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What is a Promise from the Government Worth? Quantifying Political Risk in State and Personal Pension Schemes in the United Kingdom

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What is a Promise from the Government Worth? Quantifying Political Risk in State and Personal Pension Schemes in the United Kingdom

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There are three key types of political risk facing pension schemes: those induced by demographic, economic, and pure political factors. The state scheme in the United Kingdom has been susceptible to all three types since 1980, with the result that the annual real internal rate of return on the second-pillar state pension for the average male worker fell from 5.1% to 1.5% over 25 years. The flat-rate, first-pillar Basic State Pension has also experienced a fall in its IRR of 3 percentage points as a result of the indexation basis changing from earnings to prices.

INTRODUCTION

By August 2006, 74% of private-sector company defined-benefit (DB) pension schemes in the United Kingdom had closed to new members and 41% had closed to additional contributions from existing members.[1] At that time 67% of open, employer-sponsored pension schemes were defined-contribution (DC).[2] In future, therefore, workers will have to look increasingly to the state or to a personal (or company) DC pension scheme to provide them with a retirement income. However, the state scheme in the United Kingdom offers only a very minimal pension, intended to keep pensioners out of extreme poverty, and a DC scheme involves a large range of financial risks (e.g. investment risk, reinvestment risk, interest rate risk, inflation risk and mortality risk) that in occupational DB schemes are generally borne directly by the employer.[3]

These factors have been widely discussed (see e.g. Blake 2000, 2003), but what has been less widely considered is the political risk attached to state and personal pension schemes, defined as explicit changes in legislation by the government that adversely affect the contributions to and/or benefits from such schemes.[4] A government can change the structure of the state scheme at any time. It might over-promise benefits in an immature pay-as-you-go scheme, leading to financing problems and future cutbacks when the scheme matures (see Diamond 1997). Workers therefore face significant uncertainty about how future policy-makers will change taxes and benefits in order to return the state scheme to long-run solvency. Similarly, with personal pension schemes there can be a change at any time in the tax reliefs enjoyed on contributions and investment returns, or in the terms on which annuities are purchased.

This paper provides a theoretical framework for measuring the political risk in state and personal pension schemes in the United Kingdom (Section I). It then empirically quantifies that risk over the period 1980–2006. In particular, it addresses the question of the extent to which this political risk is driven by pure politics or by underlying economic and demographic factors (Section II). The implications of political risk for assessing the value of the promise from different forms of pension scheme are discussed in the concluding section.

I. A Theoretical Framework for Measuring Political Risk in State and Personal Pension Schemes

One of the first studies of political risk in a state pension scheme (SPS) was McHale (2001). He measured the political risk in the US social security system as the reduction for an average worker in gross social security wealth (the discounted value of future benefits) resulting from various reforms introduced by the US Congress. McHale compared this measure of political risk across the G7 countries for the period of the mid-1980s to the mid-1990s. He noted that *ex ante* political risk was difficult to measure, for reasons similar to those involved in measuring credit or default risk on fixed-income assets: history is a poor guide to the probabilities and sizes of infrequent discrete adjustments. He focused on changes in social security benefit rules; thus, the extent of political risk in his measure depends on the effect of rule changes on the stream of benefits, and on the probabilities of those changes.

Political risk has also been discussed by Diamond (1997), who distinguished between 'good' and 'bad' political interventions. 'Good' interventions affect benefits or taxes in a way that reduces risk, while 'bad' interventions increase it. Diamond measured political risk as a change in social security benefits or taxes that increases the risk to per capita income or per capita consumption.

To be consistent with the measurement of risk in financial markets, I measured political risk in terms of reductions in the internal rate of return that workers receive on their social security (i.e. National Insurance) contributions. Alternatively, recognizing that the ultimate concern for risk-averse workers is their expected utility, I also measured it in terms of reductions in the expected-utility-adjusted internal rate of return (discussed later).

