

Shifting Towards Hybrid Pension Systems: A European Perspective

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Foreword

The purpose of the present publication, "Shifting Towards Hybrid Pension Systems: A European Perspective", which is drawn from the AXA Investment Managers research chair at EDHEC-Risk Institute on "Regulation and Institutional Investment", is to examine recent developments and the major risks of retirement systems, from both the sponsor and pension risk perspective, while focusing on European pension schemes. The study looks at plan design and governance, with the aim of moving towards an ideal retirement plan, and it analyses the challenges for the financial management of hybrid pension plans.

It is clear that complete reliance on sponsor guarantees makes little sense in view of the prevailing economic context and demographic trends in Europe. With more hybrid pension schemes in Europe, and a shift towards Defined-Contribution (DC) funds in the United Kingdom and the United States, there is a requirement for improved governance, investment options and communication to employees.

As this study indicates, a degree of regulatory convergence is desirable, with DC funds having more guarantees and, at the same time, more flexibility to diversify risk and adopt professional risk management practices. Defined-Benefit (DB) and hybrid funds need more flexible guarantees. However, while regulators must try to design an adequate framework and give adequate incentives, it is the responsibility of the industry, whatever the category of fund, to make the considerable improvements in investment and risk management practices that are now needed. We hope that our publication will provide encouragement for progress in this direction.

We are grateful to AXA Investment Managers for their support of this study and for their ongoing commitment to the "Regulation and Institutional Investment" research chair at EDHEC-Risk Institute.

We wish you a thought-provoking, useful and informative read.



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About the Author



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In this study, made possible with the support of AXA Investment Managers, we refer to pension plans as occupational retirement vehicles that form part of the second Pillar of the organisation of retirement systems (the first Pillar being social security and the third Pillar being individual savings schemes). The countries of interest are the Netherlands, Germany, the UK, Switzerland, France, the US and Australia (serving as an outside reference).

The general framework for occupational pension plans can be described as hybrid pension plans, with intra and inter-generational risk-sharing mechanisms between members and with sponsors. In this study, we define the degree of hybridity of a pension plan as the extent of risk-sharing with the sponsor. At one end of the spectrum lie traditional DB funds, where all the risk is for the sponsor as long as it can bear it and the pension benefit is independent of plan returns. In a DB scheme, the sponsor gives a guarantee to the fund, in exchange for the possibility that its initial cash contribution is reduced, so, the pension fund has an unfunded guarantee value. As the degree of hybridity of funds is linked to the degree of risk-sharing with the sponsor, collective defined contribution (CDC) funds, which are hybrid pension plans with collective risk-sharing and conditional indexation but without a sponsor, and DC funds, where the risk is entirely borne by individuals (and which we also call individual DC funds to distinguish them clearly from collective DC), both lie at the other end of the spectrum. However, because the market value of the pension rights in individual DC funds is always equal to the market

value of the investment fund where all pension assets are invested, and because risk is individualised, they stand apart because they are not collective solutions.

Figure A summarises the different types of pension funds. Within the countries of interest, individual DC plans are the prerogative of the Commonwealth countries, and they have progressively replaced traditional DB funds in the UK and in the US. Continental European countries,¹ and in particular the most innovative (the Netherlands) have opted for more risk-sharing in the form of **hybrid funds** – defined as collective pension plans that benefit from some (but varying) risk-sharing between participants and with the sponsor, and usually offer guarantees and conditional indexation.

The first section of this paper argues that the demographics of developed countries have on aggregate led the retirement system to rely less on unsecured sponsor guarantees. In fact, demographics imply that the unfunded part of the pension diminishes as a proportion of labour revenues – an analysis that also applies to pay as you go social security systems (Appendix A reviews a realistic government balance sheet in greater detail; it argues that a present-value framework would allow greater visibility on the future sacrifices that populations must make in order to balance public finances in the long run).

In the UK and the US, the rigidity of laws governing pension arrangements – conditional indexation is prohibited in the UK – has meant that the reduced aggregate reliance on sponsor guarantees

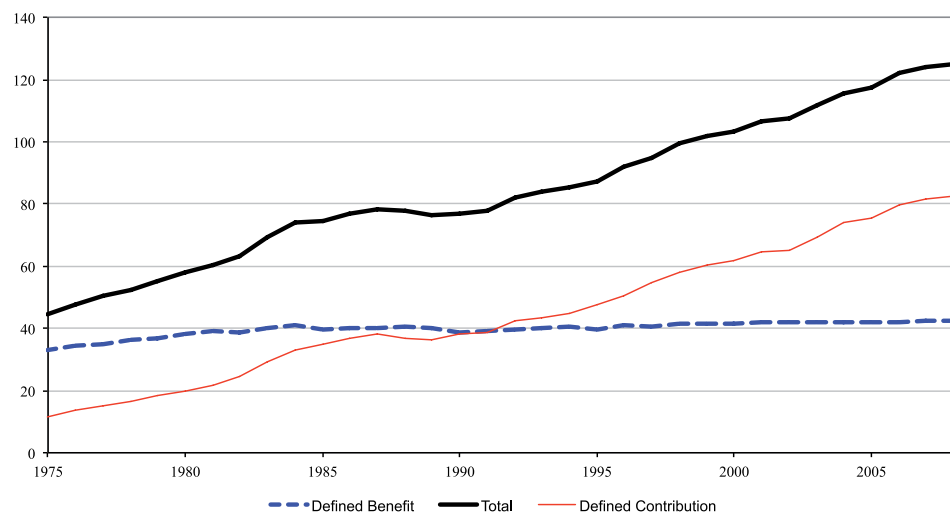
¹ - Appendix B reviews the organisation of the retirement systems in the US, the UK, the Netherlands, Germany and France in greater detail, as well as pension plan regulations in these countries.

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Figure A: Characteristics of the types of pension plans and definitions

	Definition and characteristics
Pension plan	Occupational retirement vehicles that are part of the second Pillar of the organisation of retirement systems (the first Pillar is social security and the third Pillar individual savings schemes, as opposed to occupational savings schemes).
Pension fund	Pools the assets bought with the contributions to a pension plan for the exclusive purpose of financing pension plan benefits.
Sponsor	Employer that gives a guarantee a the pension plan (usually classified as DB accounting-wise)
Traditional DB fund	Pension rights independent of the value of the assets. Annuities with partial inflation protection are usually delivered. Sponsors bear all the risks until bankrupt, then there are large risks for employees.
Individual DC (unless specified, "DC" refers to individual DC)	No risk-sharing. Liability value is the fund's market value. In theory they can be adapted to very diverse individual situations, risk appetites and wealth drivers. Currently predominant in the UK and the US. In practice they are often bound by retail-like regulation that restricts their ability to diversify risks.
Hybrid funds	A flexible framework that allows various forms of risk-sharing. Characterised by conditional indexation. They are generally regulated with the requirement of protecting nominal guarantees.
Collective DC (CDC) funds	Hybrid funds without sponsor guarantees. Under Dutch regulation, CDC plans are regulated as DB plans without a sponsor. They must respect minimum funding requirement. Indexation is conditional too: by contrast to individual DC plans, the liability value in CDC plans also results in smoothing.

Figure B: Number of participants in US private pension plans

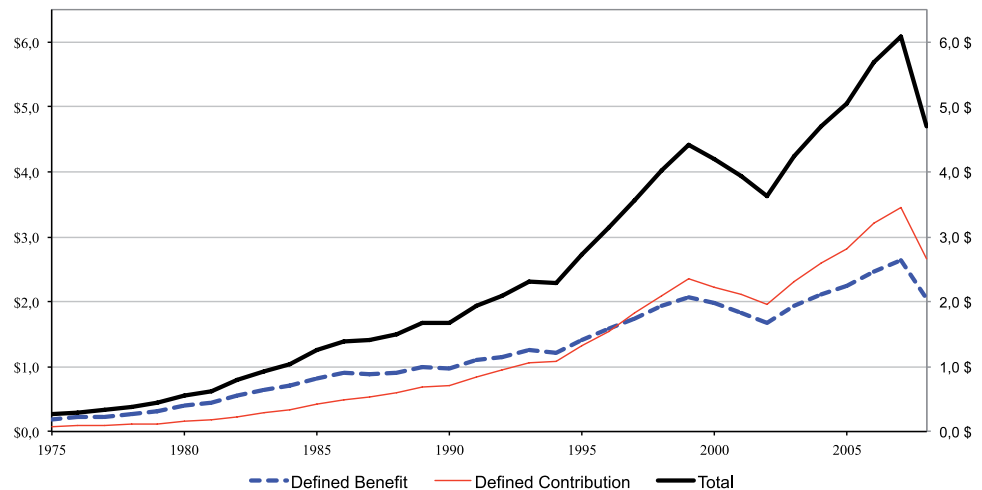


Note: 2003 data is smoothed so as to avoid the break in the series that results in the change in the methodology adjustment from DoL in 2004.

Source: Form 5500 filings with the U.S. Department of Labor

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Figure C: Total assets in US private pension plans (USD trillions)



Source: Form 5500 filings with the U.S. Department of Labor

has been obtained by a mix of DB and individual DC funds rather than by more hybrid funds.

In hybrid systems where participation is often mandatory (94% of the Dutch workers are covered by hybrid plans and only 3% by DC plans), the system can only adapt by greater hybridity, which means lower sponsor guarantees and lower overall (nominal) guarantees, as is currently being envisaged in the Netherlands.

The second section reviews the need for an institutional plan design, by examining problems in existing DB and individual DC funds.

The UK and the US mainly rely on individual DC funds and traditional DBs. Individual DC funds, as they are today, are usually deeply sub-optimal, as they are plagued by poor governance, sub-optimal default options, they are significantly more expensive than DB funds and, in the US, they do not offer annuitised income.

On the other hand, traditional DBs are often plagued by unhedged exposure to the risk that the sponsor goes bankrupt, and arguably the failure to transfer systematic longevity risk has been (and still is for remaining DBs) a very important risk over the long run and has contributed to exhausting the sponsor guarantee. On the whole, given current practices, the sustainability of traditional DB funds is not guaranteed.

In continental European countries, hybrid pension plans are professionally managed and cost-efficient vehicles. Participation in pension plans is usually mandatory and the large majority of the population is covered by hybrid pension plans. Yet, as they are regulated they must provide the same type of solution for all categories of investors. So an assessment of the type of guarantee they offer is necessary. Should hybrid pension plans offer nominal guarantees (as is usually done on invested premiums) and if so, to which participants should they offer these guarantees? Nominal guarantees may be extremely

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costly as in practice, and given the current yearly investment horizon, such guarantees may result in pension funds being locked in low interest rate yielding investments. This is particularly damaging in situations such as that currently being experienced, where quantitative easing may involve accelerating inflation in future years.²

The third section reviews the necessary improvements in pension plans.

We argue that a general and flexible framework for pension funds would make different forms of risk-sharing possible, including DB and individual DC forms of collective funds. It would also allow for a flexible definition and management of guarantees.

In the shift to individual DC funds in the UK and the US, individual DC funds run the risk of being acknowledged as inefficient vehicles, benefitting from no risk-sharing at all, being extremely underdiversified, lacking default (annuitisation in the US) and being dampened by high expansive.

So, it is urgent to rethink the DC framework and envisage a DC 2.0 that would try to compare or compete with collective solutions. There should be more involvement of states in the design of adequate solutions – or, more simply, in setting appropriate governance structures and organisations (i.e., appropriately defining roles and responsibilities to ensure an efficient delivery). The regulation of individual DC funds should be profoundly modified, and it should definitely make a departure from the inadequate retail fund regulation it is

inspired by. Individual DC funds should be able to diversify their exposures and invest in illiquid securities and, in a nutshell, have the same flexibility that DB funds have today because ultimately, they must also provide retirement income.

Of course, there is no need to wait for regulatory change to improve practices, which should be ideally driven by a genuine aim to service investors' needs rather than to blindly adhere to regulations, and to usual market practices. Today, DC funds dispose of significant means enabling them to avoid the pitfalls of short-term retail funds, as they can diversify their assets using international investments, corporate bonds, listed real estate, commodities, and even funds of hedge funds. In addition, today's technology makes it possible to offer some guarantees in DC funds. Inflation guarantees or target inflation indexation are important for those who rely primarily on the income from DC pension funds, as is often the case now in the UK and the US. We recommend a pragmatic approach where the stochastic life-cycle (where market opportunities influence asset allocation) is a risk management facility made available on top of suitably designed building blocks: the PSP would be heavily diversified amongst asset classes; the LHP would have a significant anchor to inflation; the preference of investors towards guarantees (nominal guarantees, real guarantees or rather target indexation) should be the main choices that members should make, even if customisation is possible via supplementary funds. Transparency must also be increased. Nominal guarantees can foster confidence in DC arrangements,

2 - Of course, one may be inclined to offer mandatory real guarantees in all pension plans. Unfortunately, real guarantees are impossible for the population as a whole – the supply of real bonds is insufficient and inflation is a fundamental adjustment variable against which full macro-economic protection is essentially impossible.

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especially over the short run. However, the cost of financial guarantees must be made clear, for instance by showing by how much the participation to the upside is reduced (and by how much the downside is protected).

Traditional defined benefit funds, although on the decline, still have a place in the provision of retirement. To ensure that the remaining DB funds remain a sustainable option, these must be insured against the risk of default of their sponsor, and mortality should be hedged. The risk of greater longevity could be partly shared with employees (who in theory would need to work longer).

When it comes to hybrid plans, nominal guarantees on premiums are usually required in continental Europe. Yet for the younger participants, these guarantees can be reduced – as long-term investors they have little need for nominal guarantees if these comes at the expense of real (inflation) indexation. This reduction in nominal guarantees gives way to more flexible and performing funds and, on the whole, produces more sustainable hybrid plans. Nominal guarantees can be important for the older participants because, over the short-term, they can be considered a proxy for real ones. This also means that, ideally, the system should be flexible enough to accommodate different indexation policies, in line with the life-cycle approach where the risk and reward changes with age (younger participants are expected to have a leveraged exposure to the financial markets as they borrow against their human capital or lifetime income, and retirees that only have financial capital need more security).

However, the effort should not bear on regulators alone – practices need to evolve too, as there is empirical evidence that pension funds behave sub-optimally. Even though pension funds have been praised for their ability to diversify, empirical evidence suggests that they do not fully use their ability to diversify across asset types such as illiquid assets. They also often have a strong home bias, which is not only contrary to standard academic prescriptions that recommend diversifying assets geographically, but that also runs the risk of insufficiently protecting the purchasing power of retirees in maturing economies. The demographic theme we explore in this study should also be taken into account in investment policies, as it is an important driver for growth. It can be expected that at some point in the future – as has been the case in China and India over the last decade – the production of future retirement goods will be shifted towards countries with a growing workforce (thus emerging countries *in terms of demographics*) and adequate internal organisation and resources – infrastructure, education and democracy are often associated with economic growth. Lastly, the short-term behaviour shared by many pension funds ends up locking them in to minimum funding ratios and nominal strategies, a risk that can be avoided by an adequate definition of the investment strategy.

On the whole, even if regulations can be largely improved to ensure a sustainable framework for pension funds and give adequate long-term incentives, there is still much room for improvement in current practices, relative to academic prescriptions. Beyond standard portfolio

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Figure D: Characteristics of the types of funds and recommendations

	Characteristics	Pros	Cons	Recommendation
Traditional DB fund	Sponsors bears all the risks until bankrupt, then large risks for employees	Professional management structure; target (real) retirement income	Strong regulatory and accounting requirements and strict rules. Difficult to transfer	Secure sponsor risk, hedge longevity risk.
Individual DC fund	No risk-sharing; liability value is the fund's market value	In theory can be adapted to very diverse individual situations and risk appetite and wealth drivers. Easy to transfer (when no external guarantees)	Poor communication: market value does not give clear indication about retirement income (annuity); Restricted ability to diversify; Often poor governance and costly	Ensure: <ul style="list-style-type: none"> - a professional management framework - the ability to diversify widely (PSP) - Stochastic life-cycle investing as a risk management solution - collective annuities - communication of guarantee and associated costs
Hybrid funds (including Dutch collective DC regulated as hybrids)	A flexible framework that allows various forms of risk-sharing	In theory, a framework far more flexible than either the DC or DB framework.	Often regulated with the requirement to give nominal guarantees; Intergenerational risk sharing often not fair in practice	<ul style="list-style-type: none"> - give more regulatory flexibility - ensure that risk-sharing is made on fair grounds

construction theory, it is far from obvious that pension funds have adapted their investment policies to account for demographic changes.

Beyond the analysis of existing pension funds and products, the industry landscape is also evolving. An important objective of the IORP directive (EC 2003) is to allow an efficient provision of pension solutions at the European level, which goes along with the possibilities of creating trans-border pension plans, pooling pension assets and having multi-employer or pooled pension plans. Technically, such pooling is facilitated by DC funds because of the immediacy of the link between pension rights and asset value. Such pooling is also customary for life insurance products, but these are not natural for (very long-term) retirement savings.

The first country which these measures will impact is the UK, because the Pension Act 2011 is improving coverage with the auto-enrolment procedure. Furthermore, the default option is the NEST, which is raising the standard of DC funds, as it provides economies of scale, diversification and risk management options. Market players consequently need to reposition themselves so as to offer solutions that compete with that offered by the NEST.

Of course, we expect profound modifications in the European landscape of pension providers over the coming years. As UK firms that do not provide pension plans to their employees will need to do so, a market that provides pension plans to these firms is likely to emerge, and pooled, cost-efficient and professional solutions are likely to reap strong benefits. The need for efficient

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retirement solutions should also create a market for efficient retirement funds offered to existing DC pension plans. These offers require additional capacity on top of that of traditional asset managers who essentially provide investment funds to DB plans, and of that of fiduciary managers who essentially service existing DB plans, but do not deal directly with corporations. The consolidation of the provision of pension plans and associated risk and asset management should go along with a consolidation of traditional asset management companies.

Introduction and Description of Retirement System Structures



Introduction and Description of Retirement System Structures

Occupational pension schemes, often referred to as Pillar II (for occupational) funds, serve as the focal point of this research paper. We are particularly interested in the shift from traditional defined benefit (DB) to individual defined contribution (DC) schemes in the UK and the US, and in reducing reliance on sponsor guarantees in European hybrid DB schemes. Historically, as long as a sponsor was healthy, it bore the greatest risks and exposure to the financial markets. However, pension funds relied heavily on the sponsor's guarantee. We are now in a world where members' pensions are increasingly derived from the fund's financial returns (and the sponsor has a reduced role).

3 - One can see that UK and US regulations cannot only be characterised as principle-based.

4 - Note that the US has its own hybrid plans, so-called cash-balance plans. Yet, as underlined in Broeders (2011), these plans are usually DB plans from the sponsor's perspective, as the interest rate credit to the fund is usually independent of the financial returns of the plan. Moreover, it is usually tied to an external index such as inflation or long-term government bonds. Such plans can thus be considered as more tailored DB plans. They are thus not central to our study.

1. Organisation of the Research

Demographic and subsequent macro-economic changes require that the value of aggregate sponsor guarantees diminishes as a fraction of pension liability value. Consequently, "on aggregate" there must be a shift to a more hybrid system.

In the countries of traditional DB funds, namely the UK and the US,³ overly prescriptive regulation regarding the organisation of pension funds means that this macro-economic adjustment happens via a closure of DB plans and through the replacement of a large share of pension plans by DC plans – that is, unless the DB regulation becomes more flexible and conditional indexation is made possible.⁴

Continental European countries opted towards risk-sharing in the form of hybrid funds. In these countries there must be more hybridity (i.e., less aggregate reliance on sponsor guarantees). The Netherlands,

the most innovative in terms of contract design, is already embracing more hybrid forms of funds by tending towards hybrid plans without a sponsor, which are called collective defined contribution (CDC) pension plans.

Though these evolutions are needed to respond to macro-economic developments, nothing says that the new structures that arise are optimal. The UK and US switch to individual DC funds has led to sub-optimal solutions with funds that not only benefit from no risk-sharing at all, but also often invest in extremely restricted asset classes. These funds are under-diversified, usually offer inadequate default options (with a lack of mandatory annuitisation or protection against longevity risk) and are costly. This supports the need for revisions to the DC framework. Doing so would prevent the rigidity of UK and US institutional design from making DB plans the only acceptable form of pension provision in these countries... at the same time that they are closed!

As illustrated by falling funding ratios in the Netherlands, there is a fear of pension funds being locked in nominal guarantees, even though in theory young members attach no importance to such guarantees, but rather seek increased exposure to the financial markets. Revisions to regulations and practices of hybrid funds are also important. Hybrid funds must improve their practices, notably via diversification and by specifically assessing the impact of demographic trends on their investment strategy: these trends have major impact on their liability, as well as on their assets.

Introduction and Description of Retirement System Structures

This paper is organised as follows:

- This introduction outlines the current concerns regarding pensions;
- The first section shows that the demographic evolutions in Europe imply that, on aggregate, pension funds have become more hybrid, either via a mix of DB and individual DC funds, or via more hybrid collective pension plans;
- The second section illustrates problems in existing pension plans: traditional DB plans are often unsustainable; individual DC plans often are bound by inadequate regulation for short term retail liquid funds; and hybrid plans are subject to a short-term regulation that imposes inadequate guarantees;
- The third section comments on what the ideal method of delivery of solutions should be – including how to implement appropriate regulation. It argues that the theoretical regulatory model for pension plans is that of collective and flexible pension plans (where hybrid allows for various risk-sharing agreements), but that the reliance on DC funds makes the DC 2.0 model critical;
- The last section concludes;
- Appendix A provides a realistic government balance sheet and gives conclusions;
- Appendix B analyses the framework of pension funds of major European countries in more detail.

2. A Three-Pillar Organisation

Historically, the OECD has produced a number of papers that look at the organisation of the pension retirement systems.⁵

The organisation of the retirement system is generally described as a three-pillar structure, with historically differing

importance to these systems. This description (see below) is used by both the OECD and the European Union.

Pillar I – “Social Security”. This involves publicly managed pension schemes organised on a national basis, with defined benefits and pay-as-you-go (PAYG) financing.

PAYG financing means that pension benefits are financed directly by the contributions of “active” members – usually from payroll tax. A notable exception is the United States, where public pension liabilities are partly PAYG, and partially funded from accumulated contributions.

This pillar has great historical importance in Bismarck and Latin⁶ countries—Germany, France, Italy and Belgium – as well as in some northern countries (Pillar I is important in the Netherlands too). In Anglo-American countries, the first Pillar has historically been conceived as a social safety net (that allowed living above poverty level⁷ and usually comprises healthcare).

When these schemes are balanced by cash contributions, they create implicit government debt which means that the aggregate benefits must fall when population is ageing.

Pillar II – “Occupational Pensions”. Except in the case of France, where occupational pensions are in the main pay-as-you go, and managed in the same manner as Pillar I – Social Security, Pillar II involves privately managed pension schemes provided as part of an employment contract, and is central to our work. Occupational pension plans are three-party organisations that involve

5 - The OECD is one of the major sources of documentation on pensions. See Yermo (2007), Pugh (2004, 2007).

6 - The Bismarck term has sometimes been applied indifferently to all continental European countries by opposition to Beveridge, with an explicit reference to retirement systems greatly based on Pillar I social security. But there are important distinctions to be made.

7 - In the United Kingdom, this support is a flat-rate percentage of 14% of average national earnings for all workers.

Introduction and Description of Retirement System Structures

the sponsor (an employer), the fund (a manager), and the participants (employees and pensioners).

One can identify four sources of inspiration for occupational pensions: Latin, Bismarck, Anglo-American and northern European countries. In Latin countries, mandatory pay as you go schemes form the bulk of retirement provisions, even for Pillar II. In Bismarck countries, of which Germany is the most known example, Pillar II has greater importance, and plans are thus mandatory and occupational-based. German booked-reserve plans can be totally unfunded but are protected by insurance. In northern European countries and Switzerland, participation in these plans is mandatory, and sometimes regulation explicitly requires that these plans target a minimum level of replacement income. Thus, the pension system is really based on such Pillar II plans. Despite these differences, in continental European countries, plans are usually hybrid with conditional indexation, and they are fully funded in the Netherlands. In the UK and the US, occupational pensions, though important, are not mandatorily provided. Pension plans are partially funded and partially protected by public pension insurance.

them as individual savings schemes). So, it is generally agreed that Pillar III is not related to employment. It is commonly believed that the role of the third pillar is to encourage individuals to save, if they wish to, for more generous retirement benefits, but in reality, there is not always a clear distinction between Pillar III retirement savings and more general individual savings.

Tax laws typically provide incentives for retirement savings. The usual principle for Pillar I and Pillar II savings is that contributions are tax-deductible when they are paid, and income is taxed when received during the retirement phase. As Pillar III is voluntary, tax incentives are sometimes less significant. In addition, they are usually not harmonised because Pillar III adheres to more general precautionary motives.⁸

In European countries, the state usually provides the bulk of retirement income (see table 5), whereas private pensions are more important in the US and Japan. Occupational pensions are strong in northern European countries (they are the greatest in the Netherlands), as well as in the UK and the US.

