NON-PROFIT ANNUITIES

THOUGHTS ON SOUTH AFRICA

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ABSTRACT

Three questions dominate research into non-profit annuities. Why do more people not purchase annuities? What value for money do they offer? What role should annuities play in the national old age context?

This paper summarises international research into these three issues and asks how they apply to the South African non-profit annuity market. The evidence suggests that, unlike in other countries, the market is mature, even allowing for the fact that a high proportion of annuity purchases have been compulsory. The evidence also suggests that value for money is reasonable, competition strong and charges acceptable.

But the annuity market is not automatically efficient. This paper discusses the philosophy behind the annuity market and the implication of the pooled pricing dominating South Africa's market: the poor cross-subsidise the wealthy.

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1 INTRODUCTION

> *Much attention has gone into designing and implementing pre-retirement structures; far less thought appears to have been given to the structures applicable after retirement. This is an important omission as (1) the post retirement period may be as long as or longer than the pre-retirement period; (2) investment strategies for retirement income should in order to optimise returns reflect the full period over which assets are used, and (3) the greatest risk faced by many who save for retirement is outliving their assets and falling back on state provision or worse. (Wadsworth et al, 2001, formatting altered for quotation purposes)*

Saving is a crucial part of preparing for old age. Most people know that and act on it. All actuaries are trained in this area and a considerable proportion of them base their life work on this premise.

But saving is irrelevant if spending is not appropriate. This paper considers the spending, or 'decumulation' phase. Two risks dominate the decision of how to spread the receipt of income in retirement:

- investment performance and, related to this, inflation of living costs, in particular the risk that investment returns fail to keep pace with increases in spending, and
- longevity, specifically the risk of outliving one's income.

Annuities appear to be the perfect solution, turning a lump sum of uncertain practical benefit into an income stream with guaranteed attributes continuing for as long as the recipient is alive. But there is a third risk. Most elderly do not wish to die without leaving something of substance behind: this is the risk that the decumulation exhausts all available assets. And this is one of the most important reasons why annuities are not the panacea that they might otherwise be.

This paper is about non-profit annuities, their popularity, their pricing, and their role in society. This paper is also about the perverse nature of the annuity market, which, unlike many other markets, does not operate to the natural benefit of participants. It is a paper designed to pose questions rather than to provide solutions. It is not intended to be controversial, but it is expected to cause a little discomfort with the current situation.

The paper is not about other annuity types, notably with-profit annuities and income drawdown products. This is because the non-profit annuity market has a number of characteristics that need to be explored, not because there are no issues pertaining specifically to the other annuity types that ought to be scrutinised, capital charges to name just one.

The questions that the paper poses are relevant to annuities everywhere, not specific to the South African environment. For this reason, the paper starts, in section 2, by

describing the range of issues that policymakers and researchers are looking into in the area of annuities. Section 3 seeks to apply this to the questions that should be posed in South Africa, particularly how we plan to provide appropriately priced annuities to the growing sector of low-income elderly who deserve better value for money than they are receiving at present. And section 4 summarises and suggests areas for more rigorous research.

Providers operating in the annuity market in South Africa need to ask the question: is it right? If it is not right, are they going to change the situation themselves or are they going to wait for others to do it for them?

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The responsibility for any errors remains mine.

2 INTERNATIONAL RESEARCH: CURRENT ISSUES

Ageing seems to be the only available way to live a long time (Daniel Amber, 1782 – 1871)[1]

The aim of this section is to summarise the issues foremost in the minds of policymakers and researchers in the area of annuitization. This helps to establish those issues that might need to be addressed in South Africa.

Annuities are not just handy products for individuals seeking to purchase longevity insurance or peace of mind in old age. In many countries, pension provision is an integral part of the national economic fabric.

Where pensions are provided as part of the social security benefit, they might not be considered annuities, for they are most often covered from other sources of revenue on a pay-as-you-go basis. However, where a country mandates retirement saving through individual accounts, the 'accumulation' phase, serious attention must be given to the options available for the obviously crucial 'decumulation', when citizens pick the fruit growing in their carefully planted financial orchards. Since annuity markets have been slow to develop in those countries that have recently mandated individual accounts for the accumulation phase, how to provide income to individuals forced to save for retirement is a serious concern.

The issues covered in this literature review are grouped into three areas:

- Why do more people not choose to purchase annuities?
- What sort of value for money do annuities provide and how do issues like adverse selection, charges and inflation linking affect the so-called 'money's worth'[2]?
- What are the alternatives available to policymakers for this decumulation phase and how well do insurers play their crucial role in this environment?

2.1 The Annuity Puzzle

> *… while economic well-being (as measured by income and wealth) does increase overall well-being, the effect is relatively small … having a defined benefit plan that provides a lifetime annuity has a positive impact on the well-being of retirees, compared to having no pension or even just a defined contribution plan. (Bender & Jivan, 2005:7)*

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[1] *Collins Quotation Finder,* ***HarperCollinsPublishers, Glasgow***

[2] *The term is defined more precisely in section 2.2, but refers broadly to the fairness of the annuity price against a risk-free best-estimate alternative.*

Annuities are important. They have been shown to improve significantly the well-being of retired individuals and they play the crucial and unique role of providing financial and longevity insurance to those people least able to support themselves. The annuity puzzle asks why it is that annuities are not more popular.

Underdevelopment of annuity markets

> *The near absence of voluntary annuitization and the absence of annuitization early in life are puzzling in the face of theoretical results suggesting large benefits to annuitization. (Davidoff et al, 2003:29)*

A significant body of research has been devoted to the annuity puzzle. Interested readers are refered to Yaari (1965), James and Vittas (2000), Davidoff *et al* (2003), Benítez-Silva (2003) and Vidal-Meliá & Lejárraga-García (2004 and 2005).

Historically, the United States (US) market for individual investors has been small (Mitchell *et al*, 1999), though it has grown more rapidly in recent years. Continental European investors have also been hesitant to take out annuities. In Australia the annuity market is only really developing now, in response to the superannuation industry (James & Vittas, 1999). Singapore's annuity market only started in 1987 when annuities were first permitted as a decumulation vehicle within the mandatory pension system. In Chile and other individual-account reformers the annuity industry must develop to provide retirement income to account holders, giving policymakers some hard decisions regarding structure.

Consolidated, comparable figures regarding the depth of annuity markets are hard to come by. James & Song (2001) provide a survey of six markets in local currency terms, but do not compare these figures to local gross domestic product or other scaling measures to provide a feel for "how large is large" concerning the development of any annuity marketplace. Cardinale *et al* (2002) cover 13 countries in their summary of annuity markets around the world. They acknowledge that others have not been included in the discussion, either because they are well covered in other literature, like the United States, or to avoid duplication with their other work, like the fledgling markets of Latin America.[3] Orszag & Cardinale (2002) plug the Latin American gap by describing the annuity markets in 6 countries of the region.[4] Impavido *et al* (2003) mention the rapidly growing market in

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[3] *The list of countries covered by their discussion is Australia, Belgium, Brazil, France, Germany, Ireland, Italy, the Netherlands, Portugal, Singapore, Spain, Switzerland and the United Kingdom. The authors do not cover the South African market and do not comment on this, save to acknowledge that there are omissions. The paper is descriptive rather than technical, and the authors do not attempt to put a size to every annuity market.*

[4] *Their discussion covers Argentina, Brazil, Chile, Colombia, Mexico and Uruguay, many of which have developed their annuity markets to cater for the simultaneously imposed mandatory individual account system. Others, for example, Bolivia, El Salvador and Peru, will need to follow suit, or more recently done so.*

India, where annuity premiums have grown, between 1996 and 2000, from 0.065% to 2.9% of total life insurance premiums.

With a few exceptions like the United Kingdom (UK) and Switzerland (Vidal-Meliá & Lejárraga-García, 2004), the demand for annuities is well below theoretical expectation (Impavido *et al*, 2003, among many others). And in the UK, probably the most advanced annuity market in the world, with annual purchases of over £8bn[5] increasing by around 10% annually (Gardner & Wadsworth, 2004)[6], there is growing pressure to discard the mandatory annuity purchase in place since 1921 (Murthi *et al*, 1999).

> *Within the UK, there has been vociferous criticism of the compulsory purchase obligation and, arguably as a result, some modest softening of the requirement is emerging in Government proposals for pension tax reform effective from April 2005. (Gardner & Wadsworth, 2004:1)*

A complex problem

As described by Vidal-Meliá & Lejárraga-García, Yaari (1965) showed that, in the absence of a bequest motive, individuals would be better-off annuitizing completely and, if there is a bequest motive, some annuitization remains optimal. Many other researchers have improved on this generalised position, Davidoff *et al*, for example, showing that annuity purchase is optimal even in conditions less demanding than those required by Yaari. Others have looked more deeply at the influence of the bequest motive or marital status, at the influence of the mental discount rates used by potential annuitants and at a variety of utility functions.

