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# The Pay-out Phase of Funded Pensions Plans: Risks and Payment Options

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The Pay-out Phase of Funded Pensions Plans: Risks and Payment Options - 3rd quarter 2014

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# 1. Introduction

Population structures and the main demographic drivers behind them have a major impact on pension systems, their financial status and reform needs

The role of funded individual retirement provisions has increased over recent decades. Yet, while the accumulation phase of retirement saving has attracted most of the attention of industry and research, the pay-out phase has been much less explored. This policy paper investigates the key pay-out options against the many economic and financial risks the individual faces on arriving at retirement with an earmarked accumulation that represents the main share of his or her lifetime wealth.

There are a number of reasons why funded individual retirement provisions have gained importance over recent decades, including (Holzmann 2014a):

(1) The systemic reforms of public pension schemes since the Chilean reform of 1981 and the move from nonfunded (collective) defined benefit (NDB) schemes towards (individualised) funded and defined contribution (FDC) schemes. By 2008, such reforms had reached 31 countries, with a few changes - suspension, elimination, reduction and introduction - since (Holzmann 2013). This move required new pay-out modes and the replacement of prior public annuities with other options.

(2) The decreasing public generosity of public annuities as the result of fiscally driven public pension reforms across the globe and the encouragement by governments of voluntary supplementary saving, in order to cover the old age income gap (Hinz et al. 2013). The latter is expected to increase as the result of projected further increases in longevity, giving rise to the call to "retire later and save more" (OECD 2013a).

(3) While the (partial) change from NDB to FDC for public pensions had been introduced in 31 countries by 2008, such a move from funded defined benefit schemes (FDB) toward FDC schemes is almost complete across the corporate world, and across countries, and the corporate pensions, made available for new entrants at least (OECD 2013b). But in many cases also, existing FDB schemes have been replaced by FDC schemes, with the employer typically only involved in the accumulation phase with contributions and management, while the disbursement is often left to individual decisions.

(4) In countries with the main basic provisions for the elderly financed from general government sources, as is particularly the case in Australia and New Zealand, there is an interest not only in supplementing this government provision with private retirement saving but also in having it disbursed as a life annuity (and not largely invested in private housing). This should help reduce the public retirement bill in the face of projected population ageing.

(5) Last but not least, population ageing has also reached the mostly younger societies in South and in particular East

Asia where there has traditionally been more openness to funded provisions, often in the form of central provident funds that traditionally offered no life annuities. In addition, the traditional family support in these societies is also withering because of falling fertility rates, urbanisation and migration. While supplementary voluntary saving and public encouragement to do so is on the radar screen of many countries, the need for some structured pay-out option has mostly not yet reached individuals and governments (see Holzmann 2014b for the Malaysian case).

The search for the appropriate pay-out option for accumulated individual retirement savings has to take account of a number of particularities in individual preferences and the enabling environment, including:

(a) A dislike by most individuals of private life annuities as a mechanism that translates much or all of their accumulated saving with an upfront payment into periodic unconditional payments until death. While welfare economics suggests major welfare gains from such a conversion, the worldwide demand for private life annuities remains very small. This "annuity puzzle" creates the background for the search for other pay-out options.

(b) The alternative, for individuals to sit on their accumulated retirement savings and spend as it pleases them, also has its limitations as the retiree is confronted with many demographic and economic risks. They range from the risk of running out of resources from bad investment outcomes to exposure to inflation for which no hedge may be available. These risks are often little understood by the individual and, even if they are, instruments to address them may not be available.

(c) Many developments have accentuated the heterogeneity in circumstances for individuals and countries that risk rendering general approaches (such as mandating of annuitisation and total liberty in disbursement choice) less than optimal. The increase in life expectancy increases quasi by definition the variation in individual outcomes and circumstances. The development of the financial sector in recent decades has increased the complexity of financial markets and the products offered.

Against this background, this policy paper offers three sets of considerations for individuals, industry and policy makers. Section 2 presents the diverse risks to which individuals with accumulated retirement savings are exposed. Section 3 explores the key retirement products and how these pay-out options address the main risks - the advantages and drawbacks. Finally, Section 4 outlines the role of public policy interventions in addressing the trade-offs, including suggested priority research.

## 2. Key sources of risk in the pay-out phase and retirement products

The income mix of retirees is changing due to both parametric and/or systemic pension system reforms in public and employer-related pension systems. This will induce a relative reduction in state-provided pension income and increase the uncertainty around employer-related pension benefits. Additionally, the increased (national and international) mobility of the workforce, the reduction (in some cases absence) of the number of children per couple and the increasing importance of new family structures has broken down the traditional family networks of intergenerational solidarity, impeding or at least reducing the ability of younger members of a family to take care of the older ones. The increasing difficulties and uncertainty that younger generations are facing in the labour market, and the challenges they face in accessing the real estate market, are also inverting the historical direction of this familiar intergenerational solidarity, with many parents now having to use part of their retirement and wealth to help their children meet their daily and financial obligations.

In this context, individuals will have to become more self-reliant, and will want to supplement their sources of income in retirement, for which they will need tools if they are to manage them efficiently. Although the logical response to the current retirement challenges will be to save more, saving and investing will not generally be enough. This is because some of the risks (e.g., longevity, health and inflation risks) that people face in retirement are best addressed through insurance contracts.

What are the main risks to be managed by individuals during retirement? Table 1 summarises the main risks faced by retirees for a better understanding of the way that different retirement products address their personal or financial goals.