We study Pillar II occupational pension plans (sometimes simply referred as pension funds), even if we explain the modifications of Pillar I and Pillar III that can be explained by ageing, as background information.

Pillar III – “Voluntary/Individual Savings Schemes” (i.e., savings for the purpose of retirement). The World Bank defines the third pillar as pension plans with voluntary participation (while the OECD classifies

8 - Examples of Pillar III products include: short-term products, for precautionary purposes, where income is not taxed. Short-to medium term savings, organised with insurance companies, also tend to benefit from low income taxation; longer term savings, usually locked up to retirement, also are submitted to the general retirement taxation principle.

Introduction and Description of Retirement System Structures

Figure 1a: Post-retirement vs. pre-retirement income and its source

Continental European countries usually provide a high replacement income for all classes of income. Italy has needed to reform its public finances earlier than other countries thus has a lower replacement ratio. The UK and the US have lower replacement ratios.

	Single			Married		
	All	Quintile 1	5	All	Quintile	5
Australia	75.8%	-	64.8%	72.1%	-	64.4%
France	89.7%	104.5%	85.6%	78.9%	91.9%	73.1%
Germany	76.5%	96.8%	69.8%	83.5%	87.1%	84.7%
Italy	61.1%	84.1%	61.0%	79.6%	103.3%	74.8%
Japan	86.3%	97.6%	99.0%	75.4%	75.6%	87.0%
Netherlands	74.7%	92.5%	71.9%	77.3%	83.3%	85.9%
Sweden	81.9%	98.0%	80.5%	77.0%	83.2%	77.0%
United Kingdom	68.4%	1114.1%	59.0%	67.9%	95.4%	70.1%
United States	61.5%	126.4%	57.0%	46.1%	56.7%	46.2%

1. Pre-retirement income refers to income of singles or families with a head around 55 years of age; post-requirement income is in the income of families or singles with a head around 67.

Source: OECD Family Resources Data (2011)

Note: Data on first quintile in Australia is unreliable due to small sample.

Figure 1b: composition of post-retirement income

Occupational pensions (other transfers) are very strong in northern European countries. It also is strong in the US and the UK. It is weaker in Germany and Japan, and virtually zero in France.

	Single						Married					
	Transfers			Self-Provided Income			Transfers			Self-Provided Income		
	Public	Other	All	Earnings	Assets	All	Public	Other	All	Earnings	Assets	All
Australia	77.2%	9.9%	87.1%	-8.5%	21.4%	12.9%	46.5%	10.9%	57.4%	21.0%	21.6%	42.6%
France	68.4%	-	68.4%	7.1%	24.6%	31.6%	67.2%	-	67.2%	9.2%	23.6%	32.8%
Germany	81.9%	4.9%	86.8%	4.5%	8.8%	13.3%	70.5%	5.7%	76.2%	12.1%	11.8%	23.8%
Italy	48.5%	-	48.5%	27.2%	24.3%	51.5%	25.6%	-	25.6%	45.9%	28.5%	74.4%
Japan	52.4%	4.8%	57.2%	25.5%	17.3%	42.8%	48.3%	2.6%	50.9%	32.9%	16.2%	49.1%
Netherlands	63.3%	32.5%	95.8%	0.2%	4.0%	4.2%	51.3%	39.1%	90.5%	3.8%	5.7%	9.5%
Sweden	71.1%	18.9%	90.1%	2.5%	7.4%	9.9%	63.1%	19.2%	82.3%	11.5%	6.2%	17.7%
United Kingdom	60.7%	19.7%	80.4%	4.7%	14.9%	19.6%	44.8%	24.4%	69.2%	16.8%	14.0%	30.8%
United States	45.8%	25.5%	71.3%	8.3%	20.4%	28.7%	39.7%	25.0%	64.7%	14.2%	21.1%	35.3%

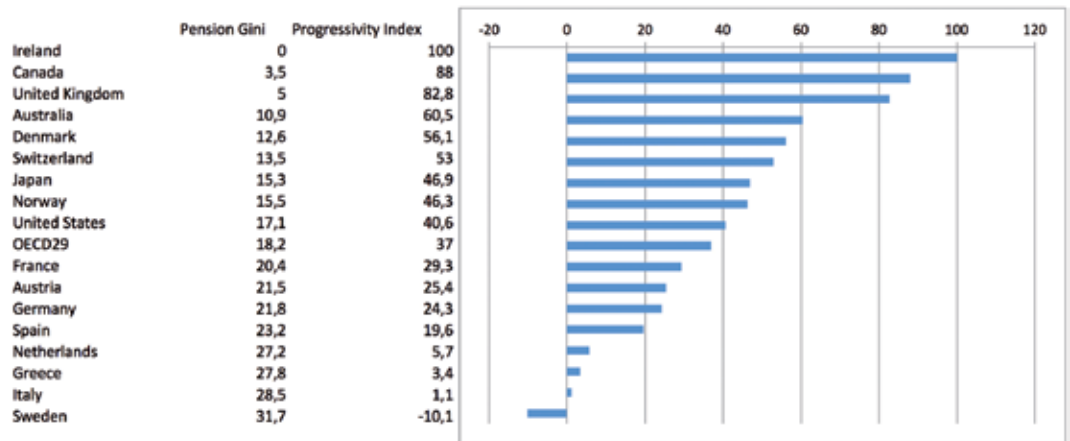
1. Income sources as a percentage of gross income of families with a head around 67 years of age.

Source: OECD Family Resources Data(2011)

Note: Mandatory occupational pensions part of public transfers in France; earnings may come from younger spouses.

Introduction and Description of Retirement System Structures

Figure 1c: Gini and progressivity index for mandatory pension schemes
 For each country, the Gini Index summarises the link between earnings and pension benefits; the progressivity index is calibrated so that flat benefits have an index of 100, whereas pure insurance of earnings have an index of zero. Commonwealth countries usually have flat benefit; continental European countries earnings-based systems.



Source: OECD (2011)

9 - Trustees duties are more explicit in common-law countries. In the United Kingdom, the board (i.e., the trustees) must act independently of the sponsor and they are legally liable for management and investment. Trustees must act in the sole interest of members in the pension fund: "As a trustee, your duties are to the scheme and not to any group or individual that you are connected with, such as the employer, a trade union or a particular group of members, such as pensioner members. Sometimes you may find yourself faced with difficult decisions because of your other interests, such as whether to pay surplus scheme funds to the employer" (OPRA 2001, 17). Trustees are liable for breach of trust, which is a way to enforce their independence from sponsoring organisations. Trustees also have a duty of good faith or loyalty to the sponsor.

3. Traditional DB, Individual DC and Hybrid Pension Plans

A pension fund which pools the assets bought with the contributions to a pension plan for the exclusive purpose of financing pension plan benefits, is legally independent from the sponsor, but pension funds classified as DB plans (traditional DB plans and most hybrid ones) are financially dependent because of the guarantee provided by the sponsor. Plan members have a legal right to all assets in plans that have been legally incorporated, and they have rights to assets that back the transfer value called the buy-out value of the pension rights in pension trusts.

The (IAS 19) accounting definition of a defined benefit plan is one where the sponsor retains a constructive obligation towards the employees in case of underfunding.

In traditional and hybrid DB plans, the management of the pension plan (both of plan assets and of contributions) is the responsibility of a board made up of the

sponsor, employee representatives, the financial institution that manages the plan and an independent advisor (the pension actuary).

The overriding objective of the board of traditional DB plans is to provide a secure source of retirement income, and it must usually act in the sole interest of plan members. At the same time, the presence of the sponsor at the board and the trustees' duty of loyalty (or good faith) to the sponsor altogether theoretically imply that trustees cannot voluntarily raise the sponsor's pension cost.⁹

In traditional DB plans, the sponsor decides on an initial contribution level, usually as a percentage of wages, and has full responsibility for any shortfall. The sponsor therefore bears the bulk of the financial and longevity risk. In fact, a current feature of US and UK DB schemes is their extreme reliance on sponsor guarantees. They are usually deeply underfunded – Figures 2 and 3 show the extent of

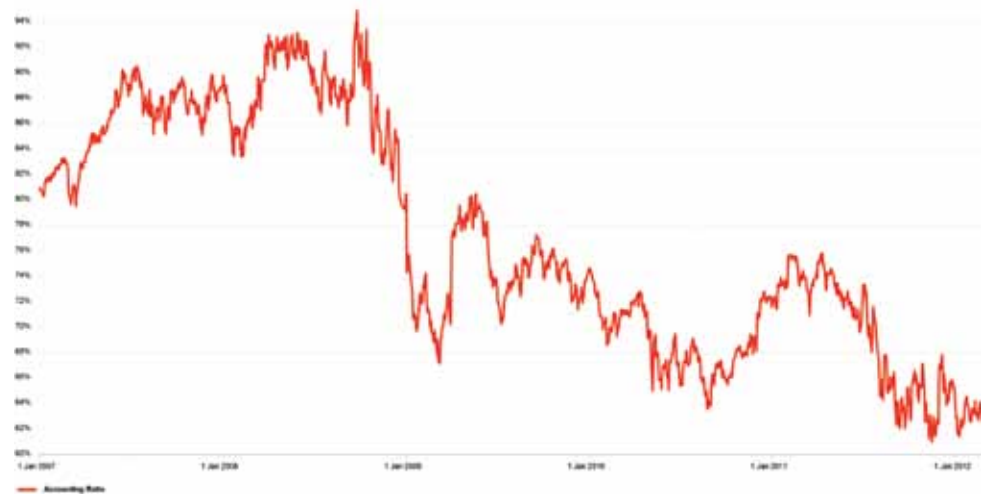
Introduction and Description of Retirement System Structures

underfunding. Even though the actuarial and accounting conventions do not make comparisons easy, in terms of magnitude, the value of the sponsor guarantee must be equal to the underfunding, thus in the

30%-50% range depending on accounting conventions. We show in Section I that this system is not sustainable from a macro-economic standpoint because of evolving demographics.

Figure 2: Accounting ratios, Europe

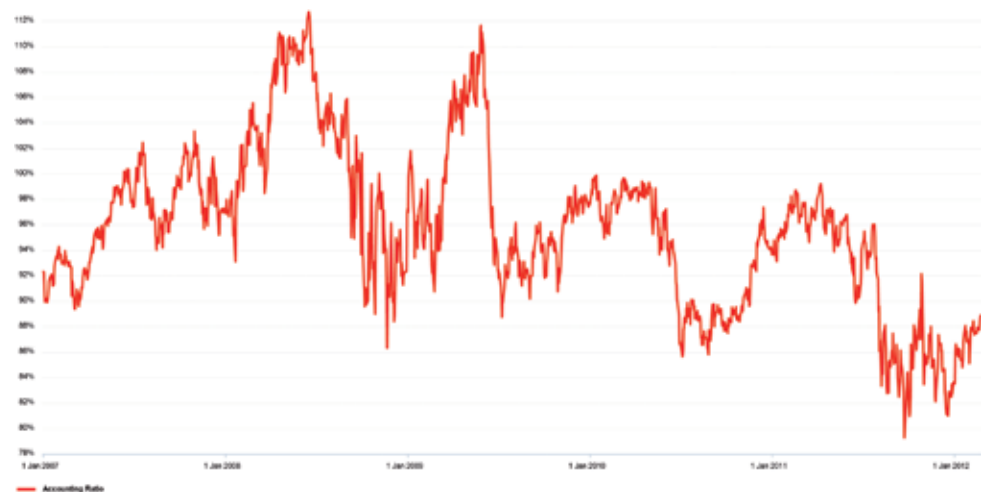
The accounting funding ratio of Eurostoxx 50 companies was at 63% in February 2012 (that of the UK FTSE 350 companies, not pictured, was of 91%).



Source: Aon Hewitt, pension risk tracker, 2011, data starting in January 2007.

Figure 3: US accounting funding ratio

The accounting ratio was at 86% in the US S&P500 companies in February 2012, lower than that of the UK FTSE350 companies. That of the S&P/TSX was somewhat greater, at 89%.



Source: Aon Hewitt, pension risk tracker, 2011, data starting in January 2007.

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By contrast, in an individual DC fund, the value of the pension rights is equal to the market value of the investment fund (times the number of units owned) in which contributions have been invested, so all the risk is for the employee. There are also far less fiduciary duties in individual DC funds. Providing a default option is sufficient to fulfil fiduciary duties, and in many cases the employee can decide on the investment fund himself.

Hybrid pension plans are collective plans which are characterised throughout this document by conditional indexation, generally with risk-sharing between employees and sponsors, but collective defined contribution (CDC) plans are in essence hybrid plans without sponsor guarantees and only involve risk-sharing between employees (within and between generations).

Conditional indexation (i.e., the fact that pension rights result from a mix of guarantees and plan financial returns) is the first source of risk-sharing in hybrid plans. Diminished financial returns first involve lower indexation (or interest rate credit, in US terminology), which diminishes the value of the liabilities. This reduction in the volatility of the value of liabilities and (pension rights) makes sponsor contributions less volatile (and, of course, it makes pension rights less volatile than those that result of investments in individual DC plans).^{10 11} For the purpose of this paper, we distinguish the degree of hybridity of a pension plan (the extent with which a sponsor brings guarantees and bears risk in the pension fund) from the ALM strategy of the pension fund and the financial guarantees that are offered in the pension contract.

To summarise, at one end of the spectrum of hybrid plans lie traditional DB funds, where pension rights are independent of the value of the assets and the sponsor is the ultimate and a sole guarantor of pension rights – in such a case, a healthy sponsor bears all the risk in the pension plan.¹² At the other end of the spectrum lie individual DC plans which benefit from no sponsor support and where pension rights equal to the market value of the fund. So, all the risk and return is for plan members.¹³

As DC plans are individual funds without any risk sharing mechanisms nor smoothing provisions, they also can also be considered as distinct – in fact, abnormal – structures on the landscape. Collective DC (CDC) funds, by contrast to individual DC plans, although they have no sponsor guarantees, are characterised by conditional indexation and some risk-sharing between plan members. In theory, the difference between the DC and the CDC approach is mainly in the way risk is shared between members. In DC funds, there is no risk sharing at all, only risk transfer to the market (for portfolio insurance or buying annuities which happens on the UK market). The CDC really acts like a collective pension plan, but with no sponsor. It provides a collective risk management framework. In particular, it provides intra- and inter-generational risk sharing.¹⁴ In the Netherlands, CDC schemes are subject to prudential regulations similar to those of DB schemes such as the Dutch prudential regulation (the financial assessment framework, FTK for “Financieel Toetsingskader”) only recognises DB and DC schemes.

10 - Technical factors such as the switch from last wage to career-average also contribute to this smoothing; hybrid pension plans are in general more easily transferable than traditional DB plans (yet, less than DC plans) because of the stronger link between funding and pension rights.

11 - Sponsor recovery contributions can also be limited as in industry-wide Dutch hybrid pension plans, or the burden of recovery plans can be shared with plan members, as in Swiss pension funds.

12 - There is of course some risk sharing between members. For instance, this applies to idiosyncratic longevity risk.

13 - Of course, some risk is transferred to the market when DC funds buy annuities or perform portfolio insurance.

14 - Of course, some of the risk, like idiosyncratic mortality risk is pooled, so it in effect acts like an insurance company. And it can externalise systematic risk exposure (such as longevity) to the market.

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4. Summary

The providers of the guarantee are to varying extents the state, the employer, an insurance company or simply the funding level. Pay as you go systems are organised by states and communication is often centred on a notion of pension rights and guaranteed income. However, they are only guaranteed "on paper" by states (unfunded promises are virtual and sometimes illusory). Funded systems are firstly guaranteed by the assets set aside in the pension fund, then usually by the sponsor and lastly by the states that sometimes provide pension insurance. But the provision of DB funds takes extremely diverse forms in developed countries. In partly funded traditional DB plans in practice (UK and US), the greatest asset of the pension fund is the sponsor's guarantee. In Germany the sponsor's guarantee was the only asset of the pension fund, backed by pension insurance – the sponsor may externalize its guarantee to an insurance company as there are now proposals for unfunded pension plans (Keating, 2011).

The provision of benefits may or may not be mandatory, as is the case for employee participation in such schemes. The reliance on individual savings is also implicit in countries like the US and the UK, where half of the population is not covered by pension plans.

Benefits also come in diverse forms. They are sometimes mandatorily indexed with inflation (nowadays, this is usually the case in traditional DB plans) or the indexation depends on the performance of the fund. In DC plans, participants solely receive the market value of the fund when shares are surrendered.

Figures 4a and 4b summarise the main sources of variation in the organisation of the provision of pension funds. DBs are voluntary in Latin countries: usually an add-on to PI, they rely partly on the private sector (and they are conceptually seen as an extension of PIII since they are voluntary in a presumably covered system). There is

15 - Since 2011, annuitisation in DC funds is no longer voluntary; however, pensioners must have a minimum of £20,000 a year of lifetime overall pension income. See http://www.hm-treasury.gov.uk/d/pensions_annuitisation.pdf

Figure 4a: Synthesis of country organisation for pension funds

The UK and the US (the main representatives of Beveridge countries) have traditional DB funds (with unconditional indexation) or pure individual DC funds; the provision of pension plans is voluntary and population coverage is low; funding requirements in DB funds are low. Northern European countries have mandatory pension plans, with full-funding objectives and conditional indexation (as such, they are hybrid). Germany and Switzerland have similar arrangements to northern European countries as participation is mandatory, but they have more flexible funding regulations (Switzerland being more flexible than Germany); in Latin countries, Pillar II pension plans are usually seen as capital add-ons to Pillar I social security as there was a strong historical reliance on PAYG systems. The provision of Pillar II pension funds is deficient in some Latin countries (they are almost non-existent in France), some of these countries have developed incentives for individual savings (in Pillar III), which are usually produced by insurance companies.

	US	UK	Ndl	Sweden	Ge	Fr
Voluntary (V)/ Mandatory (M)	V	V	M	M	M	V
Collectively managed (Y/N)?	Y	Y	Y	Y	Y	Both
Pension Fund (PF) or Insurance (Ins) ?	PF	PF (ins if buyout)	PF	Both	Both	Ins
Protection from Public Pension Insurance is:	Partial	Partial	None	Full	Full	None
Funding requirements are:	Low	Low	Full	Full	Varying	(ins)
Type of plan: Traditional (trad), hybrid or DC	Trad or DC	Trad or DC	Hybrid	Ins-like hybrid	Ins-like hybrid	Ins-like hybrid
Income annuitized?	Yes in DB, no in DC	Yes in DB, no longer in DC ¹⁵	Yes	Yes	Yes	Yes

Source: EDHEC

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usually a strong reliance on the first pillar. In northern European countries DBs are mandatory, hybrid and fully funded. In the UK and the US pension plans are voluntary and either traditional DB or individual DC. Figure 5 summarises the importance of pension assets relative to GDP in major European countries and in the US. It shows that for the part of the population covered

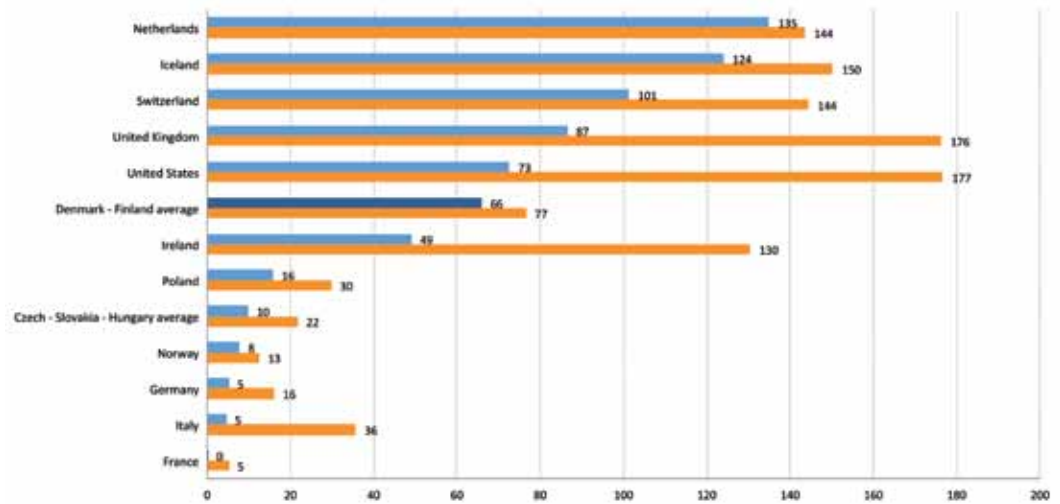
by pension funds, the UK and the US rely quite heavily on such Pillar II pension funds for retirement benefits. Moreover, the aggregate lower reliance in Anglo-American countries compared to northern European countries and Switzerland primarily arises because of a low participation rate. Appendix B details the country organisation.

*Figure 4b: Characteristics of the types of pension plans and definitions
Pension funds are independent organisations, sponsored by employers.*

	Definition and characteristics
Pension plan	Occupational retirement vehicles that are part of the second Pillar of the organisation of retirement systems (the first Pillar is social security and the third Pillar individual savings schemes, as opposed to occupational savings schemes).
Pension fund	Pools the assets bought with the contributions to a pension plan for the exclusive purpose of financing pension plan benefits.
Sponsor	Employer that gives a guarantee to the pension plan (usually classified as DB accounting-wise)
Traditional DB fund	Pension rights independent of the value of the assets. Annuities with partial inflation protection are usually delivered. Sponsors bear all the risks until bankrupt, then there are large risks for employees.
Individual DC (unless specified, "DC" refers to individual DC)	No risk-sharing. Liability value is the fund's market value. In theory they can be adapted to very diverse individual situations, risk appetites and wealth drivers. Currently predominant in the UK and the US. In practice they are often bound by retail-like regulation that restricts their ability to diversify risks.
Hybrid funds	A flexible framework that allows various forms of risk-sharing. Characterised by conditional indexation. They are generally regulated with the requirement of protecting nominal guarantees.
Collective DC (CDC) funds	Hybrid funds without sponsor guarantees. Under Dutch regulation, CDC plans are regulated as DB plans without a sponsor. They must respect minimum funding requirement. Indexation is conditional too: by contrast to individual DC plans, the liability value in CDC plans also results in smoothing.

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Figure 5: Importance of pension funds relative to the size of the economy in selected OECD countries, 2010
 The blue lines show the size of pension assets related to GDP in selected countries, according to OECD calculations (OECD, 2011). The orange lines are adjusted for (technically, divided by) the pension coverage ratio statistics published by OECD. The orange bars show that within the population covered by pension plans, the Netherlands, the UK, the US, Switzerland, Iceland and Ireland all have an asset to GDP ratio greater than 120%. Of course, this measure benefits voluntary systems since the fraction of the population covered is usually that better-off and artificially increase the coverage adjusted measure (because it is not earning-adjusted).



Source: OECD (2011), EDHEC calculations

Introduction and Description of Retirement System Structures

1. The Role of Demographics in Pension Plan Evolution



1. The Role of Demographics in Pension Plan Evolution

Since 2001, news of closure of defined benefit schemes and curtailment of pension rights after the bankruptcy of the sponsor have raised eyebrows in the UK and the US – the largest transfers to the PBGC happened in the last decade.¹⁶ The Netherlands had been thought of as an adequately protected system, until it experienced shortfalls in 2009 (and again in 2011). So, new reforms have been proposed that would diminish the guarantees offered to participants and enhance the possibility of risk taking.

National and international organisations have warned for long that implicit pension debts were not sustainable, or alternatively that the security of pension promises (and other government commitments) were at a serious risk, and the term ‘pension crisis’ has been commonly used for more than a decade. In the UK and the US alone, part of the population simply does not contribute to pension funds (as it is not mandatory in these countries), so there the level of saving has been judged to be highly unsatisfactory in countries where the pension system does not explicitly factor in retirement income as a proportion of current income. In all countries, the increased life expectancy has also often been mentioned as a source of tension, either resulting in diminished income for pensioners or a greater burden for sponsors of DB funds when guarantees are being paid at the expense of younger generations.

In this section, we illustrate the impact of demographics on the structure of retirement systems and namely the increase in the dependency ratio of the cost of the guarantees. The increase in the dependency ratio also impacts the implicit state debt, notably via its Pillar I social

security commitments. It is also the greatest motivation for the evolution of pension plans, for a progressive diminishment of sponsor guarantees, and for the shift of risk towards plan members.

When approximating the assumed value of the sponsor guarantees by use of the current underfunding in DB pension plans, the main underlying force in the model is the dependency ratio in Europe. Figure 6 shows the OECD projections. The OECD calculates the dependency ratio as the over-65 portion of the population against the size of the active population – technically defined as the working age population between the ages of 20 and 64. Of course, reforms in retirement systems will, to some extent, impact the true economic variable underlying the model – the ratio of retirees to the working population. Yet in this paper, we restrict ourselves to the dependency ratio.¹⁷

The progressive maturing of European economies means that the proportion of retired people to active participants is progressively increasing, a secular trend due to longer life expectancy and a decline in fertility rates: in 1950, according to OECD, the ratio of elderly persons (above 65) to that potentially active (in the 20–64 years range) should be of 1 to 2 in 2050.

