

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

Jorge Miguel Bravo¹
Robert Holzman²

Foro de Expertos del Instituto de Pensiones BBVA

Évora / Kuala Lumpur, June 2014

¹ Assistant Professor at University of Évora & Nova University of Lisbon, Coordinator of ORBio - Observatory of Biometrical Risk of Portuguese of Insured Population, Portuguese Insurers Association.

² Professor of Economics and Chair, Old-age Financial Protection, University of Malaya (Kuala Lumpur); Honorary Chair, Centre of Excellence in Population Ageing Research, University of New South Wales (Sydney); Research Fellow of IZA (Bonn) and CESifo (Munich), and Fellow of the Austrian Academy of Science (Vienna).

Contents

1.	INTRODUCTION.....	3
2.	KEY SOURCES OF RISK IN THE PAYOUT PHASE AND RETIREMENT PRODUCTS	5
3.	PAY-OUT OPTIONS AND RISK TRADE-OFFS	11
3.1	LUMP SUM PAYMENTS	11
3.2	PROGRAMMED WITHDRAWALS	12
3.3	LIFE ANNUITIES.....	14
3.4	REVERSE MORTGAGE AS A RETIREMENT FINANCING INSTRUMENT.....	21
4.	THE ROLE OF PUBLIC POLICY INTERVENTIONS.....	23
5.	REFERENCES.....	25

1. INTRODUCTION

The role of funded individual retirement provisions has increased over recent decades. Yet, while the accumulation phase of retirement saving has attracted main attention by industry and research, the pay-out phase has been much less explored. This policy note investigates the key pay-out options against the many economic and financial risks the individual faces when having arrived at retirement with an ear-marked accumulation that presents a main share of this life-time wealth.

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

(i) The systemic reforms of public pension schemes since the Chilean reform of 1981 and the move from unfunded (collective) defined benefit (NDB) schemes towards an (individualized) funded and defined contribution (FDC) schemes. By 2008 such reforms has 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.

(ii) The decreasing public generosity of public annuities as the result of fiscally driven public pension reforms across the globe and the encouragement by governments for 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 increase in longevity giving rise to the call of “retire later and save more” (OECD 2013a).

(iii) While the (partial) change from NDB to FDC for public pensions reached 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 offered corporate pensions, at least for new entrants (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.

(iv) In countries with main basic provisions for the elderly financed from general government sources, such as prominently in Australia and New Zealand, there is an interest not only to supplement this government provisions with private retirement saving but also to have it disbursed as a life annuity (and not largely invested in private housing). This should help reduce the public retirement bill in face of projected population aging.

(v) Last but not least, population aging has also reached the mostly younger societies in South and in particular East Asia where there has been traditionally 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 in view of falling fertility rates, urbanization 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 the 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 against private life annuities as a mechanism that translates much or all of the accumulations with an upfront payment into periodic unconditional payments till death. While welfare economics suggests major welfare gains from such a conversion, the demand for private life annuities remains worldwide very small. This “annuity puzzle” creates the background for the search of other pay-out options.

(b) The alternative for individuals to sit on the accumulated retirement saving and spent as it pleases them has also its limitations as the retiree is confronted with many demographic and economic risks. They range from the risk of running out of resources to bad investment outcomes to the 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 at hand.

(c) Many developments have accentuated the heterogeneity in circumstances for individuals and countries that risks rendering general approaches such as mandating of annuitization and total liberty in disbursement choice not optimal. The increase in life expectancy increases quasi by definition the variance in individual outcomes and circumstances. The financial sector development in recent decades has increased the complexity of financial markets and products offered.

Against this background, this policy note offers three sets of considerations for individuals, industry and policy makers: Section 2 presents the divers risks individuals with retirement savings’ accumulations are exposed to. Section 3 explores the key retirement products and how these pay-outs options address the main risks – the advantages and drawbacks. Finally, Section 4 outlines the role of public policy interventions to address the trade-offs, including suggested priority research areas.

2. KEY SOURCES OF RISK IN THE PAYOUT 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 concerning employer-related pension benefits. Additionally, the extended (national and international) mobility of the workforce, the reduction (in some cases absence) of the number of children for 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 having access to 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 support their children in not defaulting their daily life or financial obligations.

In this context, individuals will have to become more self-reliant and will want to supplement their sources of income in retirement and have tools to manage them in an efficient way. Although the logical response to the current retirement challenges will be to save more, saving and investing will not in general 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 summarizes the main risks faced by retiree for a better understanding of the way different retirement products address their personal or financial goals.

