Annuity Margins in the UK

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Abstract: The UK requires individuals with private pensions to annuitize by the age of 75. Using data on annuity rates over time, we calculate the financial cost of annuitization in terms of reduction in yield relative to alternative sources of wealth holding. We find that for a typical 65-year old male, annuitization typically involves a reduction in yield of the order of 1 percent. Selection effects, related to the lower mortality probabilities of those who annuitize, explain a large portion of this cost. Costs are raised by delaying annuitization, and by opting for real over nominal annuities.

Keywords: annuities, implicit yield, reduction in yield, annuity margin, adverse selection

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I. Introduction

Annuitization is often perceived to be among the more difficult areas of social security privatisation and reform. For example, an issue brief in the World Bank's (1994) *Averting the Old Age Crisis* identified several core problems associated with private annuities markets, including adverse selection, mortality risk, and high commissions. In addition to these core problems, other potential concerns include the yields on private annuities and the lack of consumer education. In the UK, which requires individuals with pension accounts to annuitize them by 75, annuity yields have been falling in tandem with interest rates for nearly a decade. This decline has resulted in demands for greater flexibility with respect to annuitization while also drawing attention to potential markups on annuities (particularly in the wake of the UK personal pension 'misselling' episode, which has resulted in large amounts of compensation for individuals who were poorly advised to take out high cost personal pensions).

The UK has a long history of mandatory annuitization of pension funds, dating back to the Finance Act of 1921. The UK's experience with compulsory annuitization, along with the existence of inflation-indexed annuities that are less common or non-existent in many other countries, provides a unique setting in which to investigate the operations of private annuities markets and derive possible policy lessons. Lessons from the UK are particularly relevant for other European countries that are expanding their private pension systems to cope with demographic change. Many of the issues that the UK now encounters will be relevant for these countries in the future.

This paper assesses the overall financial cost to the UK consumer of annuitizing his or her pension fund at retirement.[4] It examines costs for two main types of annuity products on the market: level and indexed, and considers how costs vary by age at annuitization and by policy size. It then explores changes in annuity costs over the past decade. Finally, it draws conclusions based on the empirical findings.

An annuity provides a stream of income until one's death in return for an initial premium. The implicit *ex ante* yield on an annuity is the return on the purchase price of the annuity, taking account of the individual's expected longevity. This yield can be compared with the yield on alternative forms of wealth holding, such as risk-free government bonds. The cost of the annuity, or the *annuity margin*, can then be examined through the reduction in yield (e.g., in basis points per year) associated with investing in an annuity relative to alternative investments.

An alternative way to examine annuity costs is to compare the purchase price of the annuity with the present discounted value of the future income stream. The ratio of the two is known as the *money's worth* of an annuity (for examples see Mitchell, Poterba, Warshawsky and Brown, 1999 on the United States; and Brown, Mitchell and Poterba, 1999, Finkelstein and Poterba, 1999, and Murthi, Orszag, Orszag, 1999b on the UK; James and Vittas, 1999 provide international comparisons). In this paper, we employ the reduction in yield approach. This approach has the advantage of highlighting costs in an easily understandable fashion: as differences in rates of return. This transparency, in turn, facilitates cost comparisons across age groups and countries, and provides an intuitive basis for comparison with other financial services (in terms of annual costs relative to assets under management). In addition, treating costs as occurring on a continual basis (i.e., as a continual reduction in yield relative to alternative sources of wealth holding) is attractive because many of the possible sources of costs arise continually throughout the life of the contract (Friedman and Warshawsky, 1990).

The sources of annuity costs may be grouped under two categories: administrative charges and selection effects (Friedman and Warshawsky, 1990; Mitchell, Poterba, Warshawsky and Brown, 1999). Administrative costs reflect all the costs that the annuity provider bears, such as marketing the annuity, providing commissions to agents, investing the proceeds, covering company overheads and capital requirements, and generating profits. These administrative costs, it is often surmised, can add up to significant sums, particularly in private markets in the absence of regulation.

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[4] In a related paper -- Murthi, Orszag and Orszag (1999a) -- we examine the financial costs during the accumulation stage of personal pensions.

Selection costs, on the other hand, are more subtle. Selection occurs in the annuities market because people with longer-than-average life expectancies are more likely to purchase annuities, and more likely to purchase larger annuities, than people with shorter-than-average life expectancies. (Given the mandatory annuitization rules in the UK, selection may occur both because of selection in who holds individual accounts during the accumulation phase and the *timing* of annuitization.) The insurance companies that sell annuity policies consequently price them based on the longer life expectancies of the annuitants. A typical person with average life expectancy must therefore pay a higher price for an annuity than would be justified on the basis of average life expectancy.

It is worth making two additional points about selection in annuities markets. First, selection may arise both from socio-economic differentials in mortality as well as asymmetric information. To the extent that insurers in the UK rarely use socio-economic factors in pricing, the observed socio-economic differentials could well be due to asymmetric information arising from the costs of verifying asset or income data accurately. Therefore, it is debatable how much of the selection effects are due to adverse selection and how much are due to objective un-priced mortality differentials among risk classes. Second, selection costs are a financial loss only relative to the actuarially fair annuity for that typical individual. They do not necessarily show that the annuitant fails to gain in utility terms from the purchase of an annuity. Nor do the lower rates of return necessarily suggest that annuities are 'dominated' by other forms of wealth-holding, since other assets do not provide insurance against longevity.[5]

[5] For further discussion of the expected utility of purchasing an annuity see Mitchell et. al. (1999).