The ratio of active to retired participants in Pillar II pension plans should logically follow the same trend. In unfunded systems (Pillar I social security in most countries, Pillar II in France), if benefits are paid out from current contributions, the rise in the dependency ratio implies a simultaneous rise in contributions, and a postponement of the retirement age or curtailment of

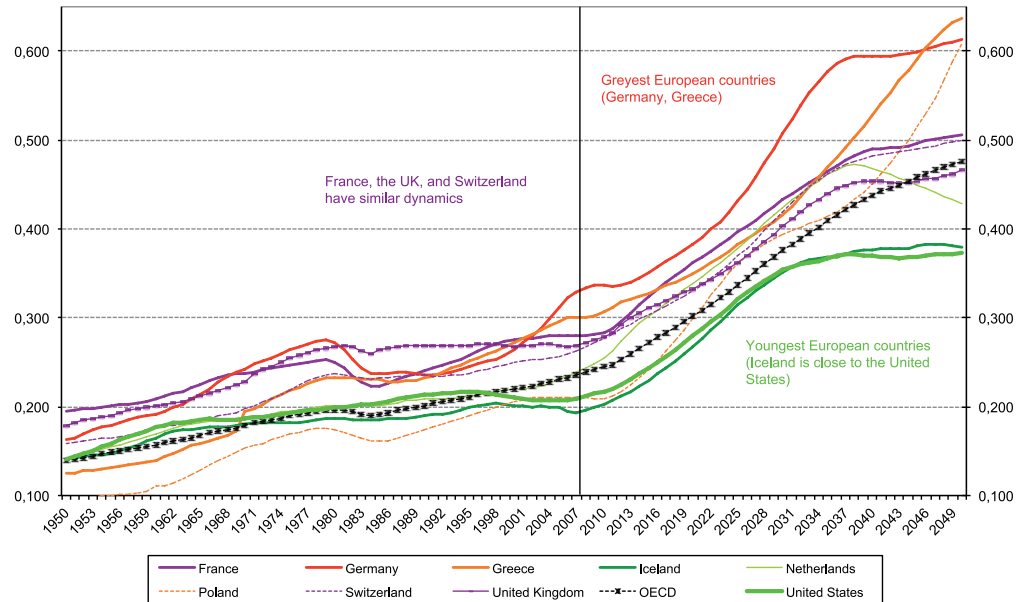
16 - In 2009, the Pension Benefits Guaranty Corporation (PBGC) agreed to take on \$6.2 billion in pension liabilities from bankrupt auto supplier Delphi Corp., making it the second largest bankruptcy ever (ranked by dollar value). The largest bankruptcy ranked by dollar that the agency took on was that of United Airlines bankruptcy in 2005, which totalled \$7.5 billion

17 - A full model would not only require modelling of the current retirement age and the current endogenous working population, with features that depend on political decisions and on the global economic factors, but that go far beyond the scope of this general paper. In addition, such studies will generally show how the actual equilibrium will depart from the long-term structural trend that we point out.

1. The Role of Demographics in Pension Plan Evolution

Figure 6: dependency ratio in Europe

Germany is the oldest European country and Poland, currently the second youngest country after Iceland, is expected to join the old-country club by 2050 (Greece too). France, the UK and Switzerland are close to the European average, but above the OECD average.



18 - OECD (2011) shows the old-age support ratio with similar trends.

Source: OECD (2009) ¹⁸

benefits for the same number of workers in order to sustain an increased number of retirees. In these systems, there are only three short-term levers to restore equilibrium: postponing the retirement age (so as to stabilize the dependency ratio), increasing contributions or diminishing pension payments. Over the longer run, of course, one can also try to influence birth rates or immigration policy.

Drucker (1976) already underlined the impact of demographic evolutions on pension rights, implicit government debt, inadequacy of the level of savings or risk on pension rights. However, as shown in figure 6, the perennial increase in the dependency ratio is accelerating, so reform for sustainable pensions must happen now. As the EC (2010) puts it, "The number of retired people in Europe compared to those financing their pensions is forecast

to double by 2060 - the current situation is simply not sustainable. In addressing this challenge the balance between time spent in work and in retirement needs to be looked at carefully."

This paper is also the first to explicitly make the link between demographic evolutions and the change in the design of (Pillar II) pension plans.

1.1 A Simple Model for Pillar I PAYG Systems

These aggregate changes can be illustrated throughout a very simple model. In a PAYG system, cash contributions serve to pay directly for retirement income. If taxes as a percentage of wages are kept constant, denoting W as the aggregate wage, w as the per active member wage and c as a constant, then retirement income to be

1. The Role of Demographics in Pension Plan Evolution

distributed is equal to $c \cdot W$ and the per capita retirement income is equal to

$$c \cdot \frac{W}{Pop_{>65}} = c \cdot \frac{W}{Pop_{<65}} \cdot \frac{Pop_{<65}}{Pop_{>65}}$$

$$= \frac{c \cdot w_{active}}{dependency_ratio}$$

And the proportion of per capita retirement income to per active member wage falls linearly with the dependency ratio (of course, it rises with the participation to the workforce):

$$c \cdot \frac{W}{Pop_{>65}} = c \cdot \frac{W}{Pop_{<65}} \cdot \frac{Pop_{<65}}{Pop_{>65}}$$

$$= \frac{c \cdot w_{active}}{dependency_ratio}$$

$$= \frac{c \cdot w_{worker} \cdot participation_rate}{dependency_ratio}$$

Thus, if the retirement age could not be significantly postponed beyond the 65 years assumed for the current ratio, older generations' participation in the workforce could not be increased, taxes and government debt would be raised. This would produce a pure PAYG system that preserves the contribution rate would see the ratio of retirement income to labour income exactly follow the "constant age" OECD definition of the dependency ratio, and fall by approximately 50% between the mid-2000 and 2050.

How much the ratio of Pillar I retirement income – or more generally old-age income – to wages will fall depends on how much other levers (increase in effective retirement age, increase in contribution rates, or increase in government debt) can be used. But, it is common knowledge that pension reforms are very progressive and government debt can no longer be

voluntarily and automatically increased in substantial proportions of GDP, there must be an important fall in Pillar I retirement income.

The remaining life expectancy at 65 is about 20 years, compared to a total working time of around 40 years. Thus 3 ½ years of postponed effective retirement age (which not only means that retirement is postponed by 3 ½ years, but also that employment duration is increases by 3 ½ years) represents an approximate decrease of 25% in the effective relative burden of PAYG pensions.¹⁹ Thus, the required 50% reduction in PAYG relative burden could be achieved by a 25% progressive reduction in aggregate pensions (for instance by higher effective taxation of the highest pensions²⁰ or reduced indexation), and a 3 ½ year increase of the effective retirement age.²¹

In fact, the current turmoil in government debt shows that current debt spreads are not only related to the size of current debt and its evolution, but also to unfunded market promises. In fact, the reliance on Pillar I explains government bond yields (and CDS spreads likewise, not illustrated) in Europe. After all, even if unfunded pension promises are not the sole factor driving the evolution of debt to GDP ratios in Europe, this evolution is an important driver, as public pension expenditures have been linked to demographic pressures (as measured by the dependency ratio) in the absence of thorough reforms (see also OECD 2011).

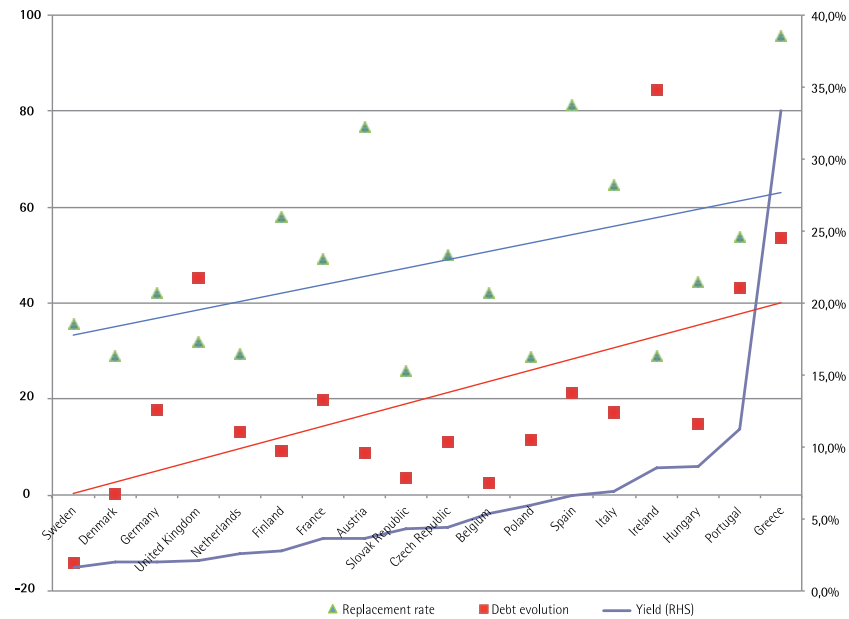
From a practical standpoint, current sovereign debt market conditions (see figure 7) indicate that government debt can no longer be voluntarily and automatically

19 - $(20 - 3.5 / 40 + 3.5) / (20 / 40) = 0.75$.
 20 - Given the need to maintain a poverty net, a 25% reduction in public pension implies a greater reduction in above-average pension rights.
 21 - Of course, if the retirement age is postponed but there is no increase in employment, there may be lower gains (the PAYG burden is then reduced by 17.5% instead of 25%).

1. The Role of Demographics in Pension Plan Evolution

Figure 7: Yields, debt to GDP ratio and Pillar I replacement rate

Figure 7 shows government bond yields (November 23, 2011) on the right hand scale, evolution of debt to GDP ratio from 2004 to 2011, and Pillar one replacement rate for the average earning employee (as estimated for 2011). A regression on these factors yields a 62% R-square, and the evolution of debt to GDP ratio has a similar coefficient than the Pillar I replacement rate. Both are significant at the 5% level for one-tailed probabilities and very close to 5% for the two-tailed probabilities.



Source: replacement rates are from OECD (2011), market data from Datastream, debt to GDP ratio from OECD Economic outlook (from Datastream).

22 - Some large international groups will avoid this trend if their size is disconnected from the demographics of fast ageing countries.

increased in substantial proportions of GDP, so there must be an important fall in Pillar I retirement income or a successful increase in the effective retirement age. Then, a stable retirement income must come through increased income from Pillar II and Pillar III, whose coverage must also be expanded to the population which relied exclusively on Pillar I, but which will receive insufficient income from this system in the future. With states short of finance, there is greater willingness to have the Pillar I safety net funded by participants rather than by the state at a later date.

A fair value approach such as the one we recommend and rely on for pension funds (see following sub-section and appendix A) would allow states and voters to understand the magnitude of future adjustments or sacrifices to be made, and how the retirement system needs to adapt.

1.2 Pillar II and the Role of Expectations

Sponsors only can offer a guarantee with a value that is commensurate to their size; as the ratio of labour force to retirees will diminish markedly in the next twenty years, so must the ratio of the size of the sponsoring organisation (measured for instance by the size of its workforce) to the size of its pension fund (which counts as participants both active members and retirees). So, the value of the guarantee that the sponsor can offer as a proportion of the liability value will diminish markedly in many domestic industries.²² This is one of the reasons why pension contract redesign has become a topical subject.

Yet the value of the sponsor guarantees, a sign of the degree of hybridity of funds, does not simply follow contemporarily the dependency ratio. The value of the

1. The Role of Demographics in Pension Plan Evolution

guarantee, a concept related to the degree of underfunding of pension plans, must be linked to the value of its asset value Y (it could also be its liability value L), so, we have $\frac{G}{Y} \approx c$. Then, when expressed as a fraction of the pension liability value, $\frac{G}{L} = \frac{G}{Y} \cdot \frac{Y}{L} \approx c \cdot \frac{Y}{L}$.

The intuition from the PAYG model would be valid if the rise in dependency was totally unexpected, and the liability value would rise simultaneously with the dependency ratio. We also hold productivity fixed, or, alternatively, we require that productivity gains are shared with retirees so that changes in productivity do not affect the ratio $\frac{G}{L}$.

The pension liability value does not mechanically and simultaneously follow the increase in dependency as in figure 6. The future increases in dependency that result from the forecasted increases in life expectancy must be reflected in today's valuation.

In other words, in funded systems, L is a present value and already incorporates all

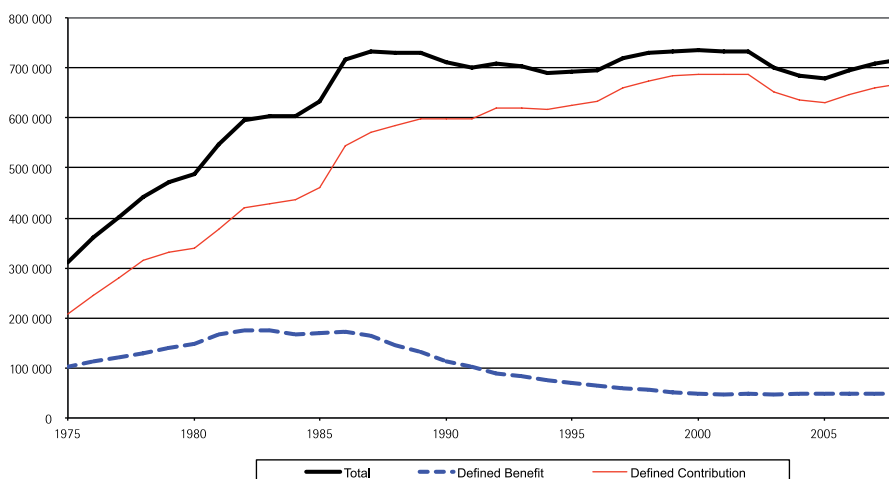
future information about life expectancy, so that, in theory, the ratio of hybridity G/L should closely follow the evolution in the mortality table rather than on the dependency ratio itself.

In PAYG schemes, as for traditional DBs, there is no implicit adjustment mechanism to (unpriced) increase in life expectancy. Thus adjustments are painful, and risk is not shared but passed entirely to those who bear the guarantees: sponsors and future generations.²³ The ongoing increase in life expectancy and the successive large revisions to the mortality table have triggered large waves of buy-outs and of new DC plans. So, the transition of PAYG systems towards reduced sponsor guarantees is not always smooth.

In the US and the UK, there are very few DB plans opening up, and many have closed. In contrast, the trend towards DC plans has accelerated in recent years (after an initial wave of DC plans in the UK in the mid-80's when these were first allowed – see figures 8a and 8b).²⁴

23 - Lower guarantees, lower indexation, the change of wage indexation to inflation indexation and capped indexation (as in the UK) are ways of passing the risk to new generations.
24 - Only US data are shown for the sake of space, and because UK data are only available over a much shorter time frame.

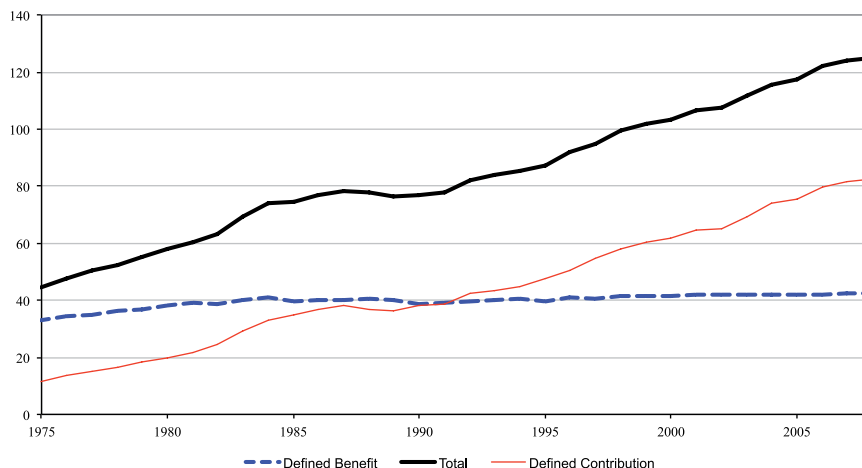
Figure 8a: Number of US private pension plans, 1975-2008



Source: US D.O.L (2010), covering the 1975-2008 time range.

1. The Role of Demographics in Pension Plan Evolution

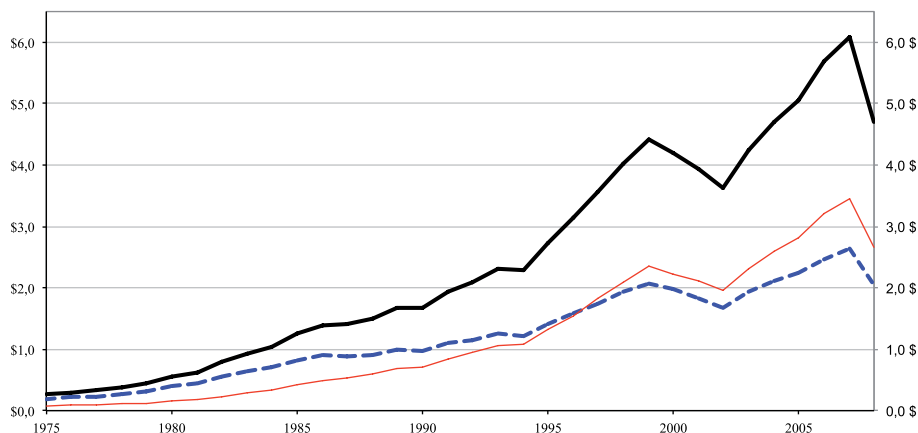
Figure 8b: Number of participants in US private pension plans



Note: 2003 data is smoothed so as to avoid the break in the series that results in the change in the adjustment methodology from DoL in 2004.

Source: Form 5500 filings with the U.S. Department of Labor.

Figure 8c: Total assets in US private pension plans (USD trillions)



Source: Form 5500 filings with the U.S. Department of Labor.

Today, the bulk of the population is covered by DC plans. Yet, both in the UK and in the US, per capita contributions to DC plans are much lower than to DB plans, so that the level of DC assets has only recently been exceeding that of DB assets. Greater coverage, which is primarily achieved through DC funds, also means covering low income population. But there is more to it, and anecdotal evidence suggests that employers who close DB funds and offer DC funds instead diminish their contributions. So, demographics are instrumental in

explaining the progressive reduced reliance on sponsor guarantees from the 1950s to the current period. In continental European countries, because pension plans are mandatory, less reliance of sponsor guarantees is needed.

Then, there also was a modification in the structure and organisation of pension funds. In the UK and US, there was a progressive shift away from DB funds (see figures 8a to 8c) and the shift to more hybrid funds in continental Europe.

1. The Role of Demographics in Pension Plan Evolution

1.3 Regulatory Consequences

Stricter accounting standards and greater funding requirements can be viewed as a direct consequence of ageing populations. Until the 1970s, pensions were generally seen as being a paternalistic social security policy and pension funds were relatively unregulated. However, the social and economic consequences of ageing populations on the financing of public pensions has brought about a new emphasis on professionally developed accounting standards as a primary means of regulating the accountability of pension funds. This is true for Anglo-American countries (Klumpes 2011), as well as for European countries, where IAS 19 applies and where risk-based regulations have been developed. It led to pension insurance, firstly in 1974 in the US (PBGC) and Germany (PsvAG), then in the rest of the world and in parallel, funding regulations became more restrictive – again, ERISA in 1974 was the first regulation to establish minimum funding requirements in pension plans and the UK was one of the last countries to implement minimum funding requirements after 2000.²⁵

The riskiness of sponsor guarantees have led to more transparent, but also stricter accounting standards – IAS 19 is progressively adopting a more ‘fair value’ approach to liabilities, where underfunding is shown in the accounts of the sponsor. As shown in the previous section, the sponsor’s guarantee must be a function of its size and riskiness, so that, on aggregate, an equilibrium approach to the funding of pension schemes (if they were all defined-benefit and subject to the same demographic trends) would involve a greater funding requirement. So, this approach has macro-economic justifications.

It is not obvious, however, that it must hold for every single DB fund. This is because strong sponsors can offer DB plans with low funding ratios.²⁶

Funding requirements once again became stricter in northern European countries that implemented Solvency II like regulations. The Dutch FTK, documented in Appendix B, can be viewed as an application of Solvency II.²⁷ At the same time, these regulations virtually require overfunding at all times, a requirement that implicitly requires portfolio-insurance-like investment policies to be performed. These regulations, though totally inconsistent with the view that there is contingent capital in the form of sponsor guarantees,²⁸ are probably testament to the trend towards lower reliance on sponsor guarantees.

1.4 Summary

Demographic changes drive modifications in the structure of pension plans. They have brought stricter accounting rules, stricter (social) funding regulations in DB funds (sometimes in a counter-productive manner), risk-based prudential regulations (i.e., inspired by portfolio insurance and that show negligence of sponsor guarantees), and a shift in the provision of retirement funds from DB funds to DC funds in the UK and the US, while the shift has been more towards hybrid DB funds in countries where the design is more flexible.

Modifications in funded systems must happen more rapidly than in PAYG systems because liabilities rise as a result of assumptions about life expectancy, and because of falls in interest rates, both of

25 - The protection offered by UK and US pension insurance is partial, pension insurance schemes involve large losses for those who have pension rights above the protection cap (around \$2000 per month in the US), and primarily for management. Then such schemes can also be viewed as giving incentives to close pension plans.

26 - For such sponsors, raising exaggeratedly funding requirements may be counter-productive. We should remember that in Anglo-American countries, sponsors can close DB plans and replace them with DC plans.

27 - In some other northern European countries, pension funds may be directly operated by insurance companies and therefore regulated under Solvency II. Sweden, Denmark and Norway are the countries that are most bound by Solvency II – more than the Netherlands, whose regulatory model is being reviewed and adapted. Solvency II encourages a wide measurement of risks, and has organisational requirements to incentivise risk management. The requirement it places on organisations and on the education of top-management enhances risk awareness.

28 - As things are today, the switch to Solvency II is totally inexplicable as it is an insurance or even a banking framework, unfit for pension funds because it totally ignores the sponsor’s guarantees.

1. The Role of Demographics in Pension Plan Evolution

which make guarantees significantly more costly until they are not affordable.

The increased reliance on second Pillar arrangements has led to governments attempting to increase coverage and get more involved by setting appropriate guidelines for an efficient organisation – they have done so by focusing on both fees and on appropriate retirement options. Consequently, many governments have launched a review of their pension systems (primarily Pillar I and Pillar II): the Myners report (2001) analyses the shortfalls in the UK retirement system and has been at the basis of all subsequent reforms; the Netherlands is in the process of a consultation on a reform of its financial assessment framework (the FTK), and consultations on the *default options* – where the guarantees, investment strategy, contribution rates and participation choices are made – in DC funds have been launched in both the US and the EU.

1. The Role of Demographics in Pension Plan Evolution

2. Problems in Pension Plans



2. Problems in Pension Plans

The maturing of European economies implies a greater reliance on Pillar II schemes. The obvious question is therefore, "Are Pillar II plans adequate?" And, if not, what improvements can be made to these schemes?

Section 2.1 analyses the main problems in existing traditional DB, individual DC and hybrid plans. Our main focus is on individual DC plans and hybrid plans. Individual DC plans now represent the majority of new pension plans in the US and the UK (and we thus give less importance to traditional pension plans); in Europe, plans are hybrid.

2.1 Problems in Individual DC Funds

2.1.1 The organisational needs and fiduciary duties

In DC plans, in theory, plan members have extensive control over the choice of retirement funds and thus on the definition of their retirement investment strategy. In practice, individuals are poor at making decisions, so good governance and an adequate definition of default options are necessary to prevent mis-management of retirement funds. Yet, DC plans have been characterised by a light-touch approach to governance.

The poster child of governance issues in DC plans and of the risks associated with bad governance can be found in American 401k plans,²⁹ and where, even if employees make their own choice amongst available options, it is the trustees' duty to define prudent investment procedures and respect diversification requirements (Paller 2006). In 2001, Enron filed for bankruptcy; as

of 31 December 2000, 62% of the assets held in the corporation's 401k retirement plan consisted of shares of Enron stock (Purcell 2002). The company's bankruptcy substantially reduced the value of many of its employees' retirement accounts. Shares of Enron, which in January 2001 traded for more than \$80 each, were worth less than seventy cents apiece one year later.

Even the respect of existing light fiduciary duties have been questioned. It was argued that even in so-called self-directed plans, there was some management pressure to purchase company's shares so as to show confidence and commitment towards the company. The relevance of the provision of such plans have been contested. Walsh (2003) and Wojcik (2002) argued that trustees (especially those belonging to the Enron's management) were aware of accounting issues at Enron, yet failed to inform plan members on the possible inadequateness of having shares that became excessively risky due to possible accounting irregularities.