Carlos Vidal-Meliá and co-author Ana Lejárraga-García summarize neatly the variety of proposals for the poor consumer demand for annuities:

- The risk associated with longevity is reduced by other sources of wealth like income received from social security or defined benefit occupational funds.
- The pricing of annuities is not actuarially fair. Only part of the high load factor is attributable to adverse selection,[7] the balance due to administration, tax and profit.
- Adverse selection itself exerts a disincentive to prospective purchasers of annuities.[8]

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[5] *Cardinale et al (2002) quote a figure of £6.1 billion for 2001, referring to Association of British Insurers figures, but point out that an additional £2.1 billion in sales of income drawdown plans, not strictly annuities for our purposes. It is not clear to me whether the £8 billion figure includes income drawdown. £8 billion represents approximately 0.75% of Gross National Product of around £1,043 billion (HM Treasury 2003: Chapter B, Table B9, figure for 2002).*

[6] *Also see Association of British Insurers (2003) which suggests a continuation of this annual growth of approximately 10%.*

[7] *Adverse selection is discussed later in this note. In their 2005 paper, Vidal-Meliá & Lejárraga-García refer to Walliser (2000) to back up their statements concerning annuity pricing.*

- Family self-insurance reduces the extent to which individuals feel the need to insure against mortality risk.
- The alternative lump sum gives the individual the illusion of ability to meet large or unexpected expenses more easily than under the alternative of an annuity.
- In some countries, taxation of annuities strongly disincentivises annuity purchase.
- Annuities are often financially beyond the reach of prospective purchasers with minimum required capital sums at entry in excess of the accumulated assets of families.
- Consumers are not sufficiently educated to make welfare-maximizing decisions.
- The bequest motive often discourages purchase of annuities, though research has shown that partial purchase of annuities under these circumstances is still optimal.

Deciding whether or not to convert a lump sum into an annuity is not a simple decision. Neither is researching the logic of the decision, agreeing on a utility function and establishing whether complete or partial annuitization is optimal. Researchers have also established that there are a number of factors influencing the theoretical optimality of the annuitization decision:

> *The value of annuitization hinges critically on the size of the initial standard-of-living relative to wealth. (Davidoff et al, 2003:abstract)*

And it is clear that we don't have complete agreement between those considering the issue. Milevsky (1998), for example, concludes that full annuitization should be postponed.

> *Another approach … is to argue that even when individuals have negligible bequest motives, annuities are simply too expensive … that the implied rates of return from life annuities are much lower as a result of transaction costs, or loads, than those available from other investment assets, considering the life-long consumption guarantee which they provide. We suggest that most individuals should defer annuitization, via the do-it-yourself scheme, until it is no longer possible to bear the mortality adjusted rate of return from the life annuity. (Milevsky, 1998:402)*[9]

Orszag (2000) supports this by calculating the optimal mix of assets by age, showing that for men and women at age 60 a little over 50% of all assets should be in equities, reducing to approximately 20% for men aged 75, and 25% for women aged 75. Given that an

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[8] *Though it is questionable whether an individual considering the purchase of an annuity is able to consider the price of the annuity as determinant of whether or not to annuitize.*

[9] *Milevsky backs this up with analysis calculating that "a sixty-five year old female (male) has a ninety percent (eighty-five percent) chance of being able to bear the rate of return from a life annuity until age eighty. Of course," he continues, "those who consider a ten percent (fifteen percent) probability of shortfall unacceptable may choose to immediately lock-in at the current rate." (Milevsky, 1998:424)*

insurer might provide rates of return on an annuity that are higher than risk-free, but not by much, this suggests that full annuitization before age 75 is sub-optimal.

Despite the variety of viewpoints, there is among researchers consensus that, were consumers to behave rationally, the annuity market would have more participants than it does at present.

The issue is very important at this time as pension reforms around the world force rapid development of annuity solutions, whether the purchase of annuities is mandatory or voluntary. As the objective of this paper is to give a survey of those issues affecting the annuity market, I consider annuities in the context of national old age policy in section 2.3.

2.2 Value for Money

The money's worth ratio has been developed over a number of years to describe the extent to which expected annuity income matches the price of the annuity. Cannon & Tonks define the money's worth ratio more rigorously as

> *… the ratio of the expected present value of the flow of payments made by an annuity to the money paid for an annuity. (Cannon & Tonks, 2002:7)*

Value for money is an elusive concept in the annuity market and the two parts of the ratio need to be very carefully defined, but this is certainly a useful tool for assessing pricing.[10] Properly measured, it includes the impacts of both charges and adverse selection, the second of which is discussed in more detail in the next section.

Adverse selection

Adverse selection in annuities – some may refer to it as *anti-selection* – is an integral part of the actuarial training. Rather than redefining, I refer to definitions from the literature:

> *One of the most intractable issues in the analysis of private annuity markets is the extent and nature of adverse selection. The primary efficient-market requirement that is violated is commonality of information, that is, annuitants might know more about their life expectancy than the annuity issuer. In a voluntary market, this presumption leads to higher quotes on annuities than are actuarially fair for the population at large, and adverse selection sets in. (Doyle & Piggott, 2002:20)*

> *Since the original empirical study by Friedman and Warshawsky in 1988[11], a number of economists have produced estimates of the difference between the price of an actuarially fair*

[10] The tool has been in development for some time. References for interested readers include Friedman & Warshawsky (1990) and Mitchell et al (1999).

[11] Palacios and Rofman refer to an earlier draft of the Friendman and Warshawsky paper. The reference in this document is to the 1990 paper.

> *annuity and the price observed in the market. This has been interpreted as adverse selection. According to this explanation, individuals have knowledge of their own mortality risk that annuity providers find costly or impossible to obtain. This information asymmetry leads to a market failure as individuals that expect to live for a long time purchase annuities and sellers raise their prices to compensate. In the end, the market fails to materialize because the average individual finds the price of the annuity too high. (Palacios & Rofman, 2001:32)*

Both pairs of authors refer to the phenomenon of the failure of the efficient market. This failure lies at the core of the questions posed in this paper, particularly concerning the role of insurers and the potential for annuities to be fairly priced for the poor.

Note that it isn't only the individual information advantage that causes the selection effect. Annuitants are, as a group, wealthier and healthier. It isn't easy to distinguish between the individual (information advantage) effect and the group (overall risk profile) effect (Murthi *et al*, 1999:25).

The variety of measures

Mitchell and McCarthy (2001) set out very well a variety of methods that can be used to measure the impact of anti-selection. I strongly recommend a careful reading of their discussion for those interested in putting a value to the anti-selection impact, but note that these do not include the money's worth ratio, which depends on an annuity price. These methods are used to compare sets of mortality rates. The authors set out a number of alternatives for comparing mortality tables:

- Plots of survival frequency or age at death distributions
- Actual over expected (A/E) method
- Expected remaining life method
- Present value of a life annuity method[12]
- Internal rate of return (IRR) method

The last of these is particularly useful in expressing the difference between mortality rate tables because an equivalent basis point or percentage point difference in investment returns is easy to understand. James & Song (2001) quote a rule of thumb equating a 1% change in the money's worth ratio to a fall in the effective annual return of 0.12%.

[12] *I use this method later in this paper to show the impact of higher mortality rates at different income bands.*

Analytics: what the researchers say about money's worth

Perhaps not surprisingly, researchers do not present a completely uniform picture concerning the fairness of annuity pricing. This section provides a brief survey of some of their findings.

Mitchell *et al* (1999) present a number of findings in their highly regarded paper analysing the US annuity market:

- There is considerable dispersion of the prices charged for single-premium immediate life annuities.[13]
- The money's worth ratio of the annuity[14] lies between 80% and 85% against population mortality[15] and between 90% and 94% against annuitant mortality.
- The ratio improved between the early 1980s and mid 1990s by around 13 percentage points.

Murthi *et al* (1999) undertook a comprehensive study of the annuity market in the United Kingdom (UK), with the following conclusions concerning money's worth:

- The financial cost associated with the purchase of an annuity ranges between 10% and 12% of the purchase price, of which around seven percentage points may be attributed to the impact of adverse selection.[16] The balance of the cost is due to administration costs and profit margin.
- The money's worth ratio for inflation-linked annuities is some eight to ten percentage points lower than for flat or nominally-adjusted annuities.[17]

The findings of James & Vittas (2000), across a number of annuity markets[18], which they describe as "preliminary" suggest that annuities actually give rather good value.

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[13] It would probably not be unreasonable to suggest that this dispersion is reducing, around the world, as a result of stronger consumer understanding and improved information flow. As noted later in this paper, transparency of annuity pricing in South Africa is high.

[14] Expressed by the authors as the "expected present discounted value of annuity payouts [in cents] per dollar of annuity premium" (Mitchell et al, 1999:2)

[15] As the authors describe it, "… for an individual chosen at random from the population…" (Mitchell et al, 1999:2)

[16] Remember that this includes the selection impact, whereas the highest money's worth ratios do not because they are measured against annuitant mortality.

[17] The authors suggest that adverse selection might go some way to explaining this difference, since annuitants with better expectations of life would tend to prefer the inflation-linked payout stream. In discussion later in this paper, I suggest, following World Bank (2005), that there are also investment-related reasons for this poor value for money.

[18] Australia, Canada, Chile, Isreal, Singapore, Switzerland and the United Kingdom

- Against annuitant mortality and using a risk-free discount rate, money's worth ratios exceed 97%, in some cases they are about 100%.
- Even against population mortality the ratio exceeds 90%, leading the authors to suggest that the combined impact of adverse selection and industry costs and profitability is not as high as might have been expected.
- Real annuities[19] have ratios 7% - 9% lower than those of nominal annuities.
- Against the perhaps more appropriate corporate bond rate there is also a 7% reduction in the money's worth ratio.

James & Song (2001) in their international study[20] obtain results very similar to these, suggesting an overall money's worth ratio against the risk-free rate exceeding 95% in most countries. They show that the investment return obtained by insurers significantly exceeds the risk free rate, suggesting an important role for these insurers in providing value for money in the annuity markets (see the discussion in the next section). They too find a significant fall in the money's worth ratio determined at a higher discount rate[21] of a further 10% - 12%.

Cannon & Tonks (2002), who provide a good definition of the money's worth calculation methodology, suggest a money's worth ratio of between 90% and 100% in the UK. They describe this ratio as "suspiciously good". They acknowledge that it is calculated using the risk free rate, making it reasonably consistent with the 97% - 100% calculated by James and Vittas, and echoes the suggestion by James and Song (2001) that insurers are able to attain better than risk-free returns on their assets.