The main findings of the paper are:

- First, for 65-year males, the annuity margin is roughly 1 percent per year.[6] In other words, the typical 65-year old can expect a yield over his lifetime that is roughly 1 percent less than that implied by anticipated population mortality and the current yield structure on riskless government bonds.

- Second, the pure administrative cost loading on annuities is relatively low. The main source of reduction in yield or cost is therefore due to selection effects. These findings are consistent with research on annuities markets elsewhere (e.g. United States, see Poterba and Warshawsky, 1999).

- Third, annuity costs rise with age. Annuity margins are significantly higher when annuitization takes place close to the mandatory upper limit (75 years) than earlier.

- Fourth, real (inflation-indexed) annuities are considerably more expensive than nominal annuities.

- Finally, although annuity margins have been roughly constant for the past five years, they are higher than they were a decade ago.

These findings are discussed in more detail in the remainder of this paper. In the next section, we discuss the framework used for computing the annuity margin and describe our data. Section 3 presents our results. In the final section, we place the results in a wider context and draw implications for policy.

II. Annuity Margins: Theoretical Framework and Data

An annuity provides a stream of income until one's death in return for an initial premium. A standard way of evaluating the value for money of such a contract is to compare the expected present discounted value (EPDV) of the future

[6] Results for similar for female life annuities and joint annuities.

income stream with the initial premium paid. The EPDV of a single life annuity can be written as:

$$EPDV = \sum_{t=1}^{T} \frac{A_t * S_t}{\Pi_{j=1}^{t}(1+i_j)} \tag{2.1}$$

where A_t is the payout at time t, S_t is the probability that the annuitant survives until time t, i_j is the one-period rate of time preference at time j, and $\prod (1 + i_j)$ is the discount factor at time t.[7] The ratio of the EPDV to the purchase price is known as the money's worth ratio (MWR). For an individual deciding on which type of annuity to buy, an annuity with a higher money's worth ratio provides greater value for money. In general, the money's worth ratio depends on the purchase price, the size of the future income flow, the individual's subjective assessment of mortality risk, and his or her rate of time preference.

The MWR approach, while intuitive, does not easily lend itself to comparisons of value for money across products for different ages, sexes, or countries, because the effective duration of the products differ. In order to develop a measure of value for money that is more amenable to such comparisons, we start with Eq. (2.1) but make the interest rate, rather than the EPDV, the variable of interest. Specifically, we wish to find an interest rate sequence i_j which solves:

$$R = \sum_{t=1}^{T} \frac{A_t * S_t}{\Pi_{j=1}^{t}(1+i_j)} \tag{2.2}$$

where R is the annuity rate on the market. For example, if the term structure is flat, $i_j = \bar{i}$, and solving for $\bar{i}$ gives the internal rate of return on an annuity. Alternatively, if a zero-coupon term structure involves interest rates r_j, we can let $i_j = r_j + m$ and solve for m, which then provides the interest rate margin implicit in the underlying annuity rate. We thus refer to m as the *annuity margin*, since it represents the reduction in yield relative to the returns on underlying investment vehicles. For each set of interest rates r_j, we can derive a different annuity margin.

[7] It is fairly straightforward to extend this framework to other types of annuities, such as joint life annuities or those with a minimum guarantee.

In this paper, we consider two alternative interest rates: the yield on UK government bonds and the the yield on UK bonds issued by the European Investment Bank (EIB). Like the high grade corporate bonds insurance companies typically hold in their portfolio, the yield on EIB bonds is higher than that on UK government gilts to compensate for the slightly higher levels of risk on the EIB bonds. In general, given the need for insurance companies to generate a reasonable profit and the administrative costs associated with annuity products, we expect *m* to be positive (that is, we expect annuities to provide a return that is below the opportunity cost of funds). The difference in the two yields is a measure of the cost of the annuity contract.

Table 1 presents data on annuity payouts for male life annuities for the week ending April 28, 2000. The data are from Ratetracker, a product of the Research Department, which reports various annuity rates from the 15 to 20 major providers in the market. Table 1 has data on both level annuities (on which the payout is fixed in nominal terms) and indexed annuities (on which the payout is indexed to the retail price index). Payouts are presented for three ages (65, 70, and 75 years), and two policy sizes, one small (purchase price £10,000) and other large (purchase price £100,000).[8]

The top panel shows that a 65-year old man purchasing a typical £10,000 level annuity could expect to receive an annual payment of £872 for life. Not surprisingly, annuity payouts increase with age (since there are fewer years over which the payments are expected to be made). Thus a 70-year old man would receive an annual payout of £1,032 a year, and a 75-year old man £1,250 a year. The initial payout is lower for an indexed annuity. A 65-year old would expect to receive a starting payment of £633 for an indexed annuity, compared to the £872 for a level annuity. Payouts are also more generous for larger policies. For an initial premium