**Table 1: Typology of risks for retirees**

Risk factor	Definition
<b>Individual longevity</b>	Risk that the individual (or the family) survives beyond what was expected at the time of retirement and, as a consequence, outlives their savings (or experiences a substantial reduction in the retirement income), and being forced to modify their standard of living (consumption) drastically.
<b>Aggregate longevity</b>	Refers to the uncertainty around the longevity of the overall population, namely the risk that individuals in general survive beyond what was expected according to mortality projections.
<b>Investment</b>	Risk that stochastic investment returns will mean that pension assets (stocks, bonds, real estate) fluctuate over time. Particular focus is of course given to the scenarios where pension assets devalue, compromising the satisfaction of the individual's financial needs and aspirations.
<b>Inflation</b>	The risk that a generalised rise in prices will result in an erosion of the real value of pensions payments and retirement income. For example, over 30 years a nominal fixed pension amount loses about 45% (78%) of its real purchasing power, when the inflation rate is 2% (5%) per annum.
<b>Credit</b>	This risk factor comprises both security and issuer risk. Credit risk refers to the events after which companies or individuals will be unable to make the required payments on their debt or contract obligations. Lenders and investors are exposed to default risk in virtually all forms of credit extension. The risk includes lost principal and interest, disruption to cash flows and increased collection costs. The loss may be either complete or partial, and can arise in a number of circumstances; for instance, the case where a debt issuer (corporate or government) is unable to repay asset-secured fixed or floating charge debt, an insolvent insurance company does not pay a policy obligation, an insolvent bank will not return funds to a depositor, a pension fund goes bankrupt or an annuity provider fails to pay its benefit commitments to policyholders.
<b>Liquidity</b>	Risk that accumulated retirement savings are not easily convertible (at least, not without a significant loss of principal) in liquidity, either for legal or contractual reasons. For example, an individual may be asset rich but be unable to use his or her wealth to pay for consumption needs in the absence of a secondary market for most of the assets in which savings have been invested.

<b>Health</b>	Risk that a sudden or increasing deterioration in the health of an individual significantly increases his or her health-care expenditure or requires expensive long-term care services.
<b>Bequest</b>	Most individuals have an altruistic approach to life and care about their closest relatives. They get satisfaction from knowing that their heirs will enjoy their inherited wealth once they die. Because of this, many parents want to leave their children their family home, leave money behind when they die, transfer some wealth to future generations or institutions. This means that individuals will not consume all their wealth during their lifetime and as a consequence of that will spend only a fraction of their savings in retirement.
<b>Annuitisation</b>	Individuals' mandates to convert their accumulated savings into traditional annuities may be required at the worst time. In fact, this risk refers to the possibility that at the time of retirement financial markets may be depressed, lowering the value of pension assets (particularly those invested in equity, bond or property markets), or that long-term interest rates may be too low, implying that fixed annuities will be expensive, thus providing a lower level benefit during retirement.
<b>Pension</b>	The risk that either public or private pension system providers may be forced to reduce their pension payments, because pension systems are financially unsustainable or as a result of a political decision.
<b>Taxes</b>	Risk that a variation in the regulatory or tax environment will reduce the disposable retirement income, e.g., an increase in income tax rates or deductions, an increase in VAT taxes, an increase in capital market taxes.
<b>Unexpected events</b>	Divorce, death of spouse/partner, etc.

In the post-retirement phase, three main risk categories need to be managed:

1. Biometric risks, namely the risk of an uncertain lifetime (longevity and mortality/brevity risk), the risk of unexpected high medical expenses, the need and the cost for long-term care services (healthcare and long-term care risks);
2. Investment risks, i.e. risks related to stochastic investment returns (market risk, annuitisation risk), to the possibility that borrowers (pension funds, insurers) fail to make required payments (credit risk), or the inability to convert a security or real asset to cash without a loss of capital and/or income in the process (liquidity risk);
3. Inflation risks, i.e. the risk that prices might rise too quickly, resulting in a decline in the purchasing power of pension payments and retirement income.

Mortality risk has two different adverse outcomes from the lifetime consumption and savings 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 cut consumption later in life which means that he or she may face the risk of falling into poverty before dying. On the other hand, the investor might die too early without consuming enough of his savings, therefore leaving an unintended bequest (in what is called brevity risk). Regarding aggregate longevity risk, this is a systematic risk (not diversifiable) for which hedging solutions are still limited (e.g. longevity bonds/swaps, q-forwards, reinsurance), and a matter of real concern for all the stakeholders (insurers, pension funds, governments, individuals, shareholders) exposed to this risk.

The fact that returns on the various asset classes (equity, debt, real estate, etc.) in which the prospective retirees might invest their accumulated retirement savings are volatile over time offer both the appeal of an upside potential but also the negative consequences of shortfall-risks due to adverse developments in capital markets. Appropriate investments in diversified portfolios are an important component of well-structured pension products. Retirees and financial intermediaries should take a prudent approach to asset management after retirement, preferring pension products that seek diversification opportunities, first between individual securities within a specific asset class, and second across different asset categories (stocks, bonds, real estate) as well as with other recurrent or extraordinary income streams such as statutory pension claims or labour income.

Despite the relatively low inflation rates of the last decade in Europe, the issue of inflation-triggered depreciation of retirement income in real terms is of crucial importance for old-age savings and the long-time horizons associated with them. This is a basic yet crucial requirement to safeguard pension benefits and pension assets against the risk of inflationary erosion in the pay-out phase. Designing retirement products to cope with cost-of-living adjustments is of critical importance. In doing so, attention should be paid to the inflation index used to measure the evolution of the prices of goods and services. For instance, using a consumer price index (CPI), which is based on the variation for all goods and services, may be inappropriate since some categories of expenditure could be much higher for the elderly compared with younger consumers (e.g. medical and healthcare costs).

Other important risk factors should not be neglected, e.g. the risk of unexpected high medical expenses due to health deterioration, 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.

Additionally, retirees should take into consideration that highly underfunded unsustainable national social security programmes are normally linked to significant political risks. This means, for instance, that future policymakers might change the legal environment of social security benefits as a response to increasing fiscal deficits or public debt, increasing taxes or reducing pension benefits.

How can the financial industry (banks, insurance companies, pension funds, annuity providers) help retirees in addressing their financial needs and risks, both in their asset accumulation and pay-out phases?

Ideally, retirement solutions should mitigate and strike a balance between the main potential financial risks faced by individuals, particularly those related to the risk of pensioners outliving their savings (investment, biometric, inflation). The way that the main retirement pay-out options address the various risks faced by pensioners is not equal. Table 2 maps the key risks that retirees face from the main retirement products.

There are four broad pay-out products: lump sum payments, annuities (pooled solution), programmed withdrawals (non-pooled solutions) and integrated products (hybrid solutions, e.g., phased withdrawals combined with advance life deferred annuities). These products, detailed in the next section, offer different advantages and disadvantages for the retiree, in particular in terms of their flexibility and risk coverage.

