The Stakeholder Pension Lottery? An Analysis of the Default Funds in UK Stakeholder Pension Schemes

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Abstract: Most defined contribution (DC) pension schemes give their members a degree of choice over the investment strategy to be followed with their contributions. Many schemes also offer a 'default' fund for members who are unable or unwilling to choose their own investment strategy. Previous research shows that where a default fund exists, the majority of members adopt it as the path of least resistance, meaning the provider's choice of default fund has the potential to have a significant effect on the welfare of the members. Given the importance of this decision by the pension scheme provider, we analyse the range of default funds offered by UK stakeholder pension schemes, which by law must offer a default fund. We find the default funds vary substantially in their strategic asset allocation and in their use of lifestyle profiles that switch the member's assets to fixed-income investments as the planned retirement date approaches. We use a stochastic simulation model to demonstrate that the differences can have a significant effect on the likely distribution of pension outcomes.

Key words: pension schemes; defined contribution; default funds; strategic asset allocation; lifestyle profile; stochastic simulation.

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1. Introduction

Defined contribution (DC) pension schemes are an increasingly common form of retirement income provision in the UK, the US and many other economies. Most DC schemes allow members a degree of choice about how to invest their contributions. Typically, a range of funds is offered in the scheme and the member can choose one or more of them in which to invest. Many schemes also have a default option that is automatically selected if the member does not actively choose a fund.

Previous research shows that a large proportion, and often the majority, of employees are inclined to take the 'path of least resistance' and passively adopt the default arrangements that exist in their scheme. For example, Choi *et al.* (2002) review US evidence on the tendency for members to accept scheme defaults for key features such as the contribution rate and the investment fund. Even though employees are free to opt out of default arrangements, very few actually do. In the schemes Choi *et al.* studied, between 42% and 71% of participants accept the default contribution rate and between 48% and 81% of scheme assets are invested in the default fund, which is typically a money market fund. In the UK, consulting firm Hewitt Bacon and Woodrow estimate that 80% of members in DC schemes accept the default fund choice (Bridgeland 2002).

The tendency of DC pension scheme members to accept scheme defaults means that the provider or scheme sponsor's choice of defaults has the potential to have a significant impact on the welfare of scheme members. In this paper we investigate this issue by analysing the variety of different types of default fund offered by UK stakeholder pension schemes.

Stakeholder pension schemes were introduced in the UK in April 2001 with the aim of providing a simple, carefully regulated savings product that could improve pension provision amongst low and middle-income employees. In essence, stakeholder pensions are personal pension arrangements operating on a DC basis and they share many of the features of other DC pension arrangements, for example, in terms of permissible contribution rates, the availability of benefits, and tax treatment. However, stakeholder schemes also have a number of specific features intended to make them easy for inexperienced investors to use.[2] The feature of interest to us is that the regulations require each scheme to have a default fund so that members do not have to make an active choice about how to invest.[3] The requirement to have a default fund and the public availability of data on most scheme's default funds makes the stakeholder pension market an interesting area in which to study what financial institutions think are appropriate investment strategies for 'uninformed' pension scheme members.

The stakeholder market is also a significant part of the UK pensions system. Stakeholder schemes are offered by most of the major insurance companies and asset managers in the UK. While they can be sold as retail financial products, they are often used by companies. The employer 'adopts' a scheme provider and employees can then enrol in the scheme. All employers who have five or more employees, and who do not provide a qualifying occupational pension scheme, must make a stakeholder scheme available to their employees, but do not need to contribute to it (Blake 2003). Figures from the Association of British Insurers (2003) show that stakeholder pension schemes had a total of 1.5m members as at June 2003, just over two years after their launch.

Our analysis of the default funds in stakeholder schemes finds substantial differences across funds in terms of their asset allocation and their use of lifestyle profiles that automatically switch the member's pension fund assets to fixed-income investments and/or cash as the planned retirement date approaches.[4] We use a stochastic simulation model to illustrate the different distributions of possible pension outcomes that the different fund structures

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[2] Stakeholder schemes must be flexible in that they have a low level of contractual minimum contributions (£20), no penalties for ceasing or reducing contributions, no penalties for transferring the fund to another arrangement, and total charges on the fund were initially capped at 1% per annum. From April 2005 stakeholder pension providers are allowed to charge a fee of up to 1.5% for each of the first ten years the pension product is held. After ten years the fee cap reduces to 1.0% (www.hm-treasury.gov.uk).

[3] Statutory Instrument 2000:1403.

[4] Lifestyle profiles are used in practice to attempt to reduce the risk that a fall in equity prices close to the planned retirement date reduces the member's retirement income. Various justifications for them have been provided in the academic literature. For example, if asset class returns are mean reverting then a strategy of investing in high-risk assets (i.e. equities) when retirement is some way off and a strategy of shifting to lower risk assets (i.e. bonds) as retirement approaches can be justified (Samuelson 1989). Bodie *et al* (1992) also argue that if an individual's human capital (i.e. future labour income) is less risky than equity, then at younger ages this capital will constitute a relatively high proportion of total wealth and thus can be balanced by investing a greater proportion of the individual's financial wealth in risky assets. As time moves on, the share of wealth accounted for by human capital declines and it makes sense to reduce the risk attached to financial wealth. Furthermore, younger individuals have more scope to increase their labour supply (i.e. how much they work) to make up for any shortfall generated by losses in financial assets.

generate for scheme members accepting the default arrangements.[5] The results of these simulations suggest that the choice of default fund can have a major impact on likely pension outcomes.