[8] In addition to age, gender, type of annuity (level or indexed) and policy size, the precise payout depends on payment frequency (monthly, semi-annually, or annually), whether payment is in advance or in arrears, and whether there is a guarantee period. Our data assume that payments are made monthly, in advance, and that there is no guarantee. Pension annuities may also be 'open-market options' or 'compulsory purchase'. In this paper we focus on the former. Murthi, Orszag and Orszag (1999b) show that there is little difference between these two segments of the compulsory market.

of £100,000, individuals receive a payout that is more than 10 times the payout from a £10,000 policy, irrespective of age and policy type.[9]

Table 1 also gives an indication of the degree of dispersion at the upper end of the market. In general, there is a small difference (typically less than 3 percent) between the average (median) rate and the fifth best rate. Differences between the average and the top rate are greater, on the order of 6-7 percent. The top half of the market thus tends to be closely clustered, suggesting that the market is highly competitive, at least for those who search for the best price.

As mentioned above, we consider mortality from two perspectives, the average person and the average annuitant. For general population mortality, we use the current projections of the Government Actuary's Department (GAD).[10] For the mortality experience of annuitants, we use reports from the Continuous Mortality Investigation Bureau (CMIB), an industry body which collects information on mortality and morbidity of individuals insured by life-insurance companies. The CMIB also publishes mortality projection factors based on past mortality improvements for use in actuarial valuations. We use tables and factors currently in use, available from CMI Reports 16 and 17.[11]

Table 2 gives an indication of mortality differences between the general population and annuitants. The table presents expected mortality for the cohort of men attaining the age of 65 in 2000. Annuitant mortality is presented in terms of both 'lives' (individual death rates) and 'amounts' (deaths weighted by policy size). We focus for the moment on the 'lives' column. The 'amounts' figures are discussed further below. Looking at the 'lives' column, we see that annuitant mortality is

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[9] The only exception is the best quote in the market for indexed annuities. The issuing company, Standard Life, does not appear to offer significantly better rates to large policy holders who buy indexed annuities.

[10] The tables currently in use (ELT15) are based on the mortality experience of the UK population during the period of the 1991 Census. Mortality improvements are assumed to approach a rate of 0.5 percent per annum over a 40-year horizon. We are grateful to Steve Smallwood for making these data available to us.

[11] The tables (PML92 and PMA92) are based on the mortality experience of annuitants during 1991-94. For the projections, mortality at each age is assumed to decrease exponentially over time to a limiting value, with the speed of convergence depending on age. At $t=\infty$, the reduction in mortality varies between 45-70 percent. See Part 6, CMIR No. 17, available from http://www.actuaries.org.uk.

considerably lighter than mortality among the general population. We expect annuity rates to reflect the fact that insurers are pooling mortality experience among a group that has higher survival chances than the population as a whole. In terms of yields, we expect to find higher yields if we use annuitant mortality in place of general mortality, since the payout period is longer based on annuitant mortality. Correspondingly, we expect to find lower margins or costs (since the costs arising from selection are not relevant). Indeed, the margin computed using annuitant mortality provides an estimate of 'pure' administrative costs since it nets out the cost component that may be ascribed to the greater longevity of the annuitant population.

It is not clear to what extent the difference in mortality experience is due to private information on the part of the annuitants as opposed to their income and wealth background. There are significant differentials in mortality by socio-economic class in the UK. Table 3 provides evidence on mortality by socio-economic class from the latest survey of health inequalities in the UK.[12] For example, during 1987-91, men aged 60-64 in classes I-II were nearly 40 percent less likely to die before reaching the age of 65 than men in classes IV-V. Some of this difference may be reflected in lower-than-average annuitant mortality since most self-employed, part-time workers, and others at the lower end of the income scale are not covered by occupational pension schemes that comprise the bulk of annuitants. On the other hand, occupational schemes do cover those in heavy manual occupations, who often have higher-than-average mortality.

In addition to mortality differences by class, there are other features of the annuities markets in the UK that encourage higher mortality individuals to opt into separate risk categories. Insurers offer "enhanced life" annuities with better payouts for those with lower-than-normal life expectancy. As more people take these annuities, the average life expectancy of the remaining pool rises.

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[12] See Health Inequalities Decennial Supplement, Office for National Statistics, September 1997. The data are for England and Wales and cover the period 1987-91. Social class is assigned on the basis of occupational status (employee, self-employed, unemployed) and job sector. For further discussion of class differentials in mortality among the British population, see Coleman and Salt, 1992. The seminal Whitehall studies on income and mortality experiences within the British Civil Service are discussed in Michael Marmot et. al., 1991, pages 1387-93.

Individuals may also act on private information on their mortality prospects. Although annuitization is mandatory, it may be delayed up to the age of 75.[13] Private information on mortality may encourage individuals to opt for withdrawals from their pension fund (subject to the legal maximum) until the age at which they can no longer put off annuitization, since this strategy would allow the possibility of bequest of one's pension savings. Short-lived individuals may thus drop out of the pool of annuitants.

Selection effects may also be evident in the size of the policy. Those who buy larger policies tend to live longer. This effect can be seen from the 'amounts' column in Table 2, which presents expected mortality weighted by policy size (rather than numbers of people). As before, the role of socio-economic background versus individual behaviour is unclear. Richer people have higher pension savings and live longer. Equally, a small policy could be indicative of someone who has chosen to draw down his or her pension saving (up to legal maximum) in anticipation of an early death.