The internal rate of return on a DB state pension scheme can be defined in different ways. It can be defined as the rate of return that is implicit in the current structure of contributions and benefits, assuming that this structure continues indefinitely. Alternatively, it can be defined as the rate of return consistent with the financial solvency of the system, which yields a lower internal rate of return than the previous definition for countries that have systems that do not have sufficient funding for long-term solvency. A third alternative would be the internal rate of return that workers expect to receive. Because I am focusing on the risk associated with changes in laws, I define the internal rate of return using the first definition. Shoven and Slavov (2006) also used this definition in their study of political risk in the US social security system. They show that there is considerable variation through time in the IRRs for a given birth cohort, and that older workers bear less political risk than younger workers.

Personal pension schemes (PPSs) are also subject to political risk, and the internal rate of return can be used to quantify this. The internal rate of return on PPSs is a weighted average of the geometric mean rate of return on the PPS accounts during the accumulation phase and the interest rate used to convert the account balance to an annuity during the payout phase.

Sources of political risk

Political risk has at least three sources that may result in reductions in benefits or increases in contributions:

1. demographically induced political risk, e.g. arising from financial pressures on the SPS caused by changes in the old-age dependency rate or life expectancy;

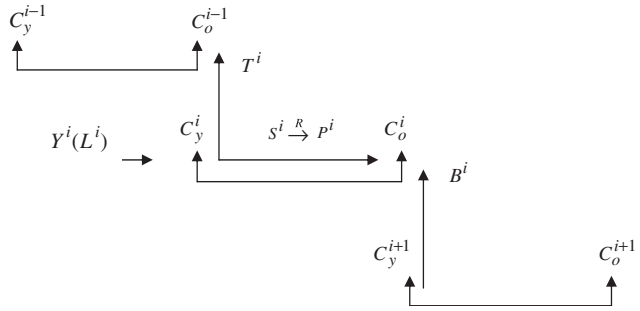

FIGURE 1. Two-period overlapping generations model with state and personal pensions.

2. economically induced political risk, e.g. arising from changes in, say, the unemployment rate or the rate of growth in wages, or from changes in economic policy such as increased incentives to work harder or save more, or from the government reducing the tax relief on contributions into PPSs to help lower a government budget deficit;
3. pure political risk, e.g. arising from a redistribution of SPS benefits or changing tax breaks in PPSs in favour of supporters of the political party in power, for example left-wing governments switching resources away from the rich to the poor.

Changes in SPS benefits and contributions are not necessarily due entirely to one source of political risk, and may generally involve more than one source. In the empirical section, however, I subjectively attempt to categorize changes as to the dominant source of the risk.[5]

A two-period model

Consider the two-period overlapping generations model in Figure 1 motivated by the simple model in Diamond (1997). In its first (young) period, each generation i receives labour income (Y^i), consumes (C_y^i), pays social security tax (T^i), which is used to pay SPS benefits to the previous generation $i-1$, and saves (S^i) in a PPS. In its second (old) period, each generation receives SPS benefits (B^i) from the next generation $i+1$ and the pension from the PPS (P^i) and consumes these (C_o^i), leaving no bequests. (The symbol $\xrightarrow{R}$ indicates accrued interest on savings.) The objective of each generation is to choose consumption in each period (C_o^i and C_o^y) and labour supply in the first period (L^i) to maximize expected utility across the life cycle.

A multi-period model

In reality, the young and old periods of life are divided into sub-periods that are of variable length on account of the uncertainty attached to employment and mortality. There might also be discretionary savings and/or contractual pension savings. Uncertainty is also attached to returns on savings and the rate of change over time in the old-age dependency ratio (the ratio of retired to active members of the population). Taking these factors into account requires the use of a multi-period stochastic life-cycle model of consumption and labour supply that can be solved using dynamic programming techniques.