Finally, Mitchell & McCarthy (2001) demonstrate a statistically significant difference between annuitant and population mortality, averaging 25% across a number of countries[22] but do not quote an equivalent money's worth ratio to compare with the work of other researchers. The essence of their work was a comparison of mortality tables, not a comparison of risk-free best-estimate annuity rates with the corresponding rates prevailing in the market at the time.

Money's worth: concluding comments

Against the risk-free rate and annuitant mortality, annuities appear to give generally good value for money. The main reason for this appears to be that insurers are able to earn

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[19] *In Chile, Israel and the United Kingdom*

[20] *The same countries as the study by James & Vittas (see footnote 18).*

[21] *They use a figure of 1.4% in excess of the risk free rate, referring to the work of Poterba & Warshawsky (1999).*

[22] *The countries in the study include Australia, Austria, Canada, Chile, Germany, Israel, New Zealand, the United Kingdom, and the United States.*

better than risk-free rates on the assets backing the annuity, roughly sufficient to cover their costs and profit. But the additional return is generally not sufficient to cover the impacts of adverse selection, which reduces effective annuity income by between approximately 6% and 10%, reflecting money's worth ratios against population mortality of around 90% or slightly more.[23]

Olivia Mitchell's 1999 research paints the most pessimistic picture of the value of annuities, presenting not only the poorest money's worth ratios but also drawing attention to the considerable dispersion between providers. As she also noted a pattern of improving value for money, her research may be the earliest in an improving trend.

A note on charges

> *Because annuity purchases are lumpy and irreversible, high commissions are often paid to salespersons who complete a deal. This in turn gives salespersons an incentive to engage in high-pressure techniques that raise costs and lead uninformed consumers to wrong choices. (World Bank, 1994:331)*

Murthi *et al* (1999), in their comprehensive study of the large UK annuity market, focus some of their attention on the charges involved in annuity purchase and conclude that:

- Charges are between 3% and 5% of the purchase price.[24]
- Annuitization costs fall with policy size, the difference in cost between a £10,000 annuity and a £100,000 alternative amounting to between 2% and 3% of the purchase price.
- There is no significant difference in charges between compulsory purchase and open market (voluntary) annuities, suggesting that intermediary incentives play no part in charges incurred by the annuitant.

Cardinale *et al* (2002) quote United Kingdom commission costs at approximately 1.5% of the purchase price.[25]

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[23] Increasing pressure on life offices to manage their risks may also force down the rate of return on the assets backing annuities as complete investment protection of the annuity portfolio becomes more important to insurers. If this is the case, the money's worth ratio would be expected to fall as a consequence of this.

[24] They point out that the charges associated with annuitization dwarf the aggregate charges associated with the accumulation phase.

[25] The authors of that paper suggest that this is insufficient for advisors to service holders of maturing personal pension funds, leading to the policyholder taking an annuity from the same provider despite the legal requirement of the "open market option" prohibiting the personal pension provider from insisting that the annuity is bought from the same firm.

Queisser (1998) expresses concern at the increase in intermediation costs in Chile, which she quotes as having

> *…increased from 1.5 per cent of gross premium in 1988 to more than 5 per cent ten years later. (Queisser, 1998:81)*

These costs include marketing, commission and administration fees and had grown, by 1998, to compare with the top end of the figures calculated by Murthi and her colleagues for the United Kingdom.

2.3 National Coverage Options

> *Can the private annuity market deliver? (World Bank 2005:162)*

The World Bank, in this key synopsis of currency policy thinking[26] questions the effectiveness of the private annuity market. This might seem remarkable to UK-educated actuaries, but well-developed annuity markets are actually quite rare, a number of countries are considering annuities as an option for the first time, and there are a number of fundamental questions to ask about the role of annuity markets.[27]

This section asks some of these questions.

Should annuitization be mandatory?

> *A growing number of countries have introduced mandatory defined contribution schemes. As these schemes mature, their success will increasingly depend on how well they translate accumulated funds into a stream of retirement income. Successful reforms will rely on a well regulated and competitive insurance sector. They will strike a balance between individual preferences and public policy objectives such as providing a reasonable amount of longevity insurance. (Palacios & Rofman, 2001:2)*

The question of annuitization at national level is particularly important in a number of countries that, having introduced an individual account system of retirement saving, must make sure that the consumption phase of the system is run to the greatest benefit of all participants.

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[26] *I highly recommend this comprehensive paper for any readers interested in understanding the whole scope of issues facing policymakers in the area of old age provision, and the current World Bank position on these issues.*

[27] *The dynamics in an annuity market depend on a variety of factors, one of which is the maturity of the market. The UK market suffers the almost unique symptoms of a market with too much annuitization, with even the broad bond markets unable to meet projected demand and aggregate capital requirements a burden on insurers as a group (Association of British Insurers, 2003:2).*

Doyle & Piggott (2004) put forward a compelling case for mandatory annuitization, despite the fact that there is currently a strong public push against this in the United Kingdom.[28]

> *As Walliser (2000a) argues, adverse selection is very limited when everyone must buy an annuity, provided there are appropriate restrictions on annuity offers. Finkelstein and Poterba (1999) have shown that the loading on compulsory annuities in the United Kingdom are half the loading in the voluntary annuity sector. Compulsion may reduce commission costs, and in addition, mandatory annuities address the possibility of preference inconsistency in arranging finances through retirement. (Doyle & Piggott, 2002:21)*[29]

This view has found its way into policymaking. In contrast to many of the other reformed Latin American systems, the Uruguayan pension reform requires mandatory annuitization of the accumulated savings of affiliates. Programmed withdrawal, what we might call drawdown, is not permitted (Queisser, 1998; Noya & Laens, 2000).

The picture around the impact of compulsion is anything but clear. While Finkelstein & Poterba (1999) find evidence of charge reduction for compulsory annuities, Murthi *et al* (1999) find exactly the opposite: that there is in fact no difference in the charges levied on the respective sets of annuities.

If there is no difference in the fee, what about the argument that the impacts of adverse selection would be lower were annuitization compulsory? Mitchell & McCarthy (2001) present evidence to suggest that there is in fact not a direct correlation between annuity compulsion and adverse selection in pricing. They suggest that there is indeed a link, but that country-specific factors need to be considered more carefully before concluding the impacts that policy might have on annuity pricing.

> *We … find that there is no significant difference between the effects of voluntary and compulsory selection on mortality, which warrants further research. We do not believe that this result implies that in an individual country, there is no significant difference between compulsory and voluntary selection. Rather, we interpret it to mean that the ranges of variation of what might be called "compulsory" and "voluntary" selection in different countries overlap. This, we believe, highlights the important point that the extent of adverse selection is highly dependent on the legal and economic environment. (Mitchell & McCarthy, 2001:25)*

Furthermore, mandatory annuitization is inappropriate for the poor. First, the poor have financial priorities more important than the accumulation of assets for old age and conversions of these assets to an inflexible flow of income. Second, it is unlikely that the poor would be treated fairly in the pricing of annuities. This is simply because their life expectancy is significantly lower than the average for the pool of annuitants. Annuity

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[28] *Changes are indeed taking place. From 2006, the current obligation to fully annuitize by age 75 will end, though it should be added that less than 5% of annuitants choose to defer annuity purchase to age 75 (Association of British Insurers, 2005:6).*

[29] *References in Doyle & Piggott paper are included in those listed at the back of this paper.*

pricing is unlikely to reflect this appropriately because it makes the pricing of the balance of annuities less competitive. I consider this in more detail in section 3.2, looking at issues pertinent to the South African annuity market.

The need for insurers as providers

> *Insurance companies take the premiums that people pay when purchasing an annuity and invest the money at rates that include a long term premium, a risk premium and an equity premium (in corporate bonds, equities, real estate as well as some government bonds) – then turn these long term medium risk investments into a risk-free annuity which is sold at a price that is actuarially fair at government bond rates, for a mixture of short and long term pay-outs. The company covers its costs and earns a profit on the investment spread. (James & Vittas, 2000:3)*

In her collaboration with Xue Song, Estelle James computes an average rate of return earned by insurers exceeding the risk-free rate by at least 1.3%, possibly as much as 2.0% annually (James & Song, 2001:4). This research suggests that insurers play the crucial role of risk intermediation, creating not only a market that provides insurance against longevity, but also pooling the investment risk and providing generally good value for money. (Refer to the discussion of the money's worth ratio in the previous section.)

It might be suggested that using a higher discount rate is equivalent simply to expecting a higher return on assets. This is true, but since the providers are taking the *"risks associated with future income streams from annuities"* (Murthi *et al*, 1999:26) the higher return on assets might be justified by the additional risk taken. If, in aggregate, the money's worth ratio against the risk-free rate is close to 100%, the annuity would appear to be providing adequate value for money.