Lump sum payments do not offer any protection against longevity risk but allow bequests. Their exposure to investment, inflation, liquidity, credit or annuitisation risks depends on the asset allocation followed during retirement.

Annuity products offer protection against longevity risk and an extra return conditional on survival through pooling mechanisms, but leave retirees with no control over assets and no flexibility in the use of accumulated assets, for instance, to address the bequest motive. There are many types of annuities that can be differentiated by the nature of pay-outs, number of people covered and duration of pay-outs, time that pay-outs commence, frequency of premium payments, distribution channel and types of options included, among other features. Importantly, the most commonly used type of annuities, nominal level annuities, provides certainty of income in nominal terms but offers no protection against inflation risk. Escalating nominal (real) annuities provide partial (full) protection against inflation but offer initially lower payments when compared to level annuities.

**Table 2: Risk characteristics of pay-out retirement options**

	Protection against the risk of:			Provision of:	
	Longevity	Investment	Inflation	Bequest	Liquidity
<b>Fixed Real Life Annuities</b>	Yes	Yes	Yes	Limited	No
<b>Fixed Nominal Life Annuities</b>	Yes	Yes	No	Limited	No
<b>Escalating Real Life Annuities</b>	Yes	Yes	Yes	Limited	No
<b>Escalating Nominal Life Annuities</b>	Yes	Yes	Partial	Limited	No
<b>Variable Life Annuities: Guaranteed Benefits</b>	Yes	Yes	Possible	Limited	No
<b>Variable Life Annuities: With-Profit</b>	Shared	Shared	Shared	Limited	No
<b>Variable Life Annuities: Unit-Linked</b>	Shared	No	No	Limited	No
<b>Variable Life Annuities: Pooled Annuity Fund</b>	Partial	Partial	Possible	Limited	No
<b>Deferred XY Life Annuities</b>	Yes	Partial	Depends	Partial	Partial
<b>Period-certain XY Life Annuities</b>	Yes	Depends	Depends	Partial	No
<b>Lifetime Phased Withdrawals</b>	No	No	Possible	Yes	No
<b>Annuities certain</b>	No	Possible	Possible	Yes	No
<b>Lump Sum</b>	No	Possible	Possible	Yes	Yes
<b>Self-Annuitisation</b>	No	Possible	Possible	Yes	Yes
<b>Reverse Mortgages</b>	Yes	No	Possible	Possible	No

Note: Annuitisation risk is present in all fixed and escalating annuities, but does not affect variable annuities. Bankruptcy risk affects all types of retirement products, but is particularly important in life annuities.

Source: Based on Rocha and Vitas (2010), with author's additions.



Alternatively, programmed withdrawal plans provide periodic payments, normally with progressive capital reduction using a systematic withdrawal pattern. The various products available in the market differ in terms of the withdrawal pattern (fixed versus variable, systematic versus discretionary), and the asset allocation strategy (dynamic, static) used in managing the different asset categories (stocks, bonds, money market) incorporated in the pay-out plan. The main advantage of these products is that they provide retirees with greater control over their assets, the chance of bequeathing any remaining assets to a given beneficiary and more flexibility, since investment strategies and withdrawal rules can in principle be adjusted to suit individual preferences. The main shortcoming is that they expose the retiree to both longevity and investment risks, although they also offer potentially higher retirement income resulting from well-managed and diversified investment portfolios and a greater opportunity to hedge against inflation.

In recent years we have seen increasing interest in the development of structured pay-out products, combining certain characteristics of annuities and phased withdrawal plans. These hybrid solutions normally provide both a certain guaranteed retirement income but incorporate the flexibility, bequest potential and upside investment potential of non-pooled solutions, typically at the cost of sharing at least part of investment and biometric risks with beneficiaries. They can be found in many forms, from investment-linked or variable pay-out annuities to asset management solutions with investment and/or income guarantees that aim to transform retirees'

accumulated wealth efficiently into income streams. Each individual's 'optimal' mix will be a function of his specific preferences for risk, time, flexibility and a potential bequest.

The number of individuals insuring against the above risks is still quite small in many countries. Some factors may explain why saving efforts are still insufficient. First, financial literacy and awareness of future financial needs is clearly insufficient. This can be explained by an underestimation of individual average remaining life expectancy and future financial needs, a downgrade of the risks faced during retirement, an overestimation of retirement income provided by public pension schemes or a misjudgement of the capacity to continue working after retirement. Many products are complex and there is no established knowledge of what information each client should be provided with and in what manner it should be done.

Second, the process of accumulating enough savings to meet future financial needs through an insurance contract or other accumulation vehicles requires financial discipline and the sacrifice of current consumption needs, something that individuals are not always willing to do. Finally, individuals postpone their actions (savings) when the consequences (transferring consumption into the future) are "unpleasant", something that may explain why individuals care more about retirement as the retirement age approaches.



## 3. Pay-out options and risk trade-offs

Payment of retirement income (pensions) is usually an integral part of funded pension schemes. The basic forms of retirement pay-out options available for allocating assets accumulated for funding retirement income include lump-sums, programmed or phased withdrawals, annuities and hybrid solutions involving any combination of them (e.g., building a portfolio of life annuities and programmed drawdown plans). The range of options includes pooled market solutions (annuities) and non-pooled market options (programmed withdrawals) and self-annuitisation strategies (lump sum payments). In addition, the investment in home property for part of the accumulation can be seen as a relevant pay-out option. It offers imputed rental income and thus a substantial share of full retirement resources; and when translated into reverse mortgage at some stage, it can cover a major share of the other income needs.

The main retirement pay-out options address the various risks faced by pensioners differently. There is a wide range of types and shapes of annuity and income drawdown products in the private market. In this section, we present an overview of the main characteristics of the various products, highlighting their advantages and limitations in protecting against the various risks faced by pensioners.