Finally, to compute annuity margins, we use two sets of interest rates: the yields on UK government bonds and the yields on European Investment Bank UK pound bonds. These data are available for maturities ranging from 1 to 30 years, with gaps. We fill in the term structure by assuming that yields for missing maturities are identical to immediately adjacent periods. So, for example, for UK government bonds where yields are available for maturities from 2 to 30 years, the 1-year yield is assumed to be the same the 2-year yield, and yields beyond 25 years the same as the 25-year yield. For discounting nominal cash flows, we use nominal yields. For indexed annuities, we treat the real payout as fixed and discount using real interest rates.

[13] For a fuller discussion of the rules governing annuitization in the UK, see Appendix.

III. Annuity Margins in the UK

Our main findings are presented in Tables 4 through 6 and Figures 1 and 2. Computations are for male life annuities and use the average (median) market rate.[14] Mortality tables and interest rates are the ones discussed previously. Table 4 presents the yield equivalent for level annuities on April 28, 2000, while Tables 5a and 5b present annuity margins assuming alternative interest rates. In Table 6, we examine indexed annuities, while in Figures 1 and 2 we turn to trends over time.

Table 4 shows the yield equivalent on level annuities purchased at three different ages. For the average individual, who expects his mortality to be in line with the general population, the expected yield on an annuity is on the order of 2 to 4 percent, depending on age. For the individual who expects to live longer, the return is higher since the payout period is longer. For the average annuitant, the expected return is of the order of 4 to 5 percent. Although we do not show the calculations here, these yields are close to the best that can be attained by searching within the top end of the market (see Table 1 for information on dispersion in annuity rates). However, they are frequently below the contemporary yields on risk-free fixed-income instruments such as government bonds. This difference allows us to compute the annuity margin, to which we will turn to below.

Table 4 also highlights the fact that annuity returns fall with age. Thus a typical 65-year who annuitizes on reaching the statutory retirement age can buy an annuity which yields significantly more over his (expected) life-time than an individual who postpones annuitization till the age of 75. The higher yield on age 65 annuities is related to two factors. First, the majority of individuals annuitize at the statutory retirement age and competition in this segment of the market is intense. Firms may offer relatively high payouts to 65-year olds in order to acquire market share and achieve economies of scale. Second, there may be an element of selection in the decision of when to annuitize. Late annuitization is often the preferred option of the relatively well-off who have other sources of income to sustain them in

[14] Results for female life annuities and joint and survivor annuities are very similar to that for male life annuities. For a detailed examination of these types of annuities, see Murthi, Orszag and Orszag, 1999b.

retirement. This adverse selection will lead to underwriting losses if insurers continue to provide payouts that are actuarially fair to annuitants as a whole.

Table 4 also points to higher yields for those with larger policies. Since there are fixed costs in writing an annuity contract, the lower yield on small contracts may be a reflection of the fact that fixed costs are a larger proportion of a small contract than a large one. However, those purchasing large contracts are also likely to be richer and longer-lived. From the yield estimates, it appears that savings in administrative or other costs in the case of large policies more than compensate insurers for the likely longer duration of payment.

Tables 5a and 5b provide estimates of the annuity margin. From the viewpoint of the average individual whose alternative investment is government bonds (5a), the 'cost' of buying a £10,000 policy is a reduction in yield of 122 basis points if he is a 65, rising to 309 basis points if he delays till 75. Individuals expecting higher longevity would perceive the costs as lower. Thus a 65-year average annuitant would perceive a reduction in yield of 29 basis points, while a 75-year old would perceive a reduction of 123 basis points. These figures also provide an estimate of the 'pure' administrative charge loading on annuities. The difference in yields by policy size discussed in the previous paragraph is reflected in Table 5a in terms of lower margins on large policies. A 65-year average annuitant purchasing a £100,000 policy would perceive a marginal improvement (1 basis point) over government bond yields (as opposed to a loss), while a 75-year old would perceive a loss of 98 basis points (relative to 123 basis points).

A comparison of costs using the different annuitant mortality tables (lives versus amounts) is also instructive. The lives table is more relevant from the individual's point of view as the individual is concerned with expected yield over his lifetime. The insurer, on the other hand, is more concerned with likely payout per £ of premium collected. For the insurer, the amounts table is the more relevant. When we compare the two columns for a £10,000 annuity, we see that what appears as a reduction in yield relative to government bonds to the 65-year old individual is a *loss* to the insurer. In other words, when mortality is weighted by the premiums collected, the insurance company appears to expect to pay out more on the annuity

contract than it can earn via investment in gilts. The same is true for annuities for 70-year olds. Only given the higher margins charged on annuities for 75-year olds does the insurance company move into profits, expecting to earn 42 basis points above gilts.