Table 1: Typology of Risks for Retiree

Risk factor	Definition
Individual longevity	Risk of that the individual (or the family) survives beyond what was expected at the moment of retirement and, as a consequence, outlives their savings (or experiences a substantial reduction in the retirement income), being forced to drastically modify its standard of living (consumption).
Aggregate longevity	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.
Investment	Risk that that stochastic investment returns will mean that pension assets (stocks, bonds, real estate) fluctuate over time. Particularly focus is off course given to the scenarios where pension assets devalue compromising the satisfaction of the individual financial needs and aspirations.
Inflation	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, a nominal fixed pension amount loses in 30 years about 45% (78%) of its real purchasing

The Pay-out Phase of Funded Pensions

	power, when the inflation rate is 2% (5%) per annum.
Credit	This risk factor comprises both security and issuer risk. Credit risk refers to the events in 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 extensions. The risk includes lost principal and interest, disruption to cash flows, and increased collection costs. The loss may be 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 won't return funds to a depositor, a pension fund goes bankrupt or an annuity provider fails to pay its benefit commitments to policyholders.
Liquidity	Risk that accumulated retirement savings are not easily convertible (at least 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 its wealth to pay for consumption needs in the absence of a secondary market for most of the assets in which savings have been invested.
Health	Risk that a sudden or increasing degradation of the state of health of an individual significantly increases its health-care expenditures or demands expensive long-term care services.
Bequest	Most individuals have an altruistic approach to life and care about their most closed relatives. They get satisfaction from knowing that his/her 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 life and as a consequence of that will spend only a fraction of their savings in retirement.
Annuitization	Individuals mandate to convert their accumulated savings into traditional annuities may be required to do so at the worst occasion. In fact, this risk refers to the fact that at the time of retirement financial markets may be depressed, lowering the value of pension assets (particularly those invested in equity, bond or real estate 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.
Pension	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.
Taxes	Risk that a variation in the regulatory or tax environment will reduce the disposable retirement income, e.g., an increase in the IRS tax rates or deductions, an increase in VAT taxes, increase in capital market taxes.
Unexpected events	Divorce, death of husband/wife, etc.

The Pay-out Phase of Funded Pensions

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 (health care and long term care risks);
2. **Investment risks**, i.e., risks related to stochastic investment returns (market risks, annuitization risk), to the chance 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 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 cut consumption later in life which means that it 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), a matter of real concern for all the stakeholders (insurers, pension funds, governments, individuals, shareholders) exposed to this risk.

The fact that returns of the various asset classes (equity, debt, real estate, etc.) in which the prospective retirees might invest their accumulated retirement savings are volatile over time offers 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 payout phase. Designing retirement products to cope with cost-of-living adjustments should be critical. In doing so, attention should be taken on 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

The Pay-out Phase of Funded Pensions

categories of expenditures could be much higher for the elderly compared with younger consumers (e.g. medical and health care 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 programs are normally linked with 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 retiree in addressing their financial needs and risks, both in their asset accumulation and payout 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 the main retirement payout options address the various risks faced by pensioners is not equal. Table 2 maps the key risks retirees face to the main retirement products.

There are four broad payout 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 annuitization 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 retiree 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 payouts, number of people covered and duration of payouts, time payouts commence, frequency of premium payments, distribution channel, types of options included among other features. Importantly, the most commonly used type of annuities, i.e. level nominal 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 initial lower payments when compared to level annuities.

Table 2: Risk characteristics of payout retirement options

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

Note: Annuitization 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, usually progressively diminishing the capital by 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 payout plan. The main advantage of these products is that they provide retirees with greater control over 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 greater opportunity to hedge against inflation.

In recent year we have seen increasing interest in the development of structured payout products, combining certain characteristics of annuities and phased withdrawal plans. These hybrid solutions normally provide both a certain guaranteed retirement

The Pay-out Phase of Funded Pensions

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 payout annuities to asset management solutions with investment and/or income guarantees that aim to efficiently transform retirees' accumulated wealth into income streams. Each individual «optimal» mix will be a function 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 remaining average 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 to continue working after retirement. Many products are complex are there is no established knowledge on what information and in which manner should be provided to each individual client.