### 3.1. Lump sum payments

The possibility of taking accumulated savings as a cash lump sum is normally dependent both on the contractual arrangements defined by the pension plan and the tax rules in force in a particular country or jurisdiction. This possibility offers retirees the flexibility to use their savings in whatever way they choose, such as spending on leisure activities (holidays, cruises, spending on hobbies or buying a car, boat, caravan, etc.), passing on part of their accumulated savings to children or other family members, investing in new or additional property, paying off a mortgage on a house or other debts, or simply continuing to invest retirement assets on a regular basis.

A major advantage of lump sum payments is the ability of retirees to "self-annuitise", at a time and on a basis that best suits their financial needs. In principle, retirees can replicate, or at least attempt to replicate, a system of scheduled withdrawals and can always decide to annuitise, just after retirement or at some later date of their choosing, by using all

or part of their accumulated capital to buy a conventional annuity from an insurance company. The difference is that this would be an individual choice, rather than something imposed by law.

Full access to retirement savings as a lump sum is frequently not permitted. However, in a number of countries it may be possible to take a fraction of the accumulated savings as a lump sum on retirement, while in others lump sum payments receive a more favourable tax treatment. Although the fiscal motive is important from the point of view of both the individual and the tax authorities, in practice the reason why granting full access to retirement savings as a lump sum is not allowed has to do with the fact that pensions savings should be utilised to provide income in retirement and not form part of any fiscal planning mechanism.

Lump sum payments rely on self-annuitisation strategies and, as such, do not provide any protection against longevity risk but do allow for bequests. Dependent on the various types of assets chosen for investing the accumulated balances, individuals are subject to investment (interest rate, stock market, inflation, exchange rate ...) risk, credit risk and liquidity risk among others.

Lump sum payments have many attractions, namely:

- Full liquidity and flexibility to use their accumulated savings in whatever way they choose;
- Coping with the bequest motive;
- Possibility of benefiting from potential higher returns on equity markets and other real assets.

However, they also encompass significant disadvantages, particularly:

- They do not provide any protection against longevity risk;
- They expose retirees to significant investment risks;
- They do not automatically protect against inflation risk, since investment returns may not be sufficient or maintain the purchasing power of retirement income;
- They require individuals to have the knowledge to manage their retirement accounts wisely and efficiently, to address their long-term needs and aspirations;
- They require individuals to maintain a long-term financial discipline, to neither outlive their savings nor die with too much unconsumed wealth.

## 3.2. Programmed withdrawals

Under an income drawdown or programmed withdrawal strategy, retirees make periodic strategic and systematic withdrawals or lump sum payments from their accumulated savings account to cover necessary expenses, instead of buying an annuity or receiving a single lump sum payment. The main purpose is to reduce the risk of running out of resources later and to continue to have resources to fund necessary expenses.

Under this option, the retiree is in the position of an owner of assets, still having some control over the investment of the funds, and there is no risk-pooling with other retirees. This means that the retiree has the freedom to decide on how to invest his wealth among the various asset categories (stocks, fixed income, cash, real estate), but knows that his investment strategy carries an investment risk since the assets will earn uncertain rates of return. The retiree is entitled to withdraw a specific amount of the invested funds periodically, to generate an income stream in retirement. How much of his balance can be spent per year depends normally on the particular drawdown programme set up. The key word here is "programmed", thus implying considerably more discipline than the less structured erosion of a lump sum payment, but less constraining than purchasing a life annuity.

Payments can result from the application of an explicit rule (e.g. an annual income drawdown corresponding to the ratio between the accumulated capital at retirement by the remaining life expectancy at that age, existence of minimum and maximum annual values, a fixed amount, etc.) or can be discretionary, although this latter version deviates from the architecture that enables the classification of this option as a valuable solution to cope with longevity risk.

In reality, most programmed withdrawal mechanisms are subject to a variety of constraints. Among them, it is common for there to be a ceiling on the amount which can be withdrawn in cash in each period, and sometimes there is also a minimum amount that can be withdrawn.

Although self-managed products are available, normally retirement withdrawal products are delegated management retirement products under which the account management activities are allocated to the asset management company. Assets held by retirees are represented by mutual fund units, offered by investment management companies. Investment management companies offer their professional asset management skills to assist retirees in selecting and managing diversified portfolios and, potentially, additional services such as guidance on defining spending rules and asset allocation patterns for retirees.

Programmed withdrawals are seen as offering more choice to the individual, permitting continued investment of a proportion of the pension assets in equities well into retirement and also permitting greater flexibility in the way in which the pension is received. For example, a pensioner may wish to defer taking a pension during a period in which some other income from employment is still being received, or until a partner also retires.

### The advantages

Programmed withdrawal has many advantages compared to an annuity purchase. but the most important are:

- High liquidity and flexibility to react to unexpected changes in consumption habits or health status. Each year the amount of income taken can be varied between the minimum and maximum limits.
- Retaining control over retirement assets, i.e. over the investment and divestment process.
- Potentially higher pay-outs due to enhanced investment returns.
- The drawdown product can, through the freedom of investment, offer inflation protection.
- Tailoring of cash flows to suit the individual's particular circumstances.
- Satisfying the "bequest motive".
- Choice of death benefits - Unlike annuities where the only death benefits are available from a joint-life annuity, drawdown offers a choice of death benefits.

### The disadvantages

There are a number of risks involved when deferring an annuity purchase by investing in a programmed withdrawal plan. The main disadvantages of this option are:

- There is no longevity protection, since individuals have to self-insure against longevity risk and there is the risk that the capital will be completely exhausted while the retiree is still alive, due to either poor investment performance of the funds or to excessive withdrawals.<sup>1</sup>
- Retirees bear investment risk;
- There is no survival credit when compared to buying an annuity contract. By deferring the purchase of an annuity the retiree will miss out on the mortality cross subsidy. The extra return required to compensate for the absence of this subsidy is termed mortality drag;
- Retirees are exposed to annuitisation risk. Indeed, retirees using this option may face the possibility of annuity prices moving against them, because of either falling interest rates on annuity contracts or a downward revision of the future mortality rates taken into account by insurers in pricing contracts;
- They do not automatically protect against inflation risk, since investment returns may not be sufficient to maintain the purchasing power of retirement income;
- They tend to incur higher operating expenses when compared to the purchase of an annuity.<sup>2</sup>

<sup>1</sup> It should be stressed, however, that the exposure to individual longevity risk can be effectively managed by choosing appropriate withdrawal rules. On the other hand, a cautious pensioner may hold back too much of the fund in order to keep reserves for later, or in case the investments perform less well than expected, with the result that they enjoy a lower income than they ought to have had and leave a large amount of the fund in their estate when they die.