Annuities may be written at rates that are higher than yields on gilts because insurance companies invest in riskier but more rewarding assets such as EIB bonds. Table 5b utilises the EIB bond rate to compute the annuity margin. From the viewpoint of the average insurance company that is likely to invest in corporate bonds, the margin on a £10,000 policy is 87 basis points for a policy sold to a 65-year old, rising to 135 basis points for a 75-year old. Margins are lower on larger policies, 56 basis points and 209 basis points respectively, for a £100,000 policy. The average annuitant who may access the higher returns afforded by the corporate bond market faces a greater reduction in yield than previously: 156 basis points if the £10,000 annuity is purchased when he is 65 rising to 234 basis points if it is purchased when he is 75. As before, the larger the policy the lower is the likely cost in terms of forgone yield.

Table 6 draws attention to differences in yields between level and indexed annuities. Yields are significantly lower for indexed annuities and margins higher. An average 65-year old purchasing an indexed annuity for £100,000 can expect a return of 0.45 percent over his lifetime. At 70 years and above, the expected return is negligible. Correspondingly, annuity margins are high: 162 basis points at 65 rising to 340 at 75. Returns look a little more promising for the average annuitant, but margins remain high relative to level annuities. The high cost of inflation insurance may help to explain why indexed annuities have proved to be relatively unpopular in the UK.[15] It would be hard to ascribe the higher cost to the cost of bearing inflation risk, since insurers can avoid some if not all of this risk through inflation-indexed bonds. A part of the explanation may lie in selection effects since indexed annuities,

[15] The annuity broker Annuity Bureau reports 83.5 percent of its customers buy level annuities and only 5.3 percent opt for any type of escalating annuity (see Peter Quinton, "Good News for Innovators", *Pensions Management*, June 1999, p. 82). The proportion of the population purchasing level annuities may be even higher than these figures suggest because of the composition of the consumer base of the Annuity Bureau.

which provide greater value in the later years of life, are likely to be favoured by those who expect to live long.

We now look at trends in yields and annuity margins over the 1990s. Figures 1 and 2 provide insight into whether the findings discussed above for April 2000 are typical. For simplicity, we focus on one type of annuity (level) for one age group (65-year olds).[16] Income streams are discounted using the term structure of yields on UK government bonds prevalent at the time the annuity was written. Likewise, mortality assumptions are contemporary. We present calculations using one set of mortality tables: annuitant (amounts).[17] The choice of example is not significant. Our findings are similar for other annuity types using alternative assumptions regarding interest rates and mortality.

Figure 1

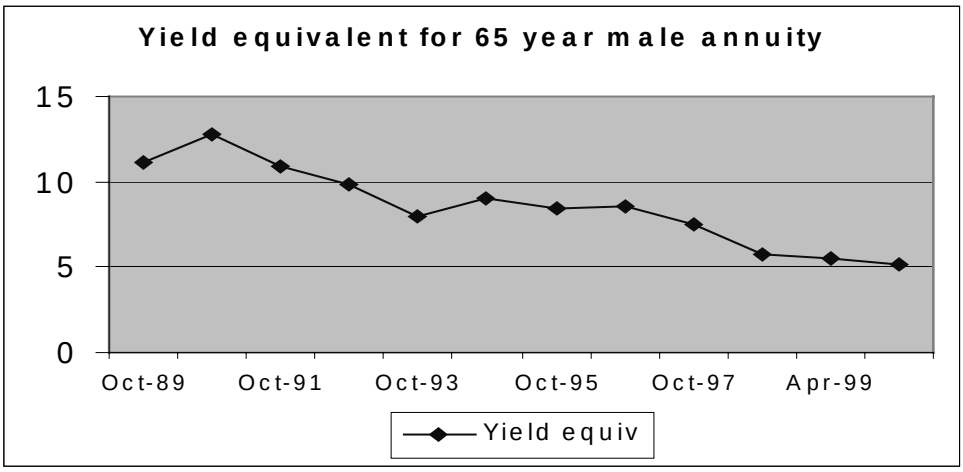
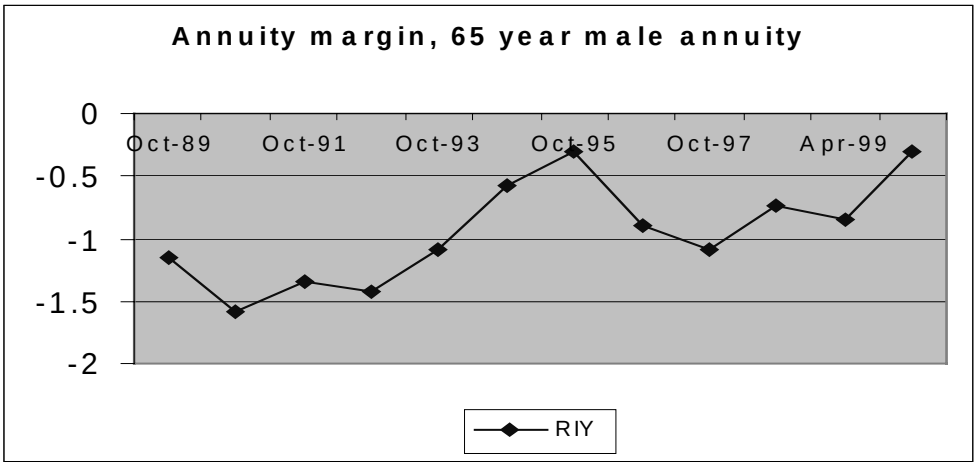


Figure 1 draws attention to the decline in annuity yields since the early 1990s. This decline is clearly related to the fall in market interest rates. Yields have fallen from 10-12 percent in the early 1990s to half that level (5-6 percent) more recently. This decline underlies much of the disquiet in the UK with mandatory annuitization.