These results are of potential concern, especially in light of the evidence that most members of DC pension schemes passively accept the default fund chosen by the scheme provider. Unless the different choices of default funds made by different providers are somehow correlated with the characteristics of the members of the different schemes – and we know of no evidence to this effect – then scheme members face an effective lottery: their choice of investment strategy is driven by the provider's choice of default fund. This raises some awkward questions about the process by which providers select their default funds; it also raises issues about due diligence and whether the selection of default funds can be justified later on, especially if members are disappointed in the pension outcomes they eventually get.

The remainder of the paper is organised as follows. Section 2 reviews previous literature modelling DC pension scheme outcomes. Section 3 describes our data on the range of fund types offered as the default in UK stakeholder pension schemes. Section 4 outlines the simulation methods we use to assess the likely pension outcomes from the default funds, and Section 5 presents the results of the simulations. Section 6 concludes.

2. Previous Literature on DC Pension Outcomes

This paper should be seen in the context of earlier studies of the effects of alternative investment strategies on the anticipated outcomes of DC pension schemes. For example, Booth and Yakoubov (2000) used historical return data from the annual Barclays Capital *Equity-Gilt Study* to investigate the retirement income implications of five different investment strategies. They assumed the 'standard' fund was a constant 70% equity / 20% bonds / 10% cash split. This standard fund is combined with four lifestyle strategies – a switch to gilts over the ten years preceding retirement; a switch to cash in the final year before retirement; a switch to cash for the final three years; and a switch to bonds for the final three years. They found limited support for the superiority of lifestyle approaches, and

[5] We also emphasise that although our analysis is based on stakeholder pension schemes, it can be generalised to all defined contribution pension arrangements where there are similar default options.

also found that an equity-based fund in the ten years preceding retirement 'stochastically dominates' the cash– and fixed-income–based strategies – principally because of the higher expected return.

Blake *et al.* (2001) investigated similar issues using the 'PensionMetrics' stochastic simulation model. Amongst the asset allocation strategies they investigated were a pension-fund-average approach – invested across a range of asset classes in proportions typical of UK occupational pension funds in the late 1990s – and a lifestyle strategy that switches from the pension fund average into a 50% gilts / 50% T-bills portfolio over the final ten years before retirement. In addition, they also found that the overall distribution of potential outcomes is very wide. In line with Booth and Yakoubov, they found that a well-diversified, high-equity strategy (i.e. the pension-fund-average strategy) produces the best overall outcomes and that, while the lifestyle strategy avoids some of the worst potential outcomes, it does so by significantly reducing the expected level of pension.

A third study, Hibbert and Mowbray (2002), used a stochastic model to investigate the outcomes from a variety of asset allocation strategies (including 100% cash, 100% bonds, and 100% equity asset allocations, and various forms of lifestyle strategy). They too found that the 100% equity strategy produces the highest expected value of annuity, albeit with a wide range of potential outcomes. The lifestyle strategies significantly narrow the range of potential outcomes, but at the expense of reduced expected value, particularly where the lifestyle switch begins 15 years from retirement.

It is clear from these studies that the asset allocation strategy of a pension fund can make a major difference to prospective pension outcomes. All three previous studies found that equity-dominated strategies produce the highest expected outcomes, but with considerable dispersion in potential outcomes. They also found that lifestyle strategies could reduce this dispersion, but only at the cost of reducing the expected outcome.

Our work differs from the papers discussed above principally in that it focuses more directly on the fund structures actually offered as the default in UK stakeholder pension schemes. The following section describes these fund structures in detail.

3. Data on Stakeholder Default Funds

UK legislation requires stakeholder pension schemes to be registered with the Occupational Pensions Regulatory Authority[6], which makes the register available to the public. As at June 2004, 46 schemes were listed on the register and these schemes form the universe for our analysis.

Of the 46 schemes, we excluded two schemes on the grounds that they are replicas of other schemes on the register offered by the same provider, and a further nine schemes no longer accept new members and so no longer provide public information on their fund structures. This leaves 35 non-trivially distinct schemes on which we were able to collect data. The key variables of interest are the basic asset allocation of the default fund and the nature of the lifestyle profile used by the fund.

Table 1 shows the range of default funds in terms of fund type and lifestyle profile. Most schemes (19 of the 35) offer a 'balanced managed' type fund which is typically invested 50% to 60% in UK equities, and 20% to 30% in overseas equities, 10% to 20% in bonds, and up to 5% in cash. Most of the balanced managed funds are actively managed, but two use a passive approach. A further 13 schemes offer a 100% equity fund as default - seven of these are UK-only and six are invested globally. The global funds typically have a split of 70% UK equities and 30% (capitalisation-weighted) overseas equities. The vast majority of these funds use passive management. The remaining three schemes offer a with-profit type fund as the default, where the insurance company providing the fund uses reserves to smooth the investment returns from year-to-year. The with-profit funds are actively managed with an average underlying asset allocation of 50% UK equities, 10% overseas equities and 40% fixed-interest.

