Mean</td>
<td>1.144</td>
<td>1.155</td>
<td>1.110</td>
<td>1.112</td>
<td>1.086</td>
<td>1.120</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.167</td>
<td>0.156</td>
<td>0.131</td>
<td>0.163</td>
<td>0.151</td>
<td>0.154</td>
<td></td>
</tr>
<tr>
<td>FUNDSQ Mean</td>
<td>1.337</td>
<td>1.359</td>
<td>1.249</td>
<td>1.262</td>
<td>1.202</td>
<td>1.280</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.403</td>
<td>0.369</td>
<td>0.298</td>
<td>0.370</td>
<td>0.331</td>
<td>0.356</td>
<td></td>
</tr>
<tr>
<td>ERR Mean</td>
<td>8.430</td>
<td>7.867</td>
<td>7.325</td>
<td>6.852</td>
<td>6.578</td>
<td>7.386</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.778</td>
<td>0.963</td>
<td>1.053</td>
<td>0.848</td>
<td>0.746</td>
<td>1.104</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>1.055</td>
<td>1.074</td>
<td>1.644</td>
<td>1.688</td>
<td>1.340</td>
<td>1.367</td>
<td></td>
</tr>
<tr>
<td>LEV Mean</td>
<td>0.183</td>
<td>0.188</td>
<td>0.205</td>
<td>0.221</td>
<td>0.269</td>
<td>0.215</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.136</td>
<td>0.128</td>
<td>0.129</td>
<td>0.146</td>
<td>0.284</td>
<td>0.182</td>
<td></td>
</tr>
<tr>
<td>STDCF Mean</td>
<td>0.087</td>
<td>0.224</td>
<td>0.130</td>
<td>0.155</td>
<td>0.128</td>
<td>0.146</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.079</td>
<td>0.672</td>
<td>0.134</td>
<td>0.170</td>
<td>0.131</td>
<td>0.330</td>
<td></td>
</tr>
<tr>
<td>TAXST Mean</td>
<td>0.032</td>
<td>0.027</td>
<td>0.032</td>
<td>0.025</td>
<td>0.065</td>
<td>0.024</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.227</td>
<td>0.029</td>
<td>0.042</td>
<td>0.021</td>
<td>0.038</td>
<td>0.033</td>
<td></td>
</tr>
<tr>
<td>PRET Mean</td>
<td>0.426</td>
<td>0.421</td>
<td>0.445</td>
<td>0.490</td>
<td>0.517</td>
<td>0.462</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.226</td>
<td>0.217</td>
<td>0.241</td>
<td>0.263</td>
<td>0.237</td>
<td>0.237</td>
<td></td>
</tr>
<tr>
<td>LNSIZE Mean</td>
<td>5.681</td>
<td>5.881</td>
<td>5.970</td>
<td>5.947</td>
<td>6.338</td>
<td>5.979</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>1.366</td>
<td>1.323</td>
<td>1.432</td>
<td>1.397</td>
<td>1.021</td>
<td>1.309</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>47.867</td>
<td>25.908</td>
<td>19.527</td>
<td>20.392</td>
<td>15.789</td>
<td>27.998</td>
<td></td>
</tr>
<tr>
<td>MKRTN Mean</td>
<td>29.054</td>
<td>10.702</td>
<td>11.708</td>
<td>-6.526</td>
<td>-1.114</td>
<td>8.450</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>1.818</td>
<td>0.926</td>
<td>2.340</td>
<td>2.930</td>
<td>0.880</td>
<td>12.157</td>
<td></td>
</tr>
<tr>
<td>RUNI Mean</td>
<td>0.09</td>
<td>0.08</td>
<td>0.07</td>
<td>0.06</td>
<td>0.06</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>SGR Mean</td>
<td>6.12</td>
<td>5.58</td>
<td>5.14</td>
<td>4.65</td>
<td>4.33</td>
<td>5.15</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.82</td>
<td>0.89</td>
<td>0.87</td>
<td>0.71</td>
<td>0.65</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>AROA Mean</td>
<td>0.26</td>
<td>0.14</td>
<td>0.02</td>
<td>0.09</td>
<td>0.18</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>0.04</td>
<td>0.05</td>
<td>0.08</td>
<td>0.03</td>
<td>0.07</td>
<td>0.06</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 6.4 (Continued)