> *Some people have argued that the provision of all annuities in a multi-pillar system should be turned over to a single public monopoly that the worker must use upon retirement. But if insurance companies can cut their costs by providing risk intermediation, this is an argument for private rather than public provision. (James & Vittas, 2000:16)*

Diversified insurance groups are also better able to provide protection against longevity risk because they hedge themselves by selling products that insure against the opposite risk, early death, for example term life products.[30]

However, insurers should not consider their role as annuity provider as cast in stone. In Mexico, for example, annuities are provided by specialized annuity companies, who are licensed by the regulator. Though the comments that follow – from the World Bank no less

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[30] *Reinsurers also have an important role to play in this market, particularly in smoothing the volatility of experience for providers, creating a better market for longevity risk and sharing the burden of capital requirements. In the UK, reinsurers have less than 5% of the market, compared with over 50% in the life insurance market. (Association of British Insurers, 2005:6,7)*

– might be said to apply mostly to those countries with weak insurance sectors that need to build an annuity market from scratch, they ought to be taken seriously:

> *… information disclosure in the insurance industry is poor in practically all jurisdictions. Accounting standards are mostly opaque, and, from the point of view of consumer protection and transparency, an argument can be made for specialized annuity companies, especially to provide annuities from mandatory schemes. (World Bank 2005:163)*

Inflation indexation

Of those countries with well-developed annuity markets, few offer index-linked annuities[31]

> *The biggest weakness of the annuity market seems to be its inability to deal with inflation protection in a low-cost way. Contrary to previous belief, private insurance companies can and do provide indexed annuities in several countries. However, consumers pay 10-12 cents on the dollar for this protection, while nominal annuities cost practically nothing. Of course, inflation insurance is never low cost, whether provided through the market or the public sector. Governments can facilitate low cost indexed annuities by issuing long term indexed bonds and by keeping inflation under control. Annuity companies can facilitate them by providing partial inflation insurance. Until these policies are in place, indexed annuities are unlikely to develop. (James & Vittas, 2000:22)*

As discussed earlier in this paper, Murthi and her colleagues, Michael and Peter Orszag (1999) suggest that, while the reduced value for money of inflation-linked annuities is real[32], the reason for this lies not primarily in the investment risks but at the door of adverse selection. Only the healthy are prepared to take the risks of the postponed receipt of income implied by the index-linked annuity.

On the other hand, the margins on investment return available on nominal annuities, well in excess of an annual 1% (see earlier discussion), are probably not available on index-linked annuities because insurers must forego the opportunity to invest in more profitable asset classes in order to ensure that they are able to meet the inflation-linking requirement (see World Bank 2005:165).

Two points should be made in this regard:

- Where there is an absent or insufficiently developed market for index-linked bonds, there is undoubtedly an investment risk taken on by providers and this will, also undoubtedly, lead to reduced value for money to recipients.

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[31] *Chile is an example of a country that requires annuities, which form a crucial part of the mandatory retirement savings environment, to be index-linked. The Chilean government also established the index-linked bond market so that suitable asset classes were available to back these annuities. (Queisser, 1998)*

[32] *Pun not intended*

- Compulsion may reduce the impact of adverse selection but this should not be regarded as a certainty. At the very least, though, compulsion would increase the pool of index-linked annuities against the alternative of voluntary purchase of such products, which should reduce the impact of adverse selection.

A final observation should be made concerning index-linking of annuities: if a government were to take the step of forcing index-linking, it should recognise that it shares the responsibility of supporting this compulsion by developing the market for index-linked bonds at the same time. This is not a simple issue:

> *… if governments want to ensure (or mandate) the availability of price-indexed annuities, they will need to issue the appropriate inflation-indexed or other specialized instruments to enable this market to develop. This, however, potentially imposes significant distributional tradeoffs because in nearly all developing (and many developed) countries the beneficiaries of indexed annuities are higher-income groups, while all will bear the costs of providing the financial instruments to enable them to develop. (World Bank 2005:165)*

Pooling

Perhaps the fundamental question for consideration by policymakers concerns pooling, the practice of treating all annuitants as a single group for pricing purposes. This sometimes happens because regulators forbid the collection of further information allowing more accurate pricing for smaller member groups. But it also happens, as in South Africa, with one exception, because established providers have no incentives to open up new pools of annuitants, because this jeopardises the profitability of the existing book of annuitants.[33]

The disadvantage of pooling is that good risks (from the point of the insurer, in other words those that die early) subsidise poor risks. Another disadvantage is the phenomenon of adverse selection arising from the asymmetry of information.

In theory, allowing insurers to rate annuitants more accurately would (probably) reduce or eliminate adverse selection, leaving good risks better off and poor risks worse off (World Bank, 2005). In practice – and this is as a result of the strange characteristics of the annuity market where the wealthy find themselves in the poor risk pool – this is unlikely to happen as suggested by the authors of the World Bank report, because the healthy and wealthy appear to sustain a perverse monopoly of this market.

Shah (2005) has noted the same problem for the pension reform process in India:

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[33] *Even where markets have developed more competitive approaches to pricing, there appears to be a disincentive to propagate this. As Cardinale et al (2002) point out "…only a small share of the [United Kingdom] market is priced differentially based on individual characteristics, despite the clear incentives for some providers to do so." (Cardinale, 2002:3)*

> *There is a tremendous cross-sectional variation in mortality in India, ranging from rich people who have mortality characteristics comparable with those found in OECD countries, all the way to poor people who have an expected lifespan of less than ten years at age 60. At present, insurance companies lump these together in a single pricing schedule for annuities. This generates a subsidy that flows from the poor (who die soon) to the rich (who live and consume annuities). Resolving this problem, and eliminating this cross-subsidy, will be a major area for new work by the insurance companies in the years to come. (Shah, 2005:13)*

The poor, and those in ill health, are of course permitted to enter the market, but only on terms unfavourable to them. I consider this in a little more detail in the context of the South African market in section 3.3.

Risk

I close this section with thoughts probably least relevant to the South African market, but certainly very important elsewhere. Changing demographics are having a profound impact on the annuity market.

First, rapidly increasing longevity means that the terms at annuitization are rapidly becoming poorer. Second, some predict that share prices and bond yields will fall as the rapidly increasing elderly proportion shift their investment allocation to safer asset classes. Both of these factors suggest a fall in annuity rates.

Who bears the risk of this change? The World Bank (2005) proposes three possibilities:

- **Insurers** continue to carry the risks, but with appropriate government regulation. The required regulation is likely to lead to higher reserving requirements and reduced value for money to annuitants.
- **Insurers and annuitants** share the risks through variable annuities that reflect changes to mortality and interest yield experience. The world of financial services is complex enough as it is already and this type of product is unlikely to be well understood by the risk-sharing annuitant, even if the expected long-term return might be slightly higher as reward for taking on some of the risk.
- **Government** could take on all or part of the risk. There are many ways of doing this: providing a minimum pension guarantee, selling longevity bonds or providing an annuity market itself. The first of these is quite common, the second less so but appears to be growing. The third has no examples that I am aware of except that many social security systems already result in an indirect annuity market created by government.

I end this section with the observation that the annuity market could do with a great deal more innovation that it has at present.[34] Wadsworth *et al* (2001) present an excellent paper setting out some of the options available for taking annuities forward. A modified version of this paper was presented to the 2002 ICA conference in Cancún (Wadsworth & Findlater, 2002).

Wadsworth (2002) also writes about the need for actuaries to respond appropriately to what he refers to as the 'unbundling' of the annuities market, with risk-rating and investment options becoming more sophisticated. In the UK, Wadsworth points out, annuities written on enhanced or impaired lives are "heading towards 10% of the total" (Wadsworth, 2002:24) and more sophisticated rating systems are being used even for those products not actually referred to as enhanced or impaired life annuities.

While flexible, market-related annuities are already established in South Africa, providers, with just two exceptions, appear to be adopting a wait-and-see attitude towards more sophisticated risk-rating. Perhaps vested interests are too strong.

[34] This is due partly to incentives to insurers to 'defend their risk pool' and partly because of the long-term risks involved in providing annuities.

3 QUESTIONS FOR SOUTH AFRICA

I prefer old age to the alternative (Maurice Chevalier, 1888 – 1972)[35]

We turn now to applying the three questions discussed in section 2 to the South African situation, asking

- whether the annuity puzzle applies to South Africa
- whether South African annuities provide adequate value for money
- how annuities might fit into the national pension picture, but looking particularly at the question of provision for the poor

3.1 Coverage

How large is the South African annuity market?

The Financial Services Board quotes net premiums into annuities at just under R14 billion for 2003 (Financial Services Board, 2004:10). This is 8.6% of the total net new business volume of R162 billion written by primary insurers.[36] This is a slight decrease from R14.1 billion written in 2002, a smaller proportion of a larger pool of premium income, 8.1% of R174 billion (Financial Services Board, 2003:11).[37] It is reasonable to assume that a high proportion of annuities purchased to date have been compulsory purchases from maturing retirement savings, but there is a growing incidence of retirements from provident funds, paying cash without annuity compulsion.

Are these figures large? The 2002 figure represents approximately 1.2% of Gross Domestic Product (GDP).[38] This compares very well with the corresponding figure of under 0.8% of GDP computed for the United Kingdom[39], where annuitization is still compulsory for the

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[35] *Collins Quotation Finder,* ***HarperCollinsPublishers, Glasgow***

[36] *This is all conventional annuity business, but it is not all on fixed terms: 30% of this business is in with-profit annuities. There may in addition to this total be some income drawdown products sold within what the Financial Services Board refers to as 'market performance' business, but these fall outside of the annuity business as described by researchers considering the annuity puzzle.*

[37] *The type of annuity purchased changed quite significantly. In 2002, 44% of all annuities sold were with-profit annuities, falling to 30% in 2003.*

[38] *The figures do not compare precisely because my GDP statistic (R1 194 billion, National Treasury, 2005) applies to the tax year 1 March 2002 to 28 February 2003. The corresponding ratio for 2003 (again, with slight period mismatching) is around 1.1%, based on a GDP of R1 277 billion (also National Treasury, 2005).*

[39] *Figures for 2002, a little over £8 billion in annuity sales (Gardiner & Wadsworth, 2004; Cardinale et al, 2002) against a GDP of £1 043 billion quoted in the 2003 budget (HM Treasury 2003: Table B9).*

majority of the retirement proceeds of an individual. Other markets are much smaller.[40] These figures certainly suggest a large and thriving annuity industry.

The 2003 figure of R14 billion compares with R24.9 billion in contributions received by occupational retirement funds (Registrar of Pension Funds, 2003:7) and R32.9 billion paid out by these funds. Taylor (South African Government, 2002) put total retirement fund contributions at R54.3 billion[41], equivalent to 14.4% of disposable income. Taylor also reported that a further R8 billion was paid into retirement funds and R27 billion into regular premium life assurance.