[Table 1 about here]

Some form of automatic lifestyle asset switching is the default for 17 of the 35 schemes. A further seven schemes offer lifestyle investing as an option, and 11 do not offer lifestyling at all. It is more common for lifestyling to be part of the default arrangements where the initial asset allocation has a high proportion of equities. For example, lifestyling is the default in six of the seven 100%-equity strategies, but not for any of the three with-profits strategies. This can perhaps be justified on the basis that the funds with lower equity weightings already offer members a degree of protection against market volatility.

Table 2 shows the range of lifestyle arrangements across the various stakeholder schemes where a lifestyle profile is part of the default arrangements. The most common structure (involving 10 of the 17 schemes with lifestyle defaults) is to start switching from the equity or balanced fund five years prior to retirement, moving progressively to a final year allocation of 75% long bonds and 25% cash. A further four schemes use the same 75:25 final year allocation, but begin switching either eight or ten years prior to retirement.

[Table 2 about here]

UK pension legislation requires that the benefits from DC pensions be taken via a (taxable) annuity with the option to take up to 25% of the value of the fund as a tax-free lump sum at retirement.[7] This explains why many lifestyle products switch from equities to a final pre-retirement allocation of 75% long bonds and 25% cash, the former to hedge the interest rate element of the annuity purchase[8], and the latter to protect the portion of the fund likely to be taken as a lump sum.

The Table shows, however, that is not the only approach in use. Other schemes use different final-year asset allocations: one scheme starts switching ten years prior to retirement with a final allocation of 100% long bonds, and the remaining two schemes offer lifestyle profiles that have a final year asset allocation of 100% cash.

It is apparent from these data that an individual joining a stakeholder pension scheme and passively accepting the default investment fund can get a substantially different asset

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[6] OPRA was succeeded in April 2005 by The Pensions Regulator, which continues to maintain the stakeholder register.

[7] Technically, it is possible to defer buying an annuity to age 75 by drawing an income directly from the pension fund, but in practice only those with substantial assets will be in a position to do this.

[8] Retirement annuities are priced on the basis of prevailing long-term interest rates and assumptions about the likely longevity of the person buying the annuity. Other things being equal, a given level of annuity will

allocation and lifestyle profile depending on which provider he, or his employer, has chosen. The following section attempts to quantify the significance of these differences by using a stochastic simulation model to assess the impact of different defaults on anticipated pension outcomes.

4. Simulation Method

The model we use is the PensionMetrics model of Blake *et al*. (2001). This model uses stochastic simulation to determine the anticipated distribution of pension outcomes, for any given set of input parameters, such as asset allocation strategy, anticipated retirement age, and so on. The details of the model are set out in the Appendix.

For the purposes of our modelling we make the following illustrative assumptions. The scheme member is a male who joins the scheme at age 25 and retires at 65 – the current state pension age for a male in the UK. We also assume that he contributes 10% of his salary each year to the stakeholder pension scheme and that the contributions are invested according to the strategic asset allocation of the default fund. A 10% contribution rate is close to the average rate observed in UK DC pensions – the NAPF Annual Survey (2003) reports an average employer contribution of 6.8% and a corresponding average employee contribution of 3.8%. The scheme member's wage growth experience is assumed to match that of a typical male employee in the UK and to simplify the analysis we assume that there is no risk to the accrual of pension benefits arising from unemployment or future work disability.[9]

When the scheme member reaches the retirement age of 65, the accumulated fund is converted into a single life annuity that provides a level income to him until he dies. The annuity rate is based on a long-term interest rate consistent both with the investment returns earned by the fund prior to retirement and with the 'PMA92' survival probabilities at age 65 taken from the mortality tables published by the Institute and Faculty of Actuaries: these

become more expensive to purchase as long-term interest rates fall. This can be hedged by holding a portfolio of bonds that will increase in value as long-term interest rates fall.

[9] The impact of differing career salary profiles, by gender and by type of occupation, on the retirement income from DC pensions is discussed in detail in Blake *et al.* (2004). For simplicity, in this paper we only consider one career wage growth profile, namely that of a typical male employee in the UK.

reflect the mortality experience of males buying pension annuities from UK life insurance companies.

To facilitate comparison with traditional defined benefit (DB) pension schemes, we take a DB pension accruing 1/60th of final salary for each year worked, and thus 2/3rds of final salary for 40 years of employment[10], as the benchmark against which we measure the outcomes delivered by the DC scheme. Our simulation results are expressed in terms of the ratio of the DC pension to the DB pension that would be achieved with the same salary experience and duration of membership – we denote this the 'pension ratio'. A pension ratio of unity implies that the DC pension scheme has replicated the pension at retirement that would be provided by a typical DB scheme.

In terms of the investment of the pension contributions, we create a number of stylised strategic asset allocation profiles based on our analysis in the previous section of the types of default fund offered in the UK. These are: 'Balanced Managed' – invested mainly in equities, but also in fixed-income and cash; 'Global Equity' – with a 70:30 split between UK and overseas equities; 'UK Equity' – 100% UK equities; and 'With-profits' – assuming a 50:10:40 split between UK equities, overseas equities and fixed-income. We use the median asset allocation of the relevant funds as the basis for the Balanced Managed profile. The asset allocation profiles are shown in Table 3.