Variable definitions:

\( \%EQUITY \) = percentage of pension fund portfolio invested in equities;

\( FUND \) = reported funding status under SSAP 24;

\( FUNDSQ \) = the squared value of \( FUND \);

\( ERR \) = expected rate of return on pension assets assumption;

\( PENRISK \) = natural logarithm of the ratio of market value of pension assets to total net assets;

\( LEV \) = firms' leverage ratio defined as total short-term plus long-term debt, scaled by shareholders' equity adjusted for pension expenses;

\( PROF \) = mean of return on shareholders' equity over the preceding 10 years;

\( STDCF \) = standard deviation of operating cash flows (earnings before extraordinary items plus depreciation expense) over the preceding 10 years deflated by the book value of equity;

\( TAXST \) = total reported taxes minus the change in deferred taxes over the preceding year deflated by beginning year total assets;

\( PRET \) = percentage of vested members over total number of vested and non-vested members, a proxy for the maturity of pension plans;

\( LNSIZE \) = natural logarithm of market value of pension assets;

\( ARR \) = contemporaneous actual rate of return on pension fund investment;

\( SGR \) = salary growth rate assumption;

\( MKRTN \) = contemporaneous actual rate of return on a weighted market portfolio with an equivalent asset mix;

\( RUNI \) = (capital expenditures + acquisitions + R&D)/total assets (rate of undertaking new investment);

\( \Delta ROA \) = change in operating earnings deflated by beginning total assets adjusted for pension expenses.

6.5. RESULTS

6.5.1. Univariate Analysis

Table 6.5 examines the relation between each of the independent variables in Eq (6.1) and \( \%EQUITY \), using a nonparametric portfolio analysis. Each independent variable is divided into five equal-size portfolios, where portfolio 1(5) contains firms with the lowest (highest) values. The relation between the funding ratio of the pension plan (\( FUND \)) and equity allocation is consistent with the non-linear relationship as predicted in hypothesis H6.2. The allocation to equities increases from 67.43 percent for the first quintile to 71.79 for the fourth quintile, and then it decreases to 68.24 for the fifth quintile.
Consistent with hypothesis H6.1, the measure of firms’ sensitivity to financial reporting risk (PENRISK) is statistically significant in explaining the allocation to equities. Firms with highest exposure to financial reporting risk (fifth quintile) allocate 65.77 percent of pension assets to equities, whereas firms with the smallest exposure (first quintile) allocated 75.99 to equities.

It is found that a negative association between the maturities of the pension plans and equity allocation. Firms with the more mature pension funds (fifth quintile) allocate 55.46 percent of pension assets to equities, whereas firms with younger funds (first quintile) allocate 75.71 percent. This evidence is consistent with prior findings in Amir and Benartzi (1999) and Peterson (1996) that firms with more mature age distribution of plan participants allocate more in bonds than equities.

The effect of long-term profitability (PROF) and pension fund size (LNSIZE) are statistically significant in explaining the allocation to equities. More profitable firms (fifth quintile) allocate 76.93 percent to equities, whereas less profitable firms (first quintile) allocate 62.56 percent to equities. Finally, firms with smaller pension funds invest more in equities. The firms sponsoring smallest pension funds allocate 75.47 percent to equities, while the firms sponsoring largest pension funds allocate 67.75 percent to equities.
TABLE 6.5
Mean Equity Investments by Quintile of the Independent Variable in Eq. (6.1)

<table>
<thead>
<tr>
<th>Independent Variables used to form quintiles</th>
<th>Quintile of the Independent Variable</th>
<th>t Test for Quintiles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(low)1</td>
<td>2</td>
</tr>
<tr>
<td>FUND</td>
<td>67.43</td>
<td>69.38</td>
</tr>
<tr>
<td>PENRISK</td>
<td>75.99</td>
<td>72.35</td>
</tr>
<tr>
<td>ERR</td>
<td>66.61</td>
<td>69.40</td>
</tr>
<tr>
<td>LEV</td>
<td>72.37</td>
<td>70.48</td>
</tr>
<tr>
<td>PROF</td>
<td>62.56</td>
<td>68.34</td>
</tr>
<tr>
<td>STDCF</td>
<td>73.71</td>
<td>71.09</td>
</tr>
<tr>
<td>TAXST</td>
<td>65.93</td>
<td>68.33</td>
</tr>
<tr>
<td>PRET</td>
<td>75.71</td>
<td>77.22</td>
</tr>
<tr>
<td>MKRTN</td>
<td>73.94</td>
<td>63.37</td>
</tr>
<tr>
<td>LNSIZE</td>
<td>75.47</td>
<td>68.48</td>
</tr>
</tbody>
</table>