However, in order to concentrate on issues related to political risk, I simplify the model in the following ways. I assume the following:

- The length of the working life is fixed.
- Each generation survives until at least the age of 68.[6]
- The probability of dying at each age after 68 is known.
- There is no bequest motive.
- There are two financial assets: a risky asset (a mutual fund consisting of equities and risk-free long-term bonds) and a risk-free short-term asset.
- The PPS holds a portfolio consisting of the two assets in an account that cannot be accessed during the individual's working life; on retirement, this account is converted into a risk-free annuity paying a constant real pension until death.
- Discretionary, non-pension savings are held in a portfolio consisting of the two assets in an account that can be accessed during the individual's working life; on retirement, and given the absence of a bequest motive, this account is converted into a risk-free annuity paying a constant real pension until death (as predicted by Yaari 1965).

Assuming further that utility is additively separable both over time and between consumption and labour supplied in the same period, each generation's optimization problem is to find the lifetime consumption stream and labour supply that satisfies the value function, V (dropping the i superscript where this does not cause confusion):

$$
\begin{aligned}
V_1(A_1) \equiv & \underset{\{C_t, L_t, \omega_t\}_{t=1}^{M}}{\text{Max}} E_1\left[\sum_{t=1}^{M} (U(C_t) - \alpha G(L_t))(1+\rho)^{1-t}\right] \\
& + \underset{\{C_t, \omega_t\}_{t=M+1}^{N}}{\text{Max}} E_1\left[\sum_{t=M+1}^{N} U(C_t)\left(\prod_{v=M+1}^{t}(1-q_v)\right)(1+\rho)^{1-t}\right]
\end{aligned} \tag{1}
$$

subject to (where $(Y_t - C_t - T_t - S_t)$ in (2) and $(B_t + P - C_t)$ in (3) is discretionary savings):

$$A_{t+1} = (1+r_t)(A_t + Y_t - C_t - T_t - S_t) \geqslant 0,\ t = 1, M, \tag{2}$$

$$A_{t+1} = (1+r_t)(A_t + B_t + P - C_t) \geqslant 0,\ t = M+1, N, \tag{3}$$

where

- $U(C_t) = [1/(1-\gamma)](C_t)^{1-\gamma}$ = one-period utility function defined over real consumption C_t at time t, with γ as the coefficient of relative risk aversion (the intertemporal elasticity of substitution of consumption is $-1/\gamma$);
- $G(L_t) = [\varepsilon/(\varepsilon+1)](L_t)^{[(\varepsilon+1)/\varepsilon]}$ = one-period disutility function defined over hours of labour L_t supplied at time t, with ε as the intertemporal elasticity of substitution of labour;
- α = marginal rate of substitution between contemporaneous consumption and labour supplied;
- $E_t[\cdot]$ = expectations operator conditional on information available at time t;
- N = maximum life span;
- M = maximum length of working life (assumed to be set by convention or regulation);
- ρ = subjective discount rate;
- A_t = real value of the portfolio of accessible financial assets at time t;

- ω_t = portfolio weight of A_t in the risky financial asset (the mutual fund); with $1–\omega_t$ in the risk-free short-term asset;
- $r_t = [\omega k_t + (1-\omega)k_s]$ = real rate of return on A_t at time t in the case of constant portfolio weights, where k_s is the constant real yield on the risk-free short-term asset and k_t is the real rate of return on the risky asset, with expected return, $\bar{k}$, and variance, σ_k^2; we will assume that $(1+r_t)$ is lognormally distributed, with an expected return of $\exp(\bar{r}+0.5\sigma^2)$, where $\bar{r}$ is the expected rate of return on r_t and $\sigma^2 = \omega^2\sigma_k^2$ is the variance of r_t;
- $Y_t = w_t L_t$ = real gross labour income at time t, the product of the real wage rate, w_t (assumed to be deterministic), and hours of labour supplied, L_t;
- $T_t = \tau_t w_t L_t$ = real social security taxes at time t with tax rate τ_t (assumed to be exogenous);
- $S_t = \varsigma_t w_t L_t$ = real contributions to a PPS at time t with contribution rate ς_t (assumed to be a predetermined contractual rate, making S_t deterministic, since L_t is also deterministic, as we later show);
- B_t = real SPS benefits at time t (assumed to be exogenous);
- P = real pension benefits from the PPS at retirement (assumed to be constant over time in real terms);
- q_t = probability of dying at time t, i.e. the mortality rate (assumed to be zero for $t = 1$, 68 and independent of the return on the risky financial asset).