[Table 3 about here]

For each initial asset allocation strategy, there are four lifestyle variants: no lifestyle; a move to 75% bonds and 25% cash that starts five years prior to retirement; a move to 75% bonds and 25% cash from ten years prior to retirement; and a move to 100% cash from five years prior to retirement. In each case the switch is assumed to take place in a linear fashion over the relevant time horizon. The lifestyle profiles are shown in Table 4. Together with the four initial asset allocation profiles, these give us a total of 16 representative asset allocation strategies.[11]

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[10] This is usually the maximum available from a final salary scheme to a member with a full service record.

[Table 4 about here]

We rely on two alternative parameterisations of the return processes. The first parameterisation is based on historical data, and assumes that annual returns on the assets in the pension fund follow a multivariate normal stochastic process[12] that is calibrated according to the realised real returns on key UK and international market indices over the period 1947 to 2003. The source for the returns is the ABN Amro / LBS data set discussed in Dimson *et al*. (2001) and available commercially through Ibbotson Associates. US equities are used as a proxy for overseas (i.e. non-UK) equities. Descriptive statistics for the returns are shown in the Appendix. While some funds are actively managed, no allowance is made for any (positive or negative) excess returns generated by active management. The returns received are also reduced by the pension fund annual charge, which is assumed to be 1.0% in line with the typical charge level on stakeholder pension schemes.

We also run alternative simulations using forward-looking investment return assumptions to account for the possibility that the historical realised equity risk premium is larger than can reasonably be expected in future. Some commentators argue that the historical equity risk premium is an upward biased estimate of the likely future risk premium. They claim that high historical equity returns were in part due to unexpectedly strong dividend growth and to a fall in the level of the required risk premium, neither of which can be relied on to boost future equity returns (e.g. Arnott and Bernstein 2002, and Dimson *et al*. 2001). Dimson *et al*. conclude that the best estimate of a global equity risk premium is about 3.4% relative to US Treasury bills, and Arnott and Bernstein (writing near the recent peak of the equity markets) make the case for an even smaller premium. We use the equity premium suggested by Dimson *et al*. to produce an alternative set of forward-looking nominal return parameters, which we adjust for pension scheme charges (1.0%) and expected inflation (2.5%). We leave the volatility and correlation structure unchanged as that derived from the historical data.[13] The return parameters are shown in Table 5.

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[11] Not all of these strategies are observed in practice, but for completeness we have presented all possible combinations of the observed default fund types and default lifestyle profiles.

[12] This was the simplest of the seven asset return models used in Blake *et al*. (2001). That study showed that the model for asset returns had considerably less impact on the estimated pension outcome than did the strategic asset allocation strategy.

[13] See Table A1. We use standard deviation and correlation figures based on annual returns. We do not take account of the possibility that the structure of risk and correlation over longer holding periods differs from that

[Table 5 about here]

As an aside, it is worth noting that UK Financial Services Authority rules require customers buying financial products to be issued with deterministic projections of the future value of their investment based on assumed investment growth rates of 5%, 7% and 9%. A review of these projection rates by the consulting firm PwC (FSA 2003) argued – partly based on Dimson *et al.* – that a reasonable forecast for the mean annual return for equities is 7.5% (nominal, pre-charges) and for bonds 4.5% in an environment where inflation is forecast to average 2.5%. These figures are consistent with the FSA's median projection rate for funds with asset allocations of approximately 85% equities and 15% bonds. Our adjusted return parameters are therefore also broadly consistent with the median rate in the FSA projection rules.

The following section presents the results of our simulations for the various default fund strategies.

5. Simulation Results

Table 6 shows the results of our historical-data-based simulations. We give the median and mean pension ratios for each of the 16 default fund strategies, together with measures of the dispersion of the results. All results are based on 5000 simulations using the PensionMetrics model.

[Table 6 about here]

Consistent with prior studies (Booth and Yakoubov 2000, Blake et al 2001, Hibbert and Mowbray 2002) the key conclusions are that the anticipated pension ratio varies significantly across asset allocation strategies, and that there is a wide range of possible pension outcomes for any given strategy.

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of a one year holding period, as argued by Campbell and Viceira (2005). It can be argued that in the context of financial planning, ignoring any mean reversion in investment returns is a 'prudent' basis for analysis.

The median pension ratio for the initial asset allocation strategies – i.e. without any lifestyle profile – ranges from 0.93 for the With-profit (WP) strategy (1) to 1.49 for the Global Equity (GE) strategy (5). Put another way, the WP strategy has a 50% chance of producing a pension of at least 93% of the DB benchmark (of 2/3rds of final salary), while the GE strategy has a 50% chance of producing a pension at least 149% of the DB benchmark. The Balanced Managed (BM) strategy lies in the middle with a median pension ratio of 1.25. The range of medians is, of course, largely explained by variation in equity content across the strategies considered.