In the UK, in a recent review of funds that involve a mix of DB and DC funds, the pension regulator found that "trustees did not always understand their scheme's structure and benefits it offered". The watchdog said "this lack of understanding increased the risk of members receiving unclear or misleading communication or incorrect retirement benefits" (Towler 2011). On the whole, transparency about objectives is important, and DC funds should clearly communicate their investment principles and aims, as well as the rationale of the options they offer to their members. Only with such clarifications can fiduciary duties and governance be substantially improved.

29 - 401k plans are DC-type retirement accounts in the US, named after a section of the Internal Revenue Code.

2. Problems in Pension Plans

2.1.2 The default options as they are today

As underlined by (Beshears *et al.* 2009) in DC retirement savings plans employees must make a number of decisions about the plan, which may include whether to participate, how much to contribute, how to allocate plan assets across various investment vehicles, and how to decumulate assets following retirement. The default option usually available in such plans would, in an ideal world, have little effect on retirement savings outcomes, because "if the default option is not the best choice for the worker, he will simply switch to his preferred option, as long as switching is not particularly costly."

Yet in the real world, default options have a tremendous impact on savings outcome, on all standpoints. Default options modify the enrolment, contribution policy, and the investment policy usually chosen by workers. In addition, an approved default option is a free pass for DC plan trustees – it totally relieves them of fiduciary duties. In the first wave of DC plans, their designs and distribution were entrusted to traditional asset managers, without proper guidelines to ensure that the products sold really did conform to the retirement objective (type of products, contribution policy, etc.). In many cases, investors needed to make their asset mix themselves, out of a limited choice of funds (usually bond and equity funds) and employees would have had to implement dynamic allocation between these funds themselves. At a time where pension funds engage in very active diversification between asset classes, relying on a sole source of risk to invest in over a very long horizon seems somewhat absurd.

One can't help being surprised that even international bodies (Antolín, Payet and Yermo 2010) advise default options in DC plans to be built out of stocks and bonds (and inflation-linked bonds are usually in short supply).

Default options have evolved, and now, in the spirit of Merton (1969, 1971)³⁰ life-cycle funds are available. While Merton's framework takes the horizon into account when deciding the amount of risk one is willing to take, so-called target-date funds usually have a deterministic glide path, which contradicts the notion of a term structure of risk that justifies a glide path in the first place (Viceira and Field 2007; Martellini and Milhau 2010).

2.1.3 The fee issue

The main recommendation from the literature is that investment fees are kept under control.

Yet it has been documented that DB funds are approximately half as costly as DC Pillar II funds, which themselves are half as costly than Pillar III (retail) investment funds.

Bauer *et al.* (2007) document that "Pension funds perform close to their benchmarks, whereas size-matched mutual funds strongly underperform. Cost, risk and style differences do not explain the performance gap between the two institutional arrangements. Our results are consistent with the notion that pension funds are less exposed to hidden agency costs than mutual funds. Efficient fund pooling provides pension boards with enough negotiating power and monitoring capacity to ensure that institutional asset managers serve the interests of participants."

30 - Bodie, Merton, and Samuelson (1992) added human capital to the framework but this is only taken into account today by the rule of thumb that states that employees with risky jobs or income closely related to the stock market should have little exposure to the stock market.

2. Problems in Pension Plans

In fact, as illustrated in figure 9 (extracted from Strauber, 2010), average costs in DB plans are half those of DC plans, which are themselves half those of mutual funds (32 bps for DB plans, 62 for DC plans, and 120 for mutual funds). After all, since DC pension funds are pre-selected by pension trustees, there should be no marketing costs associated with them.

A professional independent organisation such as those of DB plans have much more power to influence portfolio return by controlling many of the costs within the policy, both disclosed and non-disclosed, while always retaining the possibility of managing funds internally. Another possible reason for the extended control that DB funds seem to have over fees and costs is that the interests of sponsors and employees are aligned with those of DB funds (since higher costs result in a higher pension obligation for the sponsoring organisation).³¹

2.1.4 The need for annuitised income

The purpose of pension funds is to provide retirement income, so it should generally not just provide a lump sum, especially in countries where pension income is primarily provided by pension funds.³² The main problem of annuitisation lies in DC funds, and particularly in the US, where there is no mandatory annuitisation whatsoever.

Munnell (2010) argues that people do not buy annuity voluntarily.³³ And individual annuity purchases are not the answer: when one buys annuities individually, adverse selection raises prices very markedly, thus only collectively purchased annuities are an economically viable solution. So, DC plans should by default either include annuities in the accumulation phase or purchase either advanced life deferred annuities or longevity swaps to avoid the development of longevity risk from the time of savings to retirement time.

From a communication standpoint, retirement income is more meaningful than the market value of DC funds (individuals do not always find it easy to make the conversion).

As annuities are often not mandatory in DC funds, the problem of adverse selection remains, and it is not obvious that the conditions for an actuarially fair market exist (as individual annuity purchases are always costly). Another practical issue is that the market for annuities is a market for nominal annuities, whereas the need (at least when life expectancy is long) is for real income, not nominal income. From a practical standpoint, that real yields are very low means that real annuities would be costly. Thus the flourishing market for equity-linked annuities is a possible solution

31 - Strauber (2010) argues that when individual Pillar III savings schemes are wrapped in insurance savings policies, deferred tax-savings incentives are entirely captured by the implied structuring and management costs.

32 - An annuity sufficient to live on should be provided. How much must be kept in annuities should theoretically depend on other assets and income, and the U.K. requires at least £20,000 lifetime retirement income to avoid annuitisation.

33 - This happens for a mix of rational, education and behavioural reasons. The only rational reasons arise because non-mandatory annuitisation is expensive because of adverse selection. Behavioural issues are often assumed to be solved by financial education; on the whole, however, institutionalisation of investments with adequate regulations, fiduciary duties and the capacity to adapt to individual solutions should be the answer.

Figure 9: Comparisons of charges in various types of funds
 Size Eq. Hold is an across fund equally weighted average of time series of means of equity holdings, and costs are equally weighted across fund averages of time series means of costs. The results from Bauer et al. (2007) suggest that greater size diminishes costs.

	Size Eq. Hold.	Costs
All DB funds	2749.79	31.89
DC	617.32	62.08
MF	394.32	119.07
MF 97+	370.22	120.10

Extract from Bauer et al. (2007)

2. Problems in Pension Plans

to the real annuity issue, not to the adverse selection one nor globally for an efficient annuity market.

2.2 Problems in Traditional DB Plans

In traditional DB funds, as long as the sponsor is alive, it takes all the risks related to the investment, as well as any benefits resulting from exposure to the financial markets (reduced contributions).

2.2.1 Governance and fiduciary duties

In traditional defined-benefit ones such as those in the UK and the US, "the governance rules of pension plans should allow sponsors of traditional defined-benefit plans to have a better grasp of the ALM policy of their pension plans; when they draft the pension contract, sponsors should help define appropriate asset allocation rules so as to limit risks in the sponsor's account. The extreme separation of trustees' duties from sponsors' interest may be counterproductive." (Sender 2011a)

Interestingly, there is no such strong separation of roles in German book-reserved pension plans, where the trustee is an employee of the sponsor and has clear fiduciary duties to both the sponsor and employees at the same time.

2.2.2 Longevity risk and sustainability

Longevity risk is not the sole problem of DC funds. DB funds have been the main traditional provider of regular or annuity-like retirement income, but this risk has not always been hedged. In traditional defined benefit pension funds, longevity risk is considered as insured by the sponsoring firm. In Dutch hybrid pension plans, even if annuities are technically provided by

pension funds, the longevity risk is often not explicitly managed by pension funds. In industry-wide pension funds where the sponsor brings limited guarantees, the risk remains, and increased life expectancy would mean diminished indexation or curtailment of pension rights. Smaller pension plans are accustomed to purchasing annuities at the time of retirement for each plan member, but often only at the time of retirement.

The failure of Equitable Life has been attributed to longevity risk and guarantees; beyond this company the failure to hedge longevity risk has had dramatic consequences. A great risk for the stability of DB plans is that increases in life expectancy exhaust the sponsor guarantee, and lead to the closure of the DB plan – for a long time, the management of longevity risk has been neglected and today, it is sometimes considered as costly.

2.2.3 Sponsor risks

Pension arrangements, before being ring-fenced in pension funds, were usually on the balance sheet of sponsors. For employees, the risk of bankruptcy of the sponsor, or sponsor risk, was the greatest risk they could face. When sponsors went bankrupt, employees used to lose both their jobs and the bulk of their life savings.

In 2001, United Airlines (UAL) filed for bankruptcy and transfer to its pension obligations to the Pension Benefit Guaranty Corporation (PBGC). As pension benefits are not fully insured by the PBGC, UAL employees lost \$3.2 billion; the auto part-maker Delphi had a highly-underfunded pension plan and the PBGC took over \$6.2 billion in liabilities in the second-largest rescue

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operation in its history. The typical losses for employees are in the order of 30% to more than 50% of pension rights.

Today, the problem of sponsor risk is particularly important in traditional DB funds, but unfortunately, as found by Sender (2011a), only a very small minority of corporate pension funds hedge sponsor risks.

So the viability of such pension plans is limited.

2.2.4 Costs and other issues

In the UK and the US, until recently, most corporations would have their own individual retirement plan. The extremely large number of funds (there are approximately 7,000³⁴ pension schemes under the Pension Protection Fund) involves substantial costs, because all administrative costs needed to be duplicated both at the sponsor and pension fund level across the country. The small size of many pension funds also means that they are insufficiently sophisticated.

2.3 Guarantees in Hybrid Schemes

2.3.1 Definition and management of guarantees

In continental Europe, hybrid funds are usually regulated and offer nominal guarantees on paid premiums.

Because the participant's utility is on a stream of consumption (or equivalently on its real retirement income) if there are guarantees, these should theoretically be on real wealth and not nominal wealth. Yet, although that may be possible for an

individual investor, that is not possible at a country, European or OECD level for the retirement system as a whole: technically there is insufficient supply of inflation-protected securities, and economically inflation is an adjustment variable that cannot be controlled for at a macro-economic level.

At the same time, having nominal long-term guarantees involves a possible large loss of utility, because of the possibility of pension funds being locked in a nominal guarantees and giving away all future investment returns. To some extent, one can say that no pension fund is needed to produce nominal guaranteed income, because the investment strategy simply is an annuity.

Lastly, the lower the cost of guarantees, the lower the exposure to financial markets, so developments in interest rates and life expectancy call for reduced guarantees.

2.3.2 The impossibility of collective real guarantees

In theory, investors should care about the real value or purchasing power of their savings, not about its nominal value. From an individual perspective, the risk-free assets are thus inflation-linked bonds. So, Bodie (FT 2011b) and others have been advocating the use of inflation-linked bonds as the default option for retirement plans, suggesting that there are means to collectively protect against inflation.

Unfortunately, if inflation-linked bonds are available solutions for individual investors, they are not available as a default option for the retirement system as a whole, because less than 5% of pension liabilities are available as inflation-linked bonds: OECD

34 - Less than suggested by the name of the index, ppf_7800

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inflation-linked bonds represent a mere 40% of OECD pension liabilities.³⁵

So the inflation protection that participants seek cannot be achieved with certainty. Remind that from an economic standpoint, inflation is an adjustment variable: a less competitive economy will see its purchasing power globally diminished by means of a reduced exchange rate and increased inflation. The adjustment of prices and exchange rates are part of economic forces and equilibrium.³⁶ So, the real purchasing

power of a nation cannot be protected with certainty³⁷ (and protecting the purchasing power of a fraction of the population can only be at the expense of another fraction). The same logic applies both to funded and unfunded systems.

Of course, partial inflation protection is possible via investment risk, even if the exposure of real assets to inflation cannot be considered certain.

2.3.3 The Cost of nominal guarantees

35 - There are approximately \$1 Trillion inflation-linked bonds from OECD countries. This compares with OECD pension liabilities -- using the OECD's very optimistic calculation of an approximate 67.6% funding ratio-- of \$25 trillion.

36 - One often thinks that inflation adjustments are voluntary but they are not always. In Europe where tolerance for inflation is low, it is likely that spiralling inflation will be fought by central banks, yet exchange rate theories (purchasing power parity, Balassa-Samuelson, real exchange rate) imply economic (as opposed to voluntary) adjustments-- and the ECB is limited in its possibility to fight inflation by raising interest rates because these would hurt government balances at a time where government debt is excessive.

37 - Of course, Europe still has scares of past inflation, because of the unwanted redistribution and subsequent instability. The ECB is thus likely to fight very large increases in inflation, unless governments explicitly manage the undesired second effects of inflation, impoverishments of the least protected citizens. In other words, inflation is socially acceptable in Europe if government ensure that wages are temporarily indexed; one can also envisage taxing debtors, since inflation reduces the real value of private debts and favours those who are leveraged at the expense of those who have neither debt nor real assets. That being said, a 20% fall in the exchange rate and a 20% rise in prices lowers the real debt by 20%.

38 - See Sender (2011b) for an extension with risky sponsor guarantees and the need to hedge sponsor risk.

Box 1: Management of guarantees in a dynamic ALM model

The management of prudential minimum funding constraints usually require dynamic strategies to be implemented, as illustrated in previous studies (see for instance Amenc , Martellini and Sender 2009; Martellini and Milhau 2009).³⁸

Supposing indexation only happens at time T_0 , the duration of the guaranteed (nominal) liability from t to T_0 , (i.e., up to the point of indexation) is the maturity of the bullet liability; the duration of the actual liability, in a hybrid CDC fund, without sponsor risk nor guarantees, is simply that of the assets since all assets are ultimately distributed to the pensioners, thus that of the exchange option.

We suppose that the P_T is defined as a lump sum with a fixed term (e.g., 20 years), without underwriting risks. Without management of sponsor risk, the hybrid pension fund seeks to maximise the utility of the real funding ratio with nominal constraint, with horizon T_0 . The participants have CRRA over the real terminal funding ratio, (i.e., over the current P premiums increased with inflation – whose terminal values read P_T , and whose market values at t read P_t).

If assets (and liabilities) follow a diffusion process with dynamics $dA_t = A_t[\mu_t dt + \sigma_t dW_t]$ where σ_t denotes the volatility, μ_t the drift and $\theta_t = \sigma_t^{-1}(\mu_t - r_t \mathbf{1})$ is the risk premium process,

then $M_t = \exp\left[-\int_0^t \theta'_s dW_s - \frac{1}{2} \int_0^t (r_s + \theta'_s \theta_s) ds\right]$ is the stochastic discount factor.

An investor with CRRA utility and risk aversion γ over its terminal funding ratio (that we call the unconstrained investor) solves the program

$$\text{Max}_{w_t, t \leq T} E_t \left[\frac{\left(\frac{A_t}{P_t}\right)^{1-\gamma}}{1-\gamma} \right] \text{ s.t. } E_t^Q[A_T] = A_t$$

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Its optimal terminal wealth is $A_T^{u,*} = m \cdot P_T^{1-1/\gamma} \cdot M_T^{-1/\gamma}$ where m solves the budget constraint.

As usual, the optimal investment strategy (assuming constant parameters) is an option of an unconstrained strategy F^u with participation rate ξ and floor value the nominal liability; F^u is the present value of a payoff that is solely driven by the stochastic discount factor and the reference real liability value P .

When parameters are constant, the optimal unconstrained strategy is a fixed-mix that attributes constant weights to the liability-hedging portfolio that typically replicates the exposures to inflation interest rates and to the performance-seeking portfolio that has the greatest Sharpe ratio.

The constrained CRRA investor, by contrast, requires that at date T_0 the nominal funding ratio be greater than $k=100\%$ (or $k=105\%$) in the FTK, so the maximisation programme reads:

$$\text{Max}_{w_t, t \leq T_0} E_t \left[\frac{\left(\frac{A_{T_0}}{P_{T_0}} \right)^{1-\gamma}}{1-\gamma} \right] \text{ s.t. } A_{T_0} \geq kL_{T_0} \text{ and } E^{Q_L} \left(\frac{A_{T_0}}{L_{T_0}} \right) = \left(\frac{A_t}{L_t} \right)$$

The terminal constraint can be written explicitly and incorporated into the optimal terminal value:

$$A_{T_0}^{k,*} = \begin{cases} k \cdot L & \text{if } mA_{T_0}^{u,*} < k \cdot L \\ mA_{T_0}^{u,*} & \text{if } k \cdot L \leq mA_{T_0}^{u,*} \end{cases}$$

And the greater the risk-aversion, the closer $A_{T_0}^{u,*}$ will be to the liability-hedging portfolio; the greater the initial funding ratio, the greater the allocation to the long-term unconstrained strategy is, and the smaller the (nominal) funding ratio, the closer A is to L is the nominal bond that replicates the prudential nominal guarantee (liability).

m is chosen so as to equate the budget constraint (which can be written under Q_L to avoid the need to write discounted values), and with constant parameters since the assets and liabilities are log-normal, it can be found by simply equating a budget constraint:

$$A_t^{k,*} / L_t = k + E^{Q_L} \left[mA_{T_0}^{u,*} / L_t - k \right]^+$$

Calling F the nominal (or prudential) funding ratio, m solves for:

$$\begin{aligned} E^{Q_L} \left[(mF_{T_0}^{u,*} - k)^+ \right] &= E^{Q_L} \left[mF_{T_0}^{u,*} \cdot 1_{\xi F_{T_0}^{u,*} > k} \right] - k_1 \cdot E^{Q_L} \left[1_{mF_{T_0}^{u,*} > k} \right] \\ &= mF_t^{u,*} N(d+) + k \cdot N(d-) \end{aligned}$$

$$d \pm = \frac{\ln\left(\frac{\xi F^u}{k}\right) \pm \frac{1}{2} \int_t^{T_0} (\sigma_F^u)^2}{\sqrt{\int_t^{T_0} (\sigma_F^u)^2}}$$

2. Problems in Pension Plans

Where the vector volatility $\sigma_F^u = \sigma_{A^u} - \sigma_L$ is computed as above and where ξ must satisfy the budget constraint.

The scalar volatility reads $\|\sigma_F^u\| = \sqrt{\|\sigma_{A^u}\|^2 + \|\sigma_L\|^2 - 2\rho_{AL} \cdot \|\sigma_{A^u}\| \cdot \|\sigma_L\|}$, and by abuse of notation, we write σ_F^u instead of $\|\sigma_F^u\|$.

1. Short-sightedness and lock-up in low rates

Pension funds have a regulatory horizon of one year, whereas their natural horizon and the duration of their liability is much longer. With a one-year horizon, in the way strategies/regulations are usually implemented, there is a significant probability of being locked in very low interest rates.

Because only the terminal distribution of the stochastic discount factor (as well as that of the liability value) matters to the long-term investors, an excessive focus on the short run can have negative consequences and, in particular, it could lead to the risk that the strategy is too frequently locked up in minimum funding (or in underfunding if there is some flexibility for such things).

Common to corporate finance is that the strong misalignment of interests between plan members and plan management provokes horizon effects in risk-management. One way of tackling the problem is by the definition of long-term incentives (and linking the pay to the long-term impact of the strategy, and not only to its short-term impacts, a subject extensively reviewed in the corporate finance literature). However, in pension funds there may not be so many performance incentives, and the primary problem is possibly that of regulatory

incentives: if the main contract is with the regulator, then regulators should work on improving the incentives they provide.

Of course, pension funds need not resort to such sub-optimal programs. However there is ample evidence that some pension funds have been trapped.

2. Costs of inadequate nominal guarantees

Of course, un-needed nominal guarantees can be seen as costly, especially if they are set at high level that limits the capacity to take on investment risks. And it is greatly amplified by the risk from short-termist behaviour as noted above.

In reality, most pension funds rely on a slightly different model as they follow an economic capital approach by which they aim to limit the probability of shortfalls. Though the FTK requires that the yearly probability of shortfalls is limited to 2.5% the probability of shortfalls is greater, arguably because diversification assumptions embedded in the FTK are static and overestimate the diversification benefits that can be achieved during downturns when markets crash.

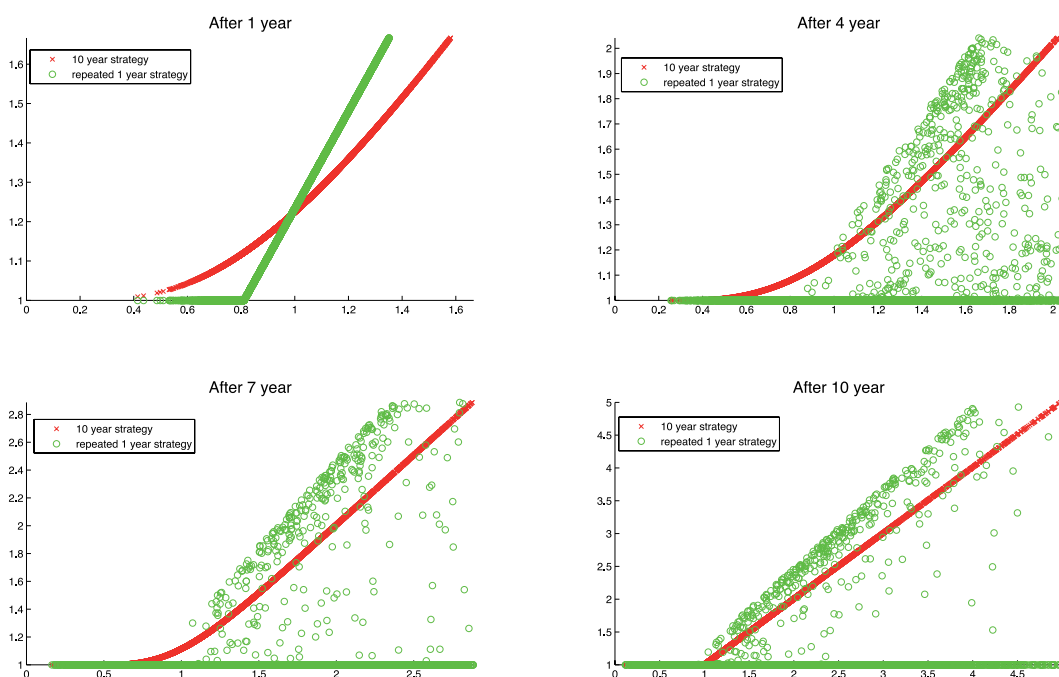
Supposing a yearly probability in the 5%-10% range, and that a pension fund fully follows the FTK's implicit prescriptions and fully switches to nominal bonds in that situation, then there is 40% to 65%

2. Problems in Pension Plans

Figure 10: Distribution of funding ratios as a function of the horizon, constant opportunity set

Assuming a constant opportunity set, having a one-year horizon leads to a greater leverage over the short-run: the green curve is an option on the one-year distribution of the unconstrained optimal strategy (the x-axis). The red curve is the present value of a 10-year option of the distribution of the unconstrained funding ratio. However, when the program is repeated, there is a significant risk that it starts with a low funding ratio, and remains locked-up in a nominal strategy. The green curve becomes a more random function of the unconstrained funding ratio, and cannot catch the subsequent rebounds in such a ratio. The one-year repeated strategy is profoundly sub-optimal.

We use the following (constant) parameters: volatility of the unconstrained funding ratio $\sigma_F=0.1$; drift $\mu_F=0.02$ (which corresponds to an optimally designed stock index with volatility $\sigma=0.2$; excess drift $\mu-r=0.04$ and for a CRRA utility with $\gamma=2$); initial funding ratio $F_0=1.2$; minimum funding ratio $K=1$; 10 thousand simulations.



Source: EDHEC-Risk calculations.

39 - $1 - (1 - 5\%)^{10} = 40\%$;
 $1 - (1 - 10\%)^{10} = 65\%$.
 40 - We suppose that investment in a bullet bond to match a single cash-flow maturing after 10 or 15 years was available and that the yield of this bond was that of the US long-term bond yields as provided by Shiller

probability that in the following 10 years the typical pension fund is locked in nominal interest rates.³⁹

The cumulative inflation risk depends on the yearly volatility of inflation as well as on the autocorrelation of inflation. Stock and Watson (2007) show that the persistency of US inflation has varied considerably through time, but that it has been very high in the period of high inflation, namely from 1970 to 1983. Supposing an autocorrelation of 50% and a yearly volatility of inflation of 1%, for a liability that has a 16-year remaining horizon, the maximum real loss that

results from switching to nominal bonds is of 16% at a 5% confidence interval, and of 23% at a 1% confidence interval. Supposing inflation is a random walk (Atkeson-Ohanian, 2001), the maximum real loss is of 40% (5% confidence interval) or 60% (1% confidence interval). From a historical perspective, a pension fund that would have de-risked after the mini-crash of 1962 and invested solely on a risk-free bond over 15 years would have only protected 50% of the real value of the liability;⁴⁰ this outcome is far worse than an investment on either the cash-account or on the S&P 500, even if these investments are supposedly

2. Problems in Pension Plans

risky from an ALM in the early 1970s, and investments in long-term bonds would have underperformed inflation by 65% over the following 15 years.