Variable definitions:
- **FUND** = reported funding status under SSAP 24;
- **PENRISK** = natural logarithm of the ratio of market value of pension assets to total net assets;
- **ERR** = expected rate of return on pension assets assumption;
- **LEV** = firms' leverage ratio defined as total short-term plus long-term debt, scaled by shareholders' equity adjusted for pension expenses;
- **PROF** = mean of return on shareholders' equity over the preceding 10 years;
- **STDCF** = standard deviation of operating cash flows (earnings before extraordinary items plus depreciation expense) over the preceding 10 years deflated by the book value of equity;
- **TAXST** = total reported taxes minus the change in deferred taxes over the preceding year deflated by beginning year total assets;
- **PRET** = percentage of vested members over total number of vested and non-vested members, a proxy for the maturity of pension plans;
- **MKRTN** = contemporaneous actual rate of return on a weighted market portfolio with an equivalent asset mix;
- **LNSIZE** = natural logarithm of market value of pension assets.
6.5.2. Results from Simultaneous-equation Estimation

Table 6.6 presents results from three-stage least squares (3SLS) estimation of the simultaneous equation model of Eq. (6.1), (6.2) and (6.3) for the pooled sample. Panel A, table 6.6 reports results from estimating Eq. (6.1), the asset allocation model of the primary interest. Consistent with hypothesis H6.2, the effect of funding level on asset allocation follows a non-linear relationship. The coefficient on FUNDSQ is negative and significant at 5 percent level. This finding suggests that the sample firms with extremely over-funded and under-funded pension plans allocated more pension assets into bonds than equities. This allocation strategy can minimize the cash flow risk caused by volatile pension contributions, as extreme under-funded plans have stronger incentive to avoid the accelerated funding requirements and over-funded plans have stronger incentive to avoid exceeding the full-funding limits.

A second finding of most interest in the Eq. (6.1) is the significant positive relationship between firms’ long-term profitability (PROF) and equity allocation. The ‘pension put’ hypothesis predicts that less profitable firms should be investing their pension portfolio in equities to maximize the value of the ‘put’ option. By contrast, this finding suggests that sample firms with higher long-run profitability have allocated higher percentage of their pension assets in equities, consistent with the univariate analysis in section 6.5.1.
<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>%EQUITY (Panel A: Eq. 6.1)</th>
<th>FUND (Panel B: Eq. 6.2)</th>
<th>ERR (Panel C: Eq. 6.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pred Sign</td>
<td>Est</td>
<td>t-Stat</td>
</tr>
<tr>
<td>FUND</td>
<td>+</td>
<td>15.551**</td>
<td>1.86</td>
</tr>
<tr>
<td>%EQUITY</td>
<td>+</td>
<td>0.037</td>
<td>0.86</td>
</tr>
<tr>
<td>ERR</td>
<td>+</td>
<td>-6.416**</td>
<td>-1.79</td>
</tr>
<tr>
<td>FUNDSQ</td>
<td>-</td>
<td>-0.054*</td>
<td>-1.42</td>
</tr>
<tr>
<td>PENRISK</td>
<td>+</td>
<td>0.061</td>
<td>0.52</td>
</tr>
<tr>
<td>LEV</td>
<td>+</td>
<td>0.006**</td>
<td>2.06</td>
</tr>
<tr>
<td>PROF</td>
<td>+</td>
<td>0.004</td>
<td>0.03</td>
</tr>
<tr>
<td>STDCF</td>
<td>+</td>
<td>0.645</td>
<td>0.85</td>
</tr>
<tr>
<td>TAXST</td>
<td>+</td>
<td>0.233</td>
<td>-</td>
</tr>
<tr>
<td>PRET</td>
<td>-</td>
<td>0.056***</td>
<td>-3.17</td>
</tr>
<tr>
<td>ΔROA</td>
<td>-</td>
<td>0.002</td>
<td>-0.21</td>
</tr>
<tr>
<td>ARR</td>
<td>-</td>
<td>0.223</td>
<td>-0.98</td>
</tr>
<tr>
<td>SGR</td>
<td>+</td>
<td>0.002</td>
<td>-0.21</td>
</tr>
</tbody>
</table>