While the median pension ratios for these strategies compare favourably against the DB benchmark, each strategy also generates a wide range of possible outcomes. The downside risk involved can be appreciated from the pension-Value at Risk (pension-VaR) figures. The Table shows that the 5% pension-VaRs range from 0.35 for the UK Equity strategy to 0.44 for the BM strategy. The interpretation in the case of the UK Equity strategy, for example, is that there is a 1-in-20 chance of the pension turning out to be below 35% of the DB benchmark, an outcome that implies that the scheme member's private pension would amount to less than 25% of his pre-retirement income.[14]

It is also notable that the WP strategy – which with a high fixed-income content would conventionally be regarded as a low-risk approach – produces a low median pension ratio and low standard deviation, but also has a 5% pension-VaR that is below that of some other strategies. This illustrates the potential 'reckless conservatism' associated with investing in low-risk–low-return assets over long investment horizons, with returns failing to keep pace with equity returns and / or long-term wage growth.

The lifestyle profiles used in several of the default arrangements are designed to reduce the risk that falling equity markets in the years immediately prior to retirement causes losses in the pension fund from which it would be difficult to recover. Table 6 shows that the lifestyle profiles (Strategies 5 – 16) do indeed have this effect. Each of the lifestyle strategies has a lower standard deviation of pension ratio and a higher 5% VaR than the corresponding strategy without lifestyling. However, the reduction in risk comes at a cost in the form of a

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[14] The pension scheme member would, of course, also be eligible for the basic state pension and, if total income was low, to certain means-tested state benefits.

reduced expected level of pension. For example, a ten-year lifestyling profile, switching towards bonds and cash, reduces the median pension ratio for the balanced managed strategy from 1.25 to 1.02.

The risk reduction benefits are, unsurprisingly, largest for strategies that have high initial equity contents (Strategy 2 vs. 8-10; 3 vs. 11-13) and lower for strategies that already have high fixed-income content (Strategy 4 vs. 14-16). The reduction in risk and in median pension ratio is greater when the lifestyle switch begins ten years from retirement rather than five years before (Strategies 6, 9, 12, 15). It is also interesting to note that for the five-year lifestyle profiles there is little difference between profiles with a final year asset allocation of 75% bonds and 25% cash (Strategies 5, 8, 11, 14) and those that end with 100% cash (Strategies 7, 10, 13, 16): the median pension ratios, standard deviations and 5% pension-VaRs are nearly identical in all cases. Though a switch to long gilts is usually recommended as a hedge for annuity rates, our simulations suggest that long gilts are of little greater benefit than cash in protecting the annuity purchasing power of the pension fund.

The simulation results in Table 6 show that higher equity strategies generally lead to higher pension ratios. However, this is due in part to the high equity risk premium (of over 7%) used to parameterise the model. To accommodate the possibility that this equity risk premium is too high looking forward, Table 7 presents simulation results based on our alternative, and arguably more realistic, forward-looking return projections, which incorporate a lower equity risk premium. The results of Table 7 indicate that a smaller assumed equity premium leads to a dramatic drop in both the median and mean pension ratio for all of the strategies, and also to a narrowing of dispersion across the different strategies. The range of pension ratios for strategies without lifestyling (Strategies 1, 2, 3, 4) now runs from 0.59 to 0.66 – indicating pension replacement rates of only 40%-45% of pre-retirement salary, which are below what many would consider to be necessary for a comfortable retirement. The 5% pension-VaRs are of more concern, ranging from 0.19 to 0.28 – corresponding to a 1-in-20 probability of pensions less than 13%-to-19% of final salary. Lifestyle profiling again produces reductions in risk, with lower standard deviations and higher 5% pension-VaRs. Lifestyle profiling is therefore less risky, but this risk reduction still comes at a price in terms of a lower median pension ratio, but this ‘price’ is much lower than is the case in Table 6.

[Table 7 about here]

The pension ratios shown in Tables 6 and 7 are based on an assumed annual contribution rate of 10% of salary over 40 years of pension scheme membership. On the basis of the forward-looking (low equity risk premium) return estimates used in Table 7 – which are consistent with the FSA requirements – the 10% contribution rate does not produce replacement ratios that many people would find attractive. This is important because, as noted above, 10% of salary is a common contribution rate in practice (NAPF 2003).

Table 8 presents the contribution rates that would be required, based on the lower-equity risk premium simulations, to produce a median pension ratio of unity – in effect to have a 50% chance that the DC pension will replicate the pension produced by a DB scheme accruing 1/60th of salary for each year worked.[15]

[Table 8 about here]

The required contribution rates range from 15.2% for a GE strategy with no lifestyling, through to 17.9% for a WP fund that begins switching to bonds and cash ten years prior to retirement. It is interesting – but not surprising – to note that these rates are consistent with total contribution rates paid into occupational DB pension schemes. (See NAPF 2003 p. 42.) At these contribution rates the 5% pension-VaR levels range from 0.31 (i.e. 20% of final salary) for the UK strategy to 0.55 (37% of final salary) for the WP strategy with a 10-year lifestyle switch. So even with relatively high contribution rates, these stakeholder pension default funds remain risky for the pension scheme members.