Today's environment could be compared with the post-war period – with a commitment from central banks to keep rates low. We are in a situation that could involve similar dynamics and the risk (over the coming years) of an increase in inflation is similar to that seen in the 1970s – as well as a subsequent fall in the price of long-term bonds. Likewise, pension funds have been severely hit by the crisis, the Dutch industry as a whole is underfunded, and long-term bonds are at very low levels following an expansionist monetary policy. While inflationary tensions may emerge over the coming years, reducing the nominal promise today will of course give pension funds room to manoeuvre and allow them to continue investing in risky assets. But if pension funds blindly adhere to the FTK1 framework, the probability of reaching the nominal minimum funding ratio is independent of the level of the guarantee (it is calibrated at 2.5% yearly but again it is arguably higher). Last, government bonds may not be riskless.

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3. Improving Pension Plans



3. Improving Pension Plans

There are many aspects to what an ideal retirement system is. It is usually assumed that it relies on a mix of PAYG social security, occupational pension plans and supplementary private savings. So, the conception of pension plans needs to be rooted with social security. The decision-making of individuals also varies significantly between countries. The US has a deeper culture of individual choice so, arguably, DC plans better fit this culture. The hands-off approach of many continental European countries means that DB, or preferably hybrid, schemes must be implemented. This may mean that DC funds may be a better fit for the US and UK culture, while collective solutions are more suited to continental Europe.

However, ageing results in a shift from Pillar I to Pillar II, so more emphasis is given on funded pensions in the organisation of retirement income. The ideal occupational (Pillar II) pension plan must thus encompass all the needs for retirement savings, and an efficient delivery organisation is needed.

Despite the differences in cultures and social laws, the retirement needs are the same from one country to another. What matters solely is how replacement income is targeted (usually measured as a fraction of average lifetime income), how it is financed (what is the contribution policy and the investment policy), and to what extent risk is shared between individuals (idiosyncratic risk), with the rest of the world (risk transfer or insurance) and between generations.

We argue that the generic framework that allows such goals is that of hybrid funds, provided it is sufficiently flexible.

We also argue that demographics make such flexibility necessary.

Countries of hybrid pension funds will likely relax the regulatory constraints that seriously limit the ability to take risk, and thus make a step towards the DC model. In these countries, pension plans must become more hybrid, more efficient and more adapted to the changing economic realities; in the UK and the US, where DC funds now are predominant, they must evolve towards professionally-managed structured with the same ability to invest that DB funds have.

We propose how to improve DC, traditional DB plans, and hybrid plans.

3.1 Improving the Individual DC Framework: Towards DC 2.0

DC funds as they stand today are inefficient vehicles and usually offer grossly insufficient diversification. Yet they cannot be expected to disappear in the UK and the US, so one must also think on how to improve on existing DC funds. Regulation is important in giving adequate incentives, in particular towards diversification, even though diversification can also be greatly improved in existing investment strategies. Regulation also dictates the organisation of funds, and the requirement of professional risk and investment management in pension plans is particularly important for DC plans. It could be imposed on small corporate providers that they engage fiduciary managers (specialised asset managers) to ensure diminished costs and professional management.

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DC plans can in theory adapt to circumstances and propose more tailored solutions, yet there should be solid default options. As absolute inflation protection may be costly, it is important that participants define their preferences with regard to indexation: if the benefits and costs of inflation-linked solutions are explained then workers could decide on the degree of protection they desire, either through formal inflation protection (inflation-linked bonds) or expected indexation via investments in appropriate real assets (or rolling investments in bonds).

Likewise, collective protection against longevity risk (such as collective annuitisation) or in their absence variable annuities – a popular product on the Australian landscape – are important to consider.

Lastly, a risk allocation framework should be available, and the modern life-cycle approaches can be applied on top of basic choices / preferences. Again, the NEST provides an interesting benchmark for any provider of DC pension plans on these aspects.⁴¹

3.1.1 Improving regulations of individual DC funds

Pension funds (together with sovereign wealth funds) benefit from investment regulations that are much less binding than those of any other (and in particular retail) investors. After all, they are mainly bound by the prudent-man rule, and not subject to quantitative restrictions, unlike insurance companies and retail funds.

This allows them to invest freely in any assets and potentially illiquid ones.

Potentially illiquid strategies include hedge funds, private equity, infrastructure, and, as the exposure of institutional investors to liquidity risk should be driven primarily by the maturity of their liabilities and by the risk of liquidity runs, one would expect pension funds, the longest-term institutional investors, to have the largest holdings in illiquid alternatives (Amenc and Sender, 2010).⁴²

On the whole, we believe that the ideal retirement vehicle, even if it is of a fund type (possibly in DC plans) should have the same investment freedom as pension funds. For economic substance to predominate over form, there must be similar organisational requirements in DC funds as in DB funds. In particular, plan trustees must act for the sole benefit of plan members and, at the end of the day, be responsible for choice of the fund manager.

Relying on retail fund-type regulation is inappropriate for retirement savings. Retail funds are usually highly regulated, and they must invest in liquid assets, which totally contradicts the notion of long-term investing. Unfortunately, when shifting from DB to DC, regulators and the fund management industry alike seem to have forgotten that these basic needs of DB and DC participants are similar, and they have made very dissimilar organisations and regulations: DC plans have similar regulation to that of European UCITS or American mutual funds, and are in the main invested in stocks and bonds. And this bias towards retail regulation is strongly anchored in minds of many participants. EFAMA, for instance, has released a proposal for a unique retirement fund vehicle that could be accessed throughout Europe, and

41 - By contrast, Australian funds often are not professionally managed.
42 - Real estate, of course, belongs to alternatives too. Yet as housing wealth is already a large fraction of personal wealth, it is not obvious that pension funds should hold a large fraction of real estate on aggregate for the benefit of participants – if solutions were individualised, it should do so for those who do not own a house.

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that would be nested in the retail fund UCITS framework. We very much disagree with this framework.

After all, the benefits from diversification are straightforward because accessing a wider range of asset classes allows increasing the Sharpe ratio of the performance seeking portfolio to the extent that the effective number of risk factors is increased (if all orthogonal risk factors are equally rewarded, the Sharpe ratio is a function of the square root of the number of factors, and the benefits in terms of utility are extremely substantial); additional asset classes also can allow a better replication of liabilities. The current regulatory framework for DC funds is not conceptually fit for retirement, and has probably contributed to severely sub-optimal funds as many regulated entities blindly adhere to regulatory prescriptions. DC funds must have their own regulation, potentially inspired by both that of Dutch collective DC funds and defined benefit funds.

This regulation must encompass the fiduciary duties of trustees, which are expected to be greater than those of other actors who could be defined in a global investment regulation framework such as the AIFMD: the independence of trustees/administrators should be as great as possible, and part of their mandate should involve trying to reduce un-necessary expenses. In fact, they should be hired by the plan, not by the fund or by its manager. DC regulations should also ensure that the eligible assets, investment strategies and risk constraints fit given objectives. Retirement fund products would be able to invest at least as DB funds currently do, and would not be subject to liquidity

constraints other than those related to cash-outflows from their liabilities and adequate risk management in general.

3.1.2 Improving practices

The descriptions of the main problem in existing pension schemes in Section II (and numerous studies referred to) illustrate many problems in DC plans, and at the same time serve as guidelines to improve on many existing solutions. For the sake of simplicity, we do not repeat them.

In a nutshell, default options should be well conceived, and life-cycle, annuitisation and inflation protection (both via investments in inflation-linked bonds and real assets) should be proposed at an affordable cost, which in practice often means with collective solutions.

The benefits of stochastic life-cycle, are shown to be significant with respect to either fixed-mix investments or static life-cycle – a form of strategy characterised by a deterministic decrease in asset allocation (see section 3.3.5).

So pension trustees and their asset managers must incorporate available sources of information on portfolio returns in their long-term asset allocation, and balance the equity weights accordingly.

Beyond the default option based on life-cycle, diversification and annuitisation, participants should have the possibility to invest in more specific funds; alternatively, life-cycle can be conceived as a default risk management layer, which also applies to default choices of funds (one representing the PSP and being fully diversified across asset classes, and one representing the

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LHP and being made of real bonds, rolling nominal bonds or assets highly correlated to inflation over the long run). See also section III.3.5 for a more extended description of these techniques.

3.1.3 Improving transparency

Transparency in DC funds can be greatly improved from the current standards. After all, guarantees may be offered implicitly or explicitly, but both come at a cost.

First, financial guarantees always involve a lower access to the upside than a contract without financial guarantees. This can be very easily explicated in rule-based strategies such as the CPPI or the so-called OBPI, because the access to the financial markets is very easy to quantify. The choice to be made between a given level of guarantees (the floor) and the multiplier is also easier to communicate: the lower the floor, the greater the multiplier. Of course, communication is more complex when either the underlying strategy or the risk budgeting rules are more complex, and in this case the pension fund must communicate on the indexation ambition and on how circumstances change this ambition.

In particular, in DC funds like in DB funds, low nominal interest rates increase the cost of applying a nominal guarantee on premiums; negative real interest rates, as is now the case in some countries, make it impossible to offer a full real guarantee on savings (it is only possible with partial protection), and the trade-off between partial guarantees and full indexation ambition must be made clear.

When there is a formal guarantee (provided by an insurance company, by contrast to the guarantees that are implicit to portfolio insurance strategies), an upfront premium must be provided which also reduces participation in the financial markets, and this must be made clear to the client as it is very easy to do so.

The evolution of the guarantee in time must also be made clear if it evolves (which supposes a form of ratchet guarantee similar to the conditional indexation in pension plans).

Likewise, the benefits and costs of protection on longevity risk must be made clear upfront, so much as the and the decision to purchase collective protection against longevity risk or not.

3.2 Improving the Traditional DB Plans

The main historical problem of DB plans is the risk that has weighed upon participants and sponsors; longevity risk was naturally part of the problem.

As shown by Sender (2011a), in the UK and the US, participants have been historically subject to the risk of the sponsor going bankrupt, a risk that needs to be either hedged by the pension fund or insured with an insurance company⁴³ – Sender (2011b) shows that sponsor risk is similar to a complex put option but that external insurance-like instruments are needed to hedge against risk-shifting actions from sponsors: dynamic strategies do not protect against tunnelling or cash-sweeping from the sponsor. Besides being external instruments, insurance contracts can be

43 - Only in countries such as Germany and Sweden is the protection from public insurance scheme comprehensive and effective.

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designed to reduce risk-shifting incentives. Note that the issues of sponsor risk and contractibility also arise in hybrid funds, and that pension insurance diminishes risk-shifting incentives in hybrid plans – this is not repeated in other sections of this document.

Without such a hedge of sponsor risk, it is impossible to guarantee that pension promises are secured.

With hindsight, longevity risk has been extremely important, with a magnitude sufficient to blow away the sponsor's guarantee. A rule of the thumb is that historically, unfunding in traditional DB schemes, a proxy for the value of the sponsor's guarantee, was in the 30%-40% range. However, post-retirement life expectancy longevity has increased by more than 50% (and interest rates have fallen) with corresponding increases of the value of the guarantees.

The increase in life expectancy (together with falling interest rates) has significantly increased the cost of guarantees, and many sponsors have thus been unable to withstand the associated increased costs. Can such a demographic trend be continued? From a risk management standpoint, such a risk must at least be envisaged, and an adequate fraction of this risk transferred, because in an underfunded DB plan, all the risk first falls to shareholders of the sponsoring company.

3.3 A General Framework for Hybrid Plans

3.3.1 The ideal pension delivery organisation

Governance is becoming an increasingly important factor in the provision of adequate retirement systems. The more hybrid the pension plans, the more the structure relies on the trustees and pension managers, and, as is well known in the case of DC funds, individuals are ill-equipped to face the retirement challenge. Thus the role of the state should be not only to impose adequate participation and contribution rates, but also to make sure that the institutional set-up makes the provision of adequate solutions possible.

Governance and fiduciary duties are important to avoid agency issues and costly solutions, and to ensure that adequate plan design and investment solutions are implemented. Globally, whatever the accounting classification of the pension plan, one should ensure that the funds are professionally managed. Regulations of fiduciary duties should also be globally tightened so that employers do set-up efficient plans.

Because professional risk management is needed in pension plans, investment management could be delegated to fiduciary managers, in particular for the smaller funds which can most greatly benefit from economies of scale.

Assets should also be pooled in multi-employer schemes – multi-employers greatly diminish sponsor risk because they pool it; they allow for economies of scale;

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last, as a side benefit, they make it possible for pension funds to avoid IFRS accounting constraints (as multi-employer schemes do in the Netherlands).

Governance should imply the use of sophisticated investment strategies, though these are of course specific to the target of the pension fund.

3.3.2 The benefits of collective retirement solutions: Inter and intra-generational risk sharing

Fehr and Habermann (2008) state that "it is a standard result in the literature that an intra-generational fair pay-as-you-go pension system is Pareto-efficient. If individual benefits are proportional to former contributions the replacement ratios are constant across income levels (...). If the link between contributions and benefits is reduced or even destroyed (...), distortions will increase."

A distinction should be made between optimally designed intergenerational risk sharing (IRS), which in funded systems should naturally be delivered by DB or hybrid pension funds, and existing pension plans.

Dutch multi-employer schemes could and should design intergenerational risk-sharing agreements on fair grounds: a current generation will on average inherit from part of the existing surplus in a pension fund, and, as the surplus is never entirely distributed, it will also leave part of the future surpluses. Importantly, these surpluses serve as risk buffers, so as to prevent future generations from being locked in low-return investments. In practice, because of great trends in life expectancy, the extent of optimal inter-generational risk sharing is widely debated: as risk sharing agreements are not always explicit but implicit, there is a risk that they lead to risk transfer rather than risk-sharing. In the absence of clear

Box 2: DB vs DC? No, the general set-up is hybrid

For long, the public debate in Anglo-American countries has focused on advantages of DB and DC funds. Yet what matters at the end of the day is the economic content of a proposition, and the regulatory classifications should matter little. Each type of fund could be considered as a subset of a more general category of hybrid funds that have a professional risk management, economies of scale, possibly risk-sharing between participants and with the sponsor: the sponsor's guarantee must be conceptually distinguished from the financial guarantee in the pension fund. In a structured product, there is always a trade-off between the degree of security and the participation of financial markets – the same happens in a structure involving a zero-coupon and a call option.

In fact, some pension funds organised as defined contribution provide guarantees; some even manage the IAS 19 accounting funding ratio, because it provides an adequate benchmark -- that of a more traditional DB fund.

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guidelines, many analysts (Von Bommel, 2007) fear that current generations are more inclined to consume surpluses than to participate to losses or deficits. And, as it happens, it is always by definition current generations that are in power and organise the distribution of value and risk in pension funds, and those who are not born (and their interests) tend to be inadequately represented at the board of pension funds. These problems are particularly salient for longevity risk.

3.3.3 Which minimum guaranteed income?

Technology allows the construction of fit for purpose products, and an ALM exercise can be seen as the conception of a structured product. So, it is crucial for pension plan participants to define their preferences and utility functions, as well as carry out an assessment of the guarantees they require. In our view, much depends on the sources of retirement income that the participant has access to. When the bulk of retirement income comes from pension plans, guarantees of minimum retirement standards are much welcome (Bodie, 2008). After all, as shown in figures 1 and 2, even though the US relies quite heavily on asset-based income, the fraction of the population covered by pension funds has a high proportion of wealth stored in these vehicles. As participants in pension funds (as well as those that rely on asset-based income, in particular through individual savings in Pillar III) rely greatly on DC funds, the definition of adequate guarantees is of great importance in this country – especially since there is no mandatory annuitisation in either case.

In the UK and US, income guarantees allow an effective transfer of the security of pension income to the private sector and occupational pension plans. Lastly, as also argued by Bodie (2008), many consumers incorrectly think there is almost no risk in the long-run performance of the stock market, and that making consumers aware that there is such risk, and that it can only be avoided at a cost, increases consumer and societal welfare. This argument on the transparency of the riskiness of retirement products agrees with that in Feldstein (1974) – that insufficient risk awareness leads to insufficient savings.

As has been seen, continental Europe is globally characterised by a high level of public replacement income.⁴⁴ Thus, for a large fraction⁴⁵ of the continental European population, the needed guarantees are achieved throughout public pension arrangements, and when Pillar I provides more than a minimum income (relative to poverty and habit earnings), then nominal guarantee on the supplemental income provided by pension funds may be irrelevant: if plan members have CRRA utility on the pension income they receive from their pension plan, then mandatory nominal guarantees represent a serious loss of monetary utility.

By contrast to the US and UK case, in most continental European countries (see figures 1a and 1b), public systems provide the bulk of retirement income⁴⁶ and in most cases, this income is earnings-based and inflation protected.

As revenues from Pillar II occupational pension plans are supplementary revenues, an important fraction of the population

44 - This remains true even after accounting for the necessary modification in PAYG systems evoked in section I where we argue that an increase of three years in effective retirement age to 68 years and 25% drop in replacement income, which could happen by diminished indexation.

45 - Access to social databases would be necessary to assess the actual fraction of the population who need no guarantees. It should depend on social security revenues, other savings and whether the plan member is a homeowner or not.

46 - On an aggregate basis, in northern European countries, there seems to be an adequate provision of retirement income, and in the Netherlands, Pillar I represents 75% of retirement income.

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can benefit from a significant amount of risk-taking (even if this of course mitigated by risk-sharing).

Yet at present in many countries, greater prudential constraints mean that the allowance for risk-taking is paradoxically lower in continental Europe than in countries such as the UK and the US.

On the whole, high nominal guarantees should be primarily set in UK and US DC plans and Pillar III funds – and perhaps to a certain extent in countries that rely only partly on public pension income, such as Italy, or in specific industries with poor public coverage.⁴⁷ A similar approach involves specifying a target replacement approach in DC funds.

Thus we argue that the general set-up in pension plans should allow defining guarantees, as they are fit for the target population that participates to the fund. Guarantees could also depend on time-to-maturity – they are more and more relevant when time to maturity decreases, and one could argue that they are required in the annuity phase, but that are then not necessary during the accumulation phase.

After all, the life-cycle principles could be applied to the population within pension plans, as younger generations have different needs to the elderly. The life-cycle theory implies that young generation should take investment risk, and thus have little need for guarantees. By contrast, in the annuity phase where the bulk of revenues comes from annuitisation, the volatility of revenues should be avoided and guarantees are important. In addition, over short horizons, nominal guarantees can serve

as a proxy for real ones. On the whole, even if conditional indexation is beneficial, it should ideally be made flexible with differing forms of indexation as a function of age. This explains the current debate in the Netherlands.

3.3.4 Towards a more sustainable (Hybrid-)DB framework

We have seen that the long-term targets of pension funds and regulation creates boundaries within which the interest-rate sensitivity of the assets backing pension liabilities can be managed. When the funding ratio falls, pension funds must decrease regulatory risk exposures, and often partially close the regulatory duration gap.

Some pension funds have succeeded in managing interest rate convexity and in controlling for underfunding, following FTK's prescriptions: "The €31bn pension fund for the building industry, Bpf BOUW, returned -4.3% on investments, but said its final result was improved by 9.2 percentage points following its extensive interest hedge on its liabilities." (IPE 2011c)

This system, however, has empirically failed on aggregate: the funding ratio of Dutch pension funds fell from 152% in Q2 2007 to 92% in Q1 2009. Since then, pension funds recovered, but at the time of writing, the deep fall in nominal interest rates and in equities at the same time has made very large falls in funding ratio in Q3 2011. IPE (2011c) states that "The €235bn civil service scheme ABP – the world's third-largest scheme – saw its coverage ratio fall by 22 percentage points to 90% at quarter-end, while its assets decreased by €2bn due to a return of -2.9%. (...)The €39bn metal

47 - Of course, ideally, pension retirement income should be designed according to individual needs. Then the wide individual variations of public replacement income across individuals should be considered, and their utility could be taken into account as well as their wealth (owners of property would have a portfolio that diversifies away from real estate risk, while renters would gain exposure to real estate to diversifying and hedge the risk on their rental income and future purchases of house prices). But this is still somewhat idealistic.

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scheme PMT saw closed the quarter with a coverage ratio of no more than 84.3% (...) despite a quarterly return of 5.9%, the coverage ratio of the €24.5bn metal scheme PME dropped 12 percentage points to 86%."

So, many pension funds failed to adequately manage FTK requirements. Reciprocally, the Dutch pension fund industry recovered after 2009 because they have not strictly followed incentives to de-risk embedded in the FTK.

Section II.3.3 shows that nominal guarantees can be costly. Low nominal and real interest rates add a very strong structural cost, because, by increasing the liability value they increase the cost of nominal guarantees: Remember that in portfolio insurance strategies, the exposure to the financial markets is linked to the risk-budget which initially depends on the funding ratio – the multiplier that defines the access to the financial market.

The nominal value of the premium is guaranteed, so the nominal/regulatory liability value attached to a unitary premium is $L_0 = e^{-D \cdot r}$ where r is the long-term bond nominal yield. At the time the FTK was implemented (in 2004), the long term bond yield was around or above 4%, consistent with the previous fixed discount rate of 4% which had been in place since 1969, and while it meant a conservative approach to the valuation of liabilities (as market rates were generally higher), it also ensured that any new premium for long-term investments could be invested relatively freely (each new premium had its own funding ratio of 180% over 15 years and 150% over 10 years, which meant there was significant leeway to invest, as illustrated in figure 12). So, any new premium enhanced the possibility to take on risks.

As long-term rates have significantly fallen towards 2.5%, this produces an initial funding ratio attached to any new premium of 128% over 10 years and 145% over 15

Figure 11: Dutch funding ratios
 Despite a 105% minimum funding requirement and an approximate 130% target funding requirement, the Dutch aggregate funding ratio fell again under 95% in Q3 2011. This fall is due to the combined effect of equity (and other risky markets) that depressed the asset value, and to the fall in interest rate yield which increased the liability value, usually partially hedged.



Source: Dutch National Bank (Compiled from Table 8.8, Estimated funding ratios of pension funds)

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years (or, reciprocally, the value of the initial guarantee attached to any new premium is 68% of the premium over 15 years and 78% over 10 years).

In this environment, to restore the ability to invest over the long run, an obvious possible mechanism is either to reduce the value of the pension liability (pension curtailment) or to reduce the value of the guarantees. If pension funds or their regulators seek that pension funds have approximately a constant exposure to the financial markets in normal times, when nominal and real interest rates are lower, they must offer lower guarantees.

As is happens, Dutch pension funds have tried to maintain their indexation ambitions despite a structurally lower ratio (low interest rates). But, with lower risk budget, such an ambition is not possible unless the guarantees are reduced.

The inconsistencies and problems described have sparked a large debate about FTK, and a new pension agreement was proposed (FTK2).

3.3.5 Improving the management of assets

Prior studies, under AXA-IM's sponsorship, have underlined the need for modern ALM techniques, namely with the hedging of liabilities, the access to diversified risk premia for performance, as well as dynamic strategies for the control of risks.

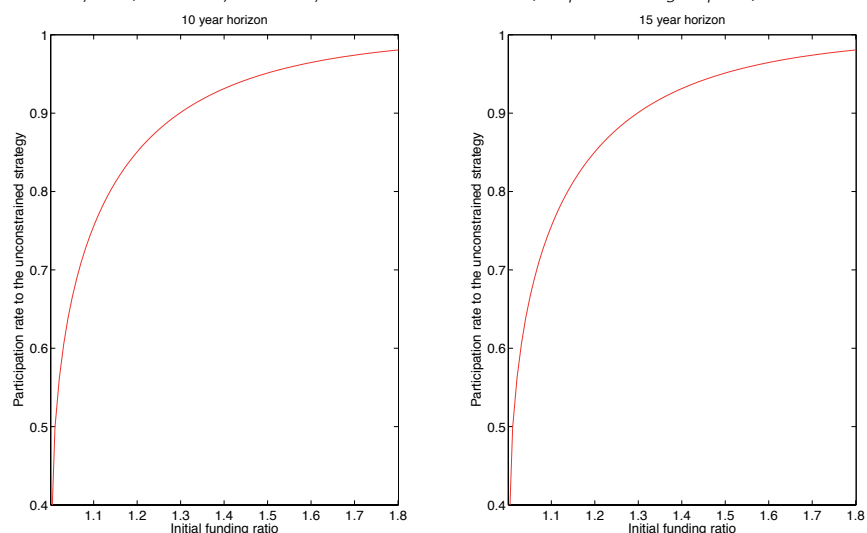
1) Improving risk-management: Interest Rate Convexity

A dynamic model for the management of assets when there are guarantees is given in Box 1 in Section II.3.

