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Managing Investment Risk in Defined Benefit Pension Funds

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MANAGING INVESTMENT RISK IN DEFINED BENEFIT PENSION FUNDS

By Dorothee Franzen

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ABSTRACT/RÉSUMÉ

Managing investment risk in defined benefit pension funds

This paper inquires into the forces that drive the practice of risk management at defined benefit (DB) pension funds in Germany, Netherlands, United Kingdom and the United States in the aftermath of the perfect pension storm. First, pension funds' risk management is grounded in the context of the development of modern risk management in the financial industry more general. Second, focusing solely on single-employer sponsored DB pension funds this research critically examines the impact of recent changes in the regulatory and accounting environment for pension funds and their sponsors thereby explicitly taking into account the specific governance context in which pension funds are situated. The aim of this research is, first, to provide a better understanding of the investment risk management of DB pension funds thereby contributing to the theory of financial decision-making. Second, by conducting this analysis on a cross-country basis, this research aims at contributing to the comparative analysis of pension funds. This paper argues that the risk-taking capacity is a central element of DB pension funds. The empirical results suggest that in general risk management has become much more sophisticated but that it is often driven more by regulatory and accounting issues than by the pension fund's specific risk profile. Furthermore, changes to the regulatory and accounting standards increasingly impede the risk-taking capacity of DB pension funds. This research draws on in-depth interviews with market participants within the pension fund industry and their advisers.

JEL codes: G23, J32

Keywords: Pension funds, defined benefit, risk management, investment, regulation, governance

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Les dispositifs de retraite à prestations définies et la gestion du risque d'investissement

Le présent document analyse les ressorts de la gestion des risques telle qu'elle est pratiquée par les dispositifs de retraite à prestations définies en Allemagne, aux États-Unis, aux Pays-Bas et au Royaume-Uni au lendemain de la violente tempête qui a ébranlé le secteur des retraites. Premièrement, cette gestion des risques s'ancre dans le contexte plus général de l'élaboration d'une gestion des risques moderne par le milieu de la finance. Deuxièmement, en s'attachant exclusivement aux dispositifs à prestations définies mono-employeurs, ce document examine d'un point de vue critique les répercussions des évolutions récentes du cadre réglementaire et comptable applicable aux régimes de retraite et à leurs promoteurs, prenant ainsi explicitement en compte les mécanismes de gouvernance spécifiques de ces régimes. L'objectif de cette étude est, dans un premier temps, de mieux appréhender la gestion du risque d'investissement par les dispositifs de retraite à prestations définies, et d'étayer ainsi la théorie de la décision financière. En s'intéressant à plusieurs pays, les auteurs de ce document entendent dans un deuxième temps contribuer à l'analyse comparative des régimes de retraite. Ils font ainsi valoir que la capacité de prendre des risques est fondamentale pour les dispositifs à prestations définies. Les résultats empiriques donnent à penser que de manière générale, la gestion des risques a sensiblement gagné en complexité, mais qu'elle dépend souvent davantage de problématiques réglementaires et comptables que du profil de risque propre aux dispositifs de retraite à prestations définies. De plus, les modifications des normes réglementaires et comptables pèsent de plus en plus sur l'aptitude de ces régimes à prendre des

risques. Ce document s'appuie sur des entretiens approfondis menés avec des participants au marché des retraites et leurs conseillers.

Codes JEL : G23, J32

Mots clés : Dispositifs de retraite, prestations définies, gestion des risques, réglementation, gouvernance

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By Dorothee Franzen[1]

Introduction

Occupational pension funds operate along a simple mechanism: Contributions are being paid into the fund, which are subsequently invested on the capital markets, and finally paid out in the form of pension benefits. But as the operational variables implied in this process are uncertain, this mechanism is inescapably embedded in risk. Investment returns are uncertain, and this holds true for mortality or salary trends as well. Pension funds are inevitably active risk takers. The two most important risk categories pension funds take are investment and longevity risk[2]. Unlike defined contribution (DC) pension funds, which re-distribute these risks to their participants, defined benefit (DB) pension funds, which give the employee the security of a pre-defined pension benefit, perform their task of providing safe pension benefits by assuming and retaining risk. DB pension funds can become complex risk-sharing institutions, as they may subsequently re-distribute risk between the different groups of stakeholders. The risks pension funds take need to get managed. But managing risk is not equivalent to avoiding risk. This paper argues that the risk-taking capacity is a central element of defined benefit (DB) pension funds. Moreover, this capacity is increasingly impeded by regulatory and accounting standards with longstanding detrimental effects threatening the future existence of DB pension funds.

Pension funds are faced with the second financial crises within less than ten years. The 2007/2008 financial crisis seems to have repeated and amplified the shock waves that the previous crisis between 2000 and 2003 sent to pension funds throughout the world. DB pension funds, which had mostly successfully restored their funding levels after the 'perfect pension storm' with simultaneously falling equity and rising bond prices, have plunged again into huge funding deficits. For many pension funds, the current crisis is far worse than the last one. It could be argued that neither the new regulatory frameworks many countries implemented after the first crisis nor the modern risk management tools applied by many pension funds prevented the reappearance of funding gaps. But have they been tuned to that goal? Rather, modern risk management systems provide transparency, thus improving the context of decision-making, and the new regulations offer the guidelines on what ought to be done. Especially the stricter funding rules many countries implemented in the aftermath of the 2000 – 2003 crisis enforcing extra contributions on behalf of employers in case of funding gaps are now at test.

The picture of the impact of the current crisis is not entirely clear yet. Even though all pension funds have been basically in similar ways exposed to the current financial crisis, the impact varies considerably due to the different regulatory framework:

- In the United States, DB pension funds lost about USD one trillion in assets while the liabilities – which are discounted with the corporate bond yield - were mostly unchanged.

[1] Dorothee Franzen, Oxford University is an independent consultant to the OECD. This paper was prepared as part of the OECD Working Party on Private Pension's risk management project. The author wishes to thank the pension funds, consultants and institutions that participated in the study. As most requested anonymity, they cannot be formally identified. The author also wishes to thank Professor Gordon L. Clark, Con Keating and the OECD Private Pensions Department for helpful comments on previous drafts. Support for this paper was provided by the OECD and the Oxford Centre for the Environment at the University of Oxford. None of the above should be held responsible for any interpretations and opinions expressed herein; errors, omissions are the sole responsibility of the author.

[2] Operational or business risk constitutes a further risk category but is here not further taken into consideration.

2008 marks the first year the funding rules of the Pension Protection Act are applied. Thus, US employers face huge extra contributions to their DB pension funds.

- The situation in the United Kingdom is basically the same. The strain on the funding position seems to have resulted mostly from investment losses. But the flexible, principle – based approach of The Pensions Regulator does not demand an immediate suppression of the emerging funding deficits allowing for rather long-term recovery periods when considered appropriate.

- Pension funds in the Netherlands suffered more from a steep increase in the liabilities due to the application of the swap curve as discount factor. Pension funds' assets fell by less than 10 percent, whereas the technical provisions soared by 25 percent. The vast majority of pension funds had to prepare recovery plans for the Dutch Regulator; most pension funds have suspended indexing of pensions and slightly increased contribution rates.

- The outcome of the current crisis for German pension funds can be seen as rather benign. As regulation had prevented 'Pensionskasse' from moving back into equity after the 2000 – 2003 crisis, their risk exposure was comparatively low. The decline in the capital market yields depressing return potential on bond portfolios seems to be the more significant challenge looking forward.

The 2000 – 2003 crisis had shifted attention to pension funds' risk management. The sudden turnaround especially of Anglo-American pension funds from surplus to deficit served as the catalyst for calls for 'better risk management' of pension funds. The large international think tanks started to analyse pension funds' risk management. The International Monetary Fund (IMF) concluded 2004 in an analysis of 'Risk management and the pension fund industry' that 'policymakers should introduce measures to encourage better risk management practices and to reduce the risk of another cycle of over- and underfunding'[3]. Stewart from the Organisation for Economic Cooperation and Development (OECD) conducted a first assessment of pension fund risk management in 2005 concluding that 'after several golden decades of equity investments delivering adequate returns, the topic of risk management has returned to the fore front of the pension industry given the now challenging funding and investment environment' (Stewart 2005).

Risk management has stayed at the above cited fore front of the pension industry. The 'perfect pension storm' set the stage for the risk management revolution to reach the doorsteps of pension funds. Modern risk management tools analogous to those which are used in other sectors of the financial industry such as securities firms and banks are increasingly applied by pension funds. Nowadays, pension funds in many jurisdictions calculate Value-at-Risk (VaR), apply risk budgeting concepts and analyse fat tails[4]. Asset-Liability-Management (ALM) is routinely applied as strategic risk management tool, albeit the quality of the models and the rigour in its application still vary. But it is questionable if the risk management approaches now being applied by DB pension funds are in all cases well suited to their needs. More fundamentally, the perception of risk appears to be currently in a state of flux. Unlike securities firms, banks or insurance companies, there is no consensus between pension funds, their sponsors, regulators and accountants on the significance of the different risk factors facing pension funds.

[3] IMF, Global Financial Stability Report: Market Developments and Issues, September 2004, Chapter III: Risk Management and the Pension Fund Industry, http://www.imf.org/External/Pubs/FT/GFSR/2004/02/pdf/chp3.pdf

[4] Fat tails denote the observed phenomenon that extreme returns are underestimated by normal distribution.

The main characteristics of DB pension funds are the importance of liabilities and the long-term investment horizon. Pension funds are usually described as long-term investors. This conception provides the argument for higher investment in asset classes such as equity that are subject to higher volatility in the short-term but also reward higher returns in the long-term. As liquidity risk is not significant pension funds can take more market risk than short-term investors thus rendering the provision of pension more affordable.

The paradigm of the long-term investor is changing. Pension fund regulation became more risk aware and safety-focused. Shortfall risk is perceived as central risk factor threatening benefit security. Many countries have introduced pension reforms in recent years encouraging higher funding ratios, so that in a balance sheet perspective assets are sufficient to cover liabilities. As funding levels are tracked over shorter periods of time the investment horizon turned more short-term as well.

It is further argued here that the accounting standards changed the perception of risk. Economically, the pension liability is subject to longevity risk and – depending on the plan design – usually wage or inflation risk. By discounting future pension benefit payments with the yield of bonds in a market-to-market valuation interest rate risk is constructed as an important risk factor facing pension funds.

At a time when the clarion call is for 'better risk management' of pension funds, there is also a noticeable trend for pension funds in many countries to lower their risk profile. Investment strategies have generally become more risk-averse. This is not without implications for costs or benefits of pension funds, as the return on investment determines to a large extent the costs of supplying a DB pension plan. This paper argues that the shift towards lower-risk investment strategies is partly caused by the new regulatory and accounting rules. Shifting pension funds' assets into low-risk investments will ultimately lead to lower pension benefits for members.

This research focuses on the management of investment risk at single-employer DB pension funds. It describes practice and regulation of DB pension funds in the context of the development of modern risk management in the financial industry more generally. Focussing solely on DB pension funds, this paper explores into what constitutes investment risk for DB pension funds and how this risk is measured. This paper aims at answering the questions how much investment risk pension funds take and how the investment decision-making is organised under the impact of regulation and governance. Following Clark the 'term 'governance' is used to refer to the formal mechanisms by which an institution makes decisions, is held accountable to its stakeholders and beneficiaries, and acts in accordance with public and private standards' (Clark 2004). Regulation and governance therefore constitute the complete net of external and internal rules informing pension funds' decision-making. This paper analyses first pension funds' attitude towards risk as it is reflected in investment strategies and risk management concepts and tools that are currently available to and applied by DB pension funds. Second, it investigates how regulation and governance impact pension funds' investment decision-making with regard to risk-taking. This analysis is conducted on a cross-country basis covering four countries, Germany, the Netherlands, the United Kingdom, and the United States. The countries were chosen for significance, the latter three being large established pension fund markets yet representing different concepts, the first for representing a growing pension fund market aiming at increasing the significance of its pension fund system to a level comparable to the other countries.

It is not aim of this project to develop a best-practice investment theory or to solve the question of the appropriate level of risk-taking for pension fund, but rather to inquire how governance and regulation produces deviations from what pension funds regard as optimal investment policy based on modern financial economic theory.

This research draws on in-depth interviews with pension fund managers and their consultants. These interviews were conducted between 2006 and 2007. The author is aware of an existing quality-bias as the interviews were in general conducted with the most sophisticated pension funds. In this regard, the findings are not necessarily representative of the overall market but the existing 'best-practice risk management'. The terms regulating and supervising authorities are used interchangeable in this article. In general, the OECD glossary of private pensions is applied with occasional recourses to nationally applied pension terms.

The paper is organised as follows: Section 2 gives an overview on the development of modern risk management in the different sectors of the financial industry. Section 3 focuses an risk management concepts and tools at DB pension funds. The changing strategies of pension investing are explored in section 4. Section 5 gives evidence of current 'best practice risk management' from four countries. Section 6 concludes.

Development of risk management in the financial industry

> '*Over the past two decades, the financial world has evolved from [a] return driven to a genuine risk management industry. The term risk management certainly is not confined to what is best denoted with risk control: Measuring risks, setting limits and ensuring adherence to these limits. This is necessarily part of the whole process of risk-return optimisation …. Risk management … also compromises the decision making process of considering risk-return trade-offs and optimising stakeholders' targets …*'. (Kocken 2006)

This section intends to give an overview on the development of risk management and its regulation at the different sectors of the financial industry. It starts with outlining a taxonomy of risk, then describes the development of modern risk management at securities firms and banks and finally the dissemination of risk management concepts to insurance companies and pension funds.

Following Kocken (Kocken 2006), a broad definition of risk management is applied. Risk management is understood as a process that starts on the strategic level, first, with analysing and defining the relevant risk factors for the pension fund and its' stakeholders, second, deciding on the acceptable and desirable amount of risk to be taken, and which then continues on the operational level with the process of measuring and controlling risk. Risk is understood as something subjective, linked to the individual profile of a pension fund and its' stakeholders. This differs from the bulk of the investment-banking orientated body of literature on risk management which usually defines risk in an objective way not differentiating according to the needs of different investors or stakeholders. The conception of risk applied here comes closer to Balzer's remark that 'risk is … a relative rather than an absolute concept' (Balzer 1994).

Taxonomy of risk at financial institutions

Applying mostly banking terms[5], the basic risk factors relevant to financial institutions can be broadly clustered into market risk, credit risk, liquidity risk, underwriting risk, and operational risk. Market risk refers to changes in the value of an investment due to changes of market factors, such as interest rates, exchange rates or stock markets. Credit risk is defined as 'the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms'[6]. Liquidity risk is the risk that a firm is not able to settle a position at market values due to liquidity disruptions in the markets

[5] Although this terminology was also adopted by the Solvency II project which reflects the move of the European Union towards convergence of insurance and banking regulation.

[6] Bank for International Settlement, Principles for the Management of Credit Risk, http://www.bis.org/publ/bcbs54.htm

(Herring 2005). The term is also used to refer to a funding crisis (Santomero 1997). Finally, underwriting or actuarial risk refers to the risk that a financial company will be unable to fulfil their contractual obligations towards their customers. These different risk factors differ in their relevance for the different sectors of the financial industry. Their regulatory regimes differ accordingly. Market risk[7] forms the most important risk category for securities firms whereas credit risk traditionally posed the central risk for banks. Insurance companies on the other hand are faced prima facie with underwriting risk. This risk is related to the correct assessment and pricing of the insured risk, which – in the case of life insurance companies– is constituted by longevity risk. It is suggested here that basically the same holds true for DB pension funds. Furthermore, the different financial sectors are faced to different degrees with liquidity risk resulting from the different time horizon of their assets and liabilities ranging from high as for securities firms and investment banks to low in the case of life insurance companies. As Herring pointed out 'insurance companies are unlikely to find it necessary to incur fire-sale losses on the liquidation of their assets and exacerbate market dislocations by selling assets in markets with falling prices' (Herring 2005). It is suggested here that this risk is even lower for pension funds. The focus of risk management systems has to adapt accordingly.

Davies points out that 'the nature of the liabilities is the key to understanding how institutions differ in their operations' (Davis 2001). In the banking and securities industry on the one hand, risk is in general perceived to be mainly on the active side of the balance sheet, in form of credit or market risk. On the other hand, the basic risk at insurance companies and DB pension funds is connected to the passive side. While in banking 'risk' usually denotes risky assets or off-balance-sheet derivatives, in the jargon of a life insurance industry, the term 'risk' is used to refer to a single contract on the liability side meaning a client. Whereas a bank aims at securing sufficient funding for the assets, insurance companies accumulate contributions in form of assets on the active side to secure the fulfilment of the liabilities. 'Liabilities differ in certainty and timing' (Davis 2001), ranging from fixed amount and timing in the case of banks, to fixed amounts but unknown timing as for traditional life insurance contracts to unknown amounts and unknown timing in the case of DB pension funds and more complex life insurance products.

But that a liability is unknown in amount and timing does not mean that it is not predictable. Also, liabilities are, to very different extent, subject to liquidity risk. The liabilities of banks are in a legal sense fixed in amount and timing but as banks are subject of the risk of a run on the bank, they are subject to liquidity risk and can in this sense become rather unpredictable for risk management purposes. The liabilities of life insurance companies are on the other hand less fixed and foreseeable in a legal sense but as insurance clients are less likely to delete a contract they are less subject to liquidity risk and therefore more stable. As pension contracts are in most jurisdictions not portable pension funds are the least subject to liquidity risk. The liabilities of a DB pension fund are in the long term unknown in amount and timing as the value of any single contract is subject to longevity risk and inflation risk but stable and well predictable in the short term as pension liabilities 'do not run'.

Development of modern risk management

Today's understanding of risk management in the financial industry is based on the pricing of risk. Risk management is a quantitative, computer-based process, blending the methodology developed by financial economic theory with the technology provided by the IT industry (Rosen 2003). It is based on finance models depicting the behaviour of market variables. The theoretical foundation of quantitative risk management as it is understood here is closely linked to the origin of financial economic theory. It can be

[7] The following draws on Herring and Schuermann Herring, R., Schuermann, Till (2005). Capital Regulation for Position Risk in Banks, Securities Firms and Insurance Companies. Capital adequacy beyond Basel: banking, securities, and insurance. H. S. Scott. Oxford, Oxford University Press**:** 15-86.. The more precise term as applied by the authors would be 'position risk' which combines market risk with liquidity risk.

put down to Markowitz' publication 'Portfolio Selection' in the Journal of Finance (Markowitz 1952) in 1952 where he introduced the concept of the mean-variance optimisation of risk-based return as opposed to the traditional approach of return-only optimisation. Further milestones included Sharpe's (and others') development of the Capital Asset Pricing Model (1964), the Black-Scholes formula on option pricing (1973), and Stephen Ross' Arbitrage Pricing Theory (1976).

The ideas developed by academics were first applied at the desks of brokers and dealers in the starting option markets in the early 1970s and found broader application in investment banking after the stock market crash of 1973/74 and the volatile economic environment that followed over the 1970s and the beginning of the 1980s (Bernstein 1999). The advancement of risk techniques accelerated at the beginning of the 1990s with the release of JP Morgan's RiskMetrics in 1994 which marked the beginning of the standardised use of VaR in measuring market risk (Rahl 2000). The 'real' start of modern risk management is therefore often linked to this event. The development of modern risk management was linked to the development of capital markets, notably the option markets, so that the needs of those trading on these markets, mainly brokers/dealers and investment banks, initially informed the development of concepts and tools. Modern risk management evolved around market risks, the assets underlying these risks are tradable and valued at market prices. It takes the financial view on risk.

Risk management was not imposed on the markets by regulation but 'evolved as part of a process of adaptation to changing market conditions across national borders and regulatory regimes. But even though risk management as we know it today was not a regulatory invention, its evolution did not occur in a vacuum and was certainly shaped by regulatory events along the way' (Mengle 2003). The 1988 Basel Accord is usually regarded as such a 'regulatory event'. It was a response of the international banking regulators to a series of bank failures and bank crises[8]. The Basel Accord set minimum capital standards for banks based on the total of a bank's risk-weighted assets. The 1988 Basel Accord represented the first step towards a risk-based regulation of banks. It was also the first time that a financial sector was regulated subject to international standards thereby creating the 'level playing field', a geographically even competitive surrounding. But the first Basel Accord referred to credit risk only which was traditionally the most relevant risk category for banks, but was in the late 1980s neither traded nor valued at market prices.