1Eq. (3a) R-sq=0.1086 (P<0.001); Eq. (3b) R-sq=0.2475 (P<0.001); Eq. (3c) R-sq=0.7446 (P<0.001)

* significant at 10% ** significant at 5% *** significant at 1% for one-tail test
TABLE 6.6 (continued)

Variable definitions:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>%EQUITY=</td>
<td>percentage of pension fund portfolio invested in equities;</td>
</tr>
<tr>
<td>FUND=</td>
<td>reported funding status under SSAP 24;</td>
</tr>
<tr>
<td>FUNDSQ=</td>
<td>the squared value of FUND;</td>
</tr>
<tr>
<td>ERR=</td>
<td>expected rate of return on pension assets assumption;</td>
</tr>
<tr>
<td>PENRISK=</td>
<td>natural logarithm of the ratio of market value of pension assets to total net assets;</td>
</tr>
<tr>
<td>LEV=</td>
<td>firms’ leverage ratio defined as total short-term plus long-term debt, scaled by shareholders’ equity adjusted for pension expenses;</td>
</tr>
<tr>
<td>PROF=</td>
<td>mean of return on shareholders’ equity over the preceding 10 years;</td>
</tr>
<tr>
<td>STDCF=</td>
<td>standard deviation of operating cash flows (earnings before extraordinary items plus depreciation expense) over the preceding 10 years deflated by the book value of equity;</td>
</tr>
<tr>
<td>TAXST=</td>
<td>total reported taxes minus the change in deferred taxes over the preceding year deflated by beginning year total assets;</td>
</tr>
<tr>
<td>PRET=</td>
<td>percentage of vested members over total number of vested and non-vested members, a proxy for the maturity of pension plans;</td>
</tr>
<tr>
<td>LNSIZE=</td>
<td>natural logarithm of market value of pension assets;</td>
</tr>
<tr>
<td>ARR=</td>
<td>contemporaneous actual rate of return on pension fund investment;</td>
</tr>
<tr>
<td>SGR=</td>
<td>salary growth rate assumption;</td>
</tr>
<tr>
<td>MKRTN=</td>
<td>contemporaneous actual rate of return on a weighted market portfolio with an equivalent asset mix;</td>
</tr>
<tr>
<td>RUNI=</td>
<td>(capital expenditures+ acquisitions+ R&amp;D)/total assets (rate of undertaking new investment);</td>
</tr>
<tr>
<td>ΔROA=</td>
<td>change in operating earnings deflated by beginning total assets adjusted for pension expenses.</td>
</tr>
</tbody>
</table>
This result appears to provide some support for ‘risk-offsetting’ story advocated by Friedman (1983) that the less profitable firms face higher risk to default on fixed payments, thus prefer bonds to equities. Consistent with hypothesis H6.1, the coefficient on PENRISK is of negative sign as predicted, and significant at 10 percent level.

Finally, the results in panel A, Table 6.6 suggest that the maturity of sponsored pension fund is statistically significant in explaining pension asset allocation decision. Other things being equal, the percentage of pension assets allocated to equities decreases as the pension fund maturity increases. However, the evidence is not supportive of hypothesis H6.3 (Panel A, Table 6.6). The coefficient of the ERR assumption is not statistically significant at conventional level. This finding suggests that managers’ reporting discretion over ERR assumption is mitigated by factors uncorrelated with the underlying incentive to allocation of pension assets between equities and bonds.

