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Rethinking Retirement Income Strategies – How Can We Secure Better Outcomes for Future Retirees?

Raimond Maurer
Barbara Somova

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Raimond Maurer
Professor for Investment, Portfolio Management and Pension Finance
Finance Department and Center for Financial Studies
Goethe University Frankfurt
Grüneburgplatz 1
House of Finance
Frankfurt am Main, Germany
e-mail: Maurer@finance.uni-frankfurt.de

Barbara Somova
Finance Department, Goethe University
Goethe University Frankfurt
Grüneburgplatz 1
House of Finance
Frankfurt am Main, Germany
e-mail: Somova@finance.uni-frankfurt.de

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Square de Meeus, 18/2
B-1050 Brussels

info@efama.org/www.efama.org

Contents

List of Boxes

List of Figures

List of Tables

Preface

Due to rising life expectancy, many European households may be faced with the prospect of insufficient pension savings to finance their desired level of consumption and lifestyle. In addition, their retirement income options are often constrained by a requirement to purchase an annuity to maintain an appropriate income level until the end of their life.

The report on *Rethinking Retirement Income Strategies: How Can We Secure Better Outcomes for Future Retirees*, prepared by Professor Maurer and Barbara Somova, shows that this requirement does not give individuals the level of flexibility needed to choose the best solution for managing their accumulated pension savings. By holding a proportion of pension assets in equity early on in retirement, and switching to bond holdings and annuities progressively over time, individuals can expect to achieve significantly higher retirement income, at a comparatively low risk.

The explanation for this result is simple: in an environment where individuals are living longer, the benefits of investment diversification extend well beyond normal retirement age, as diversification creates the kind of upside income potential not found in conventional annuities, while providing downside protection against the higher risks associated with a portfolio that is concentrated on equity holdings.

This is a striking result, which allowed Professor Maurer to formulate some important policy considerations. Particularly significant is the position that requiring individuals enrolled in defined-contribution schemes to purchase an annuity at retirement is questionable. The report shows that introducing more flexibility in this area would produce potentially large welfare gains, for four key reasons:

- Firstly, as explained above, individuals can expect to enjoy a substantially higher consumption level if they keep a balanced asset allocation of their pension savings, at least for an extended period after retirement.

- Secondly, permitting more flexible choice among investment solutions for the payout phase allows to take into account people's preferences, level of risk tolerance, and other sources of wealth to tap into retirement. This last factor is particularly relevant in countries guaranteeing a significant replacement rate in the form of first-pillar pensions. In this situation, individuals should be allowed to choose an asset allocation tailored to their personal situations.

- Thirdly, it is widely recognised that households wish to provide their surviving relatives with an inheritance and build a financial buffer to cope with the risk associated with critical illness. The key finding of the report – that people are better off not purchasing conventional annuities – is not dependent upon the assumption that bequest motives and contingency planning play a role in individual savings behaviour. Once these considerations are factored in, the disadvantage from enforced annuitisation becomes substantially bigger.

- Finally, a more balanced approach to payout solutions and a supportive tax and regulatory environment would also create incentives for the financial services industry to develop innovative alternatives to annuities. Although such alternatives have emerged in a number of countries, their market uptake remains modest and restrictions often make them unappealing. Greater innovation would also lead to greater competition between solution providers.

EFAMA is very proud to publish a report that includes such strong and practical policy recommendations, using a first-class methodology guaranteeing robust results and the respect from academic researchers. And we hope that this report, together with the study EFAMA published last year on defined-contribution pension schemes[1], will increase the awareness of policy makers on possible measures that could be taken to help households to reach or maintain sufficient retirement income.

The European investment management industry is fully committed to playing its role in assisting households by developing innovative and flexible payout products, capable of converting pension savings into a recurrent income stream after retirement.

Authorities also have a key role to play in creating a market dynamics stimulating the supply of new types of payout solutions as well as households' demand for these products. This requires a modernisation of pension regulation and tax incentives to achieve greater flexibility in the choice of products and facilitate market access for providers of pension saving products.

Mathias Bauer
EFAMA President

[1] The report *Defined-contribution pension schemes: Risks and advantages for occupational retirement provision*, was prepared by Oxera Consulting Ltd. It can be downloaded from EFAMA's website.

Executive Summary

Challenges for pension payout phase – The trend towards funded individual pension schemes calls for appropriate payout products

There is a trend internationally towards greater use of individual funded pension schemes and Europe is no exception. Faced with rising life expectancy of population and financial strains on pay-as-you-go pension systems, several countries have engaged in reforms of their pension systems to expand existing and/or create new private funded pension schemes. This development has coincided with an increasing number of occupational pension schemes being restructured from the defined benefit to the defined contribution type.

While attention is often focused on the savings or accumulation phase, it is crucial to recognise the importance of adequate solutions and regulation for the pay-out phase. For many people, their pension saving pot may well be their most significant financial asset, and deciding on how to convert it into retirement income is one of the most important financial decisions they will ever make.

Retirement solutions should mitigate and strike a balance between the main potential financial risks faced by individuals: inflation risk (risk that prices rise at a rate that erodes the value of the future retirement payments), investment risk (fluctuations in the value of the underlying assets of the funded pension), and longevity risk (threat of exhausting one's accumulated pension assets during retirement).

Market solutions for the payout phase – A variety of payout solutions exits

There are three broad payout products: annuities (pooled solution), phased drawdown plans (non-pooled solution) and integrated products (hybrid solution). These products offer different advantages and disadvantages for the retiree, in particular in terms of their flexibility and risk coverage.

Annuities offer protection against longevity risk and an additional return conditional on survival through pooling mechanisms, but tend to deprive the retiree of bequest opportunities, control over assets as well as the flexibility in the use of accumulated assets. Different kinds of annuities exist – by nature of payouts, number of people covered and duration of payouts. Importantly, the most commonly used type of annuities, i.e. level annuity, provides certainty of income in nominal terms, but offers no protection against inflation risk.

Phased drawdown plans provide periodic payments, typically progressively diminishing the capital by using a systematic withdrawal pattern. The various products in the market differ in term of the withdrawal pattern (fixed versus variable), and the portfolio strategy (dynamic, static) managing the different asset categories (stocks, bonds, money market) incorporated in the payout plan. These products have the advantage of providing retirees with greater control over assets and the opportunity of bequeathing any remaining assets to a beneficiary. While they expose the retiree to both longevity and investment risks, they also offer potentially higher retirement income resulting from superior investment returns and greater opportunity to hedge against inflation by using a diversified portfolio. Drawdown plans also allow for greater individual flexibility, as investment strategies and withdrawal rules can be adjusted to suit the preferences of the individual.

Integrated payout products combine certain characteristics of annuities and drawdown plans. These hybrid solutions provide both guaranteed retirement payments as well as the flexibility, bequest potential and upside investment potential of non-pooled solutions. They come in various forms. Investment-linked or variable payout annuities on the one side, typically offered by insurance companies, and asset management solutions with investment and/or income guarantees on the other, are both examples of solutions that allow participation in the capital market in combination with the longevity pooling component. They facilitate an efficient transformation of retirees' accumulated wealth into income streams, often by offering standardised solutions.

The continuous increase in the survival probabilities used by annuity providers for pricing purposes (and the discrepancy compared to the general population life expectancy) has enhanced the attractiveness of non-pooled solutions compared to the traditional life annuity. Further, thanks to the increase in life expectancy and the ensuring long investment horizon of pension assets, investments diversified across different asset classes might form a substantial part of a well structured payout program. It is possible to design drawdown plans or hybrid solutions that mitigate the major financial retirement risks (i.e. investment, longevity, and inflation risk) at relatively low costs.

Regulatory environment for payout solutions – Existing regulation and rules favour annuitisation

In the seven European countries surveyed in the report, tax advantages and regulation favour annuities in the majority of pension programs. This has led to a vast dominance of annuities over phased drawdown and integrated products, with annuities with fixed payouts being the most frequently used solutions. The situation is markedly different in the United States where most funded pension schemes allow for some forms of drawdown plans, and where the majority of retiring workers choose this option.

In Europe, regulation tends to favour annuities in order to protect retirees from old age poverty by mitigating investment and longevity risk. A second regulatory objective is to prevent retirees from spending their accumulated funds too rapidly, thereafter reverting to living off social security benefits.

Public pay-as-you-go pensions, social security benefits and employment-linked defined benefit plans already prevent, to a reasonable degree, retirees from falling under the poverty line in most European countries. Moreover, available empirical evidence does not support the notion that retirees deliberately spend too much and too quickly. Finally, it is possible to design non-pooled payout solutions like drawdown plans or integrated solutions that minimise longevity and investment risk at relatively low cost. Hence, the bias of existing regulation towards substantial annuitisation early in retirement is not justified.

Economic modelling of payout solutions – Full annuitisation is costly

According to the modelling presented in this report, the best investment strategy for payout solutions is to hold a significant proportion of pension assets in well diversified equity portfolios early in retirement, and to switch to annuities and bond holdings progressively over time, taking into account individuals' specific circumstances. This strategy results in significantly higher consumption possibilities, at a relatively low risk compared to immediate full annuitisation at retirement.

The risk of being worse off in terms of retirement income in case of adverse stock market developments is limited for individuals adjusting their pension asset portfolio over the entire retirement period. The simulations of consumption levels under different financial market conditions show that the majority of individuals (70%) can expect to enjoy up to a third of higher lifetime consumption level if they hold equity at the beginning of retirement and gradually switch to annuity over time, instead of annuitising all their wealth at the age of 65. Moreover, the consumption level of individuals ending up in the worst financial market scenarios would be less than 10% lower than under full annuitisation.

As a consequence, compulsory full annuitisation of retirement wealth at the age of 65 results in significant costs in terms of foregone consumption. Taking into account the desire of individuals to leave money to their surviving relatives and/or build a financial buffer to cope with large and sudden expenses, the disadvantage from enforced annuitisation becomes substantially aggravated.

The report also demonstrates that retirees can enjoy a smooth consumption pattern during retirement if they keep their retirement wealth invested in pension products featuring a switching mechanism to increase the proportion of annuities and bonds as time goes by. This result reflects the fact that short-term fluctuations in equity markets become less important over long investment horizons when the gradual reduction in equity exposure limits the exposure of pension assets to market volatility.

Policy recommendations – Regulatory reform can balance the goals of policymakers and the needs of retirees

The regulatory framework in Europe should find a reasonable balance between satisfying the concerns of policymakers and addressing the needs of retirees. Enforcing compulsory conversion of pension savings into annuities does not give individuals the level of flexibility needed to choose the best approach to suit their circumstances and risk tolerance. This is particularly the case given the very different range of retirement income likely to be available, ranging from a very strong support from state and/or salary-related pension schemes through to greater reliance on a defined-contributions savings pot.

Ideally, regulatory frameworks across Europe should support, on equal terms, both annuities and other payout solutions. Restrictions on non-annuity products should be relaxed and pooled, non-pooled and hybrid solutions should enjoy equal tax treatment.

A more balanced regulatory framework for the payout phase of funded pension schemes would spark innovation in the European financial market and stimulate the creation of payout products tailored to meet individuals' retirement needs. Competition between providers of payout products would also increase, thereby lowering the cost of products. The evidence from countries where drawdown plans and other non-pooled solutions are not hindered by legislative or tax rules, highlights the benefits of innovation and competition.

Less restrictive rules and regulation towards non-pooled solutions would also create incentives for the financial services industry to create a variety of standardised pooled, non-pooled and integrated payout products, designed especially for retirement. As such pre-packaged solutions are likely to include a range of choices with respect to risk attitude and preferences regarding the structure of periodic payments, improved information requirements,

advice and financial education should assist individuals in deciding how to invest their accumulated pension savings. In addition, appropriate default options should be in place to help individuals who cannot or do not want to chose between the available payout products.

If nonetheless compulsion is still favored, then the upper age limit for compulsory annuitisation should be pushed towards 85 in order to achieve a right balance between the objectives of securing a sufficient level of retirement income and protecting retirees from longevity risk at very old ages. This can be achieved by using some part of the accumulated assets to buy a deferred annuity starting payments at age 85 or requiring a switching of assets into annuities at that age.

One possible compromise between compulsion and a more liberalised market would be only to make pooled solutions mandatory if a basic standard of living is not available from other annuity-like sources, such as state pension, defined benefit schemes etc. Above that minimum level, individuals should be allowed to make a free decision for themselves, given both that individual circumstances will vary considerably and that it is difficult to set regulatory restrictions that do not end up becoming burdensome for individuals.

1. Introduction: Basic questions for designing the payout phase of funded pensions

1.1. The development of pension programs in Europe and USA

European and American workers are increasingly asked to accumulate pension assets, and then in their golden years, spend their retirement wealth in an orderly fashion. They do so in an aging population with falling fertility rates and against the resulting backdrop of underfunded national pay-as-you-go pension programs, which are traditionally a key determinant of retirement security. In order to augment and at least partially replace public pension benefits and move towards a more prefunded program, many countries have permitted workers to invest some of their payroll tax into Individual Retirement Accounts (IRAs).

In various European Countries, IRAs have already been adopted at a national level. For example, Germany in 2001 introduced the so called *Riester* plans which offer workers a tax inducement for voluntary saving in individual pension accounts during the work life. Sweden requires that a part of earning related contributions for the national public pension system (so called *Premium Pension*) are mandatorily directed into individual retirement accounts, which are invested in registered investment funds. In the USA, a bipartisan presidential Commission recently proposed to reform the underfunded defined benefit Social Security system, by allowing participants to invest a portion of their payroll tax into investment-based pension accounts.

In addition employers are increasingly freezing and eliminating the traditional defined benefit (DB) plans and shifting them towards arrangements of the defined contribution (DC) variety. In a traditional DB program, the plan sponsor promises to make lifelong retirement payments to the beneficiary linked through a pre-defined benefit formula. The plan sponsor is exposed to funding risk, since it is obliged to provide adequate assets to cover the promised payments. By contrast, in a pure DC plan, the employer contributes a certain amount to a pension plan, but makes no guarantees on the future benefit payouts. Consequently, the risk and return of future benefits level is shifted from the sponsor to the plan participant. This development is clearly evident in the USA where today contributions into employer based DC pension plans (widely known as 401k-plans) greatly exceed those into DB-plans. Also in Europe more and more countries allow employers to introduce tax sponsored DC-type pension schemes to help workers to accumulate assets for retirement. For example, France introduced recently the so called *PERCO-plans* which are comparable with the 401(k) plans in the USA. Also in Italy, since the TFR-reform, workers are allowed to pay a part of their payroll directly into pension fund.

These trends imply that millions of workers everywhere are increasingly relying on their own assets and become responsible to fund their retirement. As Baby Boomers move into their 60s, increasing attention is being devoted to the pool of assets (potentially worth billions) that retirees will be required to manage over what promises to be a very long period. This underscores retirees' need for insight into how to manage their own investments and how to convert their accumulated assets into a reasonable stream of retirement income. As Nobel Prize laureate in economics *Prof. William Sharpe* pointed out:[2]

[2] See *Sharpe/Scott/Watson* 2008, p. 209.

> "To address this responsibility, a retiree has either implicitly or explicitly adopted an *investment strategy* to govern his investment decisions and a *spending strategy* to govern his spending decision. A pair of investment and spending strategies constitutes a *retirement financial strategy*."

Looking at the supply side of the product market, we see that workers nearing retirement are increasingly asking for and targeted by competing financial intermediaries seeking to help them to manage their investment and spending decisions in their golden years. To do so they develop and offer a growing range of standardised payout strategies. On the one hand, insurers offer traditional *fixed life annuities* as the preferred mechanism to deploy accumulated assets. On the other hand, the asset management industry provides alternative solutions in particular *systematic drawdown plans* to manage the payout phase efficiently. The key difference between both options is that a life annuity is a collective (or pooled) product whereby the annuitant is in the position of a *creditor* to the insurance company. In contrast, the drawdown plan is an individual (or non-pooled) product whereby the retiree is in the position of an *owner* of assets, which are typically managed by a mutual fund company. Integrated products like a (dynamically managed) portfolio of traditional payout life annuities and drawdown plans or *investment linked payout annuities* are relatively new solutions which offer retirees the opportunity to combine the special skills of insurance companies in pooling longevity risk across a group of retirees with the special skills of professional investment managers in selecting and managing assets in the international capital markets.

The regulatory and legal environment set by policymakers is complex and it plays an important role in both the demand and the supply side of retirement products. Therefore, it is necessary to explore the interests of policymakers in this arena, which are basically twofold: First, in order to give the retiree up-front incentives to save for retirement and to avoid poverty in old age the state provides tax advantages usually in form of a deferred taxation. This allows for the exemption of contributions from income tax up to a certain limit and for earning profits on assets inside the plan on a tax-exempt basis. At retirement, payouts from the pension plans are taxed as ordinary income. Since taxation is related to payouts from retirement accounts, the government might be concerned that retirees spend their accumulated assets too slowly. For example, the USA tax laws require minimum distributions to begin at age 70 ½ for Individual Retirement Plans. On the other hand, policymakers seek to insure that tax supported retirement funds are earmarked for old age, i.e. that individuals are not permitted to consume assets during pre-retirement. In order to avoid substantial tax penalties the payout phase starts only at a certain age late in life (usually around 60).

A further role of the policymakers is one of a *paternalistic nature*, i.e. they try to protect people against the risk of making "bad" investments and spending decisions in retirement, resulting in possible income poverty during old age. Within that framework, an important task of regulators is to ensure a sufficient quality of retirement products (*regulation of product quality*), especially to protect product owners against the insolvency risk of the product providers (e.g. the insurance company, pension fund, or asset management company). To do so, regulators require the building of sufficient solvency capital in the case the payout products embody financial guarantees, potentially establish state guaranty associations to ensure that promised payments continues also in the event of the product provider's insolvency, or require the separation of assets underlying the payout products from those of the product provider so that they are protected from the general creditors in the case of insolvency.

Secondly, trying to help potential retirees to use accumulated funds reasonably the policymakers also regulate the process of product choice per se (*regulation of product choice*). In this respect, two different principles of regulation can be observed. On the one hand, the role of policymakers and regulators is mainly focused on enhancing product transparency and financial literacy among individuals, as well as providing truthful and objective information on the various options to potential purchasers (e.g. by disclosure requirements, standardized information). The aim is to enable well-informed retirees in a contestable market to create a financial retirement strategy among various payout products of high quality that is consistent with their individual preferences and assumptions over risk and return. On the other hand, most notably among European policymakers, there exists the desire to limit directly the menu of investment and spending options and require some explicit restrictions for tax-qualified retirement plans. Most importantly, many states have imposed (at least in part) a compulsory annuitisation of tax favoured retirement assets. Yet, from an economic perspective, annuitisation is only optimal given a set of restrictive assumptions.[3] Hence, compulsory annuitisation comes with increased regulatory costs and policymakers should be cognisant of the size of these costs.

For example, in the UK, accumulated pension assets must be converted into an annuity by the age of 75 in tandem with some maximum yearly payout restrictions until that age. German *Riester* plans require that at retirement, not more than thirty percent of the accumulated assets may be withdrawn as a lump-sum; the remainder must be taken as a fixed life annuity or be paid out according to a drawdown plan with non-decreasing payouts and which must revert to an annuity by the age of 85. In the USA, no compulsory annuitisation is required for 401(k)-plans; as a result, most retirees roll them over to Individual Retirement Accounts and manage the funds themselves. Which drawdown pattern to select, whether, how much, and when to annuitise, are questions that increasingly confront workers – and their financial services providers – as they look to retirement.

This report analyses alternative ways in which participants of pension systems can and should handle their retirement payouts. We look on the main financial risks to be managed, the specific features of retirement products, and also to the legal and regulatory environment in which these decisions are made. Specifically, we review payout solutions for retirees currently available in eight countries, including the United States, and seven European countries: Austria, France, Germany, Italy, Switzerland, Sweden and the UK. The non-statutory pension programs in all those countries have been reformed over the last decade and have moved from unfunded defined benefit to funded defined contribution type. In particular, we provide an economic analysis of the payout marketplace. Box 1.1 summarises the key questions challenging the retirees, the product providers and the policymakers when defined contribution orientated payout programs are in place.[4] Along these questions the agenda of this report is structured.

[3] See *Yaari* 1965, *Davidoff/Brown/Diamond* 2005, and *Horneff/Maurer/Stamos* 2008.

[4] We use here the term "DC-orientated" to show that not only the employment-linked or private defined contribution programs are meant, but any funded program, where payouts depend on the actual amount of funds available for use at the retirement date on the account of the prospective retiree.

Box 1.1: Key research questions in defined contribution (DC) orientated payout programs

Key Research Questions and Structure of the Report

- **Part 1:** What are the main financial risks (namely investment, inflation, and mortality risk) to be managed during retirement and what are the basic features of retirement products?

- **Part 2:** What are the specific pro and cons of pooled (namely life annuities) versus non-pooled (namely investment-linked drawdown plans) payout solutions, and how can they interrelate to enhance the wellbeing of retirees? How can financial intermediaries (esp. money managers and insurance companies) help retirees to translate accumulated assets into income by offering standardized payout products?

- **Part 3:** What is the regulatory framework of payout products in eight selected countries? What are the economic benefits and costs of regulation in the payout marketplace?

- **Part 4:** What are optimal financial retirement strategies – consisting of both an investment and spending tactic - with respect to given preferences (for risk, time, and bequest) and resources (savings and pre-existing annuities like income from mandatory state pensions)? What is a proper asset allocation strategy for a retirement portfolio, i.e. how much should be allocated to assets with high expected return and high short term volatility, such as stocks, how much to assets with low short volatility but lower returns, such as government bonds, and to what extend and when the retiree should purchase illiquid payout annuities.?

- **Part 5:** What can be done to bridge the gap between the economic optimum and the reality?

1.2. The outline of the report

After discussing in part 1 of this study the main financial risks retirees and/or providers of payout solutions must manage during the payout phase (namely inflation, investment, and mortality risk) and describing the basic features of retirement products in the market place (namely pooled and non-pooled solutions) the remainder of the report is composed of the following parts.

Part 2: Market solutions for the payout phase of funded pensions
Here, we explore the basic available retirement payout options, namely, pooled solutions, which are represented by fixed and variable payout annuities, and non-pooled solutions, represented by income withdrawals (drawdowns). We source our practical examples from the eight surveyed countries, including *Austria, Germany, France, Italy, Sweden, Switzerland, the United States* and *the United Kingdom.* We undertook structured interviews with several asset managers and insurers in the countries considered. The aim is to provide some insights from these financial institutions about their current products for payout products, their perspectives on market developments, and the potential benefits to participants in funded individual pension arrangements of having access these solutions.

Starting with the pooled solutions, we describe their basic features, the production and pricing process, the advantages and disadvantages in the payout phase from the retiree's viewpoint, and classify the main product groups. A special emphasis is put on investment-linked (variable) payout annuities. These are pooled payout solutions having an investment component, which could be influenced by the retiree during the payout phase, and also an insurance component since payments are conditional on the life of the retiree. The impact of such investment decisions on product payouts is explained in detail. The information on the degree of the annuity coverage observed in the surveyed countries provides a transition to the study of the non-pooled solutions. Our procedure here is similar to that for pooled solutions, whereby the classification of product groups is based on the degree of the retiree's day-to-day involvement in the investment and withdrawal process. The risks and potentials of the non-pooled solutions are illustrated by simulations, by using historical data, as well as by different investment and withdrawal strategies over the whole retirement period. We stress the potential benefits to participants in funded pension arrangements of having access to non-pooled solutions along with the traditionally used pooled solutions. Finally, we put the reader's attention to the so-called integrated products, which are based on the non-pooled solutions, but which also contain cash flows from an annuity and thus satisfy the retiree's need for longevity protection, for high investment potential and control over the funds.

Part 3: The regulatory environment for payout products in funded pension schemes
In the third part of the report, we analyse the regulations applying to the payout phase of funded pensions. We start with a description of the current regulatory environment in the selected countries. Hereby we concentrate our attention on the regulation of product choice and remove the regulation of product quality. Focussing on the fact that currently, the regulatory environment favours traditional pooled solutions, we classify the existing restrictions on the use of pension payout products. Next we explain the motives and the goals for the regulation of the payout phase. We represent statistics on the behaviour of contemporary retirees in light of the main regulatory goals and assess the existing regulatory framework from the perspective of the retiree as well as from the perspective of policymakers. Further, we underline the need to give pension payout regulation an economic justification, in order to ensure its stability and cost efficiency.

Part 4: Economic modelling of optimal payout strategies using pooled and non-pooled solutions

Here, we build and implement a dynamic portfolio choice model by assessing the optimal spending and investment behaviour of a risk-averse retiree facing an uncertain lifetime, stochastic investment returns and pre-existing pension income. In such a world the retiree must optimally choose how much to consume (*spending decision*) in tandem with an investment strategy (*investment decision*) to support that consumption. The investment universe consists of risky stocks, riskless bonds, and illiquid (fixed or investment linked) payout annuities. Building on such a model, we address the issue of the reasonable asset allocation of retirement assets, i.e. how much should the retiree invest in bonds and equities and to what extend and when the retiree should purchase payout annuities. Further, the model allows us to explore the shape of the potential consumption and income stream if the retiree follows an optimal payout strategy. Next, we study the implications for the asset allocation pattern when a certain level of lifelong retirement income is guaranteed by pre-existing annuity benefits, resulting from the first pillar pension or a defined benefit corporate pension scheme. Finally, we assess the economic implications from a mandatory annuitisation forced by regulation, on the retiree's lifetime utility.

Part 5: Bridging the gap between economic optimum and reality - policy implications and recommendations for a new European regulatory framework

In the fifth part of the report we deliver recommendations on changes to be made to the regulatory environment which would enable retirees to achieve an optimum lifelong consumption pattern on the one hand, giving the policymakers some means to influence the outcomes and to prevent the old age poverty risk on the other hand.

We suggest a more aggregated approach to the funds available for use in after the retirement date. These funds include benefits from statutory pension systems, funds from personal and occupational old age saving programs of the defined benefit or defined contribution type. The annuitisation should only be mandated if other sources of annuity or annuity-like income are below a reasonable threshold, which at least covers the bulk of recurring costs for making a living during the retirement. Allowing competition between the suppliers of different payout solutions should help retirees to efficiently achieve their main goals by using market forces. Such a regulatory framework across Europe should support, on equal terms, both annuities and other payout solutions. Restrictions on non-annuity products should be relaxed and pooled, non-pooled and hybrid solutions should enjoy equal tax treatment.

The requirements placed on the suppliers of payout products should ensure that information needed by retirees for an informed decision before as well as during retirement enables efficient comparison between the payout characteristics of the various products, their costs and risk/return-profiles. In addition such information should be delivered on a regular and standardized basis. Further, the suppliers of the payout solutions should be encouraged to structure their products in an understandable way, to offer standardised products with a limited number of active choice and default options for the main demand categories. In order to equip the population with the necessary knowledge required to make prudent decisions and to boost the demand for innovative products, strategic programs should be in place with the purpose of enabling access to financial education for the different population categories.

1.3. Key sources of risk in the payout phase: inflation-, investment- und mortality risk

If individuals in a DC oriented landscape have the free choice to decide how and when to use funds accumulated during their working life, as well as what kind of payout solutions to use, they are allowed to create retirement financial strategies consistent with their specific preferences for risk, time, flexibility and a potential bequest

In such a world, adverse events and risk have an important influence on the financial decisions of individuals before and after retirement. In the post-retirement phase, which is the focus of this study, three important risk factors need to be managed:

(1) the risk that prices might rise too quickly resulting in an erosion of the real value of pensions payments (*inflation risk*);
(2) the risk that stochastic investment returns will mean that pension assets fluctuate over time (*investment risk*);
(3) the risk of an uncertain lifetime (*mortality risk*).

Mortality risk can have two different adverse outcomes from lifetime consumption and saving perspective. On the one hand, the retiree may live longer than expected, and run out of money. In this case the retiree will have to reduce consumption later in life and may face the risk of falling into poverty before dying. The literature refers to this as *longevity risk*. On the other hand, the investor might die too early without consuming enough of his savings, therefore leaving an unintended bequest (*brevity risk*). Other risk factors may be added to that list, e.g. the risk of unexpected high *medical expenses*, the need and the cost for *long-term care services*, *macroeconomic risks* like technological change and productivity risk, or the *political risk* of an unexpected variation in the regulatory or tax environment.[5] Yet, while all of these aspects are important, this paper focuses its quantitative part mainly on inflation, investment, and longevity risk.[6] In what follows we provide some evidence on these basic risk factors, using simplifying assumptions for the description of the complex reality.

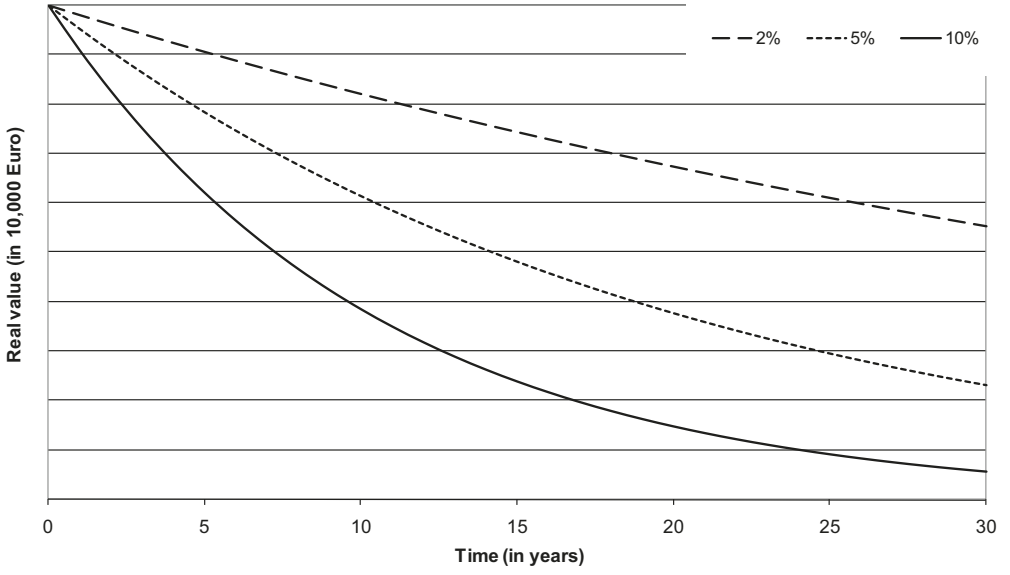
- **Inflation risk:**

Despite the relatively low inflation rates of the last decade in Europe, the question of inflation-triggered depreciation of pension income in real terms is of huge importance for old age savings and the long time horizons, associated with them. For example, a nominal fixed pension amount loses in 30 years about 45% (78%) of its real purchasing power, when the inflation rate is 2% (5%) per annum. In case that inflation rate is 10% p.a., the loss of purchasing power in 30 years amounts to approximately 95% (see figure 1.1). Thus it is a basic yet crucial requirement to protect pension income and pension assets against the risk of inflationary erosion in the post retirement phase. Often cost-of-living adjustments of pension programs measured using a consumer price index (CPI) which is based on the variation for all goods and services. Yet, some categories of expenditures could be much higher for the elderly compared with younger consumers, e.g. such as medical and health care cost. For example, the Council of Economic Advisor reports for the USA that (cf. CRS 2008, page 4) "over the

[5] See *Bohn* 2006 or *Cogan/Mitchell* 2003 for a further investigation.
[6] This limitation can be justified insofar, that for countries (especially in continental Europe) the current level of notional health insurance is adequate for the broad population. In addition, some countries have long-term care programs for the elderly. Yet, the analysis of the impact of these unexpected shocks on optimal retirement strategies (i.e. stock/bond/annuity-fraction), is an interesting research topic. We refer the interested reader for first results to a recent paper by *Horneff/Maurer/Mitchell/Stamos* 2008.

period from 1980 – 2007, the average annual rate of inflation for goods and services averaged 3.5%, but prices for medical care rose at an average annual of 5.9%".

Figure 1.1: Development of inflation-related loss of pension income



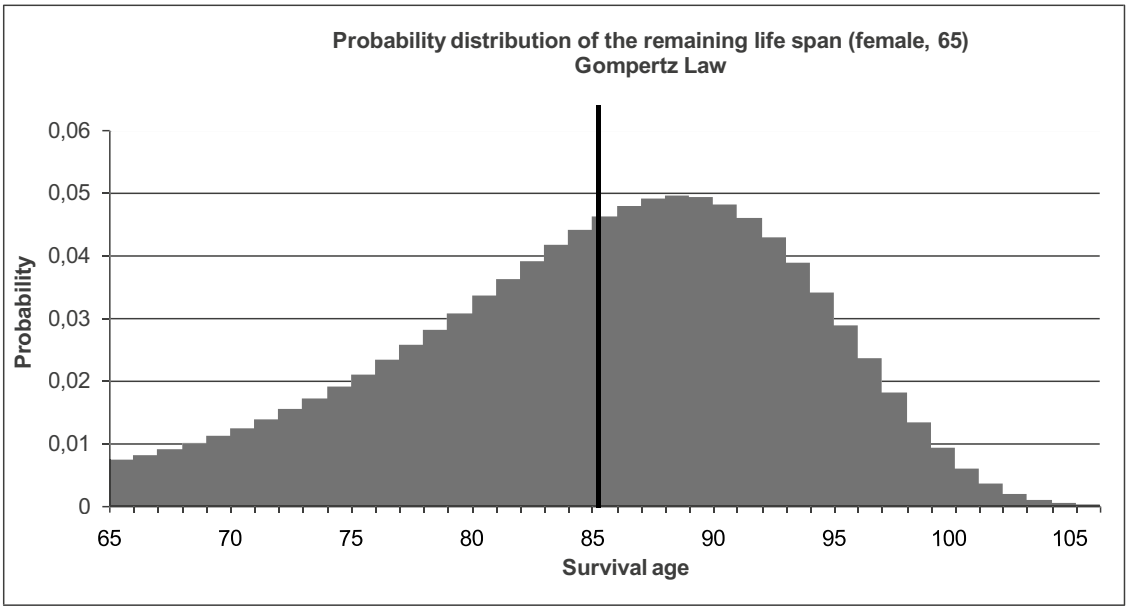
Source: own calculation, real purchasing power of a nominal wealth of EUR 10,000 in an inflationary environment of 2%, 5% and 10%.

- **Mortality risk:**

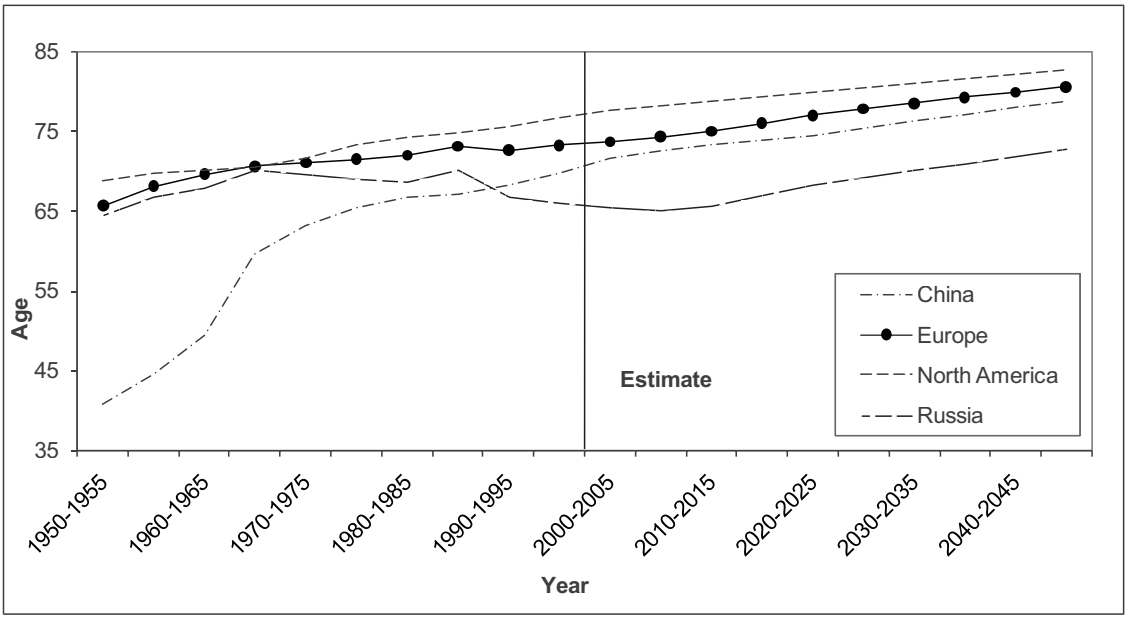
Mortality risk is the uncertainty of individual's lifetime. The following figures 1.2 (upper picture) demonstrate the range of the remaining lifetime of a 65-years-old female. To do so, we use the mortality table for the general population produced by the German Federal Statistical Office (*Statistisches Bundesamt*) and model the probability distribution by the so called Gompertz Law. The expected remaining lifetime for females is estimated to be approximately 20 years, resulting in the expected age of approximately 85. Males become, on average, a somewhat older than 81 years. Yet, the figures demonstrate from the perspective of an individual retiree that there is a considerable deviation around this statistical mean. It can be expected that approximately half of all 65-year-old females will live beyond 85; a quarter will live longer than 90 and a tenth will survive their 95th birthday. On the other hand, there is a 10% and 25% probability for a 65-years-old female not to get older than 73 and 79, respectively. So, the volatility of the individual lifetime is a factor of the economic consequences of mortality risk. Besides this *volatility risk*, uncertainty about the future development of the average lifetime itself caused by improvements to the mortality rates of the population is an additional risk factor (*estimation risk*). The following figure reports the development of the life-expectancy for several countries between 1950 and 2005 and provides some estimates for the future developments up to 2050 according to the United Nations Population Division. For example, the life expectancy for a (newborn) European increases from age 65.6 year in 1950 to age 73.7 in 2005. The estimate for the year 2050 is a life expectancy of age 80.6, i.e. around 7 years more than currently.

Figure 1.2: Variation range of the remaining lifetime

Part A: Volatility of Individual Lifetime



Part B: Development of Life Expectancy (newborn)

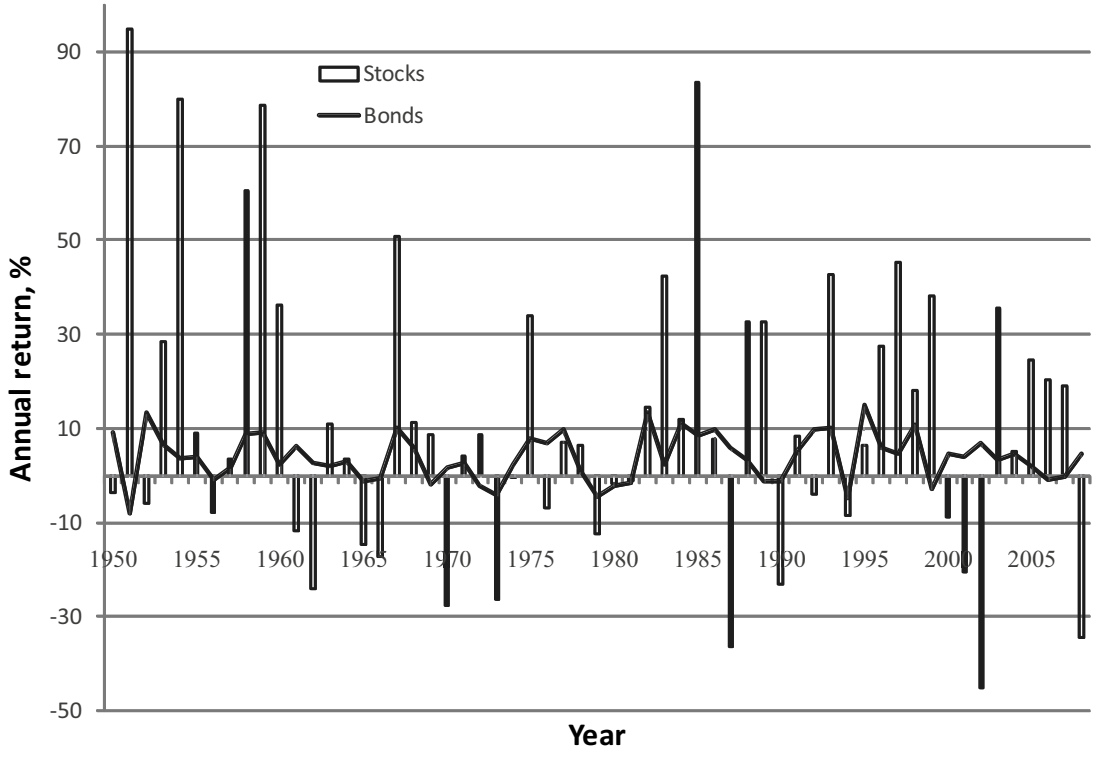


Source: Own calculation, the mortality rates in part A are taken from the 2003/05 German mortality table for the general population and were used for the calibration of the Gompertz Law. The data for life expectancy in part B are from the United Nations Population Division.

- **Investment risk:**

Fluctuating returns of the various assets, in which the prospective retirees might invest their accumulated retirement funds, contain both the attraction of an *upside potential*, but also the disadvantage of *shortfall-risks* to lose money due to adverse developments in the capital markets. The following figure visualises this on example of the historical inflation adjusted annual returns in a well diversified portfolio of German blue ships stocks (represented by DAX) and government bonds (represented by REXP) over the period 1950-2008.

Figure 1.3: Annual real returns for German stock and bond markets 1950 – 2008



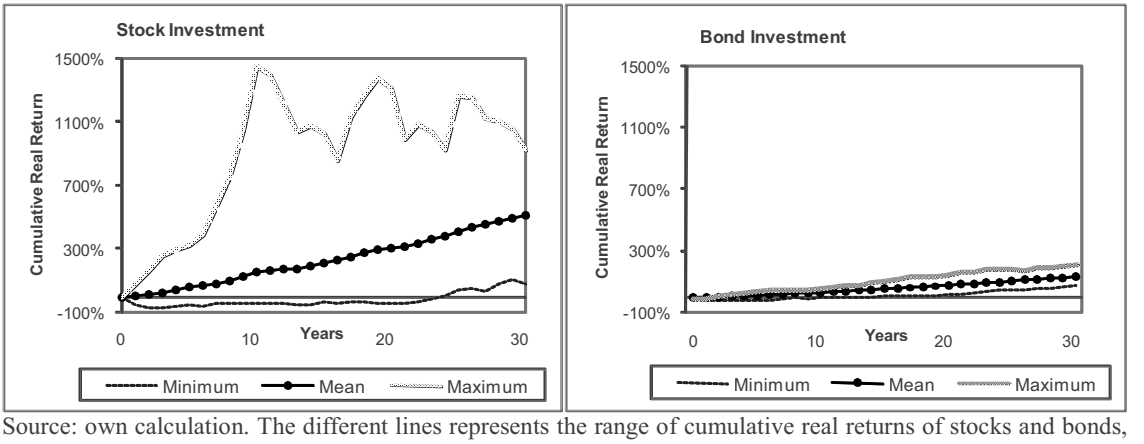
Source: Own calculation, data provided by Humboldt University Berlin and Datastream.

The graph shows that stocks have a higher return than bonds, but at the cost of higher volatility. For stocks the mean return over the period was 12.03% per year and for bonds it was 3.79%. But the standard deviation for stocks-returns was 30.02% compared to only 5.05% for bonds. These data illustrates the so-called equity risk premium, i.e. the compensation for stock holders in terms of an extra return above relatively safe investments like bonds (here around 8% p.a.) to accept the higher short term volatility. For example, in 22 out of 59 years (37 percent) stocks shows a negative real return. The average loss in such a case was 5.8 percent. In contrast to that, bonds earn only in 16 (27 percent) out of 59 years a return lower than the inflation rate, whereby the average loss in such a case was only 0.7%.

Next we illustrate the volatility of stock and bond returns over longer periods which are typical for pension investments. Note that even in the decumulation phase the average investment horizon with respect to life-expectancy is 20 years for a retiree at the age of 65. We use the same underlying data and calculate the *cumulative return* for all (overlapping) historical investment periods with the length of 1, 2, …, 30 years between 1950 and 2008. To illustrate how the range of possible outcomes varies with time we display in figure 1.4 the

minimum, average, and best cumulative return for each of the thirty investment horizons. What becomes clear is that the cumulative return for both assets becomes more volatile if the investment horizon increases.[7] In addition, it can be seen, that the cumulative return of stocks delivers a much greater fluctuation than the relatively stable investment in bonds. Yet, this stability of bond returns over time is bought by foregoing the high return potential of the stock markets in the long run. For example, if an initial occasional capital of EUR 10,000 was invested in stocks (bonds), the funds grew after 20 years to EUR 41,400 (17,900) after inflation, on average. In the most disadvantageous historical case, however, the funds were worth only EUR 6,300 (12,100) after the same period. At the same time, figure 1.4 illustrates a considerable upside potential of a stock investment, especially for long investment horizons. In the best historical case the value of the stock investment increased to EUR 141,800 after 20 years, while the value of the portfolio consisting of the government bonds was only EUR 25,100. Note also that the historical worst case returns of stocks are increasing quicker with the investment horizon than for bonds. For example, after an investment horizon of 1 year the minimum cumulative return after inflation for stocks (bonds) was -48% (-13%), after 10 years it was -35% (1%), and after 30 years the numbers are 83% (81%).

Figure 1.4: Range of historical cumulative real returns of stocks / bonds investments over various time horizons



Source: own calculation. The different lines represents the range of cumulative real returns of stocks and bonds, respectively, for all (overlapping) historical investment periods with the length of 1, 2, …, 30 years between 1950 and 2008. The calculation incorporates asset-based administrative fees of 0.5% p.a.

Analysis of historical returns to gain information about the long term downside risk of various asset categories should be carried out with caution. While we cannot observe in the historical data any period longer than 23 years where stocks have a negative cumulative return after inflation, we cannot conclude that the risk for such a shortfall is zero for future investments. To explore the shortfall risk with respect to the long term performance of stocks and bonds, we employ an *ex ante* approach by imposing an exogenous structure on the probability distribution governing the uncertainty of future asset returns. To do so, the stochastic dynamics of the (uncertain) market values of stocks and bonds are modelled as a multiplicative random walk (with drift), which is standard in financial economics and implies that the log returns of each type assets are independent over time and normally distributed. With such a model, it is possible to project the range of future (multiyear) returns over various investment horizons and compute several risk measures in which we are interested.

[7] It is well known that the volatility of average returns for increasing time periods is a problematic risk metric, and can result in misleading information. See also *Bodie* 1995, *Lachance/Mitchell* 2003, or *Maurer/Schlag* 2003.

To calibrate the model parameter we use again German capital market experience (see figure 1.3) which produces a yearly mean return of 12.03% (3.79%) and a standard deviation of 30.02% (5.05%) for stocks and bonds respectively. Next we calculate the median cumulative (multiyear) return, the shortfall probability of a negative real return (after inflation), and the average loss in the case of a negative return.[8] While the shortfall-probability answers the question "how often" a loss might occur, the average loss (also known as conditional shortfall expectation) answers the question "how bad on average" the loss will be. In this sense, this metric can be considered a worst-case-risk measure, since it only considers the consequences of the mean shortfall-level assuming that a shortfall happens.

Table 1.1 displays the results, which suggest that investors would have the potential to receive a substantially higher expected return by investing in stocks instead of bonds. For example, at the end of a 30-year investment horizon, the investor can expect a cumulative median return of 967.3% for stocks compared with only 194.6% for bonds. Further, looking at the shortfall probability shows that the likelihood of a negative real return decreases with an increasing investment horizon. Intuitively, this could be justified by the argument that over sufficiently long investment horizons, losses resulting from the high downside volatility will be offset by gains from high upside fluctuations of short term stock returns. Yet, the extent of this potential risk reduction differs notably between the two investment vehicles. For bonds, the shortfall probability is 22.9% for a yearly investment, and close to zero (i.e. lower than 0.01%) for a 30-year investment horizon. By contrast, the loss probability of a stock investment does not converge as rapidly towards zero, i.e. showing a 38.2% (5.0%) probability of a negative return after 1 (30) years.

In addition, the average loss is increasing over time especially for stocks. For example, in the case of a shortfall the equity-investor looses on average 16.0% of his money after one year but 38.7% after 30 years. Thus, although the probabilities of negative cumulative returns decrease for stocks over longer investment horizons, the potential magnitude of the loss does not. Because these opposite effects occur simultaneously, it is not clear whether the risk of stocks increases, decreases, or remains unchanged with longer investment horizon. [9] *Bodie* (2002) provided an intuitive explanation for this result "(...) the probability of a bad thing happening is only part of the risk equation. The other part is the severity of that bad thing, and the further out you go, the more severe it could be".

Table 1.1: Cumulative mean returns and the shortfall risk of stocks and bonds

	Investment horizon in years							
	1 year		10 years		20 years		30 years	
	Stocks	Bonds	Stocks	Bonds	Stocks	Bonds	Stocks	Bonds
Cum. Median return %	8.2	3.7	120.2	43.4	384.8	105.5	967.3	194.6
Loss probability %	38.2	22.9	17.2	1.0	9.0	<0.1	5.0	<0.01
Average loss %	16.0	2.8	32.0	4.9	36.5	5.4	38.7	5.6

Source: own calculation. The shortfall probability and the average loss are measured with respect to a 0% cumulative real return. The returns after 0.5% p.a. administration fee for stocks (bonds) are assumed to be log-normally distributed with yearly mean of 12.03% (3.79%) and volatility of 30.02% (5.05%).

In summary, due their enormous return possibilities appropriate investments in diversified stock portfolios are an important component of well structured pension products. Yet, even

[8] The various measures can be calculated analytically in closed form, i.e. a simulation procedure is not necessary. See *Albrecht/Maurer/Ruckpaul* 2001 for the technical details.
[9] See also *Kritzman* 1994, *Bodie* 1995, and *Kritzman/Rich* 1998 for that point.

for long horizons, which are typical for pension products, a pure stock investment is not free of the shortfall risk of losing money.[10] Hence, it is not possible to perfectly reconcile the negative short-run fluctuations of stock returns over long horizons and simultaneously keep expected excess returns with certainty. Consequently, assets with low volatility and low expected returns, like bonds or (securitised) real estate, are not redundant in the design of pension products. Therefore, retirees to make prudent decisions as well as financial intermediaries, offering standardised pension products, should seek diversification possibilities not only between individual securities within a specific asset class, but also across different asset categories (stocks, bonds, real estate) as well as with recurring income streams such as labour income and statutory pension claims.

The next box summarizes for a funded pension landscape the various risk categories the retiree may be exposed to.

Box 1.2: Risks associated with funded pension schemes in retirement

Risks associated with funded pension schemes

- **Investment risk** describes the threat that pension assets fluctuate over time and decline in value. The fundamental law of efficient capital markets implies that higher return prospects come with higher risks.