Disturbing as these results might be, it is should be noted that the analysis we have performed is relatively *generous* to the stakeholder schemes in comparison with traditional DB pension schemes. One reason for this is that we have assumed that the stakeholder pension fund is used to buy an annuity with a level stream of payments, payable only to the scheme member until death, and we ignore any further benefits that could be provided by the

[15] These figures can be derived by dividing the initial 10% contribution rate by the median pension ratio in Table 8.

annuity. However, most DB pensions, at least as currently structured, allow for indexation of the pension in line with retail prices up to some specified maximum, such as 5% per annum, and for a 50% pension payable to the spouse after the death of the member. Replicating these benefits from the DC scheme would raise the annuity cost by approximately 40% to 65% – either reducing the pension ratio or requiring a corresponding increase in contributions.[16]

6. Conclusion

We have shown that a wide variety of different strategic asset allocation profiles are offered as the default fund in stakeholder pension schemes in the UK. Our simulations also show that the choice of these characteristics can have a significant effect on the range of retirement incomes likely to be experienced by scheme members. Where scheme members passively accept the default arrangements, as behavioural economics research suggests the majority do, then the provider's choice of default fund type will be a crucial determinant of their subsequent retirement income.

Our findings raise important questions about how providers choose their default funds. It is possible that differences in the choice of default fund might be explained by differences in membership characteristics (e.g., age, salary profile, risk aversion, etc.) across different schemes. We do not have access to data that will allow us to test this hypothesis. Furthermore, any attempt to explain differences along these lines would be complicated by the fact that the schemes we have examined are generic arrangements that can be adopted by any employer and, in many cases, purchased by individuals through retail financial channels. This may make it harder for providers to identify and assess the needs of the 'average' scheme member.

It is also possible that variation in the choice of default may be related to the characteristics of scheme providers: in particular, if the marginal costs of production of particular types of funds vary across providers, then providers may be inclined to nominate their lowest cost fund as the default. For example, an asset manager with economies of scale in index funds

[16] For example, as at 11/11/05 a pension fund of £100,000 would buy a man aged 65 a level annuity of £6,828 on a single life basis; an RPI indexed annuity of £4,728 on a single life basis; or an RPI indexed annuity paying a 50% pension to the surviving wife (also age 65) of £4,140. Source: Standard Life figures in FSA comparative tables (www.fsa.gov.uk).

may be inclined to nominate an index fund as the default, while an insurance company with substantial with profits business may choose a with profits fund as the default. If this is the case then as far as the typical scheme member is concerned, the default fund would appear to be essentially random, i.e., to have no obvious explanation. This is unfortunate given the readiness of members to accept the default and how significant the choice of default can be for pension outcomes.[17]

We have focused on default funds on the basis of evidence that most scheme members use them. However, members have the option to choose funds other than the default, and this raises the question of whether providers give an appropriate range of choice. Some evidence on this is provided by Elton *et al.* (2004) in the context of the US 401(k) DC pension market. They find that in almost two-thirds of 400 cases they investigate, the choice offered by the plan sponsor is inadequate and the inferior fund range can have a significant impact on members' terminal wealth. They interpret their findings as suggesting that most sponsors carry out poor due diligence in selecting fund ranges.

Our results suggest sponsors also need to take care selecting the default fund, which in many cases will be the fund used by most scheme members. The variety of default fund approaches we have documented means that leaving the choice of default fund to the scheme provider may not result in an appropriate outcome for scheme members.

[17] The wide range of different types of default funds in use in stakeholder pension schemes also suggests that there is need for further research to identify optimal investment strategies for DC pension schemes. One possible answer is the stochastic lifestyling approach suggested by Cairns *et al.* (2005), where asset switching is determined by experienced returns as well as just time to retirement, but there are few signs yet of scheme providers switching to this type of strategy.

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Appendix A – Simulation Model and Historical Return Parameters

The PensionMetrics (PM) accumulation model is a stochastic simulation model whose purpose is to investigate the design of defined contribution (DC) pension plans. The likely pension outcomes from a particular DC plan can be compared with the pension available from a defined benefit (DB) plan. For example, the DB benchmark might be a final salary pension with a sixtieths annual accrual rate.

In a DC scheme, pension contributions from the plan member and his or her employer are invested in a portfolio of assets. The returns on the assets will be stochastic and some assets will have more volatile returns than others. The DC pension fund will therefore grow in a stochastic fashion too.

The PM model generates a range of outcomes (i.e., a probability distribution function) for the value of the accrued DC pension fund (and hence the pension) at any given future date, conditional on a set of assumptions concerning contributions, asset returns, mortality and other relevant factors. The model requires assumptions about both risk factors and control factors.

The first risk factor relates to real (i.e., inflation-adjusted) asset returns. The benchmark asset returns model we use is a multivariate normal model, with the mean returns vector and variance-covariance matrix calibrated using time series returns on assets over the post-war period. Experimentation has shown that the particular asset returns model used makes little difference to the distribution of pension outcomes, except in the extreme tails of the distribution. In this study, we therefore just report results from the benchmark multivariate normal model. The historical return parameters are shown in Table A1 below. We also use an alternative set of forward-looking return estimates, which are described in Section 4.

The second risk factor relates to interest rates. We need to model the evolution of interest rates over time in order to forecast the annuity factor at retirement. The pension at retirement is found by taking the ratio of the pension fund and annuity factor. The interest rate model that we use is based on the Vasicek (1977) model which links bond returns and bond yields in a consistent manner.