6.5.3. Robustness Tests

The pooled time-series, cross-sectional regression assumes the coefficients are consistent across time and firms and the residuals are independent. To assess the sensitivity of the results to data choices and model specification, the asset allocation model is re-estimated using fixed effects panel regression to control for firm-specific factors that may affect pension asset allocation decision. The results from fixed-effects regression as presented in Table 6.7 are consistent with the 3SLS estimates as far as the main variables on pension funding (FUND) and the sensitivity measure on firms’ financial report risk (PENRISK) are concerned. The coefficient on PENRISK remains negative and significant at 5 percent level, and the coefficient for FUND is positive and
significant. The coefficient for FUNDSQ is negative and significant at 5 percent level. In summary, the sensitivity test indicates that the findings are not driven by dependence among observations or the set of control variables included.

### TABLE 6.7

Sensitivity Tests of Asset Allocation Eq. (6.1)  
( Fixed Effect Estimators)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pred. Sign</th>
<th>Coeff.</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNDSQ</td>
<td>-</td>
<td>3.501</td>
<td>-2.25**</td>
</tr>
<tr>
<td>PENRISK</td>
<td>-</td>
<td>-0.031</td>
<td>-2.18**</td>
</tr>
<tr>
<td>LEV</td>
<td>+</td>
<td>0.115</td>
<td>1.14</td>
</tr>
<tr>
<td>PROF</td>
<td>+</td>
<td>0.007</td>
<td>0.09</td>
</tr>
<tr>
<td>STDCF</td>
<td>+</td>
<td>0.051</td>
<td>0.17</td>
</tr>
<tr>
<td>TAXST</td>
<td>-</td>
<td>0.456</td>
<td>-1.62</td>
</tr>
<tr>
<td>PRET</td>
<td>-</td>
<td>0.275</td>
<td>-2.04**</td>
</tr>
<tr>
<td>MKRTN</td>
<td>-</td>
<td>0.002</td>
<td>-0.63</td>
</tr>
<tr>
<td>LNSIZE</td>
<td>-</td>
<td>0.019</td>
<td>1.44</td>
</tr>
<tr>
<td>Adj-R²</td>
<td></td>
<td>0.179</td>
<td></td>
</tr>
</tbody>
</table>

* significant at 10%  ** significant at 5%  *** significant at 1% for one-tail test  
Variable definitions see Table 6.1
6.6. CONCLUSION

This Chapter contributes to the prior empirical literature on pension asset allocation in three ways. First, it takes theoretical insights from asset/liability or surplus return models of optimal asset allocation in hypothesis development. Second, it analyzes the effect of cross-sectional variations in funding level on pension asset allocation from alternative corporate risk management perspective. Third, it expands prior research by controlling for simultaneity among asset allocation, pension funding and related pension reporting choices.

This Chapter examines the UK firms’ management of their pension fund asset allocation and its inter-relationship with their pension funding and pension-related accounting policy over an extended period (1998-2002), during which new pension accounting standard (FRS 17) was debated, promoted and the transitional compliance was in effect. Controlling for the endogeneity among asset allocation, pension funding and expected rate of return assumption, the empirical evidence suggests that managerial discretion over asset allocation is consistent with a risk management explanation (i.e. firms seek to minimize cash contribution risks associated with adopting ‘fair value’ based pension accounting rules). In addition, it is found that the percentage of assets invested in equities is increasing with the pension funding level, and decreasing at an increasing rate as the funding level increases. In other words, the effect of pension funding on asset allocation exhibits a non-linear relationship. Contrary to prior research, the results in their entirety support the view that UK sponsors have incorporated their corporate risk management practices into the allocation of their pension assets.
7. SUMMARY AND CONCLUSIONS

7.1. SUMMARY OF FINDINGS

This thesis investigates whether the observed economic consequences of the change of pension accounting regulation from SSAP 24 to FRS 17 are consistent with hypotheses predicted by alternative theoretical perspectives on employers' pension accounting. Specifically, the impact of pension accounting rule change is being investigated empirically on pension termination and asset allocation decision by UK corporate sponsors, and its linkages with pension-related accounting choices.