- **Inflation risk** describes the threat of general price increases over time reducing the purchasing power of pension benefits or pension assets.

- **Longevity risk** describes the threat of reaching an age where all savings are already exhausted during the lifetime of the retiree (risk of capital exhaustion).

In the traditional defined benefit pension programs, these risks are, in general, borne and managed by the company in the case of an employer-linked or the state in the case of the national old-age pension programs. However, as *Blitzstein/Michtell/Utkus* (2006) pointed out, "recent corporate bankruptcies involving massively underfunded DB plans have clearly demonstrated that workers and retirees are also exposed to capital market risk in such pensions". In addition, retirees should take into consideration that a highly underfunded national social security programs is linked with political risks, e.g. that future policymakers might change the legal environment of social security benefits in lieu of increasing fiscal deficits. *Cogan/Mitchell* (2003, page 170) pointed out: "We also anticipate that many workers would elect personal accounts when they are presented with a clear statement of the substantial political risks facing the current Social Security system."

In a defined contribution world, the retiree directly takes personal responsibility to manage investment, inflation and mortality risk. It is, therefore, essential for the retiree to evaluate those risks for each payout product. This requires the prospective retiree to measure the respective risk-return profile opportunities, to compare costs in terms of fees and loadings, to estimate the flexibility and the freedom of disposition, and decide about his own willingness to bear the risks as well as about the corresponding time preferences.

[10] Using a Monte-Carlo simulation framework, *Maurer/Schlag/Stamos* 2007 and also a recent study by OXERA 2008 analyse the influence of the investment horizon on the risk of various saving plan strategies (including lifecycle funds, dynamic risk strategies, constant rebalancing tactics, etc.) with stocks and bonds.

1.4. The basic retirement payout options

Regarding the range of payout products within a DC-orientated retirement landscape, there are two basic alternatives to manage the payout phase, both of which can be combined with each other:

(1) Purchase of a Payout Life Annuity
(2) Following an Systematic Income Drawdown Plan
(3) Building a Portfolio of Life Annuities and Income Drawdown Plans (hybrid solutions)

There is a wide range of types and shapes of annuity and income drawdown products in the private market, and in part two we provide a detailed taxonomy of products offered in the market. We explore in this section the basic features of these payout options.

Life Annuity: In its basic form, a life annuity is a financial contract that entitles the investor (annuitant) to a series of regular payments contingent on survival of one or two individuals. The annuitant is in the position of a *creditor* to the provider of the annuity. In the private market these life-contingent assets are typically offered by *life insurance companies* or in the case of occupational retirement schemes also by pension funds. It should be mentioned that life annuities are also offered by the public sector, since the benefits of mandatory state pensions can also be characterised as annuities from a financial perspective. The key difference, however, is that state pension annuities are in most countries financed on a pay-as-you-go basis, while annuities in the private market offered by insurance companies or pension funds are funded by setting aside financial assets. In turn, the insurer collects non-refundable premiums from the annuitants and invests them in financial assets backing the life contingent payment promise. If the number of annuitants is sufficiently high and mortality risks are independent, the insurer can hedge its liabilities by pooling longevity risk across a group of annuity purchasers. Surviving annuitants receive the reserved funds of other pool members who die. In this way, the life annuity is a *collective* (*or pooled*) *product* and the redistribution of funds among surviving members can generate an extra return higher than the capital market return of assets with similar risk profile. This extra return is often referred to as the *survival credit* (sometimes also named mortality drag). The insurance company anticipates the extent of the survival credit with respect to an ex ante specified mortality table and guarantees (with a high probability) the annuitants to paid it out in a pre-specified manner.[11]

Since the annuity contract entitles the retiree to a regular income stream over the remainder of his life, the retired annuitant can transfer the longevity risk to the insurance company and earn the survival credit. In the special case where annuity payments are constant in real terms (inflation linked annuity) the retiree can also transfer the investment and inflation risk to the insurance company. However, this longevity insurance in conjunction with a survival credit comes at the expense of foregone liquidity, low flexibility, lost of control over retirement assets and no possibility for bequest. In addition, as *Goldsticker* (2007) pointed out, a life annuity "doesn't completely eliminate risk for the annuitant. The annuitant has, in effect swapped longevity risk and investment risk for *credit risk* – the possibility that the insurance company will default on its obligations". While the key goal of insurance regulation is to ensure the enforceability of long-term commitments of the companies towards the policyholders, and while in most countries regulators are very successful with respect to that

[11] See also *Stamos* 2008 for that point. In part 2 we provide a more detailed analysis of the nature and dimension of the survival credit.

task, empirical experience shows that within the insurance sector insolvencies are not only a matter of theory.[12]

Income Drawdown: Should the retiree choose an income drawdown strategy in retirement, this will result in periodic withdrawals or lump sum payments. In such case, the retiree has the freedom to decide on how to invest his wealth among the various asset categories (stocks, fixed income, cash, real estate). The assets will earn more or less uncertain rates of return, and the retiree may withdraw periodically a specific amount or a certain number of fund units of the invested funds to generate an income stream in retirement. Here, the retiree must select both an investment and a spending tactic, stipulating how much of his balance to spend per year. The retiree is in the position of an *owner of assets*, and there is no risk pooling with other retirees. Typically the assets are represented by mutual fund units, offered by *investment management companies*. Besides provision of professional asset management skills to select and manage well diversified portfolios of securities or properties, the investment management company can offer additional services to retirees. This could be special spending rules, special asset allocation patterns for retirees, or also some income or return guarantees. This *individual* method of generating retirement income allows for bequest, provides liquidity, control over assets, and may lead to a higher consumption, as compared to the purchase of an annuity. However, the retiree cannot earn an extra return in form of the survival credit and is exposed to the risk of running out of money, as he might outlive his assets before his uncertain time of death.

Building Retirement Portfolios using Life Annuities and Income Drawdown Plans: A retirement financial strategy need not involve a simple choice between annuitising all one's pension money versus selecting a specific income drawdown plan. Rather the retiree may optimise his retirement portfolios by simultaneously selecting combined portfolios that include both annuities and mutual fund investments, i.e. pooled and non-pooled products. To do so, the retiree has several options about when and to what extent to include a life annuity in his financial retirement strategy:

1) Purchase of an life annuity with immediate payments starting at retirement (*immediate annuity*);
2) Purchase of a life annuity with benefit payments starting at a certain point in the future (*deferred annuity*);
3) Purchase of only one life annuity, with all or with a part of retirement savings (*full / partial annuitisation*);
4) Gradual purchase of life annuities as retirement progresses (*gradual annuitisation*)

The table 1.2 provides an overview of the suppliers of the different payout options, the nature of the product, and the legal position of the retiree.

A rational person seeking to optimise his future consumption pattern, who relies on the funds accumulated during the working career to provide income for the rest of his life, would choose a combination of financial products as well as life annuities. Besides a preference for time, risk, and bequest, the decumulation strategy will depend on pre-existing periodical and certain pension income, such as the income from the statutory first pillar pension, corporate defined benefit payments, or from another annuity contract purchased earlier in life. In chapter four we show how such an optimal financial retirement strategy can be developed.

[12] See for example *O'Brien* 2006 with respect to the downfall of Equitable Life in the UK.

Table 1.2: Providers and characteristics of basic payout options

Basic types of payout products				
	Life annuity		**Hybrid solutions**	**Income drawdown**
Provider	Insurance company			Mutual fund company
Legal position of retiree	Creditor			Owner
Nature of product	Collective (pooled)	→	**Combinations of pooled and non-pooled solutions**	← Individual (non-pooled)
Role of provider	-Organising risk pool -Provide guarantees			-Organising asset pools (mutual funds) -Provide professional asset management service -Offer systematic payout options

For many retirees, the choice possibilities are not as broad and free as outlined above. In many countries of continental Europe, the annuitisation of funds, originating from the old age saving schemes, is either required by the legislation or by regulation. It can also be enforced by tax disadvantages applying to other retirement products. Further details on this point are outlined in part three of this study.

In the USA, however, given the lacking of restrictions on the choice of retirement products and given the availability of a wide range of such payout solutions, the observed demand for annuity products is very low. Despite the large economic value that protection against longevity risk can offer to retirees, many of them do not purchase annuities voluntary. This phenomenon is called "*annuity market participation puzzle*". The next table (adapted from *Boardman* 2006) illustrates the demand for life annuities and income withdrawal programs in the USA (based on data from the SCF 2001) in absence of any restrictions on the use of funds and the UK. In the UK, the annuitisation of the funds is enforced at the age of 75.

Table 1.3: Demand for life annuities and withdrawal plans in UK and USA

Product type	Estimated share in the retirement income market	
	UK market 2005	USA market 2001
Lifetime annuities	85%	<15%
Comprised of:		
- Fixed annuities	83%	*n.a.*
- Investment-linked annuities	2%	*n.a.*
Income drawdowns/withdrawals	15%	>85%

Source: *Boardman* (2006), pages 634-635.

While in the USA the demand for an annuity is completely voluntary, in the UK, as in continental Europe, the regulation enforces the mandatory purchase of annuities. Yet, as *Inkmann/Lopes/Michaelides* (2007) point out, looking at the voluntary annuity market in the UK there appears to be a substantial "annuity market puzzle since only 6% of households participate in this market".

2. Market solutions for the payout phase of funded pensions

2.1. Description of pooled solutions – life annuities

2.1.1. Basic features, pricing and survival credits of annuities

The most traditional payout solution to generate a predictable income stream in retirement is an annuity. The first annuities – know as annua – featured in the financial affairs of the ancient Romans and were offered by speculators in the marine business. A table of annuity rates from Domitius Ulpianus was calculated in 230. In the Middle Ages and afterwards, annuities were a popular financial instrument used by private individuals, the clergy (annuity payments were excluded from the churchly prohibition of collecting interest), and the state as an alternative to government bonds to finance the national debt. However, the modern annuity product based on the systematic organisation of risk pools as well as on (actuarial) pricing techniques using well-documented mortality tables and the discounting of the expected cash flows was only created in the late nineteenth century. Such prominent scientists as de Witt, de Moivre and Gauss laid with their work the foundation for the development of contemporary annuity business.[13]

Today, in the private market place, annuities are special insurance contracts offered primarily by life insurance companies or pension funds. From an economic perspective the most important characteristic of a life annuity are regular and guaranteed lifelong payments to the policyholders.[14] Such cash flow stream can help the annuitant to solve the problem of planning consumption based on uncertain lifetimes and it reduces the risk of outliving the available resources. In addition, each annuitant can expect, in theory, a payout which exceeds the income which he could earn by investing the annuity premium in liquid financial assets with a comparable risk profile. The underlying collective risk sharing principle is that the insurance company does not pay out the full amount of the annuity premium to those individuals who die earlier than on average expected. This permits higher payouts to those who remain alive (so-called survival or mortality credit)[15].

Box 2.1 displays the risk pooling effect as well as the nature and the factors driving the survival credit using a simplified numerical example. To do so, we compare the rate of return of a one-period annuity with a bond investment. The riskless rate of return is 2 percent and the probability to survive the next year is 90 percent (equivalent to a male survival probability at age 82). If the male retiree survives to the next year, he receives from the one-period (actuarially fair priced) annuity a return on investment equal to $RoI_{survival} = (1.02)/0.9 - 1 = 13.33$ percent. In the case he dies $RoI_{death} = -100$ percent. If the retiree invests in bonds, he or his heirs will receive the bond return of 2 percent. Hence, the survival credit is 0.1333 - 0.02 = 11.33 percent.

[13] For details on the history of life annuities see: *Dus/Maurer* 2007, pp. 22-24; *Maurer/Somova* 2007, pp. 305-306; *Mckenzie* 2006, pp. 1-6.

[14] From a legal perspective the term life annuity requires in most codification at least two features: (i) "regular payments" (e.g. monthly, quarterly, or yearly) which are paid to the annuitant (ii) "conditional on the life of one or more individuals". Unclear is if the additional feature (iii) "constant or increasing benefits" is also a necessary condition to qualify as a life annuity. From an economic perspective the third condition is not necessary. Yet, some national tax authorities (e.g. Germany) require such a condition to qualify a financial product to enjoy the special tax treatments of annuities.

[15] In this chapter, we do not consider annuity-like payments resulting from the pay as you go systems. For details on the (funded) annuity markets see *Poterba* 2008.

If r is the assumed interest rate and q_x the probability for a retiree with age x to die over the next year it is easy to verify that the survival credit for a one-period life annuity is given by $SC_x = (1+r)* q_x/(1- q_x)$. Clearly, the older the individual, the lower the survival probability and the higher is the survival credit. The survival credit is typically lower for annuities issued to women than those for men due to higher life expectancy of females. The survival credit increases with the increasing assumed interest rate which the insurance company applies to price the annuity.

Box 2.1: Survival credit and pooling of mortality risks by the insurance company

Suppose a life insurance company sells 10,000 identical one-period annuity contracts to 10,000 different retirees, which have an identical annual survival probability of 90%. Each retiree pays an amount of EUR 100,- to the insurance company at the beginning of the year and is entitled to receive a payment of EUR 113.33 in case of survival at the end of the year. In case of demise, nothing is paid to the heirs. In this example, no cost loads are considered.

The perspective of the insurance company: According to the law of large numbers the insurance company can expect to pay the promised amount to only 9,000 out of 10,000 insured individuals. On the other hand, it can invest the funds collected from the insurance premiums (i.e. 10,000 * 100 = 1,000,000) in the capital markets earning a 2% p.a. riskless rate of return. The invested amount together with the accrued interest is available for distribution to the 9,000 surviving retirees at the end of the year so that each surviving retiree receives 1,020,000 / 9,000 = 113.33 EUR.

	Beginning of the year (t=0)	End of the year (t=1)
(1) Assets of the insurance company	1,000,000 EUR	1,020,000 EUR
(2) Number of retirees	10,000	9,000
(3) Assets per retiree = (1)/(2)	100 EUR	113,33 EUR

Perspective of the annuitant: The Return on Investment (RoI) for an annuitant at the end of the year, in a comparison to alternative investment in a bond, can be determined as follows.

	Payout (RoI) at the year-end	
Invested amount	Alive	Dead
(1) EUR 100 in bonds	100*(1.02)=102 EUR RoI = 2%	100*(1.02)=102 EUR RoI = 2%
(2) EUR 100 in annuity	100*(1.02)/0.9=113.33 EUR RoI = 13.33%	0 EUR RoI = -100%
Spread (2) – (1)	13,33% – 2% = 11.33% (Survival Credit)	-100% - 2% = -102% (Mortality Loss)

Source: Own calculation.

However, one-period annuities as used in the simplified example above are currently not offered in the private marketplace. A product which is close to the idea of a survival credit that increases with age is a *tontine*. This is a special annuity contract whereby in return for an initial non-refundable lump sum the annuitant receives lifelong benefits which are increased each year for the survivors of a special cohort of participants. If the second-to-last participant of the pool died, the sole survivor receives the outstanding principal. Thus, the survival credit is directly linked to the population development of a special group of participants, and increases year-by-year when cohort members pass away. The financial intermediary

organising such a tontine risk pool usually provides no financial guarantee to the participants. Rather its role is to manage the assets of the pool, to redistribute realised survival credits across cohort members in a pre-specified manner, and to provide further services like record keeping, manage payouts etc. Therefore, the survival credit realised by the retiree could substantially differ from the one derived from the relevant mortality table. While tontines were quite popular in France during the 17th Century, today they play no significant role in the marketplace for payout products.

The typical annuity products sold by life insurance companies today do not provide year-by-year increasing survival credits but rather a constant one depending on the age of the retiree when signing the contract. Thus, the insurance company provides (with a certain probability) a guarantee with respect to the level of the survival credit according to an ex ante specified mortality table. To do so, insurance companies use the actuarial principle of equivalence to price the annuity. In the case of a single premium annuity this means that the gross premium should be equal to the present value of expected benefits paid to the annuitant including expense loadings (e.g. commissions, administration fees) that the annuity provider has to cover. Therefore, assumptions about mortality risk and the age of the annuitant, the interest rate used by the insurance company to discount expected benefit payments, and the cost-structure of the insurance company are necessarily to be made.

Box 2.2: Basic principles of annuity pricing in the private market

Pricing of Annuity Benefits:

Gross Premium: = Actuarial Present Value of Future Benefit * Loading Factor

Actuarial Present Value = Sum of (Future Benefits * Discount Factor * Survival Probability)

Discount Factor = Assumed by the insurance company with respect to investment performance

Survival Probability = Assumed by the insurer with respect to specific mortality tables

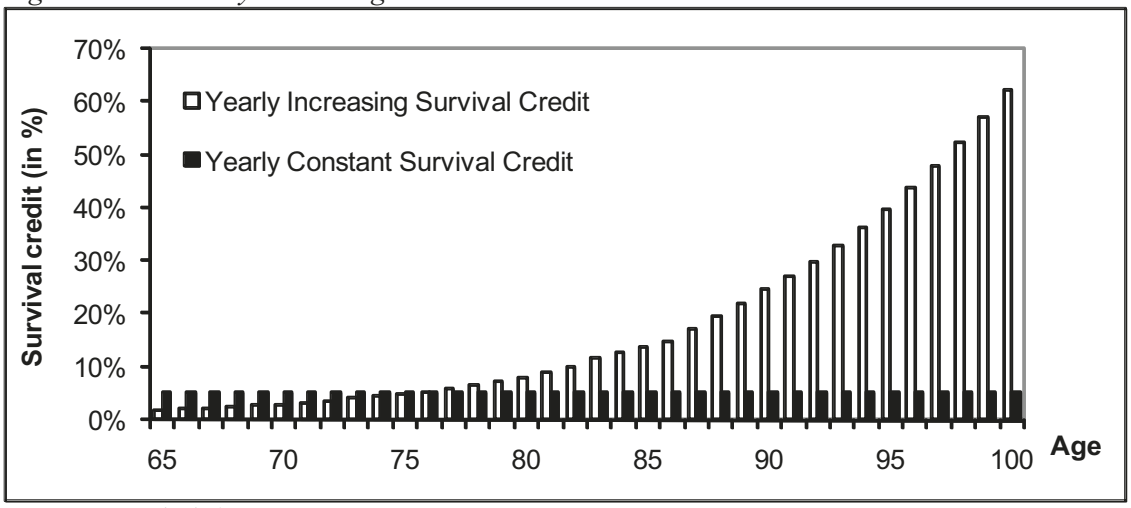
Loading Factor = Expenses of insurance company (commission, administration, profits, etc.)

The following figure 2.1 illustrates the difference between a year-by-year increasing and a constant survival credit, guaranteed by the insurance company. Here, we assume an interest rate of 2% p.a. to discount future benefits, a mortality table (male) for the general population provided by the German Federal Statistical Office, and no further costs. Using the actuarial principle of equivalence, the insurance company can offer for an initial premium of 100, a yearly payout of 7.11 as long as the annuitant is alive. If the amount of the annuity premium is invested in riskless bonds, and the retiree consumes only the yearly income flow of 2%, the constant survival credit is 7.11 – 2 = 5.11 per hundred Euro (dark bars). The white bars in figure 2.1 display the level of a year-by-year increasing survival credit according to the same mortality table and interest rate assumption. At age 65 the mortality rate is 1.71% turning into a survival credit of 1.77%. It is only from the age of 76 (5.29%) onwards that the year-by-year exceeds the constant survival credit.

The example represents the positive relation between the survival credit and the rate of return the annuity provider can earn on invested assets. In our simplified example both the

investment by the insurance company and the alternative bond investment by the retiree earn the same rate of return. In case that an alternative investment by the retiree earns a higher rate of return than the assets of the insurance company, the advantage of the annuity investment will be diminished. Since the annuity premium is irrevocable, the purchaser faces loss of liquidity irrespective of any special needs (e.g. to cover unexpected and uninsured medical costs or the reconstruction of the domicile in connection with the health condition). In addition, for the standard annuity there is no bequest potential, because the payments are contingent on the individual's survival. Therefore, buying an annuity comes at the expense of opportunity costs.

Figure 2.1: Annually increasing versus constant survival credit



Source: Own calculation.

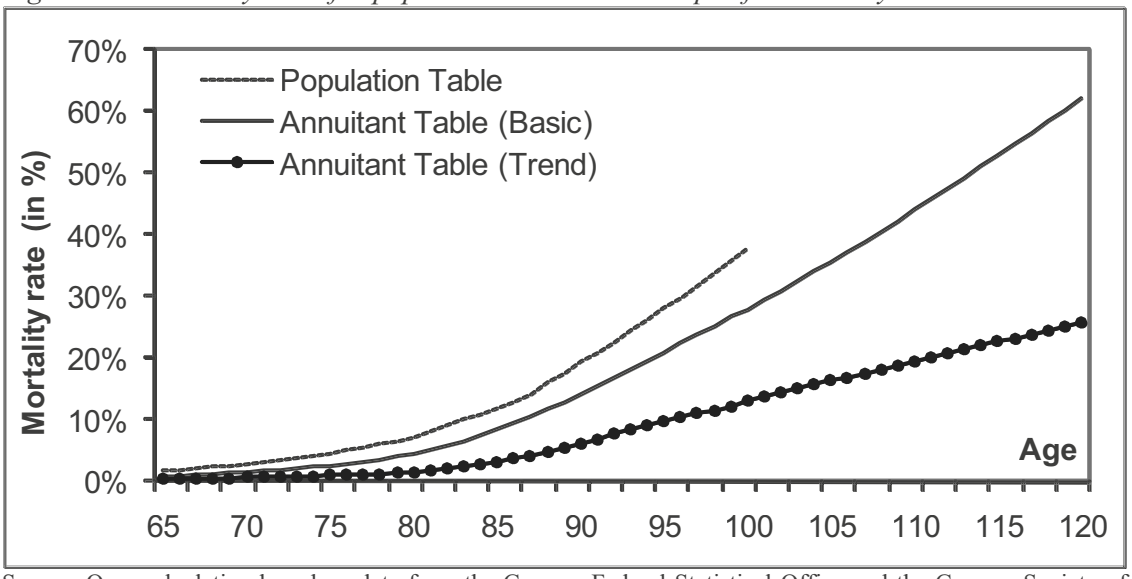
In addition, the dimension of the survival credit guaranteed by the insurance company is also reduced because the annuities cannot be perfectly priced on an actuarial fair basis. Firstly, the insurance company must cover several costs for acquisition, distribution, corporate overhead and income taxes. In addition, the insurance company must collect a certain risk premium, required by the shareholders who provide adequate equity capital which is necessary to run the business and to keep the ruin risk of the company on a sufficiently low level. Usually these costs are represented in form of an expense loading factor with respect to the net premium. Empirical evidence for the various international individual annuity markets show a wide range of loading factors between 2% and 15%, depending on the distribution channel, age, sex, and amount of annuity benefits. For example, *Finkelstein/Poterba* (2004) report for the annuity market in the UK a nonlinear relationship between annuity rates and premium, i.e. indicating that the loading factor is decreasing with increasing premium. *Mitchell et al*. 1999 report for the market in the USA, an all-company average loading factor of 7%, a number which is in line with the German market. Especially if annuity products are offered directly from the insurance company to the annuitant without interconnecting a broker or independent agent, the loading factor can be quite low.

Next, insurance companies must incorporate the problem of adverse selection in annuity markets. This means that people voluntarily buying annuities may tend to live longer than the population as a whole. In order to respond to the observed tendency and to fairly calculate the annuity premiums, the insurance companies use the modified annuitant specific mortality tables, matching the higher-than-average life expectancy of the annuitants. These annuitant specific mortality tables differ from the mortality tables of the general population in three

different aspects. First, they show significant lower year-by-year mortality rates. Second, the maximum age of the annuitant mortality table (radix) is much higher than for a general population table. For example, the annuitant specific mortality tables in Germany use a maximum age of 120 and in USA 115, compared with a maximum age of 100 in the table for the general population. Third, the basic mortality rates of these tables are corrected with a trend function to address anticipated future improvement in the life expectancy of annuitants.

The following figure shows the differences between the yearly mortality rates of a general population table, of a specific annuitant table (Basic), and a specific annuitant table corrected with a trend. All mortality rates are for a male at age 65.

Figure 2.2: Mortality rates for population and annuitant specific mortality tables



Source: Own calculation based on data from the German Federal Statistical Office and the German Society of Actuaries.

The differences in the assumed mortality rate for annuity buyers and for the general population are remarkable. For example, a male at age 85 shows a probability to die over the next year of 11.9% for the population table, 8.4% in case of the basic annuitant table, and 4.8% for the annuitant table with trend. As a result, the survival credit is reduced significantly. Table 2.1 illustrates the potential transaction costs for a retiree resulting from explicit expense loadings and implicit adverse selection adjustments if the retiree purchases a life annuity from a commercial life insurance company. In this example the male (female) annuity purchaser is 65 old and pays a single premium of € 100 in exchange for a constant lifelong yearly benefit. The insurance company uses an interest rate of 2% to discount future benefits in conjunction with four different assumptions about mortality and expense loadings. In the most favourable case (population table with no expense loadings) the extra return over the risk free return is 5.1% conditional on surviving. This is only 2.9% if the annuity is priced with an expense loading factor of 7% and by using an annuitant mortality table with a trend adjustment. For females, the level of the survival credit is significantly lower compared to males.

Table 2.1: Survival credit and assumptions about mortality and loadings for annuity pricing

Assumption about mortality and expense loadings for annuity pricing (male 65)								
	Population table 0% expense loads		Annuitant table (without trend) 0% expense loads		Annuitant table (with trend) 0% expense loads		Annuitant table (with trend) 7% expense loads	
	Male	Female	Male	Female	Male	Female	Male	Female
Livelong benefits premium € 100	7.1	6.0	6.1	5.4	5.2	4.7	4.9	4.4
Survival credit over risk free return 2%	5.1%	4.0%	4.1%	3.4%	3.2%	2.7%	2.9%	2.4%
Money's worth ratio	100%	100%	86%	90%	73%	78%	69%	73%

Note: Money's worth ratio is calculated from the perspective of a population table (without trend), a loading factor 0%, and a discount rate of 2% p.a. Source: Own calculation.

It is clear that the annuity may become unattractive to those individuals, who perceive they have the average mortality expectation of the general population rather than those of annuity buyers. This could result in a low so called money's worth ratio of annuities, which is a popular measure introduced by *Warshawsky* (1988) and elaborated by *Mitchell et al*. 1999 to quantify the attractiveness of annuity benefits. The money's worth ratio is calculated as the expected present value of payouts from annuity benefits in relation to the premium cost of the annuity. The expected present value of payouts is calculated from the perspective of a retiree which may use different assumptions about mortality rates, interest rates and expense loadings than the insurance company. In the case the money's worth ratio is 100%, the annuity is fairly priced from an actuarial perspective. The last row of the table 2.1 shows this metric. If the general population mortality table is used, the money's worth ratio per euro of insurance premium for a 65-year-old male is 86% in the case the insurance company uses the annuitant basic table (without trend) and applies no expense loadings to calculate the annuity benefits.

In what follows, in the next section we describe and categorize the various annuity products which are available in the market.

2.1.2. Typology of main annuity product groups

A wide variety of annuity products is available in the market, ranging from simple solutions to highly sophisticated products and can be bought with funds from occupational or private sources. All of them perform the main task of insuring against the risk of outliving one's resources by using (collective) risk pooling techniques. Some of the products are designed to additionally insure against other special risks such as inflation or provide dependents coverage, while others try to reduce some of the annuity's disadvantages like the loss of bequest. In the contemporary product landscape the main differentiation in the products can be made by the commencement and duration of the annuity payments, the methods of paying premiums to the insurance company, by the number of lives covered, by the nature of payouts, and by the channel of how the annuity is distributed to the annuitant. In what follows, we use and extend the typology introduced by *Poterba* (1997) to characterise the various annuity products.

An annuity contract can be divided into two phases: The accumulation phase, when premiums are paid and capital builds up, and the decumulation phase when the benefits are paid out.

This can be done through a one-time payment (*single premium*) or through gradual instalments during a period of time (*annual premium*). The payout phase can follow the accumulation phase immediately (*immediate annuity*) or after a specified period of time (*deferred annuity*). The amount the insurance company pays out can be conditional on the survival of just one (*single annuity*) or more than one individual, such as the spouse (*joint and survivor annuities*). The annuity payment can end when the annuitant dies (*lifelong annuity*). Alternatively, the annuity payment can end with the death of the annuitant, but not later than a fixed number of years (*temporary life annuity*). In the case of a *guarantee period* the periodical payments will be made to the annuitant or to the heirs for a certain period of time, such a five or ten year period, independently of whether the annuitant is alive. Guarantee periods as well as joint and survivor annuities address the reduced bequest potential of a simple annuity contract since they continue to be paid out also when the annuitant passes away. Yet, these features come at the cost of a lower survival credit. The following table displays the potential reduction of the benefits with respect to these features.

Table 2.2: Reduction of benefits compared to single immediate life annuity without guarantee period

	Guarantee Period		
Number of Lives	0 years	10 years	15 years
Single Life M75	0%	-10%	-22%
Single Life M65	0%	-2%	-5%
Joint Life M65 / F65	-24%	-25%	-25%
Joint Life M65 / F55	-45%	-46%	-46%

Source: Own calculation, interest rate 2%, mortality table DAV 2004 R, loading factor 0%.

An annuity can be purchased directly from the insurance company or alternatively via an agent, a broker or the internet (*individual annuity market*). *Group annuity markets* are linked to employer sponsored corporate pension plans. The insurance company underwrites the annuities with the employer, which is the legal owner of the contract. The employer makes the annuity benefits available to the employees (e.g. within a third party beneficiary contract), whereby the employer covers all or part of the insurance premiums. The pricing of group annuity products can differ from the individual market; most notably, loading factors to cover distributions cost may be cheaper.

The manner in which the accumulated capital is paid out during the payout phase depends on the annuity type. The simplest form is one which provides guaranteed constant lifetime level payments in nominal terms (*nominal fixed annuity*). Apart from that, annuity benefits can rise (or fall) at a pre-specified fixed nominal escalation rate with the increasing age of the annuitant (*escalating or graded annuity*), they can be indexed to inflation (*inflation linked or real annuity*), they can depend on the insurance company's surplus (*participating or with profit annuity*), or even reflect the return of a specific asset portfolio, usually represented by family of mutual funds (*investment-linked or variable annuity*).

In most countries, fixed nominal annuities are the most popular product. Inflation indexed annuities were invented by TIAA-CREF in the USA market and have recently become more popular in the UK market. The motive behind inflation indexed annuities or also of nominal escalating annuities is to hedge, at least in part, the risk of future payouts' purchasing power erosion because of inflation. Yet, this comes at the price of substantially lower initial benefits compared to nominal annuities with constant payouts. For example, a single immediate life annuity for a male aged 65 with an escalating factor of yearly 2% (3%) results in 30% (50%)

lower initial benefits compared with a constant nominal annuity. In other words, the annuitant has to survive approximately 18 (23) years to receive the same benefits compared to a constant level annuity. Such a payout pattern is often quite unpopular among potential purchasers of life annuities.

A participating annuity is usually designed with a guaranteed yearly minimum benefit and a nonguaranteed surplus which can vary year-by-year. It largely depends on the insurance company's experience with investment returns, mortality, and expenses. A participating policy can overcome the high conservatism with respect to mortality and investment assumptions faced by insurance companies when pricing long term contracts with guaranteed payouts. In the case that the realised investment returns are higher than assumed, and the realised mortality rates of the specific risk pool are higher than expected, a considerable part of the resulting (technical) profits are redistributed to policyholders in terms of a surplus. Frequently, the guaranteed as well as non-guaranteed parts exist because of the insurance regulation. With respect to the former, regulators limit the maximum amount an insurance company is allowed to guarantee with respect to current capital market conditions, and quite conservative mortality assumptions. In addition, the companies are legally obliged to distribute a certain minimum fraction of their annual profits as surpluses to the policyholders.[16] For example, in the German market participating annuities are the dominating product. The maximum interest rates that life insurers can use to discount guaranteed future benefits should not exceed 60 percent of the yield of long term government bonds, and is currently restricted to 2.25% per annum. Further, the companies should use the mortality tables with quite conservative mortality assumptions, resulting especially from the trend adjustments reflecting the potential improvements of future life expectancy. Because premiums and technical reserves are calculated in a quite conservative way, life insurance companies can expect to earn a systematic surplus. At least 90 percent of the yearly surplus must be redistributed to policyholders over a spread period of not more than five years.

Investment linked payout annuities are relatively new and interesting products in the market for payout products. They seek to link the special skills of insurance companies in pooling longevity risk, and the special skills of professional investment managers in selecting and managing assets in the international capital markets. The next section explores these products in more detail.

The following box provides an overview of the various types of annuities.

[16] For a discussion of several surplus methods see also *Ramlau-Hansen* 1991and *Albrecht*/*Maurer* 2002.

Box 2.3: Overview of the main annuity types

Nature of payouts:
- Nominal fixed (level) annuity
- Participating, with profit annuity
- Inflation-linked (real) annuity
- Escalating annuity
- Investment-linked (variable) annuity

Number of lives covered:
- Single life
- Joint life annuity (more than one life)

Waiting period when benefits starts
- Immediate annuity
- Deferred annuity

Premiums
- Single premium
- Gradual premium

Duration of payouts
- Lifelong annuity
- Temporary annuity (maximum number of years)
- Life annuity with a guarantee period.(minimum number of years)

Distribution channel
- Individual (direct) annuity market
- Group annuity market (linked to corporate pension plans)

2.1.3. Investment linked (variable) payout annuities

Investment linked variable annuities were introduced by insurance companies especially in the USA in the mid-1950s to compete with mutual funds. The market started to grow rapidly in the early 1990s: The sales of individual variable annuities in the USA rose from USD 3.5 billion in 1990 to USD 160 billion in 2006, showing the average annual growth rates of more than 25%.[17] The USA remains the biggest market for variable annuities today. The typical variable annuity contract sold in the North American market is, however, not a decumulation, but rather a (tax sheltered) accumulation product comparable to a unit-linked life insurance policy. Here, the premiums paid by the policyholder are invested in several types of mutual funds and any dividends, interest, and capital gains are reinvested to purchase additional fund units. At the end of the accumulation phase (around age 60), the policyholder has usually the option to take out the cash value of the policy as a lump sum payment, or transform it into a stream of annuity benefits. Traditionally, these annuity benefit options are from the nominal fixed variety, but recently more and more insurance companies offer also investment linked payouts options to their policyholders.

Investment linked payout annuities have both an investment component in a form of a mutual fund-style investment sub-accounts and an insurance element in terms of pooling longevity

[17] *Brown/Poterba* 2004, p. 1.

risks. The benefits paid by the insurance company reflect the return of a specific asset portfolio, usually represented by family of mutual funds (like stocks, bonds, real estate). The insurance company promises the annuitant to pay a pre-specified number of fund units as long as he lives. In contrast to a fixed annuity, the annuitant can influence how the assets are invested in the various mutual funds, and bears (at least in part) the risk and rewards of those investments. Although the assets are held in special subaccounts, the retiree is (from a legal point of view) not the owner of the assets but rather a creditor of the insurance company which must pay the retiree periodically a certain number of fund units as long as the retiree lives.

Box 2.4: Main features of an investment-linked (variable) payout annuity

Investment-linked payout annuity: The payments reflect the return of a specific asset portfolio backing the annuity. Typically this portfolio is represented by a family of investment funds (e.g. equity, bonds, real estate) whereby the retiree has the opportunity to select the fund categories with respect to his risk preferences. The regular payout is a specified number of portfolio units.

Investment-linked payout annuities could be desirable to the household as they allow the annuitant to tap both the equity risk premium as well as the survival credit resulting from risk pooling. Furthermore, the retiree enjoys some control over his retirement assets, because he has some options to decide about the asset allocation, i.e. the distribution among the various investment choices.

An insight into the ownership of variable annuities contracts is offered by the study of *Brown/Poterba* (2004). The researchers using the data from the Surveys of Consumers Finances, found that in the USA the probability of ownership of a variable annuity policy is strongly increasing with the age, the education level, the available income and wealth of an individual. The data, however, does not allow the insight in the actual payout behaviour and cannot reveal information on two important questions: Whether the households decide to take a lump sum payout or a stream of annuity payments and how the decision process is conducted.[18]

An important factor to understand the payoff structure of an investment-linked (variable) payout annuity is the Assumed Interest Rate (AIR), which is an actuarial construct to determine the number of fund units. First, the AIR specifies the initial payout when the contract is signed; the higher the AIR the higher the initial payout in the first year. Second, the AIR serves as a reference return to update future benefits. The updating rule relates the annuity payout in future periods to the previous payout and the realized portfolio returns relative to the AIR. Formally:

Updating Rule for Investment-Linked Annuities

$$\text{Benefit (Year t}+1) = \text{Benefit (Year t)} * \frac{\text{Realised Return on Investment Portfolio}}{1 + \text{AIR}}$$

If the realised return over the last period is higher than the AIR the benefits are increased, but in the case the return is lower, the retiree must accept a reduction of benefits. Thus, a high

[18] *Brown/Poterba* 2004. The study focused on annuities purchased using non-retirement plan assets.

AIR results in a relatively high initial payout in the first period, but increases the risk of a benefit reduction in future periods. [19]

To illustrate the functioning of the investment-linked payout annuity and the impact of the underlying portfolio's composition on the benefit level, we represent the possible payout profile of an annuity generated by EUR 100 single premium with the following portfolio characteristics: The retiree (male aged 65) has the choice between two investment funds. The first fund has a real (after adjustment for inflation) risk-free return of 2% p.a. The second fund, the stock fund, has an expected real return of 6% and a return volatility of 18% p.a. We assume that the yearly return of the stock fund follows an independent and identical lognormal distribution. The variable life annuity is calculated with a loading factor of 4% and the biometric assumptions as per DAV 2004 R German mortality table for annuitants. We set the AIR at 2% (after inflation) which is a common value in the industry, and analyse the following three investment strategies:

- 100% risk-free inflation-protected bonds (0% stocks),
- 100% stocks
- 50% bonds and 50% stocks (constant mix).

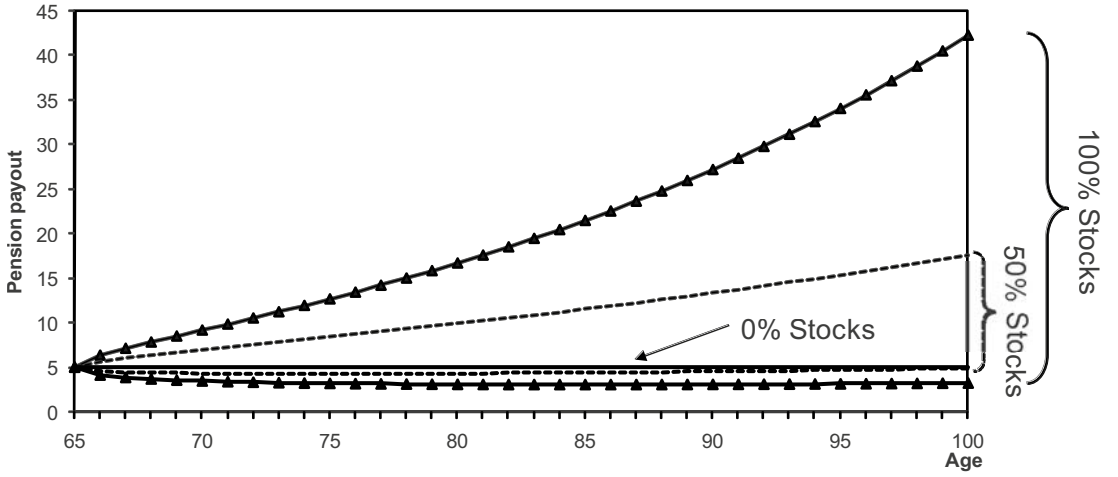
If the retiree invests all available retirement capital solely in the risk-free inflation index bonds, we have the special case of an inflation-indexed payout annuity.

Using the formal interrelationships applying to the variable annuities, and, respectively, to lognormal distribution, represented in *Horneff/Maurer/Mitchell/Stamos* (2007) and *Albrecht/Maurer* (2008, Chapter 3), the following figure 2.3 represents the development of the probable pension payments over time. The upper lines show the 90%-quantile, thus the amount of payments which is at least achieved or exceeded with the probability of at least 10%. This can be considered to be the "best case" scenario. The "worst case" scenario is shown by the 10%-quantile (lower lines). It represents such amount, which is achieved or exceeded with the probability of at least 90%.

It should be first noted, that the retiree receives livelong payments both from the variable and from the fixed annuity. Only in the extreme case that the underlying investment funds suffer a total loss, the pension payments are cancelled in the case of a variable annuity. The pension payments vary over time, nonetheless. The range of this variation is shown in figure 2.3. The frequent observation that stocks have a loss potential in comparison to the risk-free investment even for long investment periods, can be seen here as well. This should be, however, seen alongside the enormous upside potential, especially in the case of longevity.

[19] A 4 percent nominal AIR is common in the USA industry (c.f. the Vanguard and TIAA-CREF variable payout annuity websites); the USA National Association of Insurance Commissioners requires that the AIR not exceed a nominal 5 percent. See also *Horneff/Maurer/Mitchell/Stamos* 2007 for that point.

Figure 2.3: The range of payouts generated by a EUR 100 single-premium investment-linked annuity contract for different portfolio strategies



Source: Own calculation; biometric data based on DAV 2004 R (male 65); loading factor 4%; the expected real return for stocks (bonds) is 6% (2%) p.a. with a return volatility of 18% (0%) p.a.

The next table 2.3 gives a detailed insight into the matter. For different confidence levels, it shows probable inflation-adjusted payouts given that the retiree survives a certain age.

For all combinations, the first payout is the same at EUR 5.043 for single premium of EUR 100, due to the uniformed choice of AIR = 2%. This inflation-adjusted pension level is maintained during the remaining lifetime, when the capital is fully invested in the bond funds which are assumed to be risk-free. If the capital of the variable annuity is completely invested in the stock funds, the payout increases with the increasing age, on average. For example, the median payment amounts to (column 4) EUR 5.693 at the age of 70 and EUR 8.191, when the retiree becomes 85. This can be explained by the fact that the portfolio of stocks is assumed with 6% to earn a considerably higher return as the applied reference return (AIR = 2%). In case of especially favourable development in the capital markets, the income increases can be even more pronounced, as is illustrated by the 75%- and 90%-quantiles (see columns 5 and 6): With the probability of 25% (10%), the retiree receives a pension payment of EUR 7.341 (9.229) at the age of 70 and EUR 13.620 (21.527) when he becomes 85. This emphasises the high potential of a stock investment during the retirement.

It is well known that within efficient capital markets higher return prospects come along with higher risk which originates from the volatility of asset returns. An analysis of the development of the entries in the 10%- and 25%-quantile (columns 2 and 3) over time shows the following: The minimum pension level, which will be achieved at the age of 70 with a probability of 90% (75%), amounts to EUR 3.511 (EUR 4.415), thus being about 30% (12%) less as compared to the fixed annuity pension totalling EUR 5.043. At the age of 85, the corresponding values of EUR 3.116 (EUR 4.925) can be observed, meaning the reduction of the loss potential at given confidence levels with the progressing age. In the case that the retiree survives the 90th birthday, the minimum pension at the 25% confidence level surpasses, with EUR 5.236, the fixed annuity pension.

Table 2.3: Probable minimum payouts from an investment-linked payout annuity (AIR = 2%, EUR 100 single premium)

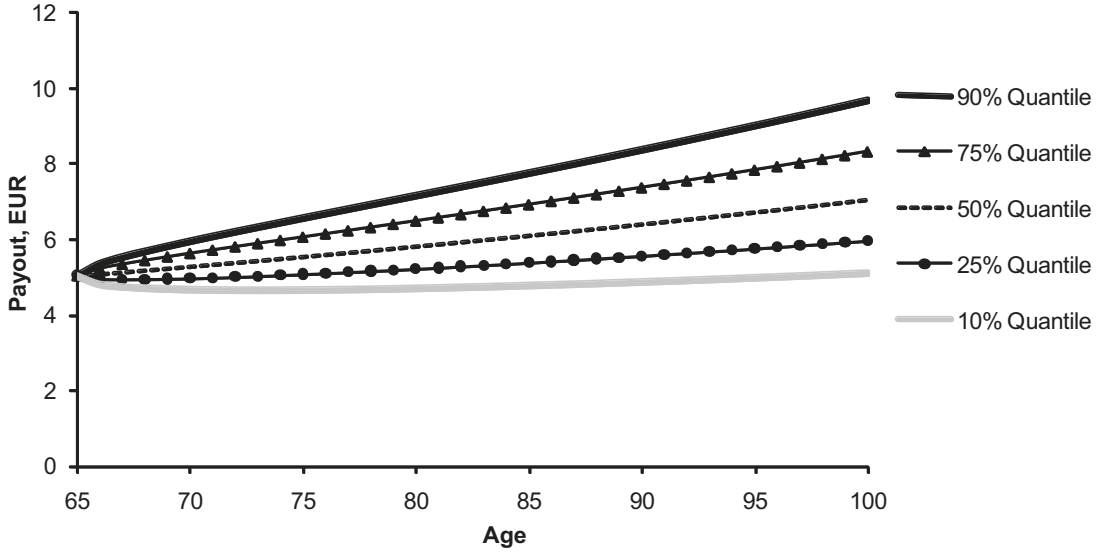
Age	Probable minimum pension payments (inflation-adjusted in advance payments) p.a. for confidence level of …				
	10%-Quantile	25%-Quantile	50%-Quantile	75%-Quantile	90%-Quantile
Part A: 100% Stocks					
65	5.043	5.043	5.043	5.043	5.043
70	3.511	4.415	5.693	7.341	9.229
75	3.245	4.485	6.427	9.208	12.727
80	3.142	4.671	7.255	11.270	16.753
85	3.116	4.925	8.191	13.620	21.527
90	3.139	5.236	9.247	16.328	27.239
95	3.196	5.599	10.439	19.461	34.090
100	3.282	6.013	11.784	23.094	42.313
Part B: 50% Stocks / 50% Bonds					
65	5.043	5.043	5.043	5.043	5.043
70	4.324	4.848	5.505	6.252	7.010
75	4.271	5.021	6.010	7.194	8.458
80	4.318	5.265	6.562	8.178	9.971
85	4.419	5.555	7.164	9.238	11.614
90	4.557	5.886	7.821	10.393	13.424
95	4.725	6.254	8.539	11.658	15.430
100	4.919	6.659	9.322	13.050	17.664
Part C: 25% Stocks / 75% Bonds					
65	5.043	5.043	5.043	5.043	5.043
70	4.687	4.963	5.289	5.636	5.968
75	4.676	5.071	5.548	6.069	6.581
80	4.720	5.212	5.819	6.496	7.173
85	4.793	5.374	6.103	6.931	7.771
90	4.886	5.553	6.401	7.379	8.386
95	4.995	5.746	6.714	7.845	9.026
100	5.116	5.952	7.042	8.332	9.694

Source: Own calculation; biometric data based on DAV 2004 R (male 65); loading factor 4%; the expected real return for stocks (bonds) is 6% (2%) p.a. with a return volatility of 18% (0%) p.a.

The second part of the table represents the values for the less risky investment strategy (50% stocks and 50% risk free inflation-indexed bonds). The median payout level (column 4) is higher as compared to the fixed annuity payment and increases with time. The loss potential, as measured by the 10% and 25% confidence level, is less compared to the pure stock investment. For example, if the retiree survives his 80th birthday, he can, with a 90% probability, expect a payout level of at least EUR 4.142 for the pure stock investment. The corresponding value of the mixed portfolio is with EUR 4.318 more than EUR 1.000 higher. The minimum payment level, which can be achieved with the probability of 75%, lies with EUR 5.265 above the fixed annuity. Of course, this reduced risk of loss is paid for by the reduction of the return potential in case of the exceptionally positive developments in the capital markets. The values for the 50%-, 75%- and 90%- quantiles (columns 4 to 6) of the mixed investment portfolio are, with the progression of time, increasingly below the corresponding values of the pure stock portfolio.

The concluding figure 2.4 shows, for a relatively conservative investment strategy with a 25% share of stocks and 75% of bonds, the time development of payout values in the selected quantiles. The exact numbers can be found in the third part of the table 2.3.

Figure 2.4: The range of payouts generated by a EUR 100 single-premium variable annuity on the basis of 25% stocks and 75% bonds portfolio strategy



Source: Own calculation; biometric data based on DAV 2004 R (male 65); loading factor 4%; the expected real return for stocks (bonds) is 6% (2%) p.a. with a return volatility of 18% (0%) p.a.

The range of payouts for this rather conservative strategy lies within quite narrow confines. The retiree has a good chance to achieve a moderately higher and, with the progression of time, increasing level of payments, as compared to the fixed inflation-adjusted annuity. At the same time, the risk of obtaining considerably minor payment as compared to the fixed annuity, when a certain age is achieved, is rather small.

It should be noted, however, that the payments resulting from the variable annuity may fluctuate, when a realised time path is considered. This means that there is a high probability, that the payout level once achieved will not be maintained in the following periods due to the volatility of the capital markets. This raises the question, if and to what extent the retirees with little or no experience in the area of finance are willing and able (also mentally), to accept such fluctuations of their income over time.

A recent development in the variable annuity market addressing this problem is a product which includes a Guaranteed Minimum Income Benefits (GMIB). Here, the insurance company offers the plan holder a certain benefit level independent of what the performance of the fund units may be. The array of insurance characteristics offered through variable annuity products is diverse and complex, whereby some features may be firm or contract specific. Such modifications as dependants cover or joint life annuities, which are often available with the fixed annuity, can also be purchased with a variable annuity.

2.1.4. Annuity coverage and market trends in the surveyed countries

In this section, we analyse the extent of annuity coverage and recent market trends in a representative group of European countries and in the *United States.* The European countries we look at are: *Austria, Germany, France, Italy, Sweden, Switzerland,* and the *UK*. We hereafter refer to this group of countries as the *surveyed countries*. Annuity coverage for the majority of the population in the surveyed countries originates from the following major sources:

- Payments from the obligatory statutory pay as you go or annuitised funded statutory pension systems
- Payments from occupational or personal funded pensions where the annuitisation of funds is either required (mandatory) or freely (voluntary) chosen by the participant

Annuity coverage from state pensions
The lifelong income streams from the statutory sources during the retirement can be compared to the inflation–linked joint life annuity: Usually the benefits from state pension programs are in some way related with inflation. In some countries, it is done directly by indexation of benefits with respect to some pre-specified consumer price index (e.g. in the USA). In other countries it is done indirectly by indexing the amount according to the development of salaries and wages (e.g. Germany), which, in turn tend to develop in line with inflation. Most statutory pensions have a dependant's benefit component, paying a certain pension to the surviving spouses and under age children.