The third risk factor is earnings. Earnings are modelled using the lifetime earnings profiles (or salary scales) for different types of occupation. These show how salary varies with age in the same occupation at a given point in time. We assume that an individual's salary over time follows the lifetime earnings profile of his or her profession, but is subject to annual uprating in line with the real growth in national average earnings. In this study we use the profile of the average male employee in the UK.

The final risk factor is unemployment. This is modelled as a binary variable (1: employed, 0: unemployed) for each period, with an age-dependent probability of unemployment, e.g. taken from national average unemployment rates. In this study, for reasons of simplicity, we assume the unemployment probability is zero.

There are three control variables: variables that are set by either the pension plan member or the pension plan provider in each period of the model. The first is the pension fund contribution rate, which we assume to be a constant proportion of the plan member's income for the whole period. We use 10% in this study.

The second is the asset allocation which is the key control variable in the model, since experiments show that it dominates the distribution of pension outcomes. The allocations we use in this study are based on the asset allocation profiles we found to be in use in the stakeholder pension marketplace.

The third control variable is the retirement age. This can be pre-set at say, age 65, or can be made to depend on the size of the accumulated fund, with an inadequate fund size at 65 leading to a delay in retirement. In this study, we assume it is fixed at 65.

Having specified all the risk and control factors, the PM modelling procedure then involves the following steps:

- For a given investment strategy (i.e., a set of contribution rates and an asset-allocation strategy), the model performs thousands of simulations of the stochastic variables, such as the asset returns and interest rates, and then generates an empirical distribution of possible pension ratios for the plan member's selected retirement date.

- A pension ratio of unity implies that the particular DC pension plan has fully replicated the DB pension plan. However, the generated distribution of pension ratios will typically be quite wide. To make a suitable comparison, we need to specify one or more percentiles from the distribution and then compare these values with the target pension ratio of unity. The i^{th} percentile of this distribution is also known as the value-at-risk (VaR) at the $(100 - i)^{th}$ confidence level.

Table A1 – Real Returns and Earnings Growth 1947 to 2003

	UK T-bills	UK Equities	UK Bonds	US Equities	UK Real Earnings Growth
Mean Return (Arithmetic %)	1.19%	9.18%	1.79%	8.71%	2.07%
Standard Deviation (Annual %)	3.99%	23.22%	13.31%	21.04%	2.00%
Correlation Matrix					
UK T-bills	1.000				
UK Equities	0.051	1.000			
UK Bonds	0.465	0.513	1.000		
US equities	0.136	0.576	0.253	1.000	
UK Real Earnings	0.049	-0.026	-0.347	0.045	1.000

Source: Returns from ABN Amro / LBS data from Ibbotson Associates (Dimson *et al.* 2001). Earnings data from the Office for National Statistics.

Table 1 – Stakeholder Pension Scheme Default Funds by Type

	Total	*Actively Managed*	*Passively Managed*	*Lifestyle Default*	*Lifestyle Option*	*No Lifestyle*
Balanced Managed	19	17	2	5	4	10
Global Equity	6	1	5	6	0	0
UK Equity	7	1	6	6	1	0
With-profits	3	3	0	0	2	1
Total	35	22	13	17	7	11

Notes: See text for a full description of each fund type.

Table 2 – Stakeholder Pension Scheme Default Lifestyle Profiles

	Years to Retirement When Lifestyle Switch Starts					
Final Year Allocation	3	4	5	8	10	*Total*
75% Bonds 25% Cash	-	-	10	2	2	14
100% Bonds	-	-	-	-	1	1
100% Cash	1	1	-	-	-	2
Total	1	1	10	2	3	17

Notes: This table only includes schemes where a lifestyle profile is part of the scheme default arrangements.

Table 3 – Stylised Default Fund Asset Allocation Profiles

	UK Equities	*Overseas Equities*	*UK Gilts*	*Sterling Cash*
Balanced Managed ("BM")	56%	28%	13%	3%
Global Equity ("GE")	70%	30%	-	-
UK Equity ("UK")	100%	-	-	-
With-profits ("WP")	50%	10%	40%	-

Note: US equity returns are used as a proxy for overseas equities.

Table 4 – Stylised Default Lifestyle Profiles

Profile	*Switch Start Date*	*Final Year Allocation*
"NL"	None	As initial allocation
"BC5"	5 years prior to retirement	75% long bonds (15yrs+) 25% Cash
"BC10"	10 years prior to retirement	75% long bonds (15yrs+) 25% Cash
"C5"	5 years prior to retirement	100% Cash

Note: Each profile involves a linear switch from the initial allocation to the final year allocation over the period indicated by the switch start date.

Table 5 – Forward-looking Return Parameters

	Nominal Annual Return	*Real Annual return*	*Real Annual Return Post Charges*
Equities (UK & Global)	7.5%	5.0%	4.0%
Bonds	4.5%	2.0%	1.0%
Cash	4.0%	1.5%	0.5%

Notes: Inflation is assumed at 2.5% in line with the RPIX target set for the Bank of England by the Government. The 1.0% charge reflects the maximum allowed under current stakeholder regulations. No allowance is made for any excess returns from active management. The cash return is derived by subtracting a 3.5% equity risk premium from the 7.5% expected equity return proposed by PwC (FSA 2003).