Therefore it can be argued that it was not the first Basel Accord but the Basel Amendment 1996 which represented the first regulatory implementation of modern risk management as it referred to assets that were traded and valued at market prices applying the concepts of financial economic theory. As banks became increasingly involved in trading activities, they became increasingly exposed to market risk as well. The 1996 Basel Committee Amendment extended the risk-based regulatory approach to market risk. The release of JP Morgan's RiskMetrics in 1994 had marked the beginning of the standardised use of VaR in measuring market risk. The Basel Amendment firmly implemented VaR as risk measure in the banking industry by allowing besides the standard approach also internal models, which base the calculation of the banks' required capital for market risk on VaR. The Basel II Accord, which is due for implementation, extends capital requirements to operational risk and applies all capital requirements to financial holding companies of internationally active banks. Furthermore, Basel II takes a more differentiated attitude towards credit risk demanding less capital for low-risk assets and more capital for higher-risk assets[9].

[8] The failures of Bankhaus Herstatt in Germany and of Franklin National Bank of New York in the United States in 1974 formed the first regulatory triggers further followed by the Mexican debt crisis in 1982. For a complete list of international bank failures and crises see Goodhart Goodhart, C. A. E. and G. Illing (2002). Financial crises, contagion, and the lender of last resort : a reader. Oxford, Oxford University Press..

[9] With the adoption of the Capital Adequacy Directive (CAD) in 1993 the European Union harmonised the regulation of banks and securities firms. Whereas other jurisdictions among them the United States regulate securities firms under a different framework focussing closer on liquidity risk.

One can conclude that the spread of risk management in the banking industry was driven by the markets' needs and the markets' crisis and later on firmly anchored in the market by regulation. On the regulatory side, risk-based supervision was introduced for the banking sector where the regulatory focus lies on preventing systemic risk.

Dissemination of risk management

Other financial sectors, i.e. insurance companies and pension funds were left out of this risk management revolution for a much longer time. Insurance companies are distinctly different from banks[10]. Their concept of what constitutes risk and therefore their need and technique to manage these risks differs from that of bankers. Insurance companies and banks define risk differently. Accordingly, the applied risk categories differ as well. Faced mainly with underwriting risk insurance companies traditionally took the actuarial view on risk. As outlined by Santomero in a study on the financial risk management by insurance companies in the United States and abroad, insurance companies mostly classified their risks following the Society of Actuaries' risk classification taxonomy into asset risk, pricing risk, asset/liability matching risk and miscellaneous risks. This classification basically takes a balance sheet view on risks. Asset risk refers to the risk of price changes of assets comprising both credit and market risk in the banking terminology. Pricing risk refers to the risk of mispricing of the liabilities and corresponds to what was earlier described under underwriting or actuarial risk. Miscellaneous risks comprise risk factors beyond the direct influence of the insurance company. Santomero found that insurance companies were always good at managing pricing risk but that the management of financial risk posed a great challenge for them.

Starting from the late 1980s insurance companies increasingly applied ALM mainly to manage interest rate risk (Santomero 1997). Asset-Liability-Models became important risk management tools especially for life insurance companies. The reasons are to be found firstly in the changing economic environment with increasingly volatile interest rates from the late 1970s onwards. Secondly, with the bundling of insurance and saving products, the business model of life insurance companies changed from underwriting pure actuarial risk into taking also speculative market risk (Scherer 2006). Thirdly, in many countries life insurance companies invested a higher percentage of their portfolio in equities from the 1990s onwards, thereby becoming more exposed to market risk. As the ALM models became more sophisticated integrating the financial view of risk with the traditional actuarial approach, asset and liability management systems became the strategic risk management tool at insurance companies as it combines the mean-variance efficiency analysis of assets with the precise liability constraints faced by insurance companies.

Subsequently, some countries also imposed mandatory ALM studies via regulation. But the originally banking focussed regulatory approaches are also spreading to the insurance sector and to pension funds. For example, the European Union started at the beginning of the 2000s the Solvency II process which will implement a risk-based regulatory approach for insurance companies which was adapted from the banking sector. It is still under discussion if this regulatory approach will also apply for pension funds in the European Union, as it was already introduced in the Netherlands in 2007.

Risk management at pension funds

Pension funds lack a common taxonomy of risk. Also the new CEIOPS' 'Survey on fully funded, technical provisions and security mechanisms in the European occupational pension sector' offers no precise definition nor calibration of the relevant risk categories for DB pension funds[11]. In practise, pension funds' risk management differs according to their different conceptualisation. The differences in these

[10] The term 'bank' is used comprising securities firms.

[11] http://www.ceiops.eu/media/docman/public_files/publications/submissionstotheec/ReportonFundSecMech.pdf

approaches can be explained by the different concepts of the underlying pension promise and the basic safety nets underwriting these promises. In the Anglo-American world the safety of the pension promise is based on the solvency of the underwriting employer, who alone bears the pension-related risks. Often, this risk is reinsured by pension insurance funds. On the continent, the pension fund itself is the basic guaranteeing institution. The guarantee given by the plan sponsor could be conceptualised as a re-insurance to the pension fund. Consequently, there are no further pension insurance funds[12]. Pension funds are requested by their regulators to build up funding buffers which serve as safety net. The legal structures differ accordingly. In continental Europe, pension funds are legally independent companies, often organised on the model of a life insurance company as in Germany or operated in the legal form of as endowment with mixed asset management and insurance characteristics as in the Netherlands. The Anglo-American pension fund is mostly organised as a trust. This structure secures the trust's assets but keeps it still closer to the company.

In countries, where pension funds are basically set up as a life insurance company, pension funds' risk management behaviour closely follows that of life insurance companies. The rigour with which risk management approaches are applied differs mainly with the size of the fund and the available resources. The large industry-wide Dutch pension funds were at the fore front of developing sophisticated ALM models. The Anglo-American countries traditionally took a more lenient view on risk-management at the level of the pension fund itself as it is more closely integrated into the risk management of the sponsoring company. It is beyond the scope of this paper to explore if the pension-specific risks were always especially well managed by the plan sponsor.

Managing risk - from 'asset only' to sophisticated ALM

Rahl describes risk management as a 'journey', as a 'lifetime's odyssey' rather than a 'one-time exercise'. Concepts and instruments have become increasingly sophisticated driven by improvements in technologies and an increased risk awareness on behalf of fiduciaries (Rahl 2000). Traditionally, in the context of Anglo-American pension funds risk management was defined as a task of the asset allocation only (Blake 2003). Starting at larger pension funds, modern portfolio theory concepts were increasingly used in deriving the strategic asset allocation (SAA) and managing investment risk.

Pension funds conduct efficient frontier analysis based on Markowitz' mean-variance model focussing on improving the efficiency of their investments. The shortcomings of this analysis is the focus on assets only and the short-term investment horizon (Campbell 2006). Tracking error which is the traditional risk measure at asset managers is also widely used by Dutch pension funds for monitoring their external investment managers. Tracking error gets also applied in a risk budgeting concept. The pension fund allocates a strategically defined risk budget in a first step among asset classes and subsequently among the single investment managers compared to the chosen benchmark. The pension fund monitors the investment manager in terms of both performance and risk taking. More recently, pension funds also calculate VaR which originates from the banking industry. In banking regulation, VaR states that the bank is 99 percent confident not to loose more than the amount of x on their trading book over the next 10 days. When RiskMetrics extended its toolset to pension funds in 2005, this period was extended to one year to meet the requirements of pension funds' longer-term investment horizon. Also the confidence interval applied is usually lower. VaR is also used embedded in a risk budgeting approach. Risk budgeting concepts were more recently developed for pension funds and have started to be implemented at large funds. Mainly since the 1990s, Asset-Liability-Management (ALM) tools have been increasingly employed by DB pension funds as integrated risk management systems. Today, the use of Asset-Liability-

[12] The German 'Pensions-Sicherungs-Verein' insures only unfunded or partly funded pension promises but not the fully funded 'Pensionskasse'.

Management (ALM) is established market practice in all analysed countries, albeit understanding and purpose of ALM differs.

ALM provides a strategic risk management system for long-term investors who pursue objectives and have to meet liabilities (Ziemba 1998). The optimal investment policy is derived in a complex system that simulates all relevant features and constraints. 'From its origins as an actuarial and cash flow matching technique, ALM has grown into a conceptual framework for financial management – and a professional activity in its own right' (Boulier 1998). Concepts and goals of ALM have changed considerably. In its beginning in the early 1970s ALM was conducted as a simple gap model analysing cash inflows and outflows and the mismatch between them. Stepwise, the risk measurement and management concepts developed by financial economic theory were implemented into the ALM models. The traditional approach to ALM, which could be termed the actuarial ALM, was deterministic in its choice of market variables. Liabilities were calculated with a fixed discount rate while market variables at due dates - current date or end of period - were used for simulating the asset side. The first ALM models implementing the current market-to-market perspective were developed in the late 1970s. While the focus of earlier ALM models was on hedging interest-rate risk, further market risk factors were by and by integrated into the models including new hedging and derivative products. ALM moved from static, deterministic to dynamic, stochastic analysis. Scenario analysis was introduced. Today, sophisticated ALM models employ economic cascade models to simulate the market variables. Also, liabilities are no longer calculated in a deterministic way but stochastically simulated.

More recently, the arrival of the fair value principle at the doorsteps of pension funds further challenges the traditionally applied risk management tools. Starting in the Dutch pension fund community, the large pension funds overhauled their ALM tools. By implementing option pricing models based on state prices, stakeholders' risk preferences can be addressed endogenously in the ALM process. Kortleve et al showed that the explicit consideration of risk changes the attractiveness of strategic pension policies. Thus, the fair value approach usually leads to a lower risk profile (Kortleve 2006). Ponds concludes: 'One way or another, fair-value accounting will lead to higher funding costs of pensions' (Ponds 2007).

At the same time, the focus of ALM studies changed. ALM models were used to derive the strategic asset allocation in a liability consistent framework, sometimes in a very detailed way. Increasingly, ALM is used as a strategic management information and decision-making framework which could be classified as total integrated risk management systems. The large Dutch and German pension funds use their ALM models to simulate the 'pension deal', i.e. to derive the key pension variables such as the rate of contribution for employers and employees or the annual increase in pension benefits, in a risk adjusted context. Accordingly, Bauer from the Dutch pension research community defines ALM as a study 'which investigates the impact of decisions with regard to investment, contribution and indexation policy on the various stakeholders of the fund (employees, employers, retired and future generations)' (Bauer 2006). In a definition coming from the United Kingdom, Blake defines 'Asset-liability modelling as a quantitative technique used by some pension funds to structure their asset portfolio by paying due regard to the structure of their liabilities … [When it is used] to discover alternative strategies that increase the probability of meeting the fund's objectives … this is known as asset-liability management' (Blake 2003).

The progress of ALM was geographically uneven. Whereas Boulier states that in Europe banks are the main users of ALM with insurance companies and pension funds lagging behind, Ziemba remarks in an US context that banks were slow to adapt ALM (Ziemba 1998). Taking a geographical view, the use of asset-liability-models seems to have been more common at continental European pension funds before it spread to the Anglo-Saxon pension world albeit these generalisations are difficult, as the use of ALM is linked to the size of a pension fund as well as to the regulatory environment. Large-scale applications were developed during the 1990s, e.g. the Russell-Yasuda Kasai model for a Japanese insurance company (Carino 1994) or Dert's scenario-based optimisation model for pension funds (Dert 1998).

The large Dutch pension funds have clearly been at the leading edge of employing and further developing ALM into the strategic risk management system it is today. The other end of the spectrum is represented by the US pension funds, which have been slow to take up ALM and still often have valuation periods of up to 5 years. As Ziemba points out, 'the most sophisticated ALM models have been developed by North-American and British researchers…but perhaps a more advanced use of such models is by the Dutch' (Ziemba 1998).

These differences can be attributed to a couple of factors:

First, the size of a pension fund is relevant. ALM studies are expensive, these costs are easier to shoulder for larger pension funds. With a few exceptions, ALM studies are not conducted by the pension funds themselves but by external consultants with a background traditionally in actuarial sciences. With ALM becoming more widespread in the United Kingdom – a 1990 survey by Greenwich Association cited in Blake found 30 percent of pension funds applying ALM - this raised concerns among the asset management industry in the United Kingdom that actuaries would gain inappropriate influence on the strategic asset allocation (Blake 2003). Increasingly though, also investment banks explore into the domain of ALM albeit their competence regarding liabilities is questioned by many and conflict of interest by at the same time providing advice on the SAA and selling the products for implementing it criticised. In the Netherlands, ALM studies are overwhelmingly – interviewees estimated 90 percent – conducted by an independent specialised consultant. Nevertheless, in addition to the direct costs of the study, pension funds also need to provide internal knowhow to understand and discuss the results of the study and to implement them properly into the internal decision-making process regarding the strategic asset allocation.

Second, the nature of the pension promise influences the attitude towards ALM – of pension funds and regulators alike. This is reflected in the attitude towards funding as ALM represents an ideal framework for managing the funding ratio. Whereas in the Anglo-Saxon world there was traditionally an attitude on benign neglect towards funding, the funding-orientated regulatory approach in continental Europe took a cohesive view on assets and liabilities. European regulators have therefore been traditionally more funding-focussed, however crude the applied methodology especially with regard to the valuation of liabilities might have been.

Third, the regulatory environment is an important factor regarding the use of ALM in a market. In the Netherlands and Germany ALM is mandatory, even in the United Kingdom with its highly critical attitude towards modelling, the use of ALM is nowadays encouraged by the regulator. Only in the United States the regulating authorities' attitude towards ALM can be described as neutral. This does not suggest that regulation took the lead in setting the market practice. It rather seems, analogue to the pattern of the evolution of risk management in general, that ALM was developed in close cooperation of academics and practitioners (see e.g. the model developed by Mulvey and Towers-Perrin in 1996), implemented in cascades starting at the largest market players, and finally firmly anchored in the market by regulation.

In spite of their increasing sophistication, this kind of model-based risk management has always aroused criticism, in the context of pension funds the most pronounced in the United Kingdom with the Myner's report, its main points being reiterated also in current statements by the regulatory authority (see section 5.3.7). Although much of the criticism may be ill founded (e.g. a presumed lack of understanding by the trustees does not disqualify the models per se), serious critics remain which are summarised here as follows: First, models are subject to 'model risk', i.e. the risk that the applied model is inappropriate, or more basically, that reality does not match the assumptions. Each financial crisis saw the breakdown of crucial model assumptions regarding e.g. correlations, volatility or the sudden emergence of not or not sufficiently included risk factors such as liquidity risk. As the application of ever more sophisticated models did not prevent financial crisis, this was often called the 'failure' of models (Scholes 2000). Furthermore, when all financial institutions apply fairly similar models this can result in 'herding

behaviour' which can lead to extreme market volatility and create what is termed liquidity black holes, which occur when liquidity in a market dries up. Regulatory authorities can further aggravate this risk by enforcing (a) the use of specified models and (b) by creating a uniform regulatory environment (Hull 2007). Banking regulation has started being scrutinised for being pro-cyclical instead of counteracting in the wake of the latest credit crunch that started in 2007. Nevertheless, this criticism should not lead to refrain from modelling but rather raise the awareness in dealing with models. The merits of model-based quantitative risk management were pointed out – among others – by Fabozzi by arguing that modelling is a key risk management instrument as it reduces uncertainty and improves decision-making and it's use has therefore become widespread also in the pension fund community (Fabozzi 2005). But both the 2000 – 2003 and the 2007 and beyond crisis qualify as 'extreme events' which would not be covered by these models.

Conceptualising investment risk

Pension fund managers often feel uneasy about applying risk management tools originating from other sectors of the financial industry. One pension fund manager criticised that the existing risk management systems focus on the adequacy of investment risk relative to the paid-in capital which is central in banking regulation. But in most jurisdictions pension funds have no paid-in capital. The expressed criticism focuses further on the inadequacy of the time horizon ('Risk budgeting with VaR on the basis of one year is probably not a great thing to do for a pension fund'.) but also on the relevance of the applied risk categories more generally. When asked what constitutes risk for a DB pension fund, one interviewed pension fund manager defined the relevant risk as the risk to loose money, whereas the risk of fluctuations of market values was described as irrelevant for him as long-term investor. One pension fund manager stated: 'We are a friend of volatility'. Others followed along these lines. Throughout all interviews with pension funds, the relevance of credit risk, i.e. the risk to actually loose money, was beyond dispute, whereas the attitude towards market risk was ambiguous at best.

The main characteristics of a pension fund are the importance of liabilities and the long-term investment horizon. Pension funds are usually depicted as long-term investors which invest over a periods of thirty to forty years. Institutional investment practice follows the adage that the exposure to equity should increase with the length of the investment horizon. At a theoretical level, Merton (1969) and Samuelson (1969) developed the conditions under which the time horizon is irrelevant for the investment decision. The investment portfolios of equally risk-avers short-term and long-term investors are identical when returns are unpredictable and no further human capital is taken into account. Campbell and Viceira (2002) developed the theoretical argument for long-term investing. 'Long-term investors … may judge risk very differently from short-term investors'(Campbell 2002). Taking human capital into account and assuming mean-reversion of stocks, they show that the long-term investor holds more equity and bonds than the short-term investor who invests more in cash. Long-term investment differs from short-term investment. Conceptualising pension funds as long-term investors underpins the fundamental argument in favour of equity investment. Mean-reversion of excess stock returns turns equities into comparatively secure assets for long-term investors. The principle of time diversification of risk lies at the core of this argument. 'As time changes risk,…, for the true long term investors … volatility represents opportunity rather than risk' (Bernstein 1996). These arguments imply that short-term fluctuations of asset prices do not constitute a relevant risk factor for pension funds. But there are caveats: The first one, this argument is based on the assumption of mean-reversion, that asset prices return to their long-term trend. Asymmetric risks, meaning instances of falling stock prices without symmetric corrections, e.g. in the case of the collapse of the TMT bubble, do pose a serious risk to all investors. This argument leads further into extreme value theory, which focuses on the analysis of events which occur at low probability but with large (adverse) impact (Embrechts 2000).

The second condition for the validity of this market-risk-irrelevance-argument is that pension funds really are the above cited 'true long term investors' which implies that they may not have to sell assets in falling markets, i.e. due to liquidity needs arising from their obligation to regularly pay pension benefits. This condition intuitively holds true in the case of an ongoing pension funds with a comparatively young plan population. Immature pension funds are cash positive, which means that they are able to pay pension benefits out of their investment income[13]. The more mature a pension fund becomes, the more cash-negative it turns. This is further aggravated if the pension fund is closed to new members. Starting from a certain point in its lifetime a pension fund needs to fulfil its pension obligation from its stock of assets. Although precise data on the projected cash flows of pension funds are not available, there is sufficient indication that this point is coming closer for the overall relative mature DB pension fund systems in the United Kingdom and the United States. Clark classified in an analysis of the largest pension funds in the United Kingdom 53 percent of private funds as mature or very mature defined as funds which have double or more pensioners relative to active members (Clark 2006). And many of the S&P 500 companies [in the United States] … are rapidly approaching the day when they will begin paying out large pension cash flows on a sustained basis' (Fore 2005). Still, the nature of a pension fund's liability rules out sudden and unforeseen liquidity needs as in the short to medium term cash flows are stable and well known in advance. Meeting its obligation constitutes a cash flow matching optimisation exercise with actually little liquidity risk in the previously defined way. Albeit increasing maturity shortens the investment time horizon of pension funds thereby reducing the risk-taking capacity of the fund. This argument underpins the move towards bonds of maturing pension funds following the life-cycle investment theory.

This conceptualisation of the pension fund as long-term investor is challenged by a variety of arguments arising from an economic and regulatory / accounting background. The previous arguments take the position of the 'stand-alone' pension fund. When the pension fund is placed into the context of its sponsor further constraints arise. The conceptualisation of a DB pension fund implies that the pension fund can come back to the sponsor in case of significant shortfalls which the sponsor will replenish subsequently. The sponsor underwrites a put option to the pension fund. The pension fund should then be seen in the context of the sponsor's risk management. To which extent the pension fund actually has to be analysed in the context of its sponsor is a highly controversial question which needs to be answered in the context of national rules and regulations. The integral view on the pension fund lies at the heart of a school in financial economics originating from the United States which argues that the pension fund itself should take no investment risk. To maximise shareholder value, the company should take risk in its core business and not in its pension fund. As Sutcliffe pointed out this theory implies, among others, that the company makes the decision at the pension funds which is not the case e.g. at British pension funds where independent trustees make the investment decision (Sutcliffe 2005). The integral view was further challenged recently in the Netherlands based on the argument that the pension fund is in their jurisdiction also the legal owner of its assets and should therefore be seen completely separate from its sponsor.