In all surveyed countries, the vast majority of the population is covered by some form of statutory pension. Yet, the importance of payments from statutory pensions as a source of retirement income differs from country to country. In the countries of continental Europe (e.g. France, Italy, Germany, Austria) payments from statutory pension programs still provide rather high replacements rates and represent the main source of income for retired people. In contrast to that, the statutory pension systems in UK, the USA, and Switzerland provide relatively low social security old age benefits, therefore placing a high responsibility for the old age provisions directly in the hands of the individuals (see also chapter 3.1.1 for more detailed information).

Annuity coverage from occupational and private pensions programs
The coverage with employment-linked and private pension arrangements, as measured by their importance in the current retiree's earnings, varies significantly from country to country, ranging from almost nil in Italy to almost 35% in Switzerland. In all surveyed countries with the exception of USA, Sweden, and Switzerland, the current size of an average retirement fund is quite small and would not be a considerable help in covering the cost of living during the whole of retiree's remaining lifetime. However, with the increase in availability and in the statutory support for the funded old age saving programs, the participation in such programs as well as the funds tied in them are expected to rise rapidly.

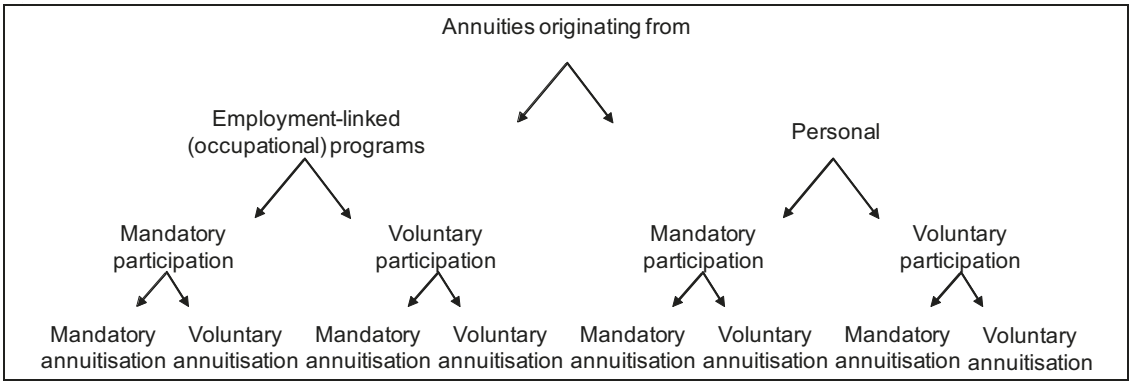
Annuity coverage from employer-based programs of defined benefit (DB) variety
In the majority of the surveyed countries, the bulk of the currently existing occupational pension obligations are still of the defined benefit nature, meaning a requirement to annuitise retirement savings. When the lifelong payout originates from the DB employment-linked funded program, it can in most cases be also compared to the inflation –linked joint life annuity. Here, the indexing for inflation can be done explicitly by choosing the relevant

annuity type of the same name, or by choosing the participating annuity, where the annual profit sharing between the insurance company and the insured compensates inflationary development. Many DB plans automatically offer the dependant's cover option, but in some programs, it could be chosen optionally.

Annuity coverage from employer-based or private programs of the defined contribution (DC) variety

For new company pension programs there is a clear trend for switching into more DC oriented benefits. When annuity is bought with funds from DC type programs, the markets for corresponding annuity products can be classified by the origin of funds into the employment linked (occupational) and private and then, by the existence of requirements to annuitise the funds at retirement; into mandatory and voluntary. The following figure illustrates this.

Figure 2.5: Classification of annuities markets by origin of funds and requirement to annuitise



The outlined classification is relevant as the production of an annuity by the insurance company may be considerably influenced by the fact whether the funds come from the occupational or private sources and whether the annuitisation of the funds is mandatory or voluntary.

In continental Europe, the tendency to mandate the annuitisation of funds, accumulated within the tax-supported DC-orientated programs, can be observed despite the respectable entitlements for the annuity-like payments from the statutory sources. This happens either by legislation or regulation or by giving strong tax discouragement of other withdrawal types. In the UK, the requirement to annuitise does not exist until the age of 75. However, the majority of the funds available at retirement are annuitised almost immediately, the most favoured product traditionally being the fixed nominal annuity, and in recent times, the inflation-linked annuity. In the USA, the requirement to annuitise does not exist at all, but when annuities are bought, they are fixed nominal or index-linked annuities, or, most recently, variable payout annuities. In Austria, France, Germany, Italy, Switzerland and Sweden, the participating annuities are the dominating product type.

Especially in the voluntary markets, the phenomenon of an adverse selection which impedes the production of fairly priced annuities is observed. This means, that people voluntarily buying annuities tend on average to live longer than the population as a whole. Since insurance companies must anticipate this effect in their pricing pattern, this implies from the perspective of an individual with an average mortality prospects a low money's worth ratio. In the mandatory annuity market the effect from adverse selection is less pronounced, as

everyone participating in the program has to annuitise. The researchers expect the smallest costs from adverse selection in the markets for occupational annuities, especially if the participation in the programs is mandatory for every employee working for the company.[20]

Low participation in the voluntary annuity markets

Throughout the world, there are not many households that actually voluntarily purchase life annuities. For example in the USA, where even for tax supported retirement programs (i.e. 401 plans, or IRAs) the choice of the payout product is not restricted, the voluntary use of annuities is very low. *Boardman* (2006) pointed out that the market share of annuity products in the USA retirement market is less than 15%. In a recent Report from the *Congressional Research Service* (2008) it is noted that: "Life annuities represent only about five percent of individual annuities sold in the United States. Most annuities sold in the U.S. are deferred annuities, which are tax-deferred retirement saving accounts". Only few of them are converted into life annuities at retirement. The same lack of voluntary annuitisation is observed for the majority of surveyed countries, where alternatives to the use of annuities are given. For example, within the Swiss private pension programs even savings placed with insurance companies are mostly paid out as lump-sums. The same is true for French life insurance contracts, which are used as old-age protection. *Inkmann/Lopes/Michaelides* (2007) report, that in the UK, only 6% of households participate in the voluntary annuity market. Similar results can be observed in Canada (cf. *Kim/Sharp* 1999), Australia (*Knox* 2000), Latin America (*Callund* 1999) and Israel (*Spivak* 1999). As *Hu/Scott* (2007) pointed out "the shrinking of DB pensions is not increasing the need for privately purchased annuities".

2.1.5. Advantages and drawbacks of life annuities as payout solution

As *Mitchell* et al (1999) pointed out, the essential attraction of a life annuity is that it entitles the retiree to a regular income stream over the remainder of his life. Insofar the retired annuitant is protected against the risk of outliving his own assets, given uncertainty about his remaining lifetime. Further the individual can earn an extra return named the survival credit, which results from pooling of longevity risk by the insurance company. For the dominant product in the private annuity marketplace, i.e. the life annuity with guaranteed nominal flat payments, the retiree also transfers the investment to the insurance company.

Yet, despite these important advantages, empirical evidence from most countries indicates that very few retirees voluntary actually purchase annuities with their disposable wealth. This empirical low demand for annuitisation is in contrast to some theoretical economic analysis on the demand for life annuities in the context of standard life-cycle models. For example, in an early study *Yaari* (1965) shows that risk-averse retirees lacking a bequest motive and facing annuity markets that charge actuarially fair prices should annuitize 100 percent of their wealth. Later, *Davidoff* et al. (2005) relaxed some of the quite restrictive assumptions of *Yaari's* analysis. Some researchers call this discrepancy between theory and empirical behaviour of households the "*annuity market participation puzzle*". Efforts to explain the low demand for annuities – either by using an empirical framework or with a normative stetting by extending traditional life-cycle models - have stressed a number of important disadvantages of annuitisation. Some of them, such as the loss of liquidity, flexibility and bequest potential, have been already addressed in this chapter. Some further aspects and some important studies on them are listed below.

[20] For further research on adverse selection in the annuity markets see *Finkelstein/Poterba* 2002.

- Loss of liquidity: Annuities are illiquid assets. The funds used to purchase an annuity cannot be recovered, irrespectively of unexpected special financial needs, like nursing home expenditures, or when unexpected and uninsured health shocks must be covered (c.f. *Brugiavini* 1993 and *Horneff/Maurer/Mitchell/Stamos* 2008).
- Loss of flexibility: Buying a fixed annuity limits the individual's opportunity to invest and to participate in the stock market (c.f. *Milevski/Young* 2002 and *Horneff/Maurer/Stamos* 2008). Illiquid (nominal) payout annuities are similar to fixed income investments, offering a riskless rate of return plus survival credit. In a low interest-rate environment, however, nominal level annuities can become unattractive compared to such alternatives as equity-based mutual fund investments. This highlights the question of timing risk, i.e. when to buy an annuity with respect to the current interest rate level (see *Horneff/Maurer/Mitchell/Dus* 2007).
- Loss of control over retirement assets: Ownership over assets is an important appeal of individual retirement accounts, especially for groups with below average earnings and groups anticipating below-average life expectancies (see *Cogan/Mitchell* 2003).
- The ability to pool longevity risk within families (cf. *Kotlikof/Spivak* 1981) and the existence of other sufficient annuitized resources such as state social security benefits and private DB pension arrangements. "Some potential annuity purchasers may already feel that they have a sufficient amount of annuitized income from Social Security" (see *CRS* 2008)
- Loss of bequest possibilities: Many retirees have a strong desire to bequeath funds to the next of kin. For the USA, about half the elderly wish to leave funds to bequest of about $ 10,000 (*Hurd/Smith* 1999 and *Bernheim* 1991).
- Low money's worth ratios: Pricing of annuities may appear disadvantageous due to high (and not always transparent) expense loadings and asymmetric mortality assumptions between insurance companies and annuity buyers. This can result in low *money's worth ratios* (MWR) of annuities, i.e. the ratio of the expected (actuarial) present value of the income stream that would be received to the annuity premium. *Mitchell* et al. (1999) report for the US annuity market a MWR of 81.4 (92.7) percent in the case a population (annuitant) mortality table is used. An international comparison by *James/Song* (2001) among five countries (USA, UK, Canada, Australia, Switzerland) found lower but still substantial money's worth differential outside the USA.
- An annuity may give insufficient protection against inflation risk, especially if the annuity payments are fixed in nominal terms.
- Perceived credit risk by the retiree, i.e. the default-possibility of the annuity provider.
- Behavioural obstacles, as explained for example by mental accounting and cumulative prospects theories, make the retirees consider converting savings into an annuity income stream undesirable. In case of mental accounting, the purchase on an annuity is not evaluated correctly by its impact on total spending potential. It is rather considered separately, unrelated to other assets available for retirement purposes, and from a gambling perspective, which increases the overall risk instead of reducing it. Because of the complexity of the intertemporal consumption planning, facing the (prospective) retiree, the problem is reduced to answering the simpler question: Will I live long enough to make back my initial investment in this annuity? (see *Read/Löwenstein/Rabin* (1999) for details[21]) Within the context of cumulative prospects theory, the pronounced loss aversion can make annuities look undesirable as compared to the non-annuitising "status-

[21] *Read/Löwenstein/Rabin* (1999).

quo" state. *Hu/Scott* (2007)[22] showed that behavioural factors can explain in large parts why annuities have not enjoyed demand that expected utility models have predicted.

Table 2.4 summarises the main advantages and disadvantages of an annuity.

Table 2.4: Overview of the main pros and cons of life annuities

Advantages	Disadvantages
- Longevity protection - Guaranteed payment - Survival credit	- Low liquidity and flexibility - Loss of bequest potential - No control over retirement assets - Potential high costs for adverse selection and expense loadings - Perceived credit and timing risk

2.2. Description of non-pooled solutions – drawdown (withdrawal) plans

2.2.1. Basic design and features of drawdown products

Although in the history of modern funded pensions drawdown products are relatively new, the underlying idea is at least as old as the idea of an annuity, and most probably much older. Because nothing is more natural and can be more easily organised than to save the funds (in whichever form they may be stored) and then, at a date the saver sees fit, to start systematically using them to support a living! Maybe it is due to this simplicity that not much historical evidence on drawdown products or drawdown decisions can be found in the literature. The decision of Joseph to store food during the seven plenty years and distribute the reserves during the seven years of famine may be considered an example of an ancient drawdown plan with a pre-determined duration (*Genesis 41, 30-36*). The systematic consumption of available funds has, however, one important disadvantage in case that one uses information on the required drawdown duration from a less reliable source than Joseph did: The available funds decline with time and may be exhausted earlier than required.

In the context of the modern funded pension payout phase the retiree may live longer than originally expected and still be alive at the time when all pension savings are already spent. The asset management solutions have no pooling of mortality risk and therefore no survival credit, which, for the survivors, may enhance the returns. The duration of the withdrawal depends on the original amount of the funds available, on the amount of the periodic withdrawals and on the return on the remaining funds during the withdrawal period. For the purposes of old age financing, the amount of the periodic withdrawal should depend on the remaining life span of a specific individual. In contrast to an average life span of a relatively numerous group of individuals of the same age, it cannot be reliably predicted, however. Box 2.5 gives a numerical example of a simple drawdown with a pre-determined duration. It shows the importance of investment results for assessing the periodic payments and the consequences of mistakes in establishing the target duration.

The example in the box 2.5 illustrates the main advantages and disadvantages of the non-pooled solutions. First, the drawdown plan gives the retiree a flexibility to change the payout pattern in order to best fit his needs. In case that unexpected liquidity needs arise, additional

[22] *Hu/Scott* 2007.

funds can be converted into cash. During the payout period, the retiree can control the investment and divestment process. For certain constellations such as high investment results for a drawdown investment and low mortality credit, coupled with a lesser investment result for a pooled solution, it may offer higher income as compared to a pooled solution. The drawdown product can, through the freedom of investment, offer inflation protection and bequest potential. The main advantages of asset management payout solutions are outlined in the table 2.5.

Box 2.5: Example of a drawdown plan with a pre-determined duration

Suppose, an individual has an original capital of EUR 100.000. The capital can be invested in a risk-free asset, earning an interest of 2% per year. The individual wants the drawdown to last exactly five years. At the beginning of each year, the individual withdraws the specified periodic amount, and leaves the rest invested. The individual has three choices:

In the case of an **income plan,** the retiree consumes only the yearly income flow from interest rate payments (2,000) and keeps the principal (100,000).

In the case of a **drawdown plan**, the first periodic payout of EUR 20,000 is determined by dividing the original amount by 5 target years. Depending on how interest rates are used the retiree has another two choices: One choice is to leave the payout constant through the duration of the drawdown. In this situation, the investment of the capital, not needed for payout purposes, leads to EUR 4,246 remaining after the five drawdown years, and being available for use during the year 6.

The second choice is to re-establish the periodic payout annually, depending on the available funds and the remaining target duration. In the first year this method leads to the same periodic withdrawal amount of EUR 20,000. In the following years, however, the periodic withdrawal amount increases. At the end of the target duration the capital is fully exhausted.

Capital available for drawdown in the beginning of the year Initial capital EUR 100,000; interest rate 2%			
Year	Income plan	Drawdown plan over 5 years	
		No adjustment of the periodic withdrawal amount	Adjustment of the periodic withdrawal amount
	Periodic payment at the beginning of the year, EUR		
1	2,000	20,000	20,000
2	2,000	20,000	20,400
3	2,000	20,000	20,808
4	2,000	20,000	20,224
5	2,000	20,000	20,649
	Sum available after the targeted drawdown period (end of the year 5), EUR		
	100,000	4,246	0

Table 2.5: Overview of the main pros and cons of pure drawdown products

Advantages	Disadvantages
- Potential higher payouts due to enhanced investment returns - High liquidity and flexibility to react to unexpected changes in consumption habits or health status - Tailoring of cash flows to suit the individual's particular circumstances - Retaining control over retirement assets - Bequest possibilities	- No longevity protection - No complete investment risk protection - No survival credit

The outlined advantages of non-pooled, asset-management products seem to be very important for current and prospective retirees: The examples of *Pensionsinvestmentfonds* in Austria and, to a certain extent, of the *PERP* in France illustrate that people are willing to forgo considerable monetary bonus and tax advantages offered by the state for members of those programs in order to retain control over their funds and avoid enforced annuitisation.

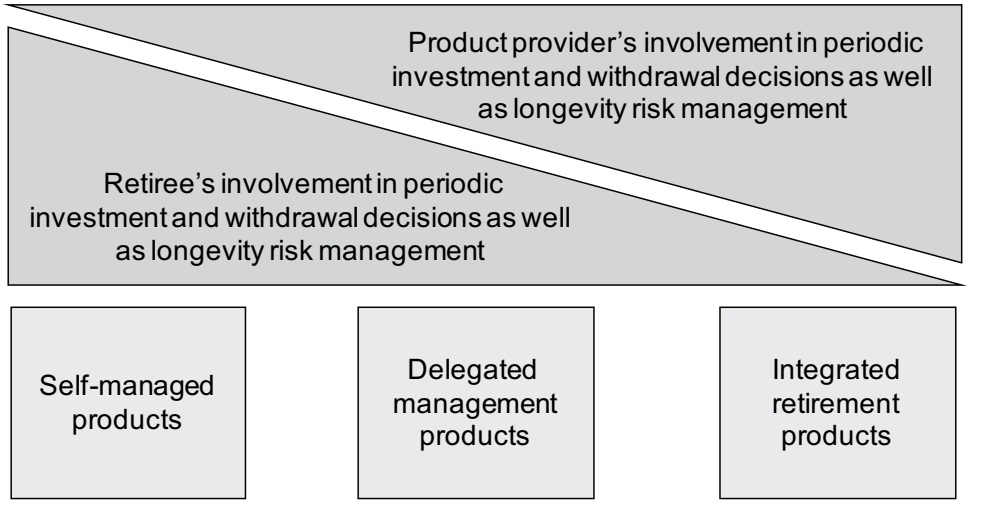
The main disadvantage of the asset management solutions during the payout phase is the risk of outliving the available assets due to the poor investment performance of the funds or due to excessive withdrawals. However, the exposure to such kind of risk can be effectively managed by choosing appropriate spending rules. There is a cross-country agreement among the asset managers about the main features of the drawdown retirement products which their customers like or would like to have. It is a product offering the virtues of flexibility and active asset management in retirement, combined with some level of guarantee with regard to the minimum income.

The proposed solutions to the guarantee requirement, which will be discussed in the next sections, focus on innovation, ranging from integrating two separate products – a drawdown product and insurance - into one retirement phase contract, to the provision of guarantees by the asset management company. They provide the customer with a range of choices regarding the desired security level including the option of guaranteeing a specified minimum for all contracts.

2.2.2. Typology of main drawdown product groups and primary sources of funds

Across surveyed European countries and the USA, a range of asset management solutions for retirement funds can be found. Three major groups aimed directly at retirees can be identified. The groups differ by the degree of the retiree's active involvement in the periodic investment decisions and the structuring of the withdrawal process, as shown in figure 2.6. In all three groups, the actual management of the retirement capital lies with the asset management company.

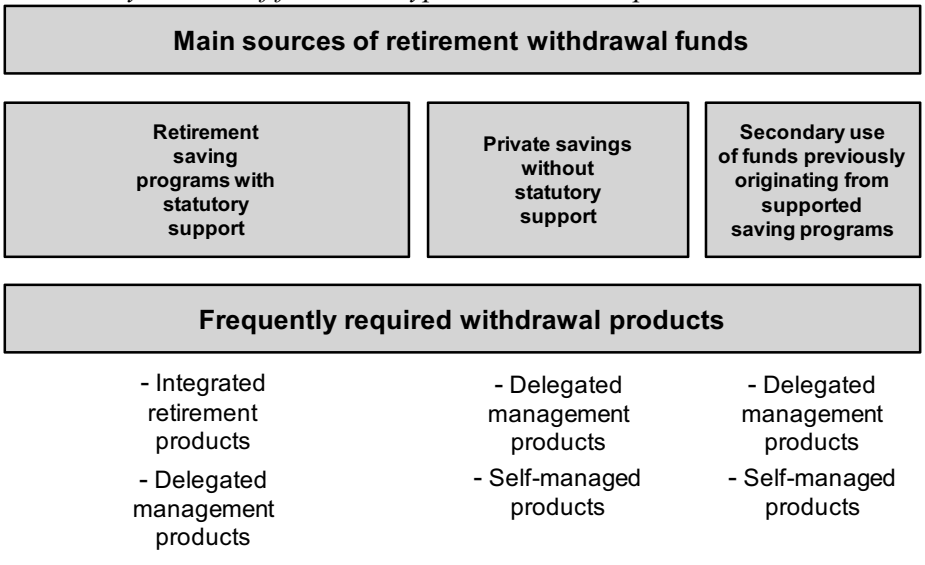
Figure 2.6: Classification of the retirement withdrawal products



The use and the popularity of products within each group largely depend on the origin of the retirement funds; whether they directly come from tax-sponsored old age saving schemes, result from private savings without tax-support or come indirectly from the tax-sponsored old age saving schemes in the form of previously taxed lump-sum payments.

Figure 2.7 summarises the main sources of funds for retirement withdrawal products and the types of products usually required by the prospective customers for each fund's source. Tax-supported old-age saving schemes could offer bigger business opportunities to the asset management companies due to the volume of funds accumulated and their growth prospects. The access to these funds is often restricted by the regulation and legislation. For funds, accumulated without any tax-support, or for funds, indirectly coming from the supported saving programs, there are usually no restrictions regarding the access to asset management solutions. Yet, funds are, as a rule, considerably smaller than the funds from tax-supported schemes, because the ability of individuals to save is limited by their disposable income.

Figure 2.7: Primary sources of funds and typical withdrawal products



Independently of the origin of funds or the degree of retiree's involvement into the decision-making and management process, a pure drawdown product consists of two main parts: an investment part and a withdrawal part. In the investment part of the product, a rule governing the choice of the assets must be defined. The assets available for payouts can be invested in a range of funds depending on the retiree's risk aversion, chosen payout rule and schedule, as well as the level of guarantees given to the retiree: stock funds, bond funds, money market funds, or their combinations. One investment possibility for a drawdown plan is to invest a fraction of the funds in an annuity product, similarly to the investment in bonds. In such case, the resulting product is called an integrated product and the main features of the purchased annuities have to be decided upon.

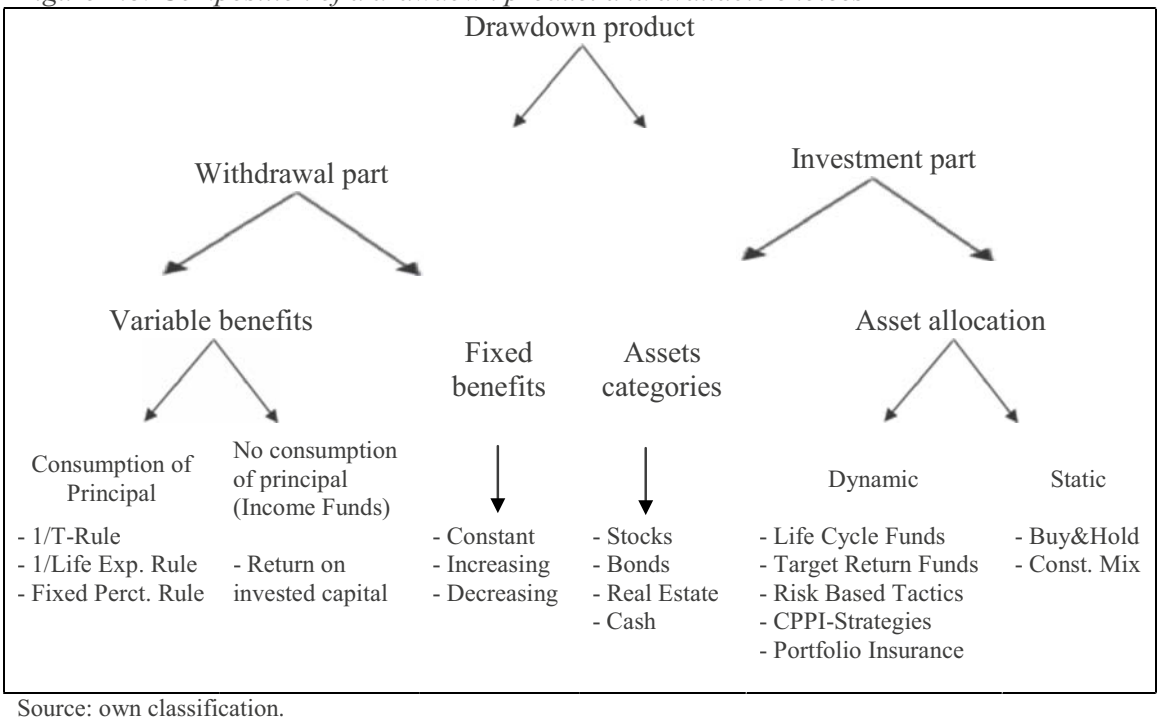
After the choice of the assets, a decision must be made regarding the management of those assets. In the simplest case, the asset allocation is static in terms of a buy and hold strategy or with a constant mix strategy, i.e. by rebalancing the portfolios with respect to a certain target allocation. The invested portfolio develops depending on the market performance of the funds and withdrawals undertaken. The implementation of a static strategy may lead to considerable deviations in the originally chosen risk exposure of the retiree's portfolio due to market developments and withdrawals. The frequent adjustment of the portfolio in accordance with a certain portfolio rule or to the actual and chosen risk exposure is called a dynamic investment strategy. Examples of rules based on dynamic asset allocation strategies are lifecycle funds which are specially designed to automatically reduce the (risky) stock exposure and shift funds into secure bonds (or annuities) with the progressing age of the retiree. Target return funds choose the assets in order to annually achieve the set return over a long period of time – they are especially important for payout solutions, which are designed to withdraw only periodic returns and not consume the invested principle. Risk based asset allocation strategies aim to dynamically manage portfolio risk in order to protect the portfolio or account value from falling below a certain floor. A well known version of such a strategy is the constant-proportion portfolio insurance (CPPI) strategy suggested by *Black/Jones* (1987). Hereby the exposure to the risky asset is set equal to the cushion times a multiplier. The cushion is defined at the beginning of each period as the difference between the current portfolio market value and the required threshold (floor). If the cushion is high (low) CPPI increases (reduces) the exposure to risky assets. CPPI is based on observable variables only, while shortfall risk-based strategy needs several input variables to be estimated and makes distributional assumptions (see also *Herold/Maurer/Stamos/Vo* 2007 for a further discussion). Yet, such strategies require complex monitoring and adjustment facilities and can be thoroughly implemented only by professional suppliers of payout solutions, whereas the static strategy can be set up by the retiree herself. The risk based dynamic strategy is especially important for payout solutions with guarantees by the asset management company and for integrated solutions, where the assets may be also gradually shifted into annuities.

The withdrawal part of the product can be first characterised by whether the withdrawals are fixed in absolute terms or may periodically vary. When the fixed withdrawals are chosen, the retiree receives a fixed, decreasing or increasing pre-determined amount as long as the plan lasts and there are enough funds in the portfolio. The variable withdrawals usually define a fraction of available funds which may be paid out. Here, a distinction can be made on the basis of whether the principle amount is touched by withdrawals. Withdrawal rules without the consumption of principle allow the maximum annual withdrawal only up to the annual return on invested principle and the investment funds may never be drawn down to nil. The withdrawal rules with consumption of principle can be designed to offer payments, determined as a constant, decreasing or increasing fraction of wealth, depending on the

retiree's preferences. The adoption of such rules may, however, lead to the intended or unintended situation, where at the end of the withdrawal period, or even earlier, the available funds are zero.

The knowledge about the composition of drawdown products and available options is important for both their potential users and suppliers. It enables informed choice and efficient comparison between the products on the one hand and the detailed analysis of the customer's needs, leading to better products, on the other hand. The next figure illustrates the described structures and options. A detailed description of products and withdrawal rules follows in the adjoining sections.

Figure 2.8: Composition of a drawdown product and available choices



Source: own classification.

2.2.3. Self-managed products

A central feature of the first group of retirement withdrawal products – *self-managed products* - is the active involvement of the retiree in the periodic investment decisions and in the structuring and commissioning of the withdrawals. The retiree can create personal investment portfolios according to his prevailing risk attitude from the funds offered by the asset management for the general public. Further, the retiree has full discretion regarding the frequency of the withdrawals, sources of withdrawals, and the amounts withdrawn. He should instruct the asset management company on those subjects before each withdrawal. Investors in this retiree-managed group of products bear full investment and income risk as well as the longevity risk. The asset management company provides its general asset management and account keeping services without or with only very limited support on the asset allocation of retirement assets or divestment decision support for its clients. It offers no guarantees to the customer. The products from this group are more likely to be used for the funds originating from sources other than the tax-supported old age saving programs.

Box 2.6: Example of a self-managed product

Investment part of the product: At the beginning of retirement the retiree decides what amount of investment risk he is prepared to bear and, through the asset management company, invests his capital in one or more mutual funds according to his risk preferences. During retirement he monitors the development of the funds, ensures that the risk profile of his investment portfolio corresponds to his risk preferences and initiates all necessary adjustments.

Withdrawal part of the product: The retiree instructs the asset management company about the time of payout, the absolute withdrawal amount and which part of the portfolio should be divested for the purpose of the payout.

2.2.4. Delegated management products

Within the second group – *delegated management products* - some of the retirement account management activities are allocated to the asset management company. Usually, some off-the-shelf features are offered to the prospective retirees. They facilitate and automate their decision-making process in the area of both investment and withdrawal management.

Currently, delegated management retirement products do not offer investment guarantees or full protection against longevity risk. Some of the offered withdrawal rules are, however, already able to reduce the risk of outliving the assets. Boxes 2.7-2.8 give examples of the delegated management products.

The investing process is usually facilitated as follows: funds for the retirees can be structured by the degree of the delivered annual income (high, low), by the degree of risk aversion (aggressive, balanced or conservative), or be life-cycle orientated. The funds within a delegated management group can offer (but do not guarantee) a target annual return.

Box 2.7: Example of a delegated management product - income fund

Investment part of the product: At the beginning of retirement the retiree places his available capital in a so-called income fund, created for retirement purposes. This fund invests in a balanced mixture of assets (e.g. stocks, bonds, cash) and targets a 4% annual investment return in the form of interest payments and dividends. No guarantee on the actual annual return or on the preservation of the invested principle is given.

Withdrawal part of the product: The capital earnings are automatically distributed to the retiree. The originally invested capital remains untouched by withdrawals.

Box 2.8: Example of a delegated management product - lifecycle fund

Investment part of the product: At the beginning of retirement, the retiree places his available capital in the lifecycle fund. This fund invests, at the beginning of retirement, in a mixture of stocks and bonds. With the progressing age of the retiree, the stock exposure of the fund is reduced in favour of bonds with high credit rating according to the specified scheme.

Withdrawal part of the product: The retiree agrees with the product provider on the payout rule and the frequency of payments. According to the agreed payout modes, the amounts due are automatically transferred to the retiree.

Also the withdrawal-making decisions can be made easier for the retiree. While with the self-managed product the retiree has to decide on the withdrawal by his own and frequently monitor the development of his funds, with the delegated management products the product provider offers some pre-packaged solutions and is able to demonstrate their risks, before the decision is taken. Generally, the major withdrawal rules can be classified by whether they deliver fixed or variable payouts.

The idea of a fixed benefit rule is to generate a steady or "smooth" yearly income stream from the retirement assets. To do so, each period (i.e. month, quarter, year) a certain amount is paid (adjusted to keep pace with inflation) until retiree dies or exhausts his retirement assets. This amount is already fixed at the beginning of the payout plan. The following box provides an example how this spending tactic works.

Box 2.9: Fixed payout rule

Fixed benefit rule

Payout = A fixed amount in EURO (as long available capital is positive)

Example: The 65 year old retiree starts with EUR 100,000 and wishes to withdraw at the beginning of each year EUR 5,043 until he dies or the retirement wealth is exhausted. The annual return on invested capital for the first year is 10%.

- At age 65 the payout is EUR 5,043
- At age 66 the remaining capital grows to (100,000- 5,043)*1.1 = EUR 104,453
- At age 66 the payout is EUR 5,043

In the example the yearly benefit is set equal to the payout generated by a life annuity with fixed benefits available for the same initial value purchased at the date of retirement. By doing this, we duplicate the steady benefits provided by a life annuity as long as the funds permit, while simultaneously retaining liquidity and bequest potential in the event of an early death. Yet, the risk of such a "self-annuitisation strategy" is that unfavourable investment returns coupled with longevity produce a situation where the remaining funds are exhausted and the retiree is still alive.[23] Clearly, a possibility to reduce the risk of running out of money is to decrease the constant withdrawal amount.[24] Yet, this creates lower consumption opportunities conditional on life and a large (unintended) surplus / bequest if the retiree dies.

An alternative spending strategy is to take variable withdrawals. Hereby, the retiree receives an ex ante specified fraction (the so called benefit-to-wealth-ratio) of the current account balance remaining each period. One the one hand it is unlikely that under this spending method the retiree exhausts his savings completely. One the other hand, the value of the retiree's fund is exposed to fluctuations in the capital markets. Therefore the benefit payments may fluctuate in tandem with the account value, and the annual benefits are less predictable,

[23] See also *Albrecht/Maurer* 2002, *Milevsky/Robinson* 2000, *Dus/Maurer/Mitchell* and *CRS* (2008).

[24] The question of how to set an appropriate withdrawal rate within a constant benefit rule is discussed by *Bengen* (1994, 1997), later by *Pye* (2000), and recently by *CRS* (2008). These authors suggest that new retirees could spend about 4 percent of initial wealth (adjusted for inflation) connected with a constant equity exposure in the range of 50-75 percent (also known as the "four percent rule of thumb" for retirement spending). Yet, as *Sharpe* et al. (2008) pointed out "Unfortunately, the 4 percent rule represents a fundamental mismatch between a riskless spending rule and a risky investment rule. This mismatch renders the 4 percent rule inconsistent with expected utility."

which "can make planning and budgeting more difficult" (see *CRS* 2008, page 27). Several options are available to specify the benefit-to-wealth ratio. Boxes 2.9-2.12 provide simplified examples of how the periodic payouts are calculated under the most common of the existing rules, i.e. the fixed percentage rule, the life expectancy or 1/E(t) rule, and the maximum age or 1/T rule.[25]

Box 2.10: Variable payout rule – fixed percentage rule

Fixed percentage rule / income rule

Payout = A fixed percentage of the available capital

Example: The 65 year old retiree starts with EUR 100,000 and wishes to withdraw at the beginning of each year 5% of the remaining capital. The annual return on invested capital for the first year is 10%.

- At age 65 the payout is 5% * 100,000 = EUR 5,000
- At age 66 the remaining capital growths to (100,000- 5,000)*1.1 = EUR 104,500
- At age 66 the payout is 104,500 * 5% = EUR 5,225

This spending rule has the advantage of simplicity, requiring no information regarding the maximum possible duration of the drawdown phase or the retiree's demographic characteristics. For example, the payout fraction can be chosen in a way that the payouts match the expected income (capital gains, interests, dividends) on the underlying assets (so called income fund). Alternatively, the payout fraction can be determined by dividing the annuity payout from a comparable annuity by initial available wealth.

Box 2.11: Variable payout rule – life expectancy rule

Life expectancy rule [1/E(t)] rule

Payout = Available capital / life expectancy (changing annually)

Example: The 65 year old male retiree starts with EUR 100,000. The annual return on invested capital for the first year is 10%. The retiree's remaining life expectancy E(*t*) at age 65 (age 66) according to a mortality table is 16.5 (15.75 years).

- At age 65 the payout is 100,000 / 16.5 = 100,000 * 6.06% = EUR 6,060
- At age 66 the remaining capital growths to (100,000 – 6,060) * 1.1 = EUR 103,334
- At age 66 the payout is 103,334 / 15.75 = 103,334 * 6.35% = EUR 6,561

This rule takes into account the retiree's remaining life expectancy – here denoted by E(*t*) - in a dynamic way. The shorter the expected remaining lifetime is, the higher the fraction that the retiree will withdraw from his retirement assets. The life expectancy rule is used in the USA under Internal Revenue Code during the payout phase of qualified IRA and retired owners of 401(k) accounts. The tax authority *requires minimum distributions* from these accounts to start after retirees attain age 70½ "to ensure that retirees consume their tax-qualified retirement accounts instead of leaving them as bequests for their heirs." [26]

[25] See also the discussion in the paper by *Dus/Maurer/Mitchell* (2005) and *Horneff/Maurer/Mitchell/Dus* (2007).
[26] See *Dus/Maurer/Mitchell* (2005) and *CRS* (2008).

Box 2.12: Variable payout rule – maximum age rule

Maximum age rule [1/T] rule

Payout = Available capital / (specified maximum age – actual age)

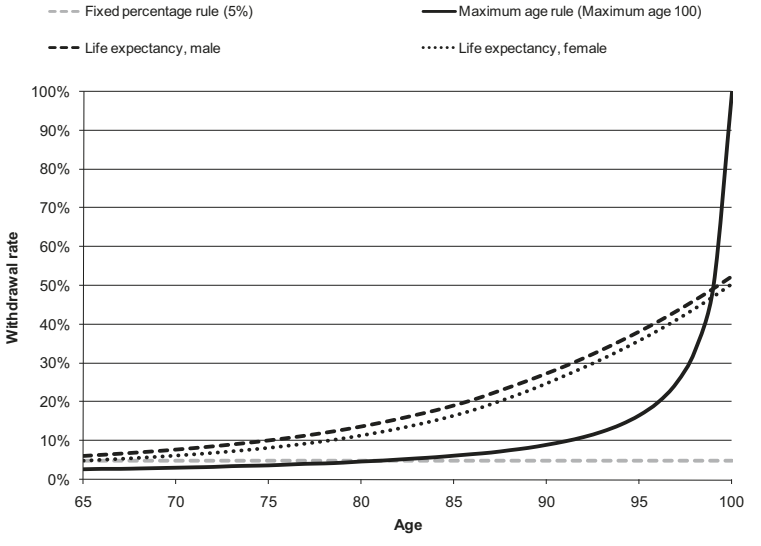
Example: The 65 year old retiree starts with EUR 100,000. The annual return on invested capital for the first year is 10%. The maximum age is 100, meaning the retiree can withdraw 1/36 ≈ 2.78 % (1/35 ≈ 2.86%) of the remaining capital at age 65 (66)

- At age 65 the payout is 100,000 / 36 = 100,000 * 2.78% = EUR 2,778
- At age 66 the remaining capital growths to (100,000 – 2,780) * 1.1 = EUR 106,944
- At age the payout is 106,944 / 35 = 106,944 * 2,86% = EUR 3,056

Finally, the maximum age rule specifies the withdrawal fraction according to a maximum possible duration of the drawdown plan. Possibilities are to use the oldest age in a mortality table, to fix it at the retiree's life expectancy as of his retirement date, or use specific age whereby additional income is provided by additional resources (e.g. from a deferred annuity).

Figure 2.9 depicts how the withdrawal rates under the selected three variable withdrawal rules evolve over time. At the beginning of retirement, the withdrawal rates for all withdrawal rules do not differ considerably and range between 3-6%. The withdrawal rate for the fixed percentage rule remains constant at 5% during the entire retirement. In contrast to this the 1/T-rule (maximum age rule) and the life-expectancy-rule show a rising payout fraction with age. The withdrawals according to the maximum age rule remain moderate in the area of 5% until the age of 86, when the withdrawal rate rises increasingly and reaches its maximum at the age of 100 (maximum age in the calculation). By contrast, the life-expectancy rule starts with a higher withdrawal rate, is less convex than the 1/*T* rule, and allows till the age 98 (for both male and female retirees) higher withdrawal rates.

Figure 2.9: Withdrawal rates for variable withdrawal rules as % of available capital



Source: Own calculation.

2.2.5. Expected benefits and risk characteristics for alternative payout patterns

The rate of withdrawal, however, is not a universal instrument in assessing how much the retiree is expected to periodically receive, especially compared to the main alternative – the annuity, as well as how the risk exposure and the principal amount evolve over time.[27] Figure 2.10 gives insights into this matter for a male retiree and selected withdrawal rules explained earlier. The retiree's portfolio is evenly (50/50 percent) split between a well diversified fund consisting of blue chips stocks and a fund consisting of government bonds. The asset allocation is constantly rebalanced to the split during the whole retirement period, which starts at the age of 65 and continues for maximum of 35 years until the age of 100. The development of the funds in the portfolio is assumed to follow a stationary geometric Brownian motion, which implies that the continuous real annual rates of return on funds involved are identically, independently and normally distributed.

We use two sets of means and standard deviations for our analysis: The first is derived from the inflation- and costs adjusted historic developments of the DAX index (representing the stock fund), and the REXP index (representing the government bond fund) for the period 1972-2007. In this case the real average discrete annual return per year on the stock (bond) fund is 10.24% (3.45%) with a volatility of 27.53% (5.32%). The correlation between the two asset classes is 0.16. The second set represents more conservative assumptions: the return on the stock fund is 6% with volatility of 18% and the return on the bond fund is assumed to be risk free at 2%.[28] The cost load for the purchase of funds is in all cases 4% of initial capital.

As shown in *Dus/Maurer/Mitchell* (2005) in the case of the variable drawdown plans it is possible to derive the probability distribution (conditional on survival) of future payouts conditional on survival of the retiree. Therefore is also possible to calculate expected benefits and various risk measures analytically. For the fixed payout rule we use Monte Carlo simulation techniques based on 100,000 paths. Specifically we calculate the expected benefits a drawdown program generates if the retiree survives until ages 66 to 100. For the purposes of better comparison, the expected benefits are set in relation to the fixed life annuity, which starts immediately at retirement and is purchased with the same initial principal. The annuity is calculated on the basis of German annuitant's DAV 2004 mortality table, adjusted for inflation and includes a cost load of 4%. As a risk measure we calculate the shortfall probabilities that at a certain age the withdrawals is smaller than the payment provided by the immediate life annuity starting at age 65. Further we calculate the expected remaining assets (i.e. the bequest potential) under the various spending tactics, conditional on death.

Panels (a), (b) and (c) of figure 2.10 show the risk and benefit measures for the history based return and volatility assumptions, panels (d), (e) and (f) – depict the conservative return and volatility assumptions. Table 2.6 gives an overview of the parameter settings used in our risk analysis.

[27] A broadly similar procedure is used to access the risk of running out of money for different withdrawal rates and portfolio compositions by *CRS* (2008), p. 18-26.
[28] In our optimisation analysis, presented in chapter four we also use these conservative parameters.

Table 2.6: Parameter settings for benefit/risk-analysis of drawdown products

	History based assumptions		**Conservative assumptions**	
	Stock fund	Bond fund	Stock fund	Bond fund
Real mean return (in % p.a.)	10.24	3.45	6.00	2.00
Volatility (in % p.a.)	27.53	5.32	18.00	0
Correlation	0.16		0	
Calculated characteristic figures, for age 65-100	Expected payouts Shortfall probabilities relative to annuity benchmark Expected (remaining) capital			
Panels of figure 2.10	(a), (b), (c)		(d), (e), (f)	

We have now a closer look at the characteristic figures, derived by using the history based return and volatility assumptions: At the beginning of retirement all drawdown rules, with the exception of the maximum age rule, deliver expected benefits in line with the annuity (see panel (a) of the figure 2.10). Both the fixed payout and the fixed percentage rules provide payouts in line with a benchmark annuity payment by construction from the beginning of retirement up to the age of 70. After that age, the fixed percentage rule delivers increasingly higher expected payouts, reaching the level of 150% of the benchmark annuity around the age of 100. The expected payouts from the fixed payout rule remain at the benchmark annuity level until the age of 80 and then start to decline, reaching the level of 70% during the last years of the product's life.

The payouts with the maximum age rule (maximum age of 100) start at the levels 50% lower than the annuity payment, but progressively increase with the passage of time. After the age of 80, this rule delivers considerably higher payments, which at the age of 99 are five times bigger than the chosen benchmark.

The life expectancy rule (male) leads up to the age of 87 to higher expected payouts than the annuity. After that age, the payouts begin to decline and after the age of 95 on average lead to the payouts being less than 10% of the annuity benchmark if the retiree survives that age.

The riskiness of the respective payout strategies over time can be measured by the shortfall probability. This measure shows the probability that at the particular age the payout from an asset-management solution would be less than the benchmark annuity payment. Panel (b) of figure 2.10 shows that up to age of 80, the fixed payout rule produces almost with surety the same payouts as the annuity. After that age the shortfall probability starts to increase, reaching 30% at the age of 100. This development is in line with the development of the expected payouts in the panel (a).

The life expectancy rule (for males) shows approximately the same tendencies as the fixed payout rule, but at considerably different starting level of shortfall: Till the age of 80, the shortfall measures remain at the levels of under 20%, and then start to quickly rise: Already at the age of 90, the shortfall probability is over 80% and reaches 100% at the age of 92.

The most stable shortfall risk of approximately 50% during the whole retirement period is associated with the fixed percentage strategy, which starts at the same level as the annuity and delivers relatively stable expected payouts over time.

While shortfall probabilities for three of the surveyed rules result mostly from the unfavourable development of the investment portfolio and the payouts, the high shortfall

probabilities for the maximum age rule at the beginning of retirement are caused by the design of the rule. The payouts resulting from that rule in the first ten years of retirement are smaller than the benchmark annuity, although available funds would support higher payouts.

The development of expected disposable capital is an additional source of information about the analysed drawdown plans: This is the amount left year after year for future payouts and / or bequest, which in our study, for reasons of better comparison, is set in relation to the initial capital available at the beginning of retirement. For life expectancy rule, the average principle starts to decrease right after the beginning of retirement. After the age of 80 it falls below the 50% level, and becomes close to zero from age 90 onwards.

For the fixed percentage, the fixed payout and the maximum age rules an increase in average principle can be observed at the start of the drawdown plans, as shown in the panel (c) of the figure 2.10. When the maximum age rule is used, the decline in average principle begins at the age of 87, while growth continues for the drawdown plans using the fixed payout and fixed percentage rules. At the age of 100, the expected disposable capital grows to 150% of the initial capital for the fixed percentage rule and to 300% when the fixed payout rule is used.

The results however, are quite sensitive to the chosen return and volatility characteristics of the portfolio and their relation to the chosen withdrawal rates or amounts. Panel (f) illustrates this. The reduction in the assumed average rate of returns and volatilities turns ceteris paribus the pronounced growth of the remaining principle observed in the panel (c) into a reduction for the fixed percentage and fixed payout rules and shifts the graph for maximum age rule down with minor shape changes.

All in all, the use of conservative risk/return-assumptions of the underlying funds reduces expected payouts and raises the shortfalls for all withdrawal rules, as is shown in panels (d) and (e). Irrespective of the assumptions about the return on the withdrawal portfolio, the life expectancy rule seems, especially in the later retirement years, to have higher shortfall risk and lower disposable remaining funds compared to other analysed withdrawal rules. This finding, however, should be evaluated in the context of the survival probabilities for the respective retirees. While our analysis was conducted under the assumption that the retiree reaches the age of 100, the statistical data shows that only a minority of those alive at their 65^{th} birthday really becomes older than 90.

The abovementioned data are calculated based on the German population mortality tables and are probabilities that a male individual, who is alive at his 65^{th} birthday will live to reach the age of 66, 70,…, and 100. Table 2.7 illustrates the characteristic figures of a drawdown plan based on the life expectancy withdrawal rule and survival probabilities for representative ages. The initial principle is EUR 100; the benchmark annuity payment is EUR 5.04.

Table 2.7: Risk and benefit measures of a drawdown plan based on life expectancy rule

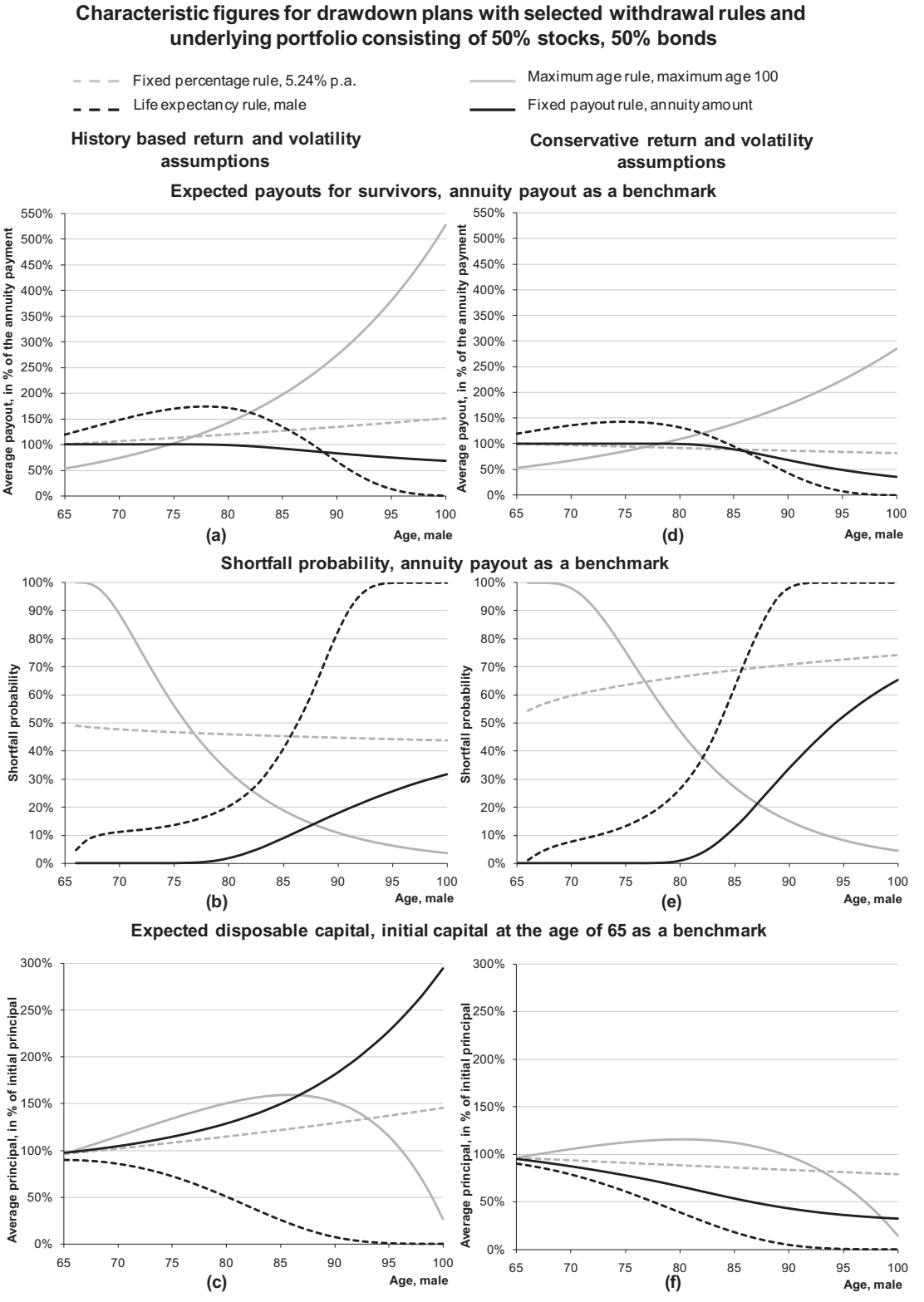
	Age 65	**Age 70**	**Age 80**	**Age 90**	**Age 100**
Survival probability (male, age 65 until age ...)	100%	90%	57.1%	16.3%	0.5%
Expected payout, life expectancy rule, EUR	6.02	7.47	8.67	3.39	0
Expected payout, % of benchmark annuity payment	119.4%	148.2%	171.9%	0.67%	0%
Payout shortfall probability, annuity payout as a benchmark	0%	11.25%	20.36%	82.52%	100%
Expected principal, % of initial principal	90.13%	85.89%	50.61%	7.29%	0%

Source: own calculation. Survival probabilities are reported for the 2003/05 German population table; capital markets parameters for the 50/50-equity/bond portfolio are based on historical time series according to table 2.6.