Table 6 – Simulation Results – Return Parameters Based on Historical Data

Strategy	*Median Pension Ratio*	*Mean Pension Ratio*	*Standard Deviation*	*5% pension-VaR*
Strategy 1: BM-NL	1.25	1.59	1.26	0.44
Strategy 2: GE-NL	1.49	2.08	2.11	0.43
Strategy 3: UK-NL	1.38	2.14	2.67	0.35
Strategy 4: WP-NL	0.93	1.10	0.69	0.40
Strategy 5: BM-BC5	1.13	1.41	1.06	0.45
Strategy 6: BM-BC10	1.02	1.22	0.84	0.45
Strategy 7: BM-C5	1.14	1.41	1.05	0.46
Strategy 8: GE-BC5	1.34	1.81	1.72	0.44
Strategy 9: GE-BC10	1.17	1.52	1.31	0.45
Strategy 10: GE-C5	1.35	1.80	1.72	0.45
Strategy 11: UK-BC5	1.26	1.86	2.18	0.37
Strategy 12: UK-BC10	1.11	1.56	1.65	0.39
Strategy 13: UK-C5	1.26	1.85	2.19	0.38
Strategy 14: WP-BC5	0.86	1.01	0.60	0.40
Strategy 15: WP-BC10	0.79	0.91	0.50	0.40
Strategy 16: WP-C5	0.87	1.01	0.59	0.41

Notes: See Tables 3 and 4 for description of the strategies. Results are based on 5000 simulations using the PensionMetrics model (assuming a multivariate normal distribution). The real return parameters are based on historical data from Dimson et al (2001) adjusted for an assumed 1.0% annual charge. All figures are expressed in terms of the pension ratio (i.e. DC pension to 2/3 final salary). There is a 1-in-20 chance that the strategy in question will produce a pension ratio below the level indicated in the 5% pension-VaR column.

Table 7 – Simulation Results – Return Parameters Based on Forward-looking Estimates

Strategy	*Median Pension Ratio*	*Mean Pension Ratio*	*Standard Deviation*	*5% pension-VaR*
Strategy 1: BM-NL	0.65	0.79	0.56	0.26
Strategy 2: GE-NL	0.66	0.88	0.77	0.23
Strategy 3: UK-NL	0.61	0.78	0.94	0.19
Strategy 4: WP-NL	0.59	0.69	0.39	0.28
Strategy 5: BM-BC5	0.62	0.75	0.49	0.29
Strategy 6: BM-BC10	0.61	0.71	0.42	0.31
Strategy 7: BM-C5	0.63	0.75	0.49	0.28
Strategy 8: GE-BC5	0.65	0.83	0.68	0.26
Strategy 9: GE-BC10	0.63	0.77	0.56	0.29
Strategy 10: GE-C5	0.65	0.83	0.67	0.26
Strategy 11: UK-BC5	0.60	0.82	0.82	0.22
Strategy 12: UK-BC10	0.59	0.77	0.67	0.26
Strategy 13: UK-C5	0.60	0.82	0.82	0.22
Strategy 14: WP-BC5	0.58	0.66	0.36	0.29
Strategy 15: WP-BC10	0.56	0.64	0.31	0.31
Strategy 16: WP-C5	0.58	0.66	0.35	0.30

Notes: See Tables 3 and 4 for description of the strategies. Results are based on 5000 simulations using the PensionMetrics model (multivariate normal distribution). The return parameters are based on forward-looking estimates net of an assumed 1.0% annual charge. The volatility and correlation structure is based on historical data from Dimson et al (2001). All figures are expressed in terms of the pension ratio (i.e. DC pension to 2/3 final salary). There is a 1-in-20 chance that the strategy in question will produce a pension ratio below the level indicated in the 5% pension-VaR column.

Table 8 – Contribution Rates Required to Achieve Median Pension Ratio of 1.0

Strategy	*Required Contribution Rate*	*5% Pension-VaR at Required Contribution Rate*
Strategy 1: BM-NL	15.4%	0.40
Strategy 2: GE-NL	15.2%	0.35
Strategy 3: UK-NL	16.4%	0.31
Strategy 4: WP-NL	16.9%	0.47
Strategy 5: BM-BC5	16.1%	0.47
Strategy 6: BM-BC10	16.4%	0.51
Strategy 7: BM-C5	15.9%	0.45
Strategy 8: GE-BC5	15.4%	0.40
Strategy 9: GE-BC10	15.9%	0.46
Strategy 10: GE-C5	15.4%	0.40
Strategy 11: UK-BC5	16.7%	0.37
Strategy 12: UK-BC10	16.9%	0.44
Strategy 13: UK-C5	16.7%	0.37
Strategy 14: WP-BC5	17.2%	0.50
Strategy 15: WP-BC10	17.9%	0.55
Strategy 16: WP-C5	17.2%	0.52

Notes: See Tables 3 and 4 for description of the strategies. Results are based on 5000 simulations using the PensionMetrics model (multivariate normal distribution). The return parameters are based on forward-looking estimates net of an assumed 1.0% annual charge. The volatility and correlation structure is based on historical data from Dimson et al (2001). Contribution rate is expressed as a constant proportion of the scheme member's salary. There is a 1-in-20 chance that the strategy in question will produce a pension ratio below the level indicated in the 5% pension-VaR column.