<sup>2</sup> This may be explained by the fact that it may require additional investment capabilities and other advice from the provider or intermediary or because the plan is a regulated product which is much more (management and capital) consuming.

### 3.3. Life annuities

The most traditional pay-out solution for generating a predictable income stream in retirement is a life annuity. Although the history of life annuities goes back to the Roman Empire where the first annuities – known as “annua” – were offered by speculators in the marine business, modern annuity products (based on risk pooling mechanisms and on actuarial pricing techniques adopting estimated life tables and stochastic discounting of expected cash flows) were only created in the late nineteenth century.

An annuity is a contract that in exchange for a lump sum payment or a sequence of payment premiums promises to make a regular series of payments over a person’s lifetime or for a fixed time period. Under this contract, the annuitant is in the position of a creditor to the provider of the annuity. The purchase of annuities can be voluntary or compulsory, as in many pension schemes.

In the private market these life-contingent assets are typically offered by life insurance companies and annuity providers or, in the case of occupational retirement schemes, also by pension funds. Life annuities are also offered by public pension schemes since, from a financial perspective, the benefits of mandatory public pension systems resemble the characteristics of annuities. The key difference, however, is in the way that state pension annuities are funded in most countries, usually on a pay-as-you-go basis, while private market annuities are funded by setting aside financial assets. This means that the insurer receives non-refundable premiums from the annuitants and invests them in financial assets backing future life-contingent payment promises.

If the number of annuitants is sufficiently high and relatively homogeneous, mortality risks are independent and future mortality trends are appropriately incorporated in the pricing and risk management of the contracts, the insurer can hedge its liabilities by pooling longevity risk across a group of annuity policyholders. The reserved funds of the pool members who die are redistributed among the surviving annuitants, generating an extra return higher than the capital market return of assets with a similar risk profile. This extra return is normally referred to as the survival credit or mortality drag and is incorporated in the price-setting mechanism through the use of a given life table.

To be more specific, insurance companies use the actuarial principle of equivalence to price the annuity, by which 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. In applying this principle, insurance companies provide, with a given probability, a guarantee with respect to the level of the survival credit according to an ex-ante specified life table. Therefore, assumptions about surviving probability given the actual age of the annuitant, the interest rate used to discount expected contingent benefit payments, and the cost structure of the insurance company are made when pricing the contract. Survival credits are directly linked to the mortality

development of a given group of policyholders, and increase year-by-year as cohort members pass away.

#### Box 1: Basic principles of annuity pricing in the private market

**Gross Premium** = Actuarial Present Value of Future Benefits \* Loading Factor

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

**Discount Factor** = Depends on the interest rate earned on investments assumed by the insurance company

**Survival Probability** = Depends on the specific life table used by the insurance company to price the contract

**Loading Factor** = Corresponds to the expenses of insurance company (acquisition, distribution, corporate overhead and income taxes, profits, etc.)

While annuities are often also an accumulation instrument, this is not a core feature of this product. Traditional life annuities entitle the retiree to a regular income stream over the remainder of his/her life. This means that the retired annuitant transfers the longevity risk to the insurance company and earns the survival credit. In some types of annuities (inflation-linked annuity), annuity payments indexed to inflation or constant in real terms which means the retiree also transfers the investment and inflation risks to the insurance company.

Buying an annuity comes at the expense of opportunity cost. In fact, the decision to buy an annuity is an irrevocable decision between the annuitant and the insurance company by which the annuitant loses control over his/her retirement assets. This means that the purchaser abdicates liquidity irrespective of any future special needs (e.g. to cover unexpected and uninsured medical costs). In addition, for the standard annuity there is no bequest potential, because the payments are contingent on the individual’s survival and the annuitant no longer has control over his wealth.

Buying a life annuity does not completely eliminate risk for the annuitant. In reality, under this contract the annuitant swaps longevity and investment risks for counterparty credit risk, i.e. the annuitant becomes exposed to the possibility that the insurance company will default on its obligations, namely discontinue paying annuity benefits. Given the long-term commitments of insurance companies towards the policyholders involved in annuity contracts, a crucial role is played by insurance regulation is ensuring that companies have the means to fulfil their promises, namely appropriate capital requirements, supervising instruments and clear disclosure policies.

By delivering regular and guaranteed lifelong payments to the policyholders, life annuities play a key economic role, helping annuitants to solve the problem of life-cycle planning consumption and saving decisions based on uncertain lifetimes, thus reducing the risk that the retiree outlives his available real or financial assets. In addition, because of the so-called survival credit, the rate of return in an annuity should exceed the income earned by investing the same amount (annuity premium) in alternative financial assets with a comparable risk profile.

## Types of annuities

Besides traditional life annuities that guarantee to pay an income for as long as you are alive, no matter how long you live, recent developments in annuity markets have delivered new types of contracts to meet the needs of retirees. A wide variety of annuity products is nowadays available in the market, ranging from simple solutions to highly sophisticated products. Box 2 provides an overview of the main types of annuities.

### Box 2: Overview of the main annuity types

#### Nature of pay-outs

- 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)

#### Time pay-outs commence

- Immediate annuity
- Deferred annuity, ALDA

#### Frequency of premium payments

- Single premium
- Periodic premium

#### Duration of pay-outs

- 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

#### Types of options included

- Guarantee Periods
- Overlap option
- Annuity Protection - Money Back Annuities
- GMDB, GMWB, GMIB, GMSB

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. The premium the insured (annuitant) has to pay can be either a single, fixed periodic (e.g., annual instalments during a period of time), or a variable periodic payment. The pay-out phase can follow the accumulation phase immediately (immediate annuity) or after a specified period of time (deferred annuity, advanced life deferred annuity - ALDA). While an immediate annuity is provided in exchange for a one-off lump sum, a deferred annuity is usually financed through regular premium payments. 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).