Furthermore, in respect of all withdrawal rules and portfolio returns, it should not be forgotten, that the composition of the portfolio considerably influences the expected payouts, the shortfall probabilities and the expected principals. In our analysis, the portfolio is evenly divided between stocks and bonds during the whole lifetime of the drawdown plan; however, the reduction of the stock exposure, especially when the retirement progresses, may stabilise the expected returns.

Figure 2.10 demonstrates, that investment-based retirement products give the retiree a good chance to participate in the development of the capital markets during the retirement and, as a result, to increase the available periodic payouts, and to enjoy the flexibility. They offer solutions, which may be more lucrative for the retiree, especially at the beginning of retirement. The simple investment-based retirement products, however, also contain risks to receive less, as compared to the full annuitisation of the funds, or even to completely outlive the funds especially in the retiree's advanced years. These risks can be managed not only by choosing the appropriate withdrawal rule (for example, maximum age rule), but also by using the co-called integrated retirement products.

Figure 2.10: Modelling drawdown plans based on selected withdrawal rules



Source: Own calculation.

2.3. Description of integrated retirement products – life annuities and drawdown

2.3.1. Basic design and features

The products within the third group – *integrated retirement products* – show a high degree of standardisation. During the payout phase, they may include guarantees from the asset management company as to the investment return, the amount of withdrawal or to the length of payment. An integral part of those products is a contract with a life insurance company, offering an effective longevity coverage either in the form of a deferred annuity bought immediately on retirement or immediate annuity bought at the certain age. The products from this group are most commonly used for funds originating from the tax-supported old age saving schemes.

Integrated products were created to overcome the disadvantages associated with annuities and simple drawdown products by combining the positive features of both solutions. On the one hand, the drawdown part of the product allows direct participation in the capital markets' investment returns and thus retains potential for higher lifetime consumption, gives the retiree control over the investment and the use of funds as well as flexibility to react to the unexpected changes in consumption habits or health. On the other hand, the annuity part of the product can guarantee certain minimum level of periodic income either during the whole retirement period or, depending on the structure of the product, starting at the certain age (like 85). Combining the pooled and the non-pooled solution within one integrated product benefits the retiree by possibilities of fine tuning of both instruments to seamlessly suit. Within this group, the creation of a more favourable environment in regulatory, legislative, and social terms could result in a distinctive supply increase and a surge of new products.

The suppliers of integrated retirement products could be both asset management companies and the insurers: The main difference of the integrated retirement product to the variable annuity is that the former bundles cash flows from capital market investments and the annuities on an individual basis, while the latter has an investment component firmly anchored within the pooled solution framework. For the retiree, the issue of which financial institution is the end supplier of integrated product does not affect the economic functioning. For institutions participating in the production, the role of the end supplier may mean the ability to receive higher margins, but also the need for expensive distribution channels and complicated account management. The role of the subcontractor may mean high degree of dependency from the end supplier, but give the ability to do without own retail distribution channels and to concentrate on the core business. Box 2.13 provides an example of how an integrated retirement product may be structured.

Box 2.13: Example of an integrated retirement product

Investment part of the product: At the beginning of retirement, the retiree places his available capital in the retirement fund or a mixture of funds according to his risk preferences and/or return targets. The product provider helps him to assess his risk attitude and has funds suitable for the main risk categories. Among other options, the lifecycle funds can be offered.
Depending on the rules of the pension program, the product provider may offer guarantees in respect of the investment return (*return guarantee*) or in respect of a minimum amount available for withdrawal (*temporally income guarantee*). The retiree's freedom of choice for risk characteristics of his investments is then restricted to comply with the offered guarantees.
Product provider ensures that both the withdrawals and the developments of the capital markets do not disturb the agreed relative portfolio composition and comply with individual risk preferences of the retiree by monitoring the development of the retirement account daily and automatically making adjustments when they become necessary.

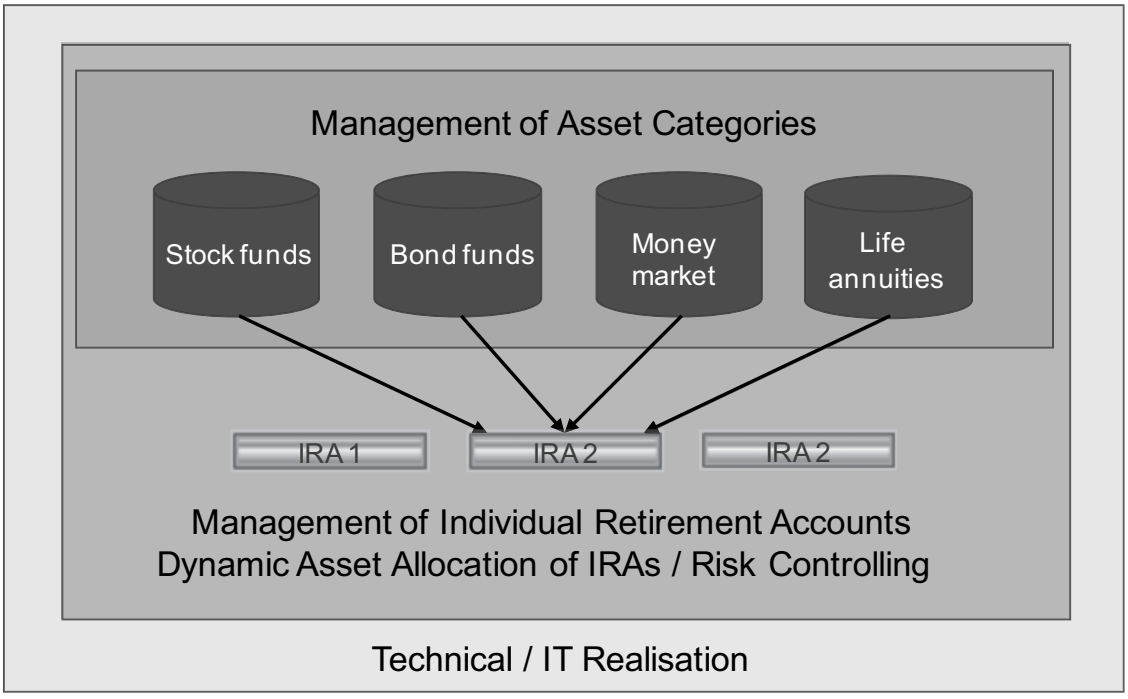
Annuity part of the product: At the beginning of retirement, a deferred annuity is bought with a part of the retiree's capital from an insurance company. The regular annuity payouts start when the retiree reaches the agreed age (for example, 85) and may either replace or complement the withdrawal plan.

Withdrawal part of the product: The retiree agrees with the product provider the payout rule and the frequency of payments. Payout rules and / or the methods to estimate the absolute periodic payout may be set by the pension scheme. The retiree may then make choices only within the allowed regulatory framework. According to the agreed payout modes, the amounts due are automatically transferred to the retiree.

Level of guarantees: The level of guarantees may differ from guaranteeing the minimum investment return to guaranteeing the minimum periodic payout. The guarantees can be either bought from the third party, such as bank or insurance company, or backed directly by the asset management company. In the last case, the asset management company must meet the risk-based capital requirements.

For asset management companies offering both integrated and delegated asset management products, the technical realisation of individual retirement account management and risk control becomes an issue of ability to supply further complex innovative solutions and maintain the competitiveness in the retirement market. The ability to monitor in a cost-effective manner the development of individual retirement accounts and to make timely adjustments to them, depending on the development of the financial markets, the retiree's individual goals, and risk attitudes, can be directly translated into the ability to create competitive products. Companies whose strategy is to further develop their retirement business, especially the segment of statutory supported retirement programs, have already heavily invested in their information technology infrastructure. The procedure of such account management is illustrated by the figure 2.11.

Figure 2.11: Technical and IT realisation of management and risk controlling goals for individual retirement accounts



Each individual retirement account (IRA) in figure 2.11 is invested in a mix of stocks, bonds, life annuities or money market instruments according to risk preferences of the retiree, and the risk-management needs of the product provider especially where the latter offers some protection (e.g. income or minimum return guarantee) to the retirees. The original composition of the portfolio can be changed by withdrawals as well as by developments in the underlying financial markets. This may result in the need to dynamically rebalance the individual accounts in order to continuously preserve the agreed personal investment goals and risk levels, and to be able to offer the guaranteed protection. Due to the fact that especially integrated products offer a number of guarantees for the retiree, it becomes crucial for the providers of such products to monitor the development of each account and to adjust its composition as required. The specially designed algorithms allow this automated individual rebalancing, but require a sophisticated information technology infrastructure. The technical realisation of the algorithm as well as the design of the corresponding IT solution becomes an important competitive know how factor for the providers of the integrated products.

On the example of integrated product described in box 2.13, we demonstrate the effectiveness of integrated retirement products in managing the risks of running out of money during the retirement by simultaneously preserving the chances to benefit from the positive development in the capital markets and the ability to at least partly control the retirement funds. Similarly to the figure dedicated to pure drawdown plans, figure 2.12 shows the development of the annual payout over time as a percentage of the benchmark annuity, the shortfall probability and the average disposable principal for products using different withdrawal rules.

2.3.2. Expected benefits and risk characteristics for integrated products

In this section we analyse the benefit and risk characteristics of the integrated payout solutions. To do so, we combine the several payout drawdown options described in the previous section with a deferred annuity starting payments at age of 85. This annuity payment is equal to the amount, which would have been received by the male retiree, had he purchased an immediate annuity with all his available funds of EUR 100 at the age of 65. In our example, it is EUR 5.04 per annum. An annuity starting at the age of 85, paying the retiree EUR 5.04 and purchased at the age of 65, costs the retiree EUR 20.68. The remaining amount of EUR 79.32 can, after accounting for upfront cost loads of 4%, be invested in the drawdown portfolio. Thus accessible capital, available for further investment decisions of the retiree up to the age of 85, is EUR 76.27.

To model the payout implications of the alternative options, we calculate the expected benefits paths conditional on survival and compared them with the profile if the retiree annuitises all of his pension savings immediately at the beginning of retirement at age 65. Again we calculate also the shortfall probability to receive lower benefits than the annuity strategy, and the expected remaining assets (i.e. the bequest potential) under the various spending tactics, conditional on death.

Again we use both the historic (1972-2007) and the conservative assumptions about the expected return and volatility (see table 2.7). The calculation procedures and cost loads for both the withdrawal and the annuity part of integrated product are the same as for the analysis of the pure drawdown products.

Although for all withdrawal rules the commencement of annuity payments represent a considerable change in the financial situation of the retiree, in contrast to pure drawdown plans, the payouts of integrated products after the age of 85 cannot become lower than the benchmark annuity level. Insofar such a strategy creates a floor (or longevity insurance) for the retiree's later retirement years and prevents old age poverty. This floor is achieved by a product using the maximum age rule at the age of 85. The reason for that is due to the construction of the product, which sets the maximum age to 84 years, and thus determines the annual drawdown payouts accordingly. The life expectancy rule produces payments on average above the annuity level almost until the age of 100, though coming close to this level after the age of 95. The fixed payout rule produces mean benefits equal to the annuity until the age of 78; than the mean payments are decreasing until the age of 85, but from the age of 85 onwards they are higher compared to the annuity. The fixed percentage rule delivers considerably higher mean payments, as compared to the annuity benchmark, starting with the age of 85 and up to the age of 100. See panel (a) of the figure 2.12 for details.

During the first twenty retirement years, both the fixed percentage rule and the fixed payout rule offer payments in line with the benchmark annuity for most of the time. These payouts suffer a reduction in the couple of years immediately preceding the age of 85, but they never become less than 95% (for fixed percentage rule) and 71% (for fixed payout rule) of the annuity benchmark. After the age of 67, the life expectancy rule never falls below the relevant annuity, moving at levels of less than 150%, while the maximum age rule rises to more that 250% of the benchmark annuity at the age of 84 after the first five years of the plan offer lower payments.

The patterns of shortfall probabilities for the maximum age rule and the fixed payout rule are, after making corrections for smaller disposable principle, similar to that of the corresponding pure drawdown plans (see panel (b) of the figure 2.12). In the case of the maximum age rule, the lower target age (84 instead of 100) considerably reduces the shortfall probabilities, as compared to the pure drawdown plan. In the case of the fixed payout rule, the reduction of the disposable principle due to the purchase of the deferred annuity with absolute payout amounts remaining unchanged, leads to an increase in shortfall probabilities, as compared to the pure drawdown plan, after the age of 80. The reduction of the disposable principle caused by the purchase of a deferred annuity is also behind the change of the shortfall patterns for fixed percentage rule and life expectancy rule, as compared to the pure drawdown plan. For all withdrawal rules, the shortfall probability becomes zero on reaching the age of 85 by virtue of the construction of the integrated product.

The purchase of the deferred annuity reduces the disposable capital for integrated products using all analysed withdrawal patterns in comparison to the pure drawdown plan by the price of deferred annuity right at the beginning of withdrawals at the age of 65. The maximum lifetime of the drawdown plan within the integrated product and the reduction of the disposable capital lead to changes in the development of the expected principal for the maximum age rule and fixed percentage rule in comparison to the pure drawdown plans. The patterns for the life expectancy rule and the fixed payout rule remain largely similar to those of a pure drawdown plan (but on a lower level because of the cost for deferred annuity). The average disposable principle remains stable at the level of 75% in the setting of our analysis when the fixed percentage rule is used, and is exhausted at the age of 85 or 90 when the life expectancy rule or the fixed payout rules govern the integrated retirement product (see panel (c) of the figure 2.12).

The following table 2.8 depicts some numerical results on the risk and benefits measures for a specific integrated payout product. To do so we combine the 1/E(t)-rule with a deferred annuity starting benefits payments at age 85.

Table 2.8: Risk and benefit measures of an integrated payout product based on life expectancy withdrawal rule with a deferred annuity starting payments at the age of 85

	Age 65	**Age 70**	**Age 80**	**Age 90**	**Age 100**
Survival probability (male, age 65 until age ...)	100%	90%	57.1%	16.3%	0.5%
Expected payout, % of benchmark annuity payment	94,7%	117,5%	136,3%	153,4%	100,0%
Payout shortfall probability, annuity payout as a benchmark	0%	33,97%	35,68%	0%	0%
Expected principal, % of initial principal	93,74%	89,32%	52,64%	7,59%	0%

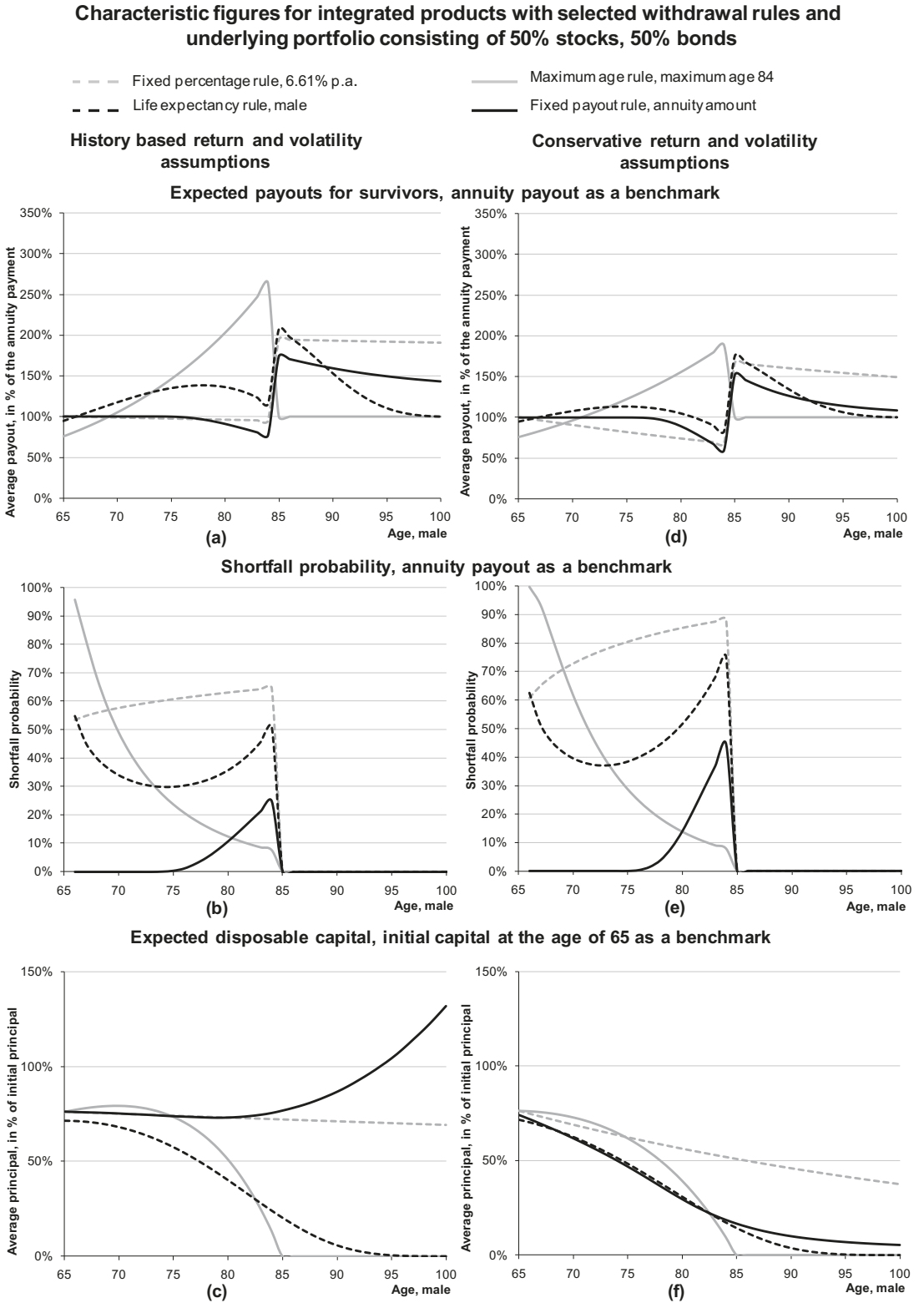
Source: own calculation. Survival probabilities are reported for the 2003/05 German population table; capital markets parameters for the 50/50-equity/bond portfolio are based on historical time series according to table 2.6.

A comparison between the tables 2.7 and 2.8 shows that an integrated product, based on a combination of life expectancy withdrawal rule and deferred annuity starting at the age of 85, has lower expected payouts in the first twenty years of retirement than a pure drawdown product, based on the same withdrawal rule. The purchase of a deferred annuity reduces funds accessible for withdrawal and, as a result, the payout shortfall probability is higher during the first twenty years of retirement as compared to the pure withdrawal product. However,

starting from the age of 85, the integrated product delivers considerably higher expected payouts, and the shortfall probability becomes zero. Thus, at the cost of lower income at the beginning of retirement, the protection against the old age poverty is bought by means of an integrated product.

It should be mentioned that the investment portfolio composition can play an important role for the risk and benefit patterns for the different payout programs. For our analysis, we have chosen a 50/50-percent portfolio allocation with constant rebalancing between stocks and bonds. The drawdown plan can, however, be managed on an individual basis, as illustrated by the figure 2.11, and have dynamic risk based asset allocation strategies for the drawdown part of the integrated product. It would be interesting to study in future research the impact of such a dynamic asset allocation strategies in more detail, especially when the product provider offers minimum income or return guarantees.

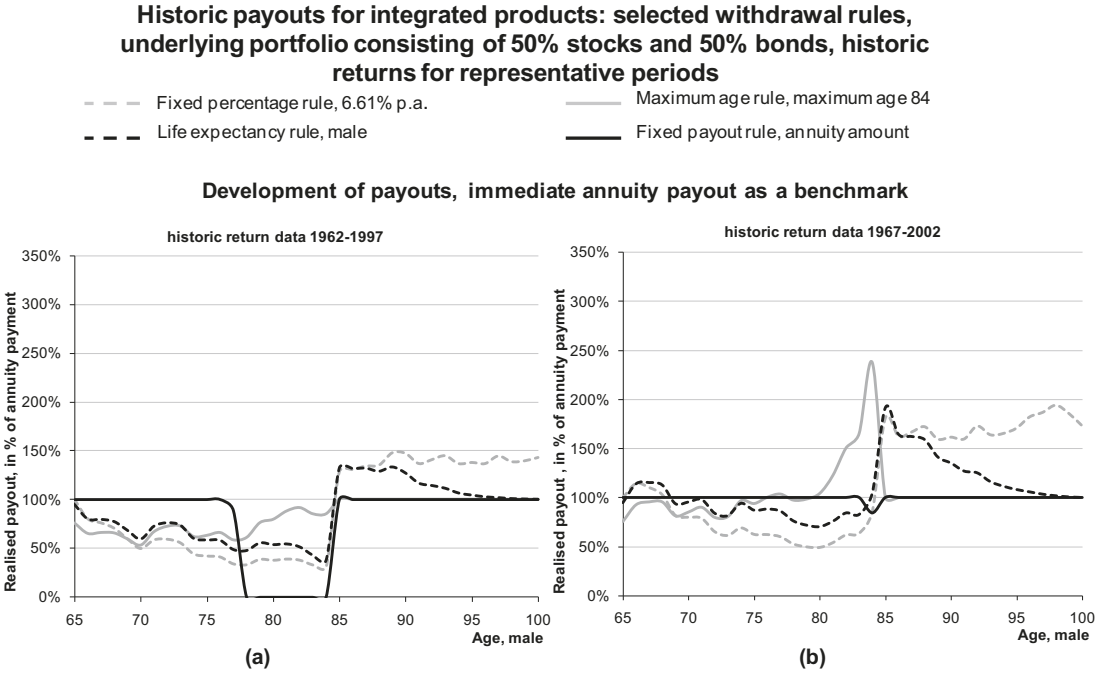
Figure 2.12: Modelling integrated products based on selected withdrawal rules



Source: Own calculation.

The assumptions about the investment portfolio's return and volatility are important for our analysis, as is shown in panels (d), (e), and (f) of figure 2.12. The practical implication of this is demonstrated in figure 2.13, where we show the historic payouts of an assumed integrated product, which starts the payouts in the year 1962 (panel (a)) and five years later, in 1967 (panel (b)): Starting the integrated drawdown plan 1962 results for the variable withdrawal rules in lower periodic payouts until age 85, as compared to the benchmark annuity. From age 85 onwards the benefits are higher, because the deferred annuity starts to pay. The fixed benefit rule pays until age 77, than seven years nothing, and from age 86 the same amount as the annuity benchmark. Starting the drawdown plan five years later, in 1967, results in no defaults at all and payments of no less than 50% of the benchmark annuity for any withdrawal rule till the age of 85. For the maximum age rule, these payments rise to more than two times the benchmark annuity at the age of 84.

Figure 2.13: Historic analysis of integrated products based on selected withdrawal rules



Source: Own calculation.

While standardised integrated payout solutions attempt to combine the advantages of two worlds – namely life annuities and drawdown plans - in a cost efficient manner, no one of the presented strategies is optimal for everyone. As noted earlier by *Dus/Maurer/Mitchell* (2005) and adopted recently in a CRS Report for Members and Committees of Congress (CRS 2008): "overall …. there is no clearly dominant strategy, because all involve trade-offs between, risk, benefit, and bequest measures, and individual preferences may vary."

2.4. Implementation of non-pooled solutions in the surveyed countries

Four out of the eight countries surveyed - Sweden, Switzerland, the UK and the USA - have longer traditions of providing for the old age through funded pensions, and already offer payout pension products. In the remaining countries – Austria, France, Germany and Italy – the funded pensions have a relatively brief history. In the USA and, to a lesser degree in the

UK, the prospective pensioners, at least theoretically, have more freedom in deciding about the use of their pension funds, whereby in the countries of continental Europe, the use of funds is more heavily restricted.

Except for the UK and the USA, which currently explicitly allow drawdown option for at least some of the tax-supported old age saving schemes, a drawdown as a means to structure retirement income remains a relatively new arrangement. The introduction of this withdrawal possibility usually coincides with the introduction of defined contribution schemes for the main occupational pension programs. Schemes of the defined benefit type are by their structure not eligible for a drawdown in any country. The drawdown options are traditionally available and widely used in the USA. The amounts directly drawn down out of the funds, accumulated with statutory support, are still negligible in all the surveyed countries except in the USA and, with a big gap, the UK.

We undertook 21 structured interviews with several asset managers and insurers in the surveyed countries aiming to provide some insights into the product landscape and market outlook as seen by the product suppliers. Interviewed asset managers in the majority of the surveyed countries consider their pensions business to be strategically important and expect it grow over time. It is anticipated to be the case especially if additional population or professional groups are to be allowed access to the supported old age saving programs suitable for the implementation of asset management solutions in retirement. Examples of such population groups could be civil servants or self-employed individuals.

From the perspective of asset managers, no real difficulties are expected to be encountered in obtaining the necessary human or technical skills required in order to expand the existing business and to create innovative new products. However, it is well understood that additional investments in financial (especially actuarial) skills, in the sales force (especially its education), and in the data processing infrastructure may be needed.

In Europe, some German asset management companies seem to be quite innovative in the area of integrated retirement payout solutions. Interestingly, the innovations were often sparked by the introduction of the state-supported old age pension programs (especially *Riester*-plans) and their specific requirements, as well as by regulation. Some of the existing solutions proved popular even outside the tax-supported programs and currently are sold through European branches to customers in other European countries as well. For example, two interviewed asset managers offer payout products which are based on individual account risk-management algorithms, i.e. each individual account is dynamically rebalanced across various mutual funds units (stock-, bond-, and money market funds). Typically, the drawdown plan stops at the age of 85 and a part of the initial capital is used at the beginning of the payout phase (e.g. age 60 or 65) to buy a deferred annuity with benefits starting at the age of 85. Until 85, the asset managers offer a minimum benefit level (sometimes based on legal guarantees) and some upside potential if the market value of the fund units increases sufficiently.

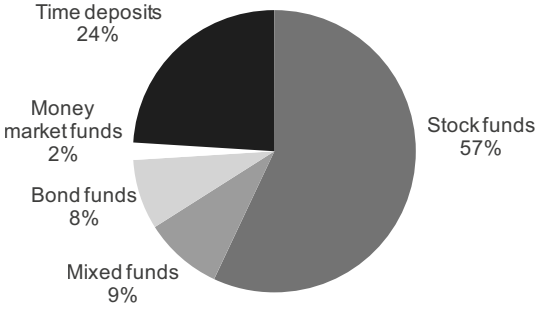
An interesting situation can be observed in North America: The pure investment management companies from the USA recognise the need for integrated products but are largely prohibited from creating them by the existing legislation. Current legislation requires that guarantees be offered only by the insurance institutions which in turn are subject to regulations varying largely from state to state. As a result, in the USA, insurance companies are the main

providers of highly innovative integrated products with a lot of protective and investment management options.

The tendency for insurance companies to offer asset-management solutions even in the absence of the strict legislative framework as observed in the USA can be seen in Europe as well. In some of the surveyed European countries, the insurance companies are starting to offer integrated products, where pronounced market leaders exist. Within the pooled solutions, insurance companies on both sides of the Atlantic seek to give their clients more freedom to decide about the investment of the funds and consequently they need asset management products for that purpose, and compete for clients with the pure asset managers. Variable annuity products, which allow both a "variable" saving and payout phase, exist in the USA. As previously mentioned in the product description of a variable annuity currently most variable annuity products in the USA are in the saving phase and have a lump-sum payout option. Figure 2.14 shows the distribution of the funds within a variable annuity product according to the type of investment. The stock funds comprise almost 60% of investment, while other types of funds account for 19%. Behind those investments lie all asset management products.

In Europe, pooled products giving the purchasers freedom to decide about the investment of the funds during the *saving* phase are called unit-linked or index-linked insurance. The performance of the designated funds determines ceteris paribus the amount of capital available for the annuitisation at the beginning of the payout phase and up to that point is similar to the variable annuity. The calculation of the annuity payouts is, however, done according to the traditional principle that the management of the insured's funds lies with the insurance company.

Figure 2.14: Variable annuities in the USA in 2004: Distribution of funds by type of investment



Source: *National Association for Variable Annuities* (2005).

In almost all surveyed European countries, the unit-linked business of life insurance companies is considerably smaller than the traditional insurance business (see table 2.9). However, the unit-linked insurance is gaining popularity among consumers and, similarly to the variable annuity product in the USA, requires asset management solutions for the production of the pooled product.

Table 2.9: Unit- (index-) linked insurance business in selected European countries

Country	Data for the year	Currency, billion of	Unit (index-) linked insurance annual premium income	Percentage of total insurance premium income
Austria	2005	EUR	1.6	22%
France	2005	EUR	27.2	22%
Germany	2006	EUR	9.0	12%
Italy	2006	EUR	27.4	39%
Sweden	2006	SEK	19.7	56%
Switzerland	2006	SFr	2.3	8%

Source: Own research, based on statistical yearbooks of the insurance industry in the respective countries listed above.

This abovementioned development broadens the implementation opportunities for asset management solutions. Among the innovative answers by the asset management industry to the recently introduced solvency requirements is the provision of the investment guarantee to the unit-linked insurance contracts by the asset-management company.

2.5. Summary of main findings

In this chapter, we looked at the payout solutions for funded pension schemes in further detail. We classified payout solutions using the characteristic of whether the retirees retain control over their funds after the purchase of the payout product, into pooled and non-pooled, and further by the degree of their standardisation. We showed the main characteristics of representative products and analysed their advantages and disadvantages; we indicated the possible use of these products in retirement portfolio and stressed the features, especially useful for the retirees. Our main findings are as follows:

- Pooled solutions offer protection against longevity risk, provide survival credit, but deprive retirees of flexibility regarding the use of funds. The degree of attractiveness of such products for the retirees largely depends on the mortality assumptions used for the product's calculation and one's individually perceived mortality. The purchase of pooled solutions is especially advantageous for retirees in the advanced age.

- Pooled solutions can offer a range of different product variations by nature of payouts, numbers of lives covered, waiting periods and the duration of payouts. Innovative, investment-linked pooled solutions (variable annuities) allow for both participation in the capital markets and a downside protection by preserving the longevity pooling component.

- Product coverage with pooled solutions in Europe remains quite high, originating from the statutory, employment-linked defined benefit plans and employment-linked or private programs of the defined contribution type. The voluntary use of annuities is low, however. This can be explained by both rational and behavioural reasons.

- Non-pooled solutions have the advantages of liquidity, individual flexibility, control over assets and potentially higher pensions due to high investment returns, but are subject to risk of outliving the available funds. Non-pooled solutions can have different degrees of the retiree's involvement in the daily capital management decisions.

- Adoption of different investment strategies and withdrawal rules allows variation of risk and return profiles on the investment portfolio as well as the different payout structures in retirement, thus enabling the retiree to custom-tailor the resulting cash flows. For non-pooled solutions, income and investment guarantees can be offered by product providers. Combinations with pooled solutions are possible both within the retirement portfolio and within a single product in order to successfully manage the longevity risk.

- Non-pooled solutions are not inferior to pooled solutions, especially when survival probabilities are taken into consideration. In Europe, however, they still remain a relatively unknown arrangement, with many relevant programs still in the saving phase. The amounts currently drawn down are small. In the USA, most retirement funds are used by means of periodic withdrawals.

- Overall there is no clearly dominant payout rule for everyone, since all involve trade-offs between, risk, benefit, and bequest with respect to individual preferences.

3. The environment for payout products in funded pension schemes

3.1. Description of current regulatory environment in the selected countries

3.1.1. The importance of retirement income from state pension systems

In this chapter, we look at the current environment for retirement payout solutions in selected representative European countries, with a particular emphasis on the regulatory framework. The European countries we examine are: Austria, Germany, France, Italy, Sweden, Switzerland, and UK. For comparison we also look at the United States. First, we describe the main funded pension programs in the surveyed countries, with a particular focus on the annuity cover and other payout-options they provide in the payout phase. Thereafter, we review the regulatory features and the motives underlying them. Finally, we assess the appropriateness of the current regulation of the payout phase.

The role, which personal and occupational funded pension schemes play in the overall pension systems of the different countries, is highly influenced by two issues. The first one is the quality of the statutory old age system, the amount of coverage it provides absolutely and in comparison to the earnings of the working population. The second one is the generosity of the social security arrangements, supporting those, who for whatever reason failed to acquire sufficient pension rights in the statutory or any other system.

Table 3.1 provides for the surveyed countries some information about the importance of the statutory national pension systems measured in terms of average *replacement rates* and *pension wealth.* The replacement rate is a ratio of the pension income over the earnings during the specified period of time. Pension wealth shows the size of the lump sum that would be needed to buy a flow of pension payments in the private market equivalent to that promised by the respective mandatory pension system.[29]

Table 3.1 shows that the national pension systems in continental Europe still provide quite generous benefits. In Austria, France, Germany and Italy statutory pension programs produce replacement rates of at least the OECD average of 69%, up to 93%. The pension wealth figures are all well above the OECD average and range between USD 221,000 and 273,000. The corresponding replacement rate figures for Sweden and Switzerland are at the OECD average, the figures for pension wealth being impressively above that threshold, especially for Switzerland. The calculations for these two countries, however, include the (quasi mandatory) employment-linked pensions, which can be considered to be an integral part of the pension systems in both countries.

[29] The numbers are calculated by OECD using a uniform discount rate of 2% and a country-specific life expectancy as projected for the year 2040. Additional statistical data about the importance of statutory pensions in the actual income of the already retired population in the surveyed countries are provided in Statistical data provided by: *Statistik Austria* 2005*, INSÉÉ* 2007*, Börsch-Supan/Wilke* 2006, *L'Istituto nazionale di statistica* 2004*, Statistics Sweden* 2007*, BFS* 2005b*, Office for National Statistics* 2007*, SSA* 2005.

Table 3.1: Net replacement rates and gross pension wealth for selected European countries and the USA

Country	Total Net Replacement Rate Base Case: 100% of Average Earning (Male)	Total Gross Pension Wealth (USD) Base Case: 100% Average Earner (Male+Female)
Austria	93%	273,000
France	69%	221,000
Germany	72%	262,000
Italy	89%	244,000
Sweden	68%	280,000
Switzerland	67%	400,000
UK	48%	172,000
USA	51%	183,000
OECD Average	**69%**	**202,000**

Note: The numbers for Switzerland are for both the statuary pubic as well as the mandatory occupational pension program. Source: OECD (2005)

In contrast, the UK and USA provide only a basic coverage in their statutory pension systems and relatively low social security old age benefits, therefore placing a high responsibility for the old age provisions directly in the hands of the individuals. As shown in the table 3.1 for UK and USA, the statutory pension programs replace only around 50% of the individual lifetime average net earnings. The pension wealth is about USD 172,000 for the UK and USD 183,000 for the US, thus being approximately 10% less than the OECD average, meaning that the retiree has to a much larger extent than in continental Europe to rely on the non-statutory, voluntary sources of financing retirement.

As already mentioned in section two the income streams during retirement from the statutory retirement sources are comparable with an inflation–linked joint life annuity. Insofar, the pre-existing coverage for retirees and their spouses with annuities is relatively high for Europe.

3.1.2. Regulation of the payout phase in funded pension schemes

In the surveyed European countries, funded pensions remain dominated by programs requiring at least some form of annuitisation. The explanation for this is twofold: On the one hand, the majority of the existing funded programs, as measured by the corresponding assets, are of the defined benefit type, which mostly implies a pooled payout solution at retirement. On the other hand, the European defined contribution programs are predominantly still in the beginning of the saving phase, they have not accumulated as much assets as the older defined benefit programs and have not commenced any mass payouts yet. Further, not all programs of the defined contribution type allow for non-pooled payout solutions at retirement. Thus, traditional pooled payout solutions (predominantly nominal fixed annuities) still remain the most used ones, depriving the retirees of the financial flexibility but giving them a guarantee for lifelong payments.

The regulation for old age saving programs in European countries is quite complicated, and often, even within one country, many different requirements and regulations as to the use of capital at retirement exist. Those programs, enjoying statutory support during the saving phase in the form of tax relieves or direct subsidies, are subject to payout restrictions in the

majority of the surveyed countries. Individuals who save for their retirement outside of tax-supported programs are, in all surveyed countries, free to use their funds as they see fit. Statistics show, however that on average, funds invested in the supported programs are, by far, bigger than the funds accumulated without such support. In countries where membership in funded programs is mandatory, the general ability of individuals to save is limited by their available income and thus not much scope is left for considerable savings outside the programs with restricted use of funds at retirement.

The exceptions from the observed multitude of regulations and requirements during the payout phase are the UK, where the same regulations apply to the tax-supported funded pensions payout phase independently of the origin of funds, and Italy (for new schemes in both countries, however).

Table 3.2 shows representative funded pensions programs for each surveyed country, provides information on the scheme's size, the actual payouts and any payout restrictions. It can be seen that in each country, there is a number of designated old age pension schemes currently open to the new members. The schemes in the table are sorted by country and within a country by the scheme's size, as measured by the respective assets. As a benchmark in terms of size, the relation of the program's assets to the assets of the country's life insurance sector is given. The life insurance sector was chosen as a size benchmark for a simple reason that, especially in the countries of the continental Europe, life insurance contracts were traditionally seen as a means to provide for the old age. They were available before the introduction of supported funded old age programs and currently include many of them, both in the employment-linked and private area. For example, this is the case in France (Article 83, Article 39, Madelin, PERP), Germany (occupational life insurance, parts of the Riester-program, Rürup-program), Italy (retirement insurance policies) and Switzerland (pillar 3a insurance). The detailed description of the payout options in funded retirement programs existing in each country, their design, and regulatory framework can be found in a*ppendix B.*

Table 3.2: Overview of representative funded pensions programs in selected countries

Name of representative old age saving program [a)]	Scheduled retirement payouts in 2007	Size of the program [b)], billion of assets / relation to life insurance sector [c)]	Annuity payout enforced / encouraged	Payout restricted by means of
Austria				
Pensionskasse	Yes	EUR 13 bn / (24%)	Yes	Regulation
Prämienbegünstigte Zukunftsvorsorge	No	EUR 2 bn / (4%)	Yes	Taxation, regulation, refund of subsidies
Mitarbeiter-vorsorgekassen	No	EUR 1 bn / (2%)	Yes	Taxation
France				
Article 83 of Code General des Impôts	Yes	EUR 28 bn / (3%)	Yes	Regulation
Article 39 of Code General des Impôts	Yes	EUR 19 bn / (2%)	Yes	Regulation
Madelin-Law	No	EUR 9 bn / (1%)	Yes	Regulation
PERP	No	EUR 1.3 bn / (0,1%)	Yes	Regulation
PERCO	No	EUR 0.6 bn / (0,05%)	No	None
Germany				
Pensionskasse	Yes	EUR 89 bn / (13%)	Yes	Regulation, articles of association
Occupational life insurance	Yes	EUR 45 bn / (7%)	No	Working agreement
Riester-Program	No	EUR 16 bn / (2%)	Yes	Regulation
Rürup-Program	No	EUR 2.5 bn / (0,4%)	Yes	Regulation
Pensionsfonds	Yes	EUR 1.2 bn / (0,2%)	Yes	Regulation
Italy				
Closed Funds	No	EUR 9.3 bn / (2%)	Yes	Regulation
Retirement insurance policies	No	EUR 4.5 bn / (1%)	Yes	Regulation
Open Funds	No	EUR 3.5 bn / (1%)	Yes	Regulation
Sweden*				
Occupational	No (for new schemes)	EUR 156 bn / (90%)	Yes	Collective agreement
PPM	No	EUR 18 bn / (10%)	Yes	Regulation
Individual pension account	Yes	EUR 5 bn / (3%)	No	None
Switzerland*				
Occupational	Yes	EUR 310 bn / (220%)	Yes	Regulation
Pillar 3a insurance	Yes	EUR 97 bn / (69%)	No	None
Pillar 3a restricted accounts	Yes	EUR 0.26 bn / (0,2%)	No	None
UK*				
Occupational (all types)	Yes	EUR 937 bn / (55%)	Yes	Regulation, articles of association
USA*				
Total IRA	Yes	EUR 2,384 bn / (76%)	No	None
Total 401(k)	Yes	EUR 1,625 bn / (52%)	No	None

*Notes: data on exchange rates as per 23.03.2008 as published by the Financial Times.
a) Programs open to the new entrants participants, without government employees.
b) The data on size of the programs is based on the latest available information ranging 2003-2006.
c) Figures in brackets show the assets of the respective program as percentage of the assets in the life insurance sector.
Source: Own calculations, data from Österreichische Finanzmarktaufsicht (2006), Fédération française des sociétés d'assurances (2006), GDV (2007), Covip (2006), Statistics Sweden (2006), Schweizerische Nationalbank (2007), GAD (2004).

In four countries – Austria, France, Germany and Italy, the assets of all designated old age pension schemes are quite small as compared to the country's life insurance sector. In the USA, the UK and Switzerland, the assets of at least one program are comparable to the size of the life insurance sector. In Sweden, the assets of the occupational pension schemes are approximately of the same size to those in the life insurance sector. The bulk of corresponding assets, however, belong to the pension obligations of the old type, allowing only traditional pooled products in the payout phase. Especially small for their respective countries, are the funds allowing unrestricted use of alternative payout solutions such as PERCO in France, individual pension accounts in Sweden and pillar 3a restricted accounts in Switzerland.

The majority of the schemes are still in the saving phase. Scheduled mass payouts are taking place for all types of programs in the USA, UK and Switzerland. In Sweden, the mass payouts from the occupational schemes of the old type, allowing only lifelong pooled solutions during the payout phase, are taking place. The payouts also take place from the non-regulated individual pension accounts, whereas the funded statutory part of Swedish old-age system (PPM) is still in the saving phase.

Of all surveyed countries, only the USA has no restrictions on the use of the payout instruments during the retirement. Rather, the potential pensioners have a lot of freedom regarding the use of their retirement funds and only a minority of them purchase annuities. In other countries, the annuity payouts are either enforced by regulation (by prescribing annuitisation of the funds) or implicitly encouraged by other means, such as taxation. In Austria, the refund of subsidies is additionally required for *Prämienbegünstigte Zukunftsvorsorge*, if at retirement the funds are not annuitised. In Germany and Sweden, restrictions on the use of retirement capital may be imposed for certain programs not by the statutory legislation, but by articles of association of the pension product providers and collective agreements.

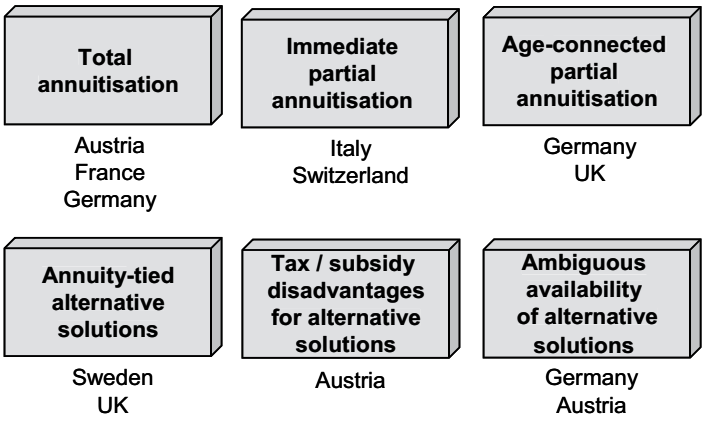
3.1.3. Classification of restrictions on the use of funds in the payout-phase

The constraints on the use of capital in the retirement phase can be imposed by using either of the following two instruments:

- Outright restrictions, prescribing the use of funds at retirement
- Implicit restrictions, using taxation, other penalties, legal or regulatory uncertainties as a means to channel the demand for payout products in the desired direction

The outright restrictions are used by the majority of the surveyed countries, mostly prescribing the use of traditional pooled products (annuitisation) during retirement and such restrictions may take many forms. Implicit restrictions also play an important role, but are not as obvious. The restrictions on the use of funds during the payout phase found in the surveyed countries can be classified as outlined in figure 3.1.

Figure 3.1: Classification of the restrictions on the use of funds during the payout phase of funded pensions



The first box in the first row of figure 3.1 describes the situation where the regulation of the corresponding scheme requires full annuitisation of funds directly at the beginning of retirement. Examples of countries having such regulations are Austria (Pensionskasse), France (pension programs by Article 83, Article 39, Madelin-Law, PERP) and Germany (Rürup-programs).

In some countries, the strong total annuitisation requirement is softened (boxes two and three in the first row): Immediate *partial* annuitisation is for example the case for occupational savings in Switzerland or for funded pension programs under new regulation in Italy. Partial annuitisation of the funds may not be required immediately, but when a certain age is achieved by the retiree, such as 75 or 85 (box age-connected partial annuitisation). This type of restriction on the use of funds at retirement can be found in Germany (Riester-programs) and in the UK (for all tax-supported funded pensions).

Usually, the age-associated partial annuitisation complements additional rules on the spending of funds and the qualities of the non-pooled solutions employed before the enforced annuitisation. This is done to ensure that funds are available for annuitisation at the required age, most often by tying the drawdown rule to an annuity factor[30]. The authorised annuity factors may either vary annually with the progressing age of the retiree, or be fixed at the beginning of retirement. The resulting periodic payments required from the non-pooled products are either calculated using the relevant annuity factor, or may vary between specified fractions of it (for example, between 30% and 90% of the relevant annuity factor).

The first box in the second row of the figure 3.1 (annuity-tied alternative solutions) represents such type of restriction. In their pure form they can be found in Sweden (funded part of the statutory pension system) and in the UK (for all tax-supported funded pensions).

The next box in the second row of the figure 3.1 describes the situation, where the use of non-annuitising solutions is not prohibited, but explicitly and deliberately discouraged by taxation. The best example of such approach is found in Austria (prämienbegünstigte

[30] Annuity factor here and afterwards is a rate, at which an initial amount of EUR 1 can be transformed into a series of fixed periodic lifelong payments by applying principles of insurance mathematics: *Dus/Maurer* (2007), pp. 17-18.

Zukunftsvorsorge, Mitarbeitervorsorgekasse): Alternative payout solutions (especially lump-sum payments) are not prohibited, but they are subject to taxation, while annuity payments are largely tax-free. Only very high annuity payments from the abovementioned programs are partially subject to taxation. In addition, when alternative payout solutions are chosen for prämienbegünstigte Zukunftsvorsorge, 50% of the direct state subsidies, received during the saving phase, must be returned to the state.

Implicit tax discouragement of non-annuitising solutions can be observed in almost all countries. This can be demonstrated on the example of lump sum payments. When lump sum payments are allowed for the payout phase of supported old age programs, the retiree can decide how to invest the amount received and to arrange for a drawdown facility if needed. This last approach has a distinctive tax disadvantage in comparison to immediate annuitisation: Because of an increasing marginal tax rate, lump sum payments may trigger substantially higher tax burden for the retiree at the beginning of retirement. Afterwards, the retiree will have to periodically pay taxes on the income from the re-invested and already taxed capital. An exemption is the UK, whereby 25 percent of the accumulated assets in pension plan can be withdrawn as a lump sum on a tax free basis.

The last box in the second row stands for the ambiguous, unclear status of alternative payout solutions, especially of periodic withdrawals, in the regulatory and institutional landscape of the surveyed countries. While not explicitly prohibited, they are not explicitly allowed as well. The lack of regulatory information on the status of non-pooled products prevents potential retirees from asking for them and as a result they are not offered. A good example of such hurdles is the German Pensionskasse, which may or may not allow lump sum payments at the beginning of retirement. The German Pensionskasse is in fact a special purpose life-insurance company and has longer history compared to many other old age saving vehicles in the country. Currently, the existing legislation does not require the complete and outright annuitisation of funds, saved within the Pensionskasse. However, out of nearly 160 existing Pensionskassen, almost all require outright annuitisation, and only a small number allow partial lump sum payment at the beginning of the retirement. Only recently, some Pensionskassen have begun to offer Riester-program tariffs, which per legislation allow a one-time lump sum payment up to 30% of the existing funds.

Similarly, in Austria and Switzerland, there is no official definition of retirement withdrawal products. In the absence of direct restrictions or allowances, traditional thinking seems to limit the choice of the old age products at least in the saving phase. While in the tax-supported third pillar of the Swiss old age saving system (pillar 3a savings) the savers are free to choose between the insurance and bank products, the pillar 3a insurance assets are four times larger than the non-pooled restricted old age accounts[31] The latter, however, do not offer standardised drawdown products and are mostly paid out as lump sum.

Table 3.3 classifies the representative funded pension programs, introduced in table 3.2 by the type of applied restriction, as explained in figure 3.1 and summarises the main features of the restrictive requirements.

[31] *Schweizerische Nationalbank* 2007 pp. 31, 73; *Schweizerischer Versicherungsverband* 2007 pp. 12-14.