Compared with these figures, also, the annuity industry in this country would appear to be mature and healthy.

Against this should be set the growing incidence of (1) retirement from provident funds paying cash and (2) voluntary postponement of annuitization through the purchase of income drawdown products. The South African non-profit annuity industry is indeed healthy, but these developments suggest that research into the annuity puzzle in this market would reveal interesting insights into the patterns of the decumulation phase in this country.

3.2 Pricing

In this section, I consider whether the annuity market in South Africa is competitive and whether it provides value for money.

Competition

If transparency of rates is anything to go by, annuity rates are competitive, for rates from the five largest providers are easily comparable and regularly published in the personal finance press (see the example in Table A1 in the appendix).

These rates do not separate the annuity consideration into commission, administrative loadings and underwriting,[42] and they certainly don't indicate the relative competitiveness of mortality and discount rates priced into the annuities, but they are a straightforward like-for-like comparison of annuity rates, with no room for hidden charges or unexpected surprises.

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[40] Australian sales, for example, between mid-2000 and mid-2001 amounted to A$175m (Cardinale et al, 2002:19), representing less than 0.05% of the corresponding Gross National Product (GNP figures from Financial Times, 2005).

[41] Latest figures are R64.9 billion (Registrar of Pension Funds, 2003:8)

[42] The price of the annuity without allowance for administrative charges and commission costs.

Money's worth ratio: annuitant mortality

The best way to determine the true competitiveness of the local market would be to calculate a money's worth ratio for the South African market in the same way as has been calculated by researchers for other markets. The ideal would be to have a best estimate mortality basis, a yield curve and a set of actual annuity rates for the date of calculation. The theoretical "best estimate risk free" annuity rate would be compared with the mean of the actual rates, giving the ratio called the money's worth ratio. Most annuity markets appear to provide a ratio, against annuitant mortality, at or just below 100% (see the discussion in section 2.2) and we would hope for the same in the competitive environment in South Africa.

This calculation, unfortunately, is not possible at present. The risk-free discount rate is obtainable using yields under government stocks, but the mortality basis is very difficult to determine. Discussions with colleagues involved in the research of mortality experience suggest that we are not quite at the point where we have a best estimate of annuitant mortality.[43]

In summary, we have the yield curve[44] and we have a set of annuity quotations[45], shown in the appendix, both at 1 July 2005. What we don't have is a best estimate of the mortality rate. What I have determined instead is the best estimate mortality rate *required* to give a money's worth ratio of 95% or 100%[46]. Solving for the required mortality rate at every age is not possible so two approaches are used, assuming that the best estimate mortality table is

1. In line with PA90(M) and PA90(F), for males and females respectively, with no allowance for future mortality improvement, but with an age adjustment.
2. In line with PA90(M) and PA90(F) with an allowance for mortality improvement[47] and with an appropriate (smaller) age adjustment as well.

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[43] Furthermore, as the annuity market deepens and annuities become accessible to a wider range of socio-economic groups, the mortality experience of this group is likely to change. This tends to counteract the potential for improving mortality but we do not, at the time of writing, have a clear picture of how these factors interact. I leave the calculations until such time as we do.

[44] This is more accurately the simulated curve of zero coupon bonds, supplied by the Bond Exchange of South Africa.

[45] These were drawn from the Personal Finance Quarterly, 3rd quarter 2005, and are provided in Table A1 in the appendix.

[46] The range is chosen for consistency with the international experience described in section 2.2. Recall the James & Song (2001) rule of thumb that suggests that the difference between 95% and 100% is roughly equivalent to an annual rate of return difference of around 0.6%, fairly significant.

[47] The improvement is assumed to be equivalent to 1/20th of a year age adjustment (younger) for each year in the future, a commonly used rule of thumb, though some suggest that it understates likely mortality improvement.

The model

Results are determined using a straightforward calculation of annuity rates. The annuity is assumed, in all cases, to be guaranteed for 10 years from the date of purchase[48] and payable monthly in arrear. The calculation itself is based on annual-in-arrears annuity with adjustment to monthly as set out by Neill (1977) to the third term in the expression.[49]

Results and discussion

The results of the analysis described above are set out in Table 1.

What do these results mean? If a best estimate mortality experience for male annuitants is in line with PA90(M) with a six year downward adjustment, then the annuity rates available as at 1 July 2005 give a money's worth ratio in the region of 100%. For females, the best estimate mortality experience to give a money's worth ratio of around 100% is between five and six years younger than PA90(F). If the true mortality experience of annuitants is heavier than this, ranging from between one and three years of age lighter than PA90(M) and PA90(F), then the money's worth ratio is in the region of 95%.

Allowance for the mortality trend at 1 year of age for every 20 years elapsed time makes little difference to the results but would 'require' a starting level of the best estimate mortality slightly heavier than were no mortality trend assumed.[50]

Is there any way of determining whether these adjustments to PA90 are reasonable? Fortunately we have some up-to-date estimates of assured lives experience. These suggest that fairly significant downward age adjustments are indeed reasonable. This is shown a little later, but first the money's worth ratio is calculated using assured lives mortality experience.

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[48] All of the quoted annuities in Personal Finance have ten year guarantee terms. The obvious disadvantage of using these figures is that they ignore mortality experience for the first ten years of the term of the annuity.

[49] Neill (1977) demonstrates the relationship between an annual annuity in arrears, a_x and an annuity paid m times per year in arrears, $a_x^{(m)}$ as:

$$a_x^{(m)} \approx a_x + (m-1)/2m - (m^2-1)(\mu_x + \delta)/12m^2$$

where μ_x is the force of mortality and δ the force of interest. Three adjustments are required to convert the annual annuity to monthly. This formula covers the mortality and interest timing adjustment. The appropriate discount rate is adjusted by interpolating between the zero rates on the yield curve at discrete year intervals to obtain appropriate discount rates at half-year periods.

[50] That is, the downwards age adjustment to the standard PA90 tables is slightly smaller, by around half a year of age in each case.

Table 1. Age adjustments to PA90 required to obtain a money's worth ratio (MWR) at the specified levels

	Age of annuitant			
	Age 55	**Age 60**	**Age 65**	**Age 70**
No mortality trend				
95% MWR				
Male	-2.2 years	-2.7 years	-2.9 years	-2.7 years
Female	-1.0 years	-1.8 years	-2.3 years	-2.6 years
100% MWR				
Male	-6.1 years	-6.3 years	-6.4 years	-6.2 years
Female	-5.6 years	-5.7 years	-5.7 years	-5.6 years
With mortality trend				
95% MWR				
Male	-1.6 years	-2.1 years	-2.4 years	-2.4 years
Female	-0.1 years	-1.1 years	-1.7 years	-2.1 years
100% MWR				
Male	-5.6 years	-5.9 years	-6.0 years	-5.9 years
Female	-4.9 years	-5.1 years	-5.2 years	-5.2 years

Notes: age adjustments are interpolated on a straight line basis between those whole-year adjustments on either side of the MWR sought. All age adjustments are expressed as years upwards so a negative number signifies a downward adjustment. The mortality trend assumed is a 1 year downward age adjustment every twenty years, interpolated on a straight line basis during the twenty year period.

Sources: Personal Finance (2005:94), Bond Exchange of South Africa and author calculations. Effective date: 1 July 2005

Money's worth ratio: assured lives mortality

The continuous statistical investigations committee of the Actuarial Society of South Africa has recently completed an analysis of the mortality experience of assured lives, covering the period 1995 – 1998. Although exposure and claims is expressed in five year age bands and aggregated for all ages above 85, this is still the best available data for considering annuity rates in the context of assured life mortality.[51]

Results for the money's worth ratio against assured lives mortality are shown in Table 2.

[51] *I have not attempted to smooth q_x's between the five year mid-points - all q_x's are assumed to apply to all ages within the five-year band. The aggregated 85-and-older rate for assured lives is higher than for annuitants aged 85, but lower than for annuitants a few years older than that. I have assumed assured lives mortality at age 84 for those ages at which it exceeds the annuitant mortality at that age, and thereafter have used PA90 annuitant mortality, producing a smooth progression by age.*

Table 2. Money's worth ratio against assured lives mortality

	Age of annuitant			
	Age 55	**Age 60**	**Age 65**	**Age 70**
Male	94.2%	93.5%	92.7%	92.3%
Female	94.3%	93.4%	92.9%	92.3%

Notes: mortality experience is based on South African assured lives, 1995-1998 and the discount rate is the set of rates implied by the zero coupon yield curve at the calculation date.

Sources: O'Malley et al (2005), Personal Finance (2005), Bond Exchange of South Africa and author calculations. Effective date: 1 July 2005

Against the international experience described in section 2.2, these numbers appear quite reasonable, suggesting that the South African annuity market appears to provide reasonably good value to participants, or at least that there is insufficient evidence of poor value, in aggregate.[52]

Scrutiny of the annuity rates arising from PA90 and this assured lives mortality shows that the latest mortality experience of assured lives is actually *lighter* than PA90. Table 3 shows the approximate adjustments to PA90 required to obtain annuity rates in line with this assured lives experience.

Table 3. Age adjustment to PA90 to approximate assured lives mortality experience

	Age of annuitant			
	Age 55	**Age 60**	**Age 65**	**Age 70**
Male	-1.6 years	-1.6 years	-1.3 years	-0.7 years
Female	-0.3 years	-0.7 years	-0.9 years	-0.9 years

Notes: assured lives mortality is based on the experience of South African assured lives, 1995-1998 and the discount rate is the set of rates implied by the zero coupon yield curve at the calculation date.

Sources: O'Malley et al (2005), Bond Exchange of South Africa and author calculations. Effective date: 1 July 2005

Assessing the implied mortality rate

We are also now in a position to assess roughly the reasonableness of the implied adjustments to PA90 required to provide reasonable money's worth ratios on annuitant mortality.