Chapter 4 of the thesis examines whether UK managers exercise the discretion over actuarial valuation assumptions to manage the contents of financial statements during the study period 1998-2002, a time frame covering both pre- and post- FRS 17 period. Evidence is found that the level of the expected rate of return on pension assets assumption (ERR) chosen by UK sponsoring firms is driven by the financial statement concern over the balance sheet leverage. This factor is consistently significant over the entire study period, consistent with the corporate finance view's prediction that the pension-related accounting choices made by a firm are systematically related to managerial short-term financial reporting incentives.

Chapter 5 of the thesis corroborates findings in Chapter 4 in the study on corporate decision to terminate their defined benefit pension plans. This study contributes new evidence to the pension termination literature that decisions made on these long-term pension promises are not independent of corporate
pension reporting choices. In addition, the results in Chapter 5 suggest that firms which terminated their under-funded defined benefit pension plan did so in part due to the potential adverse impact of FRS 17 on the balance sheet because contractual obligations are specified in terms of book leverage.

Drawing upon findings from Chapter 4 and Chapter 5, Chapter 6 of the thesis presents a related study investigating whether sponsoring firms may manage their pension asset allocation in a way so as to mitigate the leverage and/or other risk-determining characteristics in response to changing pension accounting regulation. Controlling for the endogeneity among asset allocation, pension funding and expected rate of return assumption, Chapter 6 documents evidence that the relationships among asset allocation, pension funding and related pension reporting choices are, for most part, consistent with the corporate risk management objective of hedging the cash contribution risk that stems from their long-term pension obligations.

7.2. IMPLICATIONS OF THE STUDY

This thesis has provided some unique insights into the change of UK pension accounting rule that has been debated and promoted in the context of competing theoretical perspectives concerning employers’ pension liabilities. The pension accounting rule change from SSAP 24 to FRS 17 in the UK reflects some long-standing controversies in professional accounting and actuarial literature since the 1980s: (i) pension actuarial discounting assumptions; (ii) the necessity of pension asset/liability recognition; (iii) cost-based versus market-based valuation methodology. FRS 17 has substantially changed the valuation basis of employers’ pension assets and liabilities, annual pension costs, liability
recognition and pension footnote disclosures. Both the concepts and the pension-related disclosures resulting from the new UK pension accounting rule (FRS 17) have promoted a more integrative view of the corporate pension sponsorship.

Most importantly, the accounting standard setting bodies across OECD countries are increasingly adopting a 'fair value' pension accounting model as espoused under FRS 17. The pension accounting rule change in the UK has altered perceptions on the nature of the corporate pension sponsorship and risks inherent in providing long-term pension promises. Findings of this thesis in its entirety suggests that the corporate finance perspective of employers and their sponsored pension funds comprising a single economic entity promoted by FRS-17 style pension accounting rule has important financial consequences for UK corporate managements.

As such, it can be concluded that the role of 'fair value' based pension accounting can be:

(i) a 'saviour': both the conceptual changes and transparency of information resulting from the change in pension accounting standard have promoted a more integrative view of the relationship between pension funds and their employer sponsors.

(ii) a 'destabiliser': the volatility inherent in 'fair value' reporting and short-termist management of corporate financial policy might conflict with long-term funding adequacy and security of defined benefit pension plans.

During the changing regulation period (1998-2002) investigated in this thesis, the contracting cost incentives underlying UK managers' actuarial assumption choices appear to be stronger since when new pension accounting
standard (FRS 17) was issued. Moreover, empirical evidence suggests a linkage between firms' pension termination decision and managers' discretion over their actuarial assumptions. These findings have implications to pension accounting standard setters in that the 'fair value' model in pension accounting appears to be susceptible to reliability problems arising from managers' short-term reporting incentives.

7.3. LIMITATIONS

It is noted that the findings in this thesis are subject to certain limitations. The generalisation of its findings is reduced by the use of a relatively small sample size in empirical studies presented in this thesis. The small sample size is partially caused by the limited data availability on pension actuarial assumptions disclosed on the pension footnote, termination and asset allocation information of UK sponsors. In particular, in the study on firms' decision to terminate their defined benefit pension plan (Chapter 5), the use of small dataset is limiting the finding on a statistically significant relationship between termination decision and firm leverage.