Table 3.3: Classification of funded pension programs by payout restrictions

Name of representative restrictive old age saving program	Brief description of restrictions applying to the payout phase	Short classification of annuity-related restrictions
Austria		
Pensionskasse	Annuity payout required by the regulation.	Total annuitisation
Prämienbegünstigte Zukunftsvorsorge	Annuity payouts are not taxed, all other payout arrangements are taxed. All other payout arrangements trigger partial refund of state subsidies, received during the saving phase.	Tax / subsidy advantages of annuitisation
Mitarbeiter-vorsorgekassen	Annuity payouts are not taxed, all other payout arrangements are taxed.	Tax advantages of annuitisation
France		
Article 83 of Code General des Impôts	Annuity payout required by the regulation.	Total annuitisation
Article 39 of Code General des Impôts	Annuity payout required by the regulation.	Total annuitisation
Madelin-Law	Annuity payout required by the regulation.	Total annuitisation
PERP	Annuity payout required by the regulation.	Total annuitisation
Germany		
Pensionskasse	Annuity payout required for older contracts, some new contracts allow for partial lump sum payments. Riester-program contracts available.	Restricted availability of non-annuitising solutions
Pensionsfonds	Payout restrictions as for the Riester-programs.	Age-connected partial annuitisation
Riester-Program	Annuitisation of the funds at 85 at the latest. Non-decreasing periodic payouts before the annuitisation. 30% of the capital can be paid out as a lump sum.	Age-connected partial annuitisation
Rürup-Program	Annuity payout required by the regulation.	Total annuitisation
Italy		
Closed Funds	50% of the funds should be annuitised at the beginning of retirement.	Partial annuitisation
Retirement insurance policies		
Open Funds		
Sweden		
PPM	Annuity payout or an annually re-calculated drawdown based on the relevant annuity factor.	Drawdown tied to relevant annuity factors
Switzerland		
Occupational	25% of the funds can be paid-out as a lump sum by legislation, the remaining conditions are ruled in the articles of association of the relevant scheme.	Partial annuitisation
UK		
Occupational (defined contribution)	25% of the funds can be paid-out as a tax-free lump sum by legislation. Effective compulsion to annuitise the funds at 75 at the latest. Alternative to annuitisation (ASP) disadvantaged in terms of tax treatment and payout mode.	Age-connected partial annuitisation. Drawdown tied to relevant annuity factors

Source: Own research

3.2. Regulation of the payout phase: The policymakers' perspective

3.2.1. Motives and goals for regulation of the payout phase

Cleary, the vast majority of the surveyed countries restrict the use of wealth accumulated within the designated pension schemes in one way or another (see tables 3.2 an 3.3 for details). In this section of the study we explain the fundamental reasons for restricting the use of wealth at retirement.

The main arguments explaining why the restrictions on the use of the payout funds in general and those favouring the annuitisation in particular are needed are as follows:

- Necessity to ensure a stream of incoming tax payments from the retired individuals.
- The aim of the statutory supported funded old age programs to finance the personal income of the saver and not to sponsor the bequests.
- Moral hazard and double-dipping issues, arising in the generous social security environment.
- Paternalistic reasons, where the state should preclude the possibility of old age poverty by protecting the aged citizens from bad decision making at and during the retirement.

The necessity to ensure a stream of incoming tax payments from the retired individuals, is a straightforward reason for the regulation of the payout phase. For many funded old age saving schemes, the statutory support takes the form of tax relieves during the saving phase; thus during the payout phase, the state has the right to get the deferred taxes in a way it sees fit. Obviously, the guaranteed periodic lifelong tax payments are the most favoured form of receiving taxes from the retirees. This is not the case when the retiree is reluctant to convert her retirement capital into periodic income streams, aiming to leave wealth to her heirs, and not the case, when she spends all her wealth at the early stages of retirement, financing the purchases beyond her means.

The second argument in favour of restricting the use of funds in the payout phase of funded pensions in favour of the pooled solutions is that the primary aim of the supported funded old age programs to finance the personal income of the saver and not to sponsor bequests. Annuitising products ensure both the lifelong income and absence of any bequest potential from the annuitised funds.

The other two fundamental reasons (protecting the citizens from poverty and protecting the caring state from being unduly exploited by its citizens) are more complicated and both grounded in the paternalistic attitude of the state to its citizens. The paternalistic attitude is widely spread especially across continental European countries.

The goal of the paternalism applied to the payout phase of the funded pensions is to prevent the old age poverty, which can result either from the moral hazard and an attempt to double dip the statutory support or from the supposed myopic behaviour of the retirees.

The phenomenon of moral hazard and double dipping arises, when the retirees deliberately spend their savings too early in the retirement because they expect the governments to rescue them in their advanced old age. With the widespread social safety net usual for continental

Europe, even the forward-looking individuals might be enticed to the early spending of the funded pension wealth. In such situation, the governments cannot credibly commit to leave imprudent pensioners destitute. Instead, they must rely on the regulation to prevent the situation, where the statutory support is used twice by the same individual: Once in the form of the deferred taxation during the saving phase, and later in the form of tax-financed social security payments after all accumulated wealth was spent.

In case of myopic behaviour, the retirees underestimate their life expectancy and financial needs during the remaining life span and, left to their own, spend too much at the beginning of the retirement phase. Sometimes, the retirees are thought to be generally forward-looking, but lacking the information and financial skills to make adequate payout choices by themselves.

3.2.2. Assessment of motives and goals for regulation of the payout phase

In this section, we show that the use of traditional pooled solutions is not the only means to achieve the envisaged regulatory goals. We discuss alternative ways of ensuring tax revenues apart from enforcing annuitisation. We further present statistics on the spending and bequest behaviour of the European retirees which gives some evidence on whether the fallacies from which the regulation is primarily intended to protect, exist at a large scale.

Tax revenues and taxation of bequest:
From the first glance, a conversion of funds into a traditional pooled solution at the beginning of retirement guarantees the retirees mostly fixed lifelong payments, thus providing a desirable basis for taxation. It is, however, not necessary to prescribe a purchase of a payout solution, with all its disadvantages and immanent costs, to form the retiree's taxable income in the desired way. For example, in the USA the minimum payout rules exist for pension payouts after the age of 75. In case that the minimum amount is not taken out periodically, penalty taxes are imposed. This kind of regulation does not prescribe or prohibit the use of a specific payout product, is very flexible and reliably ensures a stream of taxable income in retirement.

Without questioning the goal of preventing bequests, it could be easily noted, that first, the annuitisation may not be the only means to ensure periodic consumption of the retirement capital: A requirement to withdraw the minimum amount with a tax penalty for failing to do this would also perform this task successfully as shown by the example of the minimum withdrawal requirement in the USA. Second, the annuitisation requirement does not deter individuals who wish to leave bequests out of the funded pensions' capital, from doing so. It only forces them to save again out of the periodic annuity payments. Last but not least, the state could easily prevent undesirable inter-generational wealth transfers by imposing appropriate taxation on the heirs, receiving bequests originating out of the tax-supported funded pensions capital.

No evidence of double dipping:
The issues of myopic or hazardous over-spending in retirement have not yet been researched with scientific instruments on the large scale, especially in Europe. It could be argued, that in the USA, due to lower social security and statutory pension levels, the retirees are forced to take well-informed decisions and not to overspend: They have to rely on income from their private pensions to support their living in retirement and cannot expect their government to rescue them when they become poor at the older age. Thus, the evidence that US-Americans rather spend too little in retirement, and are leaving, on average, USD 10,000-17,000

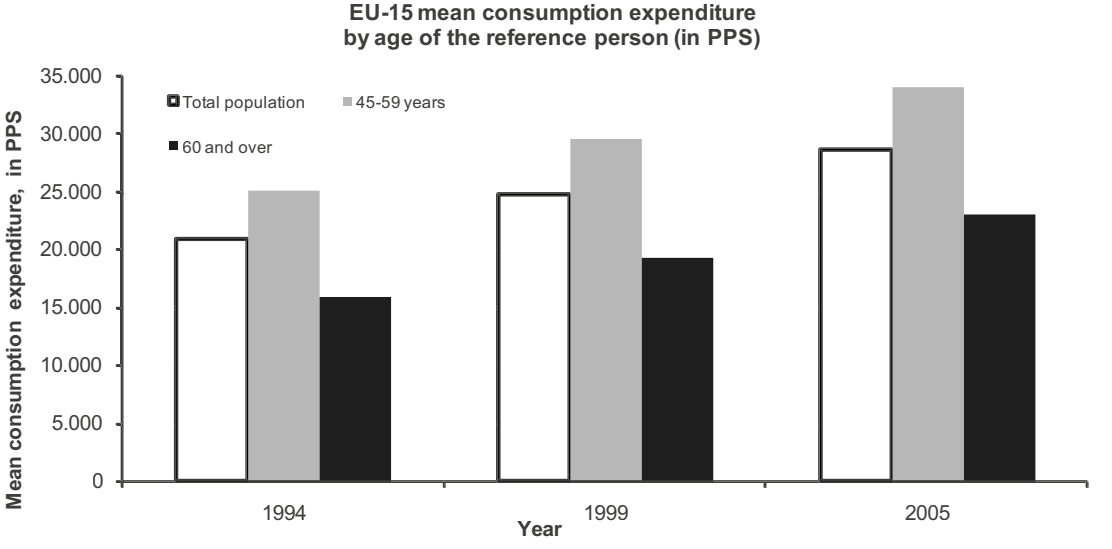
bequest[32], is not applicable for Europe, and the requirement to purchase a pooled payout solution at retirement protects both the retiree and the social security network there.

To shed some light on this issue, we looked for statistical evidence of how European retirees behave in retirement and spend their money. The at-hand indicators, which may give at least some clues as to the real goals and planning abilities of contemporary retired Europeans are consumption expenditure and its structure, as well as data about the bequests left by the retirees to their heirs.

It could be expected from myopic and hazardous individuals that they spend all their retirement funds too quickly, meaning that the money would be spent on items, not used or affordable before the retirement, and that no bequest is left to the heirs. Should this be the behaviour of the considerable part of the retirees, it would manifest in different consumption structure, and a higher consumption level for certain positions, as compared to the peer group of non retired population.

The average consumption structure figures for EU-15 (Euro area) provided by the Eurostat do not support such proposal, however. Figure 3.2 shows that although the mean consumption expenditure of the individuals aged 60 and over[33] was rising since 1994, it remains smaller than the average consumption expenditure of the total population and considerably smaller than the consumption expenditure of the group of the 45-59 years olds. Further, the consumption[34] structure of the retirees is largely similar to the consumption of the active population aged 30-59 (see table 3.4 for details).

Figure 3.2: EU-15 mean consumption expenditure by age of the reference person



Source: *Eurostat* 2008

[32] *Behrmann/Rosenzweig* 2007.
[33] It can be well argued that in Europe, a considerable proportion of the aged population is effectively retired at the age of 60. The 2001 data from the Survey of Health, Ageing and Retirement in Europe (SHARE) suggests, that out of 12 surveyed countries, in 8 countries the share of the employed individuals within the 55-64 age group is lower than 40%, in only three countries the share of employed elderly is considerably higher than 50% and in no country it is over 70%.
[34] We use the United Nations classification of individual consumption by purpose.

Table 3.4: Average consumption structure for EU-15 countries

Average consumption structure for EU-15 countries:		30-59 year olds, year		60 and over year olds, year	
Position ranking for 30-59 year olds, as per 2005		**1994**	**2005**	**1994**	**2005**
1	Housing, water, electricity, gas and other fuels	23%	26%	30%	33%
2	Transport	14%	14%	10%	10%
3	Food and non-alcoholic beverages	16%	12%	18%	14%
4	Miscellaneous goods and services	8%	10%	8%	10%
5	Recreation and culture	10%	10%	9%	9%
6	Restaurants and hotels	7%	7%	5%	5%
7	Clothing and footwear	7%	6%	6%	4%
8	Furnishings, household equipment and routine maintenance of the house	7%	6%	7%	6%
9	Communications	2%	3%	2%	2%
10	Health	3%	3%	4%	4%
11	Alcoholic beverages, tobacco, narcotics	3%	2%	3%	2%
12	Education	1%	1%	0%	0%

Source: *Eurostat* 2008.

Housing, water, electricity, gas and other fuels account for slightly more than a third of the older population's consumption, followed by food (14%) and transport (10%). Almost 60% of consumption in the group of over 60 years olds consists of these three positions. It is unlikely that the over-spending would manifest itself in them, as there are natural limits to consumption in these areas. In fact, the figures are largely in line with the consumption distribution of the working population aged 30-59. For the aged population, who are seemingly pre-destined to presumed overspending, consumption on such products as miscellaneous goods and services, recreation and culture, restaurants and hotels, furnishings, household equipment and maintenance of the house, together accounting for another 30% of the consumption, either remains in line with the working population or is even slightly lower. Also the remaining positions such as clothing, communications, health, alcoholic beverages, ranging each between 2% and 4% of the total consumption, are on the same scale as that for the peer group of the 30-59 year olds.

With the consumption structure showing no significant signs of differences to the active population or of spending excesses, it is interesting as a next step to look at the bequests the contemporary retirees are leaving or intending to leave to their heirs: The desire to bequeath prevents individuals from spending funds too quickly and from making gambling decisions during the retirement. Further, the funds intended for the heirs can be easily resorted to, should the retiree fall into poverty or not have enough funds to support the desired living standards. The large-scale absence of the (intended) bequests in the population cohorts with considerable wealth at the beginning of retirement could thus suggest the rational unwillingness to bequeath, myopic or imprudent spending planning or imprudent investment decisions during the retirement.

The Survey of Health, Ageing and Retirement in Europe (SHARE) uses data collected on individual life circumstances of about 22,000 persons aged 50 and over in 11 European countries, including six out of eight countries surveyed in this report.[35] The first results show

[35] The results of the SHARE here and throughout the section, are quoted from: *Börsch-Supan et al.* 2005. The six European countries are Austria, France, Germany, Italy, Sweden and Switzerland. The data for the UK is not available in SHARE.

that independently of the level of available wealth, about one third of individuals aged 50 and over, expect to leave at least half of their current wealth as a bequest.[36]

Table 3.5 is based on the SHARE research and allows more detailed insight into the matter. For surveyed 11 European countries, the average inherited wealth for the lower 60% (by total wealth) of surveyed households amounted to EUR 82,200. Within the total available wealth category of EUR 50,000-100.000, approximately one third of the respondents are *sure* to leave at least EUR 50,000 to their heirs.

Table 3.5: Empirical evidence on available wealth and bequest potential of aged population in EU countries

	Figures for all 11 surveyed EU countries					
Average inherited wealth, for 3rd available wealth quintile, in EUR	82,200 EUR					
Proportion of respondents with estimated 100% chance of leaving a bequest higher than EUR 50,000, for households with total wealth ranging between 50,000-100,000, in % of all respondents	29.7%					
	Figures for selected countries					
	Austria	France	Ger-many	Italy	Sweden	Swit-zerland
Median net worth (PPP adjusted), in EUR thousands	100-120	120-140	100	>140	100	>140
Already received gifts and inheritances >EUR 5,000, in % of all respondents	24.1	28.1	32.8	27.7	41.1	48.1
Percentage of inherited amounts of the top 10% of all households	85.5%	87.3%	73.2%	83.2%	79.4%	71.4%
Chances for a decrease in statutory pensions, mean positive response in % of all respondents	≈60%	≈50%	≈50%	≈35%	≈60%	≈40%

Source: *Börsch-Supan et al*. 2005, Figures 6.1,6.2, tables 4A.2, 4A.4, 4A.5.

The data for Austria, France, Germany, Italy, Sweden and Switzerland shows that the median net worth, available to the aged population in those countries is higher than the abovementioned wealth range and varies between more than EUR 140,000 for Switzerland and EUR 100,000 for Germany and Sweden[37]. For five countries, approximately 30% of the respondents already received an inheritance or gift of more than EUR 5,000. Interestingly, in Switzerland, where the pension payout regulation does allow considerable lump-sum payments and the statutory pension insurance by constitution is intended only to adequately cover the subsistence level, almost 50% of the respondents received such an inheritance or gift. However, it should be noted that the inherited amounts are very unevenly distributed in the population: The top 10 quantile households (by wealth) received more than 70% of the inherited amounts in all six countries. It should be noted, that in four countries, 50% or more of the aged respondents answered positively to the question of whether it is possible that their statutory pensions entitlements will be lowered before they retire, implying that the aged population is aware of the need to support their habitual way of living from private funds.

[36] *Börsch-Supan et al.* 2005, p. 187.

[37] Net worth is defined as the sum of all financial and real assets minus liabilities. Financial assets include seven categories, including individual retirement accounts and life insurance policies. Real assets include primary and other residences, businesses and vehicles.

Thus, the statistical evidence does not seem to support the suggestion that Europeans are unable or for whatever reasons unwilling to manage their funds prudently and responsibly during the retirement. Moreover, the availability of considerable bequests in the environment where annuitising payout solutions are widespread is an indication of successful, purposed and planned investment and saving activities conducted by the retirees. The enforcement of annuitisation for many funded old age programs may result at least in additional financial transactions needed by retirees to create the desired cash flow profiles.

The misuse of the European rather generous social security network by the hazardously impoverished retirees cannot be seen from the publicly available statistics. In light of the evidence of the, on average, largely careful behaviour of the contemporary retirees, it should be possible to devise efficient motivation and control mechanisms for a minority, inclined to hazardous behaviour in any environment, without restricting the choice of the payout products for the majority of the prudent population.

Pre-existing annuity-like income prevents poverty:
For five countries of continental Europe, the minimum share of annuity or annuity-like payments in a retiree's income is 70%, as shown in table 3.6. A comparison with the table 3.4 implies that, should the retirees consume all their periodic income, three main and recurring consumption positions such as housing/water/electricity/gas/fuels, transport, food and non-alcoholic drinks, as well such positions as health and clothing would be on average more than covered by those also recurring payments. For two remaining European countries, Switzerland and UK, the share of the PAYGO pensions in retirees' income is 41% and 46% respectively, which would enable the average retirees to cover their housing, food and health costs. Further annuity coverage could be easily available both in Switzerland and in the UK, if needed, up to the level of more than 70%, from the employment-linked pensions, which in those countries comprise 34% and 25% of a retirees' income.

Table 3.6: Distribution of retiree's income by selected sources

Country	Share of main pension type in retiree's total income, in %	Type of main pension	Private pensions, share in retiree's total income, in %		Asset/Investment income, share in retiree's total income, in %
			Employment-linked	Personal	
Austria	70%	PAYGO	Data not available		3%
France	80%	PAYGO	Data not available		8%
Germany	80%	PAYGO, with civil servants pensions	5%		10%
Italy	94%	PAYGO and other public transfers	Data not available		2%
Sweden	76%	PAYGO+occupational wholly annuitising pensions	See main pension type	Data not available	15%
Switzerland	41%	PAYGO	34%	Data not available	12%
UK	46%	PAYGO and other public transfers	25%	3%	9%
USA	39%	PAYGO and other public transfers	10%		14%

Source: *Statistic Austria* (2005), *INSÉÉ* (2007), *Börsch-Supan/Wilke* (2006), *L'Istituto nationali statistica* (2004), *Statistics Sweden* (2007), *Office for National Statistics* (2007), *SSA* (2005).

In an environment, where the existing annuity coverage, mostly from statutory sources, is that considerable, the undifferentiated enforcement of annuitisation for funded pension programs produces for the retiree only another lifelong income stream of low marginal utility. This additional annuity income stream is most probably beyond the need to finance the living essentials, but is provided at the cost of loosing flexibility and liquidity, which in the described situation are very likely to be of considerable value.

The challenge to the policymakers is most obviously illustrated by the evidence that the regulations originally meant to protect those less well-off, such as annuitisation, turn out to disadvantage them first. Especially for small and average savers, who in most countries represent the majority of the funded pension program members, the wealth from those programs is the only noteworthy capital at the beginning of the retirement period. The requirement to fully or almost fully annuitise this wealth means leaving those people without any cushion to absorb unexpected health and consumption shocks in their old age. Further, the wealthy individuals tend to live longer as their less moneyed peers. Thus, requiring a full annuitisation can lead to additional transfers of wealth from the poor to the wealthy within the mandated pooled solutions. *Brown (2000)* estimates that for some annuity design options such as an individual, real life annuity, the wealth transfers from the economically worse off individuals to better off individuals can be as large as 20% of initial wealth.[38]

In many of the surveyed European countries, the share of private pensions in retiree's income currently is still small due to the young age of the major programs. This may be one reason for the absence of the relevant statistical positions in some of the surveyed countries. The share of the programs with no employment link could, to a certain extent, be estimated by looking at the position *asset/investment income*, if not shown in the private pensions category. The situation is, however, going to change, as the population grows older and the participation in the funded pension programs increases. While currently the share of population aged 65 and over accounts, on average, for 17% of the total population of the European Union, it is expected to rise to 23% on average, during the next twenty years, meaning, for the EU as a whole, more than 30 millions more retirees. Table 3.7 illustrates the changes for all surveyed countries and the EU total, using the baseline projections of EUROSTAT, data from the Swiss Federal Statistical Office and the USA Census Bureau.

Table 3.7: Total and aged population in selected countries

Year	**2007**			**2017**			**2027**		
Population, in millions	Aged 65 and over	Total	*Share of 65-over in total, %*	Aged 65 and over	Total	*Share of 65-over in total, %*	Aged 65 and over	Total	*Share of 65-over in total, %*
Austria	1.4	8.3	*17%*	1.6	8.3	*19%*	2.0	8.5	*23%*
France	10	62	*16%*	12	63	*20%*	15	65	*23%*
Germany	16	82	*20%*	18	83	*22%*	21	82	*26%*
Italy	12	59	*20%*	13	59	*23%*	15	57	*26%*
Sweden	1.6	9.1	*17%*	1.9	9.5	*21%*	2.2	9.8	*22%*
UK	9.7	61	*16%*	12	62	*19%*	14	64	*22%*
EU-25	**79**	**466**	***17%***	**92**	**468**	***20%***	**110**	**470**	***23%***
Year	**2007**			**2020**			**2030**		
Switzerland	1.2	7.5	*16%*	1.6	8.0	*20%*	2.0	8.1	*24%*
USA	36	294	*12%*	55	336	*16%*	71	364	*20%*

Source: *Eurostat* (2008), *BFS* (2006), *US Census Bureau* (2008)

[38] *Brown* 2000, p. 46.

The increase in participation in designated old age saving schemes can be illustrated on the examples of PERCO contracts in France and Riester contracts in Germany, both countries having no considerable history of funded pensions. Since the start of the program in the year 2004, PERCO assets increased more than twentyfold up to the end of the year 2008. The number of Riester contracts, since the introduction in the year 2001 has grown almost eight times to reach the figure for the year 2008. Today, about one third of the German workforce is holding a Riester contract to save for retirement. Table 3.8 shows the development of Riester and PERCO contracts.

Table 3.8: Development of PERCO and Riester contracts

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
PERCO-contracts, in EURm of assets	-	-	-	77	329	761	1,400	>1,700
Riester-contracts in millions of units, thereof:	1,400	3,371	3,924	4,190	5,631	8,050	10,757	11,973
- Mutual funds	*-*	*174*	*241*	*316*	*574*	*1,231*	*1,922*	*2,237*
- Insurance policies	*1,400*	*3,047*	*3,486*	*3,661*	*4,797*	*6,468*	*8,355*	*9,216*
- Bank accounts	*-*	*150*	*197*	*213*	*260*	*351*	*480*	*520*

Source: *AFG* (2008), *BMAS* (2008).

The preferences of the individuals during the payout phase with regard to annuitisation versus any other use of funds in tax-supported old age programs in the absence of any purposed restrictions can be illustrated in an example from Switzerland. In this country, retirees have to rely on their private pensions to maintain the usual and desired standard of living in retirement and have a considerable successful history of doing so. Table 3.9 shows for tax-supported personal pensions that the single annuity policies which pay out the benefits at retirement only as an annuity, have almost 10 times less assets than restricted old age accounts and more than 400 times less assets than the single endowment policies. Both of the last products pay the accumulated amounts as a lump sum. This is a good example of the fact, that, even when pooled products are traditionally favoured as accumulation vehicles, the preferences during the payout phase are clearly in favour of non-annuitising solutions.

Table 3.9: Key data on composition of tax-supported pillar 3a funded pensions in Switzerland

In SFr million	**2003**	**2004**	**2005**
Single endowment policies (3a)	85,428	86,908	92,276
Single annuity policies (3a)	209	199	220
Restricted old age accounts (3a)	20,760	23,037	25,422

Source: *Schweizerische Nationalbank* 2007 pp. 31, 73; *Schweizerischer Versicherungsverband* 2007 pp. 12-14.

Thus, the regulatory rules on the payout phase of funded pensions are in the future very likely to strongly affect the welfare of increasing numbers of the population and for that reason a careful balance must be struck between the private goals of the retirees and the statutory policy objectives. The persisting tensions between individual preferences and the existing public policies in the payout area of funded pensions, which are observed in the majority of the surveyed countries, repeatedly point to the need to strike a careful balance between the wants of the retirees on the one hand and the goals and the instruments chosen by policymakers to achieve their goals on the other hand instead of continuing to uphold a mandate to fully annuitise the retirement capital.

3.3. Regulation of the payout phase: The stakeholders' perspective

3.3.1. Criteria for proper regulation

The task of striking a careful balance between the need to regulate the markets for private pensions, and the preferences of the participants in funded pension schemes, can be successfully approached only when it is clear what makes up a proper regulation. An attempt to evaluate the efficiency of the regulation can be done by analysing the following five aspects[39]:

Table 3.10: Criteria for proper regulation

Transparency:	The regulations and rules for the funded pension schemes must be easily understandable for the average (potential) participant.
Sparkling innovation:	The regulation must not impede, but encourage the creation of new products which satisfy the needs of the potential retirees in the best possible way, as well as keeping pace with changes in the economy.
Encouraging competition:	The regulation should help the potential retirees to get the most for their money by encouraging competition between the suppliers of payout products.
Shield from political pressures:	The regulations must be credibly long-term-orientated, give the retirees the feeling of reliability and security, and be protected from the changes due to political pressures.
Keeping cost low:	The (explicit and implicit) cost of implementing the regulation should be proportional to the benefits the society receives from the regulation.

3.3.2. Assessment of the consequences of the regulation of the payout phase

Our survey of the selected countries shows a sheer complexity of frameworks and a multitude of programs, rules, participation requirements and restrictions often within a single surveyed country. For an average participant in the funded pension scheme, it is very difficult to independently and adequately process all the information needed for an informed far-sighted decision, to frequently monitor the development of the decision's results and to deal at an eye level with the institutional counterparts, especially when things do not go as intended. Depending on *transparency* of the regulations to the non-specialist, three groups can be identified within the surveyed countries.

The countries in the first and most transparent group have chosen to regulate the payouts originating from all or majority of the pension programs similarly, whereas a variety of possibilities to save for the old age on the occupational or private basis exists. Those countries are the USA, UK, and Italy (for programs created under the new legislation). We consider this to be the most retiree-friendly approach.

In Sweden and Switzerland, the second group of countries, the occupational pension schemes are obligatory. Such schemes do not have opting out possibilities, are highly standardised and they distinctively dominate all other old age saving vehicles of many different varieties. Within the mandatory framework, the payout rules are widely similar and easily understandable.

[39] *Roberto* 2004, *World Bank* 1999, p.2.

In the third group there are countries like Austria, France, and Germany, where the regulation on the payout phase of funded pensions is product-orientated and therefore very fragmented. Here, the largest variety of programs or products with differing payout regulations exists. This variety of potential pension income sources with different regulations, taxation rules and often without the possibility or practicable ways to aggregate the funds at retirement complicates the analysis and decision process for the (potential) retiree.

The more liberal view on payout possibilities and the transparency of the programs' framework tends to *spark innovation*, which is needed to keep pace with the wants and preferences of the participants and the developments of the markets. No new product can be, however, created in the environment, where the use of only one product type is strictly prescribed. In the USA, where no restrictions on the use of payout products are in place, we observe a lot of innovation and product modifications for both pooled and non-pooled solutions. In Germany, where the strict annuitisation requirements were relaxed for the so-called *Riester plans*, there soon appeared many interesting product modifications, offered by competing institutions. As mentioned in section 2.4 some of these have proved popular even outside the tax-supported programs and currently are sold through European branches to customers in other European countries as well. Hereby, asset manager offer integrated payout products based on two components: (i) an individual account risk-management algorithms using various types of mutual funds for the pure drawdown part (which typically stops at the age of 85) including some minimum benefit level, and (ii) using a part of the initial capital at the beginning of the payout phase to buy a deferred annuity with benefits starting when the drawdown plan stops (e.g. at age 85). Conversely, in many countries (such as Austria, Italy and Switzerland), the withdrawal as a means to structure the payout from the tax-supported retirement fund is not defined in the legislation or relevant regulation, although it is not explicitly prohibited. This lack of certainty also prevents the development of alternative payout products, as it restrains prospective retirees from asking for such products and potential product providers from offering them.

The assessment of the *competition* between the suppliers of payout products must be done for both the suppliers of the pooled and the non-pooled solutions. We did not perform an analysis of the competitive situation in the surveyed countries, because a thorough assessment of it would require a separate study. However, based on the information obtained during our survey, some fundamental observations were made. In most of the surveyed countries, the competition between the providers of pooled and non-pooled solutions is not in place due to the fact, that the non-pooled solutions are disadvantaged payout options for most programs and countries. Such competition takes place, however, and is definitely won by the non-pooled solutions in the USA. Up to the age of 75, it is allowed in the UK also, and the non-pooled solutions are allowed to compete with the annuitising products during the funded pensions payout phase but are currently not enjoying the popularity of the traditional annuities for complex reasons, which must be studied in more detail.[40] The structure of the pooled products often prohibits competition even between the suppliers of pooled solutions at the beginning of the payout phase in such countries as Austria, France and Germany. In these countries, no open market option necessarily exists for all pension programs and the retiree is often tied to one financial institution from the beginning of the saving contract till until the

[40] It could be argued about the reasons for observed development in the UK, because in countries, where, for certain programs, a complete freedom of choice is given between annuitising and non-annuitising solutions is given, the voluntary use of annuities is low. The decisive clue for change in observed preferences may be the condition that the funds must be annuitised only ten years after the beginning of retirement and in view of the transaction costs the majority of the retirees prefer annuitisation. Further research on this phenomenon is needed.

last payout payment (for example, *Pensionskasse* in Germany). In such case the retiree is almost powerless to act, when the performance of the originally chosen pension providers is perceived to be unsatisfactory.

In our assessment of the regulatory framework's stability and its *protection from political pressures*, we concentrate on the economic issues rather than legislative or historical ones. We do not perform the analysis of how the rights of the existing retirees should be protected from the politically-triggered changes by legislative means, how the historical record of such changes was in the surveyed countries and to what degree the pension payout regulation was and is politically influenced in the surveyed countries. We believe, however, that protection of the pension payout regulation from the short-lived political pressures is in the interest of the vast majority of the population which will retire sooner or later. We also believe that the regulation can only then be effectively shielded from political influences when it has a solid economic foundation: It would be difficult for the politicians to influence the pension payout regulation in their interests, when this regulation would use economically and cost efficient methods to achieve its goals, such as it would be difficult to politically influence the required amperage to produce the desired voltage when the qualities of the resistance are known in the area of electrical engineering. To our knowledge, the issue of the payout regulation has not been thoroughly studied in this direction so far.

Every regulation per se is costly. The *costs of regulation* are incurred to the affected individuals and to the society as a whole by creating the regulatory rules, by implementing them and by supervising their implementation. They can be directly observable in the form of additional fees and duties which should be paid by the subjects to regulation and which finance the regulating apparatus. The bulk of the regulation costs is, however, not directly observable. For members of funded pension programs, it is the inability to purchase the desired payout products and to structure the retirement cash flows in accordance with their preferences and the perceived optimum. Naturally, the actual preferences of retirees cannot be observed if their options are restricted due to regulation. However, by observing the behaviour of retirees in countries where regulation on payout solutions is less strict, some indication of such preferences can be provided. As already explored in section 2.1.4, in such countries not many households do voluntary purchase life annuities. Judging by the decisions of retirees, who due to less restrictive regulatory environment actually have a choice, it is obvious that the disadvantages of annuities represent considerable costs to retirees.

It is important to carefully balance the advantages of the regulation against the cost incurred to the affected individuals and the society as a whole. An important attribute of the proper regulation is, therefore, choosing such regulatory instruments and their combinations, which achieve the regulatory goals by incurring the minimal costs. In the section 3.2 of this chapter we have already shown, that for all fundamental regulatory goals in the area of funded pension payouts the desired effects could be achieved not only by means of enforcing annuitisation. In the optimal situation, the solution incurring the least costs should be chosen.

Thus, starting from the above outlined need to find an economically reasonable solution for the regulation of the funded pension payout phase in order to reduce the economic costs and obtain protection from politically motivated short-lived interventions, in the next chapter, we measure one aspect of the total cost of regulation. We assess the cost of the requirement to annuitise the retirement capital by comparing the resulting utility of a rational retiree with the situation where he is free to structure his retirement portfolio and consumption.

3.4. Summary of main findings

In this chapter, we looked at the regulations and rules applying to the members of funded pension schemes. We showed the fundamental motives and goals for existing regulations along with some empirical evidence on the behaviour of contemporary European retirees. Further, we assessed the existing regulatory landscape from the perspective of proper regulation and from the perspective of an individual affected by restrictions on the use of retirement funds. Our main findings are as follows:

- In the surveyed European countries, the regulations on funded pensions in general and on their payout phase in particular are very complex. They differ not only from country to country but often even from program to program within one country, complicating the financial decisions of the prospective retirees. The majority of existing funded and tax-supported old age programs have restrictions on the use of capital at the beginning or during the retirement.

- The restrictions on the use of funds in retirement mostly take the form of prescribing the total or partial annuitisation of the funds by means of traditional pooled solutions or in the form of tax burdens. The restrictions disadvantage both the non-pooled and the innovative pooled solutions.

- In Europe, the main motives for restricting the use of retirement capital are paternalism as well as avoidance of moral hazard and double dipping, evoked by paternalism. The primary goal of regulators is to avoid old age poverty resulting from the retirees' myopic or irresponsible investment and spending decisions. Statistical data about consumption and bequest behaviour of contemporary European retirees, however, does not support the hypothesis of widespread overspending or irresponsible financial decisions in retirement.

- The coverage with annuity or annuity-like products is high in surveyed European countries. This coverage originates both from the statutory or occupational programs on the paygo basis, as well as from the funded or unfunded private programs on the defined benefit basis.

- The enforcement of annuitisation for funded pension programs in the environment where a high level of annuity or annuity-like income already exists, does not bring any additional value for the retirees, but rather deprives them of the protective cushion against consumption shocks. There is evidence that especially small and average savers are most disadvantaged by the enforcement of the annuitisation. The tensions between the payout solutions enforced by the regulation and the preferences of the retirees would be more pronounced with the ageing of the population and increased participation in the funded pension programs across Europe.

- The diversity and complexity of the pension regulations in Europe as well their generally restrictive attitude towards non-pooled and innovative pooled solutions in retirement does not comply with the criteria of proper regulation and have economic consequences for the society as a whole and especially for those individuals affected.

4. Economic modelling of optimal payout strategies using pooled and non-pooled solutions

4.1. Advantages of creating a portfolio of annuities and drawdown plans

4.1.1. Setup of the analysis

From the perspective of the household, represented in our analysis by a female retiree (i.e. from the demand side), retirement income planning need not only involve a *simple stand-alone approach*, i.e. selecting either an annuity or an income drawdown approach. The question that arises next is whether retirees might benefit from following a blended strategy, whereby the retirement portfolio can include both approaches. Such a blended strategy seems intuitively appealing, as it allows the retiree to capture the strength of both products, i.e. (non-pooled) drawdown options to enhance returns by taking the equity risk premium, provide bequest and liquidity, as well as (pooled) life annuity policies to control longevity risk and capture the survival credit. In addition, creating a financial retirement strategy is not a *simple one-time decision* which is restricted at the point of retirement. Rather, the retiree can react to new information by dynamically adjusting the composition of the retirement portfolio with increasing age. In this section, we explore what is the optimal composition of the retirement portfolio over time, and how individual characteristics of the retiree (preferences, survival probabilities, wealth status) as well as exogenous parameters (capital and insurance markets) influence the results. We present a theoretical model, a simplified image of reality, containing only the selected crucial features, with the aim to capture the main developments, sources of influence and effects of alternative decisions. Most retirees will be overburdened with the unaffiliated implementation of such model for their personal financial decisions under their personal circumstances. However, they should be aware of the main results and predictions for the generalised cases and use them in their financial planning. It is the task of financial institutions to create affordable products at low costs, based on and monitored according to the dynamic lifecycle models, which are tailored for the major characteristic retiree groups.

To do so, we build and implement a dynamic portfolio choice model by assessing the optimal spending and investment behaviour of a risk-averse (female) retiree facing an uncertain lifetime and stochastic returns from capital markets. [41] In such a setting the retiree must decide in each period how much to consume (*spending decision*) in tandem with an investment strategy (*investment decision*) to support the envisaged consumption. The investment universe consists of risky stocks, riskless bonds, and illiquid (investment linked) immediate payout annuities. We introduce short selling restrictions on bonds, stocks, and life annuities to prevent the household from leveraging stock investments and annuity purchases. The household is endowed with a certain level of savings already accumulated during its working life (*pre-existing wealth*). In addition, the retiree possesses a recurring stream of *pre-existing pension income* in the form of life long (inflation adjusted) fix annuity benefits. The pre-existing pension income may be composed of a statutory pension benefits, other social security transfer payments, or corporate pension benefits of the DB variety.[42] For the periods

[41] We do not take into account consumption shocks, e.g. resulting from uncertain medical or nursing expenses. This simplification can be justified due to the relative high level of medical insurance coverage, especially in continental Europe. In addition, we do not analyse the interaction between the accumulation and decumulation phase. This requires additional assumptions to model the accumulation phase, e.g. about the labour income profile, the incorporation of deferred (investment linked) annuities, the possibility of flexible retirement dates, and tax support for retirement accounts.

[42] If the pension income comes from defined benefit plans, the level of the income is a function of the salary history and the duration of the previous employment. A similar computation level also holds true for the level of statutory pension.

to come, the retiree has to decide at the beginning of every year after retirement (which is at age 65) how much to consume and how best to invest her liquid wealth into stocks, bonds and new life annuities. We assume (implicitly) that the pre-existing pension income is above some minimum (well defined) standard (e.g. to avoid poverty).

Building on such a model, we address the following issues:

- **The retirees' perspective:** What is the reasonable allocation (and location) of retirement assets, i.e. how much should the retiree invest in riskless bonds or risky stocks, and to what extend and when the retiree should purchase illiquid payout annuities? Further, the model allows us to explore the shape of the potential consumption and income stream if the retiree follows an optimal payout strategy. Next, we study the implications for the asset allocation pattern when a certain level of lifelong retirement income is guaranteed by pre-existing annuity benefits, resulting from the first pillar pension or a DB corporate pension scheme.
- **Product provider perspective:** The model offers also interesting conclusions that may be useful for the supply side. They may enable financial intermediaries like asset managers and/or insurers to create standardised and affordable integrated payout products helping retirees to achieve maximum lifetime consumption levels and convert assets into a reasonable income stream according to their preferences.
- **Policymaker perspective:** Finally, we assess the economic implications from the mandatory annuitisation enforced by regulation on the retiree's lifetime utility.

We proceed as follows: In a first step, we (numerically) solve the model to gain the optimal consumption pattern and portfolio holdings in annuities, stocks, and bonds as a function of both wealth and age (details are given in the appendix A). In the next step, we run Monte Carlo simulations of 10,000 life cycles, and calculate the expected range of consumption and portfolio patterns over time, taking into account the consumer's optimal portfolio rebalancing.

While appendix A explores the technical aspects of this model in more detail, the following box 4.1 highlights the basic features of the model with respect to the key individual and exogenous parameters.

Box 4.1: Basic features of the retirement optimisation model

Retirement Optimisation Model

Annuity and capital markets: Yearly stock returns (after inflation) are assumed to be log-normal distributed with a mean of 6 percent and a standard deviation of 18 percent. Bonds have a riskless real return of 2 percent per year.[43] The immediate fixed life annuity (adjusted for inflation) is priced by assuming the female US 2000 Annuitant Mortality table with a radix of 115. The expected annuity benefits are discounted by the 2 percent; the loading factor is 0%.

Preferences: To model preferences we adopt an additively time-separable utility function of the Constant Relative Risk Aversion (CRRA) class, a standard assumption in financial economics. The basic idea is to calculate a kind of risk-adjusted present value of consumption and a potential bequest (see appendix A for mathematical details):

Life-time Utility = PV(Consumption, Bequest)

The retiree enjoys utility from consumption (C) if alive and from bequest (B)[44] in the case of death. This specification allows to model time preferences, the level of risk aversion, willingness of the retiree to engage in intertemporal substitution of consumption, and the strength of the bequest motive. We discount future consumption with $\beta = 0.96$ per year, i.e. the rate of time preference lies between the riskless interest rate and the expected equity return. We report results, varying the range of risk aversion to capture a retiree with a relative low ($\rho = 2$), moderate ($\rho = 5$) and high risk ($\rho = 10$) aversion. Subjective survival probabilities p^s differ from those used to price the annuity.

Financial Wealth and Pre-Existing Pension Income: At the beginning of retirement, at the age of 65, the household has a certain level of savings (*financial wealth*) and a stream of *pre-existing pension income* in the form of life long (inflation adjusted) annuity benefits. In the analysis we look at the ratios of financial wealth to pension income (wealth/pension-ratio).

Optimal Retirement Strategy: Each year the retiree must decide how to optimally allocate the current disposable wealth between consumption, a drawdown plan consisting of direct stock and bond investments (non-pooled solution), and new purchases of life annuities (pooled solution). The retiree has to do so with respect to uncertain capital market returns, uncertain time of death, and the opportunity to adjust his decision dynamically over time.

Presentation of Results:
1. Step: Solve the model to specify the optimal consumption and portfolio pattern.
2. Step: Conduct Monte Carlo Analysis for 10,000 life cycles and calculate the average consumption and portfolio patterns over time taking into account the retirees optimal feedback controls.

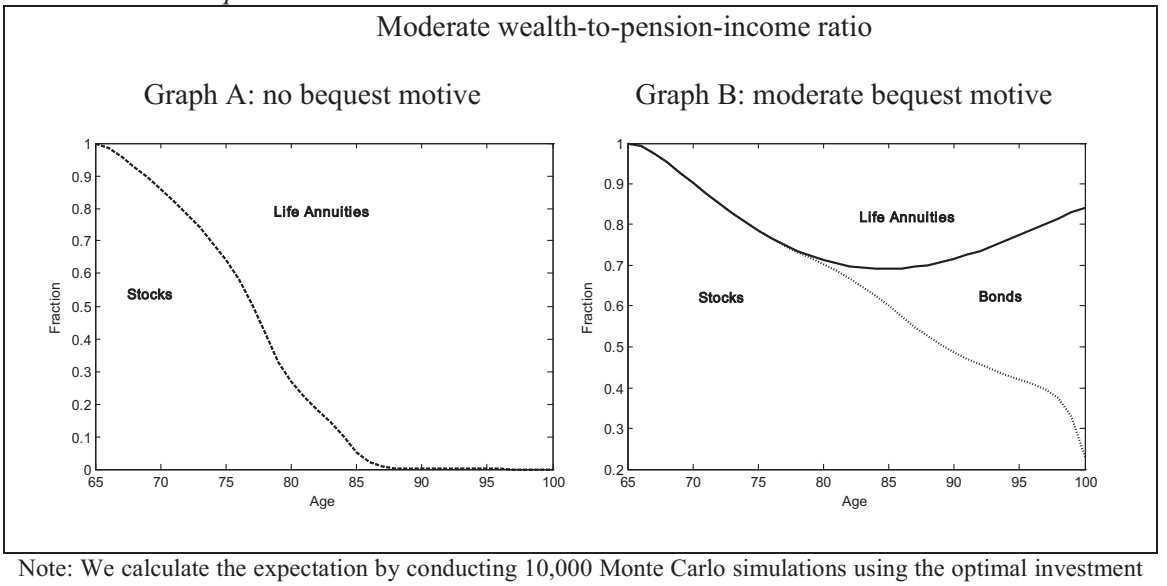
[43] While since 1950 the historical equity premium (i.e. the real return of well diversified equity portfolios over government bonds) in the USA and in Europe has been around 6%, many forward looking economists doubt if this holds also for the future. Our assumption of an equity premium of 4% is more conservative and in line with the current consensus among practitioners and the literature on long-term portfolio choice.
[44] We understand bequest as the possibility to transfer the funds to the heirs at the death of the retiree. For a retiree with a bequest motive the possibility of such transfer can be quantified in utility terms.

4.1.2. The base case: moderate wealth/pension ratio and moderate risk aversion

In this section we refer to a moderately endowed household, where the financial savings are five times as much as the yearly pre-existing pension income (i.e. from public old age programs or from a DB-orientated company pension). For instance, if the household has a financial wealth of 100,000 EUR, the yearly pre-existing pension income would be 20,000 EUR. Further, the analysed household has a moderate risk aversion (i.e. the coefficient of relative risk aversion is five) and no resp. a moderate preference for bequest. Based on this procedure, we evaluate for the influence of a bequest motive on the decision to purchase annuities. Second, we analyse the impact of pre-existing pension income on the optimal drawdown and annuitisation strategy. Both pre-existing pension income and bequest motives are said to be major impediments to voluntary annuitisation.

Figure 4.1 shows the expected asset allocation based on a Monte Carlo Simulation for 10,000 life cycles taking into account optimal rebalancing of portfolio holdings and consumption patterns. The results are displayed for a representative household with characteristics outlined above, without (Graph A) and with (Graph B) bequest motives.

Figure 4.1: Expected asset allocation for a household with moderate risk aversion and moderate wealth/pension ratio



Note: We calculate the expectation by conducting 10,000 Monte Carlo simulations using the optimal investment and consumption policies derived by solving the dynamic portfolio choice model. Graph (A) shows the expected life cycle profile for a household with moderate wealth-to-pension-income ratio household (savings are 5 times the yearly pension income), moderate risk aversion, and no bequest. Graph (B) displays the results with a bequest.
Source: Own calculation.

Graph (A) of figure 4.1 shows the expected life cycle profile of a household without bequest motives. The lines show the relative weight of the retirement portfolio invested in liquid stocks, bonds, and life annuities purchased in the private market.[45] At the age of 65, financial wealth is entirely composed of stocks. Liquid stock holdings are used for two purposes: either to consume or to shift savings into life annuities if the retiree becomes older. The household is

[45] To specify the market value of the annuities we calculate the actuarially fair premium (using the annuitant mortality table) for all annuity benefits the retiree holds in a certain point in time. Liquid stocks and bonds are priced according to their current market values in the model.

mostly invested in stocks until the age of 75 in order to profit from the equity return while the survival credit is not yet sufficiently high to fully crowd out stocks. At age 87, the household has finally completely replaced stocks with life annuities.

Graph (B) of figure 4.1 displays the expected asset allocation for a retiree with a moderate bequest motive. The asset allocation looks different from the case without bequest insofar as life annuities play a minor role. Life annuities can replace stocks up to 30 percent at the maximum. While bonds are fully crowded out when there is no desire to bequeath the heirs, they become increasingly important for the case with a moderate bequest motive. Successively, bonds replace stocks as the likelihood of dying becomes more pronounced.

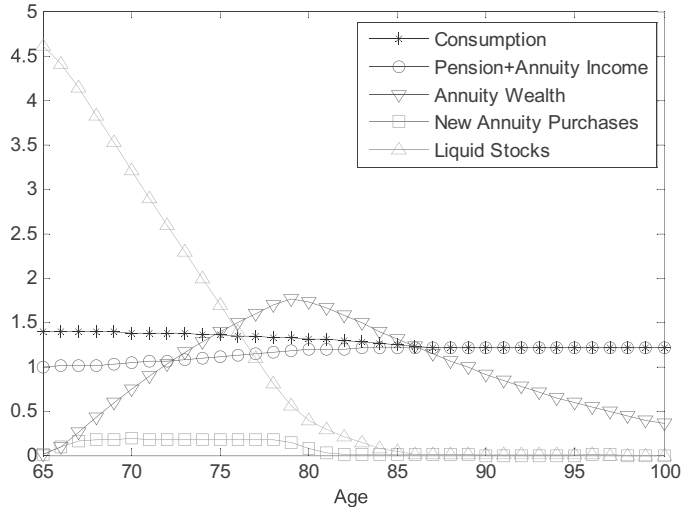
In figure 4.2, the year-to-year investment and consumption decisions can be seen in more detail. It shows the life cycle profile of a household without (Graph A) and with (Graph B) bequest motives. Both graphs illustrate the expected consumption, pension and annuity income, annuity wealth, the amount of new annuity purchases, the overall level of retirement wealth and liquid stock holdings. All parameters are reported as a multiple of the yearly pre-existing pension income.

We can infer from Graph A that the expected consumption level is either above or exactly at the level of the pre-existing pension income and is at its highest at the beginning of retirement. Pension and annuity income, from which the consumption is predominantly financed, consists of the pre-existing pension payments and periodic payments from the purchased annuity stock. It never falls below the starting level, observed at the age of 65. New annuity purchases take place predominantly between the ages of 65 and 80. At the age of 80, annuity wealth, which is defined as the present value of all pre-existing payouts of life annuity purchases, is at its maximum. It declines thereafter in the absence of new purchases and as a result of the reduction of the present value of existing annuity stock due to progressing payments and increasing mortality. The amount of wealth invested in liquid stocks declines continually and reaches zero at the age of 87. It is used to fund the purchase of new annuities and consumption.

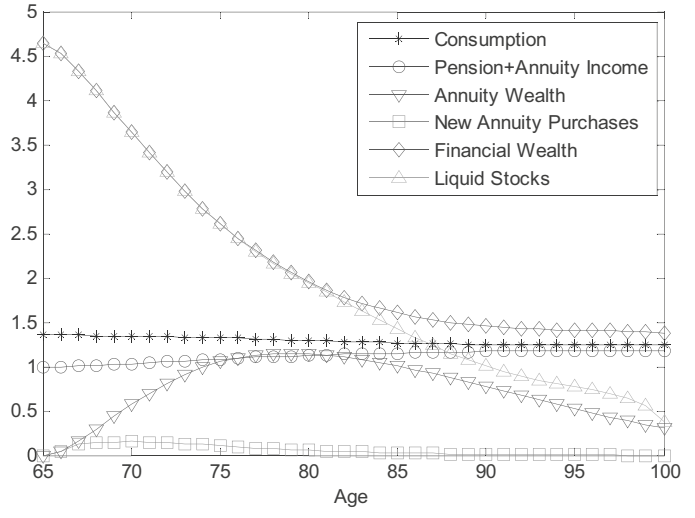
Graph B of figure 4.2 also displays the expected life cycle profile, i.e. displays information about consumption, when and to what extend annuities are purchased, the level of liquid financial wealth, and the income-level from pre-existing pensions and annuities. Compared to the case without a bequest motive, the household with bequest motives decumulates the assets more slowly and shifts less wealth gradually into life annuities. Financial wealth never gets exhausted and bonds gain more importance, as the household becomes older. In both settings the retiree consumes on average slightly more at the beginning of retirement, and less as she becomes older.