The intermingling of pension fund and sponsoring company certainly impacts the actual investment horizon of the pension fund. Some authors argue against the long-term investor concept on the basis that the long-term investment horizons dissolve into a frequency of one-year accounting horizons when taking the point of view of the CFO (Scherer 2006). It is beyond dispute that the sponsor's short-term accounting perspective prevails the pension fund's long-term investment perspective horizon if the sponsor is put on the market for corporate control or files for bankruptcy. In the case of mergers & acquisitions, the sponsor usually must immediately compensate potential shortfalls. The lifetime of a pension fund may exceed the lifetime of the sponsoring company. For these reasons, the plan sponsor may impose a shorter time horizon on the pension fund than plan characteristics would suggest.

[13] It certainly holds true that compulsory participation extends the investment horizon Maatman, R. H. (2004). Dutch pension funds: fiduciary duties and investing. Deventer, Kluwer Legal Publishers..

The new accounting standards (for details see section 3.2) that prescribe how the sponsoring company has to account for the cost of DB pension funds have been strongly criticised for artificially and unnecessarily shortening pension funds' investment horizon. As they in principle integrate plan sponsor and pension fund into one accounting unit valued at market prices, the sponsors' financial statement becomes exposed to short-term market risk evaporating from its pension fund's asset investments not withstanding the time horizon of these investments. Therefore, many plan sponsors impose second-order constraints on their pension fund such as 'avoid shortfalls in an accounting period of one year or one quarter' thereby impacting the pension fund's effective time horizon. In this case, a pension fund can retain its risk taking capacity only through funding buffers in its own balance sheet which is basically the way pension funds are operated in continental Europe – but it comes at costs.

Also, regulatory authorities tend to impose regulations that shorten the investment horizon of a pension funds. This holds true for all strict rules that pension funds have to adhere to in a 'short' period of times of e.g. one year and that require immediate corrective action on behalf of the pension fund in case of non-compliance. Examples are quantitative investment rules or inflexible funding regulations. But also in countries where regulators refrained from direct interference pension funds feel, as one interviewee put it, that 'the impact of regulation and accounting has been to make people more short-termed without a doubt'.

It can be concluded that there is no consensus at the moment what actually constitutes investment risk for DB pension funds. The dogma of the long-term investor to whom short-term market risk is irrelevant is challenged by both economic and regulatory / accounting arguments. The cases of externally imposed restrictions which turn a pension fund into a short-term rather than long-term investor are clearly detrimental to the efficiency of the investment process and increase the costs of providing DB pensions.

Governance of risk taking

It is a well established fact that the level of investment risk pension funds take can be clustered on a national scale. Using equity exposure as the conventional albeit very basic measure of investment risk and applying this analysis to the here analysed countries, the Anglo-American pension funds have traditionally been the most active risk takers with 70 percent equity exposure in the United Kingdom and 60 percent in the United States. Continental European pension funds were less exposed to investment risk with Dutch pension funds investing around 40 percent in equity and the German 'Pensionskasse' with only around 20 percent equity investment. This picture has changed recently as UK pension funds took the lead in de-risking their portfolios. Increasingly, also in the Netherlands and, most recently in the United States, employers seek to shield themselves against interest rate risk at their pension funds what is often attributed to the new accounting standards and/or regulatory approaches. This section attempts at exploring into the reasons for these differences pension funds' risk taking by analysing the different governance structures.

In all four analysed countries pension funds are set up under a fiduciary arrangement where trustees make decisions on investments. Furthermore, in all countries these arrangements are governed by fiduciary law which regulates the tasks of the trustees and the complex web of relations between the trustees and the different stakeholders of the pension fund. In addition, all countries have extensive regulations concerning the scope of allowed plan design which is routed in social and labour law. None of the countries apart from Germany openly regulate pension funds' investment apart from rules limiting the investment in the assets of the sponsoring company. Pension funds are obliged to invest in a prudent manner. This prudent person rule originates from Anglo-American trust law but has also been applied in the Netherlands for about 50 years (Maatman 2004). But even in Germany remains the fact that German 'Pensionskasse' do not exploit their legal risk-taking limit.

Basically, the different stakeholders' attitude towards risk can be mapped as follows: The employer would be expected to encourage higher risk taking as this lowers his funding costs. His objective function

can usually be described as minimising funding costs within reasonable risks which translates into the financial-economic framework of risk-adjusted return optimisation. Beneficiaries are usually depicted as more safety-focussed thus favouring lower risk investment strategies. This holds true especially for pensioners. But pension fund members can get inclined to take higher risks if the plan is contributory so that they benefit as well from lower funding costs or in case of pension plans where the benefits are linked to the investment return of the fund.

The differences in the trustees' risk attitude can be broadly clustered around the following two questions:

- Whose interests have the trustees to take into account when they decide on investment policy and investment risk?

- Who benefits from above target investment returns and who has to bear the losses resulting from below target investment returns?

The most common answer to the first question is: 'the beneficiaries'. Trustees are usually conceptualised as agents of the beneficiaries. Controversial is the legitimacy of the sponsor's interest. Prevailing market practice is often not properly legally encoded. The Netherlands is the only country of the here analysed ones which openly approves that trustees should also take the sponsor's interest into account when setting the investment policy. The pension fund is conceptualised as fiduciary of the beneficiaries and the employer thus extending the fiduciary duty to all stakeholders (Maatman 2004). The large industry-wide pension funds in the Netherlands carefully assess the interest of all stakeholders in the annual pension deal. On the other end of the spectrum, the recent governance changes in the United Kingdom enacted by The Pensions Regulator aimed at strengthening the independent position of the trustees and diminishing the sponsor's influence on the investment policy. Trustees are the agents of the beneficiaries. Other jurisdictions are rather silent on this question. In the United States the trustees are constituted by representatives from the company but are legally required to act in the sole interest of the beneficiaries, what is often termed as 'wearing two hats'. The interpretation of fiduciary law rests with the Department of Labor, which has repeatedly interpreted this 'solely in the interest rule' as not precluding the consideration of other interests as long as this is not detrimental to the interests of the beneficiaries[14]. The careful interpretations indicate the difficulties inherent in fiduciary law which bears the analogy of walking a tightrope. Market practice in the United States closely aligns the interests of beneficiaries and sponsor. The same holds true for Germany.

Regarding the second question, it will be shown that asymmetries in the risk/reward pattern distort the neutrality of the risk attitude of the investment decision makers resulting in either too much or too little risk taking. Asymmetries can result either from the design of specific pension promise or the design of pension insurance funds and are as such politically underpinned.

Different modes of risk taking will be developed by means of stylised cases which resemble the situations in the four analysed countries. This section does not intend to argue the case of high risk-taking but attempts at explaining the different mechanisms that govern trustees' attitude towards risk taking.

Case I: Risk-taking governance structure

Under a final salary plan, the employer promises a pension benefit to the employee, which is dependent on salary and years of service. The actuary calculates the pension liability and suggests the

[14] See e.g the Advisory Opinion 98-04A, May 1998, on socially responsible investment, http://www.dol.gov/ebsa/programs/ori/advisory98/98-04a.htm

contribution rate at which the employer funds the plan. As the pension promise is not dependent on the investment returns the employer alone bears the investment risk. When the investment returns are worse than expected, the employer has to compensate the shortfall. When the investment returns are better than expected the employer is rewarded by contribution holidays. In this case, risk and reward is symmetrically distributed[15]. The investment decisions are made by a board of trustees which is composed of representatives of the employer. The trustees are bound by fiduciary duty to act in the interest of the beneficiaries but can also consider the interest of the employer as long as it is not detrimental to the interests of the beneficiaries. They are also bound by the prudent expert rule to diversify the portfolio and to maximise risk-adjusted returns. Whose agents are the trustees? The argument can be made that the trustees err on the higher spectrum of possible risk taking as lower funding cost enhance the economic well-being of the employer and this also serves best the interest of the beneficiaries. Trustees can be expected to follow an active risk-adjusted return optimisation. The interests of the employer rank high.

Now add a pension insurance fund to the case: The employer can still benefit from the upside but is insured on the downside. This asymmetric distribution of risk and reward incorporates moral hazard, as has been frequently analysed and documented. In conjunction with weak bankruptcy laws it invites to strategic default and encourages an investment behaviour which can be characterised by 'gambling for resurrection', namely the increased risk-taking in a situation of crisis as one can benefit from successful 'gamble' but has got 'nothing to loose' if the 'gamble' goes wrong. This structure incentivises high risk-taking.

Case II: Risk-averse governance structure

The employer promises under a final salary plan a pension benefit to the employee, which is dependent on salary and years of service. The actuary calculates the pension liability and sets or suggests the contribution rate at which the employer funds the plan. The employer fully underwrites the pension risks. The investment decisions are made by independent trustees, under what could be termed a strong trustee structure. The trustees are bound by fiduciary duty to take care of the interests of the beneficiaries only. The employee perspective prevails. As plan members do not benefit from risk-taking under the here described non-contributory pension plan with fixed benefits trustees turn risk-averse. Their risk-taking is beneficial to the employer only as it lowers the pension costs but detrimental to the beneficiaries as it deteriorates the employer's covenant and thus the safety of the pension benefits. This governance structure is basically risk-averse.

The risk averseness of the trustees could be expected to be overcome by introducing a pension insurance fund. But as pension insurance funds usually cap pension benefits members are always worse off in case of the sponsor's bankruptcy.

Case III: Risk-neutral governance structure

Employer and employee contribute under an average pension a fixed percentage of the employees' salary to a pension fund. The guaranteed pension covers only the sum of the paid in contributions. Investment risk is thus shared between employer and employee. The employee benefits twofold from good investment returns as firstly the contribution rate is lowered and secondly the pension benefits are indexed in line with inflation In case of insufficient investment returns indexation is suspended and/or contributions increased. The employer still underwrites the shortfall risk, but can also benefit from strong investment returns as investment returns which exceed what is required for indexation can be recovered in form of

[15] This situation was criticised for its immanent cyclicality as contributions tend to increase in economically difficult times. For suggestions for change see Weller Weller, C., Baker, Dean (2005). "Smoothing the Waves of Pension Funding: Could Changes in Funding Rules Help Avoid Cyclical Under-funding?" The Journal of Policy Reform **8**(2): 21..

lower contributions. The investment decision is taken by trustees, equally representing employees and employers, who have to consider the interests of all stakeholders including the sponsoring company. As risks and rewards are symmetrically distributed, the risk attitude is not distorted. Interests of employer and employee are well balanced.

Case 4: Risk-diffuse governance structure

Let us assume a case, where the employer promises a future pension which depends on contributions, which are fixed in absolute terms, and the years of service. The pension benefit is projected based on actuarial assumptions. It consists of a minimum benefit guaranteed by the employer and an additional benefit subject to higher then calculated investment returns. The investment decision is made by the employer. The employer fully underwrites the shortfall risk but can also recover the surplus, so that the employer's risk profile is still mainly neutral[16].

In a second case the employer offers the employee the possibility to convert part of her salary into a future pension. The pension benefit is projected based on actuarial assumptions. It is not guaranteed but depends on the investment returns. The difference to a pure DC plan is that the employer guarantees a minimum return on the paid-in contributions. The investment decisions are made by the employer. The employee benefits from higher than expected investment returns and is shielded from the downside, whereas the employer has the risk of extra contributions in case of adverse investment results but cannot reap the upside. The employer is strongly discouraged from risk taking and can be expected to implement a low-risk investment strategy.

These stylised cases might help to explain differences and changes in the risk attitude although they are certainly not sufficient. The offered theory is consistent with the low risk profile of German pension funds as well the recent de-risking of UK pension funds as the situation in the United Kingdom moved from case 1 to case 2. It certainly does not explain the traditionally higher risk-taking of pension funds in the United Kingdom compared to those in the United States as the long standing existence of a pension insurance fund in the United States would have suggested the opposite. Regarding the significantly lower equity investment by the Dutch pension funds, one could suggest that the equal participation of employers and employees in the bearing of risk and the decision-making on the taking of risk tends to lower the risk profile.

Measuring risk – from the actuarial valuation to fair value

> '*The strong influence of accounting on behaviour highlights the need to narrow the gap between accounting and economic reality. In an ideal world, there would be no tension between accounting, underlying economic realities and sound risk management.*' (Borio 2005)

The valuation of pension funds is in a state of flux. The traditional consensus between actuaries, regulators and accountants is in most pension fund jurisdictions broken. A new consensus is in most countries not yet reached.

The valuation of pension funds is the task of the actuary who analysis assets, liabilities and funding status, advises on the necessary contribution and certifies compliance with the regulatory rules[17]. The actuarial valuation is usually commissioned by the trustees who pass it on to the sponsor, the beneficiaries

[16] Apart from the reward for the guarantee the employer has written.

[17] For an analysis of the role of the pension actuary in the countries of the European Union, see 'Professional Responsibilities of Pensions Actuaries', Groupe Consultatife Actuariel Europeen, 2005, http://www.gcactuaries.org/documents/prof_resp_pens_jun05.pdf

and to the regulator. Most countries have a certain set of rules for conducting the actuarial valuation which can take the form of guidance notes by the professional association, e.g. in the United Kingdom, or the form of legally encoded regulations as in the other here analysed countries to varying extent. It is noteworthy that as all countries practise different actuarial assumptions e.g. with regards to mortality tables or discount rates, the present value of what could be defined as one unit of pension promise differs widely.

The actuarial valuation can be characterised as taking the perspective of the pension fund. The accounting rules prescribe how the plan sponsor has to account for the cost of providing DB pension plans in its own balance sheet. Traditionally those two professions and the regulators took a similar look on pension funds.

The standard actuarial valuation is usually conducted on an ongoing basis focussing on accrued rather than projected liabilities. It takes a forecasting view on the pension fund judging weather the pension fund will be able to fulfil its accrued obligation given its current assets and investment strategy, and what level of contribution from the sponsor is necessary to reach this goal. The assumptions regarding the main risk factors surrounding the value of the pension promise mainly mortality and – if applicable - inflation as well as the assumptions in deriving the present value of future liabilities are the key variables in the actuarial valuation. Each country usually applies a standardised mortality table which may be adapted to the specific characteristics of the plan population and which is either prescribed by regulation or recommended by the professional bodies. The mortality tables differ widely[18]. The same holds true for the chosen discount factors. Anglo-American pension funds discounted liabilities with the long-term expected return on assets, which would be derived from the asset portfolio mix. Other jurisdictions applied nominal or book values for the assets and used a fixed discount rate for the liabilities thereby approximating the expected portfolio return. In continental Europe the actuarial valuations were conducted yearly whereas triennial valuations dominated in the Anglo-American countries.

The old accounting rules recognised actual or averaged contribution to the pension fund derived by the actuaries as pension cost in the sponsors' financial statement. The traditional accounting rules are therefore usually described as the actuarial model as they followed the actuarial best estimates. The traditional actuarial approach focused on the funding requirements to meet the obligations of pension contributions but neglected the financial status of the pension fund (Whittington 2006).

None of the traditional approaches applied marked-to-market valuations to pension funds. In this world, the corporate sponsor of a pension fund was largely shielded from market risk in the pension fund. One might suggest that balance-sheet risk, namely the risk of unplanned deficits in the sponsor's balance sheet triggered by financial market volatility, did not constitute a relevant risk category for corporate sponsors. But due to the often extensive smoothing and the long intervals between valuations also at the level of the pension fund market risk was not measured. As one market participant put it: 'In the old actuarial valuation we could trust that any deficit would just vanish.'

This traditional actuarial approach was heavily criticised for its lack of transparency, as actuarial values were constructed rather than putting the spotlight on current market values (Exley 1997). Principles for evaluating pension provisions in the economic world of the plan sponsor taking a financial economic rather than an actuarial view were developed in an US context from the late 1970s onwards. The first paper was by Sharpe 'Corporate pension funding policy' in 1976 (Sharpe 1976). The theories were transferred into accounting and applied in an UK context in the late 1990s by Exley, Mehta and Smith in a paper 'The

[18] Cass Business School conducted a detailed study on the different mortality tables applied by the countries of the European Union, Canada and the United States, 'Mortality research project - Mortality assumptions used in the calculation of company pension liabilities in the EU', http://www.gcactuaries.org/documents/mortality_project_report.pdf

Financial Theory of Defined Benefit Pension Schemes' (Exley 1997) presented to the Institute of Actuaries. Basically, market prices are applied to pension assets and liabilities. Based on the assumptions of complete markets and contracts the pension liability is constructed as a bond and discounted with the yield of a bond with matching duration. Furthermore, this school of financial economics takes an integral view on pension fund and plan sponsor and concludes that the plan sponsors' investment risk taking in its pension fund is detrimental to the goal of optimising shareholder value.

This new approach to accounting is known as 'balance sheet' approach as it focuses not on the long-term funding requirements for meeting the DB pension promise but on the current financial situation of the pension fund. This approach calculates the pension fund's surplus or deficit as difference between the current values of the pension fund's assets and liabilities, which has to be included in the sponsor's financial statement (Whittington 2006).

Starting out from the United States pension accounting standards are converging internationally (Fore 2005). The US standard SFAS 87 introduced in 1986 was the first accounting standard following the 'balance sheet' approach. Assets are valued at market prices and pension fund's liabilities discounted at a long-term interest rate. Surplus or deficit is recognised in the sponsor's financial statement. But SFAS 87 applied a smoothing methodology to alleviate annual fluctuations of pension fund's assets and liabilities and commented on the plan's surplus or deficit in the footnotes only. The following accounting standards stepwise abolished the smoothing mechanisms and extended the recognition of surplus or deficit in the plan sponsor's financial statement thus increasingly exposing plan sponsors to short-term fluctuations of market prices. The international standard IAS 19 eliminated the smoothing of asset prices but still kept some smoothing option for liabilities. Surplus or deficit must be recognised in the sponsor's balance sheet. Finally, the UK's FRS 17 completely eliminated smoothing but requested sponsor's to report surplus or deficit in a separate statement and not directly on the balance sheet. More recently, FASB started reforming the US standards in a similar way. Furthermore, starting with SFAS 87, the accounting standards focussed on projected rather than accrued benefits. As thus the pension liability increased and turned volatile, the plan sponsor's world changed dramatically. Balance-sheet risk became a relevant risk category for corporate pension fund sponsors.

This move by the accounting standard setting bodies breached the uniformity of the methodology of measuring values and risks: The UK pension funds mostly still apply the actuarial approach for their own accounting but have to provide fair valuations to their sponsors. The same applies to German pension funds whose accounting system, which is prescribed by the regulatory authority, is rooted in book valuation, whereas the corporate sponsor usually has to apply IFRS accounting at fair values. The Dutch Central Bank took the lead among the pension fund supervising authorities to fully implement the fair value principle also in the new regulatory framework. The recent reforms in the United States point into a similar direction. But there still remains the difference that regulators focus on accrued benefits whereas corporate sponsors have to account for the projected benefit obligation which is usually significantly larger.

Pension funds and their sponsors have to cope with the fact that different values are put on their pension plan. As was shown in a previous study sponsored by the OECD, the liability resulting from one identical pension plan differs in absolute amount and behaviour under the different jurisdictions and valuations. Following the old adage that 'we manage what we measure' the application of various valuation methodologies creates a dilemma for risk management as the management objective becomes ambiguous. In these cases, a hierarchy of values is required but not supplied (Blome 2007).

The introduction of the new accounting standards coincided with the perfect pension storm thus exposing often large funding gaps at the pension funds. Whereas the traditional approach to accounting was criticised mainly for its lack of transparency, critics of the new approach argued that by 'reporting short-term fluctuations in the estimate of a long-term liability, it was introducing spurious fluctuations into

the accounting reports which might give a misleading picture of a company's performance and financial state' (Whittington 2006). Klumpes showed that the introduction of FRS 17 triggered the closure of DB pension funds in the UK (Klumpes 2003). Boeri states that the new accounting standards eroded the risk taking capacity of the plan sponsor (Boeri 2006).