The need to rebalance from the unconstrained portfolio to the constrained portfolio involves not only risk-budgeting for the allocation to risky assets, but also a large interest rate convexity. In this

Figure 12: Multiplier as a function of the initial funding ratio

The figure shows the participation of an unconstrained strategy which initial value is the initial funding ratio. A reduction of 25% of the initial funding ratio due to interest rate changes implies a significant reduction of the multiplier. Here, the unconstrained strategy has volatility 15%, and a 10-year or 20-year horizon is considered (left panel and rights panel).



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simplified setting, the value of the pension rights is the value of the assets, but its duration depends on the funding ratio: for high (nominal) funding ratios, the duration of the assets is that of the unconstrained asset allocation (that can be called the target or strategic asset allocation). This duration can be thought of as close to the duration of an inflation-linked bond,⁴⁸ much lower than the duration of a nominal bond.

For an illustration of the convexity of the optimal constrained (regulatory-driven) investment strategy, the duration and volatility of the unconstrained asset allocation is needed. The nominal duration simply is the term to maturity, 10 years here; the unconstrained duration is of 4 years. This is consistent with the calibration in Hovenaars *et al.* (2008), which states that in the absence of inflation linked bonds, the replicating portfolio is made for a large part of a rolling portfolio of very short-term bonds.

In brief, portfolio insurance is often summarised as the fact that the allocation

to risky assets is diminished towards when wealth approaches the floor. But in reality, portfolio insurance involves a rebalancing between an unconstrained asset allocation and the regulatory liability. As such, the difference in duration between the two strategies should be managed. It does not suffice to rebalance from risky assets to bonds; one also needs to buy longer maturity bonds in the dynamic allocation process. Alternatively, one may use swaptions to manage the duration convexity.

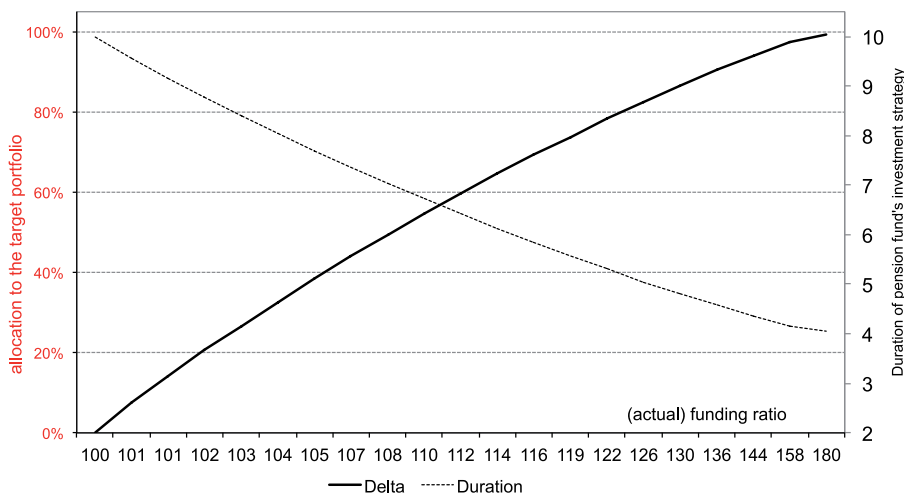
2) Improving diversification

Hybrid schemes are nowadays characterised by a great ability to diversify their assets, and usually have the objective of indexing pension rights (and payments) with inflation. Because they are large actors in the economy, an important question is how their assets should be managed.

Firstly, modern portfolio theory, with the underlying CAPM model, suggests that investors must hold the market portfolio (i.e., the world portfolio). Of course, from an implementation standpoint, research has shown that market indices have unstable

48 - This duration is a mix between the duration of the LHP and that of the PSP. The former is a proxy for an inflation-linked bond missing in the universe; the latter, comprising risky assets such as equities, is usually thought of as having a low duration. In fact, at least during downturns, the negative correlation between risky assets and bonds means that the PSP can also be thought of as having a negative duration. This contributes in lowering the assumed duration of the unconstrained allocation.

Figure 13: Allocation to the target portfolio and duration as a function of the funding ratio of a Dutch pension fund



Source: EDHEC calculations.

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exposures to implicit factors as well as to sectors. They result in trend following strategies that lead to a loss of performance when markets are noisy (trend following also subjects the investor to excessive noise, as it leads to overweighting the assets most subject to noise). Consequently, it is recommended to deviate from market weights.

Nonetheless, modern portfolio theory suggests a strong international diversification (as well as one between asset classes), even without accounting for the major economic forces linked to demographics – an important focus of the current study.

However, as surveys underline, pension funds display a great home bias (or more generally a bias towards developed countries) relative to the propositions of modern portfolio theory.

3) Long-term prospects and life-cycle

The benefits of long-term investing are best illustrated with models that incorporate mean reversion in asset returns, now very popular in asset management especially for institutional investors.

Campbell and Shiller (1988) as well as Campbell and Viceira (2005) pioneered the now very large literature on the term structure of risk that explains how mean reversion and the horizon effects impact the investment strategy,⁴⁹ and such work is also incorporated in EDHEC-Risk ALM studies (see Amenc, Martellini and Sender, 2009, and Martellini and Milhau 2010). Most of these models find that the mean-reversion (and thus the explanatory power on future stock returns) is statistically

weak, but economically significant over the long run.

The horizon effect or the so-called term structure of risk that results from mean-reversion is a feature that justifies the life-cycle paradigm, because this mean reversion implies that the total risk of cumulative returns is a decreasing function of the horizon. Thus the Sharpe ratio is an increasing function of the horizon. In addition equities offer a protection against the states of the world where there are future low returns thus they also serve as a hedge (this is also true when the utility is on real wealth, and Campbell and Viceira (2005) argue that long-term bonds, by contrast to equities, offer no protection against inflation – it is only the rolling of a portfolio of fixed maturity bonds that offer inflation protection over time. But the main benefits do not come from the increased mean allocation to stocks and risky assets, rather from its state (and time) dependence.

Campbell and Viceira (2005) find a humped-shape composition of the tangency portfolio (and optimal asset allocation) with the weight of equities increasing up to a horizon of 10 years. That their attractiveness increases with the horizon considered is presented across many models, but what matters is to capture the variation in the investment opportunity set (the current and expected compounded Sharpe ratio of assets).

One should note that investors do not care for volatility per se, but only about the variations in the Sharpe ratio as they only seek exposure to the stochastic discount factor (hence to the current and cumulative

49 - Most of the models have been developed and estimated within a vector auto-regressive (VaR) framework, but Campbell et al. (2004) show that there is an equivalent continuous-time representation of such models.

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future Sharpe ratio). The myopic component of the strategy, which seeks to replicate only the immediate volatility of the s.d.f. (i.e., the Sharpe ratio) must have an exposure that is an inverse function of the volatility ($\sigma'w = \lambda \Leftrightarrow w = (\sigma')^{-1} \lambda$).

We now consider that the Sharpe ratio follows a mean-reversion (OU) process. Mean reversion allows pension funds with a long-horizon building a greater leverage. When the initial Sharpe ratio is equal to its long-term mean, over 10 years, for reasonable parameter values, the unconstrained long-term strategy has a 5% greater exposure to the stock

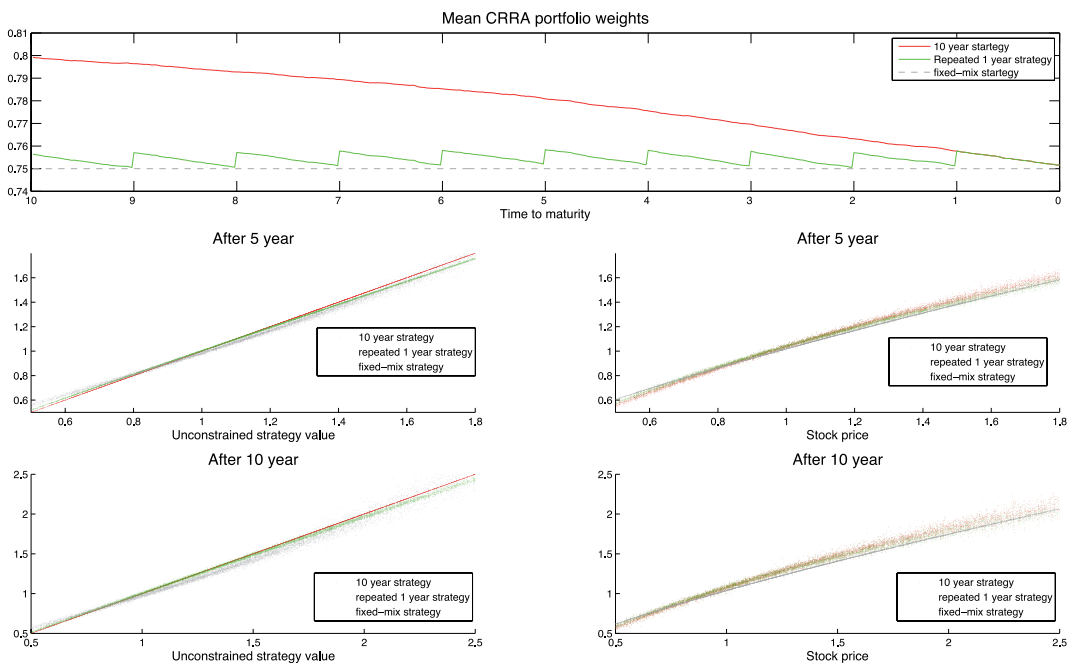
index when it is mean-reverting than the one-year strategy has. But the expected utility benefits arise mainly because of the time-varying exposure to stock markets. Effects are significant for a 10-year horizon (and beyond), and the benefits are particularly visible when the initial Sharpe ratio is low.

4) Illiquid assets

The arguments developed here have more pronounced effects for illiquid assets. The arguments about the horizon effects in long-term investing are sometimes dismissed by Barberis (2000), who argues that the uncertainty in expected returns acts

Figure 14: Distribution of allocation to and portfolio values as a function of the horizon, stochastic opportunity set
 Figure 14 illustrates the benefits of a state-dependent approach, even with a limited predictability and relatively short horizons (5 and 10 years). We use the following parameters: the risk premium (Sharpe ratio) process follows a mean reverting OU process with mean-reversion speed $\kappa=0.04$, mean $\underline{\lambda}=0.3$ and volatility $\sigma_{\lambda}=0.01$; the risk aversion is $\gamma=2$; the stock index (or PSP) has volatility $\sigma=0.2$, and the correlation between the stock index and the risk premium is $\rho=-0.9$; ten thousand simulations are made, with weekly discretisation and rebalancing. In Panel A, the long-horizon strategy achieves superior pay-offs, more markedly over 10 years. In panel B, the initial funding ratio is $F_0=1.3$ and the minimum funding ratio (floor to the CPP) is $K=1$; the long-horizon strategy is superior in the sense that it allows achieving a greater multiplier essentially with a much lower cost than at short horizons (over 5 years, the greater multiplier also means lower payoffs when the unconstrained CRRA strategy performs poorly, but over 10 years, when the CRRA strategy performs poorly, the short-sighted and long-horizon strategies have similar performance).

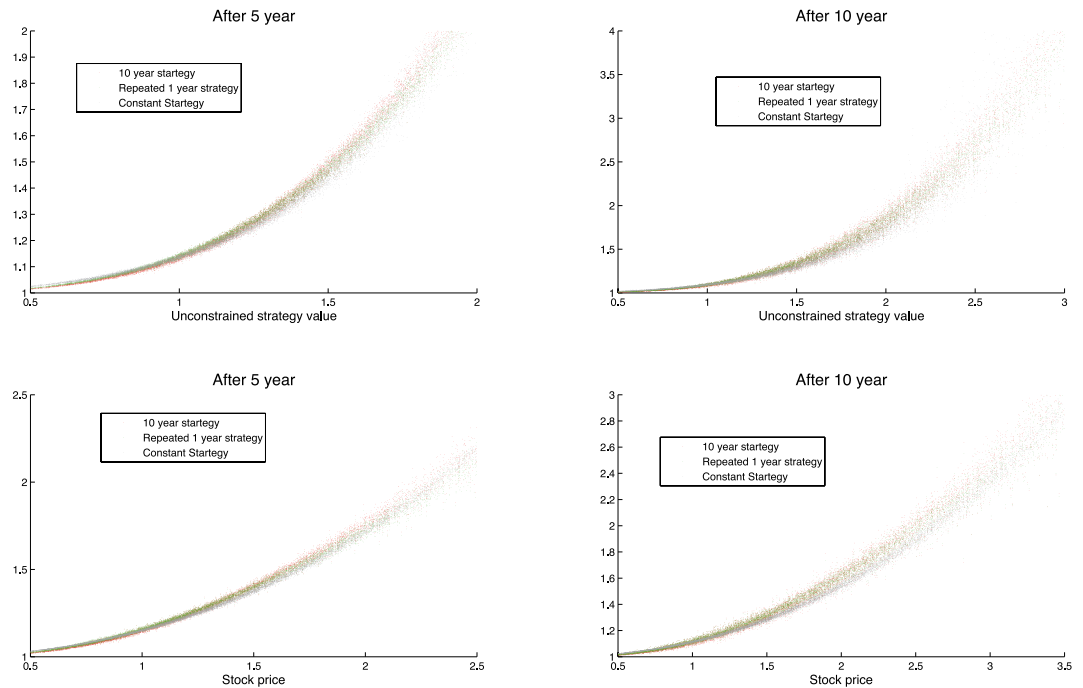
Panel A: Unconstrained strategy



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Panel B: CPPI strategy

Weights are the optimal unconstrained portfolio weights: the allocation to equities is $(\lambda/\gamma\sigma) + \text{hedging terms}$ multiplies by the risk budget $(1-A/L)$.



in a reverse way to predictability but with more pronounced effects. Such drawbacks are less important with illiquid assets.

A common representation (Amihud and Mendelson 1986a, summarised in Amihud 2006) of illiquid assets is that they have greater implicit or implicit transaction costs (explicit costs arise because of market frictions and bid-ask spreads, whereas implicit transaction costs may arise because of private information about fundamentals or the order flow) – a model that is naturally refined in the vast literature. Of course, these greater costs must be compensated by a greater risk premium, called the illiquidity risk premium, which would compensate investors for the cost of holding illiquid securities. Without risk aversion, the risk premium would be equal to the transaction cost divided by the time horizon (of course, risk aversion makes the risk premium greater).

Thus it is primarily long-term investors that can access such illiquid assets, because transaction costs cannot be compensated over the short run. Of course, compared to other investors, pension funds are best placed to invest in illiquid assets because they face less stringent regulations. Still, empirical evidence suggests that DB and hybrid pension plans have surprisingly limited investments in illiquid assets (in the survey in year II of the AXA chair, Sender 2010, respondents report exposure to illiquid assets including real estate of on average 16%).

5) Embedding demographics

Of course, demographics – an important theme for our research – can also be taken into account in the definition of the investment strategy. After all, in a closed economy, standard macro-economic models (IS/LM) show that population ageing (more precisely the increase in the

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dependency ratio) must lead inexorably to a lower profitability of capital and a relative greater remuneration of labour. This is due to the fact that it modifies the share of capital and labour in production. Research suggests that the sharp rise in US stock prices in the 1990s was due to an increase in savings for retirement purposes (and greater purchases of financial assets) which correlates to the rise in the population of savers (the baby boom generation who are now in the 40-50 age range – according to the permanent income theory, young individuals would borrow to consume, and they would save mainly around the peak of their revenues). And of course, the 2000s are characterised by an overall lower return on capital in developed countries, both from a historical perspective and compared to emerging countries which also illustrates the limitations of the reliance on domestic financial investments.

50 - European governments have recently increased their balance sheet and a supply of bonds judged to be excessive have led to increase in yield; but austerity measures should involve government bond yields returning to low levels.

Japan has often been mentioned as an interesting case study as it is the first developed country to have an inverted age pyramid, due to its birth rates having declined more rapidly than in Europe. It is likely that the increased demand for bonds that followed the growing population of seniors (in the life-cycle approach, ageing goes with deleveraging) has structurally pushed bond yields and stock prices lower at the same time (after being pushed up earlier by increased savings). In some sense, the Japanese bond and, particularly, stock markets have experienced patterns similar to those in the Europe and the US, but a decade earlier.⁵⁰

International demographics is an important theme for investments also for the identification of growth opportunities they

provide. China and India have experienced a very strong growth as the population of developed countries was maturing; as the Chinese population will also mature in the next 20 years, it is possible that production of future retirement goods will be shifted towards countries with a growing workforce (thus emerging countries *in terms of demographics*). Of course, as illustrated by the analysis of the respective sources of growth in China and India, demographics is not the sole factor, and the accumulation of capital, education, labour force are at play. Democracy, or at least economic freedom, is sometimes mentioned as an important factor. In that sense, a long-term matching policy would involve choosing the country weights not on the basis of current production, but rather on the basis of future production, thus giving more weight to the countries which will represent a greater share of production at retirement age. More globally, capital must be invested where there are profitable projects (and sources of growth).

In an open economy, still characterised by home biased investments, such models imply that ageing countries see, relative to emerging countries, the total output per head decline, and this lower total productivity (considering that the home production still serves the country as a whole and not only workers) will imply a falling exchange rate, and in turn a rise in prices, which shows that the actual pension liability cannot be considered as domestically labelled, but rather globally labelled.

In an open economy with international capital flows, direct investments (from ageing to emerging countries in terms

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of population structure) can have mixed effects over the short-run. After all, investing domestically does not increase the capacity to consume assets (unless there are cross-border flows and the nation's future output is sold to foreigners, today or at some point in the future). However, the quantification of benefits in time depends on the model considered because capital flows in the short-term can increase productivity abroad at the expense of home productivity, thus not resulting in solely positive effects. Interestingly, there is now substantial evidence that some countries make strategic acquisitions in order to secure the future needs of goods (such as land and commodities) thought of as essential to the production and consumption process.

On the whole, demographic changes add to modern portfolio theory arguments in favour of international diversification.

3.3.6 Main regulatory initiatives and business implications

The need for an adaptation of country retirement systems is partly tackled by country regulations, as summarised in Appendix B – the UK and the Netherlands are the countries where the most important reforms are happening (in the UK, the Pension Act 2011 focuses on coverage and the NEST on the provision of cost-efficient DC pension schemes with adequate default options; in the Netherlands, the FTK2 aims to tackle the issues of demographics and costly nominal guarantees in hybrid schemes). The adaptation of retirement systems is also influenced by European regulation, primarily by the IORP directive (EC 2003).

The most known impacts of the IORP directive are those that tentatively try to homogenise country regulations on the basis of Solvency II, because these trials show a profound misunderstanding of what a pension fund is by the European Commission, or, alternatively, because it is under the influence of commercial entities such as insurance companies who try to influence pension regulation to make it comparable to that of insurance companies. The counterproductive temptation of Solvency II-like regulation for pension funds (see EC 2001 and EIOPA 2011), which is illustrative of a total misunderstanding of a sponsor's contingent capital and how to secure it, may accelerate the closure of traditional DB schemes, notably in the UK.

Beyond this regulatory failure for which IORP is best known, it will also provide the condition for a more efficient European market for pensions, notably by creating the possibility of European pension plans as well as pools of European pension assets. Pooled pension plans and pension plan platforms, whether they are pan-European or at a country level, are much easier in DC plans due to the ease of valuing liabilities in such plans.

The effects of the IROP directive will be first visible in countries where the pension system is most severely inefficient, fragmented and costly, and where regulators try to enhance coverage. As one might imagine, the UK would be one of the countries where market lines will moove, and where the approximately 50% of the population who are uncovered will either go to the NEST or to competitors if they prove that they can match the scale of cost efficiency and

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risk management competence. This is of course possible, especially in the first year since the NEST will primarily outsource the management of most of the investment funds, so more integrated approaches are possible.

Countries which rely on life insurance will follow suit because, as with CDC funds, the absence of contingent capital makes the valuation and transfer of rights much more straightforward – transfer of insurance assets and liabilities already takes place in some contracts. However, insurance is not the basic model and is not deemed to be the case in the future for retirement savings (unless new forms of insurance products are designed) as in the current climate nominal guarantees are both costly and inefficient; CDC funds, though a possible evolution of multi-employer hybrid pension plans, are not yet the norm.

As the pooling of DB plans is a more complex issue, it is likely that the DB market will primarily remain a market for servicing (fiduciary managers) rather than for structuring and pooling in the short run, even though there are important initiatives to be taken in terms of insurance products to secure pension plans against the riskiness of their sponsors.

3.3.7 Summary

As the retirement system needs to (on aggregate) rely less on sponsor guarantees and turn to more hybrid plans, it is necessary to compare the various alternative options. Continental Europe as a whole offers a variety of hybrid funds, and Germany arguably is where this variety is the greatest, while the Netherlands is the most innovative and professional.

Hybrid funds allow for both limited sponsor guarantees (or even no sponsor guarantees) and risk-sharing between plan members at the same time. They also allow for professional management and large diversification. Intergenerational transfers have been documented to be utility-enhancing contracts when they are built on fair grounds, but such transfers also raise significant concerns as underlined in the current discussion about the FTK.

In practice, the regulations that bind hybrid collective plans and impose inadequate guarantees and risk management may diminish the attractiveness of these schemes. Thus, it is important to adapt regulations so that they provide adequate incentives for investments and risk management.

Commonwealth countries have instead relied on a mix of DB and DC schemes. DB schemes have proven too risky, yet DC schemes are usually inefficient in terms of cost and governance. DC funds have become the main retirement vehicle in these countries, so it is important to make them viable. With the NEST, the UK has made an interesting proposal for a default collective DC fund, which may have strong impact on the smallest plans, because the pension industry is quite fragmented.

On the whole, the virtual end of the creation of new traditional DB schemes means that a new framework for DC funds must be found so that they offer similar benefits to the collective hybrid schemes. We thus recommend the establishment of DC. 2.0, which can comprise most of the elements that made the success of the hybrid fund model: a regulation and an organisation

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that ensure adequate governance;⁵¹ a meaningful communication to employees that give visibility on the retirement income that can be expected from the investments in DC funds; a broad range of funds and risk allocation solutions that respond to the main retirement objectives and allow for diversification – often labelled the only free lunch in financial markets. In other words, from the Australian model one can take inspiration in the form of industry-wide organisations, and from the European framework (and more particularly the Dutch model) one can take inspiration from the professional management organisation and a regulatory framework that allows for deep diversification between asset classes.

with a market for the provision of adequate retirement funds to existing pension plans, but also with the provision of pension plans that target corporate sponsors (firstly targeting those which do not currently provide pension plans to their employees).

51 - In DC funds, governance may be partly externalised to the producers. Due to the usual conflicts of interests, a more robust governance framework is also needed.

From a product standpoint, an adequate DC plan offer should incorporate funds that offer inflation protection, funds that target retirement income, diversified funds that aim to maximise wealth, as well as collective annuity purchases so that adequate default options can be built. Life-cycle investing must be understood as a robust risk-management approach applied to these basic bricks or building blocks so as to offer funds that serve as robust pre-packaged default options.

Reforms in country laws and in the IORP directive will allow for a more efficient provision of pension plans and products, with the aim of having cost-efficient products that truly encompass the needs for retirement savings. Pooled pension assets and pension plans, which should in principle be easy to implement in DC funds, will arguably lead to modifications in the organisation of pension plans. The current market for services to existing pension trustees will be complemented

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Figure 15: Characteristics of the types of funds and recommendations

	Characteristics	Pros	Cons	Recommendation
Traditional DB fund	Sponsors bears all the risks until bankrupt, then large risks for employees	Professional management structure; target (real) retirement income	Strong regulatory and accounting requirements and strict rules. Difficult to transfer	Secure sponsor risk, hedge longevity risk.
Individual DC fund	No risk-sharing; liability value is the fund's market value	In theory can be adapted to very diverse individual situations and risk appetite and wealth drivers. Easy to transfer (when no external guarantees)	Poor communication: market value does not give clear indication about retirement income (annuity); Restricted ability to diversify; Often poor governance and costly	Ensure: <ul style="list-style-type: none"> - a professional management framework - the ability to diversify widely (PSP) - Stochastic life-cycle investing as a risk management solution - collective annuity purchases - a meaningful communication of guarantee and of their costs
Hybrid funds (including Dutch collective DC regulated as hybrids)	A flexible framework that allows various forms of risk-sharing	In theory, a framework far more flexible than either the DC or DB framework.	Often regulated with the requirement to give nominal guarantees; Intergenerational risk sharing is documented as often not fair in practice	<ul style="list-style-type: none"> - give more regulatory flexibility - ensure that risk-sharing is made on fair grounds (see the section on guarantees)

Conclusion



Conclusion

Early papers regarding pension funds, notably Sharpe (1976) and Drucker (1976), had already underlined significant risks in pension funds. Sharpe underlined the risk of a lack of protection of plan members for a lack of funding; Drucker underlined how ageing would be an important revolution for modern societies and in particular for pension funds. Drucker was right in his assessment of the importance of ageing which has shaken the very foundation of the organisation of retirement income. He was also right in assessing how unprepared organisations and politicians were regarding these changes. Even after decades of reflection on these issues, most systems still do not pass the stability test today.