[16] The data are for level annuities, payable in advance, with a five year guarantee.

[17] For 1989-1998 we use PMA80, the base (period) tables that were in use at the time and allow for improvements in mortality probabilities of 4 percent per year at all ages (see MacDonald, 1996 on trends in annuitant mortality in the 1960s and 1970s). For 1999-2000, we use PMA92,

Figure 2



Accompanying the decline in yields has been a decline in annuity costs as measured by the reduction in yield (see Figure 2). Whereas annuities were written at rates of return that were 150-100 basis points below gilt yields in the early 1990s, since the mid 1990s they have been written at 50-100 basis points below gilt yields. The lower margins observed in the latter half of the 1990s may be ascribed either to growing competitiveness in the industry or to falling costs.

IV. Discussion and Conclusion

Our results suggest that for the typical 65-year old man, the cost of annuitizing a pension upon retirement implies a reduction in yield of around a 1 percent over his expected lifetime relative to investing in government bonds. A large part of the forgone yield arises from selection (i.e., the greater longevity of those who buy annuities). The administrative cost element is relatively small. For a £10,000 annuity, the administrative cost element would reduce the yield by 29 basis points a year. In other words, less than one-fourth of the overall reduction in yield (29 out of 122 basis points) may be attributed to administrative costs. For most of the cases considered in the previous section, the administrative cost component is less than a

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the base tables that became available in 1998 and allow for mortality improvements in line with CMIR 17 (see footnote 9 for details).

half of the overall cost. The one exception is indexed annuities, which are discussed further below.

How do costs of this magnitude compare with costs incurred at the earlier stage when the consumer is accumulating pension savings? Even if we include the costs of selection, annuitization costs are relatively low in the UK compared to the costs of accumulation. A simple way to compare costs at the two stages is in terms of the impact on accumulated pension saving. In a no charge scenario, an individual would be able to annuitize his pension savings at actuarially 'fair' rates that reflect his mortality probability. Although he would have to pay some intermediation costs for the services provided by the insurance company, there would be no costs associated with factors such as monopoly profits earned by the insurer in imperfectly competitive markets. The 'loss' to the consumer from market imperfections (including selection) can be estimated as the ratio of annuity yields in the two scenarios, one without charges and one with charges. Table 5a provides some guidance on the size of this financial 'loss'. For the average 65-year old buying £10,000 annuity, if prices were in line with general population mortality, the expected lifetime yield would be 4.56 percent. With selection, it is reduced to 3.65 percent, or by around 20 percent. For larger annuities, the 'loss' is lower e.g. it is 18 percent for £100,000 annuity. Some of this reduction in value is owed to normal intermediation costs, including the normal profits of the annuity provider. Thus a smaller figure, say 10 or 15 percent, would be a reasonably conservative estimate of the financial losses associated with annuitization. In Murthi, Orszag and Orszag (1999a), we found that the historical level charges during the accumulation stage of a personal pension amount to 36 percent of the accumulated balance on average.[18] These figures suggest that the annuitization phase is thus significantly less costly than the accumulation phase in the UK, although that at least partly reflects the high level of accumulation charges.

[18] The figure takes account both of charges imposed on personal pension individual accounts and the effect of low persistency. See Murthi, Orszag, and Orszag (1999a) for full details. With the advent of Stakeholder Pensions and a 1% cap on total charges, there has been a dramatical fall in both the level and degree of frontloading of charges in 1999 and 2000.

Our finding that annuitization costs are low relative to accumulation costs is consistent with other features of the annuities market in the UK. Although IFAs who advise on annuities are typically paid through commission, commissions tend to be low relative to other financial products. Moreover, once sold, annuities are relatively easy to administer. This would tend to keep administrative costs low. Unlike personal pensions, pension annuities are irreversible, so providers do not bear any lapse risk. Annuities are also a useful balance against life insurance liabilities, so providers may be willing to sell them at quite competitive prices. It may also be the case that consumers benefit from economies of scale in the annuities market. While there are no publicly available quantity data by company in the UK, we were able to piece together market share data using the regulatory returns of the insurance companies.[19] In 1997, the top 4 annuity companies had 63 percent of the market. By comparison in 1997, the market share of the top 4 insurance companies in terms of new premia for pension business was 34 percent and for overall life insurance business was 20 percent. On the consumer demand side, two further factors may contribute to relatively competitive pricing. First, annuities are 'commoditised', so it is easy for consumers or advisers to compare rates across products. Second, purchases are for relatively large amounts, so customers have an incentive to search extensively.