Regarding the duration of pay-outs, benefit payments can continue as long as the annuitant is alive (life annuity), up to a specified date (annuity certain), the earlier of the two (temporary annuity) or the later of the two (guaranteed annuity). The duration of pay-outs is the most important

feature in connection with longevity risk. 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 (e.g. a ten-year period), regardless of whether the annuitant is alive. Guarantee periods as well as joint and survivor annuities are included to address the reduced bequest potential of a level annuity contract, since they continue to be paid out also when the annuitant passes away. Including these features comes, of course, at the expense of a lower survival credit (rate of return).

Regarding the way that the annuity is purchased, the contract can be purchased directly from the insurance company or alternatively via an agent, a broker or the internet (individual annuity market). The purchase of an annuity can be intermediated as a group contract (group annuity), 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 premiums are paid either by the employer alone or by the employee and the employer together. In principle, group annuity products should be cheaper than individual annuities since the loading factors to cover distribution costs tend to be smaller.

The manner in which the accumulated capital is paid out during the pay-out phase depends on the annuity type. The simplest is one which provides guaranteed constant lifetime level payments in nominal terms (nominal fixed annuity). Apart from that, variable annuities can adopt different forms. Annuity benefits can rise (or fall) at a prescribed fixed nominal rate that escalates with the age of the annuitant (escalating annuity); they can be indexed to inflation, thus providing a guaranteed income in real terms (inflation linked or real annuity); they can depend on the insurance company's surplus (participating or with profit annuity); or even reflect the performance of an underlying investment portfolio, usually represented by a family of mutual funds (investment-linked or variable annuity). In some annuities, pay-outs can also participate in mortality risk. In the case of with-profits (or participating) annuities, annuitants share both investment and longevity risk but gain the benefit of risk-pooling.

Additionally, pay-outs can contain various forms of additional guarantees, namely:

- A minimum investment return (accrued annually or over the duration of the policy in the form of a terminal bonus),
- A minimum death benefit (e.g., lump sum in case of death, which is reduced with each annuity payment),
- A minimum accumulation benefit (lump sum at the end of a specified period),
- A guaranteed minimum withdrawal benefit (option to cash out a predefined amount or percentage of accumulated funds) and/or,
- A guaranteed minimum income benefit (minimum level of income is guaranteed).

The motivation behind both inflation indexed annuities and nominal escalating annuities is to hedge, at least partially, the

risk that the purchasing power of future annuity benefits declines because of inflation. The negative side is, of course, that these annuities offer lower initial benefits when compared to traditional nominal annuities with constant pay-outs.

Participating annuities are usually designed with a guaranteed yearly minimum benefit and a nonguaranteed surplus which can vary year by year, depending on the insurance company's realised performance with investment returns, mortality, and expenses. If realised investment returns are higher than assumed or the realised mortality rates of the specific risk pool are higher than expected, a proportion of the resulting technical profits is redistributed to policyholders in terms of a surplus or bonus. Bonuses, once added, usually become part of the guaranteed level of annuity.

Under a unit-linked annuity the annuitant has direct exposure to the investment risk, but the mortality risk is shared and the insurer carries the risk of systematic improvements in mortality. The premium is invested in a unitised fund (or split between several unitised funds), with a corresponding number of units in each fund being allocated to the annuitant, according to the price of units at the time. The value of the individual's fund varies with the current unit price, just as with a unit-linked pension product in the accumulation phase. Income to the annuitant is provided by the cancellation of units, the amount of income being dependent on the current selling price of the units. Contrary to a fixed annuity, the annuitant retains some control over the way the assets are invested in the various mutual funds and bears some investment risk.

Pooled annuity funds are unitised products where each cohort of participants share aggregate mortality risk and each individual also bears investment risk. Whenever a participant dies, their units are shared out equally between the survivors in the cohort. The surviving members of the cohort thus benefit from worse mortality than expected and lose out if mortality improves. If the reallocation of units from deceased participants to survivors were permitted to continue indefinitely, the result would be a tontine

Most annuities are organised in pools founded on the principle of mutuality (participating life annuity) and the income stream an annuitant receives is unrelated to his health status. This makes traditional life annuities unattractive to those with relatively short life expectancies; they can expect to lose the annuity "bet" and end up subsidising those with longer life expectancies. However, a relatively new class of products, developed in the USA, UK and some other countries takes into account the shorter life expectancy of people with impaired lives (enhanced and impaired annuities).

For enhanced annuities, the primary factors are related to lifestyle - i.e. occupation, smoking habits and the presence of non-critical medical conditions such as diabetes. Lifestyle annuities take into account certain behavioural and environmental factors, as well as medical factors, to determine whether someone has a reduced life expectancy. Enhanced annuities tend to pay out more than lifestyle annuities but not as much as full impaired life annuities, because they are designed for those with a reduced life expectancy, but to a lesser degree than a full impaired life annuity. Impaired life

annuities are suitable for people with severe medical conditions.

Variable annuities with guarantees have been developed to meet retiree demands more effectively than fixed annuities, namely claims for some upside market potential and increasing flexibility. The most popular product offering these advantages is the variable annuity (VA), a unit-linked product commonly sold with guarantees. The most common guarantees included in these contracts are:

- Guaranteed minimum death benefit (GMDB). If a policyholder dies, a pre-defined death benefit or the fund value is paid out, whichever is higher.
- Guaranteed minimum income benefit (GMIB): guarantees a pension income stream, with defined minimum benefits until death. If investments perform better than expected, the individual is free to use the proceeds to purchase a market annuity, should this provide higher pension benefits.
- Guaranteed minimum withdrawal benefit (GMWB): allows the annuitant to withdraw a predefined maximum percentage of the total investment, regardless of market performance. It does not require annuitisation.
- Guaranteed lifetime withdrawal benefit (GLWB), keeps paying for life.
- Guaranteed minimum accumulation benefit (GMAB) guarantees a lump sum, usually at least the principal, after a set period, regardless of investment performance. For extra payments, yearly minimum returns are guaranteed or an annual ratchet is applied. At the end, the guaranteed amount or the account value is paid, whichever is higher.