A comprehensive and realistic valuation of the government balance sheets shows that there are sacrifices to be made in Pillar I unfunded schemes: supposing that reforms made to delay the retirement age are successful and that the effective retirement age is postponed to 68 years on average in Europe, the ratio of the average Pillar I retirement income to employment income will need to fall by 25% relative to current standards. If the lack of transparency shared by most governments will make adjustments painful due to them being unexpected by parts of the population, these adjustments will probably be progressive by way of successive reforms, as has been the case up to now.

As market values imply a more realistic assessment from pension funds, funded systems need to adapt today. Moreover, the pension crisis at the turn of the century illustrates the need for an adaptation that improves its stability and ensures greater reliance on these systems, as in the future

a greater share of retirement income will come from funded pensions.

Hybrid funds are a general set-up which makes risk-sharing and professional management possible. However, they are regulated, and regulations often impose nominal guarantees even on a population that has little need for such guarantees (for instance when they are covered by still generous Pillar I schemes in Europe, or for younger participants that can not only take risks, but also for whom nominal guarantees mean little over the long run). So, more flexibility is needed with the nominal guarantee, especially those offered over very long horizons because they are not very meaningful. The new proposed Dutch financial framework ("FTK2") will arguably offer more flexibility.

Nevertheless, practices also need to evolve, as there is empirical evidence that pension funds behave sub-optimally. Though regulatory incentives may be missing, the fact that many pension funds put themselves in a situation where they are locked up in minimum funding ratios and nominal strategies shows a sub-optimal design of their strategies. Likewise, even though pension funds have been praised for their ability to diversify, empirical evidence suggests that they do not fully use their ability to invest in illiquid assets; in addition, pension funds often have a strong home bias which not only is contrary to standard academic prescriptions that recommend diversifying assets, but that also runs the risk of insufficiently protecting the purchasing power of retirees in maturing economies.

Conclusion

When it comes to traditional DB funds, they have also been severely hit by demographic developments, and the condition for the long-term stability of such funds is to manage this risk, together with sponsor risks. For a traditional defined benefit scheme, the sole risk for plan members is the bankruptcy of a sponsor. That is, that a bankrupt sponsor will leave an underfunded pension plan (this risk comes second only to investment risk, in hybrid pension plans). In most countries, because the protection offered jointly by prudential regulations and pension insurance schemes is incomplete, it is important to hedge this risk which in practice means relying on external insurance such as pension indemnity assurance because contractibility issues and risk-shifting must be solved by (incentive) contracts and external protection. The fragmented UK market means large efficiency gains can be obtained by outsourcing the strategy and its implementation to fiduciary managers. DC funds, which now make up the bulk of pension funds in the UK and the US, are too often inspired by the model of short-term liquid retail funds, which mainly consist of stocks and bonds. We argue that regulatory changes are needed to give birth to a DC 2.0 model that should give the same flexibility that DB funds have today and, ideally, continental-like forms of hybrid funds with conditional indexation should also be made available (as opposed to the simple mix of DB and DC funds that is sometimes referred to as hybrid in the UK and the US).

Today, as we await improvements in regulatory standards, there is significant room for improvement in DC funds. Firstly, there are great diversification benefits to be made beyond the domestic equity asset class that has for too long represented the

bulk of their investments. Equities can be diversified across geographies, styles and sectors; credit bonds also are an available asset, as are listed real estate and funds, commodities, and even funds of hedge funds. Secondly, solutions can be built on a true ALM vision and notably, they can embed inflation protection as well as guarantees like there are in DB (and hybrid) funds – even if long-term nominal guarantees may be, to some extent, irrelevant. Amongst these guarantees, longevity risk is an important one, and a collective management approach has proven more efficient. After all, as underlined in Bodie (2008), guarantees are needed when DC funds provide the bulk of retirement income as is the case in the UK and the US. The stochastic life-cycle model can be thought of as a risk management solution that applies to this diversified PSP and takes the guarantees or objectives into account. The UK NEST is a very interesting benchmark for modern DC funds, as it provides adequate default options, explicitly targets a replacement income and addresses the question of enrolment and fees. Lastly, if guarantees, implicit (via financial techniques) or explicit (via insurance), are important in DC funds in the absence of sponsor guarantees, they must be clearly communicated to plan members.

Changes are coming not only in terms of adequate DC products that truly encompass the need for retirement savings, but also in terms of the very organisation of pension plans themselves. After all, the IORP directive allows pooling pension plans and creating cross-border schemes, which will primarily happen with DC schemes because of the ease of their valuation. At the same time, the need for greater reliance on Pillar II implies country efforts

Conclusion

to extend coverage, which will first happen in the UK as the Pension Act 2011 requires auto-enrolment in pension plans. So, there will be a great demand for cost-efficient providers of pension plans (and not only for the efficient management of assets of existing pension plans).

Lastly, as the issue of demographics is a major theme that has shaken the foundation of retirement systems, it should ideally be embedded in investment strategies of pension funds, in the same way that it influences the structure of pension plans. If demographics are proven to be a major force in developed economies, which have failed to adequately prepare for the challenges of ageing, it now is time for Asian countries to gather insight from the development of their older counterparts. The more recent economic development in Asia goes together with overall lower coverage capital accumulation than in Europe. The demographic transition will happen in one generation in some Asian countries. So, while the developed countries have taken 30 years to reform retirement systems that were already judged as inadequate by field researchers in the 1970s, most Asian countries cannot afford the luxury of failing to reform. A formal investigation of the impact of demographics on Asian retirement systems and solutions appears necessary, as well as an assessment of the demand for pension products and solutions.

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Appendices

A. Appendix: A Realistic Government Balance Sheet

For states as for pension funds, it is important to have a comprehensive view of the balance sheet, including future income, liabilities, and guarantees received and given. When they seek to organize an adequate replacement income for their citizen, governments must have a holistic view of the balance sheets of second pillar pension funds as well as of their own PAYG systems. Yet the conventional representation of government balance sheets is accrual-based, and excludes future commitments from the representation of the balance sheet, and the debt that has arisen because of past generations is a very biased representation of the total debt that must include the value of (the potential future payments arising from) promises and guarantees.

The IPSABS (International Public Sector Accounting Standards Board) is actively promoting a more fair-value government accounting standards (as opposed to

the accrual-based accounting), namely explicitly stating that the current crisis is the consequence of deficient accounting practices. FT (2011d) mentions that the \$77bn German accounting error, equivalent to 2.6 per cent of Germany's gross domestic product, shows that the Greek are not the only one to have deficient public accounting. It argues that while the collapse of Enron had led to stricter accounting standards, the current sovereign crisis has not led to calls to a strengthened and more transparent public accounting. Exposure Draft 46 (IPSABS 2011) clearly advocates supplementing currently available information in government accounting with a forward-looking approach – with a projection of the future economic sacrifices necessary to ensure the balance sheet precisely is balanced.

For illustration purposes, we provide the estimate of comprehensive balance sheets in spirit similar to those in IPSABS (2011), as provided by Morgan Stanley (2010), who states that debt to GDP ratios were around

Figure 16: A realistic government balance sheet
 This balance sheet borrows from Morgan Stanley (2010) and IPSABS (2011). The lower part, raw debt and assets is the traditional view. A comprehensive 'going-concern' view must incorporate future income and expenditures. The residual (blue) is the government 'realistic' net worth. A negative realistic net worth means in theory that future taxes are under-estimated or that pension promises will not be made good of.

Assets	Liabilities	
	Realistic government net worth	
	Social liabilities (future expenditures)	}
PV of future taxes	Future spending	
		Fiscal assets and liabilities
Solid assets (land, real estate)	Current raw (Maastricht) debt	}
Financial participations		
Other financial assets		
		Current values: financial assets and liabilities

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250% in France and in the UK after the second world war than they were today. As the fiscal pressure was much lower at the time, the debt to state income ratios were again greater than they are today. In addition, at the time there were no hidden state liabilities. Since then, the generous unfunded social promises (social security and retirement income) have been accumulated, and so were future state commitments. In the years to come, these unfunded promises need to be either paid out or curtailed.

The sustainability of public finances can be assessed by evaluating future expenses and receipts. The dependency ratio can be forecasted with some relevance over a twenty to twenty-five years horizon, because it is a ratio computed from the age distribution of living persons that are already born.⁵²

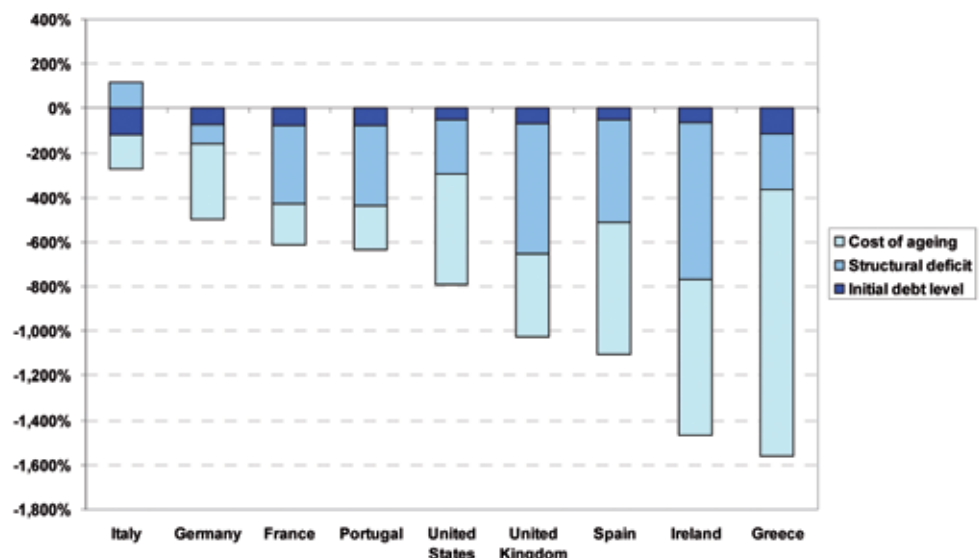
Morgan Stanley (2010) shows that shows that a realistic assessment of government net worth implies debt to GDP ratio in the

500%-1000% range for most developed countries (Italy stands at 200%, Greece at 1700%). Of these large amounts, current gross debt represents only a very small fraction.

These very large imbalances imply some correction on the level of tax receipts or expenses. Tax competition between states and a history of tax rises mean, in the eye of many, that taxes can only be raised in a limited way, and that benefits need to be curtailed—and/or retirement age is postponed. As far as the government balance sheet is concerned, this need to cut expenses has meant that the conception of the first Pillar is progressively shifting to a poverty/safety net rather than a true replacement income: so-called Bismarck countries are seeing a progressive alignment towards the Anglo-American or Beveridge conception (see also börsch1997 retirement).⁵³ Some of the first Pillar benefits are tentatively being transferred to second or third pillar funded benefits—in this way, individuals weigh less on states

52 - And it only depends on the evolution of fertility beyond 20 or 25 years.
 53 - "Public pensions and social security, usually termed the "first pillar" of retirement income, will play a less dominant role than it does now because the demographic changes will force the public pension systems to realign their replacement rates. In principle, societies may choose any compromise between reducing replacement rates or increasing contribution rates. Due to international competition, however, economic forces will not permit tax and contribution increases to accommodate current replacement levels, given the magnitude of the demographic changes to come. Indeed, many countries have already started with the process of reducing future pension claims for the current generation of workers, although some of them rather silently. (Germany, for example, will reduce its pivotal net replacement rate from 72 to 64 percent over the next fifteen years)." P3

Figure 17: Illustrative estimates of government net worth (% of GDP)



Source: EU Commission, Eurostat, CBO, IMF, Morgan Stanley Research

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finance since they are obliged or given incentives to fund their retirement income themselves.

In fact, adjustments are also taking place in the Anglo-American landscape. Martin Feldstein has long been an advocate of privatising social security in the US, not only because its current funding was not sustainable for demographic changes, but also because Feldstein (1982) shows that PAYG social security decreases savings (and in turns, makes it again more costly). It is obvious today that the lack of recognition of future adjustments by the public has led to insufficient aggregate retirement savings, especially in countries where PAYG are important, and a more flat Pillar I is to be expected.

The recent European debt crisis, if anything, has again brought large media attention on this problem, as European countries bailed out have need to adopt IMF medicine and slash social security expenses. It has also brought the attention on the fact that once countries reach a critical "current" debt level, they may curtail not only pension payments, but also the repayment of their debt to other stakeholders (for instance with soft or hard default on their debt, or for countries with autonomous monetary policy, pursue inflationary policies and have their currencies devaluated to repay their debt with less real money--remind that the possibility to adjust debt ratio via inflation is the reason why it is not possible to guarantee real pensions).

So, while default is a term that applies to debt and more appropriately to corporate debt. It has become clear that governments cannot make good on their promises, and

in that sense they will necessarily deceive many stakeholders. If they do not default on their debt, their will default on their promises to their population, raising taxes and cutting social expenses (including retirement rights).

Governments have always been reluctant in reforming PAYG systems; yet, people are more interested and knowledgeable about the retirement problem that is usually assumed. A reduction in PAYG retirement income accompanied by a preservation of minimum rights means a more flat PI retirement system.

B. The Country Retirement Systems Geographical Variations in the Provision of Benefits

Retirement and health benefits have great variations around the world. In most developed countries, there is a kind of PAYG (Pillar I) safety net for those who have no income. Beyond this Pillar I security net, there are great variations in the funding of pension promises, particularly occupational (Pillar II) ones: they are totally unfunded in France, they have been unfunded in history in Germany (in book-balance, they are funded by machinery and equipment), they are partly funded in countries like the US and the UK, and have been fully funded or overfunded in Northern European countries.

The provision of retirement income is subject to social laws, prudential laws, accounting and governance regulations. The social law dictates whether pensions are mandatory or voluntary, and the type of benefits that can be offered (type of indexation). Prudential laws dictate funding and risk

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management requirements. Accounting laws dictate how the pension obligation should be re-transcribed in the account of the provider of the guarantee (usually, the sponsor; more rarely, an insurance company) and sometimes give funding guidelines. Governance dictates the duties of plan trustees (that include the sponsor) towards plan members--duties tend to be greater in DB plans than in hybrid plans, and again than in individual DC plans.

In history, the Bismarck model has been strongly contrasted with the Beveridge model of Anglo-American countries. After all, the Bismarck model, named after Otto von Bismarck, the German Chancellor whom in 1889 made Germany the first nation in the world to adopt an old-age social insurance programme, has been progressively designed as a comprehensive system of income replacement. So, Bismarck systems are usually described as those who organize retirement income around the social insurance, and thus give a great importance to Pillar I unfunded schemes (Latin and Germanic countries are usually associate with this name – we distinguish however these two groups in our analysis). By contrast, the alternative reference system, the Beveridge system, named after William Henry Beveridge, a British economist and social reformer known for his 1942 report *Social Insurance and Allied Services* (known as the Beveridge Report) implemented in 1948 has limited the role of the state to the provision of a basic state pension for people in retirement. As we see things, there are more sources of variation that the classical but now somewhat poor distinction between common law and civil law countries.

The Netherlands

The Netherlands primarily relies on Pillar I as the first source of retirement income, with yearly benefits of €13k for a single and €17k for a couple in 2008 (OECD, 2011). It also has the most professionally organised pension fund industry and, relative to GDP, more assets under management than any other country. The large asset to GDP ratio of occupational pension plans compared to the US and the UK result from full funding requirements and a mandatory participation to pension funds. In fact, 94% of the Dutch population is covered by a (Pillar II) hybrid pension plan, and 85% of the population by an industry-wide plan. Company pension plans cover 12% of the population, including the 3% that are covered by DC plans.

Plans are generally of hybrid DBs, with nominal guarantees plus indexation conditional to the funding ratio being higher than the prudential requirement. With the Financieel Toetsingskader, or FTK, the Netherlands has chosen a regulatory framework with the same modular approach as that of SII, which is far more stringent than the requirements of the IORP directive). After all, Solvency II requires full funding plus risk buffers, whereas the IORP permits underfunding for a limited period of time. The minimum nominal liability is discounted at a risk-free rate (the zero-coupon interbank swap curve), and quarterly smoothing has been recently introduced so as to smooth market noise while retaining the quarterly economic information in the term structure, as recommended in Sender (2009b).

There is a large variety of contractual arrangements with varying degrees of hybridity (reliance on sponsors), with

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corporate DBs of the traditional type (unconditional guarantees), corporate hybrids, industry-wide hybrids, limited DBs where sponsors contractually limit their maximum recovery contributions, and collective DCs without sponsor guarantees. All these funds are regulated as DB schemes by the DNB; CDC and industry-wide are treated as DC schemes in accounting norms though.

With risk buffers that aim at insuring that a minimum funding ratio of 105% is reached within one year with a 97.5% probability, the Dutch system has relied exclusively on funding requirements and risk management to secure pension rights. If the system was successful, it would have in effect turned Dutch DB pension funds into CDC funds, because an overfunded pension fund never requires recovery contributions from the sponsor, so the value of the sponsor guarantee is null.

After the fall of funding ratio from 152% mid-2007 to 92% in Q1 2009, and recent

estimates (the funding ratio fell on aggregate to 94% in Q3 2011) it appeared clearly that the sole reliance on funding requirements to protect pension promises was insufficient: most severely underfunded pension plans were not in position to restore the 105% minimum funding ratio within three years.

So, the Government, social partners and pension funds in the Netherlands have been actively investigating more hybrid forms of funds, with lower guarantees than currently available, but higher ambitions. Lowering these guarantees not only means a greater proportion of risk taken by participants in the funds, it also means passing part of the current losses to them. Or curtailing liabilities.

In other words, the failure to effectively secure pension rights solely with risk management has led regulators and large pension funds to propose a more flexible or hybrid regulatory framework.

Box 3: FTK2

With FTK 2, the Dutch prudential framework is shedding sponsor guarantees, and making financial guarantees more flexible. In the trade-off between nominal guarantees and indexation ambitions, it is clearly favouring the second.

Only a level-I directive has been adopted. As it stands today, many details of the specific reforms are still to be negotiated and the potential costs of the agreement are yet to be analysed by the Dutch Government's Central Plan Bureau. The main elements of the new Pensions Agreement, which overall framework was agreed on September 20, excluding specific labour-force measures, are as follows (see IPE, 2011b):

- The financial assessment framework (FTK) will be improved and extended to cover a pension accrual based on real but conditional pension rights, rather than on the current unconditional but nominal funding. FTK2 may allow discounting liabilities at an expected rate of return.
- Market downturns and the ramifications on pension levels were recommended to be spread over 10 years.

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The main rationale, is that under FTK1 funds that approach the 105% funding levels scale back on risk to meet their guaranteed liabilities, which potentially lock pension funds and members into a nominal rather than an indexed pension (see Sections II.3.3 and III.3.8)

This new contract has generated a lot of debate. On the pros side, it is seen as favouring risk-taking and a more stable retirement system, and it could as well avoid useless constraints that distorts the risk-profile of pension fund investments. Many large pension funds have been reported as being favourable to FTK2. On the cons side, some commentators (Cardano, 2011) have argued that FTK2 could lead to uncontrolled subsidies from younger generations to older ones, current generations being more prone to benefit from surpluses than to losses that arise (on a market-value basis) in pension funds. Technically, it is unclear how easy the transition from the current system to FTK2 will happen. From a legal standpoint, it is unclear whether social partners at the board of the pension plan will be allowed to decide for a transition in the name of their members, or whether the decision to switch would be individual and whether contracts should be sent to each members. New laws may be needed to facilitate the transition, because individual transitions runs the risk that a generation of workers will accept or not the deal.

In terms of design of financial guarantees, it is this comprehensive Pillar I system with an already adequate replacement rate that makes the envisaged by FTK2, with most of the risks now born by employees and little or no guarantees, relevant (see section II.3.3).

Germany

Germany's Pillar I is earnings-based; for Pillar II occupational pension plans, Germany has historically relied on book-reserved pension plans with public insurance, not funding requirements, as a main protection. So the security mechanisms in Germany are the historical opposite to those in the Netherlands. German book-reserved pension⁵⁵ plans allows pension liabilities to be used by firms to fund their own growth, and some have argued that this system has contributed to the success of the German *Mittelstand* as medium-size companies have least access to financial markets, and booked-reserve pension plans allow machinery and investments to be financed out of pension liabilities. Like the UK, it is very protective of creditors such as pensioners.⁵⁶ Interestingly, both the German and the Dutch systems are perceived as successful in providing retirement income, in particular compared to the 'intermediate' UK system.

The Pensions-Sicherungs-Verein Versicherungsverein auf Gegenseitigkeit (PSVaG) fully protects plan members from sponsor bankruptcy, for book-reserved, CTA and *Pensionsfonds*: monthly vested benefits are guaranteed up to €7,665 as of 2011,⁵⁷ so most members are fully protected. Benefits are covered with an annuity. The PSVaG works like a mutual insurance company, with the contribution of remaining members being adjusted when more unfunded liabilities are taken

55 - Historically, German employers were neither compelled nor given tax incentives to build up external pension funds, a situation again radically different from that in other European countries. As a consequence, the typical balance sheets of German companies differed greatly from those of companies in other countries.

56 - "Prior to the introduction of the pension guarantee insurance corporation, pensions in Germany were treated as wage claims in bankruptcy, with the book reserve system consequently forcing workers to take on significant risk" (Stewart 2007b). As the PSVaG steps in, the question technically becomes the creditor rank of the insurance corporation. In 1999 German bankruptcy law was changed so that all unsecured creditors are treated the same and priority rankings were basically disbanded, and the PSVaG therefore stands in the same position as all other creditors.

57 - Insured benefits in new Länder are €6,720.

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on by the PSVaG. The insurance levy is not risk-based.

The traditional booked-reserve occupational benefits now coexists with funded pension plans (CTAs, *Pensionsfonds*) usually built up for accounting purposes; specialized insurance firms – *Pensionskassen* – are also able to provide secured benefits. *Pensionskassen* as insurance companies are required to be fully funded and they should logically be regulated under Solvency II. This means that Germany has a wide variety of retirement vehicles, from totally unfunded defined benefit pension schemes to fully funded insurance solutions.

Recent academic and industry progress on the management of sponsor risk have paved the way for an adaptation of this model in other countries (where laws are too protective of debt covenants).

Pension plans are hybrid, and the type of indexation mechanism is similar to that in insurance companies: a minimum nominal guarantee is increased each year, typically conditionally on the financial returns of pension plans (by contrast to the Netherlands where the nominal guarantee is increased conditionally on the funding ratio of the pension plan).

The German insurance-type hybridity of pension arrangements means that pension funds are on average less risky than in the Netherlands or DC funds.

The UK

The UK has a flat and low Pillar I system, with a basic state pension of £90 per week plus an earnings-related scheme with

replacement rate between 10% and 20% for most considered buckets.

After the Netherlands, the United Kingdom has the largest per capita pension industry in the European Union. Participation to the pension funds, however, is not mandatory, and approximately half of the population is not covered by pension funds (figures 1b and 2 shows that occupational pension funds have 49% coverage in the UK, low by European standards but still higher than the 33% coverage in the US).

Defined benefits are of the traditional type: benefits are defined by a formula and are independent of the assets of the plan; indexation is prescribed by the regulator, and most of the financial risk is born by the sponsor as long as it is healthy.

Funding requirements at pension funds were progressively imposed after 2000 (first as part of the MFR in 2002, then as part of the Pensions Act 2004). Target funding requirements are of approximately 80%. The current prudential system based on self-funding principles is now under review – in the current debate the Solvency II regulation for pension funds (EIOPA 2011), that considers full funding but abstract from the sponsor is discussed, but it is extremely unlikely to be accepted not only because of the reticences of employers and governments, but also more fundamentally because it ignores the nature of the sponsor covenant.

A public pension insurance scheme, the Pension Protection Fund (PPF), was created in 2005. Protection is partial and capped. Cap grows with age, to reach a maximum of £30,000 at retirement age. So, the

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United Kingdom now has an intermediate regulatory approach between the Dutch and the German one, with partial funding requirements and partial protection by a pension insurance, the pension protection fund (PPF).⁵⁸

The UK offers annuitized income in both DB and DC funds. In DB funds, the annuitized income is indexed to LPI (limited priced index), and decided by a formula when contributions are paid; in DC funds, there is mandatory conversion to an annuity at retirement age, but the mortality table is not known at inception so the annuity amount is unknown.

The UK is not immune from a global trend on Pillar II savings, hence a progressive greater reliance on DC funds given the current pension regulation, and the objective of greater coverage, cost efficiency and governance.