While annuity costs are low relative to accumulation costs, we find evidence of relatively high costs for some products, notably indexed annuities. This is an area that requires further investigation. We believe the high costs are due to a combination of greater selection effects and the greater difficulty of matching real liabilities with real assets. The high cost of indexed annuities quite likely acts as a deterrent to investing in a product that provides a fixed income in real terms. This has important implications for public policy. The fact that the bulk of annuitants buy level products means that most annuitants will see their real pensions erode over time, with implications for poverty rates among the elderly and the call on state benefits. The fact that indexed annuities are more expensive also carries implications for financial planning under private defined contribution schemes, especially in

[19] We used Form 47, Col. 3, Line 10 (Non-linked, non-profit single premium pension policies) for non-linked annuity policies. Analysis of many of the 1997 raw DTI returns of top companies suggested that this was a reasonable estimate.

comparison to public pay as you go (PAYG) pension systems. Most PAYG social security arrangements provide price-indexed benefits in retirement. Given the greater costs of indexed annuities, savings in private defined contribution plans will need to be higher if the purpose is to replicate the indexed aspect of state arrangements.

We also observe that annuity costs rise with age, so the highest costs are paid by those who annuitize at the statutory upper limit. Postponing annuitization can thus have a significant independent cost on retirement income. This fact needs to be brought to bear in modelling the annuitization decision.[20]

Finally, we need to point out that out that our results have a number of important caveats. Perhaps the most important is that our focus is on means, not distributions. Although we find the annuities market to have low costs relative to the accumulation phase for the typical worker, a large fraction of individuals may not be getting good yields on their annuity purchases. The paradox arises because relatively unsophisticated investors with small pension funds often do not exercise their option to buy an annuity from the most competitive provider in the market.

A further caveat relates to mortality assumptions. As indicated, mortality improvements in the UK have been far greater than previously anticipated. An analysis of yields and margins that takes full account of mortality risk may well yield higher yields and lower costs than our risk-neutral calculations would suggest.

[20] For further discussion of the individual's annuitization decision see Khorasanee, 1996, Milevsky, 1998, Kapur and Orszag, 1999.

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Table 1: Annuity Payouts (£s) Per Year for Males

Week ending 28 April 2000

Payouts based on a purchase price of £10,000 or £100,000 (in parentheses)

	Age 65	***Age 70***	***Age 75***
Industry Average			
Level	872	1,032	1,250
	(8,942)	(10,481)	(12,694)
Indexed	633	777	978
	(6,533)	(8,177)	(10,187)
Fifth Best			
Level	906	1,041	1,285
	(9,081)	(10,563)	(13,020)
Indexed	633	791	1,016.
	(6,611)	(8,183)	(10,214)
Top Rate			
Level	941	1,114	1,378
	(9,634)	(11,367)	(14,003)
Indexed	703	865	1,093
	(7,032)	(8,652)	(10,932)

Notes: Each entry indicates the yearly income in pounds accruing from an open-market option annuity policy with no guarantee period, payable monthly in advance.

Source: Ratetracker (The Research Department)

Table 2: General Population and Annuitant Mortality Projections (x 100) for Men Attaining 65 in 1999-2000

	Population	***Annuitants***	
		Lives (PML)	Amounts (PMA)
Age:			
65	2.1	1.4	1.0
70	2.9	2.4	1.8
75	4.9	4.0	3.2
80	7.7	6.4	5.6
85	11.8	10.1	9.3
90	16.9	15.1	14.4
95	23.4	21.5	21.1
100	31.3	29.1	28.8
105	45.3	37.4	36.7
110	66.7	45.8	44.4

Notes: Each cell gives the probability (x 100) that a person aged *x* dies before reaching age *x+1*.

Source: Government Actuary's Department (population mortality) and Continuous Mortality Investigation Reports Nos. 16 and 17 (annuitant mortality).

Table 3: Abridged Life Tables by Socio-Economic Class, England and Wales, 1987-91

	I-II	***III M***	***IIIN***	***IV-V***	***All***
Age:					
60 - 64	0.08	0.10	0.08	0.13	0.10
65 - 69	0.13	0.16	0.15	0.19	0.16
70 - 74	0.20	0.25	0.23	0.29	0.25
75 -79	0.29	0.36	0.33	0.38	0.35
80 - 84	0.41	0.48	0.45	0.52	0.47
85 - 89	0.64	0.62	0.56	0.62	0.61
90+	1.00	1.00	1.00	1.00	1.00

Notes: Each cell indicates the probability of a person in the relevant age group dying before reaching the next age group. Socio-economic classes range from I (highest) to V (lowest). Class III is divided into Manual (M) and Non-Manual (N) occupations.

Source: Health Inequalities Decennial Supplement, Office for National Statistics, September 1997.

Table 4: Yield Equivalent of Level Male Life Annuities (%)

Week ending 28 April 2000

	Purchase Price £10,000			***Purchase Price £100,000***		
	Population Mortality	Annuitant Mortality		Population Mortality	Annuitant Mortality	
		Lives	Amounts		Lives	Amounts
Age 65	3.65	4.56	5.16	3.97	4.87	5.47
Age 70	3.06	4.35	5.08	3.29	4.57	5.31
Age 75	2.10	3.93	4.75	2.35	4.19	5.00

Notes: Calculations use the industry average annuity rate.