Figure 4.2: Expected optimal life cycle profile for a household with moderate risk aversion and moderate wealth/pension ratio

Graph A: Moderate wealth/pension ratio, no bequest motive



Graph B: Moderate wealth/pension ratio, moderate bequest motive



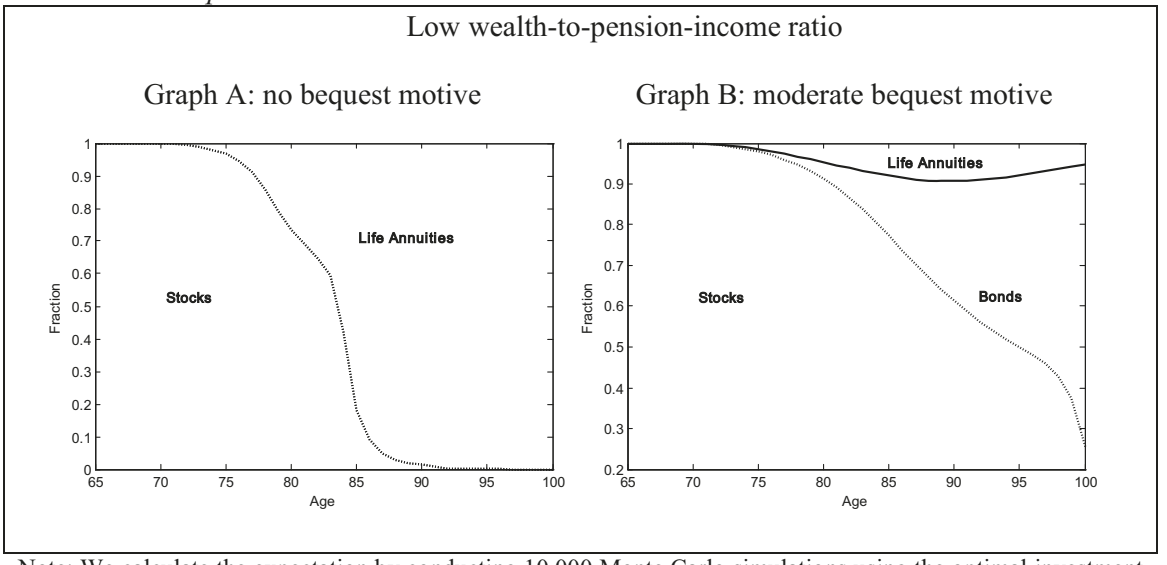
Note: We calculate the expectation by conducting 10,000 Monte Carlo simulations using the optimal investment and consumption policies derived by solving the dynamic portfolio choice model. All parameters are reported as a multiple of the yearly pre-existing pension income.
Source: Own calculation.

To sum up, the optimal expected asset allocation over time shows a similar "life-cycle-profile" as in the accumulation phase, i.e. starting with a high equity exposure early in retirement and shifting gradually into safer investments, such as government bonds. Yet, the key difference compared with the accumulation phase is that, in the decumulation phase life annuities with fixed real benefits play the role of the "safe asset", while stocks still play the role of the "return drivers". In addition, the survival credit (i.e. the excess return of annuities over the riskless bonds) rises with age, making annuities more attractive from the return perspective.

4.1.3. The case of low and high financial wealth relative to pre-existing pension income

In this section we analyse a situation where financial wealth is relatively low compared to the pre-existing pension income. Concretely, we assume that the household is endowed with financial saving twice as high as the annual pre-existing pension income. For instance, if the yearly pre-existing pension income of the household is 25,000 EUR the financial wealth would be 50,000 EUR. Also in this case, the household has a moderate risk aversion. Figure 4.3 shows the expected optimal asset allocation for such a household without (Graph A) and with (Graph B) a moderate bequest motive.

Figure 4.3: Expected optimal asset allocation for a household with moderate risk aversion and low wealth/pension-ratio



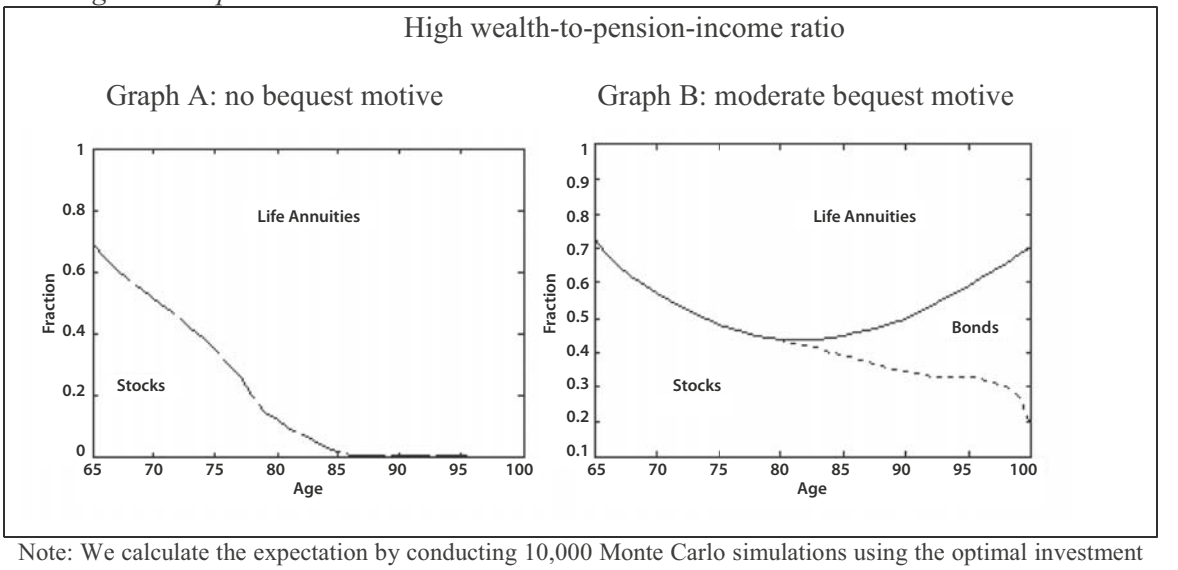
Note: We calculate the expectation by conducting 10,000 Monte Carlo simulations using the optimal investment and consumption policies derived by solving the dynamic portfolio choice model. Graph (A) shows the expected life cycle profile for a household with low wealth-to-pension-income ratio household (savings are 2 times the yearly pension income), moderate risk aversion, and no bequest. Graph (B) displays the results with a bequest.
Source: Own calculation.

Without the bequest motive, the household continues holding only stocks for a longer period than in the case with moderate wealth to pension ratio. The reason is that the household wants to participate longer in the return opportunities of the stock market in order to possibly reach higher consumption levels. In order to augment the total wealth, the household adds risky stocks to the overall portfolio until age 92 when all assets are finally annuitised (Graph A). Compared to the case with moderate wealth/pension ratio, the household postpones full annuitisation for five years.

Graph B displays the expected asset allocation of a household with bequest motives. The household annuitises only a small fraction of available wealth, with annuitised wealth expected to never exceed 10 percent of the total. Instead of annuities, the household shifts from stocks to bonds as time goes by.

Next, we analyse a situation where the household has relatively high financial savings compared to the pre-existing pension income, i.e. the wealth/pension ration is ten. For instance, if the yearly pre-existing pension income of the household is 20,000 EUR the financial wealth would be 200,000 EUR. Figure 4.4 shows the expected optimal asset allocation for such a household without (Graph A) and with (Graph B) a moderate bequest motive. Compared with the base case the retiree which has no bequest motive uses about 30 percent of her individual savings at the beginning of the decumulation period to buy annuities (Graph A). The rest is initially invested in stocks, and gradually converted into annuities.

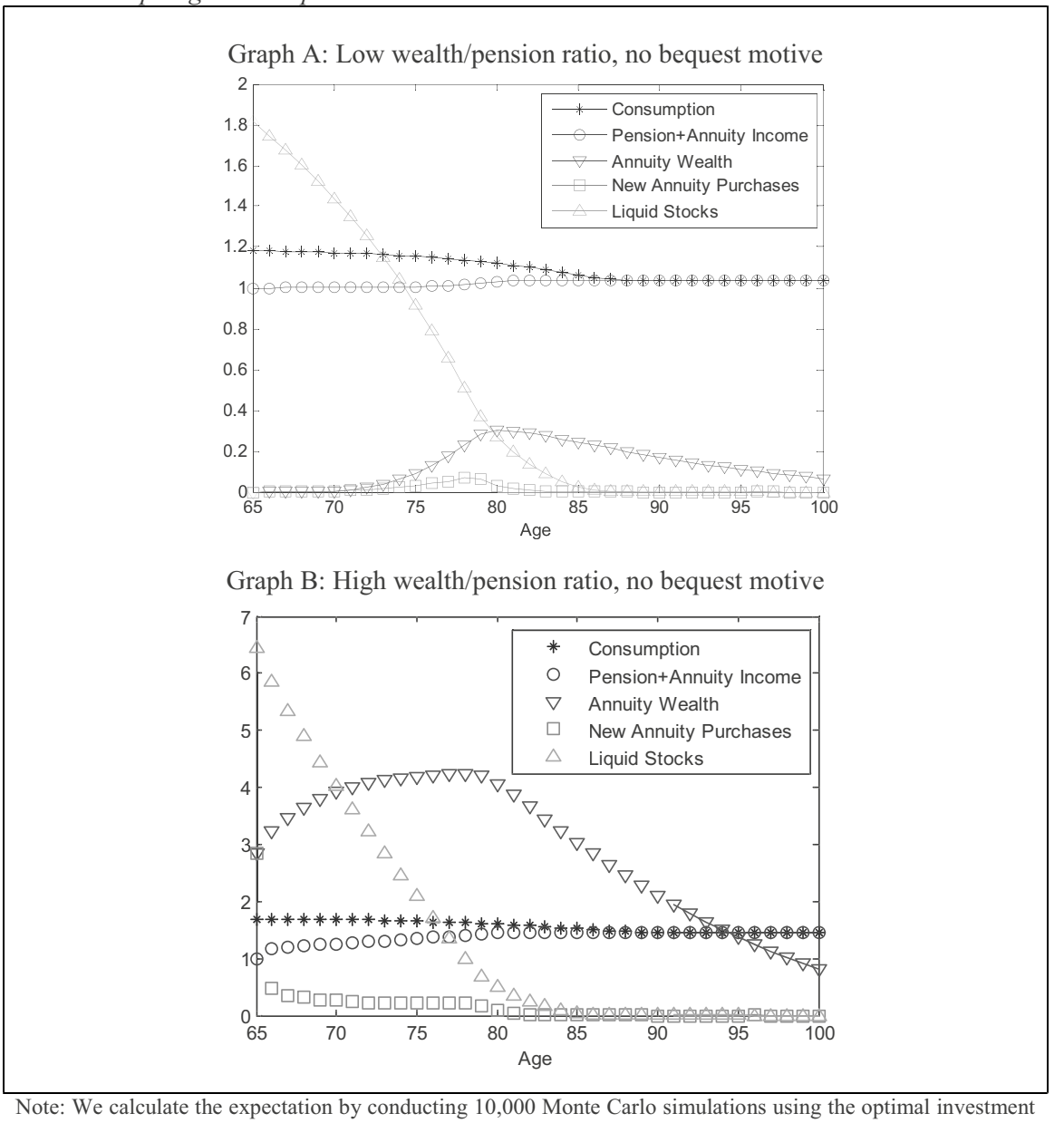
Figure 4.4: Expected optimal asset allocation for a household with moderate risk aversion and high wealth/pension-ratio



Note: We calculate the expectation by conducting 10,000 Monte Carlo simulations using the optimal investment and consumption policies derived by solving the dynamic portfolio choice model. Graph (A) shows the expected life cycle profile for a household with high wealth-to-pension-income ratio household (savings are 10 times the yearly pension income), moderate risk aversion and no bequest. Graph (B) displays the results with a bequest.
Source: Own calculation.

Finally, figure 4.5 displays in more detail the year-to-year investment and consumption decisions of a household assuming no bequest motive. Graph A shows the life cycle profile of a household with a low wealth-to-pension income ratio (i.e. two). It can be inferred that the household buys annuities later and to a much smaller extent than in the case with a moderate wealth/pension-ratio. Most annuities are purchased between 75 and 85 years of age. Graph B shows the case with a high wealth/pension ratio (i.e. ten). Here, the household purchases much more annuities at the beginning of the retirement period, but is still substantially invested in risky stocks. In addition, the expected consumption profile is slightly decreasing with age for both cases.

Figure 4.5: Expected optimal life cycle profile for a household with moderate risk aversion and low resp. high wealth/pension ratio



Note: We calculate the expectation by conducting 10,000 Monte Carlo simulations using the optimal investment and consumption policies derived by solving the dynamic portfolio choice model.
Source: Own calculation.

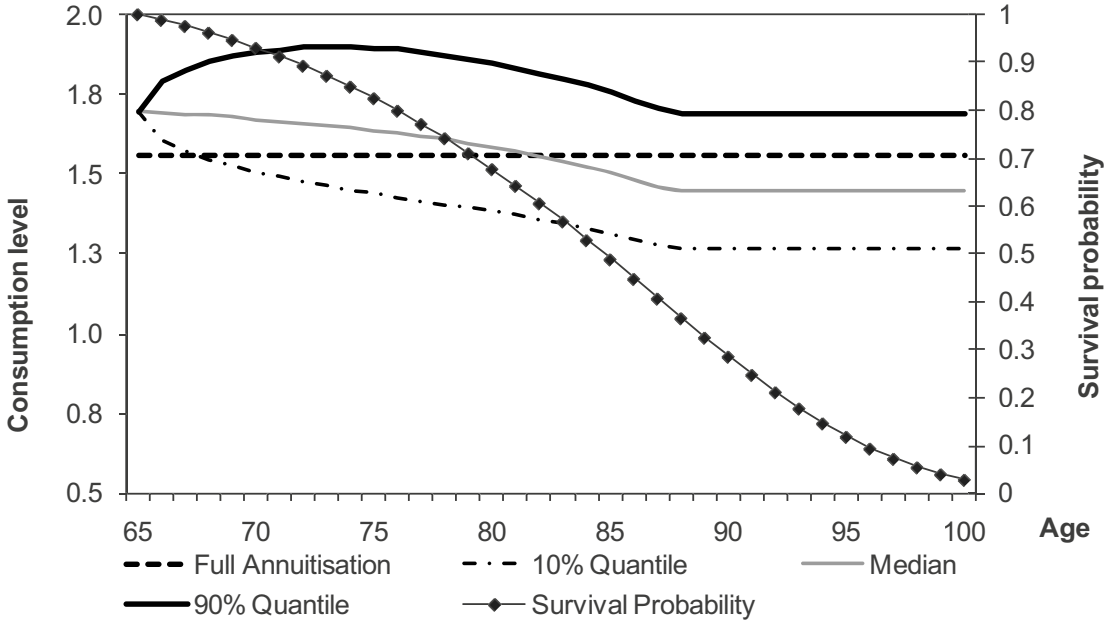
In summary, the analysis in this section supports the result from the previous section that the expected optimal investment behaviour of a household in the payout phase shows a "life cycle" profile, starting with a high equity exposure early in retirement and shifting gradually into more safe investments. When the household has no bequest motive, a fixed life annuity completely assumes the role of the safe asset, while for the case with bequest motives government bonds play also an important role later in life.

4.1.4. Worst case income risk analysis of optimal payout policies

In this section we provide an additional detailed insight into the range of possible consumption levels if the retiree follows a financial retirement strategy described in the previous section. Based on a Monte Carlo Simulation of 10,000 life cycles we calculate the 90%, 50%, and 10%-quantiles of the resulting consumption level (conditional on surviving), given that the retiree rebalances the portfolio optimally. The retiree shows a relative high level of savings with respect to pre-existing pension (i.e. factor ten), a moderate level of risk aversion (i.e. the coefficient of RRA is equal to five), and no bequest motive. The 10%-quantile can be regarded as a worst case measure, meaning that the equity market shows an ongoing adverse development over time, which results in some consumption shortfall for the retiree. On the other hand the 90%-quantile of consumption can be seen as a best case metric providing the retiree with a high consumption level because of quite favourable developments in the capital markets. To compare the results we also report the situation if the retiree annuitizes all of the savings immediately at retirement.

The following figure 4.6 displays the results. The scaling on the left hand horizontal axis refers to the 10%-, 50%-, and 90%-quantile of consumption level as a multiple of pre-existing pension income. The scaling on the right hand horizontal axis is the survival probability of a 65-year old female (according to a population table).

Figure 4.6: Range of consumption levels for optimal payout strategies



Note: The left vertical axis shows the probable minimum lifetime consumption for a confidence level of 10-, 50-, and 90% if the retiree (moderate level of risk aversion, and high pension/wealth ratio) follows the optimal payout strategy. The thick dashed line is the consumption level in case of full annuitisation. The right vertical axis shows the probability of a 65-year female to survive until age 66, 67 , … 100.
Source: Own calculation.

If the household annuitises all financial wealth, she can increase her consumption level compared to her pre-existing pension income by about 56%, independently of her age. In the

case where the optimal retirement strategy using all financial instruments (stocks, bonds, life annuities) is implemented, the resulting consumption pattern is highest early in retirement (i.e. when the probability to survive is relatively high) and thereafter decreases as the retiree becomes older (i.e. when the probability to survive becomes lower). At the age of 65 the median consumption level is 1.7 times the pre-existing state pension, going slowly down to a level of 1.45 from age 87 onwards. Since we have no bequest motive, until the age of 86, all the liquid savings are gradually switched into life annuities, and therefore the level of consumption remains constant until the retiree passes away. On average, the household is able to consume more until the age of 82 compared to a full annuitisation strategy.

Looking at the possible consumption pattern over the complete life cycle (i.e. from age 65 until 100) and by taking into account survival probabilities, it is clear that the retiree can expect to consume substantially more by following the optimal strategy compared to the case of full annuitisation. This can be seen, by using the expected present value of probable life time consumption as a metric:

Expected Present Value of Probable Life-Time Consumption

$$EPV(LifetimeConsumption) = \sum_{t=0}^{T} \beta^t \cdot p_t^s \cdot PMC_\alpha(C_t)$$

The expected minimum level of consumption $PMC_\alpha(C_t)$ at time t with respect to a given confidence level (here α = 10%, 50%, 90%) is weighted by the conditional probability that the retiree is still alive *t* years after retirement. All possible consumptions are discounted back to the beginning of the retirement period using the time preference parameter $\beta = 0.96$. In the case of full annuitisation this measure shows a value of 16.7. Thereof, 13.05 results from benefits provided by pre-existing pension income (e.g. from state pensions). This means, by converting all of the savings at age 65 into a life annuity, the retiree increases his life time consumption opportunities to a level which is 28% higher than the benefits from his pre-existing pension income. If the retiree follows instead the optimal strategy, the value is 17.4 (on a confidence level of 50%), i.e. the retire can expect to increase his life time consumption opportunities in present value terms by 33% compared to pre-existing state pensions.

Table 4.1: Present value of probable minimum life time consumption for the optimal dynamic payout strategy

	Full annuitisation	PV of probable minimum pension payments (inflation-adjusted in advance payments) p.a. for confidence level of … Optimal Dynamic Strategy		
		10%-Quantile	50%-Quantile	90%-Quantile
	Moderate wealth-to-pension-income ratio			
Absolute	16.7	15.9	17.4	19.5
As % of pre-existing pension income	128%	122%	133%	150%
As % compared to full annuitisation	100%	95%	105%	118%

Source: Own calculation.

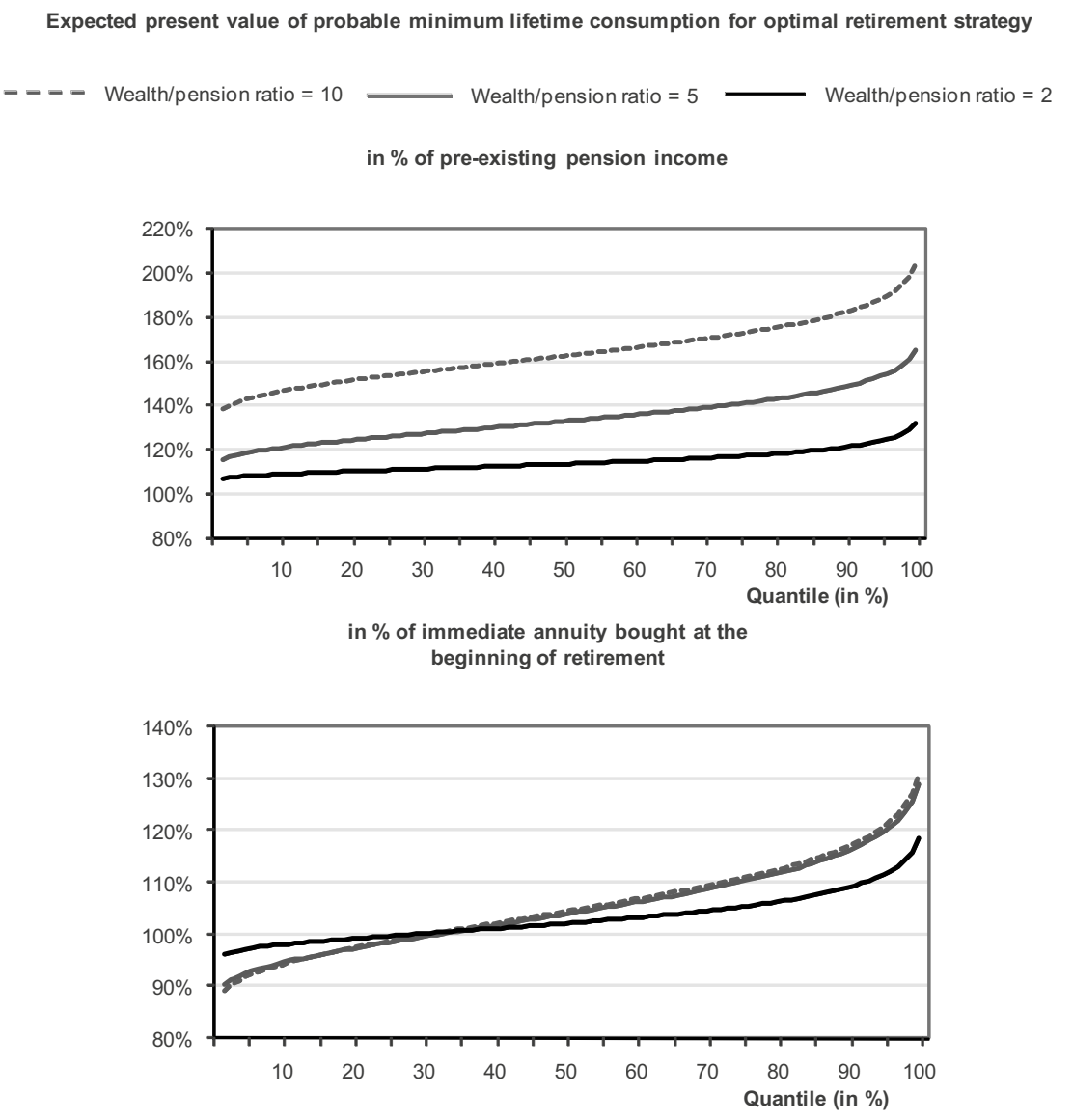
In the case the returns on the assets invested in the financial markets are developing unfavourably, the retiree has to accept a lower consumption level. The 10%-quantile shows that, early in retirement up to the age of 68, the consumption level is even higher compared to

the full annuitisation tactic. At the age of 70, the consumption level is 1.51, i.e. 3.3% lower compared to full annuitisation. At the age of 75, this consumption shortfall is 7.7%, at the age of 80 it is at 11.1%, and if the retiree survives until the age of 85, the loss relative to the full annuitisation tactic is 15.8%. To evaluate these possible losses, two important factors must be pointed out: First, the probability that capital markets will show such an unfavourable development is relatively low, i.e. not higher than 10%. Second, the probability that the retiree will have the experience of relatively high consumption shortfalls is also low, because the survival probabilities are exponentially decreasing with age. Therefore the expected present value of life time consumption shows a value of 15.9 on the 10%-confidence level, which is only slightly (i.e. 5%) lower compared to the full annuitisation case.

Finally, we look at how the worst case scenarios stand vis á vis best case scenarios. The 90%-quantile shows that, if the realised returns on the assets invested in the capital markets are relatively high, the retiree is able to enjoy consumption level which is, for all ages, significantly higher compared to the full annuitisation case. For example, at the age of 75 the level of consumption for the optimal dynamic strategy shows a value of 1.55 which is 21 percent higher than the full annuitisation tactic. The present value of life time consumption is in such a favourable scenario is 19.5 and therefore 50% higher than the social security benefits and 18% higher compared to the full annuitisation strategy.

The next figure shows the result if we calculate for the optimal strategy the expected present value of probable lifetime consumption (EPV) for all quantiles in the rage from α = 1%, 2%, ….99%. In the panel (a) the results are compared to the corresponding value of pre-existing pension income and in the panel (b) they are compared to the full annuitisation strategy. If the household has a wealth/pension ratio of 10, she can expect to consume in the worst case (i.e. at the 1%-quantile) about 40% more compared to the income from state pensions, and about 100% more (i.e. at the 99%-quantile) in the best case. The corresponding numbers a wealth/pension ratio of five (two) are 16% (7%) in the worst case scenario and 65% (32%) in the best case scenario. From the panel (b) it can be inferred that the break even quantile of the optimal strategy compared with the simple full annuitisation tactic is about 30% for all wealth/pension ratios. This means that 70 out of 100 households can expect to enjoy a (substantially) higher life-time consumption level if they follow the optimal financial retirement strategy instead of annuitisation all of their individual savings at retirement.

Figure 4.7: Present value of probable minimum life time consumption for the optimal retirement strategy



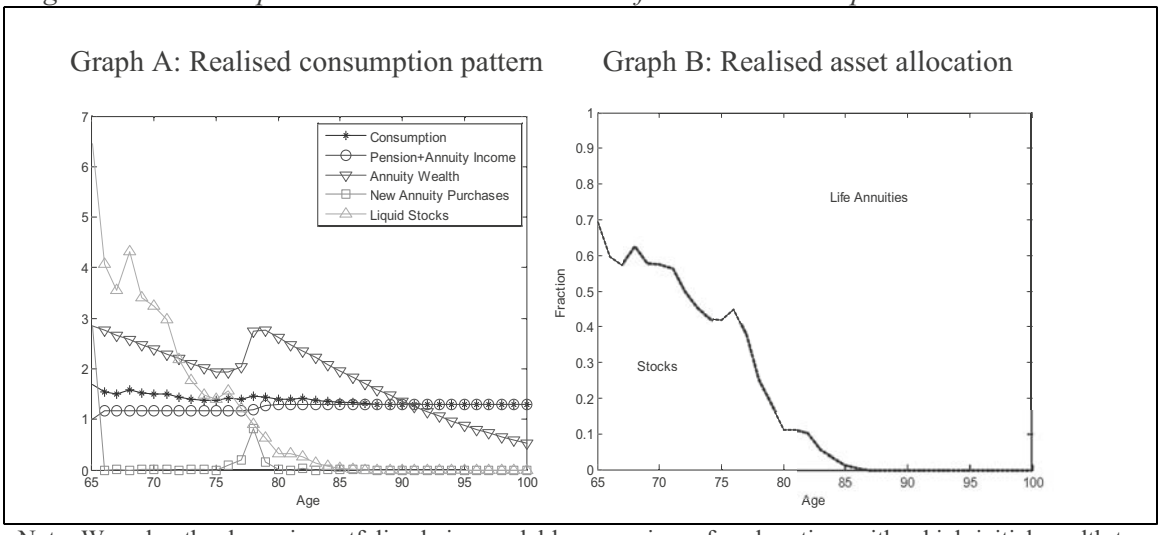
Note: The expected present value of probable minimum life time consumption with respect to the quantile at 1% to 99%-levels are calculated by conducting 10,000 Monte Carlo simulations using the optimal investment and consumption policies derived by solving the dynamic portfolio choice model for a female retiree with a moderate risk aversion (i.e. ρ=5) and no bequest motive. The various quantiles are weighted with the survival probabilities according to a female population table and discounted back at 4% p.a. to age 65.
Source: Own calculation.

A case study: Implementing optimal payout strategies to historical data: Next, we look for the results when the household follows the optimal investment and consumption policy by solving the dynamic life cycle model on a specific scenario. To do so, we use the inflation adjusted annual time series of a well diversified stock index-portfolio in the period 1973-2007 and specify the optimal portfolio holdings assuming a initial wealth-to-pension-income ratio of 10. Here, we use the German equity index (DAX) which consists of 30 blue chips stocks traded on the German Stock Exchange. Since the model predicts a high initial equity

exposure, we study the impact of a dramatic downturn in the stock market in the first year after retirement. To do so, we undertake the following experiment by modifying the historical times series in the following way: The lowest yearly return over that period -59% was realized in year 2002; we switch that return from the year 2002 at the beginning of the time series to the year 1973, and switch the corresponding value of the effectively realised return in the year 1973 to the year 2002.[46]

The following figure shows the realised consumption profile (Graph A) and the optimal asset allocation strategy over time (Graph B).

Figure 4.8: Consumption level and asset allocation for a historical capital market scenario



Note: We solve the dynamic portfolio choice model by assuming a female retiree with a high initial wealth-to-pension ratio of ten and moderate level risk aversion (ρ=5). The optimal strategy is implemented on a realised (and modified) return history of a portfolio consisting of German stocks, represented by the (modified) DAX–returns from 1973-2007. Source: Own calculation.

Graph B of the figure shows that the retiree invests at age 65 about 70% of her saving in stocks and 30% in life annuities. Graph A of the figure illustrates the dramatic stock market loss in the first year of the retirement phase. In addition, the value of the stock portfolio shows quite high fluctuations over time. Yet, the resulting consumption profile is remarkably smooth over time. This is due to the fact that the short term fluctuations in the equity markets become less important over longer investment horizons, especially when the investor is able to dynamically readjust the asset allocation in a reasonable way.

To sum up: The optimal retirement strategy requires a relatively high exposure in equities. Therefore, the retiree is exposed to the usually remarkable short term fluctuations in the equity markets. Yet, our analysis shows that the resulting worst case risk with respect to life time consumption levels is moderate.

[46] The sequence of annual stock returns we apply to our optimal payout strategy is: 2002, 1974, 1975, …, 2001, 1973, 2003, …, 2007. This means that retirement starts when the stock returns are especially low.

4.2. The economic cost of compulsory annuitisation

4.2.1. Setup of the analysis

After analysing the existence of an optimum retirement strategy, it is a natural next step to quantify the possible utility losses resulting from the enforced annuitisation (e.g. set by legal or regulatory requirements) or utility gains following the possibility to combine different retirement instruments.[47] Based on the additively time-separable utility function of the Constant Relative Risk Aversion (CRRA) class defined over consumption and bequest, we compare the utility effects observed in two worlds: In the world without any restrictions, or *free world*, retirees are free to choose their retirement strategy as a combination of a drawdown plan and a gradual purchase of fixed annuities. In another, *restrictive world*, the retirees are forced to fully annuitise their wealth at the beginning of retirement (65 years) using the *fixed* annuity. The more detailed model description is given in appendix A.

In our analysis we differentiate between three degrees of retirees' risk aversion: low ($\rho = 2$), moderate ($\rho = 5$) and high ($\rho = 10$). We also distinguish between three combinations of pre-existing pension income and financial wealth, as both of them influence the choice of retirement strategy in the absence of any restrictions.

For the purpose of our analysis, we depict the financial situation of a prospective retiree as a relation of the financial wealth available at the beginning of retirement to the pre-existing pension (S_0). Thus, in our framework the following wealth/pension income categories exist:

- *Low ratio of pre-existing wealth to pre-existing pension* ($S_0=2$), means that financial wealth is relatively low and just twice the pre-existing annual pension.

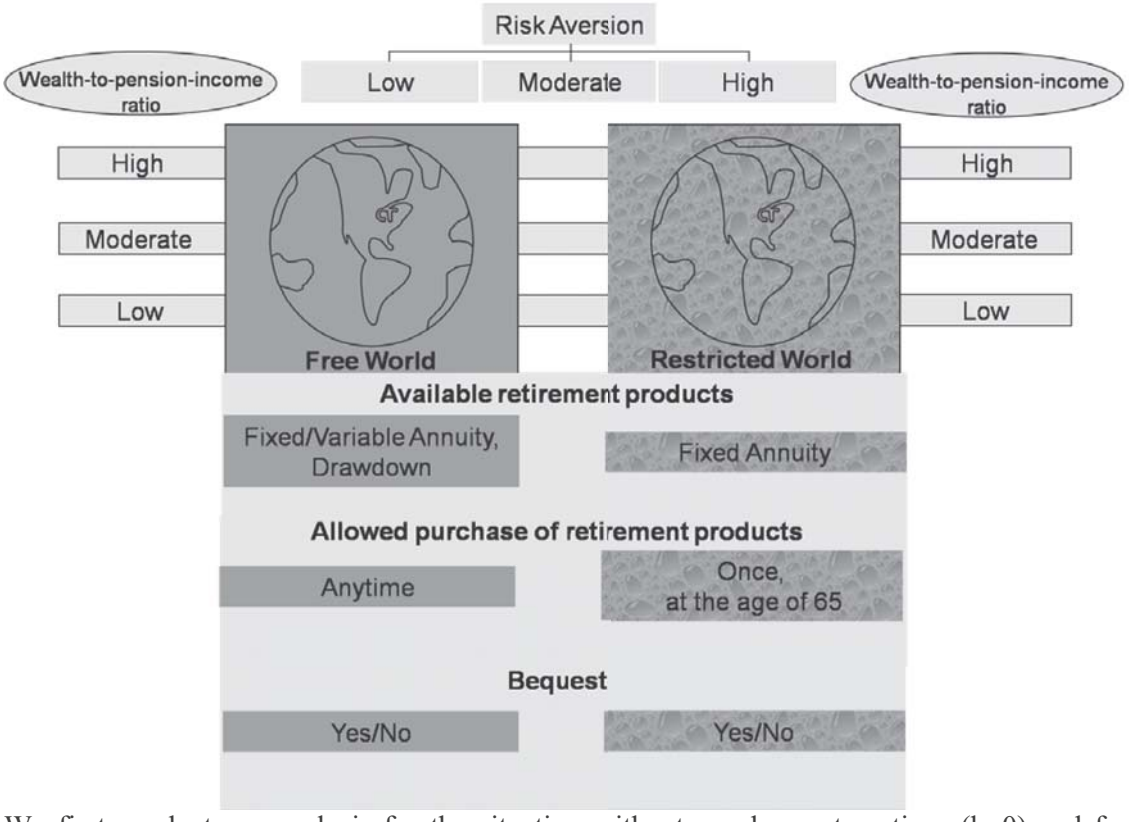
- *Moderate ratio of pre-existing wealth to pre-existing pension* ($S_0=5$), meaning that financial wealth is, with five times the pre-existing annual pension, moderate.

- *High ratio of pre-existing wealth to pre-existing pension* ($S_0=10$), meaning that financial wealth is relatively high and amounts to ten times the pre-existing annual pension.

Figure 4.9 summarises all the dimensions of our analysis.

[47] Regulatory restrictions on the use of the retirement funds prevent the retiree from achieving the optimal consumption pattern and thus result in lower lifetime consumption, leading to utility losses. When the regulatory restrictions are in place, the level of consumption, obtainable by pursuing optimal retirement strategy, and thus the corresponding utility level, can be achieved when more funds are at retiree's disposal at the beginning of retirement. The difference between the funds needed to achieve the same utility level with and without the restrictions on the use of funds in retirement is the utility compensation.

Figure 4.9: Dimensions of utility analysis



We first conduct our analysis for the situation without any bequest motives (k=0) and for three risk attitudes. Then we introduce a bequest motive (k=2) in the case of moderate risk aversion. The following table shows the relative utility impact of an enforced annuitisation as compared to the free world – the world without any restrictions on the use of retirement capital, measured as a compensation for utility loss in % of the financial wealth available at the beginning of retirement. This way of representing the utility impacts of the enforced annuitisation permits the calculation of the required absolute utility compensation for any absolute combination of pre-existing financial wealth and annual pension income which produces the surveyed relations.

Table 4.2: Relative utility impact of an enforced annuitisation vs. the free world with withdrawals and fixed annuities available: Percentage of the initial wealth required as a compensation for utility loss

Compensation, % of the initial wealth	**Low risk aversion, no bequest**	**Moderate risk aversion, no bequest**	**High risk aversion, no bequest**	**Moderate risk aversion, bequest**
Pension Level (S)	(ρ = 2, k = 0)	(ρ = 5, k = 0)	(ρ = 10, k = 0)	(ρ = 5, k = 2)
Low wealth/pension ratio (S_0=2)	17%	14%	8%	81%
Moderate wealth/pension ratio (S_0 = 5)	24%	16%	10%	54%
High wealth/pension ratio (S_0=10)	22%	13%	9%	36%

Note: The numbers represent the required compensation as a percentage of initial wealth at retirement (age 65) which makes the retiree indifferent in utility terms between a situation with mandatory annuitisation using fixed annuities, and the optimal investment and consumption policies using stocks, bonds, and annuities. Source: Own calculation.

4.2.2. Main findings and a numerical example

For a better understanding, as a further step, we express our findings in absolute numbers by introducing an example: We assume that an annual pension income of EUR 15,270 is originally available to both groups of retirees – living in the restricted and the unrestricted world. The retirees have, as mentioned above, three different degrees of risk aversion and three levels of pre-existing pension income. Maintaining the relation of financial wealth to the annual pension at the levels specified in the model, while leaving pension income constant, yields the following financial wealth available at the beginning of retirement:

- *Low ratio of pre-existing wealth to pre-existing pension* (S=2):
Financial wealth of EUR 30,540

- *Moderate ratio of pre-existing wealth to pre-existing pension* (S=5):
Financial wealth of EUR 76,350

- *High ratio of pre-existing wealth to pre-existing pension* (S=10):
Financial wealth of EUR 152,700

The annual pension amount of EUR 15,270, which we use in our example, is the mean equivalised net income of the population aged 65 and over in the EU-15 countries for the year 2006, as calculated by Eurostat. In all European countries surveyed in this study, this figure is even higher, ranging from EUR 15,280 in Italy through EUR 18.655 in Austria to about EUR 30.000 in Switzerland.[48] The amounts of financial wealth which are available for the retirees in our example are a range out of the lower three quintiles of the total wealth distribution in 11 European countries, as illustrated by table 4.3.[49]

Table 4.3: Average total wealth in 11 European countries, by total wealth quintile

Household wealth quintile	Average total wealth, in EUR
1st Quintile	4.100
2nd Quintile	49,700
3rd Quintile	130,400
4th Quintile	240,600
5th Quintile	660,500

Source: *Börsch-Supan et al*. (2005), Table 4A.5.

Table 4.4 shows the impact of the enforced annuitisation with fixed annuities on the utility of rational retirees with different risk attitudes and levels of wealth to pension income ratios, on the numbered examples.

It can be seen that, in the world with enforced annuitisation, retirees across all groups would require compensation in addition to their available initial wealth, independently of the absolute amount in order to achieve the same utility as those having correspondingly the same wealth but living in a world without restrictions.

[48] *Eurostat* (2007), *EVE* (2005).
[49] *Börsch-Supan* et al. (2005), Table 4A.5.

Table 4.4: Utility impacts of enforced annuitisation vs. the free world with withdrawals and fixed annuities available: Initial wealth amount and compensation for utility loss in the restricted world

Wealth + compensation, EUR	**Low risk aversion, no bequest**	**Moderate risk aversion, no bequest**	**High risk aversion, no bequest**	**Moderate risk aversion, bequest**
Pension Level (S)	($\rho = 2$, $k = 0$)	($\rho = 5$, $k = 0$)	($\rho = 10$, $k = 0$)	($\rho = 5$, $k = 2$)
Panel 1: Retirement Wealth 30,540 / Pre-Existing Pension Income 15,270 p.a.				
Low wealth/pension ratio (S=2)	35,732 Compensation= 5,192	34,816 Compensation= 4,276	32,983 Compensation= 2,443	55,277 Compensation= 24,737
Panel 2: Retirement Wealth 76,350 / Pre-Existing Pension Income 15,270 p.a.				
Moderate wealth/pension ratio (S=5)	94,674 Compensation= 18,324	88,566 Compensation= 12,216	83,985 Compensation= 7,635	117,579 Compensation= 41,229
Panel 3: Retirement Wealth 152,700 / Pre-Existing Pension Income 15,270 p.a.				
High wealth/pension ratio (S=10)	186,294 Compensation= 33,594	172,551 Compensation= 19,851	166,443 Compensation= 13,743	207,672 Compensation= 54,972

Note: The numbers represent the required initial wealth or the compensation in EUR at retirement (age 65) which makes the retiree indifferent in utility terms between a situation with mandatory annuitisation using fixed annuities, and the optimal investment and consumption policies using stocks, bonds, and annuities. Source: Own calculation.

Intuitively, in the absence of any bequest motives, people with high risk aversion, independently of their wealth or income situation, would suffer the least utility losses from enforced annuitisation, as they generally tend to favour sure outcomes to any uncertainty. However, even for those with high risk aversion, the enforced annuitisation brings substantial utility losses. In our example, the compensation for utility loss for this group ranges from EUR 2,443 to EUR 13,743, depending on the wealth/income relation. Those with low risk aversion suffer, as expected, the biggest utility losses, ranging from EUR 5,192 to EUR 33,594. The utility losses for retirees with moderate risk aversion are bigger than for retirees with high risk aversion, but fall below of those with low risk aversion and range between EUR 4,276 and EUR 19,851.

For each of the different wealth/income combination groups in the absence of any bequest motives, the following results can be observed: Across all risk attitudes, the smallest compensation for utility reduction would be needed for those with low wealth to income ratio: The required compensation would range between EUR 2,443 and EUR 5,192 depending on the risk aversion. The utility loss is the biggest for the case of high wealth to pension ratio: The required compensation would range between EUR 13,743 and EUR 33,594 depending on the risk attitude. This means that those, who were hard working and saving diligently during their active years, would be the most damaged by the enforced annuitisation.

The ranking order of required utility compensations remains the same independent of the absolute levels of pre-existing pensions or financial wealth as long as the relation between the pre-existing financial wealth and annual pension income is maintained. The absolute amount of the required compensations, however, would increase with the amount of pre-existing financial wealth subject to potential enforced annuitisation.

In respect of a retiree with a bequest motive and a moderate risk aversion, the utility losses from the enforced annuitisation and, therefore, the required compensation, become especially

pronounced. They range from more than one third of the initial wealth for high wealth to pension relation (EUR 54,972 in our example) to more than three quarters for low wealth to pension relation (EUR 24,737 in our example). The strength of the impact can be intuitively understood, as the low wealth to pension relation can mean that only a relatively small absolute amount of money is available and the small utility gains from guaranteed additional consumption originating from the annuitised retirement wealth are overshadowed by the huge utility losses resulting from the inability to bequeath at all.

4.3. Benefits arising from the introduction of investment linked annuities

4.3.1. Setup of the analysis

To answer the question whether innovative pooled solutions such as investment-linked annuities (which at least partly depend on the return of the underlying investment portfolio) bring an additional value for the retirees, we change slightly the setting of our analysis from that of the previous chapter. We now compare the utility derived by a retiree in a restricted world where, as before, a full initial annuitisation with fixed annuities is required, to the world without restrictions. In that free world, the retiree can voluntary combine the drawdown plans and the purchase of investment-linked annuities. Both inside the annuity wrapper as well as within the drawdown plan, the retiree can choose among a riskless bond and a risky stock investment. The retiree has thus to make both an *asset location* and an *asset allocation* choice. The asset location choice refers to the question how much of the retirement wealth should be invested in liquid financial asset versus investment-linked payout annuities. The asset allocation decision refers to the question how much of the overall funds should be invested in risky stocks and riskless bonds (in-/outside the annuity wrapper).

We answer this question in the same dynamic portfolio choice setting as in the previous section. This means that we use the same set of assumptions regarding the capital markets, mortality, preference for time, risk, bequest motives, and pre-existing pension income compared to available financial wealth. The difference is that we extend the opportunity set from a fix annuity with flat benefits to an investment-linked annuity. Again, a detailed description of the methodology is given in appendix A. We expect this strategy to offer increased welfare compared to a fixed annuity tactic in conjunction with a withdrawal plan consisting of liquid assets.

4.3.2. Main findings: example continued

Table 4.5 shows the relative utility impact of an enforced annuitisation as compared to the free world with variable annuities. Also in the new setting, this way of representing the utility impacts allows the calculation of the required absolute utility compensation for any absolute combination of pre-existing financial wealth and annual pension income.

Table 4.5: Relative utility impacts of an enforced annuitisation vs. the free world with withdrawals and variable annuities available: Percentage of the initial wealth required as a compensation for utility loss

Compensation, % of the initial wealth	**Low risk aversion, no bequest**	**Moderate risk aversion, no bequest**	**High risk aversion, no bequest**	**Moderate risk aversion, bequest**
Pension Level (S)	($\rho = 2$, $k = 0$)	($\rho = 5$, $k = 0$)	($\rho = 10$, $k = 0$)	($\rho = 5$, $k = 2$)
Low wealth/pension ratio (S=2)	22%	19%	13%	82%
Moderate wealth/pension ratio (S=5)	34%	25%	17%	56%
High wealth/pension ratio (S=10)	33%	20%	13%	40%

Note: The numbers represent the required compensation as a percentage of initial wealth at retirement (age 65) which makes the retiree indifferent in utility terms between a situation with mandatory annuitisation using fixed annuities, and the optimal investment and consumption policies using stocks, bonds, and investment-linked annuities. Source: Own calculation.

We continue with our example of a EUR 15,270 annual pension income and three different financial wealth amounts, available to retirees living in the restricted and the free world and observe the following absolute results:

Table 4.6: Absolute utility impacts of an enforced annuitisation vs. the free world with withdrawals and variable annuities available: Initial wealth amount and compensation for utility loss in the restricted world

Wealth + compensation, EUR	**Low risk aversion, no bequest**	**Moderate risk aversion, no bequest**	**High risk aversion, no bequest**	**Moderate risk aversion, bequest**
Pension Level (S)	($\rho = 2$, $k = 0$)	($\rho = 5$, $k = 0$)	($\rho = 10$, $k = 0$)	($\rho = 5$, $k = 2$)
Panel 1: Retirement Wealth 30,540 / Pre-Existing Pension Income 15,270 p.a.				
Low wealth/pension ratio (S=2)	37,259 Compensation= 6,719	36,343 Compensation= 5,803	34,510 Compensation= 3,970	55,583 Compensation= 25,043
Panel 2: Retirement Wealth 76,350 / Pre-Existing Pension Income 15,270 p.a.				
Moderate wealth/pension ratio (S=5)	102,309 Compensation= 25,959	95,438 Compensation= 19,088	89,330 Compensation= 12,980	119,106 Compensation= 42,756
Panel 3: Retirement Wealth 152,700 / Pre-Existing Pension Income 15,270 p.a.				
High wealth/pension ratio (S=10)	203,091 Compensation= 50,391	183,240 Compensation= 30,540	172,551 Compensation= 19,851	213,780 Compensation= 61,080

Note: The numbers represent the required initial wealth or the compensation in EUR at retirement (age 65) which makes the retiree indifferent in utility terms between a situation with mandatory annuitisation using fixed annuities, and the optimal investment and consumption policies using stocks, bonds, and investment-linked annuities. Source: Own calculation.

From the numbers in table 4.6 it can be seen that the groups requiring the largest compensations for the change from the free world into the world with the enforced annuitisation remain the same, independent of whether fixed or variable annuities are available in the free world.

Across all fields, however, even more compensation is needed to put a retiree in the restricted world on par with a retiree from the free world, where variable annuities are available. It could be, therefore, concluded, that the variable annuity has some highly desirable features for a retiree who is free to optimise her retirement portfolio.

Obviously, these features are valued most by retirees with a high wealth to pension ratio across all risk attitudes, especially if they have a low risk aversion. The retirees with a low and moderate wealth to pension ratio, however, independently from their risk attitude, also benefit greatly from the existence of the variable annuities.

The favourable qualities of the variable annuity seem to be predominantly needed in order to achieve the optimum personal consumption rather than in order to bequeath. The utility compensation required by a retiree with a moderate risk aversion and a bequest motive across all wealth / pension dimensions living in the free world where variable annuities are available, is only slightly higher compared with the same retiree, living in a free world with fixed annuities.

4.4. Utility impacts from the softening of restrictions for payout solutions

4.4.1. Setup of the analysis

So far we have analysed the utility implications of the enforced annuitisation on two extremes – where the full annuitisation of the funds was enforced and a full freedom was given to combine drawdown and fixed annuity options. It is, however, very interesting to examine how the relaxation of the strict annuitisation requirements would affect a retirees' utility (*soft restriction cases*). While preserving the main settings of our existing model, we have explored some of the regulatory suggestions from two European countries: Italy and the UK. Similar regulatory schemes can also be observed in other countries, which relax strict annuitisation requirements for some programs. For the purposes of our analysis and to facilitate comparability, we simplified these respective regulations to three cases and compare them to the previously introduced restricted world, were all funds must be annuitised at the age of 65. The cases are as follows:

Case A (free world as introduced and analysed in the previous sections): The retiree is free to choose between fixed annuities and withdrawals at any time. When compared to the restrictive world, this case yields the same results as already discussed and is repeated in the current analysis to enable better comparisons between the cases.

Case B (based on simplified Italian regulations): Mandatory annuitisation of 50% of the initial wealth at the age of 65. No restriction on the disposition and use of the remaining funds at any time: In our model, fixed annuities can be bought and withdrawals arranged annually during the remaining lifetime of the retiree. A similar idea governs the regulation for Swiss occupational pensions.

Case C (based on simplified UK regulations): Mandatory annuitisation of the remaining funds at the age of 75. No restriction on the disposition or use of funds before that age: fixed annuities can be bought and withdrawals arranged annually. German regulation for Riester plans resembles that from the UK, with different annuitisation age limits and rules governing the drawdowns.

For all three cases, we consider a household with a moderate risk aversion only, with and without bequest motives.

4.4.2. Main findings: example continued

Similar to the situations analysed in the previous sections, retirees living in the restricted world would need to be compensated in order to achieve the same utility as those initially having just the same amount of wealth and living either, in a world without any restrictions, or in the world with softened restrictions.

The following table shows, corresponding to the procedure in the previous sections, the relative utility impacts on the inhabitant of the fully restricted world as compared to the free world and the world with softened restrictions. The utility impacts are measured as a compensation for utility loss in % of the pre-existing financial wealth.

Table 4.7: Relative utility impacts of enforced full annuitisation vs. free world and softened restrictions: Percentage of the initial wealth required as a compensation for utility loss

Compensation, % of the initial wealth	**No bequest**			**Bequest**		
Pension Level (S)	**Case A** Free world	**Case B** 50% annuitised at 65	**Case C** Remaining funds annuitised at 75	**Case A** Free world	**Case B** 50% annuitised at 65	**Case C** Remaining funds annuitised at 75
Low wealth/pension ratio (S=2)	14%	7%	5%	81%	60%	30%
Moderate wealth/pension ratio (S = 5)	16%	11%	14%	54%	46%	22%
High wealth/pension ratio (S=10)	13%	10%	9%	36%	33%	12%

Source: Own calculation.