[52] *These statements are deliberately cautious, but still need to be qualified. The international research is unmistakeably based on population mortality, while these numbers are based on assured life mortality. South Africa's inequality ratios are so high that using population mortality would almost certainly give substantially poorer results. Assured life mortality is being utilised here as a flawed but best-available basis for comparison with international figures.*

As the money's worth ratios against assured lives mortality fell between 92% and 95%, following the patterns of international researchers, we would reasonably expect the corresponding money's worth ratios against annuitant mortality to be around the 100% mark. [53] We have already established that, in order for this to be true, the best estimate mortality experience of annuitants must be in line with PA90 with a downward age adjustment of around six years for men and between five and six years for women.

Table 3 shows that the most recent assured lives experience is lighter than PA90 by the equivalent of an age adjustment of between one and two years. It would not be stretching credibility to postulate that the true experience of annuitants is the equivalent of a further age adjustment of four or five years.

This argument is all rather circular, since suggesting that a 100% money's worth ratio is credible is the same as suggesting that the additional age adjustment is also credible. I look forward to the release of reliable annuity mortality figures and conclude, in the absence of these statistics, that the rates in today's annuity market appear to provide reasonable value for money to participants.

Charges

I have not been able to obtain information on the charges implicit in annuity pricing. But for two reasons, I am not particularly concerned about charges in the non-profit annuity sector[54]:

- Prices quoted, and easily comparable, are 'all in'. There are no hidden or poorly-disclosed charges and no freedom for insurers to change the charges used.
- What little evidence I have found suggests that the charges component is not significant and that commission is negotiable, starting at zero.

I am also concerned that a charge comparison would be difficult in practice, since providers are likely to use different combinations of risk margin, profit margin and expense margin in their annuity pricing, even were they to arrive at very similar prices.

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[53] Again subject to the flaw acknowledged in the footnote on the previous page that I use assured lives mortality as a comparison against the population mortality figures used by other researchers.

[54] Please note the emphasis on non-profit annuities. With-profit annuities are far less transparent: annuities are dependent on the investment returns of the so-called guaranteed fund, the bonus declarations of the office and, crucially, the seldom-disclosed annual capital charge required to provide the guarantee.

3.3 Annuities in the National Interest

> *… only the very richest can afford to take on the risk of their own longevity. (Richards & Jones, 2004:6)*

Section 2.3 summarises the most important issues, on a national scale, around annuities:

- Should annuitization be mandatory?
- Is there a need for insurers as providers?
- Should annuities be indexed against inflation?
- Should pooling be prescribed, permitted but not mandated, or even legislated against?
- Who should bear the financial risks?

These questions apply to South Africa as well.

Mandatory annuitization of at least part of the proceeds of the accumulation phase appears to be quite likely. South Africa's National Treasury clearly favours some compulsion, which would require those provident funds paying only lump sum benefits to modify their rules.

> *The new Retirement Funds Act should therefore prescribe the payment of only a modest proportion of the benefit in the form of a lump sum, with the balance being used to secure an annuity. (South African Government, 2004:36)*

This suggests a deepening of the already mature annuity market and an extension of the market towards the middle and lower income parts of the population in which provident fund coverage is more widespread. This magnifies the importance of addressing the issue of cross-subsidy by socio-economic class.

It would appear fairly clear that the insurance industry in any country plays a very important role in the annuity market, representing probably one of the most efficient mechanisms for delivering this risky type of insurance. Some countries prefer to separate annuity providers from other insurers but that is a separate discussion.

Less clear for South Africa is whether more needs to be done to encourage (or force) insurers to distinguish more finely between groups of annuitants rather than pooling across all characteristics except age and sex.

In this section, I draw together some of the discussion on anti-selection and the annuity market place and ask whether the annuity market in South Africa is able to provide longevity insurance to the aged poor.

A very unusual marketplace

In some ways, this strange market appears to favour the participants over the providers. After all, anti-selection effects arise because those that elect to purchase annuities have an information advantage, supposedly, over those that provide them, believing themselves to be about to live longer. And so providers protect themselves against this effect by pricing in the assumption that they will.

Do annuity providers price annuitants as a single group or do they allow for factors that indicate differences in mortality experience? They price in factors, but only some factors. Providers in all countries allow for the age of the annuitant and their sex[55]. In some countries the market is deep enough for impaired life annuities to be developed, providing better value to individuals with poor health, consequently a poorer expectation of life.

South African providers have considered this approach, but only one has, to date, launched an impaired life annuity product, Metropolitan Life[56]. And the reason for the scarcity of special-price annuities is fairly simple: existing providers stand only to spoil their book because they are able currently to sell annuities to impaired lives at standard rates. If special rate classes are set up, either the provider stands to lose money on the main book of business or they must change the pricing, making the annuities at standard rates less attractive.[57]

The same applies to pricing annuities for the poor. There is little doubt that the poor have lower standards of living, lower quality of health and, to put it bluntly, die earlier on average. This is supported by the evidence in the section that follows. The poor deserve better annuity rates, but there is no incentive to providers to give this to them.

The sheer perverseness of the annuity market comes to the fore here, for the money is to be made from the healthy and wealthy, generally in the same group. Not surprisingly, data on mortality of the poor aged is hard to come by. In the section that follows I take a very simple look at the theoretical rates that might be offered to the poor.

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[55] To be more accurate, providers price for the sex of the annuitant where permitted to. Some countries require providers to charge the same price for males and females. This is not (currently) the case in South Africa. There are a number of papers discussing the advantages and disadvantages of such an approach. See for example an easy-to-read discussion of the situation in the US in Campbell & Munnell (2002).

[56] Channel Life also provides annuities on special terms, but I understand that these are available to smokers only. Their rates appear to be some 5% - 7% above the average for standard lives, whereas the terms on which Metropolitan sells its impaired life annuities are considerably more generous than that.

[57] Responses by the larger offices to the Metropolitan Life launch of impaired life annuities will be interesting. As soon as a credible alternative appears providing better rates, the argument for other offices that launching impaired life annuities threatens their own book no longer applies because they risk losing their future impaired life annuitants to a competitor.

Annuity pricing on the fly

The continuous statistical investigations committee of the Actuarial Society tells me that mortality statistics of annuitants by income group are not available. Extrapolating from life insurance information is possible, but may give the wrong picture. Instead I have used a study carried out by the Continuous Mortality Investigation (CMI) of the Institute and Faculty of Actuaries (CMI, 2005) which sets out the ratio of mortality rates for varying amounts of pension. The information was presented as a chart, but is set out numerically in Table 4 for clarity.

Table 4. Ratio of mortality rates (q_x) by pension amount

	Annual pension			
Age	**> £13,000**	**£8,500 - £13,000**	**£4,500 - £8,500**	**< £4,500**
60 – 64	1.00	1.60	2.10	1.95
65 – 69	1.00	1.35	1.85	1.85
70 – 74	1.00	1.30	1.65	1.90
75 – 79	1.00	1.10	1.45	1.60
80 – 84	1.00	1.20	1.40	1.45
85 – 89	1.00	1.00	1.25	1.30

Source: CMI (2005)

The only available South African comparison appears in the assured lives mortality investigation in O'Malley *et al* (2005). The authors of that paper compute mortality experience in three bands according to the sum assured, greater than R250 000, between R100 000 and R249 999, and less than R100 000. For males aged between 60 and 64, relative mortality rates, using 1.00 for the highest sum assured are just below 1.10 in the middle band and just over 1.60 for those lives with the lowest sum assured. The equivalent figures for females are, respectively, just over 1.00 and approximately 1.80.

There are important differences between the experience of assured lives and annuitants so comparison across these groups should be exercised with care. We also do not know how these three bands might compare with the four from the UK experience in terms of distribution of participants. The South African assured lives figures do at least tell us that the UK CMI statistics might credibly be applied to a South African annuitant population as well.

As is well known, the distribution of income in South Africa is more skewed than in the United Kingdom. The GINI coefficient, a measure of this 'skewness', where a high number

is more skewed, is 58.4 for South Africa[58] against 32.6 for the UK (World Development Indicators, 1998). This supports the view that mortality differentials between the rich and poor are greater in South Africa than in the UK. Some would argue that it also suggests much weaker demand for annuities at lower income, a fallacious argument were the policy objective fair access and value for money.

Turning back to the evidence of mortality differentials in the UK, the figures may look impressive, but they are not helpful on their own. Table 5 shows the impact of this additional mortality in terms of the theoretical annuity rate that follows. Base mortality for the wealthy group is PA90(M) and the table shows the percentage impact dependent on the interest rate at which the annuity is calculated. The model used to determine these differences is based largely on the model used to calculate the money's worth ratios.

Table 5. Calculated annuity rate increases based on mortality multiples in table 1: PA90(M)

	Annual pension			
Discount rate	**> £13,000**	**£8,500 - £13,000**	**£4,500 - £8,500**	**< £4,500**
0%	0.0%	11.9%	31.1%	36.7%
2%	0.0%	10.7%	27.5%	32.1%
4%	0.0%	9.7%	24.4%	28.2%
6%	0.0%	8.8%	21.8%	25.0%
8%	0.0%	8.0%	19.6%	22.3%
10%	0.0%	7.3%	17.8%	20.1%

Source: CMI (2005) and author calculations. Mortality for the wealthy assumed in line with PA90(M). All calculations apply to an annuitant aged 65.

Note: percentages are higher at higher ages, lower at lower ages and lower assuming lighter mortality (for females, for example). See tables in appendix.