The Pension Act 2011 requires auto-enrolment of employees in pension plans, and introduces the UK Government's National Employment Savings Trust (NEST), a government managed DC fund that offers a default option. The NEST will bring consistency to the British retirement system, especially if Pillar I social security benefits need to be reduced. The main objective the Pension Act 2011 is to improve coverage: "The Pensions Act will take effect from 2012 and will be gradually introduced depending on an employer's size. All employers that do not offer a qualifying workplace pension scheme will have to enrol staff into the Government's National Employment Savings Trust (NEST), which is being launched to provide access to a low-cost pensions' vehicle (...) Eligible

staff are those aged between 22 and State Pensionable Age (SPA) who earn between £5,035 and £33,540 a year." (Woods, 2010). Participation will become progressively mandatory for smaller structured (by 2012 for those with more than 30k employees, 2013 for more than 350, and 2014 or 2015 for the smaller ones).

The NEST marks an evolution in the thinking of Great-Britain, as it creates a form of industry-wide DC pension plan with collective organisation. The NEST that will provide, mandatory DC funds which will improve coverage, and a large-scale organisation which should limit administrative and management expenses – it aims to having lower administrative expenses than ordinary DC pension plans. It will also invest in broader categories of assets and improve diversification, and governance is made professional. Over the first years the NEST will fully externalise investment management, then it will progressively start managing assets by itself. In addition, the NEST will also provide an adequate governance framework which has arguably been missing in DC funds.

The NEST adopts target date funds as the basis of its default option for auto-enrolled pension savings. Because they aim at fostering participation, the NEST, after studying the characteristics their target group, lower median-income earners, has adopted principles based on the following views: approximately 70 and 90 per cent) of those automatically enrolled into DC pension schemes in the US, Sweden and Chile invest in the default fund; unless prompted, many in the target group do not consider particular risks, notably inflation risk; young members are averse to volatility

58 - The UK bankruptcy code, unlike that of the United States, typically favours creditors – although debtors are no longer left to rot in prison.

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which may deter them from investing. This pleads for a tailored life-cycle approach, with a foundation phase which incorporates the risk aversion of young members and essentially aims at replicating inflation, a growth phase where the objective is to outperform inflation with greater risk, and a consolidation phase where there will be a progressive convergence to annuity-matching. In all phases, a real income will be targeted.

On top of these default retirement date funds, the NEST offers a limited number of fund choices that allows members tailoring their more specific needs (with a more risky and a less risky fund, a pre-retirement fund that tracks annuity prices, and finally ethical and Sharia funds).

Because the NEST will first invest in external funds, it can be seen as a risk-management solution applied to different underlying sources of returns.

It could be that the NEST attracts competition from the investment management industry if and when it sees employers shift away from the DC funds they manage to NEST, so much as the IORP directive makes it possible to pool plans and assets. ATP, the Danish pension provider, is launching a UK platform (IPE, 2011a). It remains to be seen whether CDC funds or hybrid funds will be considered in the UK in the near future.

As far as the design of pension guarantees is concerned, the low public replacement rate in Pillar I makes DB pension funds, with high guaranteed replacement income, a relevant solution vehicle. It is interesting to note that though most of the risk in UK traditional DB funds is for the sponsor and that there

is an explicit target of retirement income, pension funds have historically had a large share of equities -- in fact more than in the Netherlands. By contrast to DB funds, the first generation of UK DC funds, without any guarantee, may lead to excessive risk (see also section III.1.3).

The US

The US has a pension prudential system very comparable to the UK: old-fashioned DB with low funding requirements (funding ratio are even lower than in the UK, see figures 2 and 3).

DC and DB funds can be mixed is what is called also hybrid funds, though such hybrid funds are fundamentally different from continental European hybrid funds which provide a guarantee and conditional indexation: US-type hybrid funds provide DB-like guarantees on the fraction invested in DBs, and no other guarantee than the financial guarantees in DC funds on the other part.

The US tax and legal codes are singular, because US bankruptcy law favour the continuation of business, so the US is the country where pension rights are the most at risk: strategy bankruptcy is predominantly a US phenomenon. When a business is unable to service its debt or pay its creditors, the business or its creditors can file with a federal bankruptcy court for protection under either chapter 7 or chapter 11. Under chapter 11 protection, renegotiations with creditors are favoured, and, unsurprisingly, given the large interest of active members (current wage-earners) in pension plans in the continuation of business, there have been many examples where the pensioners have accepted a large

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share of losses. The transfer of the pension obligation to the PBGC implies large losses for the youngest members or those with the highest pension rights because of the limitation of the insured amount by the PBGC: the amount guaranteed is \$2,025 for a straight annuity of a member aged fifty-five, and \$1,125 for a member aged 45; health, welfare, and future disability benefits are not guaranteed by the PBGC.⁵⁹ On the whole, in the United States, pension beneficiaries are at a disadvantage in bankruptcy negotiation. Like the UK PPF, the PGBC offers only partial insurance against sponsor risk, and insurance that may be revised downwards in the future.

Last, in US DC funds, there is no mandatory contribution to annuities, which means that investors in US DC funds must be severely affected by adverse selection when they want to transform their savings into retirement income.

The US has progressively strengthened fiduciary duties and default options in DC plans, yet it is still lagging in overall reforms, both in terms of coverage and organisation of the pension industry. For the latter, while multi-employer plans are technically possible, they only represent less than 0.1% of participants in DC plans (0.2% of participants in DB plans, 0.1% of all plan members).

Australia

Australia is often considered a country of interest for the UK and US pension industries, because it is a system almost entirely based on DC funds.

Australia, has a rather flat Pillar I, as many commonwealth countries but still more

progressive than the UK or the US (see figure 1c), and Pillar II savings explicitly reduce Pillar I benefits,⁶⁰ so Australia is a strong example of a country that seeks to transfer the government security net to more private funding. Australia has a social security basic Social security income that is means-tested, but aims to rely essentially on Pillar II income which organisation is related to the superannuation scheme introduced in 1992. It requires a mandatory 9% contribution on wages (employers are not obliged to contribute for employees earning less than AUD 450 a month).

Retirement income is by default annuitized, but one may opt out for a lump sum (which is then subject to a tax rate 15% higher compared to annuitized income).

Australian DC pension plans are usually organised at the industry level, which allows significant economies of scale. However, they remain DC funds, not collective DC. In addition, governance is often perceived as poor as industrial associations presiding over DC arrangements are not investment professionals, and are usually more costly (Klumpes, 1999).

So, one may argue that a more professional management organisation is needed for Australian DC funds, with reinforced governance.

France

The social security 'general regime' targets a replacement rate of 50 % up to a certain threshold (50% of approximately €35k per year) for a full career at legal retirement age and after a career of at least 25 years for the authorised maximum retirement age; it is completed

59 - <http://www.pbgc.gov/workers-retirees/benefits-information/content/page13181.html>
60 - "The Age Pension is designed to provide a safety net for those unable to save enough through their working life (...) [it] starts to be reduced once annual income from other sources exceed a threshold (...) 44% of all pensioners have benefits reduced" (OECD, 2011, p194)

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by mandatory participation to public occupational schemes (Arrco and Agirc) with is contribution-based.

There are few funded occupational pension plans in France (the biggest pension plans are those of multi-national companies), and technically most benefits would be produced by insurance companies, i.e., without sponsor guarantees. There are less important Pillar II plans, with DC funds ("article 89"), with-profit funds (hybrid DB fund with guarantees and conditional indexation such as "article 39"), and Perco that can combine both. There are also partly funded, partly PAYG pension institutions (which have diminishing reserves due to current demographic trends). However, recent initiatives such as the establishment of a funded additional retirement account for public servants (the RAFP, managed by the ERAFP) shows an interest from the state towards pension plans.

On the whole, the reliance on Pillar II is small, and the most known retirement product is the PERP (the acronym stands for Popular Savings Retirement Plan), which is a Pillar III retirement product distributed by insurance companies, that involves a life-cycle approach (with a deterministic benchmark glide path from which insurance companies and/or clients can depart), and combines a with-profit fund for the security part (with guarantees and conditional indexation) and unit-linked funds (DC funds) for the performance part.

Pillar III is not specifically part of our study, but since Pillar II is underdeveloped and France relies mainly on insurance companies for savings plans, there are no sponsor

guarantees and in practice the distinction between Pillar II and Pillar III is more tenuous than in other countries.

That 25% of the pension income is asset-based means some funded retirement system is necessary, yet there is no true retirement savings vehicle and investors mostly rely on very vague approximations such as under-diversified retail funds and medium-term insurance savings.

Switzerland

The Swiss Pillar I is earnings-based with a progressive formula; a full pension requires 44 years of contributions (43 for women), and income under this regime is limited to 107% of national average earnings.

For Pillar II, Switzerland has mandatory pension arrangements, like in Northern European countries: all employees with an income above €16,000 per year are by law covered by occupational pension schemes, and an explicit replacement income is targeted: the law requires that the first pillar (PAYG) and second pillar combined provide benefits equal to 60% of pre-retirement income,⁶¹ and accumulated Pillar II savings⁶² are indexed to inflation. After accumulated savings are converted into annuities, the revaluation of pensions paid is made on a voluntary basis by pension funds. Naturally, pension funds may offer additional contractual benefits, and some index paid pensions to inflation.

Sponsors are required to contribute 50% to contributions recoveries to the pension plans, which means that in practice risk-sharing between sponsors and plan members is half way between DB and DC funds.

61 - <http://www.bsv.admin.ch/themen/vorsorge/00039/00335/index.html?lang=en>
62 - Before they are converted into benefits, i.e., into annuities.

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As in the UK and Germany, a pension insurance (protection fund) supplements the relatively lax requirements for technical provisions (underfunding is also permitted): pension insurance covers 100% of government-mandated minimum benefits and additional benefits are subject to salary cap.

As Gerber and Weber (2007) notes, one of the most noteworthy characteristics of the Swiss second pillar is its variety. Autonomous pension funds bear all risks (longevity, death, and disability) alone or with reinsurance, whereas partly autonomous funds transfer the disability and/or longevity risk to life insurance companies. Collective pension funds, for their part, have entered a collective contract with a life insurance company under which the latter assumes all risks.

There has been an ongoing shift from DB plans to DC plans since the post-2000 stock-market crash. Today, more than three quarters of employees are members of a DC plan. DB plans are still maintained by some large corporations and by most pension funds under public law (those that provide the mandatory part of the second pillar). The system is hybrid, with accumulated savings indexed by inflation during the accumulation phase, and on a conditional and discretionary basis afterwards. Switzerland's hybrid system Pillar II, with shared sponsor risk and relatively lax funding requirements, make it possible to achieve a similar degree of risk-sharing than in the Dutch system.

Switzerland is updating its legislation of occupational pensions. It aims to strengthen governance by clearly delineating

responsibilities and obligations of trustees, auditors and actuaries. Additionally, it has focused on supervision, by establishing an overarching independent federal supervisory commission, while also tackling funding, by strengthening the funding objectives of pension plans.

Country summary

There are important cultural differences between continental European and Commonwealth retirement systems.

The commonwealth retirement systems have an all-or-nothing quality: they either are centred on the notion of a sponsor which in principle bears the blunt of risks (but which in practice has led to very substantial risks for plan members), or in fully individual DC funds. Although the institutional structure is rigid, the provision of pension plans is still voluntary in the UK and the US, which means that only half the working population is covered in these countries. The specific of the US is that there is no mandatory annuitisation in DC funds; the specific of Australia is that it relies fully on a DC systems, organised at the industry level (not at the firm level), and mandatory.

Yet there are evolutions in Commonwealth countries, with greater coverage in Pillar II funds. The NEST will bring mandatory pension plans in the UK as it is in Australia, but with a more adequate governance framework. It remains to be seen whether CDC funds or hybrid funds will be considered in the UK in the near future.

The culture in continental Europe is that of hybrid funds, with in general nominal guarantees plus conditional indexation.

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There is, however, a wide variety of such funds, from funds that have no sponsor (insurance companies, CDC or even DC plans), funds with limited sponsor guarantees (like industry-wide Dutch pension plans or Swiss pension plans), or even fully unfunded booked-reserve plans as in Germany.

The focus in the Netherlands has been on redesigning the pension contract whenever it has been viewed as inadequate or unsustainable. The importance of sponsor guarantees is diminishing in the Netherlands, and costly nominal guarantees are questioned. The new contract proposed looks ever more closely to collective DC.

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This strategic choice is applied to all of the Institute's research programmes, whether they involve proposing new methods of strategic allocation, which integrate the alternative class; taking extreme risks into account in portfolio construction; studying the usefulness of derivatives in implementing asset-liability management approaches; or orienting the concept of dynamic "core-satellite" investment management in the framework of absolute return or target-date funds.

Academic Excellence and Industry Relevance

In an attempt to ensure that the research it carries out is truly applicable, EDHEC has implemented a dual validation system for the work of EDHEC-Risk. All research work must be part of a research programme, the relevance and goals of which have been validated from both an academic

and a business viewpoint by the Institute's advisory board. This board is made up of internationally recognised researchers, the Institute's business partners, and representatives of major international institutional investors. Management of the research programmes respects a rigorous validation process, which guarantees the scientific quality and the operational usefulness of the programmes.

Six research programmes have been conducted by the centre to date:

- Asset allocation and alternative diversification
- Style and performance analysis
- Indices and benchmarking
- Operational risks and performance
- Asset allocation and derivative instruments
- ALM and asset management

These programmes receive the support of a large number of financial companies. The results of the research programmes are disseminated through the EDHEC-Risk locations in Singapore, which was established at the invitation of the Monetary Authority of Singapore (MAS), the City of London in the United Kingdom, and Nice, France. In addition, it has a research team located in the United States.

EDHEC-Risk has developed a close partnership with a small number of sponsors within the framework of research chairs or major research projects:

- **Core-Satellite and ETF Investment**, *in partnership with Amundi ETF*
- **Regulation and Institutional Investment**, *in partnership with AXA Investment Managers*

About EDHEC-Risk Institute

- Asset-Liability Management and Institutional Investment Management, *in partnership with BNP Paribas Investment Partners*
- Risk and Regulation in the European Fund Management Industry, *in partnership with CACEIS*
- Exploring the Commodity Futures Risk Premium: Implications for Asset Allocation and Regulation, *in partnership with CME Group*
- Asset-Liability Management Techniques for Sovereign Wealth Fund Management, *in partnership with Deutsche Bank*
- The Benefits of Volatility Derivatives in Equity Portfolio Management, *in partnership with Eurex*
- Structured Products and Derivative Instruments, *sponsored by the French Banking Federation (FBF)*
- Advanced Modelling for Alternative Investments, *in partnership with Newedge Prime Brokerage*
- Advanced Investment Solutions for Liability Hedging for Inflation Risk, *in partnership with Ontario Teachers' Pension Plan*
- The Case for Inflation-Linked Corporate Bonds: Issuers' and Investors' Perspectives, *in partnership with Rothschild & Cie*
- Solvency II Benchmarks, *in partnership with Russell Investments*
- Structured Equity Investment Strategies for Long-Term Asian Investors, *in partnership with Société Générale Corporate & Investment Banking*

The philosophy of the Institute is to validate its work by publication in international academic journals, as well as to make it available to the sector through its position papers, published studies, and conferences.

Each year, EDHEC-Risk organises two conferences for professionals in order to present the results of its research, one in London (EDHEC-Risk Days – Europe) and one in Singapore (EDHEC-Risk Days – Asia), attracting more than 2,000 professional delegates.

EDHEC also provides professionals with access to its website, www.edhec-risk.com, which is entirely devoted to international asset management research. The website, which has more than 50,000 regular visitors, is aimed at professionals who wish to benefit from EDHEC's analysis and expertise in the area of applied portfolio management research. Its monthly newsletter is distributed to more than 1,000,000 readers.

EDHEC-Risk Institute: Key Figures, 2010-2011

Nbr of permanent staff	80
Nbr of research associates	19
Nbr of affiliate professors	26
Overall budget	€11,200,000
External financing	€6,215,000
Nbr of conference delegates	1,850
Nbr of participants at EDHEC-Risk Indices & Benchmarks seminars	391
Nbr of participants at EDHEC-Risk Institute Risk Management seminars	419
Nbr of participants at EDHEC-Risk Institute Executive Education seminars	356

About EDHEC-Risk Institute

The EDHEC-Risk Institute PhD in Finance

The EDHEC-Risk Institute PhD in Finance is designed for professionals who aspire to higher intellectual levels and aim to redefine the investment banking and asset management industries. It is offered in two tracks: a residential track for high-potential graduate students, who hold part-time positions at EDHEC, and an executive track for practitioners who keep their full-time jobs. Drawing its faculty from the world's best universities and enjoying the support of the research centre with the greatest impact on the financial industry, the EDHEC-Risk Institute PhD in Finance creates an extraordinary platform for professional development and industry innovation.

Research for Business

The Institute's activities have also given rise to executive education and research service offshoots. EDHEC-Risk's executive education programmes help investment professionals to upgrade their skills with advanced risk and asset management training across traditional and alternative classes. In partnership with CFA Institute, it has developed advanced seminars based on its research which are available to CFA charterholders and have been taking place since 2008 in New York, Singapore and London.

While EDHEC-Risk makes important public contributions to the advancement of applied financial research and the improvement of industry practices, the insights drawn from EDHEC-Risk's "Indices & Benchmarking", "ALM and Asset Management" and "Derivatives and Asset Management" research programmes over the past several years have led to a series of

indices and benchmarks that provide more efficient or more academic-based solutions to investors' needs than current offers available on the market.

EDHEC-Risk Institute Publications and Position Papers (2009-2012)



EDHEC-Risk Institute Publications (2009–2012)

2012

- Martellini, L., V. Milhau and A.Tarelli. Dynamic investment strategies for corporate pension funds in the presence of sponsor risk (March).
- Goltz, F. and L. Tang. The EDHEC European ETF survey 2011 (March).
- Blanc-Brude, F. Pension fund investment in social infrastructure (February).
- Ducoulombier, F., Lixia, L., and S. Stoyanov. What asset-liability management strategy for sovereign wealth funds? (February).
- Amenc, N., Cocquemas, F., and S. Sender. Shedding light on non-financial risks – a European survey (January).
- Amenc, N., F. Cocquemas, R. Deguest, P. Foulquier, Martellini, L., and S. Sender. Ground Rules for the EDHEC-Risk Solvency II Benchmarks. (January).
- Amenc, N., F. Cocquemas, R. Deguest, P. Foulquier, Martellini, L., and S. Sender. Introducing the EDHEC-Risk Solvency Benchmarks – Maximising the Benefits of Equity Investments for Insurance Companies facing Solvency II Constraints - Synthesis -. (January).
- Amenc, N., F. Cocquemas, R. Deguest, P. Foulquier, Martellini, L., and S. Sender. Introducing the EDHEC-Risk Solvency Benchmarks – Maximising the Benefits of Equity Investments for Insurance Companies facing Solvency II Constraints (January).
- Schoeffler.P. Les estimateurs de marché optimaux de la performance de l'immobilier de bureaux en France (January).

2011

- Amenc, N., F. Goltz, Martellini, L., and D. Sahoo. A long horizon perspective on the cross-sectional risk-return relationship in equity markets (December 2011).
- Amenc, N., F. Goltz, and L. Tang. EDHEC-Risk European index survey 2011 (October).
- Deguest,R., Martellini, L., and V. Milhau. Life-cycle investing in private wealth management (October).
- Amenc, N., F. Goltz, Martellini, L., and L. Tang. Improved beta? A comparison of index-weighting schemes (September).
- Le Sourd, V. Performance of socially responsible investment funds against an efficient SRI index: The impact of benchmark choice when evaluating active managers (September).
- Charbit, E., Giraud J. R., Goltz. F. and L.Tang. Capturing the market, value, or momentum premium with downside risk control: Dynamic allocation strategies with exchange-traded funds (July).
- Scherrer, B. An integrated approach to sovereign wealth risk management (June).
- Campani, C.H. and F. Goltz. A review of corporate bond indices: Construction principles, return heterogeneity, and fluctuations in risk exposures (June).

EDHEC-Risk Institute Publications (2009–2012)

- Martellini, L., and V. Milhau. Capital structure choices, pension fund allocation decisions, and the rational pricing of liability streams (June).
- Amenc, N., F. Goltz, and S. Stoyanov. A post-crisis perspective on diversification for risk management (May).
- Amenc, N., F. Goltz, Martellini, L., and L. Tang. Improved beta? A comparison of index-weighting schemes (April).
- Amenc, N., F. Goltz, Martellini, L., and D. Sahoo. Is there a risk/return tradeoff across stocks? An answer from a long-horizon perspective (April).
- Sender, S. The elephant in the room: Accounting and sponsor risks in corporate pension plans (March).
- Martellini, L., and V. Milhau. Optimal design of corporate market debt programmes in the presence of interest-rate and inflation risks (February).

2010

- Amenc, N., and S. Sender. The European fund management industry needs a better grasp of non-financial risks (December).
- Amenc, N., S. Focardi, F. Goltz, D. Schröder, and L. Tang. EDHEC-Risk European private wealth management survey (November).
- Amenc, N., F. Goltz, and L. Tang. Adoption of green investing by institutional investors: A European survey (November).
- Martellini, L., and V. Milhau. An integrated approach to asset-liability management: Capital structure choices, pension fund allocation decisions and the rational pricing of liability streams (November).
- Hitaj, A., L. Martellini, and G. Zambruno. Optimal hedge fund allocation with improved estimates for coskewness and cokurtosis parameters (October).
- Amenc, N., F. Goltz, Martellini, L., and V. Milhau. New frontiers in benchmarking and liability-driven investing (September).
- Martellini, L., and V. Milhau. From deterministic to stochastic life-cycle investing: Implications for the design of improved forms of target date funds (September).
- Martellini, L., and V. Milhau. Capital structure choices, pension fund allocation decisions and the rational pricing of liability streams (July).
- Sender, S. EDHEC survey of the asset and liability management practices of European pension funds (June).
- Goltz, F., A. Grigoriu, and L. Tang. The EDHEC European ETF survey 2010 (May).
- Martellini, L., and V. Milhau. Asset-liability management decisions for sovereign wealth funds (May).
- Amenc, N., and S. Sender. Are hedge-fund UCITS the cure-all? (March).

EDHEC-Risk Institute Publications (2009–2012)

- Amenc, N., F. Goltz, and A. Grigoriu. Risk control through dynamic core-satellite portfolios of ETFs: Applications to absolute return funds and tactical asset allocation (January).
- Amenc, N., F. Goltz, and P. Retkowsky. Efficient indexation: An alternative to cap-weighted indices (January).
- Goltz, F., and V. Le Sourd. Does finance theory make the case for capitalisation-weighted indexing? (January).

2009

- Sender, S. Reactions to an EDHEC study on the impact of regulatory constraints on the ALM of pension funds (October).
- Amenc, N., L. Martellini, V. Milhau, and V. Ziemann. Asset-liability management in private wealth management (September).
- Amenc, N., F. Goltz, A. Grigoriu, and D. Schroeder. The EDHEC European ETF survey (May).
- Sender, S. The European pension fund industry again beset by deficits (May).
- Martellini, L., and V. Milhau. Measuring the benefits of dynamic asset allocation strategies in the presence of liability constraints (March).
- Le Sourd, V. Hedge fund performance in 2008 (February).
- La gestion indicielle dans l'immobilier et l'indice EDHEC IEIF Immobilier d'Entreprise France (February).
- Real estate indexing and the EDHEC IEIF Commercial Property (France) Index (February).
- Amenc, N., L. Martellini, and S. Sender. Impact of regulations on the ALM of European pension funds (January).
- Goltz, F. A long road ahead for portfolio construction: Practitioners' views of an EDHEC survey. (January).

EDHEC-Risk Institute Position Papers (2009–2012)

2012

- Amenc, N., F. Ducoulombier, F. Goltz and L. Tang. What are the risks of European ETFs? (January).

2011

- Amenc, N., and S. Sender. Response to ESMA consultation paper to implementing measures for the AIFMD (September).
- Uppal, R. A Short note on the Tobin Tax: The costs and benefits of a tax on financial transactions (July).
- Till, H. A review of the G20 meeting on agriculture: Addressing price volatility in the food markets (July).

2010

- Amenc, N., and V. Le Sourd. The performance of socially responsible investment and sustainable development in France: An update after the financial crisis (September).
- Amenc, N., A. Chéron, S. Gregoir, and L. Martellini. Il faut préserver le Fonds de Réserve pour les Retraites (July).
- Amenc, N., P. Schoefler, and P. Lasserre. Organisation optimale de la liquidité des fonds d'investissement (March).
- Lioui, A. Spillover effects of counter-cyclical market regulation: Evidence from the 2008 ban on short sales (March).

2009

- Till, H. Has there been excessive speculation in the US oil futures markets? (November).
- Amenc, N., and S. Sender. A welcome European Commission consultation on the UCITS depositary function, a hastily considered proposal (September).
- Sender, S. IAS 19: Penalising changes ahead (September).
- Amenc, N. Quelques réflexions sur la régulation de la gestion d'actifs (June).
- Giraud, J.-R. MiFID: One year on (May).
- Lioui, A. The undesirable effects of banning short sales (April).
- Gregoriou, G., and F.-S. Lhabitant. Madoff: A riot of red flags (January).

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