In more detail, problems arise with the application of market prices to pension funds' assets and liabilities. As the majority of pension fund's assets usually consists of assets traded at liquid markets market prices are easily available. The valuation of illiquid and not-traded assets such as private equity, hedge funds and, most recently, structured bond products such as CDOs is more problematic. Challenging is the construction of fair values to pension liabilities as a market for pension liabilities does not exist. This gap is bridged by constructing the cash flow arising from pension fund's liabilities as bond-like thus – applying the Law of One Price - discounting the liabilities with a long-term interest rate theoretically the zero-coupon structure of Government bonds or – less sophisticated – as a long-term interest rate with fixed maturity, usually the yield of high quality corporate bonds. De Jong showed that it is not possible to value pension liabilities in incomplete markets as they exist in the real world (de Jong 2005). Although, mathematical iterations can be found to cope with the challenges, the valuation of pension liabilities remains in a certain way constructed. Orszag and Sand critically summarise the theories developed by corporate finance on pension concluding that 'as yet, modern finance theory does not provide and answer to ... the most fundamental question in pension finance how much to fund pensions and how to invest' (Orszag 2006).

In practice, the perceived risk profile of the pension liability changed. As the classical final salary pension promise links benefits to years of service and final salary, the main economic risk factors surrounding the liability are longevity risk and - depending on the plan rules - wage or inflation risk. The fair value approach calculates the present value of the pension liability by discounting the cash flows with the yield of bonds which are subject mainly to interest-rate risk. As the focus shifted to the equivalence of the present value of assets and liabilities rather than their future cash flows, fluctuations of the liabilities due to interest-rate changes became a further focus of risk management. Interest-rate risk was turned into an important risk category facing pension funds. Thereby, the accounting standards changed the perception of risk.

Regulating risk management

Pension fund regulation forms a further factor determining risk taking. The investment process is embedded in the distinct regulatory framework. The regulatory environment is a key determinant for pension fund management (Fabozzi, 2005).

Although pension funds are heavily regulated the rational for pension fund regulation is usually not very clear. In most countries, pension fund regulation actually started as a side activity in the respective Treasury Departments. As the provision of occupational pension is subsidised, the state is seen to have a legitimate interest in overseeing the process of pension provision to make sure that public money is employed in an efficient way. Comprehensive pension regulation was in most countries introduced in the early 1970s mostly driven by a major crisis, the most famous are Studebaker in the United States and Maxwell in the United Kingdom. Today's mantra of pension fund regulators is usually the protection of member's benefits. In economic terms, the rational for regulating pension funds is consumer protection based on asymmetric information and the principal –agent problems, which is basically the same as for regulating insurance companies. Unlike insurance companies, pension funds are usually not in the pro-profit business. Maximising shareholder value is not a valid business proposition for pension funds. Unlike insurance companies, pension funds have – at least in principal – a sponsor as guarantor and protector. There is consensus that opposite banks, pension funds do not pose a systemic risk. Nor is there the need to protect against monopolies. Regulation of pension funds is still conducted mainly on a national scale. The

European Union (EU) introduced the first supranational regulation of pension funds in June 2003 with the directive on 'the activities and supervision of institutions for occupational retirement provision'[19]. This directive allowed cross-border provision of occupational pensions but apart from formulating some rather broad regulatory principles, regulation remained mainly with the national regulatory agencies.

As the ultimate goal of pension regulation is formulated as the protection of members' benefits, safety aspects rank high in all jurisdictions. But there remains the efficiency argument: Employing pension contributions in an efficient way is not only in the interest of Governments aiming at minimising tax subsidies but even more so in the interest of employers and employees aiming at minimising the cost for providing a defined benefit or maximising the benefits from a given contribution. Investment is a core function of pension funds (Davis 2001). As the investment return on pension funds' assets determines the costs of providing a defined-benefit pension plan, the efficiency argument requires efficiency of the investment process. The European Union states in the preamble to the pension fund directive that 'the investment policy of an institution is a decisive factor for both security and affordability of occupational pensions'. Security and affordability can be seen as constituting the two main goals in pension regulation. Pension fund regulators recognise the risk-return trade off which is inherent in the pension fund system, but regulators' attitude towards risk differs. Anglo-American regulators were traditionally more lenient on pension funds' risk-taking than their continental European counterparts. It was argued that these differences in the approach to pension fund regulation mirror the differences in the conceptualisation of pension fund systems (Laboul 2006).

Regulation of the asset investment of pension funds is generally classified along two broad concepts: The prudent person principle as the qualitative regulatory principle requiring diversification of assets and the limit setting of the quantitative regulatory approach. The prudent person principle is deeply embedded in the principle of fiduciary duty which forms a fundamental aspect of the Anglo-American regulatory approach. Fiduciaries are required to act with prudence. Although the United Kingdom and the United States share these basic principles, the understanding of what constitutes prudent investment differs. Under UK law trustees are not requested to have professional investment knowledge but only to 'obtain proper advice about it'. This rule paved the way for the huge influence of investment consultants in the United Kingdom. In the United States the prudent person rule was over time further developed into the prudent expert rule. A pension fund manager's decisions are compared to those of investment professionals. In the United States, prudence is interpreted along the lines of financial-economics, i.e. maximising risk-adjusted returns. This is consistent with the traditional focus on affordability in US pension regulation. Prudent investment requires a well diversified portfolio. It seems doubtful if the heavily bond-geared portfolios of some continental European pension funds would pass the prudence test in the United States.

Quantitative investment regulations were wide-spread in continental Europe. The way they are usually applied, quantitative investment restrictions reflect a clear focus on safety forfeiting affordability. They were increasingly criticised for producing suboptimal investment results and – following the wave of liberalisation of financial markets in the 1990s – mostly abolished[20]. A general case against quantitative investment rules for pension funds was made in a report commissioned by the European Commission what became famously known as the 'Pragma-Report'. Quantitative investment restrictions were criticised for being 'in the way of optimisation of the asset allocation and securities selection processes and, therefore,

[19] DIRECTIVE 2003/41/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 3 June 2003 on the activities and supervision of institutions for occupational retirement provision.

[20] The abolition of quantitative investment regulation in favour of the prudent person principle constitutes the only noticeable impact the economic de-regulation wave exerted on pension funds.

may lead to sub-optimal return and risk taking'[21]. The different types of portfolio regulations and their impact of pension funds and life insurance companies were examined in more detail 2001 by Davies in a research commissioned by the OECD concluding that 'the key points for policy purposes are that prudent person rules are generally preferable to quantitative restrictions for pension funds' (Davis 2001). A quantitative approach investigating the impact of regulatory rules on investment and risk management of pension funds in selected OECD countries was taken 2007 in a further OECD project (Blome 2007). The results of this project further emphasises Davies' policy recommendation that 'appropriate strategies of deregulation will thus … (contain) an early introduction of prudent person regulation' (Davis 2001). In general, there is a trend towards 'increasing convergence toward some form of "prudent person" rule in investment regulations and away from quantitative restrictions' (Laboul 2006).

The sometimes rigid rules of continental regulators were often criticised for allowing too little flexibility and thus imposing too high costs on pension funds, but in times of crises they prevented pension funds on the continent from plunging into deficits comparable to those suffered by their Anglo-American counterparts. The Anglo-American regulatory approach on the other hand was considered as not providing adequate safety to beneficiaries. The focus shifted from affordability towards safety. Both the United Kingdom (The Pensions Act, 2004) and the United States (Pension Protection Act, 2006) imposed pension reforms in recent years requesting higher funding ratios as additional safety measures in addition to existing – as in the United States – or newly established – as in the United Kingdom – pension insurance funds. Although the need for action was considerably lower on the continent in terms of crisis management, the Netherlands completely overhauled its regulatory regime and introduced a risk-based supervision by implementing a model-based approach similar to those used in international banking and EU insurance regulation[22].

Regulation became more risk aware and safety-focused demanding higher funding levels and often encouraging pension funds to lower the risk profile of their portfolios. As a general trend, policy makers focus much closer on the funding of pension funds. Shortfall risk is perceived as central risk factor threatening benefit security. Many countries have introduced pension reforms in recent years encouraging higher funding ratios, so that in a balance sheet perspective assets are sufficient to cover liabilities. Solvency became the core regulatory instrument. Whereas this approach is consistent with the general concept of pension funds as stand-alone companies in continental Europe it is questionable in the Anglo-American world where the safety of the pension promise is mostly based on the sponsor's covenant. Regulation in the United Kingdom has started to take the sponsor's covenant into consideration; the United States strengthened the funding rules instead.

The regulatory tools employed to steer the funding ratio differ distinctively. In continental Europe regulation is rule-based. Continental Europe in general exercises precise, quantitative rules that apply to all pension funds in the same way, although increasingly taking the individual risk profile of pension funds into account. The German funding rules are the strictest as they do not provide recovery periods in case of underfunding. The Netherlands introduced a risk-based approach based on the fair value principle analogue to banking regulation. They concede specified recovery periods. As indexation is in nearly all pension plans conditional, pension funds do not need to fund for it. The United Kingdom adopted a principle-based approach explicitly dismissing quantitative rules given the negative experience with the Minimum Funding

[21] European Commission, 1999, 'Rebuilding pensions, security, efficiency, affordability - recommendations for a code of best practice for Second Pillar Pension Funds,' prepared by Pragma Consulting for DG-XV, European Commission, Brussels, http://ec.europa.eu/internal_market/pensions/docs/studies/1999-occupa-full_en.pdf

[22] There is ongoing debate at the EU level if the Solvency II regulations for insurance companies should also be applied to pension funds.

Rule (see section 5.3.5). Regulation is focussed on enabling the trustees to operate the pension funds prudently but following a scheme-specific approach. Accordingly, there are no precise rules regarding recovery plans or periods in case of underfunding. Regulation of pension funds' governance can be seen as a fundamental aspect of this approach. As the United States share the fiduciary law tradition, regulating governance forms a key aspect also of US pension fund regulation. Albeit with regard to funding regulation, the United States underpinned moral principles with quantitative rules. US funding rules compose a massive and powerful piece of regulation.

In the pension literature the goal of a pension fund is usually described as paying benefits to members. Only rarely is 'funding the pension benefits' constructed as a primary goal in its own right. We share the majority view that it is the ultimate goal of a pension fund to pay the promised pensions to the beneficiaries. A pension fund which is 'fully funded' over its life cycle ensures that the promised benefits can be paid even in case of bankruptcy of the plan sponsor. In this view, 'funding' becomes an intermediary target, which could also be conceptualised as an instrument of risk management imposed by the regulating authorities on pension funds.

The current discussion in the United Kingdom and the United States highlights the difficulties surrounding the concept of 'funding'. The first caveat relates to the difficulty to define 'full funding'. Pension assets are usually easy to evaluate as they are mostly traded on liquid markets were prices are available. Pension liabilities on the other hand tend to be uncertain, which holds true especially under an Anglo-American DB pension promise, as neither salary nor mortality trends are known variables. As was shown in section 3.2., financial economic theory does up to now not provide a theoretically coercive and unambiguous valuation methodology. As all countries apply different funding concepts, national funding ratios are not compatible on an international scale. For example, the valuation concepts applied in the United Kingdom include indexation of benefits (which is legally required in the UK), whereas the funding concept used in the Netherlands does not (as indexation is voluntarily, but aspired). When comparing funding figures internationally, as a rule of thumb a funding level of 100 percent stated in the UK would be roughly equivalent to a funding level of 120 percent as disclosed in the Netherlands. General acceptance of valuation methods therefore rests on stakeholders' consent. Whereas in Germany and the Netherlands the interpretation of funding which is formulated by the regulating authority is in general accepted by the pension fund community, this does not seem to be the case in the Anglo-American countries. The concept of funding seems to be a highly controversial and partly contested area.

In general, the focus of Anglo-American pension fund regulation shifted from affordability towards security. In spite of the inherent problems surrounding this concept, solvency turned into the shared intermediate target of regulation. By increasingly applying market rates in assessing the adequacy of solvency levels regulation turned more short-term.

The changing paradigm of pension investing

> '*The nature of an institutional investor's liability will dictate the investment strategy it will request its money manager to pursue*' (Fabozzi 2007).

It seems that in today's world the focus of investment is more on the way the liability is measured than on its nature. Furthermore, as investment is embedded in regulation, the funding focus of regulation impacts the strategic goals of investment.

Whereas in the United States pension fund investment is still often focussed on optimising risk-adjusted returns, throughout Europe, pension funds have become more funding orientated often extending the duration of their bond investments. According to a Dutch interviewee 'the investment policy is turned to the goal of maintaining a certain solvency level in the fund'. A British pension fund manager

commented: 'The main concern is that the deficit grows again'. Albeit the regulatory constraints became tighter and pension fund managers' complaint over too much regulation is common over all countries, German pension fund managers were the only ones who stated that their portfolio would be very different in the absence of regulation.

In the traditional world, investment was mainly an exercise in optimising risk-adjusted returns conducted by the pension fund manager with often a rather loose view on liabilities. In the new world, investment resembles an optimisation exercise under multiple often conflicting constraints formulated by different stakeholders. The 'perfect pension storm' at the turn of the century with simultaneously falling equity prices and bond yields challenged the wisdom of the conventional investment strategies and risk management techniques of pension funds (Ambachtsheer 2005). Especially the traditional balanced mandate with a 60:40 portfolio mix of equities and bonds[23] which was the dominating investment strategy in the Anglo-American countries was criticised for exposing pension funds to considerable funding gaps. In continental Europe where pension funds' equity investment had traditionally been significantly lower at 40 percent in the Netherlands and around 20 percent in Germany, the blow from the 'perfect pension storm' was less devastating but still damaging. Globally, pension funds were criticised for taking too much investment risk.

Since then, pension funds' investment strategies have in general become more risk-focused. Investment strategies moved from statistic to dynamic and from balanced to core-satellite. Pension funds portfolios are increasingly diversified over asset classes and regions. The investment in alternative asset classes has increased in all countries. Especially Anglo-American pension funds invest increasingly internationally. At the same time, the risk focus of pension funds' investment strategies has changed. With the changing regulation and accounting rules as well as the maturing of pension funds, liabilities became more important for the formulation of the investment strategy. In accordance with the changing perception of risk, risk management became much closer focused on managing shortfall risk and to hedge interest rate risk, which is in many cases seen as the most significant risk pension funds face. This change can be seen as triggered by regulation and accounting. Especially the change in the measured risk profile of DB pension funds' liabilities profoundly impacted pursued investment strategies as investment policies follow the changing perception and management of risk of those involved in investment-decision making.

In continental Europe where pension funds had to follow stricter funding rules the investment policy has always been stronger influenced by the prevailing valuation method of the liabilities. Discounting liabilities with a fixed discount rate as in Germany encourages the use of absolute return strategies where the aspired return is constituted by the discount rate plus x. German 'Pensionskasse' frequently aim at enhancing yield by buying into structured products. Discounting liabilities with the term structure of current bond yields as in the Netherlands triggered the implementation of interest-rate hedges while staying in their 40 percent equity and 40 percent bonds strategic asset allocation.

As interest-rate risk is now often perceived as the main risk pension funds face in managing the funding level, Liability-Driven-Investment (LDI) strategies are a new much discussed investment strategy. Although its theoretical foundations date back to the 1950s (Fabozzi 2007) practical applications were more recently offered by investment banks in the United Kingdom in the early 2000s, where it was since then much discussed but little implemented. LDI strategies arrived in the United States about 2006 where they seem to spread rapidly among smaller pension funds. Initially, the understanding of LDI varied significantly internationally. A study by JPMorgan Asset Management on LDI[24] showed that on the

[23] In the UK the mix was closer to 70:30 Blake, D. (2003). Pension schemes and pension funds in the United Kingdom. Oxford, Oxford University Press..

[24] JPMorgan Liability-Driven Investment (LDI) Survey: A Survey into Trends in Risk Management among Europe's Defined Benefit Pension Schemes, 2006

continent there was often an understanding of LDI in the sense of applying the results of an ALM exercise. The market participants in the UK regarded LDI more often as a liability immunising strategy.

The primary goal of LDI approaches is to manage interest rate risk. As in ALM more generally, liabilities are taken as the benchmark for the asset allocation, but whereas ALM represents just the framework for a consistent picture of assets and liabilities, LDI strategies implement investment portfolios which aim at matching the characteristics and behaviour of the liabilities thus eliminating or at least reducing interest rate risk. There are two main concepts for LDI:

- Immunisation strategies match the duration of the assets and liabilities. In the first instances this was done by shifting the complete portfolio into bonds (the best known example is the Boot Pension Scheme). Today, a series of interest-rate swaps is offered whose duration matches the duration of the liability.

- Dedication strategies aim at matching the cash flows of assets and liabilities utilising a bond portfolio.

LDI strategies are expensive, dedication strategies even more so than immunisation strategies. Apart from their genuine costs, the implementation of LDI strategies was further hold back by the underfunding situation of many pension funds in recent years as they require the sponsor to fill the gap prior to the implementation of the LDI strategy as well as the long period of very low interest rates which made LDI strategies even more expensive. Furthermore, the degree of certainty with which the actuaries calculate the cash flows of the pension liability diminishes as the time horizon increases. One pension investment consultant conceded: 'There are a number of reasons why your cash flows are going to be imprecise and that is why a precise solution to an imprecise problem seems like sort of overkill'.

Most funds hedge only part of their liabilities, so as to leave room for outperformance. Or, in what is called contingent immunisation, LDI strategies aim at providing only a basic safety net. Therefore, pension funds often hedge the cash flows of the next 10 to 20 years depending on the individual pension funds' maturity, and shift the remaining part of the portfolio into what is termed 'return-seeking assets', which consist of equity as the traditional asset class and the alternative asset classes, which – in the UK – also include property. Applying a LDI strategy in this respect does not necessarily reduce risk, but it distributes risk in different ways and can also imply actually increasing the risk of the portfolio. Nevertheless, such strategies may present a balanced compromise between the interests of the different stakeholders, but the high degree of investment sophistication clearly requires sound governance structures at the pension funds.

LDI concepts are deeply routed in the school of financial economics which advocates that companies shall not take investment risk in their pension funds. Their recent popularity is closely related to the implementation of the financial valuation of liabilities in recent accounting standards and partly regulation rules. Drawing on a LDI critical industry report, at the heart of LDI lies a simple logic: When the liability is basically a bond and the assets should be managed to match this bond-like liability to reduce risk, the available asset is a bond[25]. Fore's prediction that the new accounting standards 'will probably change the way pension investments are managed' (Fore 2005) seems to be accurate.

LDI strategies seem to be taken up especially be smaller companies. This is compatible with the more general trend that smaller companies more than large companies opt out of providing defined benefit pension plans. Apart from the underlying cost argument, there are different triggers for shunning DB pension funds. For many companies complying with the ever complex web of rules set by regulators and accountants became too expensive as it requires increasing internal resources. Also, especially for smaller

[25] http://www.wilshire.com/BusinessUnits/Consulting/Investment/CDI_LDI.pdf

companies with large DB pension funds the pension fund inherent risks became too big in an enterprise risk management context. There are different possibilities to eliminate the risks surrounding DB pension plans. In some countries, merging the pension fund with larger funds seems to be an attractive solution. In countries where this possibility does not exist due to legal barriers, 'the first measure of risk management is to close the fund; the second measure was to implement a LDI strategy' (pension fund manager). Furthermore, especially in the Netherlands and the United States there is a noticeable trend towards outsourcing of the investment function or even the complete management of the pension fund.

Investment strategies will surely be revisited in the aftermath of the second financial crisis within six years. In general, only a straightforward risk reduction in the investment portfolio as e.g. in classical LDI strategies (or very high funding buffers) seems to have worked successfully in shielding pension funds from plunging into new funding gaps. The alternative portfolios advocated by the investment industry for its merits in diversification suffered in a marked-to-market valuation from the current illiquidity. Investment strategies developed by financial economic theory and the accounting reality seem to be not very well aligned at the moment.

Evidence from four countries

This section aims at giving an overview of the different pension fund systems in Germany, the Netherlands, the United Kingdom and the United States. Each section starts by giving a short overview of the main characteristics of the pension fund market, followed by chapters on the funding status, governance structure, pension plan design and regulation. Finally, it is analysed how these factors impact investment strategies and risk management.

Germany

Context

The German market for occupational pension provision amounted to EUR 439bn in 2007[26], which renders it by far the smallest of the four analysed countries. But the German Pension Reform, which was implemented from 2002 onwards, seems to have succeeded in enhancing the relative importance of occupational pension provision for total old age income thus compensating the reduction in the state-provided pension benefits. Not yet clearly noticeable in the volume of invested pension assets, the proliferation of occupational pension increased from an estimated 52 percent in 2001 to 65 percent of employees in the private and public sector in December 2006[27].