Please note that, while these figures are the simplest to calculate, they probably represent a worst case scenario. The equivalent tables assuming other underlying mortality experience and annuity structure are set out in the appendix: as PA90(M) may be too strong a mortality basis annuitants, PA90(M) with a 5 year downwards age adjustment[59] is used as an alternative, producing numbers significantly lower than these. At a discount rate of 8% members of the poorest socio-economic class would have annuities priced to

[58] *This is one of the highest in the world, comparable to Colombia (57.2), Guinea-Bissau (56.2), Kenya (57.5) and Brazil (60.1), and much higher than Nigeria (45.0) and Madagascar (43.4).*

[59] *A 65-year-old is assumed to experience mortality in line with the 60-year-old under the PA90(M) table, quite a significant adjustment.*

give a payment rate 16.5% higher than for the wealthiest, compared with 22.3% in the table above. See Table A2 in the appendix for details.

For annuities with guaranteed terms, one of the most effective protections against high mortality within the arena of conventional annuities[60] for male annuitants without age adjustment, the corresponding improvement is 9.1%. Refer to Table A3 for the complete analysis.

For females – see Table A4 – the impacts of the mortality adjustments are also weaker. The equivalent annuity at the lowest level of annuity gives a payment rate 14.0% higher than at the highest.

For a combination of these, the difference would be still smaller. At a discount rate of 8%, for a female annuitant with a ten year guarantee and mortality of PA90(F) adjusted downwards by five years, the difference is 6.2% at the lowest level of annuity compared with the highest.

Is there evidence of larger mortality differentials in other studies?

Some literature appears to provide evidence that larger mortality differentials emerge from other methods of stratification. Richards & Jones (2004) quote the equivalent change in interest rate from annuity size as 0.36% annually, while regional differences amount to 0.37%, differences between the top two lifestyle groups as 0.40% and between the top and bottom lifestyle groups 1.75%. Their research thus appears to show lifestyle differential having a much stronger relationship to mortality experience than annuity size.

The authors quote the source of their analysis – Prudential generalised linear mortality model – but not the details of their comparison. I find their equivalent interest rate difference significantly lower than mine, which ranges from 0.6% to 1.9% for males on PA90(M) with a 10 year guarantee and 1.3% to 3.6% for males with the same mortality and no guarantee.[61,62] The CMI figures that I have used appear therefore to encapsulate the full range described by the top and bottom lifestyle groups used by Richards & Jones.

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[60] *A drawdown strategy is even more effective.*

[61] *My numbers are also calculated from the 5% discount rate that they suggest.*

[62] *Consider the implication of these percentages. Providing to the group with the poorest mortality the same annuity as the group with the best mortality is equivalent to taking away returns of up to 3.6% per year. Again, note that this is the worst case scenario: in the case of males with a ten year guarantee, the largest equivalent interest rate difference is 1.7% and for females with a ten year guarantee and lighter mortality than PA90(F), the gap would be still smaller with a calculated maximum difference of 0.9% per year. This is still not insignificant.*

Comments on results

I show the results in Table 5 to one decimal place with hesitation because that may convey an inappropriate impression of precision. The point is that annuities in the UK theoretically priced for the poor would provide considerably better rates than for the wealthy. A range for this difference of between five and twenty percent is not unreasonable.

Would the same apply in South Africa? There is little doubt that, if a significant mortality difference exists in the UK along the income axis[63] a significantly mortality difference can be assumed also for South Africa. And there is a strong argument that the differential would be greater in this country. The strong social security environment in the UK, for example, probably sustains the health of the low-income aged better than the equivalent low-income South African elderly population.

How one defines the 'poor group' is obviously not easy, but there appears to be sufficient evidence to suggest that, were the poor provided annuities at rates fair to them as a group, they would be priced significantly more generously than for the annuitant population as a whole.

This conclusion might be tempered slightly by the observations that:

- there is an extent to which annuitants select according to their expected mortality experience, the wealthiest postponing annuitization altogether,
- members of the low-income groups are likely to experience the most rapid improvements in mortality, and
- the fairly common practice of spreading fixed costs across the annuity book as a percentage of the consideration slightly counteracts the impact of differentials as larger annuities are subsidised by smaller.

These do not appear sufficient to address the fundamental concern that pricing does not recognise the well-established relationship between socio-economic status and mortality experience.

The poor cross-subsidise the wealthy?

A case can be made, then, that the poor annuitants cross-subsidise the wealthy. This surely illustrates the inherent perverseness of the annuity market. Most environments provide cross-subsidy in the opposite direction: tax tables are designed to redistribute to the poor, social security plays a redistributive role and fixed charges in financial products

[63] *The CMI research shows that this difference exists by pension amount, but it is probably fair to say that the same relationship applies if the annuity amount proxy is replaced by total income. Simply put, the poor have lower pensions than the wealthy.*

might be designed to meet fixed costs but they also play a part in cross-subsidising the poor.

Annuity providers have no real incentive to provide more competitive annuity rates because the market for such rates is small and because it compromises the profitability *and* competitiveness of the existing book.

Part of the counter-argument is that there are very few poor South Africans purchasing annuities at present. "As the annuity books of life offices in this country are dominated by the wealthy," the reasoning continues, "concerns about cross-subsidy, while theoretically interesting, are of little practical use in this market."

This line of argument is counter-productive. Firstly, we have a strong indication from policymakers that compulsory annuitisation is likely to be extended from the pension fund to the provident fund environment, increasing the number of annuitants and almost certainly increasing the proportion of annuitants from lower socio-economic classes. Second, just because there are not many poor South Africans purchasing annuities does not mean that it is acceptable to continue a practice that discriminates against the poor. Third, if it is true that the pool is dominated by the wealthy, then this group of annuitants does not have much to lose were annuity prices to stratify by social class, but the poor, a smaller group, certainly have much to gain.

In their discussion concerning annuity markets, the World Bank has noted that annuities are not always appropriate to the poor and that pooling works to the disadvantage of the poor. Since the insurers in this country pride themselves as developers of the underprivileged, the importance of this issue to them cannot be overstated. But market competition alone is not going to bring about a change – for it would surely have done so already were that the case – and alternatives are difficult to determine.

Value for money to those who most need it

What are the options available for providing more appropriately priced annuities to the poor? Those more likely to die early are taking on a type of longevity risk when they purchase an annuity designed to pay out for longer than they are expected to survive. This is exacerbated by their exposure to improvement in mortality experience for the annuitant pool that comes from better access to medical facilities that the poor are unlikely to have.[64]

The thoughts discussed in more detail below cover the areas of:

- product design

[64] *I acknowledge that the issue of better equality of medical access is being addressed in South Africa, but it will certainly only partly address the inequality.*

- mandatory provision of an impaired lives product
- compulsory underwriting
- mandatory stratification of the applicant population
- centralised provision

Product design that compromises this so-called 'longevity risk' might reduce the inequity but it cannot address it properly. Thus, an annuity that pays a bonus on death would reduce the financial risk of early death, for the annuitant, and the extent of the cross-subsidy between participants in a heterogeneous pool. But the essence of the problem would remain, unless the death benefit is sufficiently large to cancel it, in which case the annuity loses its essential characteristic of longevity insurance. Adverse selection would remain as those in good health would not select this product and the same types of market stratification would emerge as in the next suggestion.

Since an impaired life annuity market has not emerged naturally in South Africa, the government might feel the need to impose it, licensing annuity provision only if an impaired lives alternative is also provided. This might be the only way to improve the rates available to the poor, but such centrally imposed requirements almost always result in a number of consequences that would be difficult to anticipate and control. For example, if this were to work, it would have to force certain requirements, like a minimum difference in annuity terms between normal lives and impaired lives and some limit to the degree of underwriting required to define a life as impaired. It would be extremely complex to apply and possibly give rise to more perverse incentives than exist at present.

A variation on this would be to make the type of underwriting required for life cover compulsory for annuity provision, in theory levelling the information inequity between applicant and provider. This too is unlikely to work because underwriting itself is a competitive differentiator. If this approach were to work it would have worked already by virtue of the free market. Underwriting is also not cost free, so average annuity terms could be expected to worsen.

A variation on the imposition of an impaired lives category as a condition for licensing annuity provision would be some compulsory stratification of the population of applicants with free market pricing within strata. Using an objective measure, like income, would, in theory, make this approach more practical than the previous. But unintended consequences are likely to abound again. And any measure would need to be clear and preferably publicly available, which could incentivise applicants to present incorrect information, like understated income.

Centralised provision might be the only approach that would overcome the dynamics preventing the natural or regulated development of a fair annuity market for the poor. And it need not be as dramatic as a government entity. A non-profit organisation with an insurance licence could be set up with the approval of the regulator to provide annuities at

better-than standard rates to applicants with poorer-than-average life expectation. Some source of financial underwriting would probably be required and government itself would probably have to provide this. The alternative of forcing levies on existing providers to sustain such an entity might seem attractive but would also be difficult to implement practically.

Centralised provision would be difficult to implement. It appears to run philosophically contrary to free market principles, but it would seem that the annuity market is not a free market in any case. I have also pointed out the important role of insurers in the annuity market. Centralised or separately licensed providers may not be able to play the role as effectively as insurers, resulting in greater risk and poorer terms to participants. But one of the spin-offs of such an entity is that it might stimulate the natural development, among commercial providers, of impaired life annuities. A non-free-market intervention may play a key role in stimulating the operation of the free market.

There are also many variants on this centralised provision. Many old age systems around the world are supported by a safety net from government, a minimum pension to those that have not been able to accumulate sufficient assets over their working lives to sustain themselves adequately in their old age. This is a type of support to the annuity market, but it could also be extended to private sector annuities in the form of a guarantee at the lowest level. Government thus shares some of the risk, providing a social service in the process.

It is not my intention to recommend an approach, but to provoke discussion. Original thinking is clearly required.

Post script: indexation and other annuity types

This discussion would not be complete without references to two more issues.