Furthermore, the research design employed in the asset allocation study (Chapter 6) has not provided a way to control for the possibility that firms can choose to terminate their sponsored pension plans in order to mitigate the potential financial reporting risk as postulated due to the adoption of FRS 17-style pension accounting rule. Finally, due to the lack of pension liability data on UK sponsoring firms, the measure of long-term funding ratio that is used in this thesis is the one that is disclosed in the footnote of sponsoring firm's financial statement. This measure is likely to be a noisy measure because managers use
differing actuarial concepts in estimating pension liabilities, or even exercise discretion to pension discount rate for opportunistic objectives.

7.4. SUGGESTIONS FOR FURTHER RESEARCH

Changing perspectives about defining the nature and scope of employers’ pension commitments have influenced recent UK pension accounting standard setting activities, and these developments have implications for evaluating the existing strand of empirical research concerning the value relevance of pension disclosures.

One interesting and potentially fertile area of research that pertains to this thesis is whether firms electing to disclose their pension exposures based on market (rather than actuarial cost-based) valuation principles provide potentially value relevant information to the investors. As suggested in Chapter 5, at least some UK firms updated their ERR assumptions as reported under requirements of SSAP 24, while others followed SSAP 24 literally by reporting ‘sticky’ ERR assumptions that are not adjusted in accordance to current market conditions. If interest rates change rapidly and market conditions are volatile, the sensitivity of reported pension assets and/or liabilities will be potentially value relevant to capital market participants. The empirical implications of such questions still await confirmation from future research.

Another fertile area of future research in pension accounting is to examine the empirical implications of insurance perspective concerning pension contractual arrangement. Neither of the polemic views of corporate finance perspective and labour economics perspective about the economic relationship
between pension plans and employer sponsors appears to accord entirely with either pension law or economic reality (Bodie, 1990; Klumpes, 2001). Instead the insurance perspective makes an economically more plausible assumption that shareholders and employees both have complex contingent claims over pension surpluses and deficits. However, the empirical implications of insurance perspective for corporate funding and investment decisions have to date received scant attention from accounting researchers. The insurance perspective may provide further insights into understanding long-term pension commitments as a retirement income insurance provided by employers to employees.
BIBLIOGRAPHY


Accounting Standards Committee. 1988. SSAP 24, Accounting for the Cost of Pensions. London: ASC.


Economist. 2004. Time to end a scandal. 28 October.


—. 1985. SFAS 87 *Employers’ Accounting for Pensions*. Stamford, CT: FASB.

—. 1990. SFAS 106 *Employers’ Accounting for Postretirement Benefits other than Pensions*. Norwalk, CT: FASB.


Gordon, T. 1999. The price of actuarial values. *Presented at the Staple Inn Actuarial Society (February).*


USA Today, 2002. Pension revenue can mislead investors. 5 September.


APPENDICES

APPENDIX A: TYPES OF EMPLOYER SPONSORED PENSIONS IN THE UK

The pension promise is inherently a long-term compensation arrangement. Under this agreement, a worker earns ("accrues") a right to an eventual pension benefit, payable after the employee attains certain eligibility criteria, with benefits frequently commencing at retirement and continuing until death. Two types of occupational pension schemes are commonly used by UK employers to provide retirement benefits to their employees: defined benefit pension schemes and defined contribution pension schemes.

Under a final salary scheme the benefits to be provided are defined in advance based on earnings and years of service, and the contributions are calculated to secure these benefits. The key type of defined benefit pension schemes is the final salary scheme. Over 90 percent of active members of occupational pension schemes belong to final salary schemes. Under such schemes retirement benefits are expressed as a fraction (frequently 1/60th or 1/80th) of the scheme member's final pensionable salary at retirement age multiplied by the member's year of pensionable service. Employers' contributions to a defined benefit scheme depend on actuarial calculations that project the likely cost of the promised benefits when workers retire, taking account of such factors as life expectancy, likely workforce turnover, future pensionable earnings, and assumed investment returns. The annual pension benefit paid, however, does not depend on actual pension fund returns, since when actual returns are lower than expected; the employer is ultimately responsible for covering the shortfall.
In contrast, a defined contribution scheme defines the contribution to be paid to the scheme in advance and the retirement benefits payable depend only upon the cumulated value of contribution amounts, as well as related investment earnings. Money purchase scheme is the main type of defined contribution scheme in the UK. Under money purchase schemes contributions are attributed to the benefit of individual members, earning either a fixed or variable rate of return. The actual benefit at retirement, on leaving service or at death, is a function of the rate of return and the duration of the investment. The total amount of pension benefits payable depend on market rates for annuities at the date of retirement and not on the individual’s final salary. Therefore investment risks are borne by employees under a defined contribution pension scheme.
APPENDIX B: CHRONOLOGY OF DEVELOPMENT OF UK AND INTERNATIONAL PENSION ACCOUNTING STANDARDS