For Germany, this research focuses on 'Pensionskasse' only, as this is the most relevant and best documented funding vehicle in Germany: 153 'Pensionskasse' managed assets of EUR 104bn in 2008[28]. It

[26] Arbeitsgemeinschaft für betriebliche Altersversorgung, 2007, http://www.aba-online.de/seiten/betriebsrente/daten_fakten/1_Deckungsmittel_bav/Aktualisieungen_0609/1a-Deckungsmittel-_Aufteilung2007__19Juni_2009__SD_-Folie.pdf

[27] TNS Infratest Sozialforschung, 2007, http://www.bmas.de/coremedia/generator/952/property=pdf/2007__07__03__situation__und__entwicklung__bav__2006__endbericht.pdf

[28] Bundesanstalt für Finanzdienstleistungsaufsicht, Jahresbericht 2008,http://www.bafin.de/cln_108/nn_722604/SharedDocs/Downloads/DE/Service/Jahresberichte/2008/jb__2008__gesamt,templateId=raw,property=publicationFile.pdf/jb_2008_gesamt.pdf

is not surprising, that 'Pensionskasse' are on average with 20 pensioners per 100 active members the most immature pension funds of the here analysed countries[29].

The reader should bear in mind that the 'Pensionskasse' is just one in five available vehicles and accounts for about a quarter of the German market for occupational pension provision. The 'direct pension promise', where the pension liability was traditionally not separately funded and pension benefits were paid from the sponsoring company's cash flow, is still the dominating vehicle accounting for over 50 percent of occupational pension provisions. These 'direct pension promises' are nowadays increasingly funded: Companies irrevocably dedicate assets to the pension liabilities, in order to avoid having what accountants term 'unfunded pension liabilities' on their balance sheet. But companies usually do not use one of the existing regulated vehicles for that purpose but establish so-called 'Contractual Trust Agreements' (CTA), which are purely legal structures, unconnected to occupational pensions and therefore not regulated by the German pensions regulator. There is no official statistic on the use of CTA's, but building on companies' announcements it could be very roughly estimated to have about the same volume in terms of assets under management as the 'Pensionskasse'. This implies that two pension-fund like structures exist in Germany, one whose investment is heavily regulated, and one with completely unregulated investment and risk management[30]. Comparative research into companies' decision-making regarding the choice of the funding vehicle and also the decision-making in these vehicles could provide valuable insights into the impact of regulation, but is beyond the scope of this research.

Funding Status

As German pension funds are legally prevented from building up a high equity exposure and are requested to be well funded, they are comparatively well shielded from the negative impact of an equity market downturn compared e.g. to the United Kingdom. Although some company-sponsored 'Pensionskasse' were hit hard during the 2000-2003 crash due to asset losses, the subsequent fall in bond market yields lowering the returns on the dominating fixed income portfolio in many cases below the absolute return requirements was for many 'Pensionskasse' a more urgent challenge they had to cope with. In its annual report 2006 the German regulatory agency qualified German pension funds as being in good financial condition. Hidden losses that occurred at a number of pension funds in the aftermath of the 'perfect pension storm' were regained. But regulation prevented many pension funds from benefitting from the favourable stock market trends from 2003 onwards thus limiting the return potential. The thus significantly reduced exposure to 'risk assets' in turn rendered the impact of the 2007/2008 crisis less severe. Nevertheless, according to the regulator, 'Pensionskasse' will re-enter 2008 into building up of hidden losses with some also experiencing underfunding problems.

Governance Structure

A 'Pensionskasse' is organised in the legal form of an independent life insurance company. It can serve one or more employers. Traditionally, 'Pensionskasse' were operated by the sponsoring company or groups of companies. More recently, following the German Pension Reform in 2001, also financial service providers started operating 'Pensionskasse' on a for-profit basis. Also, trade unions and employer

[29] Bundesanstalt für Finanzdienstleistungsaufsicht, http://www.bafin.de/cln_108/nn_721290/SharedDocs/Downloads/DE/Service/Statistiken/Statistiken2007/Erstversicherungsunternehmen/st__07__erstvu__pk,templateId=raw,property=publicationFile.pdf/st_07_erstvu_pk.pdf

[30] The youngest funding vehicle, the 'Pensionsfonds', which was introduced with the German Pension Reform in 2001, and which combines features of both vehicles as it is an insurance-like structure with mostly unregulated investment management, has just recently been chosen for funding pension liabilities by large German companies due to mostly legal problems.

associations mostly established 'Pensionskasse' as vehicle for the industry-wide pension provisions, which were established following the new German pension law. In terms of assets under management, company 'Pensionskasse' dominate the market. They are usually organised in the form of a mutual society. Insurance law regulates the necessary bodies: The 'Pensionskasse' is run by a management board consisting of at least two managing directors supervised by the supervisory board with equal representation of employers and employees. The senior representative body is the assembly of members. The memorandum and articles of the association specify how these bodies are established[31].The supervisory board is usually responsible for setting the strategic investment policy, the management board for its implementation. German 'Pensionskasse' operate as professional pension fund management companies, with a full staff managing in-house pension administration, investment, risk management and reporting. The influence of consultants is therefore relatively low. The large 'Pensionskasse' manage the complete pension investment process including manager selection in-house. Most 'Pensionskasse' pursue a mix of in-house and outsourced investment: Bond investment is mostly done in-house, whereas more research-intensive asset classes as for example emerging markets are outsourced to external investment fund managers. The exact apportioning is closely linked to the size of the pension fund.

There are today very different models regarding the degree of separation between the sponsor and the 'Pensionskasse'. Some companies operate their 'Pensionskasse' as in-house undertakings from their finance and human resources departments. In these cases, the sponsoring company is strongly involved in the decision-making on the strategic investment policy, they set the guidelines. As a pension consultant put it: 'In Germany, it is difficult to distinguish between the company and the trustees'. In this model, there is strong involvement and commitment of the company. Companies are usually more inclined to take investment risk in their 'Pensionskasse'.

Other companies seek greater separation from their pension funds. Especially when the sponsor disintegrates into a fragmented group of companies on the market for corporate control, the 'Pensionskasse' can become a truly independent company and might also be opened to for-profit third party business. The 'Pensionskasse' can be operated as a core business of the company group with a risk and return budget set by the mother company. In this case, regress to the sponsor's covenant is still a legal provision but not any longer a relevant option for the pension fund's strategic policy.

Pension Plan Design

German pension plans are mostly hybrid. Pure DC plans are legally not permitted[32], pure DB plans are becoming increasingly rare. The dominating plan type for new contracts is a 'contribution orientated' DB plan ('Beitragsorientierte Leistungszusage'), which is quite close to the cash balance plans in the US. It is basically an average salary plan, where the employer guarantees a pension benefit based on fixed contributions. The pension benefit is calculated according to actuarial rules. As the calculation of this pension benefit is based on very conservative estimates, the promised pension benefit is actually a minimum benefit, which usually gets topped up by surplus benefits. In general, benefits must be indexed in Germany. Every three years, the employer must check, if the purchasing power of the benefit is still in line with the originally promised benefit and, if necessary and economically viable for the sponsoring company, adjust the benefit in line with the increase of the consumer price index or net wages. Alternatively, the employer can increase the pension benefits automatically by 1 percent per year. The

[31] Bundesanstalt fuer Finanzdienstleistungsaufsicht, Act on the Supervision of Insurance Undertakings (Insurance Supervision Act - VAG), http://www.bafin.de/gesetze/vag_en.htm#top

[32] The employer is legally required to guarantee at least the accumulated contributions as pension benefit to the employee as a minimum protection against investment risks. This guarantee is also often referred to as 'zero-interest-rate-guarantee'.

'Pensionskasse' can exempt from the indexation rules, if all pro rata surpluses are used to increase the benefits of the pensioners.

Like life insurance companies, 'Pensionskassen' guarantee a fixed minimum rate of return per annum on the paid in contributions during the accrual phase. 'Pensionskasse' generally determine the level of guaranteed interest rate up to a cap, which is fixed by the Ministry of Finance in relation to the yield of long-term Government bonds (2.25 percent since January 2007). The guaranteed interest rate applies for the entire life of a contract. As this maximum interest rate guarantee was subsequently lowered over the last years following the decline in market rates, many 'Pensionskasse' still have contracts in their books with guaranteed returns of 4 percent per annum or more. The liabilities of 'Pensionskasse' therefore follow long-term bond-yields, but - given the long-term nature of pension contracts - with a significant time-lag. The total pension benefit paid by a 'Pensionskasse' consists of the guaranteed benefit and the surplus benefit, which depends on the return of investment.

The second new plan type, which was introduced in 2001, is a DC plan with additional guarantees for the employee ('Beitragszusage mit Mindestleistung'). The investment risk is shared between employer and employee, as the employee is sheltered by a nominal guarantee of the contributions paid in (less disbursements for the cover of biometric risks). Here, indexation of benefits is not required.

Quite often, the pension plan includes options regarding the level of required contributions and/or guaranteed benefits. The 'Pensionskasse' can then either increase contributions or decrease benefits in case of severe economic problems. Today, most 'Pensionskasse' offer a variety of pension plans with different benefit structures employers and/or employees can choose from.

Regulation

German pension funds are regulated and supervised by the insurance division of the Federal Financial Supervisory Authority ('BaFin'), which operates since 2002 as integrated supervisor for banks and financial service provider, insurance companies and securities trading. The 'BaFin' pursues a risk-orientated regulatory approach. German 'Pensionskasse' are subject to strict funding rules. 'Pensionskasse' must be constantly funded at 104.5 percent of its technical reserves, it is technically insolvent at a funding level below 100 percent. At funding levels below 104.5 percent, a recovery plan has to be prepared and approved by the regulator.

'Pensionskasse' are discouraged from risk-taking. First priority is given to the safety of investments. Pension funds are legally prevented from investing in assets which are rated by the large rating agencies below investment-grade[33]. The regulator's investment principles further demand investments to yield a positive rate of return, to be liquid, and to be well diversified by asset class and debtor. The investment principles are outlined by law ('Versicherungsaufsichtsgesetz') and detailed by 'circulars' which are decreed by the regulator. These 'circulars' are legally binding.

German 'Pensionskasse' are the only pension funds (of the here analysed countries), which must adhere to quantitative investment rules, which are applied in two steps. First, the regulator defines the investment universe by specifying the asset classes 'Pensionskasse' are allowed to invest in. Market participants criticised the regulatory authority for reacting too slowly to market innovations thus preventing

[33] Long-term ratings of at least BBB- by Standard & Poor's and Fitch or Baa3 by Moody's and short-term ratings of minimum or above A-3 by Standard & Poor's, F3 by Fitch, or Prime 3 by Moody's are classified as investment grade. As an exemption of this rule, 'Pensionskasse' may invest in high-yield- bonds which are rated at least 'speculative' with a rating of B- by Standard & Poor's or B3 by Moody's up to 5percent of their assets.

'Pensionskasse' from capitalising on first-mover opportunities. For example, investments in hedge funds were allowed only in 2004 with a limit of 5 percent of total assets ('Sicherungsvermoegen'). While Anglo-American and Dutch pension funds started investing in commodities a few years ago, this is still not allowed to German 'Pensionskasse'.

Second, the regulator imposes limits in relation to the assets under management for the maximum investment per asset class or group of asset classes, thus legally prescribing and to a certain extent detailing the diversification principle which is central to modern investment theory. The most important quantitative investment limit is the general quota of maximum 35 percent 'risk-taking assets'. 'Pensionskasse' may invest up to 35 percent of assets in so-called 'risk-taking assets' which comprises asset classes with as highly diverse risk profiles as listed equity, hedge funds and high-yield investments. The pension fund's individual risk taking capability determines the extent to which investments in risk-taking assets are regarded as suitable, which in turns depends on the extent of reserve buffers or the implementation of hedge strategies. In this respect, German regulation is case-based and risk-orientated.

Further quantitative investment rules include the postulation that not more than 5 percent of the portfolio may be invested with the same debtor. This quota increases to 30 percent in case of German public authorities, international organisations and qualified banks. Investments in currencies other than the Euro are closely limited as, firstly, at least 80 percent of the assets must be invested in the same currency in which the liabilities are denominated, and, secondly, assets have generally to be invested in the same country where the liability was generated.

All quotas are calculated on nominal or book-value basis. Regulatory accounting rules allow the building up of hidden reserves and hidden losses thereby allowing for a more stable investment policy as the portfolio does not need to be rebalanced following capital market volatility. The German regulator has not (yet) followed the international trend towards fair value accounting, apart from some reporting requirements[34]. The – compared by international standards – rather low 35-percent-quota for risk-taking assets has to be judged in this light: In phases of strong equity markets this allows for an equity exposure of up to 50 or 60 percent in fair value terms which brings it more in line with international practice.

These investment regulations impact the funding cost of pension plans not only by directly setting a risk limit but also by reducing the variety of available asset classes thus limiting possible investment strategies as well as by reducing the time horizon of investment.

Investment Strategies

As German regulation is very strict on funding, the primary investment goal is to avoid shortfall risk in the funding level. As liabilities are evaluated at a fixed discount rate which is also the guaranteed rate of return on contributions, assets have to grow at least at the same pace to keep the funding level in line. Therefore, 'Pensionskasse' pursue an absolute return target as secondary investment goal. '4 percent + x' represents a commonly formulated investment goal, with the 4 percent being the prevailing discount rate, the 'x' resulting from the regulator's demand to increase capital and from the need to enhance mortality.

[34] But BaFin is on the brink of abandoning book values and following the international bandwagon towards fair value. In this case, the trigger is Solvency II, the upcoming new EU regulation for insurance companies which albeit still under discussion and negotiation on EU level, is to a certain extent anticipated by German regulatory practice. But given the ongoing discussion on EU level weather solvency II will apply to pension funds as well, application of fair value accounting for German pension funds is still pending. But BaFin already now demands fair values in addition to book values as far as structured products and asset based securities are concerned.

German ‘Pensionskasse’ are conservative and risk-averse investors. The maximum investment limit of 35 percent for ‘risk-taking assets’, e.g. equity, profit participation rights or hedge funds, was used to only 13 percent in 2008 compared to 18 percent in 2005[35]. Equities are the main source of risk-taking assets. Hedge funds added 0.9 percent-points and high-yield investment 0.4 percentage points to the risk-quota. Most of the hedge funds investment constitutes indirect investment via structured products with the return linked to underlying hedge funds. A further 1.2% of the portfolio was on average invested in asset-backed securities (ABS). It can be concluded that portfolios have been further de-risked and only reluctantly diversified into alternative assets.

The investment behaviour of ‘Pensionskasse’ is similar to that of life insurance companies, which is not surprising given the identical legal structure and regulation. The traditional investment strategy is to pursue a buy-and-hold strategy with registered, not-quoted bonds or loans issued by banks or the Government which are valued at face value. It is regarded as a low-risk strategy, as losses on the balance sheet that would incur to quoted bonds in times of rising yields as bond prices fall can be avoided as marked-to-market valuations do not have to be applied to these registered, not-quoted bonds. Also, this investment strategy fits well into the nominal value orientated German regulatory context. Of the in this research analysed countries, German pension funds are the only ones which still apply nominal values to assets and a fixed discount rate to the liabilities. This valuation methodology smoothes out capital market volatility in a way which is comparable to the traditional actuarial approach common in the Anglo-American countries. But it is widely criticised by consultants and investment bankers for being a low-yield strategy. Implementing core-satellite strategies is the first step out of the traditional investing, thus benefiting from the positive diversification of assets with low correlation. The dominating asset classes are clearly bonds and equity; only the larger and more sophisticated ‘Pensionskasse’ have started to invest in alternative asset classes, such as hedge funds and private equity. Liability immunising strategies are not common in Germany.

A common investment approach is to stay in the fixed income investment but to enhance yield by buying into structured products, which are synthetic investment instruments created by investment banks. The kind of investments that appeal to ‘Pensionskasse’ usually uses bonds as underlying combining them with derivatives thereby creating bond-like instruments with returns higher than bonds or with cash-flows that better match the investor’s cash need. Examples are multi-callable bonds, which offer a higher return in exchange for a cash-flow risk or reinvestment risk. ‘Pensionskasse’ invest in structured products within their strategic bond allocation. It can amount up to 25 percent of the overall portfolio.

Some ‘Pensionskasse’ had also started to invest in collateralised debt obligations (CDO). Their charm is, as one market participant put it ‘to offer the return of equity at bond-like volatility’. This is an indication of regulation-induced sub-optimal investment. ‘Pensionskasse’ are in a dilemma, which was especially problematic during the low-yield phase from 2003 up to end 2006: In order to fulfil their pension obligations they need annual investment returns at or above the guaranteed return, which was significantly above the risk-free return of long-term government bonds. This implies the need to take investment risk. But as they are prevented from openly taking investment risk by investing in highly liquid equities priced on public stock exchanges in a transparent and competitive way, they are incentivised to capture risk premiums in a more discreet way by investing in asset classes which are either illiquid or with opaque pricing mechanisms or both.

Nearly all interviewees stated that their investment portfolio would look very differently in the absence of regulation. Most would like to have a higher exposure to equity, all would like to be able to react earlier to new investment topics. Depending on the individual specifications of the pension fund

[35] Bundesanstalt für Finanzdienstleistungsaufsicht, Jahresbericht 2008, http://www.bafin.de/cgi-bin/bafin.pl?verz=0904010000&sprache=0&filter=&ntick=0

regarding maturity of plan population or regress to the sponsor's covenant, pension funds would not necessarily take more risk but would take risk from different sources in a way they deemed to be more efficient. This contrasts sharply with the responses from pension funds from the other analysed countries, which all stated that regulation had either none or very little influence on their investment decisions. The strong influence of regulation in Germany was emphasised by one market participant with the comment: 'When you make an investment-decision, the first question you ask is: "Is this compliant with regulation?" The investment-related questions rank actually second'.

Risk Management

In Germany, risk-management is outlined by the regulatory authority in some detail. Risk management is clearly regulation driven. The requirements pension funds have to meet include requirements regarding

- Asset-Liability-Management
- Stress-test
- Internal organisation and revision.

With the 'circular 15/2005', Asset-Liability-Management (ALM) became implicitly legally required. The circular states that insurance companies (including pension funds) have to decide on their strategic asset allocation within the specific context of their liabilities. A detailed analysis of the risks involved in assets and liabilities and their relation (ALM) is therefore an important precondition for the formulation and implementation of the investment policy. The ALM studies have to stress-test the investment policy in a range of different capital market scenarios. Methodology, assumptions and results have to be reported to the regulator[36].

The most important risk management tool is the stress test imposed by the regulator, which is basically a tool to analyse the impact of negative developments of capital markets on the portfolio with a one-year horizon. The 'BaFin' conceptualises the stress-test as an important quantitative risk management instrument which acts as early-warning system. The stress-test questions if the pension fund still fulfils the solvability requirements, i.e. funding level above 100 percent, in certain pre-defined negative scenarios for equity and bond markets. The 'Pensionskasse' must pass the stress-tests, otherwise the regulator could demand changes to the investment policy or even close the pension fund. The stress tests were extended over the years. Since 2006, 'Pensionskasse' must four different stress tests, including one on equity and property combined. The parameters are not fixed but determined by 'BaFin' according to market conditions. The four tests as applied in 23008 are specified in table 1:

Table 1: Stress-test of the German pension regulator:

Stress-test	Asset class	Market value
A 35	Equity	- 35%

[36] Bundesanstalt für Finanzdienstleistungsaufsicht, Rundschreiben 15/2005, http://www.bafin.de/rundschreiben/89_2005/050820.htm

R 10	Bonds	-	10%
RA 25	Equity,	-	20%
	Bonds	-	- 5%
AI 28	Equity	-	20%
	Property	-	10%

Source: Bundesanstalt für Finanzdienstleistungsaufsicht

Market participants cited the stress-tests as the main reason why the quota of 35 percent for 'risk-taking assets' never gets fully tapped. It shortens the investment horizon of 'Pensionskasse' to a period of one year maximum und thus prevents German pension funds from benefiting from the opportunities of long-term investing. It is a pro-cyclical tool as cyclical downswings in the equity market can force pension funds to sell equity in order to pass the stress-test instead of benefiting from the opportunity volatility offers to long-term investors. Especially in the aftermath of the 'perfect pension storms' when hidden reserves were exploited and often turned into hidden losses, many pension funds were rumoured to have been forced to sell equities, thus realising losses.

Furthermore, the regulating authority details internal operation and control and revision processes, also specifying which actors at the pension funds are responsible for which tasks. This prompted large 'Pensionskasse' to compile detailed 'risk management handbooks' outlining the complete risk management process from the ALM to the reporting. The circular on the regulatory requirements on risk management[37] was further updated in January 2009 implementing the recommendations of the Financial Stability Forum (FSF).