Second, the process of accumulating enough saving 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 payout 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 programme drawdown plans). The range of options includes pooled market solutions (annuities) and non-pooled market options (programmed withdrawals) and self-annuitization 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 one moment, it may cover a major share of the other income needs.

The main retirement payout 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, investing in 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 continue investing retirement assets on a regular basis.

A major advantage of lump sum payments is the ability of retirees to “self-annuitize”, 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 annuitize, 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

The Pay-out Phase of Funded Pensions

granting full access to retirement savings as a lump sum is not allowed relates the fact that pensions savings should be utilised to provide income in retirement and not make part of any fiscal planning mechanism.

Lump sums payments rely on self-annuitization strategies and, as such, do not provide any protection against longevity risk but 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 to maintain the purchasing power of retirement income;
- Requires individuals to have the knowledge to manage their retirement accounts wisely and efficiently to cope with their long term needs and aspirations;
- Requires individuals to maintain a long-term financial discipline to neither outlive their savings nor pass away 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 rather instead of buying an annuity or receiving a single lump sum payment. The main purpose is to reduce risk of running out of resources at higher ages and continue to have resources to fund necessary expenses.

In 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 investment risk since the assets will earn uncertain rates of return. The retiree is entitled to withdraw periodically a specific

The Pay-out Phase of Funded Pensions

amount of the invested funds to generate an income stream in retirement. How much of his balance can be spend per year depends normally on the particular drawdown program 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 be discretionary although this latest 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 products retirement under which 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, 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 pension is received. For example, a pensioner may wish to defer taking pension during a period for 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.
- Potential higher payouts due to enhanced investment returns
- The drawdown product can, through the freedom of investment, offer inflation protection

The Pay-out Phase of Funded Pensions

- Tailoring of cash flows to suit the individual's particular circumstances
- Satisfy 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.³
- Retirees bear investment risk;
- There is no survival credit when compared to buying an annuity contract. By deferring the purchase of an annuity retiree will miss out on the mortality cross subsidy. The extra return required to compensate for the absence of this subsidy is called Mortality Drag;
- Retirees are exposed to annuitization risk. Indeed, retirees using this option may face the possibility of annuity prices moving against him/her, 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.⁴

3.3 LIFE ANNUITIES

The most traditional payout solution to generate 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

³ 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.

⁴ 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.

The Pay-out Phase of Funded Pensions

stochastic discounting of expected cash flows was 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 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 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 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 costs. 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 has no longer control over his wealth.

Buying a life annuity doesn't 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 continue 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 its 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 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)

Time payouts commence

- Immediate annuity
- Deferred annuity, ALDA

Frequency of premium payments

- Single premium
- Periodic 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

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, a fixed periodic (e.g., annual instalments during a period of time), or a variable periodic payment. The payout 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

The Pay-out Phase of Funded Pensions

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 payouts, 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 payouts 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., ten year period), independently 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, off course, at the expense of a lower survival credit (rate of return).

Regarding the way 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 where 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 annuity since loading factors to cover distributions costs tend to be smaller.

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, variable annuities can adopt different forms. Annuity benefits can rise (or fall) at a pre-specified fixed nominal escalation rate with the increasing 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 family of mutual funds (investment-linked or variable annuity). In some annuities, payouts 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, payouts 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),

The Pay-out Phase of Funded Pensions

- 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 payouts.

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 realized 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 fraction of the resulting technical profits are 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 bears also investment risk. Whenever a participant dies, their units are shared out equally to 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

The Pay-out Phase of Funded Pensions

products, developed in Anglo-Saxon 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 one's 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 if you have 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 was 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 it 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 annuitization.
- 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 independent of returns), for life annuities when compared to their temporary counterpart (because they are paid until the individual passes away), 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 bigger for level fixed premium, deferred, level benefit, life and non-inflation indexed annuity products. Some products are designed to additionally 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 like the loss of bequest by offering, for instance, some guarantee period.