Table 5a: Reduction in Yield (Annuity Margin) of Level Male Life Annuities (%)

Week ending 28 April 2000

Interest rate: *Government Bond Yield*

	Purchase Price £10,000			***Purchase Price £100,000***		
	Population Mortality	Annuitant Mortality		Population Mortality	Annuitant Mortality	
		Lives	Amounts		Lives	Amounts
Age 65	1.22	0.29	-0.31	0.92	-0.01	-0.60
Age 70	1.96	0.65	-0.08	1.74	0.44	-0.30
Age 75	3.09	1.23	0.42	2.84	0.98	0.17

Notes: Calculations use the industry average annuity rate and the term structure of yields on UK government bonds.

Table 5b: Reduction in Yield (Annuity Margin) of Level Male Life Annuities (%)

Week ending 28 April 2000

Interest rate: *European Investment Bank UK Pound Bond Yield*

	Purchase Price £10,000			***Purchase Price £100,000***		
	Population Mortality	Annuitant Mortality		Population Mortality	Annuitant Mortality	
		Lives	Amounts		Lives	Amounts
Age 65	2.48	1.56	0.87	2.17	1.25	0.56
Age 70	3.14	1.85	0.99	2.92	1.63	0.77
Age 75	4.18	2.34	1.35	3.93	2.09	1.09

Notes: Calculations use the industry average annuity rate and the term structure of yields on EIB bonds.

Table 6: Yield Equivalent and Reduction in Yields of Indexed Male Life Annuities (%)

Week ending 28 April 2000

Interest rate: Government Bond Yield, Purchase price: £100,000

	Yield Equivalent			***Reduction in Yield***		
	Population Mortality	Annuitant Mortality		Population Mortality	Annuitant Mortality	
		Lives	Amounts		Lives	Amounts
Age 65	0.45	1.39	2.07	1.62	0.68	0.01
Age 70	0.00	1.30	2.14	2.18	0.86	0.02
Age 75	0.00	0.73	1.69	3.40	1.55	0.59

Notes: Calculations use the industry average annuity rate and the term structure of yields on UK government bonds.

Appendix : Annuitization Requirements in the UK[21]

The Finance Act of 1956 introduced the current requirement of annuitization before age 75, which it applied to individual pension accounts for the self-employed (the annuities were known as Section 226 Retirement Annuities). In 1988, when a broader form of individual accounts known as personal pensions were introduced, the system became somewhat more complicated:

- The portion of an individual account funded by National Insurance Contribution (NIC) rebates must be fully annuitized, and the annuity must be purchased at some point between age 60 and age 75. The annuity payments must be the same for men and women for a given age of annuitization: providers cannot provide lower annual payments to women to reflect their longer life expectancies. [22]
- The portion of an individual account funded by additional contributions does not have to be entirely annuitized. In particular, up to 25 percent of the accumulated balance from this component of the individual account can be withdrawn tax-free in a lump sum. If the account holder retires before the age of 75,[23] the rest of the account can be distributed in one of three ways: (1) an annuity purchased from a life insurance company, (2) an annuity purchased from the life insurance company providing the individual account,[24] or (3) an income drawdown facility, under which the retiree withdraws specific amounts of money while most of the balance continues to earn market returns. At 75, regardless of which option is initially chosen, the balance of the account must be converted into an annuity.[25]

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[21] For a complete overview of mandatory annuitization in the UK, see Oonagh McDonald, 1999.

[22] These 'protected rights' annuities must now also be (RPI) index-linked up to a maximum of 5 percent and be underwritten on a joint life basis, even if the individual is not married.

[23] Individuals designate a retirement age, normally required to be between 50 and 75, for their individual accounts.

[24] In practice in the UK, the vast majority of personal pensions are underwritten through life insurance companies or vehicles, from whom individuals also obtain their retirement annuity.

[25] There are a wide variety of annuity types, including level annuities, which pay the same amount in pounds for the term of the annuity; unit-linked annuities, which pay an amount linked to stock prices for the term of the annuity; index-linked annuities, which pay an amount linked to the retail price index for the term of the annuity; and with-profits annuities, which pay an amount linked to the profits of the provider. Other choices include whether the annuity is single life or joint; minimum guarantee or not; and the frequency of payment (monthly, quarterly, annual, etc.). A recent product introduced by Canada Life allows individuals to successively purchase five year temporary annuities, delaying lifetime

- All pension annuity income is taxed as ordinary income. The tax-free lump sum may be used to purchase an *immediate* (or 'purchased life' or 'voluntary') annuity, under which annuity payments are split up into returns on capital and income for taxation purposes. Since capital is taxed at lower rates, particularly for those on lower income, voluntary annuities have particular tax advantages. [26]

Workers do not have to begin receiving the two components of the individual account -- the part funded by NIC rebates, and the other part funded by additional contributions -- at the same time. If workers die before annuitizing their account, the balance of the account enters their estate. Individuals are not required to annuitize their account with the financial provider from the accumulation stage: under the so-called open-market option, individuals are allowed to annuitize their account with any life insurance company. In summary, although the system is complicated, it still involves (in most cases) a requirement to annuitize before age 75.

annuitisation until up to age 85. The annuities market thus presents a wide variety -- perhaps a bewildering variety -- of choices for retirees.

[26] One anomaly is that impaired life annuities involve less proportional tax relief because capital amounts are the same as ordinary voluntary annuities but income is greater.