All annuity contracts promise to perform the main task of insuring against the risk of outliving one's resources by using risk-pooling techniques. What distinguishes them is the type of guarantees they provide. These guarantees determine the size of the risks involved in annuities - i.e. longevity risk, investment risk, interest rate risk and inflation risk. For instance, the impact of longevity risk will be larger for deferred annuity products (because the uncertainty surrounding future mortality improvements is bigger the longer the deferral period), for fixed annuities (because they guarantee a fixed return regardless of returns), for life annuities when compared with their temporary counterpart (because they are paid until the individual dies), for joint-and-survivor annuities (because the life expectancy uncertainty is attached to more than one "head"), and for individual annuities versus group annuities.

On the other hand, the impact of investment risk is more significant for annuity products that are financed through fixed premiums (contributions are fixed in advance and not volatile market conditions), for deferred annuities, for level annuities (since they guarantee a rate of return), and for life annuities. Finally, inflation risk is higher for level fixed premium, deferred, level benefit, life and non-inflation indexed annuity products. Some products are designed additionally to insure against other risks such as inflation, health care costs or provide dependents coverage, while others try to reduce some of the annuity's disadvantages such as the loss of bequest by offering, for instance, some period of guarantee.



### 3.4. Reverse mortgage as a retirement financing instrument

People aged 60/65 and over without any regular income in general are usually unable to fulfil the rigid lending conditions of the financial institutions. This population group, which does not have enough money for covering everyday living expenses and medical bills, often owns and lives in valuable homes, flats or other real estate ("Home rich - cash poor"). Home equity is an important wealth component for the elderly. Elderly homeowners can use home equity to supplement their retirement income to fund consumption, repair their homes and finance long-term healthcare as they age. The problem that many elderly homeowners face is how to tap their housing wealth for consumption without selling their house and relocating. The possible and most reasonable solution to this problem lies in a financial instrument called reverse mortgage, also known in some markets as "equity release".

**Reverse mortgages** allow retirees to have access to their home equity without selling or moving out of the house. The homeowner receives a lump sum payment, periodic payment for life, access to a line of credit or any combination of these options. In plain vanilla contracts, during the life of the loan the homeowner makes no interest or principal payments and, as such, accrued interest is added to the principal. The loan becomes due only when the borrower and his spouse both die or permanently move. At that time, the house may be sold, with the proceeds used to repay the mortgage and interest and any additional funds going to the borrower or their heirs. If they prefer, the borrower or their heirs may repay the loan and keep the house.

Alternative product structures in this category include **home reversion schemes**, under which the homeowner sells part or all of his or her home to a reversion company. The home is sold for less than its market price (at discount), but the homeowner can remain in the property until they die or voluntarily vacate the home. Typical structures for home reversion schemes include a sale and leaseback model and a sale and mortgage model. **Shared appreciation mortgages (SAMs)** are contracts by which the homeowner gives up the right to some of the capital gain on the property in return for paying reduced or no interest on that part of his or her borrowings.

Is equity release the answer for asset-rich, cash-poor pensioners? Reverse mortgages and home reversion schemes can be used by elderly people who are asset-rich but cash-poor to, for example, supplement their incomes or to provide lump sums to fund urgent repairs or maintenance to the house. Alternatively, they can use the money for leisure or to pay for long-term care or the cost of medical treatment. Shared appreciation mortgages, on the contrary, can be used by younger individuals who do not have enough savings to enter the housing market. Additionally, income from reverse mortgage generally does not affect social security or health-care system benefits and may receive a more favourable tax treatment.

Although these contracts increase the range of possibilities for funding consumption in retirement, equity release products are complex and, if used inappropriately or with poor advice, present some risks for retirees. The most negative aspects of equity release mechanisms are the significance of the costs involved (interest rate, loan origination fee, mortgage insurance fee, appraisal fee, title insurance fees and various other closing costs), that are not disbursed but rolled into the loan, the complexity of the legal structure involved, in which the ownership and management of the property are shared between the provider and consumer over an extended period of time, the requirement to repay the loan if the retiree should permanently move out of the home (e.g., if they need to enter a full-time care facility), the downside effect of the contract on the market value of the house.

There are critical issues involved in the design and valuation of equity release products. Among them, we include the projected movements in interest rates and property prices, changes in homeowner's life expectancies and old age caring and housing needs, the intergenerational tensions and conflict between the desire to leave an inheritance and the need for money to live on in older age. Additionally, there are obligations and consequences specific to some products of which individuals should be aware, namely the possibility of negative equity (when the debt exceeds the value of the property), the terms and conditions that can trigger the immediate repayment of the loan and loss of key rights, the issue of which party is obliged to undertake necessary repairs to the property and who obtains the financial benefit from any renovations completed and the impact of capitalising interest with reverse mortgages, particularly if interest rates increase significantly

## 4. The role of public policy intervention

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The highlighted trade-offs in addressing the diverse risks and in satisfying the preferences for liquidity and bequests within and between the key pay-out options cannot be eliminated by public interventions. However, some government interventions can assist in limiting the trade-offs and in improving the capability of individuals to making better pay-out selections. The suggested key interventions to this end are the following:

(i) Providing minimum annuitisation levels via public benefits that, in addition, offer adequate incentives in the arbitrage game. Publicly provided annuities of some minimum level - as either minimum benefits in mandated earnings-related schemes or basic benefits in social assistance type provisions - offer some protection against wrong pay-out selections by individuals. Transferrability between public and private sector annuities (and family provisions) is the subject of much speculation and is consistent with some empirical evidence. However, such public provisions also create a moral hazard problem, as individuals can become risk-takers to the detriment of the public purse. Mechanisms to limit such arbitrage possibilities consist, for example, in requiring minimum annuitisation of private retirement savings at or above public income guarantees. Of course, such public safeguards may themselves reduce the retirement savings incentives.

(ii) The quality of financial decisions by individuals seems to be closely linked to the level of financial capability/literacy, albeit the exact mechanism is still not well understood (see Holzmann, 2014). This seemingly also applies to retirement savings and, more importantly for us, to pay-out decisions (Bateman et al, 2013). Such a link would speak in favour of public intervention that promises to strengthen financial capability, such as financial education, to correct behavioural biases, or simply offer advocacy/social marketing for making decisions on retirement for the longer run. While many of these interventions will emerge from private sector activities,

public guidance and support can be critical at various levels: the adequate measurement of financial capability; the right decision-making environment for individuals and conducive nudging structures; the rigorous monitoring and evaluation of interventions that aim to improve financial capability, and broad dissemination of the results of such studies. The instruments to achieve this range from guidance in a national financial capability strategy, research support and supervision, to direct advocacy efforts in mass media.