Again, we take up our previous example, where the retirees have EUR 15,270 of annual pension income and calculate the absolute amount of wealth and compensation. The total amounts required are specified in the table 4.8. It can be seen, that utility compensations in case A, representing the free world, are identical to those presented in chapter 4.2.2.

Table 4.8: Absolute utility impacts of enforced full annuitisation vs. free world and softened restrictions: Initial wealth amount and compensation for utility loss in the restricted world

Wealth + compensation, EUR	**No bequest**			**Bequest**		
Pension Level (S)	**Case A** Free world	**Case B** 50% of funds annuitised at 65	**Case C** Remaining funds annuitised at 75	**Case A** Free world	**Case B** 50% of funds annuitised at 65	**Case C** Remaining funds annuitised at 75
Panel 1: Retirement Wealth 30,540 / Pre-Existing Pension Income 15,270 p.a.						
Low wealth/pension ratio (S=2)	34,816 Compens.= 4,276	32,678 Compens.= 2,138	32,067 Compens.= 1,527	55,277 Compens.= 24,737	48,864 Compens.= 18,324	39,702 Compens.= 9,162
Panel 2: Retirement Wealth 76,350 / Pre-Existing Pension Income 15,270 p.a.						
Moderate wealth/pension ratio (S = 5)	88,566 Compens.= 12,216	84,749 Compens.= 8,399	87,039 Compens.= 10,689	117,579 Compens.= 41,229	111,471 Compens.= 35,121	93,147 Compens.= 16,797
Panel 3: Retirement Wealth 152,700 / Pre-Existing Pension Income 15,270 p.a.						
High wealth/pension ratio (S=10)	172,551 Compens.= 19,851	167,970 Compens.= 15,270	166,443 Compens.= 13,743	207,672 Compens.= 54,972	203,091 Compens.= 50,391	171,024 Compens.= 18,324

Source: Own calculation.

From the table 4.8 it may be seen that, for all pension levels and independently of a bequest motive, the softening of the strict annuitisation requirement (represented by case A) has a considerable impact on utility losses and thus the required compensation.

In the analysis without bequest motives, retirees with a high wealth to income ratio experience the most absolute disadvantages from annuitisation enforcement of any kind and thus require the greatest absolute compensation. The biggest relative utility impacts are, however, observed for the group with a moderate wealth to income ratio, ranging from 11% of wealth for case B (partial annuitisation) to 16% for case A (total annuitisation). This means that for the group with moderate wealth to income relation, the case C (annuitisation with 75) is the second best solution after the free world without any restrictions on the use of wealth. This result is consistent with our findings in chapter 4.2.2, where we analysed the optimal asset allocation for a moderate pension without bequest motives. In the world without any restrictions, by the age of 75-77, the retiree becomes mostly invested in annuities anyway and has fully annuitised her wealth by the age of 87.

Retirees with low wealth to pension, and high wealth to pension, ratios slightly prefer case B (annuitisation of 50% of the funds at 65), should their retirement mode be regulated in any way. The utility differences between both cases B and C are relatively small, however.

Interestingly, the softening of the regulation is still perceived by retirees in the high wealth to pension group and especially in the low wealth to pension group to be very restrictive and not that far away from the absolutely restrictive world. In the low wealth to pension group, the retirees require a 14% compensation, when they change into a fully restricted world from the world without any regulations (case A), but only 5% compensation, when they change into the restricted world out of the case B (annuitisation with 75). This means that they perceive relatively little differences between full restriction and the restriction of case B.

It should be noted, however, that despite the remaining considerable utility losses, the softening of restrictions allows the retiree to noticeably reduce them. This is especially obvious for the case of a moderate wealth to pension ratio: The direct comparison between the free world and the restriction of the case C shows that while a compensation of 16% of the available wealth is required, should the total immediate annuitisation be enforced, a compensation of only 2% (16% minus 14%) should be needed, in case when the remaining funds could be annuitised at the age of 75. For our numbered example it means, that instead of a compensation of EUR 12,216, only EUR 1,527 (12,216-10,689) would be needed.

The presence of a bequest motive multiplies utility losses, compared to the situation without any bequest and, as a result, requires increased compensations for all cases. The largest relative compensation is needed by those with low wealth to pension ratio, ranging from 30% for case C to 81% for case A. For all pension levels, it can be said that even with the softened annuitisation requirements, the utility losses remain high. Those utility losses can be reduced, however, by achieving the main regulatory goals at the same time. To elaborate recommendations how to balance regulatory goals and reduce utility losses is the focus of the final part 5 of this study.

4.5. Summary of main findings

In this chapter, we showed the optimal investment and spending strategies in retirement with respect to given preferences and resources. We put an emphasis on the role of stock investment and of combination of pooled and non-pooled solutions in the retirement portfolio, differentiating our analysis by different risk attitudes, wealth levels and availability of bequest motives. The lifecycle consumption levels resulting from the optimal strategies were compared to those achieved with full immediate annuitisation of the funds at retirement. In the next step, we assessed the individual costs of enforced annuitisation in the payout phase of funded pensions for rational individuals. Our main findings are as follows:

- Optimal retirement investment and spending strategy, in the framework of lifecycle profile analysis, calls for considerable stock investment at the beginning of retirement and a gradual annuitisation of wealth, whereby the speed of the annuitisation depends on individual risk aversion and wealth to pension ratio. Without the presence of bequest motives, a full switch to annuities is completed not earlier than between the age of 85-90, depending on the level of wealth and risk aversion.

- The upside potential of dynamic lifecycle strategy consisting of stock and annuity investments is considerable for all surveyed wealth to pension ratios: 70 out of 100 households can expect to enjoy substantially (up to a third) higher lifetime consumption levels, if they follow the optimal strategy instead of annuitising all wealth at the beginning of retirement.

- The present values of probable minimum lifetime consumption for the worst 10% of the possible capital market developments in case of following the optimal strategy, are only 2-5% lower than the values obtained by the full immediate annuitisation. This holds for all surveyed wealth to pension ratios.

- The consumption profile resulting from the optimal strategy is despite the relative high initial share of stocks remarkably smooth over time. This is due to the fact that the short term fluctuations in the equity markets become less important over longer investment horizons, when the investor is able to dynamically readjust the asset allocation in a reasonable way.

- Enforcement of annuitisation results in high utility losses: For individuals without any bequest motives, these losses range from 8% up to 24% of the wealth available at the beginning of retirement depending on the risk aversion and the relation of wealth to pension income.

- The presence of a bequest motive makes these losses even more pronounced, ranging from 36% to 81% of the retirement wealth. The presence of investment-linked annuities in the dynamic optimum portfolio increases utility losses incurred by the enforcement of annuitisation with traditional fixed annuities in all surveyed cases.

- Softening of the annuitisation requirements, such as allowing for partial annuitisation at the beginning of retirement or for annuitisation of remaining funds in more advanced age, reduces utility losses while preserving the main goals of the regulators.

5. Bridging the gap between economic optimum and reality: policy implications and recommendations for a new European regulatory framework

5.1. Main results of the study

In this chapter, we develop recommendations on the payout phase of funded pensions and answer the following two questions:

1) Whether there is a gap between the optimum consumption and investment behaviour in retirement and the regulation-influenced reality observed in Europe?

2) What can be done in order to bridge the gap between the optimum and reality?

We base our suggestions on the research results introduced in the previous chapters 2, 3 and 4, which were dedicated to characteristics of existing payout solutions, the regulatory framework applying to the payout phase of funded pensions and the optimal retirement lifetime strategies.

In the first part we presented the main challenges for strengthening the role of funded pensions rooting from the demographic, social and financial changes in the society. We stressed the need to consolidate social preferences and personal goals by means of efficient and reliable regulation, and emphasised the essential role of increasing understanding of the payout phase and its products in motivating the population to get actively involved in financial planning and saving for retirement. We explained the key risks, which should be managed in the payout phase, outlined the key questions and the sequence in which they will be answered in the course of the study.

In part two of our study, we characterise the payout products and answer the following questions: What are the specific pros and cons of pooled vs. non-pooled solutions, how can financial intermediaries and especially asset managers help retirees to translate accumulated assets into income by offering standardised products?

In part three of our study, we have a closer look at the regulatory issues: What are the regulations and rules, especially for the payout phase, currently applied to the members of funded pension schemes? How are they motivated? Can the targeted goals be achieved by a range of regulatory instruments and which of them is the most applied? Does the statistically observed behaviour of the contemporary retirees support the observed choice of the regulatory instruments? How can the existing regulatory framework be assessed from the perspective of the retiree and from the perspective of the requirements for proper regulation?

In part four, we concentrate on the following questions: What are the optimal investment and spending strategies in retirement with respect to given preferences and resources? What is the role of stock investment, of pooled and of the non-pooled solutions in these strategies? How the different risk attitudes, wealth levels and availability of bequest motives influence the preferences of the retirees? What are the individual and economic costs of regulation of the payout phase for rational individuals?

Our main findings in parts 2-4 are as follows:

- Non-pooled payout solutions are not inferior to pooled solutions, especially when survival probabilities are taken into consideration. They have the advantages of liquidity, individual flexibility and can potentially deliver higher pensions as compared to pooled solutions, but are subjects to longevity and investment risks.

- The adoption of different investment strategies and withdrawal rules within a non-pooled solution allows for the variation of risk and return as well as payout profiles and enables the creation of custom-tailored cash flows in retirement. Innovative payout solutions consist of pooled and non-pooled solutions, and may be equipped with guarantees on income or investment return of the pooled part from product providers.

- In Europe, non-pooled solutions still remain a relatively unknown arrangement, with many programs still in the saving phase and little experience with the payout phase. Coverage with traditional pooled products is high, but the completely voluntary use of annuities is low.

- The regulation of funded pension plans in general, and on their payout phase in particular is very complex, differing even within the same country depending on the program. The majority of existing funded tax-supported old age programs have restrictions on the use of capital in retirement.

- The restrictions mostly take the form of prescribing the total or partial annuitisation by means of traditional pooled solutions and disadvantage both the non-pooled solutions and the innovative pooled solutions.

- In Europe, the main motives for restricting the use of retirement capital are paternalism as well as avoidance of moral hazard and double-dipping, evoked by paternalism. The primary goal of regulators is to avoid old age poverty resulting from myopic of irresponsible decisions by the retirees. Statistical data on the consumption and bequest behaviour of contemporary European retirees, however, does not support the hypothesis of widespread overspending or irresponsible financial decisions by the retirees.

- The diversity and complexity of pension regulations in Europe as well as the generally restrictive attitude towards non-pooled and innovative pooled solutions in retirement does not comply with the criteria of proper regulation and have economic consequences for the society as a whole and especially for those individuals affected. Research suggests that especially small and average savers are the most disadvantaged by the enforcement of annuitisation.

- Optimal investment and spending strategy, in the framework of lifecycle profile analysis, calls for considerable stock investments at the beginning of retirement and the gradual annuitisation of wealth, depending on individual risk aversion and wealth to pension ratio. This strategy considerably differs from the regulation-influenced reality observed in Europe.

- 70 out of 100 households can expect to enjoy substantially higher lifetime consumption levels, if they follow the optimal financial retirement strategy instead of annuitising all wealth at the beginning of retirement. For the worst 10% of the possible capital market developments in case of following the optimal strategy, the present values of probable minimum lifetime consumption are only 2-5% lower than the values obtained by the full immediate annuitisation. The consumption profile resulting from the optimal strategy is remarkably smooth over time.

- Enforcement of annuitisation results in high utility losses, depending on the risk aversion and the relation of wealth to pension income. The presence of a bequest motive makes the utility losses even more pronounced, ranging from 36% to 81% of the retirement wealth. The softening of the annuitisation requirements such as allowing for partial annuitisation or for annuitisation in the more advanced age, reduces utility losses while preserving the main goals of the regulators.

The results outlined above show that there are considerable differences between the optimum consumption and investment behaviour in retirement and between the observed preferences of the retirees on the one hand and the regulation-influenced reality on the other hand. Those differences result in substantial individual utility losses for affected individuals. The utility losses will accumulate and become even more pronounced than currently with the ageing of European society and with increased participation in funded pension schemes. In what follows, we propose the steps needed to bridge or at least to narrow this gap[50].

[50] Our proposals are broadly in line with those made regarding the balance between the flexibility and protection against longevity risk in *OECD* (2008).

5.2. Policy recommendations to bridge the gap

5.2.1. Procedure

Taking into account the importance of funded pensions, especially those of the defined contribution type, to the generations of future retirees, the regulatory framework in Europe should find a reasonable balance between achieving the goals of the policymakers and the retirees:

- The aim of the policymakers is to prevent old age poverty, secure tax income, and prevent imprudent behaviour by the retirees.

- For the aged individuals, it is important to achieve the optimal asset allocation during the retirement depending on one's individual preferences and financial status, and to minimise the cost of regulation and supervision.

We derive our recommendations on the basis of the five criteria of proper regulation presented earlier in the chapter on the regulation. In the following areas, changes in the existing regulatory situation could, in our opinion, help to achieve the five key goals of regulatory efficiency by:

- Improving transparency;

- Sparking innovation and encouraging the creation of payout products which address the needs of the retirees;

- Increasing competition between the suppliers of payout products;

- Ensuring long-term credibility of the proposals; and

- Decreasing regulation costs both for the society as a whole and for a single individual

In this respect, we proceed in two stages[51]:

1) Suggest changes in the overall regulatory framework which could be implemented at EU or member states level.

2) Propose the tools and mechanisms to achieve the goal of creating reliable payout solutions and of motivating the market participants.

For both stages, we indicate the main stakeholders involved in the process and their main tasks and we describe the main challenges and opportunities that may arise by pursuing the targeted goals.

[51] Procedure suggested by OECD recommendations on good practices for financial education relating to private pensions, and for enhanced risk awareness and education on insurance issues.

5.2.2. Changes in the overall regulatory framework for payout solutions in funded pension schemes

To increase the transparency and efficiency of the funded pensions, in both the savings and payout phase, framework changes in some countries might be needed on both the EU and country levels.

- **Apply equal (tax) treatment to schemes**. For the saving phase, the same basic statutory support framework (tax allowances etc.) should apply to qualifying programs, independently of whether they offer pooled or non-pooled solutions, are employment-linked or offered by independent financial institutions. Equally, the tax treatment of income from retirement payout products should be purely based on the periodic income amount, and identical taxation rules should apply to pooled or non-pooled products or their combinations.

- **Encourage aggregate view of wealth**. Immediately before and during the payout phase, the main regulatory framework should encourage an aggregate view of the total wealth available for the individual's spending after the retirement date. This view should include statutory pensions, pensions from all employment-linked and private pension programs, independently of whether they are defined benefit, defined contributions, funded or non-funded. Economically rational and far-sighted decisions on post-retirement consumption can only be made when all income sources and their characteristics are taken into account.

- **Facilitate consolidation of funds**. In order to help individuals to achieve an aggregate view of wealth, a regulatory and legislative framework should be created, which enables the retiree to aggregate pension funds within different defined contribution programs before deciding about the payout products and their combinations. This procedure could enable the retiree to oversee the available wealth better and to get better deals with the suppliers of the payout products. The abovementioned option should enable the tax-neutral transfer of funds between the institutions for the purposes of arranging the actual retirement. In the surveyed European countries, only the UK and Italy have adopted, to a certain degree, the procedures of aggregating funds and applying similar treatment towards the funded pension payouts, independently of the fund's origin.

- **Apply regulation across aggregated funds**. Possible payout restrictions for the payout phase of funded defined contribution pensions and among them, annuitisation requirements, should apply to the aggregated funds within defined contribution schemes after taking into consideration the total pension wealth of the retiree, and not on a program-by-program basis.

- **Employ selective restriction on the use of funds**. Restrictions on the use of funds should apply only if the pre-defined level of coverage with annuity-like or annuity payments from the statutory or unfunded pension programs is not achieved, and only to the extent which enables the achievement of this level. If a certain threshold level of lifelong income is secured by statutory annuity-like payments, by unfunded pension programs or by annuities from the private funded pensions, it should be possible to invest the remaining funds at the retiree's discretion.

- **Use deferred or partial annuitisation, if needed**. Should the compulsion to annuitise be used nonetheless above the minimum annuity coverage level, the annuitisation age should be set at a level where the utility losses are less profound, such as towards the age of 85 (like in German Riester plans), or use the partial annuitisation of funds. Thereafter, the retiree should be allowed to control the remaining funds.

- **Minimise legal uncertainty**. A fundamental framework which applies to all funded defined contribution pension programs should be established. In terms of consumer protection, it should ensure that suppliers of the payout products and their intermediaries uphold standards and codes of conduct in respect to customer treatment, especially in the areas of explaining the design, operation and performance of payout products. At the same time, the suppliers of payout products should be protected from the legal uncertainty caused by customers who may deliberately buy risky instruments and hope to take advantage in any future situation: for example, by suing the supplier of the product for losses. In almost all surveyed European countries, such legal uncertainty was highlighted as an important reason for not supplying innovative products.

- **Enhance financial literacy**. The current existing measures and programs for financial education should be further developed[52]. A special focus should be given to financial planning in retirement, payout phase of funded pensions and available products[53]. The cognitive abilities of different population groups should be taken into account with a special focus on young people, people with low savings or education level, as well as those approaching retirement[54]. The suppliers of pension products and sponsoring employers should be used to ensure the timely access to relevant independent information.

5.2.3. Tools and mechanisms to achieve the goal of creating reliable payout solutions and of motivating the market participants

The reforms of the regulatory environment would spark the creation of innovative retirement solutions by providing the reliable framework for the potential product suppliers and increase potential demand by reassuring prospective retirees. The products for the retirement payout phase should be constructed by assuming the following general approach to the organisation of retirement spending by the retiree:

- **Financial plan**. The retiree should be able to create a kind of financial retirement plan, where the main expected needs and sources of spending should be identified and largely quantified. As we outlined above, the individual should be able to efficiently re-group the available funds before the retirement in a way to achieve the optimal consumption patterns after retirement.

- **Range of products**. The prospective retiree should be given access to a range of pooled and non-pooled products, which alone or in combination, could be easily understood and controlled by a person with average cognitive abilities. To support the

[52] For the existing financial education programs within the EU see: *Kosicki* 2008, *Rinaldi* 2008.
[53] *Lusardi/Mitchell* 2007.
[54] Our recommendations are in line with the OECD recommendations on good practices for financial education relating to private persons /for enhanced risk awareness and education on insurance issues from 28th March 2008.

prospective retirees in their decision-making, non-pooled and pooled payout products designed especially for retirement purposes should exist. Such products should give the retirees reasonable standardised choices in order to better fit personal risk aversion and preferences as to the structure of the retirement cash flows.

- **Provision of default options**. Sensible default choices must help those who cannot or do not want to decide on a particular course of action. Along with the pure pooled or non-pooled solutions, the integrated products should exist and be easily accessible. By using the integrated products, the retiree could completely delegate the task of monitoring the portfolio development and initiating the necessary changes according to the agreed scheme to the managing company.

- **Clear information**. The suppliers of the payout solutions should present information about their products in an honest, easily understandable and comparable way. The information on the risk and return profile of the product, the past performance of the product in question and its expected development under the reasonably realistic conditions as well as the product's total costs should be clearly communicated. Further, the rights of the retiree and the supplier as well as the information standards on the product supplied to the retiree should be clearly set. A unified scheme on this subject, applying to all suppliers of pension payout products might be an efficient solution. In the case that both saving and payout solutions for funded pensions can be offered by the same supplier, it could be easier to ensure that the access to the independent educational information is given to all members of the funded pensions' programs in due time during the saving phase.

- **Advice network**. In order to smooth the elaboration of procedures and organisational structures which could enable and simplify the introduction and proper use of payout products as well as in order to co-ordinate the efforts of the policymakers and the business, a network of practitioners should be created. The main goal of this network should be to exchange views on the best practice and advise European policymakers, similarly to the network created by the European Commission for advising on financial education.[55]

[55] *Kosicki* 2008.

Contents

1. Monographs and articles in periodicals

Albrecht Peter/Maurer Raimond (2002)
Self-Annuitization, Consumption Shortfall in Retirement, and Asset Allocation: The Annuity Benchmark, Journal of Pension Economics & Finance 1/2002, No. 3, 269–288.

Albrecht Peter/Maurer Raimond (2008)
Investment- und Risikomanagement, 3nd edition, Stuttgart 2008.

Albrecht, Peter / Maurer, Raimond / Ruckpaul, Ulla (2001)
The Shortfall-Risk of Stocks in the Long Run, in: Financial Markets and Portfolio Management vol. 4 (2001), 427-439.

Behrmann Jere R. / Rosenzweig, Mark R. (2007)
Parental allocations to children: New evidence on bequest differences among siblings, PIER working paper, 02-007.

Bengen, William P. (1994).
Determining Withdrawal Rates Using Historical Data. *Journal of Financial Planning*, 7 (4), 171-182.

Bengen, William P. (1996).
Conserving Client Portfolios During Retirement, Part III. *Journal of Financial Planning*, 10 (6), 84-97.

Bernheim, Douglas B. (1991)
How strong are bequest motives? Evidence based on estimates of the demand for life insurance and annuities, Journal of Political Economy 99 (1991), 899-927.

Black Fischer / Jones, Robert (1987)
Simplifying Portfolio Insurance, The Journal of Portfolio Management Fall, 48-51

Blitzstein, David / Michtell, Olivia / Utkus, Stephen P.(2006)
Restructuring Retirement Risks, Oxford, (Oxford University Press) 2006.

Boardman, Tom (2006)
Annuitization lessons from the UK: Money-back annuities and other developments, The Journal of Risk and Insurance, Vol. 73, issue 4, 633-646.

Bodie, Zvi (1995)
On the Risks of Stocks in the Long Run, in: Financial Analysts Journal, May-June 1995, 18-22.

Bodie, Zvi (2002)
Time Horizon does not Reduce Risk, *Financial Times*, 01/26/2002.

Bohn, Henning (2006)
Optimal private responses to demographic trends: savings, bequests and international mobility, paper presented at the G-20 Workshop on Demography and Financial Markets, Sydney, Australia, July 23-25, 2006.

Börsch-Supan, Axel et al.(editors) (2005)
Health, Ageing and Retirement in Europe, First Results from the Survey of Health, Ageing and Retirement in Europe, Mannheim 2005.

Brown Jeffrey R. / Poterba James M. (2004)
Household demand for variable annuities. In: Center for Retirement Research at Boston College, WP March 2004.

Brown, Jeffrey (2000)
Differential mortality and the value of individual account retirement annuities, in: NBER working paper series, working paper 7560 (February 2000), Cambridge, 2000.

Brown, Jeoffrey / Mitchell, Olivia S / Poterba, James M. / Warshawsky, Mark (2001)
The role of annuity markets in financing retirement, Cambridge 2001.

Brugiavini, Agar (1993)
Uncertainty resolution and the timing of annuity purchases, in: Journal of Public Economics 1993, vol. 50, 31-62.

Callund, Jonathan (1999)
The Annuity Market in Chile, report prepared for the World Bank Annuity Research Project, World Bank 1999.

Cocco, João / Gomes, Francisco /Maenhout, Pascal (2005)
Consumption and portfolio choice over the life-cycle, in: The Review of Financial Studies 2005, vol. 18, 491-533.

Cogan, John / Mitchell, Olivia S. (2003)
Perspectives from the President's Commission on Social Security Reform, in: Journal of Economic Perspectives 1993, vol. 17, issue 2, 149-172.

Congressional Research Service (Ed.) (2008)
CRS Report for Congress, Converting Retirement Savings into Income, Annuities and Periodic Withdrawals, by Mulvey, Janemarie and Patrick Purcell, December 1st, 2008.

Davidoff, Thomas/Brown, Jeffrey/Diamond, Peter A. (2005)
Annuities and Individual Welfare, in: American Economic Review, Vol. 95, No. 5, 1573-1590.

Dilnot, Andrew (1995)
The assessment: The future of the welfare state, Oxford Review of Economic Policy 1995, vol. 11, issue 3, 1-10.

Dus, Ivica / Maurer, Raimond (2007)
Finanzierung des Ruhestands: Leibrenten und / oder Entnahmepläne. Die Gestaltung der Auszahlungsphase in der kapitalgedeckten Altersversorgung. Köln 2007, 22-24.

Dus, Ivica, /Maurer, Raimond /Mitchell, Olivia (2005)
Betting on death and capital markets in retirement: A shortfall risk analysis of life annuities versus phased withdrawal plans, in: Financial services review no. 14, 169-196.

Elton, Edwin J. / Gruber Martin J. / Blake Christopher R. (2006)
The Adequacy of Investment Choices Offered By 401K Plans, in: Journal of Public Economics 2006, Vol. 90, Issue 6-7 (August 2006),1299-1314.

Feldstein Martin / Ranguelova, Elena / Samwick, Andrew (2001)
The transition to investment-based social security when portfolio returns and capital profitability are uncertain, in: Risk Aspects of Investment-based Social Security Reform, University of Chicago Press, Chicago 2001.

Finkelstein, Amy / Poterba, James (2002)
Adverse selection in the annuity markets: Policyholder evidence from the UK annuity market, in: The Economic Journal, 112 (467), January 2002, 28-50.

Finkelstein, Amy /Poterba, James (2004)
Adverse selection in insurance markets: Policyholder evidence from the U.K. annuity market, in: Journal of Political Economy, Vol. 112 (2004), 183–208.

Goldsticker, Ralph (2007)
A mutual fund to yield annuity-like benefits, in: Financial Analysts Journal, vol. 63, no. 1, January/February 2007, 63-67.

Hallman Victor G. / Rosenbloom Jerry S. (2000)
Personal Financial Planning, New York.

Herold, Ulf / Maurer, Raimond / Vo, Thanh Huy / Stamos, Michael (2008)
Total return Strategies for Multi Asset Portfolios: Dynamically Managing Portfolio Risk , in Journal of Portfolio Managment 33, 2007, 60-76

Horneff, Wolfram / Maurer, Raimond / Stamos, Michael (2008)
Optimal Gradual Annuitization: Quantifying the Costs of Switching to Annuities, in: Journal of Risk and Insurance 75, 2008, 1019-1038.

Horneff, Wolfram / Maurer, Raimond / Mitchell, Olivia S. / Dus, Ivica (2007)
Following the Rules: Integrating asset allocation and annuitisation in retirement portfolios, in Insurance: Mathematics and Economics (2007), 1-13.

Horneff, Wolfram / Maurer, Raimond / Mitchell, Olivia S. / Stamos, Michael (2007)
Money in Motion: Dynamic portfolio choice in retirement, working paper, Michigan Retirement Research Center (MRRC) 2007-152.

Horneff, Wolfram / Maurer, Raimond / Mitchell, Olivia S. / Stamos, Michael (2008)
Asset Allocation and Location Over the Life Cycle with Survival-Contingent Payouts National Bureau of Economic Research (NBER) Working Paper Nr. 14055.

Hu, Wei-Yin / Jason S. Scott (2007)
Behavioral obstacles in the annuity market, in: Financial Analysts Journal, Vol. 63 (2007), No. 6, 71-82.

Hurd, Michael / Smith, James (1999)
Anticipated and Actual Bequests, NBER Working Paper 7380, October 1999.

Inkman, Joachim / Lopes, Paula / Michaelides, Alex (2007)
How Deep is the Annuity Market Participation Puzzle? Financial Markets Group Working Papers 2007, dp593.

James, Estelle / Song, Xue (2001)
Annuities Markets Around the World: Money's Worth and Risk Intermediation, in: SSRN Research papers December 2001

Kim, Hyun Tae / Sharp, Keith (1999)
Annuities in Canada, report prepared for the World Bank Annuity Research Project, World Bank 1999.

Knox, David (2000)
The Australian annuity market, The World Bank Policy Research Working Paper Series, paper no. 2495.

Kotlikof, Laurence / Spivak, Avia (1981)
The Family as an Incomplete Annuity Market, Journal of Political Economy, 89 (1981), 372-391.

Kritzman, Mark (1994)
What practitioners need to know about time diversification, Financial Analysts' Journal, January/February, 14-18.

Kritzman, Mark, / Rich, D. (1998)
Beware of Dogmas: The Truth about Time Diversification, Journal of Portfolio Management (summer 1998), 66-77.

Lachance, Marie-Eve / Mitchell, Olivia S. (2003)
Understanding Individual Account Guarantees, in: O.S. Mitchell and K. Smeters (eds), The Pension Challenge, 159-186.

Lusardi, Annamaria / Mitchell, Olivia (2007)
Financial literacy and retirement planning, new evidence from the Rand Americal Life panel, University of Michigan Retirement Research Center, Working Paper WP 2007-157.

Maurer, Raimond / Schlag, Christian (2003)
Money-Back Guarantees in Individual Pension Accounts: Evidence from the German Pension Reform, in: Olivia S. Mitchell, Kent Smetters (2003), The Pension Research Council: Risk Transfer and Retirement Income Security, Oxford 2003, 93-115.

Maurer, Raimond / Schlag, Christian / Stamos, Michael (2007)
Optimal Life-Cycle Strategies in the Presence of Interest Rate and Inflation Risk, WP2008-01 Pension Research Council Working Paper, 2007

Maurer, Raimond / Somova, Barbara (2007)
The German insurance industry: market overview and trends, in David Cummins, Bertrand Venard (Eds.) Handbook of international insurance, New York 2007.

Mckenzie, George (2006)
Annuity markets and pension reform, New York 2006, 1-6.

Milevski, Mosche / Robinson, Christopher (2000)
Self-annuitisation and Ruin in Retirement, in North American Actuarial Journal vol. 4 (2000), 113-129.

McGill, Dan M. / Kyle N. Brown / John J. Haley / Sylvester J. Schieber (2005)
Fundamentals of Private Penions, eight edition, Oxford 2005.

Milevski, Mosche / Young, Virginia (2002)
Annuitization and Asset Allocation, Working paper IFID Centre, the Schulich School of Business, December, status 15.12.2003, download at:
http://www.ifid.ca/pdf_workingpapers/WP2003Oct15.pdf

Mitchell Olivia S. /Poterba, James M. / Warshawsky, Mark J. / Brown, Jeffrey R. (1999)
New Evidence on the Money's Worth of Individual Annuities, in: American Economic Review 1999, issue December, 1299-1318.

Mitchell, Olivia S. / Mottola, Gary R. / Utkus Stephen P. / Yamaguchi, Takeshi (2005)
The Inattentive Participant: Portfolio Trading Behavior in 401(k) Plans, working paper, Michigan Retirement Research Center (MRRC) 2006-115, June 2006.

O'Brien, Chris (2006)
The Downfall of Equitable Life in the United Kingdom: The Mismatch of Strategy and Risk Management, in: Risk Management and Insurance Review (2006), vol. 2, 189-204.

OECD (Ed.) (2005)
Pensions at Glance, Paris 2005.

OECD (Ed.) (2007)
OECD *Factbook 2007*: Economic, Environmental and Social Statistics, Paris 2007, download on 01st May 2007 at:
http://miranda.sourceoecd.org/vl=1516532/cl=58/nw=1/rpsv/factbook/01-01-01-g03.htm.

OECD (Ed.) (2007b)
OECD *Global Pensions Statistics 2007*: Economic, Environmental and Social Statistics, Paris 2007, download on 01st May 2007 at:
http://miranda.sourceoecd.org/vl=1516532/cl=58/nw=1/rpsv/factbook/01-01-01-g03.htm.

Oxera (2008)
Defined-contribution pension schemes. Risks and advantages for occupational retirement provision. A report published by the European Fund and Asset Management Asssociation, Brussels 2008.

Polyak, I. (2005)
New advice to retirees: Spend more at first, cut back later, in: New York Times, September 25, 2005.

Poterba, James (1997)
The History of Annuities in the United States, NBER Working Paper 6001, April 1997.

Poterba, James M. (2008)
Annuity markets and retirement security, working paper by Center of Retirement Research at Boston College, status June 2008, download on 01st August 2008 at: www.bc.edu/crr on 02.

Pye, Gordon B. (2000).
Sustainable Investment Withdrawals. *Journal of Portfolio Management,* Summer, 73 – 83.

Ramlau-Hansen, Henrik (1991)
Distribution of surplus in life insurance, ASTIN Bulletin 21, 57–71.

Read, Daniel / Löwenstein, George / Rabin Matthew (1999)
Choice bracketing, in Journal of Risk and Uncertainty, vol. 19 (1999), no. 1-7, 171-197.

Schifko, Bettina / Bachmeier Herbert (2002)
Die Betriebliche *Mitarbeitervorsorge in der Praxis*, in: Bilanzbuchhalter, w/o volume number, issue from November 2002, 17-18.

Schleife, Katrin (2004)
Dokumentation der *Ruhestandsregelungen in verschiedenen Ländern*, in: ZEW-Zentrum für Europäische Wirtschaftsforschung Mannheim (Ed.)**,** Dokumentation Nr. 04-01, Januar 2004, Mannheim 2004.

Schönholzer, Diot B. (2003)
Das Parlament verabschiedet *die 1. BVG-Revision*, in: Soziale Sicherheit CHSS 6/2003, 344.

Sharpe, William F. / Scott, Jason S. / Watson, John G. (2008)
Efficient retirement financial strategies, in: Ameriks, John / Mitchell, Olivia S. (Eds.), Recalibrating Retirement Spending and Saving, Oxford University Press, Oxford 2008, 209-226.

Spivak, Avia (1999)
Pension Reform in Israel and Money's Worth of Pensions and Annuities, report prepared for the World Bank Annuity Research Project, World Bank 1999.

Stamos, Michael (2008)
Optimal consumption and portfolio choice for pooled annuity funds, in: *Insurance: Mathematics and Economics* 43, 56-68

Warshawsky, Mark (1988)
Private Annuity Markets in th United States: 1919-1984, in: The Journal of Risk and Insurance, vol. 55, September 3rd, 1988, 518-528.

Whitaker, B. (2005)
Managing retirement, after you really retire, in: New York Times, October 16, 2005.

Wilke, **Peter (2001)**
Finanzielle *Mitarbeiterbeteiligung in Westeuropa* – Rahmenbedingungen und Entwicklungstrends in ausgewählten Ländern im Lichte neuerer Forschungsergebnisse, Hamburg 2001.

Yaari, Menachem (1965)
Uncertain lifetime, life insurance and the theory of the consumer, in: Review of Economic Studies, 32(2), 137-150.

2. Legislative Sources

DRÉÉS (Ed.) (2006) (Gouvernement de la France: Direction de la recherche, des études, de l'évaluation et des statistiques)
Études et résultats, No. 518, September 2006, Table 01.

Eidgenössische Departement des Inneren (EDI)/Bundesamt für Sozialversicherungen (BSV) (Ed.) (2006a)
Mitteilung über die Berufliche Vorsorge Nr. 96, status 2006. Download on 02nd May 2007 at: http://www.admin.ch/ch/d/sr/1/101.de.pdf (Bundesbehörden der Schweizerischen Eidgenossenschaft).

Eidgenössische Departement des Inneren (EDI)/Bundesamt für Sozialversicherungen (BSV) (Ed.) (2006b)
Verordnung über die Wohneigentumsförderung mit Mitteln der beruflichen Vorsorge (WEFV), status 2006. Download on 02nd May 2007 at: http://www.admin.ch/ch/d/sr/1/101.de.pdf (Bundesbehörden der Schweizerischen Eidgenossenschaft).

Federal Republic of Germany (Ed.) (1999)
Budget Consolidation Act, status 1999, download on 01st February 2007 at: http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (1999)
Pensions Correction Act, status 1999, download on 01st February 2007 at: http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (1999)
Social Code Pensions Reform Act, status 1999, download on 01st February 2007 at: http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2001)
The Act to Reform the Statutory Old Age Insurance and to Promote the Funded Old Age Funds / Old Age Assets Act, status 2001, download on 01st February 2007 at: http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2002)
Act to Saveguard the Contribution Rate, status 2002, download on 01st February 2007 at: http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2003)
Second, Third and Fourth Act Reforming Book VI of the Social Code, status 2003, download on 01st February 2007 at: http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2004)
Act Reforming the Organisation of Old-Age Pensions Insurance, status 2004, download on 01st February 2007 at: http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2004)
Old Age Pensions Insurance Sustainability Act, status 2004, download on 01st February 2007 at:
http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2004)
The Act to Certify the Old Age Provision Agreements, status 2001, last modified 2004, download on 01st February 2007 at:
http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2005)
The Act to Re-Arrange the Income Tax Treatment of the Expenditures on Old Age Provisions / the Old-Age Income Act, status 2005, download on 01st February 2007 at:
http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2006)
The Act to Improve the Occupational Retirement Provision, status 1974, last modified 2006, download on 01st February 2007 at:
http://www.gesetze-im-internet.de/aktuell.html

Federal Republic of Germany (Ed.) (2006)
The Income Tax Act, status 2006, download on 01st February 2007 at:
http://www.gesetze-im-internet.de/aktuell.html

Gouvernement de la France (Ed.) (2007)
Code General des Impôts (CGI), Download on 25th April 2007 at:
http://perso.orange.fr/zeroimpot/art_83.htm, http://www.legislation.cnav.fr/textes/lo/cgi/TLR-LO_CGI_83.htm)

HM Revenue and Customs (Ed.) (2007)
Changes to Alternatively Secured Pension Rules and Rules to Prevent Devices Designed to Pass on Tax-Favored Pension Savings. Download on 04th April 2007 at:
http://www.hmrc.gov.uk/.

Republik Österreich (Ed.) (2007)
Betriebliches Mitarbeitervorsorgegesetz – BMVG, § 14. Download on 11th July 2007 at:
http://www.ris.bka.gv.at/bundesrecht/.

Schweizerische Eidgenossenschaft (Ed.) (1990)
Bundesgesetz über die direkte Bundessteuer [DBG] status on 4th Dezember 1990. Download on 02nd May 2007 at:
http://www.admin.ch/ch/d/sr/1/101.de.pdf (Bundesbehörden der Schweizerischen Eidgenossenschaft).

Schweizerische Eidgenossenschaft (Ed.) (2006a)
Bundesgesetz über die berufliche Alters-, Hinterlassenen und Invalidenvorsorge (BVG), status per 2006. Download on 02nd May 2007 at:
http://www.admin.ch/ch/d/sr/1/101.de.pdf (Bundesbehörden der Schweizerischen Eidgenossenschaft).

Schweizerische Eidgenossenschaft (Ed.) (2006b)
Bundesverfassung der Schweizerischen Eidgenossenschaft, status on 08th August 2006, download on 02nd May 2007 at:
http://www.admin.ch/ch/d/sr/1/101.de.pdf (Bundesbehörden der Schweizerischen Eidgenossenschaft).

Schweizerische Eidgenossenschaft (Ed.) (2007)
Verordnung über die steuerliche Abzugsberechtigung für Beiträge an anerkannte Vorsorgeformen (BVV 3), Art. 7. Download on 02nd May 2007 at:
http://www.admin.ch/ch/d/sr/1/101.de.pdf (Bundesbehörden der Schweizerischen Eidgenossenschaft).

United Kingdom of Great Britain and Northern Ireland (Ed.) (2004)
Finance Act 2004 (coming into effect April 2006).

3. Official Publications

AFG (Ed.) (2006) (L'Association Française de la Gestion Financière)
France Country Report, October 2006, download on 22nd June 2007 at:
http://www.afg.asso.fr/afg/uk/plan_site/plan_nad.html

AFG (Ed.) (2007a) (L'Association Française de la Gestion Financière)
Communiqué de presse: L'épargne salariale plébiscité par les enterprises et les salariés! Pairs, April 2007, download on 08th August 2007 at:
http://www.afg.asso.fr/afg/fr/epargne_retraite/produits.htm

AFG (Ed.) (2007b) (L'Association Française de la Gestion Financière)
Communiqué de presse retraite ont été créés à la suite de la loi du 21 août 2003 portant réforme des retraites, Pairs, February 2007, download on 08th August 2007 at:
http://www.afg.asso.fr/afg/fr/epargne_retraite/produits.htm

AFG (Ed.) (2007c) (L'Association Française de la Gestion Financière)
Communiqué de presse, PERCO: un plan d'épargne retraite qui a le vent en poupe! Paris, May 2007, download on 08th August 2007 at:
http://www.afg.asso.fr/afg/fr/epargne_retraite/produits.htm

AFG (Ed.) (2007d) (L'Association Française de la Gestion Financière)
Deux produits d'épargne retraite ont été créés à la suite de la loi du 21 août 2003 portant réforme des retraites, download on 08th August 2007 at:
http://www.afg.asso.fr/afg/fr/epargne_retraite/produits.htm

AFG (Ed.) (2008) (L'Association Française de la Gestion Financière)
Poursuite de la forte croissance des PERCO en 2007, Mars 2008, download on 18th November at:
http://www.afg.asso.fr/afg/fr/epargne_retraite/produits.htm

Alecta, (Ed.) (2007)
Brochure No. 8024:01, dated April 2007, *Defined Benefit and Defined Contribution ITP*, What's The Difference?, download on 01st April 2007 at:
www.alecta.com.

Arbeiterkammer Wien (Ed.) (2005)
Private prämiengeförderte Zukunftsvorsorge, status June 2005, Vienna 2005, download on 10th July 2007 at:
www.ak-konsumentenschutz.at.

Association of British Insurers (Ed.) (2005)
Annuities: Bonus or Burden?, London 2005, download on 04th August 2007 at:
http://www.abi.org.uk/Bookshop/default.asp on 16th July 2007.

BaFin (Ed.) (2006) (Bundesanstalt für Finanzdienstleistungsaufsicht)
Jahresbericht 2006, Bonn, Part II, Table 150, 250, 750.

BFS (2005a) (Bundesamt für Statistik)
Die berufliche Vorsorge in der Schweiz 1998-2004, download on 18th August 2007 at:
http://www.bfs.admin.ch/bfs/portal/de/index.html on 22nd June 2007.

BFS (2005b) (Bundesamt für Statistik)
EVE 2005: Haushaltseinkommen und -ausgaben nach sozioökonomischer Gruppe der Referenzperson, download on 18th August 2007 at:
http://www.bfs.admin.ch/bfs/portal/de/index.html on 22nd June 2007.

BMAS (Ed.) (2006a) (Bundesministerium für Arbeit und Soziales)
Announcement of the Federal Ministry of Labour and Social Affairs from 02. February 2006, download on 18th August 2007 at:
http://www.bmas.bund.de/BMAS/Navigation/Presse/nachrichten,did=110752.html

BMAS (Ed.) (2006b) (Bundesministerium für Arbeit und Soziales)
Entwicklung der privaten Altersvorsorge, download on 18th August 2007 at:
http://www.bmas.de/coremedia/generator/22004/riester__rente__entwicklung__tabelle__stand__III__2007.html

Bundeskanzleramt Österreich, Abteilung E-Government (Ed.) (2006)
Offizieller Amtshelfer für Österreich, Versteuerung der Pension, Stand 16. Juni 2006, download on 03rd July 2007 at:
http://www.help.gv.at/Content.Node/27/Seite.270221.html on
03.

Bundesministerium für soziale Sicherheit,
Generationen und Konsumentenschutz (Ed.) (2005)
Broschüre: *Die Pensionsanpassung*, Vienna 2005.

Central Office of Information (Ed.) (2007)
Directgov.uk – Public Services All in One Place, *Understanding the Basic State Pension*, status 2007, download on 11th July 2007 at:
http://www.direct.gov.uk/en/MoneyTaxAndBenefits/PensionsAndRetirement/StatePension/DG_10014671.

Department for Work and Pensions (Ed.) (2006)
Security in Retirement: Towards a New Pension System, Newcastle Upon Tyne, May 2006.

Department for Work and Pensions (Ed.) (2007)
Security in Retirement: Pension Reform – 2010 onwards Department for Work and Pensions, download on 07th September 2007 at, http://www.dwp.gov.uk/pensionsreform/

Deutsche Rentenversicherung (Ed.) (2006)
Information dated 27th Dec. 2006 and 29th Dec. 2006, download on 21st May 2007 at:
http://www.deutsche-rentenversicherung.de/nn_12250/SharedDocs/de/Navigation/Rente/Berufsgruppen/pflichtversicherte/Arbeitnehmer__node.html__nnn=true and http://www.deutsche-rentenversicherung.de/nn_6480/SharedDocs/de/Inhalt/Servicebereich2/Lexikon/B/beitragsbemessungsgrenze.html.

Eder, Florian (2007)
Italien Begräbt Pensionsreform, in: Financial Times Deutschland, 21st June 2007, page 14.

EFRP (Ed.) (2007) (European Federation for Retirement Provision)
EFRP Survey on Private Vehicles Operating Supplementary Pension Arrangements Accessed

through Paid Work, Brussels 2007, download on 01st May 2007 at:
http://www.efrp.org/web.html.

Eidgenössische Departement des Inneren (EDI)/Bundesamt für Sozialversicherungen (BSV) (Ed.) (2007)
Sozialversicherungsgesetzgebung – Stand der Reformen per Ende Herbstsession 2006 (by Helena Kottmann), January 2007. Download on 02nd May 2007 at:
http://www.admin.ch/ch/d/sr/1/101.de.pdf (Bundesbehörden der Schweizerischen Eidgenossenschaft).

Eidgenössische Departement des Inneren (EDI)/Bundesamt für Sozialversicherungen (BSV) (Ed.) (2007)
Übersicht über die schweizerische soziale Sicherheit, status on 01st January 2007. Download on 02.May 2007 at:
http://www.admin.ch/ch/d/sr/1/101.de.pdf (Bundesbehörden der Schweizerischen Eidgenossenschaft).

Embassy of France in the Federal Republic of Germany (Ed.) (2005)
Rente: *Das französische Rentensystem*, stand vom August 2005, download on 25th April 2007 at:
http://www.botschaft-frankreich.de/article.php3?id_article=900&var_recherche=alter.

Embassy of France in the Federal Republic of Germany (Ed.) (2006)
Die Gewinnbeteiligung der Arbeitnehmer in Frankreich, Auszüge aus einem Bericht der Nationalversammlung vom 13. September 2006, download on 25th April 2007 at:
http://www.botschaft-frankreich.de/article.php3?id_article=900&var_recherche=alter.

Federal Ministry of Social Security, Generation and Consumer Protection (Ed.) (2005)
Broschüre – Die Pensionsanpassung, Vienna 2005.

Federal Ministry of Social Security, Generation and Consumer Protection (Ed.) (2006)
Social Protection in Austria, Vienna 2006.

Federal Ministry of Social Security, Generation and Consumer Protection (Ed.) (2005)
Broschüre – Die Pensionsanpassung, Vienna 2005.

Financial Services Authority (Ed.) (2004)
FSA Guide to Annuities and Income Withdrawal, London, August 2004.

Financial Services Authority (Ed.) (2006)
FSA Factsheet: Your Pension – it's Time to Choose, London, August 2006.

Fora (Ed.) (2007)
Collective Insurances - Supplementary Insurances Provided by Employers, download on 25th June 2007 at:
https://www.fora.se/foracm/jsp/polopoly.jsp?d=293&a=2311.

Fora (Ed.) (2007)
Pension Choices, download on 25 th June 2007 at:
https://www.fora.se/foracm/jsp/polopoly.jsp?d=293&a=2311.

GAD (2005) (The Government Actuary Department)
Occupational Pensions Schemes 2004, the twelfth survey by the Government Actuary, June 2006, London 2006

GAD (2006) (The Government Actuary Department)
Occupational Pensions Schemes 2005, the thirteenth survey by the Government Actuary, June 2006, London 2006

Gouvernement de la France (Ed.) (2005)
Rapport de Strategie Nationale sur Les Pensions, Annexe No. 1, Table No. 7, Paris 2005.

Gouvernement de la France (Ed.) (2007)
Le site d'information sur la réforme des retraites, download on 08 th March 2007 at:
http://www.retraites.gouv.fr/site_retraite/sommaire.html

Government of the Federal Republic of Germany (Ed.) (2005)
National Strategy Report on Old Age Pension Provision (2005), Annex X, Berlin 2005.

HM Government (Ed.) (2005)
An Update National Strategy Report on Adequate and Sustainable Pensions to the European Commission, July 2005, London 2005.

HM Treasury (2006)
The Annuities Market, Dec. 2006, London 2006

HM Treasury (Ed.) (2006)
The Annuities Market, London 2006.

INSÉÉ (Ed.) (2007) (Institut National de la Statistique et des Études Économiques)
Composition du revenu avant impot selon l'age de la personne de référence du ménage, download on 22nd June 2007 at:
http://www.insee.fr/fr/ffc/chifcle_fiche.asp?ref_id=NATSOS04231&tab_id=60

Invest in Sweden Agency (Ed.) (2007)
Factsheet *Occupational Pension and Insurance*, Stockholm, February 2007. Download on 15th February 2007 at:
http://www.isa.se/templates/Startpage____2008.aspx

L´Administration Française (2007)
Vos droits et démarches: Emploi et travail – *Plan d´épargne pour la retraite collectif (PERCO)*, download on 08 th March 2007 at http://vosdroits.service-public.fr/particuliers/F10260.xhtml, from le portail de l´administration française, main page www.service-public.fr.

L'Istituto nazionale di statistica (2004)
Data series 2004, tavola 2.1 - Famiglie per fonte principale di reddito, caratteristiche della famiglia e del principale percettore, download on 22nd August 2007 at:
http://www.istat.it/dati/ on 22nd June 2007.

MISSOC (Ed.) (2006b)
Country Report France 2006 (Summary), Brussels 2006. Download on 15th January 2007 at:
http://ec.europa.eu/employment_social/soc-prot/missoc98/english/f_main.htm

MISSOC (Ed.) (2006c)
Country Report Germany 2006 (Summary), Brussels 2006. Download on 15th January 2007 at:
http://ec.europa.eu/employment_social/soc-prot/missoc98/english/f_main.htm

MISSOC (Ed.) (2006d)
Country Report Italy 2006 (Summary), Brussels 2006. Download on 15th January 2007 at:
http://ec.europa.eu/employment_social/soc-prot/missoc98/english/f_main.htm

MISSOC (Ed.) (2006e)
Country Report Sweden 2006 (Summary), Brussels 2006. Download on 15th January 2007 at:
http://ec.europa.eu/employment_social/soc-prot/missoc98/english/f_main.htm

MISSOC (Mutual Information System on Social Protection in the Member States of the European Union) (**Ed.) (2006a)**
Comparative Tables 2006 – Slovakia, Finland, Sweden UK, Brussels 2006. Download on 15th January 2007 at:
http://ec.europa.eu/employment_social/soc-prot/missoc98/english/f_main.htm

National Association for Variable Annuities (2006)
Annuity Factbook, Reston 2006

OECD (Ed.) (2008)
OECD recommendations on good practices for finacial education relating to private persons, 28th March 2008

OECD (Ed.) (2008)
OECD recommendations for enhanced risk awareness and education on insurance issues, 28th March 2008

OECD (Ed.) (2008)
Policy options for the payout phase, paper DAF/CMF (2008) 24, 12. November 2008, download on 25th November 2008 at: (http://www.oecd.org/dataoecd/56/30/41668652.pdf).