Regulation thus firmly anchored ALM in the German market. ALM studies are usually conducted by consultants. Large 'Pensionskasse' have started implementing own ALM tools not only for deriving the SAA but also to simulate pension policy decisions in a way that is comparable to the market practice in the Netherlands. But in many cases ALM studies lack sophistication. The gap between the leading and the lagging pension funds seems to be quite high. Therefore, it is not surprising that some market participants describe the stringency between the ALM study and the decision-making as relatively low, whereas other pension funds cite ALM as the most important strategic management instrument. Risk budgeting is not common in Germany.

[37] Rundschreiben 3/2009 (VA) - Aufsichtsrechtliche Mindestanforderungen an das Risikomanagement (MaRisk VA), http://www.bafin.de/cln_115/nn_721290/SharedDocs/Veroeffentlichungen/DE/Service/Rundschreiben/2009/rs__0903__marisk__va.html?__nnn=true

Netherlands

Context

The pension fund market in the Netherlands is one of the largest in the world, in absolute and even more so in relative terms compared to GDP. At the end of 2008, assets of Dutch pension funds were estimated at close to EUR 700bn thus still exceeding the Dutch GDP. s[38]. With around 43 pensioners per active members the market is relative mature. In 2006, 637 pension funds provided pension benefits, thereof 95 industry-wide pension funds, which are mostly mandatory for the employees in a specific industry, 529 company pension funds[39] serving the employees of a single employer, and 13 occupational pension funds, that cover the members of specific professions[40]. The industry-wide pension funds dominate the market holding 70 percent of all pension assets and covering approximately 85 percent of active members. For a recent overview of the Dutch pension system see e.g. Ponds and van Riel (Ponds 2007). The two largest pension funds, ABP, the pension fund for the public sector (privatised in 1996), and Pensioenfonds Zorg en Welijn (PfZW)[41], which covers the employees in the healthcare and social work sector, alone account for about 40 percent of the Dutch pension fund market, with accumulated assets of EUR 173bn and EUR 71bn respectively end 2006. Apart from these giants, the market is surprisingly fragmented. On average, the 529 company pension funds manage close to EUR 400m, and the industry-wide pension funds – apart from ABP and PfZW – close to EUR 2bn. Since the early 2000s there is considerable market consolidation at the level of smaller funds. There were still 754 company pension funds in 2001 compared to 529 in 2006. These funds are bought-out by insurance companies or merge with other funds.

Funding Status

With funding ratios plunging on average for the whole industry to 95 percent at the end of 2008 compared to 144 percent a year earlier, the 2007/2008 crisis impacted the funding status of Dutch pension funds more severely than the 'perfect pension storm' from 2000-2003. With a decline of assets of close to 9 percent in 2008 the asset side did not fare much worse than in the previous crisis. Funding ratios were more significantly hit by liabilities with technical provisions soaring by 25% at end 2008 compared to 2007. The application of the fair value principle on pension funds' liabilities for regulatory purposes accounts for the main difference in the impact of both crises. The widening interest rate spread between government bonds and the swap curve on the one hand and corporate yields on the other hand resulted in additional funding shortfalls of Dutch pension funds compared to their British and US counterparts. According to a survey by the Dutch Central Bank most pension funds will suspend indexation of pension benefits in 2009 and pension contributions will rise on average from 15 percent to 16 percent[42]. Pre-crisis,

[38] De Nederlandsche Bank, Macroeconomic statistics pension funds, http://www.statistics.dnb.nl/index.cgi?lang=uk&todo=Pen1

[39] The seemingly contradictory existence of both mandatory industry-wide pension funds and company pension funds is due to the regulation that a company can opt out of the industry-wide funds if it establishes a company pension fund which offers better benefits to its members than the industry-wide fund. While according to the statistics of DNB, employers and employees contributed on average 15.5 percent of salary to the industry-wide pension funds in 2007, the average contribution rate of 21 percent at company pension funds clearly exceeded this level (http://www.dnb.nl/dnb/home/file/StatisticalBullMarch07_tcm47-153821.pdf).

[40] De Nederlandsche Bank, Financial information on pension funds, http://www.statistics.dnb.nl/index.cgi?lang=uk&todo=PenFinGeg

[41] ABP and PfZW both separated the pension fund from the administrative organisation in 2008.

[42] De Nederlandsche Bank, Statistical Bulletin March 2009, http://www.dnb.nl/en/binaries/DNBsbmarch09_tcm47-216481.pdf

Dutch pension funds had steadily recovered from the period 2000-2003 due to continuously high returns increasing assets. The nominal coverage ratio, which refers to the guaranteed liabilities only, increased to 135 percent end 2006, the highest level since 2000. But also in real terms, thereby allowing for inflation-indexing, the Dutch pension funds were well above 100 percent funded. This enabled nearly all Dutch pension funds to resume the full indexing of accruals and benefits in 2006.

Governance Structure

Dutch pension funds are legally independent companies run by boards of trustees with equal participation of employers and employees. The governance structure at Dutch pension funds does not discourage trustees form taking the degree of investment risk that they deem appropriate in the interest of active and passive plan members and the plan sponsor. Required by law, there are now clear agreements in place how to share risk and return, how to use higher than expected investment returns to either improve the benefits for the members or reduce the funding cost for the sponsor, and the other way round, how to distribute the burden in case of lower than expected investment returns. A 'policy ladder' may state that pensions are fully indexed when the fund fulfils the solvency requirements at a level of around 130 percent, that pensions are only partly indexed when the solvency level falls to below 130percent and that indexing stops at 105 percent, which is the minimum level. Below 105 percent a recovery plan is legally required which usually includes an agreement with the sponsor to increase contributions, and above a funding level of e.g. 150 percent the sponsor might benefit from a reduction in premiums or even benefit from the restitution of the surplus, which is not legally prevented in the Netherlands.

Pension Plan Design

Pension plans in the Netherlands are still overwhelmingly DB, but most plans changed from the traditional final salary plan to average salary plans. Final salary plans provide automatic wage-indexing, which is usually close to inflation-indexing, of pension accruals as pension entitlements are linked to the number of years in service and the 'final' salary. In an average salary plan, pension accruals are linked to the annual salary earned in each year of service. Inflation-indexing of pension accruals is an explicit goal of pension funds' policy, but conditional on the financial position of the fund. This relates to the sharing of investment risk between employer and employee. Average salary plans therefore combine elements of DB and DC plans, which leads Ponds and van Riel to conclude that 'average-wage pension plans may be better viewed as hybrid DB-DC schemes' (Ponds 2007).

The change to average-salary plans provided Dutch pension plans with a second policy instrument besides the contribution rate. It can be seen as a real option, enhancing flexibility. This flexibility allows pension funds to better cope with external shocks. As one market participant put it: 'Flexibility keeps the system alive'. Conditional indexing thus becomes a powerful policy instrument. Ponds and van Riel showed in the context of an ALM study that with the change from final-salary to average-salary plans a pension fund gains nearly complete protection against shortfall risk (Ponds 2007).

The new trend in the Netherlands is the change to 'Collective Defined Contribution (CDC) Plans'[43]. In a move which is according to market participants mostly driven by the introduction of the IFRS accounting rules, pension plans are further changed to hybrid plans, which offer DB like guarantees to the employee but qualify as DC plan in accounting terms for the employer[44]. Under a CDC plan, the premium

[43] According to an interviewee, 15 pension funds had changed to a CDC plan design at the end of 2006 including 2 industry-wide schemes and –according to internal surveys – a total of a third of company pension funds are considering the change.

[44] This requires an unanimous decision by the pension board, which is represented to 50percent each by both employer organisations and labour unions.

is fixed over a time horizon of 5 to 10 years at a level above the level needed under a DB plan thus including a risk buffer. The employer can no longer be made liable for shortfalls, but is not able to recover surpluses either. Basically, the employer opted out of the risk sharing mechanism of a DB pension fund. The pension fund renounces 'the use of the contribution rate as a risk-steering instrument'(Ponds 2007). Under a CDC arrangement the intergenerational risk sharing between active and passive members is at the core of the system.

Regulation

Dutch regulation is traditionally funding orientated. In the absence of a pension insurance fund, the safety of the pension fund system is based on the solvency of the pension funds. At the beginning of 2007, the Dutch Central Bank (DNB)[45] which is the prudential regulator for the financial situation of the pension funds, imposed an entirely new regulatory system, which is a risk-based approach based on the fair value principle, which applies to both pension funds and insurance companies, albeit with some differences.

Dutch regulation fully applies the fair value principle in regulating pension funds. Pension funds assets and liabilities are valued in an consistent way, thus exposing both sides of the balance sheet to capital market risk. Only the contribution rate can still be calculated based on a fixed discount rate of 4 percent to counter undesirable volatility of the contribution rate.

The new regulatory approach was under discussion for a long time. The basic principles of the Financial Assessment Framework (FTK) were already outlined in 2001 by the Pensioen- & Verzekeringskamer, the predecessor of the DNB. 'On the basis of generous external feedback and progressive internal insight, work continued on the substance and the practical implementation of the FTK with, of course, strong input from the international dimension (IASB-IFRS, the Solvency II project and the Basel II Capital Accord for banks)'[46]. The new FTK was finally implemented as of January 2007, with a delay of one year, and after some relaxations, i.e. lengthening of the required recovery periods.

The pension liability relevant for regulation-purposes is the pension liability derived from the accrued nominal benefits discounted with the term structure of zero-coupon interest rates. The applicable yield curve is published monthly by DNB based on interest rates in the interbank swap market. Conditionally indexed benefits are excluded from the funding requirements. Dutch pension funds pay indexing out of their current investment returns, only unconditionally indexed benefits must be backed by funded assets. This regulation is the main reason that pension funds have nearly all clarified that indexing of pension benefits is conditional. The difference between the regulatory relevant 'nominal' funding ratio and the funding ratio 'in real terms' refers to the conditionally indexed pension benefits, which can amount to approximately 50 percent of the pension funds' balance sheet.

At the heart of the Dutch pension regulation are the solvency requirements. Pension funds have to fully fund their nominal liabilities with a solvency buffer of 5 percent. The probability of undershooting

[45] Dutch Pension funds used to be regulated by the Pensions and Insurance Supervisory Authority (Pensioen- & Verzekeringskamer), which was integrated into the De Nederland'sche Bank (DNB), the Dutch Central Bank, thus creating an integrated supervisor for banks, insurance companies, security firms and pension funds. Besides the DNB, the financial market authority is the second supervising authority responsible for protecting pension plan members.

[46] Pensioen-& Verzekeringskamer, Financial Assessment Framework Consultation Document,

http://www.dnb.nl/dnb/home/supervision/supervision_of_pension_funds/ftk_consultation/en/47-150605-64.html

100 percent may not be larger than 2.5 percent, which has to be proven in a solvency test. This requires the average pension fund to be funded at approximately 130 percent of their nominal liabilities. Pension funds are given a recovery period of three years to restore financial stability if the funding ratio fund falls below a funding ration of 105 percent. This three-year-deadline (initially, policy had proposed a one-year-deadline which was extended to 3 years after intense lobbying of the pension fund industry) was temporarily extended to five years in the wake of the credit crunch crisis. Pension funds are requested to prepare a recovery plan with a planned recovery period of up to 15 years, which must get approved by the regulator, when the funding level is between the targeted solvency balance (130 percent for the average fund) and the minimum funding level of 105 percent. Pension funds also have to pass a continuity test every three years, where they have to prove in the framework of an ALM study their long-term financial stability over a period of 15 years, including the outlining and financing of their indexation objectives. In the current crisis 350 pension plans had to submit a recovery plan.

There are three ways to perform the solvency test, which vary according to complexity and sophistication. Small pension funds with a low risk profile of their investment portfolio can apply the 'simplified method' thus exempting from any complicated calculations. The solvency test provided by the Dutch Central Bank under the 'standard method' will be applied by most pension funds, which is a scenario technique to calculate their funding requirements based on the composition of their portfolios. Based on historic data this test provides pension funds with scenarios for market and credit risk they have to fulfil with 97.5 percent probability measured on a one year horizon. The implementation of internal models comparable to those introduced to the banking industry within Basle II constitutes the most sophisticated way in terms of risk management to perform the solvency test. According to consultants, the parameters were chosen in a way that internal models will not be rewarded and therefore are unlikely to get implemented.

Investment regulations will not be affected by the new pension legislation. Current regulations are based on the prudent person rule. There are no quantitative investment rules apart from a 5 percent ceiling on investment in the sponsoring employer (10 percent in the case of employer groups).

Investment Strategies

Overall, the asset allocation of Dutch pension funds remained remarkably stable since the early 2000s. The equity exposure fluctuated only slightly between 35 percent and 41 percent. A study on the financial behaviour of Dutch pension funds from 2002 onwards confirms that 'pension funds do not reduce the risk of their portfolio after a deterioration of their financial position' (Kakes 2006). Rebalancing behaviour, i.e. restoring a strategic asset allocation by net purchases or sales to balance price movements, was found especially for the large industry-wide pension funds, whereas company-pension funds, on the other hand, are faster at adjusting contributions (Kakes 2006). These finding are in line with what would be expected built on intuition, as companies are more committed to their own pension funds where they are the only sponsor than in case of an industry-wide pension fund, where they are just one under many, and are hardly able to influence the decision-making process. The difficulty to organise the consent to increase contributions rises with the number of parties involved.

With two-thirds of their assets invested abroad, there is no noticeable home bias of Dutch pension funds. Differences in the asset mix were found to be attributable mostly to size: 'Large pension funds hold more foreign assets than small ones'. But company pension funds, which are usually smaller than the industry-wide ones, 'are more internationally orientated' (Kakes 2006). This internationalisation of the pension funds' asset allocation took place during the 1990s, when Dutch pension funds diversified out of private loans, mostly to the Dutch Government, into equities, real estate and bonds (van Riel 2003).

Graph 1: Asset Allocation of Dutch Pension Funds 2008:

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Source: De Nederlandsche Bank

Drawing on a survey conducted by JPMorgan Asset Management[47] in 2006, LDI strategies became very popular in the Netherlands already at an early stage, with a total of 66 percent of respondents either already using an LDI strategy or implementing or considering implementing an LDI strategy. But the understanding of LDI in the Netherlands seems to differ distinctively from the predominant view in the UK: Instead of a risk-immunising strategy, the Dutch view focuses more on using the liabilities as the benchmark for the management of assets, a view which is more consistent with the actual asset allocations. In 2006 market participants observed, that not many Dutch pension funds have actually hedged out interest rate and inflation risk, although regulation ought to drive them into these strategies. This seems to have changed with the actual implementation of the new legislation as is indicated by the comparatively high share of financial derivatives in pension funds' assets. Early simulations from the research department of the DNB expected the FTK ' to only slightly reduce the attractiveness of equity investment' but the ' the optimal duration of bonds in portfolio seems to be much higher than currently observed' (Vlaar 2005). According to market participants, reducing the interest-rate mismatch between the duration of the pension assets and the usually much longer duration of the pension liabilities has become widespread. This is backed by recent research from the DNB, which found that already 'in recent years, many pension funds have extended the average maturity of their fixed-income portfolios'[48]. A further technique to reduce the duration mismatch especially in the context of a Dutch pension funds seeking full inflation-indexing is shifting parts of the portfolio into inflation-linked bonds. Inflation-rate swaps are increasingly applied to fully hedge the interest-rate mismatch, especially as the swap market is much more liquid than the marked for inflation-linked bonds and also Dutch pension funds are experienced derivative investors.

Overall, Dutch pension funds have become more funding orientated, 'the investment policy is turned to the goal of maintaining a certain solvency level in the fund.' The new regulatory framework, which seems to be based on broad consent in the Dutch community, was cited as the main reason for this change in the investment strategies, followed by the new accounting rules IAS 19.

Asset Management is often conducted in-house. Especially the large industry-wide pension funds employ highly professional teams and can be regarded to be at the cutting edge of investment and risk management know how. These investors increasingly capitalise on risk premiums apart from equity, which can be found in alternatives, thereby either reducing or better diversifying risk. An increasing number of pension funds outsource the investment process under a 'fiduciary management' arrangement, which is basically a partnership between the pension fund and the fiduciary manager, who is the agent acting on behalf of the pension fund. This is mostly done by smaller pension funds. But also larger funds, which retain their legal structure, efficiently transfer the management of the pension funds to professional pension fund management companies, under a 'fiduciary management' arrangement. The pension fund board concentrates on strategic issues and supervises the fiduciary manager. The fiduciary manager advises the board and takes over all operational issues, ranging from proposing the strategic investment policy, constructing the investment portfolio, manager selection up to reporting and risk management. The

[47] JPMorgan Liability-Driven Investment (LDI) Survey: A Survey into Trends in Risk Management among Europe's Defined Benefit Pension Schemes,

[48] De Nederlandsche Bank, Statistical Bulletin June 2007, http://www.dnb.nl/dnb/home/news_and_publications/dnb_publications/statistical_bulletin/en/47-151587-64.html

fiduciary manager usually refrains from managing client's assets themselves thus reducing conflict of interest. This concept requires carefully monitoring the inherent principal agent problems.

Risk Management

The main risk management tool is Asset-Liability-Management, which can be regarded as being firmly in place in the Dutch market, although the Kakes' study states that ALM becomes (even) more important following the fact that it is now legally required (Kakes 2006). The large industry-wide pension funds and the large pension fund management companies conduct the ALM themselves, but mostly ALM-studies are carried out by consultants[49]. ALM is mostly used as a tool to decide on the optimal pension policy in the framework of the 'pension deal' and to derive the strategic asset allocation.

The implementation of the fair value principle, which makes both pension funds' assts and liabilities volatile, poses a challenge for risk-managing. The leading Dutch pension funds developed their ALM tools into what is called 'value-based ALM'. 'As future outcomes are discounted back to the present with an appropriate risk adjusted discount rate' the present value of the key variables is added to the information given in the ALM. Also, risk preferences which are commonly an exogenous variable in ALM models become endogenous under 'value-based ALM' (Kortleve 2006). As was shown by Kortleve and Ponds, the application of value-based ALM often leads to a different mostly lower risk profile of the pension fund (Kortleve 2006).

ALM represents in the Netherlands the strategic tool for deriving the pension deal and to manage risk on the strategic level. Risk budgeting is a more operational tool which is further supplemented by risk monitoring. According to a market participant Dutch pension funds 'map the whole investment process from the SAA to the TAA, the sector allocation, timing, yield curve position etc. and to allocate risk budgets to each step in the investment process. They apply tracking error limits and basically calculate the performance contribution and the tracking error of each step of the investment process. This is a relative VaR approach compared to the benchmark'.

United Kingdom

Context

The UK pension fund market is the largest in the European Union with GBP1trr assets under management in 2007[50]. The number of pension funds providing DB pensions to employees in the private sector is estimated at 8.490, thereof nearly 70% with less than 100 members. Over 60 percent of active employee members are concentrated in a small number of very large pension funds with more than 10,000 members[51]. This setting renders the UK pension market highly fragmented in terms of scheme numbers and fairly concentrated in terms of scheme size at the same time. The single company pension fund is the

[49] According to market participants, ORTEC is the dominating supplier of ALM in the Netherlands with a market share of around 80percent. The internationally large consultants like WatsonWyatt, Mercer, TowerPerrins and Hewitt, cover only 20percent of the market in the Netherlands. They are regarded as not sufficiently sophisticated in terms of ALM and their advisory role is mostly confined to the actuarial work.

[50] Office of National Statistics, http://www.statistics.gov.uk/statbase/tsdtables1.asp?vlnk=mq5

[51] Occupational Pension Schemes Annual Report 2007, Office for National Statistics, http://www.statistics.gov.uk/downloads/theme_population/Occ-Pension-2007/OPSS_Annual_Report_2007.pdf

dominating organisational form in the United Kingdom. DB pension funds have been closed rapidly by their sponsors. According to the Purple Book[52] at end March 2008 69 percent DB pension funds were closed, mostly to new members (50 percent), but 17 percent also to future accruals of existing members. 2 percent of schemes were winding up. This leaves only 31 percent of all private DB schemes open. This trend started at the smaller schemes but has now also reached larger pension funds. Only the very large schemes with over 10,000 members are still predominately open.