(iii) There are a number of priority research areas where public and private attention are highly recommended- perhaps in a public-private partnership (a la Netspar in Netherland and Italy):

First, improving the conceptual and empirical exploration of the role of deferred annuities to improve retirement income security for higher age groups, while offering the requested flexibility for the younger end of the old-age group (say between 65 and 85).

Second, a better conceptual and empirical exploration of the scope and limits for sharing the aggregate longevity risk with and among the annuitants (or beneficiaries in similar arrangements). Successful approaches promise to offer more attractive prices to annuitants, but may also be needed to attract enough supply by the life insurers as this reduces their reserve requirements.

Last but not least, sharing the investment risks has a tradition, with life annuities and variable annuities now experiencing a rising demand in developed financial markets around the world. However, increasingly, products come on the market that promise the best of all worlds: access to the equity premium and guaranteed pay-outs. To tease out the scope of such claims but also establish the limits must be part of the research agenda.



## References

- [1] Antolín, P. 2008. "Ageing and the pay-out phase of pensions, annuities and financial markets." OECD Working Papers on Insurance and Private Pensions, No. 29, OECD publishing
- [2] Antolín, P., C. Pugh and F. Stewart. 2008. "Forms of Benefit Payment at Retirement." OECD Working Papers on Insurance and Private Pensions, No. 26, OECD publishing
- [3] Blake, D. 1999. "Annuity Markets: Problems and Solutions: The Geneva Papers on Risk and Insurance Vol. 24 No. 3, 358-375.
- [4] Bateman, H. and Piggott, J. 1999. "Mandating retirement provision: the Australian experience." Geneva Papers on Risk and Insurance: Issues and Practice, 24(1), 95-113.
- [5] Bateman, Hazel, John Geweke, Fedor Iskhakov, Jordan Louvriere, Stephen Satchell, and Susan Thorp. 2013a. "Disengagement: A partial solution to the annuity puzzle", Australian Research Centre project, Sydney: NSWU et al, March 20 (submitted).
- [6] Brown, J.R., Mitchell, O.S., Poterba, J.M. and Warshawsky, M.J. (2001). The Role of Annuity Markets in Financing Retirement. MIT Press, Cambridge, MA.
- [7] Cannon, E., E. Tonks, I. (2008). Annuity Markets. Oxford University Press.
- [8] CEIOPS (2010). Draft Report on Variable Annuities, Consultation Paper no. 83.
- [9] Cardinale, M., Findlater, A. and Orszag, M. (2002). Paying out pensions: a review of international annuity markets. Watson Wyatt Research Report, 2002-RU07.
- [10] Hinz, Richard, Robert Holzmann, David Tuesta, and Noriyuki Takayama. 2013, eds. Matching Contributions for Pensions: A Review of International Experience. Washington, DC: The World Bank and BBVA.
- [11] Holzmann, R., and R. Hinz, and World Bank Team. 2005. Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform. Washington, D.C: The World Bank. [available also in Spanish: Soporte del ingreso económico en la vejez en el siglo XXI: Una perspectiva internacional de los sistemas de pensiones y de sus reformas. 2006. Banco mundial con Mayol Ediciones, Bogota, Colombia]
- [12] Holzmann, R. 2014a. "Addressing Longevity Risk through Private Annuities: Issues and Options." Paper prepared for the 22nd Annual Colloquium of Superannuation Researchers, CEPAR and ABS' School of Risk and Actuarial Studies, New South Wales University, Sydney, July 7-8, 2014.
- \_\_\_\_\_. 2014b. "Old-Age Financial Protection in Malaysia: Challenges and Options." Policy paper prepared at the request of the leadership of the Employees Provident Fund (EPF) of Malaysia. Kuala Lumpur: Social Security Research Centre (mimeo), June.
- \_\_\_\_\_. 2013. "Global pension systems and their reform: Worldwide drivers, trends and challenges", International Social Security Review 2013 66 (2, April-June): 1-29.
- [13] Impavido, G., Thornburn, C. and Wadsworth, M. (2003). "A Conceptual Framework for Retirement Products: Risk Sharing Arrangements between Providers and Retirees", the World Bank and Watson Wyatt Working Paper Series
- [14] Ledlie, M. et al. (2008). Variable Annuities, Presented to the Faculty of Actuaries, 17 March 2008.
- [15] Milevsky, Moshe A. (2005). Real longevity insurance with a deductible: Introduction to advanced-life delayed annuities (ALDA). North American Actuarial Journal 9 (4), 109-122.
- [16] Milevsky, Moshe, A. 2013. Life Annuities: Optimal Products for Retirement Income. The Research Foundation of the CFA Institute. www.cfapubs.org
- [17] OECD. 2013a. Pensions at a Glance – OECD and G20 Indicators. Paris: OECD.
- \_\_\_\_\_. 2013b. Pension Markets in Focus 2013. Paris: OECD.
- [18] Poterba, James 1997. The History of Annuities in the United States, NBER Working Paper 6001, April 1997.
- [19] Rocha, R., Dimitri Vitas, and Heinz, P. Rudolph. 2011. Annuities and Other Retirement Products: Designing the Pay-out Phase. Washington, DC: The World Bank.
- [20] Rusconi, R. 2008. "National Annuity Markets: Features and Implications." OECD Working Papers on Insurance and Private Pensions, No. 24, OECD publishing.
- [21] Telford, P. et al (2010). Developments in the management of annuity business, Presented to the Faculty of Actuaries, 15 March 2010.
- [22] Wadsworth, M. Findlater, A. Boardman, T. (2001). Reinventing. Annuities. Presented to the. Staple Inn. Actuarial Society.
- [23] Wei-Yin Hu and Jason S. Scott (2007). Behavioural Obstacles to the Annuity Market. Pension Research Council Working Paper, WP2007-10.