Office for National Statistics (2007)
The Pensioners' Incomes Series 2005/6 (Revised) download on 22nd August 2007 at:
www.statistics.gov.uk

Office for National Statistics, Pensions Analysis Unit (2007)
Private Pension Contributions: Updated Estimates 1996-2005, download on 22nd August 2007 at:
www.statistics.gov.uk

Österreichische Finanzmarktaufsicht (Ed.) (2006)
Der Markt für die prämienbegünstigte Zukunftsvorsorge 2006. Vienna 2007.

Österreichische Finanzmarktaufsicht (Ed.) (2006)
Der Markt für prämienbegünstigte Zukunftsvorsorge 2006, Wien 2006

Österreichische Nationalbank (Ed.) (2007)
Mitarbeitervorsorgekasse, Aufgaben und statistische Meldepflichten, Vienna 2007.

Österreichische Nationalbank (Ed.) (2007b)
Mitarbeitervorsorgekasse, Aufgaben und statistische Meldepflichten, Vienna 2007

Österreichische Nationalbank (Ed.) (2007c)
Statistik: Mitarbeitervorsorgekassen MV und ZV – Geschäft, Mitarbeitervorsorgekassen Eigenmittel, Status on 15.06.2007, download on 10th July 2007 at:
http://www.oenb.at/isaweb/reportExcelHtml.do?report=3.13.2&sort=ASC&dynValue=0&lang=DE&linesPerPage=alle&timeSeries=All&page=1

Österreichische Vorsorgekasse (Ed.) (2002)
Abfertigung Neu – Mitarbeitervorsorge - *Überblick*, Vienna, 2002, download on 03rd July 2007 at:
www.uniqua.at

Österreichische Vorsorgekasse (Ed.) (2002)
Abfertigung Neu – Mitarbeitervorsorge - *Detailinfo*, Vienna, 2002, download on 03rd July 2007 at:
www.uniqa.at

Österreichische Vorsorgekasse (Ed.) (2006)
Vertragsbedingungen des Beitrittsantrags, Vienna, 2006, download on 03rd July 2007 at:
www.uniqa.at.

Österreichische Vorsorgekasse (Ed.) (2006)
Vertragsbedingungen, Vienna 2007

Österreichische Vorsorgekasse (Ed.) (2006)
Vertragsbedingungen, Vienna 2006, download on 03rd July 2007 at:
www.uniqa.at

PPM - Premium Pension System Authority (Ed.) (2007)
How Your Premium Pension Works, 2007 download on 31st May 2007 at:
http://www.ppm.nu/tpp/infodocument/1:1;201471,201304,201475,201481.

PPM (Ed.) (2007) (Premium Pension System Authority)
Statistics, download on 31st May 2007 at:
https://secure.ppm.nu/tpp/infodocument/1:1;21,100029;:.

PTK - The Council for Negotiation and Cooperation (Ed.) (2007a)
New Pension Agreement for Private Sector Salaried Employees, dated 15th January 2007, download on 26th June 2007 at:
http://www.ptk.se/templates/TextPage____2621.aspx

PTK - The Council for Negotiation and Cooperation (Ed.) (2007b)
You Are Insured Through Your Employment – Insurance and Pensions in Accordance With Law and Collective Agreements Within the PTK Area 2007, download on 26 th June 2007 at:
www.ptk.se.

Schweizerische Nationalbank (Ed.) (2007)
Bankenstatistisches Monatsheft Juli 2007, Zürich 2007.

Schweizerischer Versicherungsverband (2007)
Zahlen und Fakten 2007, Zürich 2007.

Statistics Sweden (2005)
Summary distribution of old age pension income from national, occupational and private pensions in Sweden, download on 18th August 2007 at:
http://www.scb.se/default____2154.asp

Statistics Sweden (2006)
Public Finances in Sweden 2006, Stockholm 2006, download on 18th August 2007 at:
http://www.scb.se/

Statistics Sweden (2007)
Income composition for people 65 + years of age for the year 2005, Stockholm 2007, download on 18th August 2007 at:
http://www.scb.se/default____2154.asp

Statistics Sweden (Ed.) (2005)
The Swedish Survey of Living Conditions, cited by: Swedish Government Offices (*Regeringskansliet)* (Ed.), The Swedish National Strategy Report on Adequate and Sustainable Pensions (2005).

Statistik Austria (Ed.) (2005)
EU-SILC 2005, download on 22nd June 2007 at:
http://www.statistik.at/web_de/dynamic/statistiken/soziales/haushalts-einkommen/publikationen?id=6&webcat=151&nodeId=310&frag=3&listid=151

Swedish Government Offices (*Regeringskansliet)* (Ed.) (2005)
The Swedish National Strategy Report on Adequate and Sustainable Pensions (2005), Stockholm 2005.

The Pension Service / Department for Work and Pensions (Ed.) (2005a)
Occupational Pensions: Your Guide, Newcastle Upon Tyne, October 2005.

The Pension Service / Department for Work and Pensions (Ed.) (2005b)
Personal Pensions: Your Guide, Newcastle Upon Tyne, October 2005.

The Pension Service / Department for Work and Pensions (Ed.) (2005c)
Stakeholder Pensions: A Guide for Employers, Newcastle Upon Tyne, November 2005.

The Pension Service / Department for Work and Pensions (Ed.) (2005d)
Stakeholder Pension Guide, Newcastle Upon Tyne, November 2005.

TPAS (2007a) (The Pension Advisory Service)
Changes to Alternatively Secured Pension Rules, status as per 07. December 2006, download on 06th August 2007 at:
http://www.pensionsadvisoryservice.org.uk/
The pension advisory service, independent, non-profit, government-funded body providing pension-related information and guidance to the members of the public

TPAS (2007b) (The Pension Advisory Service)
Death benefits for occupational, personal and stakeholder pensions. without the status date,

download on 06th August 2007 at:
http://www.pensionsadvisoryservice.org.uk/

Verband der Versicherungsunternehmen Österreichs (Ed.) (2007)
Prämienbegünstigte Zukunftsvorsorge, status for the year 2007, download on 02nd July 2007 at:
www.vvo.at.

Wiener Börse (Ed.) (2006)
Varianten der Zukunftsvorsorge, status as per 2006, download on 10th July 2007 at:
www.wienerbörse.at.

World Bank (Ed.) (1999)
Notes to the World Bank Pension Reform Primer, Supervision: Building public confidence in mandatory funded pensions, June 1999

4. Presentations / Working Papers

Knell, Markus (2005)
Situation und Probleme der *Alterssicherung in Österreich*, Präsentation auf der Bundesfachtagung der VolkswirtschaftsprofessorInnen in Winterthur am 18.-20. Mai 2005, download on 15th June 2007 at:
http://www.zhwin.ch/departement-w/zwp/wptagung05/Knell.pdf.

Kosicki, Daniel (2008)
Financial education initiatives of the European Commission. Presentation on International Conference on Financial Education, Washington, 7-8 May 2008.

Queisser, Monika / Vittas, Dimitri (2000)
The Swiss Multi-Pillar Pension System: Triumph of Common Sense? In: World Bank Development Research Group (Ed.), Working Paper Series, August 2000.

Rinaldi, Ambrogio (2007)
Discussion of the Ambachtcheer's Paper "the Optimal Pension Delivery Organisation: Theory and Practice," a presentation prepared for DNB-NETSPAR-IOPS conference in Amsterdam, March 2007.

Rinaldi, Ambrogio (2008)
Financial Education and Pensions, presentations on International Conference on Financial Education, Washington, 7-8 May 2008.

Roberto, Flávio M. (2004)
Facilitating savings for old age – strengthening voluntary private savings, conference of the World Bank "Keeping the promise of old age security", held on June 23, 2004 in Bogota

5. Other Sources / Internet Sources

ACTIFINANCES (Ed.) (2007)
La Retraite Article 83: La mise en place de la retraite Article 83, download on 01st April 2007 at: http://www.retraite-article83.com/miseenplace.html.
ACTIFINANCES est une société privée, totalement indépendante des compagnies d'assurances, spécialisée dans le conseil en revenus différés, retraite, Plan d'épargne et prévoyance pour les entreprises.

ACTIFINANCES (Ed.) (2007)
La Retraite Article 83: Les avantages fiscaux et sociaux, download on 01st April 2007 at: http://www.retraite-article83.com/.

ACTIFINANCES (Ed.) (2007)
La Retraite Article 83: Les cotisations, download on 01st April 2007 at: http://www.retraite-article83.com/.

ACTIFINANCES (Ed.) (2007)
La Retraite Article 83: Les prestations, download on 01st April 2007 at: http://www.retraite-article83.com/.

AGF (Ed.) (2007)
Product Description, download on 09th March 2007 at: http://www.agf.fr/pdf/51/fproduit_tellus_aven.pdf.

AvoirConseil (Ed.) (2007)
Nos produits - Faites appel à notre expertise, download on 04th April 2007 at http://www.avoir-conseil.com/nos_produits.php.

BanquePopulaire (Ed.) (2007)
PERCO – Mettez en place un outil de politique sociale sans précédent, download on 01st March 2007 at:
http://www.banquepopulaire.fr/clients/p708_FR.htm.

Benchmark Group (Ed.) (2007)
Qu´est-ce qu´un PEA?, in: Linternaute Pratique, download on 02nd March 2007 at: http://www.linternaute.com/pratique/argent/epargne/le-pea-plan-epargne-en-actions/461/qu-est-ce-qu-un-pea.html.
Linternaute Pratique est le premier magazine en ligne grand public de l'Internet français.

Companeo - internet supplier search platform (Ed.) (2007)
Detail de l´offre PERCO, download on 02nd March 2007 at: http://www.companeo.com/offer.php?offerid=1319_4128&k=epargne_salariale__perco__plan_d_epargne_retraite_collectif.

**Eidgenössisches Finanzdepartement EFD /
Eidgenössische Steuerverwaltung ESTV (2007)**
Hauptabteilung Direkte Bundessteuer, Verrechnungssteuer, Stempelabgaben, Abteilung Recht, information about the taxation of funded pensions in Switzerland. Communication per Email with Chef Team 2, *Markus Küpfer* lic. iur, Fürsprecher; Eigerstrasse 65, 3003 Bern, Tel.:+41 31 322 73 63, Fax: +41 31 323 51 26, markus.kuepfer@estv.admin.ch, on 24/27th April 2007.

Epargne Salariale (Ed.) (2007)
Qu´est-ce que le Plan d´Epargne d´Entreprise (PEE), download on 14th February 2007 at: http://www.epargne-salariale.fr/e_situation.php

Groupe Express-Expansion (Ed.) (2007)
Dix bonnes raisons de s´intéresser au PERCO – Un système simple et des partenaires pour vous aider / Même les patrons peuvent souscrire / L´abondement n´est pas taxé et son montant, modulable / C´est un moyen d´attirer et de fidéliser les salariés / La sortie est fiscalement avantageuse pour le salarié / , in: L'Entreprise – online magazine - des idées, des conseils, des solutions, download on 18th November 2007 at:
http://www.lentreprise.com/3/1/2/dossier/9797/4511.html
http://www.lentreprise.com/3/1/2/dossier/9797/4514.html
http://www.lentreprise.com/3/1/2/dossier/9797/4515.html
http://www.lentreprise.com/3/1/2/dossier/9797/4516.html
http://www.lentreprise.com/3/1/2/dossier/9797/4518.html

La société Uni-Éditions (Ed.) (2007)
Comment compléter votre retraite? Les limites de l´avantage fiscal, download on 15th February 2007 at:
http://www.dossierfamilial.com/user/openloupes.php?idelem=934&uni=3&rub=14&typelem=1&idloupe=5266&color=vert&withdos=Comment compléter votre retraite

La société Uni-Éditions (Ed.) (2007)
Retraite: Le PERP est-il fait pour vous? / Comment compléter votre retraite? Les limites de l´avantage fiscal, in: DossierFamilial , download on 15. February 2007 at:
http://www.dossierfamilial.com/html/art_934.html; www.dossierfamilial.com.

L'Association Française de la Gestion Financière- AFG (Ed.) (2007)
Deux produits d'épargne retraite ont été créés à la suite de la loi du 21 août 2003 portant réforme des retraites. Download on 08th August . 2007 at:
http://www.afg.asso.fr/afg/fr/epargne_retraite/produits.htm

Lin, Li (2006)
Pension Reforms in Italy, in: EDHEC Asset Management Research (Ed.), January 12, 2006. Download on 01st May 2007 at:
http://www.edhec-risk.com/site_edhecrisk/public/latest_news/Business%20_Strategy_Issues/RISKArticle.2006-01-12.4703 on 01st May 2007

MutuelleMédicis (Ed.) (2007)
Dossier: comprendre la loi Madelin, Quelles sont les règles, les avantages de la loi Madelin?, status as per 16th April 2007, download on 17th April 2007 at: http://www.mutuelle-medicis.com/accueil/informations_retraite/dossier_loi_madelin.htm,
Médicis est la Mutuelle des Entreprises et des Indépendants du Commerce

Paparella, Domenico (2004)
Pensions in Italy, in: European Foundation for Improving of Living and Working Conditions, September 2004, Download on 01 st May 2007 at:
http://www.eurofound.europa.eu/eiro/2004/09/feature/it0409101f.html Document-ID: IT0409101F.

PensPlan Centrum Bozen, Reparto Comunicazione e Informazione (2007)
Information of the helpdesk on the payout rules for deceased members during the saving and the payout phase. Communication per email with *Manuela Matha*, Reparto Comunicazione e Informazione, PensPlan Centrum S.p.A, Via della Rena, 26, 39100 Bolzano, Italy, Tel. +39 0471 317611, Fax +39 0471 317666, Manuela.Matha@pensplan.com, on 02nd July 2007.

Without named author (2007a)
Assurance Vie, in: Votre Argent − le site de mieux vivre votre argent, download on 01st April 2007 at: http://www.votreargent.fr/assurance_vie/.

Without named author (2007b)
Information on Pensionszusatzversicherung 2007, in: Unabhängiges Portal für Menschen über 50, owner: Andreas Hollinek, Liesinger Str. 19a, A-3012 Wolfsgraben, download on 15th July 2007 at: www.50plus.at.

6. Databanks

Association of British Insurers (Ed.) (2007)
Databank *Long-Term Insurance Statistics*, download on 16th July 2007 from:
http://www.abi.org.uk/.

Eurostat (Ed.) (2007)
Statistical Databank, download from:
http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1090,30070682,1090_30298591&_dad=portal&_schema=PORTAL

Eurostat (2008)
Total and aged population in selected countries, Average consumption structure for EU-15 countries, EU-15 mean consumption expenditure by age of the reference person, download at:
http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1090,30070682,1090_30298591&_dad=portal&_schema=PORTAL

APPENDIX A
METHODOLOGY OF THE LIFECYCLE OPTIMISATION MODEL

Contents

1. Investor's Optimisation Problem

In this section we describe the dynamic portfolio choice problem of a risk averse retiree to optimally choose how much to consume (*spending decision*) in tandem with an investment strategy (i*nvestment decision*) to support that consumption. Hereby we follow the approach introduced by *Horneff/Maurer/Mitchell/Stamos* (2007).

The investment universe consists of liquid risky stocks, riskless bonds, and illiquid investment linked payout annuities. Insofar, the retiree must make both an asset allocation choice, regarding how much to hold in liquid assets versus investment linked payout annuities. In addition he must make an asset allocation decision how much of the funds to hold in risky stocks versus riskless bonds.

We assume that at the beginning of the retirement phase (here set at the age of 65) the retiree has initial financial assets S_0. In addition he is endowed with a constant lifelong yearly pension income (adjusted for inflation) of $Y_t = Y$ which results e.g. from Social Security and/or a defined benefit company pension. To model preferences we adopt an additively time-separable utility function of the Constant Relative Risk Aversion (CRRA) class defined over consumption and bequest, a standard assumption in financial economics. The retiree's subjective survival probability to survive until date t+1, given he is alive at t, is denoted by p_t^s. In this case, the retiree's preference function is then recursively defined by:

$$V_t = \frac{C_t^{1-\rho}}{1-\rho} + \beta E_t\left[p_t^s V_{t+1} + \left(1 - p_t^s\right) k \frac{\left(B_{t+1}\right)^{1-\rho}}{1-\rho} \right], \qquad \text{(A1-1)}$$

with terminal utility $V_T = \frac{C_T^{1-\rho}}{1-\rho} + \beta E_T\left[k \frac{\left(B_{T+1}\right)^{1-\rho}}{1-\rho} \right]$.

Here C_t denotes consumption level at time t in the case the retiree is alive; T is given by the curtailed lifetime (set to age 100); ρ is the coefficient of relative risk aversion (RRA) and also reflects the retirees willingness to engage in intertemporal consumption substitution. This parameter is of key interest in assessing the different financial retirement strategies when payouts are uncertain. In the special case ρ= 0 the retiree is called risk neutral, and for ρ >0

risk averse. We set in our base case ρ= 5 which is a standard value in the life cycle literature and represents according to the classification of *Horneff/Mauer/Mitchell/Dus* (2007) a retiree with moderately risk aversion.[56]

A retiree with a parameter ρ=2 has a low risk aversion. The parameter β reflects her time preference (set to 0.96); and B_t represents the remaining financial wealth at death. The strength of her bequest motive is represented by the parameter k. Having a bequest motive k > 0 means that the retiree will always keep some wealth not annuitised, in order to be able to bequeath wealth to potential heirs. In the case of a (moderate) bequest motive set k = 2, which is in the ballpark of values used by *Cocco/Gomes/Maenhout* (2005).

In this framework, each year the retiree must decide how to allocate the current cash on hand W_t, between consumption C_t, financial wealth S_t (i.e. direct stock and bond investments), and new purchases of (investment linked) life annuities A_t. Hence, the intertemporal budget constraint at time t is given by:

$$W_t = S_t + A_t + C_t . \qquad \text{(A1-2)}$$

In the next period, cash on hand is then:

$$W_{t+1} = S_t\left(R_f + \pi_t^s\left(R_{t+1} - R_f\right)\right) + L_{t+1} + Y , \qquad \text{(A1-3)}$$

where π_t^s denotes the fraction of financial wealth S_t invested in risky stocks, R_f denotes the real bond growth rate, and R_{t+1} the cumulative risky stock return. The sum of annual income which the retiree gets from all previously purchased annuities is L_{t+1}. If the retiree passes away at t+1, the remaining estate is given according to $B_{t+1} = S_t\left(R_f + \pi_t^s\left(R_{t+1} - R_f\right)\right)$.

Besides the intertemporal budget restriction, the retiree is restricted from borrowing against future pension income and annuity payouts, as well as from selling short positions in annuities.

2. Capital Markets

For simplicity, the capital market provides only two assets: a riskless bond and risky stocks. We assume that the yearly return on the riskfree asset (after inflation) is constant to 2 percent. Further, we assume that in any year the stochastic characteristic of the risky stock movements follows the same lognormal distribution, and that the return is independent of the movements in previous years. Risky stocks has an expected return (adjusted for inflation) of 6 percent per year (in other words a risk premium of 4 percent) and volatility of 18 percent per year. This choice of parameters for risky stock investments is in line with the recent portfolio choice literature, and reflects the anticipated risk/return assumption for a well diversified market portfolio of international stocks.

3. Investment-Linked payout Annuity Markets

Besides traditional liquid asset the retiree has access to investment linked (variable) payout annuities. This a financial contract between an annuitant and an insurer whereby the purchaser receives a pre-specified number of fund units conditional on survival in each period. When

[56] See for example *Horneff/Mauer/Stamos* (2007). Yet, this is a higher value than in *Feldstein/Ranguelova* (2001), which considers a reasonable range for the coefficient of risk relative aversion between 2 und 3.

the price of a fund unit at time t is Z_t, the income received from this annuity is $L_t = n_t Z_t$. To receive this life long income stream the retiree must pay the insurer an initial immediate premium A_t, which is given according to the actuarial principle of equivalence by:

$$A_t = Z_t(t) n_{t+1}(t) \sum_{t=1}^{T} \frac{{}_t p_y^a}{(1+AIR)^{t-1}}. \tag{A1-4}$$

where ${}_t p_y^a = \prod_{t}^{t+s-1} p_t^a$ is the cumulative conditional survival probability for an individual aged y to survive until age y+t according to the mortality table used by the insurance company to price the annuity.

The subjective year-by-year survival probability p_t^s can differ from the assumptions made about mortality p_t^a by the insurer, which is standard in the insurance industry. Our numerical analysis takes survival probabilities from the US 1996 Annuity 2000 female mortality table to price the annuities, and the corresponding population mortality table to compute utility. The difference between the two mortality tables reflects ongoing adverse selection in the annuity market (see *Brugiavini*, 1993). The *AIR* is the so-called assumed interest rate, and determines how the number of fund units evolves over time. One can think of the *AIR* as a shrinkage rate for the number of fund units the retiree is supposed to receive. The evolution for the price of the fund unit can be written according to:

$$Z_{t+1} = Z_t R_{t+1}^a, \tag{A1-5}$$

where $R_{t+1}^a = \left(R_f + \pi_t^a \left(R_{t+1} - R_f\right)\right)$ is the growth rate of the underlying fund and $\pi_t^a \geq 0$ denotes the stock fraction at date t inside the investment linked annuity wrapper. Note, the investment return and therefore the annuity payouts will be random when the fund is invested in risky stocks. Accordingly, the year-by-year income of an investment linked payout annuity can be recursively expressed as:

$$L_{t+1} = \frac{L_t R_{t+1}^a}{1+AIR}. \tag{A1-6}$$

Compared to the previous year the payout rises when the return of the investment funds inside the annuity wrapper exceeds the Assumed Interest Rate $R_{t+1}^a > 1+AIR$, decreases when $R_{t+1}^a < 1+AIR$, and is constant when R_{t+1}^a equals the *AIR*.[57]

An annuity with lifelong constant payouts is a special case of a investment linked annuity whereby the fund inside the annuity wrapper is allocated fully in riskless bonds and the 1+AIR = R_f is set equal to the risk-free interest rate. In such a case, we obtain also the classical result for pricing a payout annuity with lifelong payments of $L_t = n_t Z_t = 1$:

$$A_t = \sum_{t=1}^{T} \frac{{}_t p_y^a}{R_f^t}. \tag{A1-7}$$

[57] More discussion of the role of the AIR on payout profiles appears in Horneff, Maurer, Mitchell, and Stamos (2007).

4. Numerical Solution and Simulation Analysis

Analytical solutions to this type of problem do not exist, so we solve it by backward induction through a three-dimensional state space $\{W, L, t\}$. Although we assume CRRA preferences, cash on hand W cannot be omitted as a state variable because illiquid annuities are included in the analysis. It is also necessary to include the sum of current annuity payouts L as a state variable, because once purchased, annuities can no longer be sold. Finally, the optimal policy depends on the retiree's age, because the price of newly purchased life annuities as well as the present value of her remaining pension income – which below we refer to as *pension wealth* – vary with her age. We refer the reader to *Horneff, Maurer, Mitchell, and Stamos* (2007) for further details of the numerical solution technology.

To evaluate how the retiree's annuity purchases, stock fraction, and consumption, would be expected to evolve assuming she followed the optimal policy functions derived above we undertake a stochastic analysis. To do so, we run Monte Carlo simulations of 10,000 life cycles. The figures in the main text show the expected range of simulated possibilities, taking into account the consumer's optimal portfolio rebalancing.

5. Utility Loss of Compulsory Annuitisation

To compare the utility loss of a mandatory annuitisation, and to evaluate the economic cost of the different regulatory framework we conduct a welfare analysis similar to *Mitchell et al.* (1999), and *Horneff/Maurer/Mitchell/Stamos* (2007). In this analysis, we compare the retiree's expected life time utility when living in a scenario with a mandatory annuitisation of retirement wealth, with the utility in a scenario without such requirement. To measure the utility loss in monetary units we compare these alternatives by computing the additional amount of financial wealth the retiree would need at the age of 65 (i.e. at retirement) in the restricted world, that would buy her the same wellbeing (i.e. provide the same expected utility) as in the unrestricted scenario. This is achieved by equating the expected utility in the unrestricted case (open access to annuity and capital markets) with that of the restricted case (compulsory annuitisation) but with a higher initial financial wealth at the age of retirement.

APPENDIX B
PAYOUT APPROACHES IN SELECTED COUNTRIES FOR TAX-QUALIFIED FUNDED PENSIONS

Contents

1. General information and definitions

Facing a large ageing population with an increasing life expectancy, all European countries considerably reformed their traditional public non-funded pay-as-you-go pension systems, encouraging the participation in funded private pension programs. Following the classification developed by OECD, the reference to *private* pension programs means those pension plans, administered by an institution other than the general government. These plans could be managed by the sponsoring employer, a designated pension fund or a private sector provider. In contrast to *occupational* pension plans, access to *personal* pension plans does not have to be linked to an employment relationship. Individuals can independently select material aspects of the arrangements.[58] Yet, the maturity of the occupational and personal pension programs, the means of providing for the old age and the size of the provisions vary considerably from country to country, and are not necessarily correlated with the population numbers.

In the framework of the three-pillar model, we understand the first pillar to be the (mostly pay-as-you-go) statutory system, with the two other pillars belonging to the private pension category. The second pillar includes the occupational, employment-related funded arrangements. The third pillar includes funded personal pension plans. Thus, we concentrate our attention on programs within the second and third pillars. The participation in these programs can either be *voluntary* or *mandatory*.

Pension plans can be from the defined benefit or defined contribution type. Following *McGill et al.* (2005, p. 235): "In a *defined benefit plan* benefits are established in advance by a formula, and employer contributions are treated as the variable factor. The formula for establishing the benefits may provide that the amount of monthly pensions after retirement is fixed, or it may provide that the amount varies after retirement in accordance with some fixed standards (e.g. the consumer price index)". By contrast, the pure *defined contribution* plan, "provides an individual account for each participant and bases benefits solely on the amount contributed to the participant's account and on any expense, investment, and forfeitures allocated to that account" (cf. *McGill et al*. 2005, p. 272). In practice, many pension plans have both, features of DC and DB-plans (*hybrid plans*).

Taxation is an important aspect to understand the use and the relative attractiveness of the various pension products. To motivate individuals to save for retirement, the governments in many countries established preferential tax treatments for special retirement accounts.

[58] OECD (2005), p. 49.

Following the typology developed by *Dilnot* (1995), the engagement in retirement plans are connected with three basic transactions: (i) the contributions made to the plan, (ii) income on assets that accrues in the plan, and (iii) the payments of benefits from the plan. Each of them can be subject to special tax treatments, i.e. exempt (E) or taxed (T). In practice, there are three main tax regimes. The first are so called taxed deferred retirement accounts (also know as a EET tax-regime), which allow for income tax exclusion of contributions up to a certain limit, for earning tax-free profits on assets inside the plan, but during retirement, payouts are taxed as ordinary income at the personal tax rate. A second regime is that of tax exempt accounts (TEE), whereby contributions are funded with after-tax-income, and neither the profits on assets nor the payouts are taxable. Finally, households can put their retirement savings into conventional taxable accounts (TTE) without limits, whereby contributions result from after tax-income and investment profits are taxed as well, but payouts exempt from taxation. These definitions are summarised in the following box:

Table B.1: Categorisation of Taxation of Retirement Schemes

Categorisation of Taxation of Retirement Schemes			
Taxation of….	**EET tax regime**	**TEE tax regime**	**TTE tax regime**
- Contributions	No	Yes	Yes
- Profits	No	No	Yes
- Payouts	Yes	No	No

Especially in retirement plans within EET tax regimes in many countries legislation/regulation requires some restrictions for the use of the funds, both in the accumulation and payout phase. In what follows, we examine the major tax sponsored occupational and personal pension systems of the seven European countries and the US, and give condensed information on the possible payout structures within these programs.

The results of our research are summarised in the tables B2-B9 represented below. All tables have similar structure: In the first and second column, we differentiate between occupational and private programs and, within these programs, whether the participation is obligatory or voluntary. Then, we distinguish between three possible payout forms, such as annuity payments, drawdowns and lump sum payments and provide brief information on whether the respective forms are mandatory, permitted or prohibited for enlisted programs. The last column, "*Comments*" contains additional information on the taxation and other important details.

2. Summary tables for Austria, France, Germany, Italy, Sweden, Switzerland, UK and USA

*Table B.2: Summary of payout options in **Austrian** private and occupational retirement plans*

	Obligatory /Voluntary	Annuity	Drawdown	Lump Sum	Comments
Occupational	**V**				
at retirement		- permitted, tax free	- not permitted with the saving institution MVK - after the receipt of a lump-sum payment, the self-arranged drawdown solutions are available	-permitted, taxed at a privileged tax rate	- EE(T)* tax system - applies automatically starting 2003 to all new labour market entrants - for older generations transitional rules apply and an option to choose between the new and old system exists
before retirement, at the termination of the employment contract if eligible to payout		- transfer to another saving institution - purchase of deferred annuity with insurance company	-not permitted with the saving institution MVK - after the receipt of a lump-sum payment, the self-arranged drawdown solutions are available	-permitted, taxed at a privileged tax rate	- tax-free transfer to another MVK, or to an insurance company for the purpose of old age saving
Private	**V**				
Prämien-begünstigte Zukunfts-vorsorge (PZV)		-permitted, tax-free	- not defined in the legislation - after the receipt of a lump-sum payment, the self-arranged drawdown solutions are available	- permitted, taxed - refund of the 50% of the state subsidy required	- TE(E)* tax system; 9% state subsidy to contributions within the promotional limit of EUR 2,115 p.a. (in 2007) - traditional or unit-linked insurance contract, or investment fund product with minimum 10 years duration, with required guarantee on paid-in capital and optional guarantee on interest rate - tax-free roll-over after 10 years into another pension program possible - pension payments, originating from contributions above the annual statutory promotion limit, are subject to income tax, independently of the payout solution
Prämien-begünstigte Pensions-zusatz-versicherung		-mandatory	-not permitted	-not permitted	- (T)EE Tax System - since 2004 available only if the PZV exists; the contributions up to EUR 1,000- to the pension insurance policy can be re-claimed as a special expense in the tax refund bill - payouts start simultaneously with the statutory pensions

* Brackets mean that the relevant stage of the old age pension program is subject to tax treatment, applying to the old age pension programs only.

*Table B.3: Summary of payout options in **French** private and occupational retirement plans*

	Obligatory (O) /Voluntary (V)	Annuity	Drawdown	Lump Sum	Comments
Occupational	**V**				
Article 39 of Code General des Impôts		- mandatory	- not permitted	- not permitted	- Defined benefit program
Article 83 of Code General des Impôts		- mandatory	- not permitted	- not permitted	- EET tax system - Contributions are subject to CSG/CRDS tax for employees
Madelin-Law		- mandatory	- not permitted	- not permitted	- EET tax system
PERCO		- permitted	- permitted	- permitted	- TE(T)* tax system - access restricted till retirement age - in the case of death or severe health impairment, over-indebtedness or purchase of real estate for private use, the restriction can be deemed void without any cost - Roll-over from PEE/PEI possible
Private	**V**				
Capitalisation		- permitted	- not permitted	- permitted	- EET tax system
PEA		- no information on payout restrictions	- no information on payout restrictions	- no information on payout restrictions	- TEE tax system - maximum lifetime amount of 132.000€ per person - access restricted for 5 years - after 8 years only CGS/CRDS tax is due at withdrawal
PERP		- mandatory	- not permitted	- not permitted	- EET tax system - access restricted till retirement age - in the event of death or severe health impairment, over-indebtedness or purchase of the real estate for the own use, the restriction can be void
Life Insurance		- permitted - not usual for France, lump sum preferred	- permitted	- permitted	- TEE tax system - contract life at least 8 years

* Brackets mean that the relevant stage of the old age pension program is subject to tax treatment, applying to the old age pension programs only.

*Table B.4: Summary of payout options in **German** private and occupational retirement plans*

	Obligatory (O) /Voluntary (V)	Annuity	Drawdown	Lump Sum	Comments
Occupational	**V**				
Life Insurance		- permitted	- permitted	- permitted	- EET tax system
Pensions-fonds		- like Riester	- like Riester	- like Riester	- EET tax system
Pensions-kasse		- permitted	- not defined	- permitted	- EET tax system
Direktzusage		- permitted	- permitted	- permitted	- EET tax system - no contribution limits
Private	**V**				
Riester		- permitted (fixed or increasing payments) - semi-compulsory: annuitisation required at the age of 85, mandatory swichting	- permitted until age 85 - fixed or increasing payments	- permitted up to 30%	- EET tax system + direct subsidies - regular payouts at age 60
Rürup		- mandatory	- not permitted	- not permitted	- EET tax system - regular payouts at age 60
Life Insurance		- permitted		- permitted	- TEE tax system - holding period for a minimum of 12 years and payments after the 60th birthday of the insured qualify for the reduction on the capital gain tax - tax exemptions terminated in 2004

*Table B.5: Summary of payout options in **Italian** private and occupational retirement plans*

	Obligatory (O) /Voluntary (V)	Annuity	Drawdown	Lump Sum	Comments
Occupational	**O/V**	closed and open funds as well as insurance policies have the same payout structure and taxation rules			- the employee can reject the automatic transfer of the end-of-the-service allowance to the occupational pension program
Closed (negotiated) funds		- permitted	- not permitted	- permitted - up to 50% of the accrued balance, remainder as annuity	- hybrid ETT Tax System - restricted access to the funds until the retirement age can be deemed void in the event of severe health impairment, unemployment or for the purchase of the first home
Open Funds		- permitted	- not permitted	- permitted - up to 50% of the accrued balance, remainder as annuity	- hybrid ETT Tax System - the restricted access to the funds till the retirement age can be deemed void in the case of severe health impairment, unemployment or for the purchase of the first home
Insurance Policies		- permitted	- not permitted	- permitted - up to 50% of the accrued balance, remainder as annuity	- hybrid ETT Tax System - restricted access to the funds until the retirement age can be deemed void in the event of severe health impairment, unemployment or for the purchase of the first home
Private	**V**				
Open Funds		see occupational	see occupational	see occupational	see occupational
Insurance Policies		see occupational	see occupational	see occupational	see occupational

*Table B.6: Summary of payout options in **Swedish** private and occupational retirement plans (to be continued on the next page)*

	Obligatory (O) /Voluntary (V)	Annuity	Drawdown	Lump Sum	Comments
Fully Funded Statutory	**O**				
		- permitted	- permitted - the pension is re-calculated every year based on insurance principles and the development of the available funds	- not permitted	- EET Tax System - transfer of funds in the event of the insured's death can be conducted only by applying for the survivor's coverage
Occupational	**O**				
ITP1	-obligatory to offer if collective agreement exists - contributions paid by the employer	- permitted	- permitted: payment over a fixed period of not less than five years	- not permitted	- ETT Tax System - defined contribution (DC) plan - applies to persons born after 1979, to all employees and/or high earners if the company allows this - optionally family and/or repayment cover
ITP2	-obligatory to offer if collective agreement exists - contributions paid by the employer	- permitted	- permitted: payment over a fixed period of not less than five years	- not permitted	- ETT Tax System - defined benefit (DB) plan - applies to persons born before 1979 - optional family cover
ITPK	-obligatory to offer if collective agreement exists - contributions paid by the employer - employee contributions possible - addition to ITP2	- permitted	- permitted: payment over a fixed period of not less than five years	- not permitted	- ETT Tax System - defined benefit (DC) plan - applies to persons born before 1979 - optionally repayment cover

*Table B.6: Summary of payout options in **Swedish** private and occupational retirement plans (continued from the previous page)*

	Obligatory (O) /Voluntary (V)	Annuity	Drawdown	Lump Sum	Comments
Occupational	**O**				
SAF-LO new	-obligatory to offer if collective agreement exists - contributions paid by the employer	- permitted	- permitted: payment over a fixed period of time	- not permitted	- ETT Tax System - defined benefit (DC) plan - applies to persons born after 1965 - optionally family and/or repayment cover
SAF-LO interim	-obligatory to offer if collective agreement exists - contributions paid by the employer	- permitted	- permitted: payment over a fixed period of time	- not permitted	- ETT Tax System - Interim Ruling, Defined benefit (DB) and Defined Contribution (DC) plan - Applies to persons born 1935-1965, DB rights till 1995 - Optionally family and/or repayment cover
Private	**V**				
Traditional life insurance		- permitted	- permitted	- not permitted	- ETT Tax System - Tax deductible amount starting 2008 SEK 12,000 (approx. EUR 1,294) for all private provisions
Unit-linked insurance		- permitted	- permitted	- not permitted	- ETT Tax System - Tax deductible amount starting 2008 SEK 12,000 (approx. EUR 1,294) for all private provisions
Individual pension account		- permitted	- permitted	- not permitted	- ETT Tax System - Tax deductible amount starting 2008 SEK 12,000 (approx. EUR 1,294) for all private provisions

*Table B.7: Summary of payout options in **Swiss** private and occupational retirement plans*

	Obligatory (O) /Voluntary (V)	Annuity	Drawdown	Lump Sum	Comments
Occupational	**O**				
		- permitted - usually the default option - the only way for defined benefit	- not permitted	- permitted - 25% on demand at the beginning of retirement with any institution; right granted by legislation - 100% if the articles of association of the pension institution permit this - 100% if the funds are small	- EET Tax System - Special withdrawal rules on the early/special withdrawal when - leaving Switzerland - becoming self-employed - purchase of real estate for private use
Private	**V**				
		- permitted	- not explicitly mentioned in the legislation - purchase possible with capital paid out as a lump sum	- permitted - the usual form of accumulated funds' use	- EET Tax System - Differences in taxation of annuity and lump sum payments - Differences in taxation of plans offered by banks and insurance institutions - Special withdrawal rules on early or special withdrawal when - leaving Switzerland - become self-employed - the purchase of real estate for private use

*Table B.8: Summary of payout options in **UK** private and occupational retirement plans*

	Obligatory (O) /Voluntary (V)	Annuity	Drawdown	Lump Sum	Comments
Occupational	**V**				
		- permitted - semi-compulsory: annuitisation required at the age of 75 (*) - special rules for contracted-out schemes	- generally permitted, institutional arrangements (change to a private pension program) may become necessary - annuitisation required at the age of 75 (*)	- permitted - 25% generally tax free at the start of retirement, subject to detailed rules depending on the origin of the funds - 100% if the funds are small	- EET Tax System - *Open Market Option*, separating the saving and withdrawal phase - special rules for severe health impairments
Stakeholder	**V**				
		- permitted - semi-compulsory: annuitisation required at the age of 75 (*)	- permitted - withdrawals are tied to the relevant annuity - annuitisation required at the age of 75 (*)	- permitted - 25% generally tax free at the start of retirement, subject to detailed rules depending on the origin of the funds - 100% if the funds are small	- EET Tax System - *Open Market Option*, separating the saving and withdrawal phase - special rules for severe health impairments
Private	**V**				
		- permitted - semi-compulsory: annuitisation required at the age of 75 (*)	- permitted - withdrawals are tied to the relevant annuity - annuitisation required at the age of 75 (*)	- permitted - 25% generally tax free at the start of retirement, subject to detailed rules depending on the origin of the funds - 100% if the funds are small	- EET Tax System - *Open Market Option*, separating the saving and withdrawal phase - special rules for severe health impairments

(*) The alternatively secured pension (ASP) after the age of 75 is intended for religious groups, denying the pooling of mortality risks. As from April 2007, the minimum withdrawal, starting with the year the retiree turns 75, amounts to 65%, the maximum to 90% of the comparable annuity rate for a 75 year old. On the death of the member the remaining funds are authorised to be used for payment of dependant's pension benefits, for transfer to a charity or, in limited circumstances, for repayment to the employer. The transfer to other person's pension funds as a lump sum attracts unauthorised payment charges of up to 70%.

*Table B.9: Summary of payout options in **US** private and occupational retirement plans*

	Obligatory (O) /Voluntary (V)	Annuity	Drawdown	Lump Sum	Comments
Occupational	**V**				
DC (401(k) or 403b plan)		- permitted	- permitted	- permitted	- EET Taxation / Often rollover in IRA (at retirement/job change)
DB		- usually the default option (as nominal fixed / Inflation adjusted benefits)	- permitted for cash balance plan type	- rollover of accrued benefits into IRA permitted (at retirement / job change)	- EET Taxation
Roth 401(K)		- permitted	- permitted	- permitted (no limits)	- TEE Taxation
Private	**V**				
IRA		- permitted (no restriction on annuity type)	- permitted - between age 59.5-70 without any restriction - from age 70.5 minimum distribution rules based on updated life expectancy apply	- permitted (no limits)	- EET Taxation
Roth IRA		- permitted (no restriction on annuity type)	- permitted	- permitted (no limits)	- TEE Taxation - transfer of IRA into Roth until 2010 possible

GLOSSARY

Annuitisation: Conversion of retirement funds into a stream of annuity payments, purchase of a collective pooled product called life annuity. Total annuitisation means conversion of all available retirement funds into a stream of annuity payments. Partial annuitisation means that only a fraction of available funds is used to buy an annuity. Immediate annuitisation means that annuity has to be purchased immediately when retirement age is achieved. Deferred (age-connected) annuitisation means that the purchase of annuity can be postponed until some later date (until the arrival of certain age).

Annuity factor: In our study, it is a rate, at which an initial amount of EUR 1.00 can be transformed into a series of fixed periodic lifelong payments by applying principles of insurance mathematics.

Annuity market participation puzzle: Empirically observed phenomenon, that despite the large economic value that protection against longevity risk can offer to retirees, many of them do not purchase annuities voluntary. Efforts to explain annuity puzzle root both in extending traditional lifecycle models and in analysing behavioural obstacles.

Asset allocation: Is a decision how much of the overall funds should be invested in risky stocks and riskless bonds.

Asset location: Is a decision how much of the retirement wealth should be invested in liquid financial assets (such as stocks and bonds) versus illiquid annuities.

Bequest: In our study, we understand bequest as the possibility to transfer the funds to the heirs at the death of the retiree. For a retiree with a bequest motive the possibility of such transfer can be quantified in utility terms.

CPPI-Strategy: The constant-proportion portfolio insurance (CPPI) strategy is a dynamic investment strategy suggested by Black/Jones (1987) that aims at protecting the portfolio value from falling below a pre-specified threshold (floor). Hereby, the exposure to the risky asset is set equal to the cushion times a multiplier. The cushion is defined as the difference between the portfolio market value and the threshold. CPPI is based on observable variables only and makes no distributional assumptions.

Defined benefit (DB) pension plan: In a defined benefit plan the benefits which the plan member can expect to receive at retirement are established in advance by a formula, and member's contributions are treated as the variable factor. The benefits may be fixed or vary in accordance with some fixed standards (e.g. the consumer price index).

Defined contribution (DC) pension plan: pure defined contribution pension plans provide an individual account for each participant. The benefits which the plan member can expect to receive are based solely on the amount contributed, net of any expenses and losses. In practice, many pension schemes are hybrids, having features of both defined benefit and defined contribution plans.

Fixed life annuity: Is a life annuity providing guaranteed constant lifetime level payments in nominal terms.

Funded pension program: Is a systematic and purposed process of saving and consuming funds. During the saving phase, the program member accumulates funds, which are used to finance the living during the retirement.

Income (retirement) fund: An income drawdown product with management activities largely delegated to the asset management company. At the beginning of retirement the available capital is placed in a fund, investing in a balanced mixture of assets, and targeting a specified (but not guaranteed) periodic return. Periodic earnings are distributed to the retiree; the originally invested capital remains untouched by withdrawals.

Income drawdown (withdrawal) product: *Individual* method of generating retirement income. The retiree is in the position of an owner of assets, there is *no risk pooling* with other retirees, and the retiree has the freedom to decide on how to invest his wealth among the various asset categories. The payment for the retiree will result in periodic withdrawals or lump sum payments. The possible duration of withdrawals depends on the original amount of funds available. Further, it depends on the absolute amount of periodic withdrawals and on the return on the remaining funds during the withdrawal period.

Inflation risk: Describes the threat of general price increases over time resulting in an erosion of the real value of pension payments and retirement capital. Inflation reduces the purchasing power of pension benefits or pension assets.

Integrated retirement product: Retirement product showing a high degree of standardisation and simultaneously including both pooled and non-pooled solutions in the retirement portfolio during the payout phase. The retiree has several options about when and to what extent to include a life annuity in his financial retirement strategy. She can do it by purchasing an immediate annuity or a deferred annuity, or purchase annuities as retirement progresses (gradual annuitisation). Further, she can decide what fraction of funds to invest in the pooled product (full/partial annuitisation). During the payout phase, integrated products may include guarantees from the asset management company as to the investment return, the amount of withdrawal or to the length of payment.

Investment risk: The risk that stochastic investment returns on pension assets fluctuate over time. Fluctuating returns of the various assets, in which the prospective retirees might invest their accumulated retirement funds, contain both the attraction of an *upside potential*, but also the disadvantage of *shortfall-risks* to lose money due to adverse developments in the capital markets.

Life annuity: Special insurance contract offered primarily by life insurance companies or pension funds. From an economic perspective the most important characteristic of a life annuity are regular and guaranteed lifelong payments to the policyholders, contingent on survival of one or more individuals. Most often, an annuity contract entitles the retiree to a regular income stream over the remainder of her life. Life annuity is a *collective* (*or pooled*) *product,* depriving the investor of the outright ownership of her funds once the product has been purchased, and replacing it with the obligation of the product provider to render a series of life-contingent payments. The redistribution of funds among surviving members can generate for them a higher return than the capital market return on assets with similar risk profile. A wide range of annuity products can be bought, differing by the nature of paying premiums to the insurance company, by the number if lives covered, and by the nature of benefits paid to the insured individuals. See also fixed and variable life annuity.

Lifecycle (retirement) fund: An income drawdown product with management activities largely delegated to the asset management company. At the beginning of retirement, the available capital is placed in a fund, investing in a balanced mixture of assets. With the progressing age of the retiree, the stock exposure of the fund is reduced in favour of bonds with high credit rating according to the specified scheme. According to the agreed payout modes, the amounts due are automatically transferred to the retiree.

Money's worth ratio: A measure to quantify the attractiveness of annuity benefits. The money's worth ratio is calculated as the expected present value of payouts from annuity benefits in relation to the premium cost of the annuity.

Mortality risk: The risk of an uncertain lifetime. Mortality risk can have two different adverse outcomes for the retiree. On the one hand, the retiree may live longer than expected, and run out of money, falling into poverty before dying. The literature refers to this as *longevity risk*. On the other hand, the investor might die too early without consuming enough of his savings, therefore leaving an unintended bequest (*brevity risk*).

Non-pooled product: A financial product, attributing the performance of the individually managed funds directly to the product purchaser, without any risk pool creation. The purchaser of a non-pooled product is the owner of assets, placed within this product.

Occupational (employment-linked) pension program: A category within private pension programs. The access to *occupational* pension plans is firmly linked to an employment relationship. Material aspects of the arrangements are selected in agreement with the sponsoring employer. The participation in the occupational programs can either be *voluntary* or *mandatory*. While the term occupational is generally used in the majority of countries, in the UK the term occupational is used only for employment-linked schemes, organised as trusts. Therefore, for UK we use the general expression "employment-linked." In our terminology, we follow the classification developed by OECD.

PAYGO pension program: Within the paygo (pay-as-you-go) pension program, the benefits to the retirees in one period are paid out of contributions gathered from active members in the same period. This system is applied mostly for the statutory pension programs.

Pension wealth: Shows the size of the lump sum that would be needed to buy a flow of pension payments equivalent to that promised by the respective mandatory pension system.

Personal pension program: A category within private pension programs. The access to *personal* pension plans does not have to be linked to any general government institution or an employment relationship. Individuals can independently select material aspects of the arrangements. In our terminology, we follow the classification developed by OECD.

Pooled (collective) product: A financial product, applying principles of risks pooling. In this study, this is a product, used for the purpose of providing for the old age. The underlying collective risk sharing principle in that case is that the insurance company does not pay out the full amount of the annuity premium to those individuals who die earlier than on average expected. This permits higher payouts to those who remain alive (so-called survival or mortality credit). The purchaser of a pooled product is in a position of a creditor of an insurance company. She gives up ownership of the funds she pays to the provider of the pooled product in exchange to the promise of a defined series of payments after the retirement date.

Pooling of risks: Pooling risks together is a fundamental way of insuring against their adverse outcomes. The underlying principle is that large groups of similar and independent risks exhibit on average stable and measurable characteristics, enabling the reliable estimation of expected outcomes and risk costs. When pooling of risks is applied, the group members with higher risks characteristics are subsidised by those with lower risk characteristics. For example, in pure life insurance, the individuals who survive are subsidising those who die within the insured period.

Private pension program: Means those pension programs, administered by an institution other than the general government. These plans could be managed by the sponsoring employer, a designated pension fund or a private sector provider. In our terminology, we follow the classification developed by OECD.

Replacement rate: Is a ratio of the pension income over the earnings during the specified period of time.

Statutory pension program: Old age program administered by a general government institution.

Survival (mortality) credit: Additional return over the return on assets with similar risk profile on the capital markets, generated for the surviving investors in a *collective* (*or pooled*) *product*, achieved by the redistribution of funds among surviving investors.

Three pillar model: A description of the structure of the old age pension systems in the industrialised countries. Within the framework of the three pillar model, we understand the first pillar to be the (mostly pay-as-you-go) statutory system, with the two other pillars belonging to the private pension category. The second pillar includes the occupational, employment-related funded arrangements. The third pillar includes funded personal pension plans.

Utility function: A function used in microeconomic models to rank preferences of a rational individual, facing a set of (risky) choices.

Variable life annuity: A life annuity, having both an investment component in a form of a mutual fund-style investment sub-accounts and an insurance element in terms of pooling longevity risks. The benefits paid by the insurance company reflect the return of a specific asset portfolio, usually represented by family of mutual funds (like stocks, bonds, real estate). The insurance company promises the annuitant to pay a pre-specified number of fund units as long as he lives. In contrast to a fixed annuity, the annuitant can influence how the assets are invested in the various mutual funds, and bears (at least in part) the risk and rewards of those investments. Although the assets are held in special subaccounts, the retiree is (from a legal point of view) not the owner of the assets but rather a creditor of the insurance company which must pay the retiree periodically a certain number of fund units as long as the retiree lives.

EFAMA - European Fund and Asset Management Association
18 Square de Meeûs, B-1050 BRUXELLES
T. +32 2 513 39 69 - F. +32 2 513 26 43
E-mail: info@efama.org - http://www.efama.org