3.4 REVERSE MORTGAGE AS A RETIREMENT FINANCING INSTRUMENT

People of the age 60/65 and over without any regular income in general, usually cannot fulfil rigid lending conditions of the financial institutions. This population group, which does not have enough money for covering everyday life expenses and medical bills often owns and lives in a valuable home, flat 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 go to the borrower or his heirs. If they prefer, the borrower or his 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 vacates the home. Typical structures for home reversion schemes include a sale and lease 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

The Pay-out Phase of Funded Pensions

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, could be used by younger individuals who do not have enough savings to be able to enter the housing market. Additionally, income from reverse mortgage generally does not affect social security or health-care system benefits and may have 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 mechanism 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 is shared between the provider and consumer over an extended period of time, the requirement to pay back the loan if you should permanently move out of the home (e.g., if you 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 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 of interest with reverse mortgages, particularly if interest rates increase significantly

4. THE ROLE OF PUBLIC POLICY INTERVENTIONS

The high-lighted 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 annuitization levels via public benefits that offer furthermore the adequate incentives in the arbitrage game. Publicly provided annuities of some minimum level – as minimum benefits in mandated earnings-related schemes or as basic benefits in social assistance type provisions – offer some protection against wrong pay-out selections to individuals. The substitutability between public and private sector annuities (and family provisions) is strongly conjectured and consistent with some empirical evidence. However, such public provisions create also a moral hazard problem as individuals can become risk-takers at the detriment of the public burse. Mechanism to limit such arbitrage possibilities consists, for example, in requiring minimum annuitization 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 be level of financial capability/literacy albeit the exact mechanism is still not well understood (see Holzmann 2014). This seemingly applies also 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 environment for individuals and conducive nudging structures; the rigorous monitoring and evaluation of interventions that want to improve financial capability; and broad dissemination of the results of such studies. The instruments to do so 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 - perhaps in a public-private partnership (a la Netspar Netherland and Italy) - are highly recommended:

First, exploring conceptually and empirically better the role of deferred annuities to improve retirement income security for higher age groups while offering the requested flexibility for the younger old age group (say between 65 and 85).

The Pay-out Phase of Funded Pensions

Second, exploring conceptually and empirically better 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 the adequate supply by the life insurers as this reduces their reserving requirements.

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

5. REFERENCES

- Antolin, P. 2008. "Ageing and the payout phase of pensions, annuities and financial markets." OECD Working Papers on Insurance and Private Pensions, No. 29, OECD publishing
- Antolin, 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
- Blake, D. 1999. "Annuity Markets: Problems and Solutions.: The Geneva Papers on Risk and Insurance Vol. 24 No. 3, 358-375.
- 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.
- Bateman, Hazel, John Geweke, Fedor Iskhakov, Jordan Louvriere, Stephen Satchell, and Susan Thorp. 2013a. "Disengagement: A partial solution to the annuity puzzle", Australian Research Center project, Sydney: NSWU et al, March 20 (submitted).
- 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.
- Cannon, E., E. Tonks, I. (2008). *Annuity Markets*. Oxford University Press.
- CEIOPS (2010). Draft Report on Variable Annuities, Consultation Paper no. 83.
- Cardinale, M., Findlater, A. and Orszag, M. (2002). *Paying out pensions: a review of international annuity markets*. Watson Wyatt Research Report, 2002-RU07.
- 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.
- 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]
- 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.

The Pay-out Phase of Funded Pensions

_____. 2013. "Global pension systems and their reform: Worldwide drivers, trends and challenges", *International Social Security Review* 2013 66 (2, April-June): 1-29.

Impavido, G., Thorburn, C. e 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

Ledlie, M. et al. (2008). *Variable Annuities*, Presented to the Faculty of Actuaries, 17 March 2008.

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.

Milevsky, Moshe, A. 2013. *Life Annuities: Optimal Products for Retirement Income*. The Research Foundation of the CFA Institute. www.cfapubs.org

OECD. 2013a. *Pensions at a Glance – OECD and G20 Indicators*. Paris: OECD.

_____. 2013b. *Pension Markets in Focus 2013*. Paris: OECD.

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

Rocha, Robert, Dimitri Vitas, and Heinz, P. Rudolph. 2011. *Annuities and Other Retirement Products: Designing the Payout Phase*. Washington, DC: The World Bank.

Rusconi, R. 2008. "National Annuity Markets: Features and Implications." *OECD Working Papers on Insurance and Private Pensions*, No. 24, OECD publishing.

Telford, P. et al (2010). *Developments in the management of annuity business*, Presented to the Faculty of Actuaries, 15 March 2010.

Wadsworth, M. Findlater, A. Boardman, T. (2001). *Reinventing. Annuities*. Presented to the. Staple Inn. Actuarial Society.

Wei-Yin Hu and Jason S. Scott (2007). *Behavioral Obstacles to the Annuity Market*. Pension Research Council Working Paper, WP2007-10.