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Pension Accounting Rule Development</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Panel A: UK Pension GAAP</td>
</tr>
<tr>
<td>1983</td>
<td>Exposure Draft</td>
<td>ASC proposes UK firms to disclose pension cost information by way of footnote</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>Exposure Draft</td>
<td>ASC proposes UK firms footnote funding ratio and discount assumption</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>SSAP 24</td>
<td>ASC implements ED39; SSAP 24 effective 1990</td>
</tr>
<tr>
<td>1995</td>
<td>Discussion Paper</td>
<td>ASB discusses deficiencies related to SSAP 24;</td>
</tr>
<tr>
<td>1998</td>
<td>Discussion Paper</td>
<td>ASB restates intention to require UK firms to recognize pension assets and liabilities on balance sheets; in favour of market-based valuation methodology</td>
</tr>
<tr>
<td>1999</td>
<td>FRED 20</td>
<td>ASB proposes UK firms to recognise pension assets and liabilities using market-based assumptions</td>
</tr>
<tr>
<td>2000</td>
<td>FRS 17</td>
<td>ASB implements FRED 20; FRS 17 effective 2003</td>
</tr>
<tr>
<td>2002</td>
<td>FRS 17</td>
<td>ASB postpones implementing FRS 17 until 2005 for re-issue of IAS 19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Panel B: International Pension GAAP</td>
</tr>
<tr>
<td>1983</td>
<td>IAS 19</td>
<td>IASC requires firms to disclose pension information by way of footnote</td>
</tr>
<tr>
<td>1996</td>
<td>Exposure Draft</td>
<td>IASC proposes valuation of pension assets/liabilities using market-based assumptions</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Revised IAS 19</td>
<td>IASC implements ED 54</td>
</tr>
</tbody>
</table>
APPENDIX C: ACCOUNTING DEFINITION OF ALTERNATIVE MEASURES OF REPORTED PENSION LIABILITIES

Pesando and Clarke (1983) examine accounting implications of pensions as labour markets institutions. In their exploratory study, Pesando and Clarke (1983) delineate two competing economic models of the labour market, the 'implicit lifetime contract' and the 'spot contract' model, each of which they conclude bearing important implications on employers' pension accounting.

Under the 'implicit lifetime contract' model, firms are a long-term 'going-concern' and employees' total compensation is not necessarily equal to the value of their labour services performed on a periodic basis (Pesando and Clarke, 1983). An 'implicit lifetime contract' assumes a strong moral commitment between the firm and its employees, extending beyond the legal binding labour contract. Firms are therefore confronted with the ongoing need to recognize the accrued liability for the funding of future service costs. The projected benefit obligation (PBO) is the actuarial present value, on a specified date, of benefits attributed by the pension plan’s benefit formula to employee services rendered prior to that date, assuming the plan continues in operation and that service and earnings of active participants increase at projected rates. According to Pesando and Clarke (1983), the PBO simply represents one component of the employer’s long-term compensation obligation, and is the most consistent with 'implicit lifetime contract' model.

Pesando and Clarke (1983) also argue that those who analyze the tax and related pension issues from the perspective of corporate finance perspective tend to adopt an 'explicit spot contract model', that assumes nothing but a legal
relationship exists between the employer and employee and employers thus can easily terminate pension plans. The accumulated benefit obligation (ABO) is the actuarial present value of benefits attributed by the pension plan’s benefit formula to employee service rendered before a specified valuation date, based upon employee service and compensation prior to that date. This measure of pension liabilities is also a ‘wind-up’ measure since it identifies the precise amount that the firm would be required to discharge its ‘explicit’ legal obligation if the pension plan were terminated.