Funding Status

After having achieved a resurrection from the deficit situation in the wake of the 'perfect pension storm', the funding status of UK pension funds has again deteriorated significantly. Official figures covering both crises are not available, but evidence suggests that the 2007/2008 credit crunch crisis is far worse than the 2000 - 20003 crisis, when the aggregate shortfalls were estimated in a range from GBP 55bn to 65bn, representing 6.5 percent of GDP, 'raising concern amongst policymakers' (OECD 2005). But the fact remains that it is very difficult to assess 'funding' in the United Kingdom as a number of different of calculation methods are in use. The 2008 Purple Book documents different approaches to funding: At end March 2008 funding levels of pension schemes in the United Kingdom are stated 99.4% on a 's179' (section 179) basis, as 98.5 percent on a FRS17 basis, and as 61.7 percent on a full buy-out basis[53]. This variety of data on a key regulatory variable, namely 'funding', contrasts sharply with the regulatory practise in other countries, where 'funding status' is unambiguously defined and measured. Pension funds usually report four different figures describing their funding status. The most important figure from the point of view of the pension fund is their actuarial valuation on an ongoing basis which is conducted according to the guidelines from the actuarial profession. Liabilities are calculated as accrued liabilities and discounted usually with the expected return on assets. But as each fund applies its own 'best actuarial' estimate pension funds' valuations are not compatible.

The funding level according to FRS17/IAS19 represents the accounting view of pension schemes. Plan sponsors are requested to calculate a projected benefit obligation, which includes mainly future salary increases, and to discount it with the yield of corporate bonds. As there are less parameters of choice in this valuation, the resulting figures are comparable over the variety of pension funds. But as the pension liability according to the FRS17/IAS19 rules usually exceeds the pension liability in the actuarial valuation, a pension fund which is fully funded under its own actuarial valuation can still imply a significant deficit for the plan sponsor. Recent market distortions in the wake of the credit crunch defied this logic though. As credit spreads rose sharply the funding position in accounting terms fared much better than in actuarial valuation. The third funding ratio usually reported by pension schemes is the funding level calculated according to the rules of the Pension Protection Fund (PPF), the 's 179' funding level which is the basis for calculating the PPF's risk-based pension protection levy. It is calculated to reflect the volume of pension liability the PPF would expect to take over in case of eligibility. It is therefore 'related to the costs of buying out liabilities with a regulated insurance company rather that the ongoing valuation' (Purple Book, 2007) but reduced according to the benefit caps the PPF applies when paying compensation, e.g. a general reduction on benefits of 10 percent. The 's179' valuation is probably the most appropriate figure for the purpose of statistical comparisons, as the PPF closely prescribes the actuarial assumptions to

[52] The 'Purple Book' is a joint publication by the Pension Protection Fund (PPF) and The Pensions Regulator (TPR), analysing 6,898 PPF-eligible schemes, representing 3 0percent of estimated liabilities. http://www.thepensionsregulator.gov.uk/pdf/PurpleBook2008.pdf

[53] The 2008 Purple Book cites for the first time a fourth number, namely using the Technical Provisions measure, but as this was judged rather 'illustrative' this will not be further reported here.

be applied[54]. At last, the 'full buy-out' ratio, represents an estimate of the cost an insurance company would place on the pension fund in the case of a buy-out.

The situation in the United Kingdom demonstrates the difficulty of constructing 'funding'. All funding ratios have their own rational. Still, funding gaps are ambiguous as, firstly, their extent depends on the disputable choice of the valuation methodology and, secondly, *per se* they do not take into account the solvability of the sponsoring employer, the sponsor's covenant, which underwrites the pension promise in the Anglo-American pension system. Only the actuarial valuation can implicitly relate to the employer's covenant by setting the assumptions in case of a financially weak employer more carefully than in the case of a financially strong employer thereby building up a sort of buffer within the valuation of the liability. The Pensions Regulator strongly advises trustees to do so.

Governance Structure

Occupational pension funds in the United Kingdom are usually set up as pension trust funds which are legal structures connecting the assets provided by the plan sponsor for funding the pension promise, with the trustees holding these assets for the benefit of the individual members (Blake 2003). The relationship between the three involved parties and their agents, i.e. actuary, consultant, investment bank, informs the governance structure at UK pension funds. Unlike their counterparts in continental Europe, UK pension funds have mostly very small staff, therefore relying heavily on outside advice and operational support. Trustees are bound by fiduciary law to act in the sole interest of the beneficiaries. The 'general power of investment'[55] rests with the trustees. This power is surprisingly unrestricted, only bound by the 'duty of care' and the obligation 'to obtain and consider proper advice'. This regulation paved the way for the strong influence of the pension consultants in the United Kingdom. UK pension funds overwhelmingly use external investment managers, internal asset management is confined to some of the very large funds. UK pension funds rely heavily on consultants in determining the investment strategy. The attitude towards consultants could be described as heterogeneous, ranging from denoting them as 'the angels of the trustees' up to describing the UK as being in the 'stranglehold of the large consultants'. The 'reliance by trustees on a small number of investment consultants supplying actuarial and investment advice bundled together' was addressed by the Myners' report as one of the problems in the UK pension market resulting form the trustees' lack of the necessary investment expertise (Myners 2001). Although in the United Kingdom, as in all Anglo-American systems, the trustees are firmly at the heart of the pension fund system, UK law does not require trustees to have professional know-how, only that they 'obtain proper advice' about it. What is legally termed 'the duty of care' and generally referred to as 'prudent person rule' requires trustees to act with 'reasonable care and skill'. Shortcomings in the competence of trustees and consultants were first addressed in the 'Myners' Report', subsequently academically researched, see e.g. Clark (Clark 2007), and finally politically addressed.

Role and duty of the trustees and their relation to the plan sponsor were last clarified by the Pensions Act 2004 and further detailed by the 'Codes of Practice' issued by The Pensions Regulator, the regulatory authority which was established April 2005 following the 2004 Pensions Act in succession to the Occupational Pensions Regulatory Authority (OPRA). A detailed process was established as to the responsibilities of the trustees regarding the funding of the pension fund, the instances in which the agreement of the employer needs to be reached or where the employer is merely consulted and how to manage conflicts. In general, this opened a gap between the sponsor and the board of trustees, or as a former regulator put it, turned it into a 'proper arms-length relationship'.

[54] Pension Protection Fund, Guidance for undertaking the valuation in accordance with Section 179 of the Pensions Act 2004, http://www.pensionprotectionfund.org.uk/section_179_guidance_version_g4_april_2007.pdf

[55] Trustee Act, 2000, http://www.opsi.gov.uk/ACTS/acts2000/20000029.htm

It is suggested that the changed governance imposed on pension funds by the Pensions Act 2004 and subsequent interpretations by the regulating authority significantly impacted the risk attitude at UK pension funds and their stakeholders. The trustees who are responsible for the investment decisions have in many cases become significantly risk averse as they are not rewarded for risk-taking. Trustees are supposed to shield the interests of the beneficiaries of the plan, recent UK law does not specify the positioning of the plan sponsor. Is the plan sponsor a beneficiary of the pension fund as well? Ultimately, a surplus would belong legally to the employer (even though in practical life a surplus is hardly recoverable). Trustees clearly find themselves confronted with difficult decisions to what extent the interest of the plan sponsor are to be taken into account.

Pension Plan Design

The majority of pension plans in the United Kingdom are final salary plans, where the pension at normal retirement age is related to pensionable earnings at the time of leaving service or shortly before. The typical rate of accrual at private sector funds is $1/60^{th}$ of annual salary. Investment and longevity risk are usually borne by the employer only. Therefore, one can argue that the solvency of the sponsor, the 'covenant' underwrites the pension promise. Occupational pension schemes in the United Kingdom have employed different variants in negotiating changes to plan design to re-distribute risk between the stakeholders. Pension deals at companies' pension funds mostly included burden sharing in the sense that early retirement options became less onerous or that employees' contributions were being increased in exchange for the willingness of the plan sponsor to keep the pension plan open for new accruals, but investment and longevity risk mostly stayed with the company. Over the last years, also average-salary plans have become more wide-spread (Sutcliffe 2007). With the rapid closure of DB schemes the market structur will change accordingy. As DB plans are mostly replaced by a DC plan, DC pension plans spread rapidly in the United Kingdom over the last years. Whereas public pension plans remained DB, already 25% of the employees in the private sector were in 2007 covered by a DC plan.

Since 1997 pensions in payment must be indexed. The Pensions Act 1995 turned the prevailing market practice into a legal requirement. Pensions which accrued after April 1997 must be indexed with the retail price index up to a maximum of 5 percent p.a.. For pensions accruing from 2005 onwards this cap was reduced to a maximum of 2.5 percent p.a. This indexing requirement renders inflation hedging an important investment goal at British pension funds and distinctly increased the cost of providing DB pension benefits. As one plan sponsor remarked: 'Indexation of benefits is the biggest threat to DB plans'. According to market participants, most employers have therefore stopped granting not-legally required annual cost of living adjustment in the wake of what is commonly termed the 'pension fund crisis' of the early 2000's, exploiting the fact, that inflation adjustment is not included in the trust deed but at the employer's discretion.

Regulation

The United Kingdom implemented new pension legislation in 2004 coming into force at end 2005. The salient elements are the establishment of a pension insurance fund, the Pension Protection Fund (PPF), for protecting pension benefits in case of insolvency of the plan sponsor and the establishment of a new regulatory authority, The Pensions Regulator, which supervises the implementation of the risk-based and funding-orientated approach, thus also 'protecting' the PPF.

The new regulatory approach defines itself as risk-based and rule-based, risk-based in so far as it focuses on the most significant risks, and rule-based in the sense of focussing on outcome and procedure rather than on the prescription of specified rules. As the UK occupational pension system is trustee-based, regulation became strongly focussed on enabling trustees to supervise the pension schemes in the legally prescribed prudent way thereby following a scheme-specific approach, i.e. recognising the specific and

individual properties of the single scheme. Insofar, UK pension fund regulation could be characterised as regulation of governance.

This philosophy lies at the heart of the new funding concept, which was adopted by the Pensions Act 2004 and further outlined by the new regulating authority, The Pensions Regulator. In general,

> '*every scheme is subject to a requirement ('the statutory funding objective') that it must have sufficient and appropriate assets to cover its 'technical provisions'*'[56].

The funding status is assessed by the scheme specific funding (actuarial) valuation which is in the United Kingdom conducted every three years. If the pension fund does not meet the statutory funding requirement, it must prepare a recovery plan which details the measures to be taken and the needed timeframe to recover to full funding. This recovery plan has to be handed in with The Pensions Regulator. But neither pension law nor the regulator's interpretation specify the exact methodology of valuation or guidelines further actuarial assumptions, apart from the rather broad specification that an accrued benefit funding method has to be applied. It is the task of the trustees to choose the assumptions with prudence and with regard to reasonable affordability (payable contributions must be reasonably affordable to the employer) based on the advice of the scheme's actuary and in consultation with the employer following a process specified by the regulating authority. The regulatory approach, therefore, gives general guidance but leaves the detailing in the responsibility of the pension funds.

The change to a rule-base approached was also a result of criticism of and experience with the former funding regime, the Minimum Funding Rule (MFR), which was introduced by the 1995 Pensions Act. It marked the first time that funding became a relevant policy issue. The MFR obliged employers to fully fund their liabilities according to specified definitions. Funding gaps were for the first time turned into legally enforceable debt of the employer. As Blake (Blake 2003) points out, prior to the act, employers could decide to wind up their pension funds and reduce the benefits according to the availability of funds. Although a binding policy requirement for only a short time, the MFR was strongly criticised from the beginning, among others, as being too strict, not taking into account scheme-specific factors, and because 'the MFR has encouraged pension fund managers to lower their weighting in equities and other 'volatile' assets' (Blake 2003)[57]. The regulatory authorities were mostly concerned with the MFR because albeit constructed as a minimum rule it actually served as policy goal which triggered funds to lower their funding level down to the now legally allowed level.

The new approach also caused concern at first, as it gave little orientation. Only with the release of the so-called 'trigger-points' for regulatory action the situation became clearer. A pension fund can expect to be further scrutinised by regulator in case of

- Funding shortfalls at a certain point between the employer's accounting standard (either FRS17[58] or IAS19) and the 's179' basis set by the Pension Protection Fund depending on scheme maturity and employer covenant strength.

[56] Pensions Act 2004,Chapter 35, http://www.opsi.gov.uk/acts/acts2004/ukpga_20040035_en_2

[57] The 1995 Pensions Act introduced the 'Minimum Funding Requirement' (MFR) which obliged funds to be funded according to prescribed definitions. The MFR was incrementally introduced between April 1997 and April 2002 and effectively suspended in 2004.

[58] In reaction to the large spread between corporate bonds and gilts during the 2007/2008 crisis, TPR dismissed FRS17 as an adequate lens for providing prudence without further adjustments.

- Recovery plans with recovery periods of more than 10 years, plans where the special contributions are concentrated at the end of the recovery period, or plans with 'inappropriate' investment return assumptions[59]

In general, pension funds commented that regulation does not impact their investment strategy. None of the interviewed pension funds followed an explicit funding target. The regulatory changes that were cited to have the most impact are the changes to the governance structure (see section 5.3.3)[60].

Investment Strategies

The reduction in the equity exposure and the development of 'Liability-Driven-Investment (LDI) Strategies' are the most significant changes to investment patterns at UK pension funds. Discussed at length, both are now clearly visible, even though statistics offer slightly ambiguous views[61],

Traditionally, UK pension funds had the highest equity exposure of all OECD countries which is usually quoted at around 70 percent. UK pension funds also invested around 10 percent of their portfolio in property. Bonds constituted the remaining portfolio. The classical balanced mandate, with 70 percent of assets invested in equity and 30 percent invested in bonds and other assets (Blake 2003) constituted the dominating investment practice. This underlines the statement of a market participant: 'Pension funds in the UK have lived off beta, of rising equity markets'. According to the traditional pension investment paradigm, shares constitute the best hedge against inflation. As UK pension funds are legally obliged to index pension benefits, hedging inflation constitutes a major investment goal. This rather crude investment policy was not discouraged by either context or regulation. Given this portfolio composition, pension funds were heavily exposed to market risk, namely volatility of equity markets, but it was obviously considered as an acceptable risk. Investment strategies were not geared at avoiding or minimising market risk. Pension funds were less mature and the traditional actuarial valuations, which were conducted every three years, applied extended smoothing thus ignoring market risk to a large extent.

Most surveys quote UK pension funds equity exposure at end 2008 at around 50 percent which represents a noticeable reduction compared to former levels. UK pension funds started to de-risk their portfolios. According to the Purple Book that 'there is a clear tendency for the proportion of assets held in gilts and fixed interest to rise as scheme maturity increases'.

The core-satellite-approach is firmly market practice. Pension funds have moved away from balanced mandates, employing specialist managers instead. On the one hand, this is clearly reflected in the internationalisation of UK pension funds' investment: Even though the overall equity exposure was not significantly reduced, UK pension funds moved from domestic into international equity investments. The

[59] The Pensions Regulator, Recovery Plans – an initial analysis, http://www.thepensionsregulator.gov.uk/pdf/recoveryPlansSept2007longVersion.pdf

[60] Cited among regulatory changes impacting pension funds was also the 1997 tax budget which abolished tax relief on dividends paid into pension funds which was at that time estimated to cost pension funds about GBP 4bn per year. http://www.hm-treasury.gov.uk/media/8/F/foi_dividend_background.pdf

[61] Reliable data on asset allocation are surprisingly hard to obtain. The Office of National Statistics produces the quarterly ONS Pension Funds' survey which is directed at a sample of 350 private and public sector pension funds. The figures are very detailed on asset classes but do not give 'look-through' data on mutual fund. The equity exposure of UK pension funds is generally stated considerable lower than in all other sources. The Purple Book covers a large statistical sample, but not very detailed asset classes. The NAPF does not cover asset allocation itself in its surveys but only asks for changes in the SAA. The most widely used figures are those published by large consultants based on customer surveys. Recently, also Investment Management Association (IMA) started to regularly publish data based on member surveys.

proportion of international equity was at end 2006 with 18 percent of assets nearly as high as the investment in domestic equity at 19 percent[62]. On the other hand, investment in alternative asset classes is still low, with private equity and hedge funds accounting for 1 percent and 0.6 percent of assets in the mean respectively. The National Association of Pension Funds (NAPF) suggests that investment in alternative asset classes is confined to a small number of large pension funds. But nearly half of the DB funds questioned in the NAPF survey use derivatives for their investment strategy, mostly currency forwards and index futures. Stock lending is permitted by 23 percent of funds, mostly by large private or public sector funds.

LDI strategies were invented for UK pension funds in the early 2000s and have been intensively discussed ever since. Predicted to become the dominating investment strategy within short, the uptake of LDI stayed below predictions but seems to have picked up in 2007 and 2008. The IMA survey estimates that at end 2008 12 percent of DB pension fund assets were invested under a LDI strategy compared to 5 percent in 2006. .As the number of schemes applying LDI is estimated much higher, it might be suggested that especially smaller pension funds are interested in this investment strategy, a suggestion which is clearly backed by the interviews conducted with pension funds.

UK pension funds have in general become more risk-conscious and funding-focussed de-risking their investment portfolios. Regulation was mostly classified as neutral to the investment strategy by the interviewed market participants. Albeit, according to a pension fund manager, today 'there is a lot of focus on the question: 'How much downside can I tolerate?' That is really the focus of setting the investment policy. The main concern is that the deficit grows again'.

Risk Management

According to market participants, ALM is standard in the market and has been for quite some time, although the link between assets and liabilities has tightened: 'In the 1980s and 1990s, the asset allocation was done in the light of the liabilities, we are getting a much greater and more direct input from the liabilities now.' The reasons can be attributed to the increasing maturity of the funds and a more funding focused attitude of all stakeholders: 'There are fewer degrees of freedom available now'.

ALM studies are usually conducted every three years along with the actuarial valuation. Since Myners' criticism of the bundled provision of actuarial and investment advice, advice is more often split between the few large pension consultants in the UK, who also provide risk modelling, calculating and budgeting analysis. VaR calculation are being conducted, scenarios generated, fat tails analysed. At some pension funds 'asset-liability-modelling has become an ongoing process'.

According to the NAPF survey, nearly 90 percent of schemes (asset-weighted) base their investment decisions at least in part on an asset-liability study. 'Large employers are more likely to use asset-liability studies' (NAPF). Asset-liability studies are in the UK conducted by consultants. Nearly 80 percent of funds base their SAA decision on the advice of an external consultant.

But the general reservations in the United Kingdom towards asset-liability modelling which were also formulated in the Myners report still persist. The Pensions Regulator's Code of Practice on Funding Defined Benefits reiterates Myners' criticism that the results of the ALM depend decisively on the assumptions made and explicitly warns trustees that ALM may not be mistaken as a forecasting tool 'rather

[62] Office of National Statistics (ONS), http://www.statistics.gov.uk/downloads/theme_commerce/Q32007MQ5.pdf

they are illustrative of possible outcomes' and should not 'take on a credibility in the eyes of trustees and others which is unwarranted'[63].

But also some interviewees expressed concern against the currently available quantitative risk management tools, which they say apply risk definitions and risk management approaches that are not suitable for the needs of pension funds. This criticism refers to the treatment of market risk and the definition of the investment horizon. Especially industry-wide pension funds who are not concerned with the sponsor's covenant tend to ignore the risk management systems derived from the bank's trading departments conceptualising themselves as the classical long-term investor: 'We don't pay any attention to something like Value-at-Risk', further stating: 'We are a friend of volatility'. But also users of sophisticated risk management systems like the tools marketed by Barrie&Hibbert mostly at insurance companies express concern about becoming too short-termed: 'Risk budgeting with a VaR on the basis of one year is probably not a great thing for a pension fund'. But as there is no legal necessity to manage the fund along these lines, UK pension funds tend to use these systems more as an information tool and not as a stringent management tool.

United States

Context

With private pension assets under management of USD 8.2 trillion at the end of 2008the US pension market is the largest pension market worldwide. Employer-sponsored pension plans accounted for USD 4.6 trillion, approximately 60 percent thereof were hold under a DC plan and 40 percent under a DB plan[64]. About 50 percent of workers in the private industry participate in a retirement plan. The market is highly segmented. Since the mid-1980s, the number of plans seems to have stabilised at a level around 700,000, over 90 percent hereof constituted by DC plans with the vast majority being very small plans with less than 100 participants[65]. Single-employer plans are the dominating organisational form in the United States.