Indexation of annuities appears to be on the cards, particularly as a result of the pension legislation that imposes this requirement on pension funds. It would be inappropriate for Government to require indexation of providers without recognising (1) that it has an obligation to develop a liquid market of index-linked debt and (2) that international research has shown how difficult it is for providers to safely earn returns in excess of the index-linked risk-free return, making value-for-money difficult to provide to annuitants.

This research has excluded with-profit and income drawdown annuities, but should some of the principles covered in this note result in changes to the non-profit annuity environment, their application to other annuity types must be considered as well.

4 IMPLICATIONS & FURTHER RESEARCH

Is it just me, or are pensioners getting younger these days? (Elizabeth, the Queen Mother, The Sunday Times, July 2001)[65]

I conclude the paper with some thoughts on the implications of the analysis in this paper and thoughts on further research.

4.1 The National Savings Fund

This paper is essentially about how to provide security of income after retirement, with a strong emphasis on fair treatment for the poor.

The most obvious application of this is the proposed National Savings Fund, designed almost exclusively for the poor. Early drafts of government proposals for this fund suggest that it is aimed at those earning below the tax threshold, in other words low-income workers or those employed periodically. A number of issues need to be addressed if this mechanism is to work, not least providing sufficient motivation to save in the first place. Assuming that the barriers to saving are addressed, the key question then is how income is to be accessed after retirement. If the Latin American mandatory savings model is to be followed, some combination of annuitization and drawdown might be permitted. At least South Africa does not need to consider the problem of developing the capability to offer annuities from scratch.[66]

If partial or full annuitization is encouraged or enforced, some effort should be made to ensure that the terms on which annuitization is offered are equitable. Since the existing annuity market appears to be efficient and competitive,[67] I am reasonably optimistic that the best way to make reasonable value available to annuitants retiring from the National Savings Fund would be to encourage active competition.

Rating would be difficult for providers, of course, because the mortality experience of this group is not well understood. It would be in the interest of participants for the authorities to encourage research into the mortality experience of this group well in advance of any proposed launch to address the potential for pricing at launch to include a significant margin for provider risk.

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[65] *Collins Quotation Finder,* ***HarperCollinsPublishers, Glasgow***

[66] *I should add that I am not in a support of a universal review of the right of existing insurers to offer annuities. I have made it clear that the role of insurers in this market is crucial.*

[67] *… putting aside the philosophical problem that the market has little incentive to segregate annuitants more fairly…*

I have found no evidence to suggest that the charges component of non-profit annuities is unduly high, but it should be expected that costs as a percentage of the lower average consideration (and the annuity) would be higher. Consideration should be given to options to reduce these costs: some form of centralisation of administration would help, private or publicly managed.

Providing special rates to this distinct group of annuitants might increase the call for better rates to be given to the group in the middle, those currently purchasing annuities on terms disadvantageous to them as a group. And it might provide incentive to providers to segment the market more actively. Still, careful deliberation of all alternatives ought to be undertaken.

4.2 Further Research

The most significant gap in this analysis concerns the money's worth ratio for the South African market, which we cannot calculate without a reliable estimate of annuitant mortality. To be complete, a comparison with population and assured life mortality should be calculated as well, with reference to international experience.

The analysis of money's worth ratio should be extended to the with-profit annuity sector, which should demonstrate the impact of capital charges on value for money, though it is difficult to argue that capital charges are all bad if they provide smoothed consumption in old age. I would be interested also to see research into the income drawdown environment, for two reasons:

- The profile of those postponing full annuitization through drawdown affects the corresponding profile of the annuitants, hence their expected experience.
- It is difficult to market these products objectively since they must, to some extent, play on the fear of early death. Does this practice compromise on best advice and how does it affect the pattern of eventual annuitization?

Further research into the mortality experience of the elderly poor would provide an extremely important basis for determining the extent of the cross-subsidy from the poor to the wealthy and may encourage policymakers to take active steps to encourage the development of annuity products for the poor and for wealthier impaired lives. The most important source of information concerning the mortality experience of the very poor is the old age social security system itself: a very large pool of the country's poorest. A comprehensive study into the mortality experience of this group would be invaluable.

Concerning more general information of annuity mortality experience by socio-economic status (or even simply by annuity size), the major players in the insurance industry probably have the best information, but do not have the incentive to develop this fundamentally different marketplace. I applaud the first steps taken by Metropolitan Life to change the status quo.

4.3 Final Thoughts

> *In the future, actuaries working on annuities will need (1) to invest much more time in understanding and analysing the risks that they are writing; (2) to develop more sophisticated tools for analysing these risks; (3) to devise a variety of annuity products covering different market sectors; [and] (4) to be much more selective about the business that they will or will not write. (Wadsworth, 2002:24, formatting altered)*

The argument of the South African annuity industry is that we do not have the depth of market to find room for more sophisticated rating and, to put it bluntly, better value for money to a wide cross-section of annuitants. While acknowledging that it is the absolute size of the market that counts when considering additional rate classes, the figures suggest that the local industry is strong and robust. It is certainly competitive.

There is no evidence to suggest that the rates available to the pool of annuitants, considered as a whole, provide poor value for money to participants. But the market has little incentive to address the fundamental philosophical problem with pooled rating: the cross-subsidy of the wealthy by the poor. Perhaps things need to change.

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APPENDIX DETAILED DATA TABLES

Quoted annuity rates

Table A1: Quoted annuities rate per R100 000 consideration

Company	*Monthly annuity rate (rank)*			
	Age 55	**Age 60**	**Age 65**	**Age 70**
Male				
Old Mutual	R752.97 (2)	R799.94 (2)	R856.14 (3)	R920.59 (3)
Momentum	R721.90 (5)	R772.12 (5)	R825.98 (5)	R885.58 (5)
Metropolitan	R737.34 (4)	R793.19 (3)	R857.42 (2)	R929.14 (2)
Liberty	R746.53 (3)	R792.13 (4)	R847.28 (4)	R913.35 (4)
Sanlam	R754.60 (1)	R800.04 (1)	R859.53 (1)	R933.17 (1)
Arithmetic average	***R742.67***	***R791.48***	***R849.27***	***R916.37***
Female				
Old Mutual	R701.43 (2)	R734.20 (2)	R778.39 (4)	R835.39 (5)
Momentum	R682.48 (5)	R724.88 (5)	R781.94 (3)	R844.07 (3)
Metropolitan	R684.54 (4)	R729.40 (3)	R786.17 (2)	R855.64 (2)
Liberty	R691.62 (3)	R728.82 (4)	R778.31 (5)	R842.19 (4)
Sanlam	R714.64 (1)	R751.71 (1)	R802.13 (1)	R869.19 (1)
Arithmetic average	***R694.94***	***R733.80***	***R785.39***	***R849.30***

Notes: rates are for voluntary purchase single-life monthly annuities, assumed payable in arrears, from the age indicated, with a guarantee period of 10 years.

Source: Personal Finance (2005:94). Effective date: 1 July 2005

These figures have been confirmed by Moonstone Information Refinery. They cover only the providers offering non-profit annuities at standard rates, though Metropolitan Life appears to offer two sets of rates to standard lives, the other set through their Odyssey platform slightly better than those indicated here. These have been excluded from the average to avoid double-counting the life office.

Metropolitan also offers substantially better rates to impaired lives, with different levels of enhancement depending on the severity of impairment. Channel Life offers slightly improved rates to smokers, some 5% - 7% better than the averages above.

Annuity rates differentiated by income: alternative underlying mortality

Table A2. Calculated annuity rate increases based on mortality multiples in table 1: PA90(M) – 5years

	Annual pension			
Discount rate	**> £13,000**	**£8,500 - £13,000**	**£4,500 - £8,500**	**< £4,500**
0%	0.0%	8.7%	23.6%	28.2%
2%	0.0%	7.8%	20.6%	24.5%
4%	0.0%	7.0%	18.2%	21.3%
6%	0.0%	6.3%	16.1%	18.7%
8%	0.0%	5.7%	14.3%	16.5%
10%	0.0%	5.2%	12.8%	14.7%

Source: CMI (2005) and author calculations. Mortality for the wealthy assumed in line with PA90(M) with a 5 year age adjustment downwards, in other words assuming lighter mortality. All calculations apply to an annuitant aged 65.

Table A3. Calculated annuity rate increases based on mortality multiples in table 1: PA90(M) with 10 yr guarantee

	Annual pension			
Discount rate	**> £13,000**	**£8,500 - £13,000**	**£4,500 - £8,500**	**< £4,500**
0%	0.0%	6.9%	17.1%	20.3%
2%	0.0%	5.8%	14.0%	16.6%
4%	0.0%	4.8%	11.5%	13.5%
6%	0.0%	4.0%	9.4%	11.1%
8%	0.0%	3.3%	7.8%	9.1%
10%	0.0%	2.8%	6.4%	7.5%

Source: CMI (2005) and author calculations. Mortality for the wealthy assumed in line with PA90(M). All calculations apply to an annuitant aged 65 and, in this case, the annuity is guaranteed paid for ten years.

Table A4. Calculated annuity rate increases based on mortality multiples in table 1: PA90(F)

	Annual pension			
Discount rate	**> £13,000**	**£8,500 - £13,000**	**£4,500 - £8,500**	**< £4,500**
0%	0.0%	7.4%	20.2%	24.3%
2%	0.0%	6.6%	17.6%	21.0%
4%	0.0%	5.9%	15.4%	18.3%
6%	0.0%	5.3%	13.6%	15.9%
8%	0.0%	4.8%	12.0%	14.0%
10%	0.0%	4.3%	10.7%	12.4%

Source: CMI (2005) and author calculations. Mortality for the wealthy assumed in line with PA90(F) without adjustment. All calculations apply to an annuitant aged 65.