The long-term decline of DB pension plans in favour of DC plans is extensively academically researched[66] and shall be only documented in a nutshell here. The importance of DB pension funds in the United States in terms of both number of plans and number of active participants peaked in the mid-1980s at 175,000 plans in 1983 and 30 million active participants in 1984 respectively. But the move from DB to DC had actually already started in the mid-1970s when the number of newly created DC plans started to outnumber newly created DB plans. 1984 marked the first year when the active participants in DC plans outnumbered those in DB plans.. But only since the mid-1990s did DC pension funds surpass DB funds in absolute terms with the market share of DB pension funds decreasing to 42 percent in 2008 in terms of assets under management. The US DB pension fund system is rather mature with only 47 percent active members, which reflects its long-term decline.

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[63] The Pensions Regulator, Code of practice: Funding defined benefits, http://www.thepensionsregulator.gov.uk/codesOfPractice/definedBenefit/index.aspx

[64] A further USD 3.6 trillion are hold in Individual Retirement Accounts (IRSs), Source: Boar of Governors of the Federal Reserve System, Flow of Fund Statistics, http://www.federalreserve.gov/releases/z1/Current/z1.pdf

[65] U.S. Department of Labor, Private Pension Plan Bulletin http://www.dol.gov/ebsa/pdf/1975-2006historicaltables.pdf

[66] For a summary see e.g. Munnell who analyses the shift from DB to DC in the US and UK pension systems Munnell, A. H. (2006). Employer-sponsored Plans: The Shift from Definded Benefit to Defined Contribution. Oxford Handbook of Pensions and Retirement Income. G. L. Clark, A. H. Munnell and M. Orszag. Oxford, Oxford University Press**:** 359-380..

As in the United Kingdom, employers started in the early 2000s to close down DB pension funds. But whereas the UK most plans are at least initially kept open to accruals for existing employees (what is termed 'soft freeze' in the US), in the US it is also widespread to close funds to all accruals ('hard freeze').

Funding Status

By 2006/2007 US DB pension funds had successfully restored funding levels after the perfect pension storm of 2000 - 2003 had opened huge gaps. These gains were erased by the asset losses which occurred in 2008. The assets of DB pension funds shrank by nearly 30 percent in 2008; losses amounted to roughly USD 1 trillion. As US pension funds apply corporate bond rates as discount factor, pension liabilities did not further aggravate the situation, unlike the Dutch case. Nevertheless, according to a study from the Centre for Retirement Research, the funding status of private sector defined benefit plans measured as the ratio of assets to projected benefit obligation fell from close to 100 percent in 2007 to 85 percent by October 2008 (Munnell 2008). Industry figures point to even lower funding ratios of on average below 80 percent in an accounting perspective but with a high variability with funding ratios varying from below 50 percent to above 150 percent[67].

2008 marks the first year where the new funding requirements under the Pension Protection Act apply. Even though these are based on the accrued pension liability thus disregarding the impact of future salary increases, Munnell estimates that companies will have to increase their contributions by about USD 90 billion in 2009, nearly double the 2008 level. This clearly underlines the pro-cyclicality of current funding rules which demand companies to make extra contributions to their pension plan in times of economic crisis.

Governance Structure

> '*A dominant feature of the investment policy of a defined benefit plan is that the plan sponsor bears most of the investment risk. […] The amount of benefits payable to plan participants or their beneficiaries is not affected by investment experience, except in the event of plan termination, and only then under certain circumstances. It follows that a plan sponsor (employer or employers) can pursue riskier investment strategies without breaching its fiduciary obligations than if unsatisfactory investment results were going to diminish the benefits of the participants*'. (McGill 2005)

The governance structure of Anglo-American pension funds is fundamentally regulated by the principle of fiduciary duty: Trustees and other pension fund fiduciaries (including the financial service sector) must act in the exclusive benefit of the beneficiaries (Clark 2006). As fiduciary duty forms the fundamental principle of Anglo-American regulatory approaches, the regulation of pension funds' governance can therefore be seen as the fundamental aspect of the Anglo-American regulatory approach. The interpretation of fiduciary duty forms one of the responsibilities of the Department of Labor, which has frequently interpreted that the interests of others than the beneficiaries may also be taken into consideration as long as this is not detrimental to the beneficiaries. Also, e.g. with regard to funding, US regulation always underpinned the moral principle with quantitative rules.

With regard to managing the assets of a pension fund, fiduciaries are required to act with prudence. In the United States, this principle of prudence evolved over time into what is termed 'prudent expert principle', which means that the decision-making of a pension fund manager is compared to the investment behaviour of other professionals rather than against that of ordinary people acting with 'reasonable care

[67] Milliman, Pension Funding Study 2008, http://www.milliman.com/expertise/employee-benefits/products-tools/pension-funding-study/pdfs/2009-pension-funding-study-03-01-09.pdf

and skill' as under the 'prudent person rule' which applies in the United Kingdom. The interpretation of what defines an investment as 'prudent' lacks the denotation of 'conservative investment' which it is interpreted with in the United Kingdom. In the United States 'prudence' is interpreted along the lines of financial economics, i.e. maximising risk-adjusted returns. As a regulator put it: 'You want efficiency in the system and that is what 'prudence' really is'.

The governance structure of US pension funds clearly incentivises risk taking on behalf of the pension fund fiduciaries. As the US law allows representatives of the management to act as fiduciaries, pension funds can actually be operated by the plan sponsor. Although pension plans have their fiduciary boards and committees, there is 'no gap between the sponsor and the pension plan' according to interviewees. The company takes the decisions with regards to plan design, funding strategy and investment policy. On the one hand, this gives the pension fund direct access to the sponsor's expert knowledge especially in the Treasury and Human Resources Departments, which is in line with the 'prudent expert rule'. On the other hand, the goals of beneficiaries and plan sponsor might get closer aligned than they eventually are. Identity of sponsor's management and pension fund's fiduciaries bears potential conflict of interest and principal-agent problems. As was shown in section 2, the introduction of a Pension Insurance Fund, the Pension Benefit Guarantee Corporation (PBGC) in the case of the US, distorts the symmetric distribution of risks and rewards and incentivises high risk-taking.

Pension Plan Design

The traditional pension plan is still the dominating plan design, 75 percent of all workers with access to a DB pension plan are covered by a traditional DB plan. Thereof, about half of the traditional DB plans are final salary plan, albeit average salary plans increased to a market share of 19 percent. Plans based on dollar amount formula account for 24 percent of all traditional DB plans[68]. Here, the benefit is based on a dollar amount per month for each year of eligible service. The indexing of pension benefits is not legally required in the United States, although according to an interviewee 'it was somewhat market practice up to the mid-1990s'.

Cash balance plans have steadily gained in importance reaching a market share of 23 percent in 2005. Cash balance plans combine features of DB and DC plans. The employer specifies a contribution and an interest rate on that contribution, thereby taking investment risk as in traditional plans. But as the resulting account balance is usually paid as a lump sum at retirement, longevity risk is shifted to the employee. The rising popularity of cash balance plans was impeded by legal insecurity in the 1990's when age-discriminating lawsuits were successfully conducted. Only a major ruling in August 2006 erased this legal uncertainty. The new regulation contains some elements which render cash balance plans now an interesting plan design for employers, even as they represent DB plans in accounting terms.

Regulation

The introduction of the Employee Retirement Income Security Act (ERISA) in 1974 marked the first comprehensive regulation of private pension funds in the United States[69]. It enacted rules to protect employee benefit rights, addressed tax issues, clarified standards for actuaries, provided pension plan benefit insurance and defined the responsible governing agencies respectively. Jurisdiction is jointly exerted by the Department of Labor and the Treasury Department. The Department of Labor is responsible mainly for protecting employee benefit rights, whereas the Treasury Department has jurisdictional

[68] U.S. Department of Labor, National Compensation Survey: Employee Benefits in Private Industry in the United States, March 2006

[69] This section draws on McGill et al 'Fundamental of Private Pensions' McGill, D. M. e. a. (2005). Fundamentals of Private Pensions, Oxford University Press..

authority over all tax issues and the provision of standards and qualifications for actuaries. The task of providing insurance to pension plan benefits was transferred to a newly erected agency, the Pension Benefit Guarantee Corporation (PBGC), which is a non-profit agency supervised by the Department of Labor.

But although ERISA was characterised as a 'massive and exceedingly complex piece of legislation' (McGill 2005), it marked only the beginning of intensive regulatory activity on pension funds, rendering US pension law increasingly complex. The Pension Protection Act (PPA) 2006 represents the latest piece of legislation which can be expected to exert significant influence on the way DB pension funds are managed. Signed into law by President Bush on August 17, 2006, the main changes to DB pension funds concern the funding rules which will be enacted stepwise up to 2010.

US employers used to have considerable leeway in the decision how to fund their pension plans, which led academics to conceptualise funding as a an economic decision of the employer (Fabozzi 2005). It can therefore be concluded, that funding was traditionally not at the heart of pension regulation. In a report published in May 2005, the Government Accountability Office (GAO) carefully analysed the funding and contribution behaviour of the largest DB funds and – having depicted the weaknesses of the former funding rules - recommended 'broad pension reform that is comprehensive in scope and balanced in effect'[70]. Criticism focused on employers' scope for discretion in choosing the actuarial assumptions in calculation pension assets and liabilities, as well as the legal situation allowing sponsors not to make any cash contributions to their underfunded pension funds and still satisfying the minimum funding requirements. The GAO focused on the implications for the PBGC, whose deficit had risen strongly since the turn of the millennium. Although the PBGC is not backed by a Government guarantee, there was widespread concern that a state bail-out of the pension system comparable to the Savings & Loans crisis might become politically unavoidable with considerable cost to the tax payer,

Protecting the PBGC - and finally the Government - was one motivation behind the PPA (Warshawsky 2007), as its two main components regarding DB pension funds, namely tougher funding rules for all private DB pension funds and the temporary relief measures for the airlines industry which was threatening to further significantly increase the PGBC's deficit, both will provide relief to the agency. Addressing excesses and abuses in the system was given by interviewees as further main motivations of the new pension law. Not addressed by the PPA was the topic of the reversion of surpluses, which is effectively prohibited under U.S. law due to punitive excise taxes[71]. The non-reversibility of the surplus in combination with a strict upper tax limit on pension fund assets traditionally discouraged employers from fully funding their pension funds. As the new law requires in general a higher funding level and any shortfalls to be corrected faster and more thoroughly, pension finance logic would expect surpluses to become more frequent. The PPA requests plan sponsors to fully fund their pension plans measured against corporate bond yields. Plan assets usually consist mostly of assets which achieve a higher yield than corporate bonds, e.g. equity. Once, a plan is fully funded surpluses inevitably build up. At least, the upper tax limit on surpluses was raised considerably with the PPA 2006 so that it is not immediately financially damaging to run into a surplus. Also, in an ongoing plan the plan sponsor can correct surpluses by reducing contributions. But this instrument becomes considerably less powerful in the case of frozen plans, which will become a more frequent framework for pension funds. It might therefore be suggested, that the topic of surplus reversion will return to the political agenda. A first suggestion was how to implement a solution was made by Pang and Warshawsky (Pang 2007).

[70] United States Government Accountability Office, Private Pensions: Recent Experiences of Large Defined Benefit Plans Illustrate Weaknesses in Funding Rules, http://www.gao.gov/new.items/d05294.pdf

[71] As was pointed out by interviewees, given a history of abuse of surplus reversion during the mergers & acquisitions of the 1980s, it was regarded as politically unacceptable to give plan sponsors recourse to surpluses.

A market participant summarised the new funding rules loosely as: 'The new law tries to get you to 100 percent in seven years, the old rule tried to get you to 90 percent in three to six years'. In more detail, the funding rules for single-employer pension funds can be summarised as follows:

- After a funding break 2006/2007, plan sponsors have to amortise shortfalls within seven years thereby applying actuarial assumptions closely prescribed by the administration (as under the old law). The goal is to be 100 percent funded of the accrued liability in an ongoing valuation.

- The liability must be discounted with corporate bond yields, either the full rate curve or in three segments with two-year smoothing. The Department of Treasury provides an improved mortality table.

- Smoothing is restricted to a two-year smoothing of plan assets and the discount rate.

Furthermore, pension funds which are below 80 percent funded are qualified as 'at risk' at must increase the contribution. Very poorly funded plans, which are less than 60 percent funded, are prohibited from further accruing pension benefits. This marks the first time that beneficiaries are directly affected by the funding policy pursued by their employer (Warshawsky 2007). The ramifications of the PPA can be expected to be most significant with regard to employers' risk management. As the funding rules are not implemented before 2008, 2007 still marked a phase of ongoing interpretation of the law.

Investment Strategies

'To maximise returns and to protect the sponsor' are according to market participants the two dominating investing goals of pension funds. When questioned if this is always in line with the fiduciary duty of trustees, the interests of sponsor and beneficiaries were stated to be closely aligned with respect to investment.

The traditional investment strategy of US pension funds was a balanced strategy, which consisted of 60 percent equity and 40 percent fixed income, which is according to a pension consultant still widespread. Drawing on what is observable in the markets, pension funds geared up considerably after the turn of the millennium. The equity expose of around 60 percent remained mostly unchanged in nominal terms, but the domestic investment was reduced in favour of international equity, thereby partly reducing the famous 'home bias' of US institutional investors. Investment in fixed income was also reduced to below 30 percent. Instead, public and corporate pension funds shifted assets to alternative investments, especially private equity and equity real estate, thereby following the investment behaviour of the large endowments. Taken into account the parallel surfacing of partly large deficits this investment behaviour could be conceptualised as 'gambling against resurrection'. Neither external regulation nor internal governance rules prevented pension funds from increasing the investment risk when facing funding deficits. As US accounting rules allowed for discounting liabilities with the expected rate of return, this policy helped to reduce deficits by increasing the portfolio of riskier assets promising higher returns thereby at the same time lowering liabilities. The gamble paid off nicely, as pension funds recovered by benefiting from strong returns on equity and alternatives between 2003 and 2006. Taken into account the put option provided by the PBGC, the actual risk taken by sponsors was limited. The investment behaviour between 2003 and 2006 can therefore serve as an example for the asymmetric nature of the governance rules regarding risk taking, which prevails in the United States.

2007 may have marked the beginning of the next era of new 'investment paradigm'. The Greenwich[72] report highlighted the starting implementation of new investment products and strategies.

> '*It is a completely new world. This is the world of absolute return, portable alpha, and liability-driven investment. All of a sudden, in a very short period of time, this big, stable, slow-moving industry may be completely shifting gears*'

These changes in the investment behaviour can be attributed to the new accounting rules and the changing regulatory framework. LDI strategies have arrived at the doorsteps of US pension funds, with a ruling of the DOL legally paving the way. In an 'advisory opinion under ERISA' the DOL's Division of Fiduciary Interpretations stated that a fiduciary would not violate their duties 'solely because the fiduciary implements an investment strategy that takes into account the liability obligations of the plan and the risk associated with such liabilities and results in reduced volatility in the plan's funding requirement.'[73] A market participant commented, that 'LDI has not been tested in the courts'. Following anecdotal evidence from interview, especially smaller companies with pension liabilities that are high compared to the sponsor's market capitalisation and closed pension funds implement LDI strategies as part of the risk management. De-risking seems to have continued in 2008 at corporate pension funds. Minimizing pension volatility and increasing the predictability of pension contributions was the overriding goal for corporate sponsors[74].

Outsourcing of the investment process seems to have become a rather recent trend for smaller and mid-sized pension funds. The applied concept is a manager-of-manager approach under which a large investment company takes over the investment process whereby the outsourced parts can be individually agreed. The pension fund may retain the decision on the strategic asset allocation but assigns the investment company with all other duties including manger selection at own discretion. This approach bears many similarities with the Dutch 'fiduciary management', only that (not yet) as many components of the investment process get outsourced. The reasons for the outsourcing are mainly costs, and can be found in the increasing complexity of investment in the context of regulation and accounting as well as in a shortfall of in-house resources at the sponsor. If the contracts are well written to properly handle the inherent principal-agent relationship this would lead to a further professionalization of asset investment and pension fund management in the United States.

Risk Management

As in other countries, risk management is clearly linked to the size of the pension fund as size rules available resources. Furthermore, pension fund's risk management can be regarded as being integrated part of the sponsor's risk management as the pension fund is usually integrated into the financial framework of the company. ALM studies are nowadays conducted as a matter of routine, but not historically so. Only with the new pension law, they are expected to become standard in the market. Up to now, ALM studies are mostly conducted every four to five years by external consultants. It was mostly commented that the strategic asset allocation is based on the results of the ALM study, 'but not one to one'. Even large pension funds apply what they consider 'risk management' to the asset side only in the form of efficient frontier analysis. Risk budgeting is not common practise.

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[72] Greenwich Report 2007: New Products and Strategies Shake Up 'Traditional' Asset Allocation for U.S. Institutions

[73] U.S. Department of Labor, http://www.dol.gov/ebsa/pdf/ao2006-08a.pdf

[74] Greenwich Associates, Managing Crisis: U.S. Institutions Roll Out Their Responses to Global Downturn, June 2009

In general, U.S. pension funds can be said to have become much more risk-conscious. The risk tolerance is set by the finance department and informed by the new funding and accounting rules as well as by the market experience since the turn of the century. The relative size of the pension liability compared to the company's market capitalisation, the funding situation of the pension plan and the overall economic situation of the sponsor are the parameters in which sponsors decide the pension funds' risk exposure. Whereas large and well funded pension funds with strong corporate sponsors can usually conduct their investment strategy independently of corporate risk management requirements, the situation is significantly different for smaller companies which cannot 'afford to take a hit'. According to one market participant, 'the main measure of risk management was freezing the plan. The second was to implement a liability-driven tool'.

The main consultant is usually the actuary, which all pension funds must have. Besides, some companies employ specialised risk managers.

Conclusions

The modern risk management revolution arrived at the doorsteps of DB pension funds. This paper offers an in-depth analysis of the practice of risk management of DB pension funds in Germany, the Netherlands, the United Kingdom and the United States. This analysis is conducted, first, in the context of the development of risk management in different sectors of the financial industry taking a comparative view. Reasons for convergence and difference of risk management approaches are deducted from the different nature of the institutions. Second, the practice of risk management at DB pension funds is grounded in the context of the relevant risk factors facing pension funds and their measurement, in regulation and governance.

In the aftermath of the perfect pension storm pension funds and their stakeholders became more risk aware. DB pension funds nowadays increasingly apply modern risk management tools originating from other sectors of the financial industry. As the current crisis painfully showed, risk management does not mean risk reduction. Furthermore, the shortcomings are that the tools are not always well adapted to the needs of DB pension funds. More fundamentally, there seems to be no consensus on pension funds' risk management needs. The question regarding nature and significance of the different risk factors pension funds face needs to be answered. Current practise increasingly deviates from the paradigm of the long-term investor.

The new funding focus of pension regulation in the Anglo-American countries marks the shift from affordability towards security. In general, shortfall risk is constructed as the main risk facing a pension fund. This paper argues that the goal of a pension fund is to pay the promised pensions to its members. Funding can be seen as an intermediate target, as an instrument of risk management. As financial economic theory offers up to now no theoretically coercive and unambiguous valuation methodology for pension liabilities, funding remains in a way constructed. Tracking funding ratios over shorter periods of time with, short or no recovery periods in case of underfunding shortens the investment horizon of pension fund.

Furthermore, the accounting standards changed the perception of risk. By applying market values to plan assets and liabilities and recognising the balance in the sponsor's financial statement, the sponsor became exposed to market risk in its balance sheet. Discounting pension liabilities with a bond yield actually aligns the measured risk profile of the pension liability with the risk profile of a bond. Interest rate risk was thus constructed as a main risk factor facing pension funds instead of longevity (and inflation) risk as the basic economic risk factors. Fair value accounting represents a major shift in the way pension funds perceive and manage risks.

As a consequence, investment strategies became more liability-focused and risk-focused. Asset-Liability-Management is firmly established market practise although with different degrees of sophistication and for different purposes. Investment strategies are frequently geared to the goal of avoiding shortfalls thus often lowering the risk profile and hedging interest rate risk. Liability-Driven-Investment (LDI) strategies emerged as a new strategy to lower or eliminate interest rate risk. LDI strategies seem to spread especially among smaller pension funds. Overall, the costs of providing pensions increase.

This has far-reaching ramifications. As the web of regulatory rules became ever more complex pension funds' risk management became more sophisticated demanding more attention and resources on behalf of pension funds and their sponsors. The risk-taking capacity of plan sponsors is increasingly eroded. Especially smaller company-based pension funds increasingly opt out of providing DB pensions.

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