The PPS pension at retirement is determined as follows:

$$P = \sum_{t=1}^{M} S_t \prod_{\upsilon=t}^{M} (1+r_\upsilon)(\ddot{a})^{-1} \tag{4}$$

where $\ddot{a} = \sum_{t=M+1}^{N} \left(\prod_{\upsilon=M+1}^{t} (1-q_\upsilon)\right)(1+k_L)^{M+1-t}$ = annuity factor (expected present value of £1 per year for life, using the real yield on risk-free long-term bonds, k_L (assumed to be constant)).

The PPS pension expected at retirement is given by

$$\bar{P} = \sum_{t=1}^{M} S_t E_1\left(\prod_{\upsilon=t}^{M} (1+r_\upsilon)\right)(\ddot{a})^{-1} \tag{5}$$

with

$$E_1\left(\prod_{\upsilon=t}^{M} (1+r_\upsilon)\right) = \exp(\bar{r}+0.5\sigma^2)^{M+1-t} \tag{6}$$

The real internal rate of return on the PPS, r_{PP}, satisfies the equation

$$\sum_{t=1}^{M} S_t (1+r_{PP})^{M+1-t} = \sum_{t=M+1}^{N} P\left(\prod_{\upsilon=M+1}^{t} (1-q_\upsilon)\right)(1+r_{PP})^{M+1-t} \tag{7}$$

The real internal rate of return, r_{SP}, on the SPS satisfies the equation

$$\sum_{t=1}^{M} T_t (1+r_{SP})^{M+1-t} = \sum_{t=M+1}^{N} B_t\left(\prod_{\upsilon=M+1}^{t} (1-q_\upsilon)\right)(1+r_{SP})^{M+1-t} \tag{8}$$

Given the separability between labour supply and consumption in equation (1), we can solve (1) in two stages: first we find the optimal path of labour supply over time, and

then, conditional on this, we find the optimal path of consumption over time. Given the assumed functional form for $G(L_t)$, the optimal labour supply across consecutive periods is given by (see Blanchard and Fischer 1989, p. 339, eqn (20))

$$L^*_{t+1} = \left(\frac{w_{t+1}(1-\tau_{t+1}-\varsigma_{t+1})(1+\rho)}{w_t(1-\tau_t-\varsigma_t)(1+k_L)}\right)^{\varepsilon} L^*_t, \equiv \kappa_t L^*_t \tag{9}$$

where L^*_1 depends, via the first-order conditions for the maximization of (1) subject to (2), on optimal first-period consumption:

$$L^*_1 = \left(\frac{\lambda w_1(1-\tau_1-\varsigma_1)}{\alpha}\right)^{\varepsilon}, \tag{10}$$

since λ is the marginal utility of wealth and is equal to $\left(C^*_1\right)^{-\gamma}$. From (9) and (10), it is clear that L_t is deterministic.

Political risk affects labour supply in two ways. First, it can lead to an increase in τ in (9), which changes optimal labour supply in consecutive periods. For example, if τ is constant over time, except when changed by policy, a 1% increase in τ in a particular year will reduce labour supply by ε% in that and all subsequent years. Second, it can lead to a mandatory change in the length of the working life which corresponds to a change in M in equation (1). An increase in M will have a negative impact on the value function (if $\alpha > 0$), but at the same time will increase lifetime income, which raises consumption in all periods; so the net effect on lifetime welfare is ambiguous.

Equations (9) and (10) can be used to factor out the disutility of labour supply from (1), which can be rewritten in Bellman recursive form (see Intriligator 1971, chapter 13) as

$$V_s\left(A_s|\left\{L^*_t\right\}_{t=1}^{M}\right) = \underset{\{C_t,\omega_t\}_{t=s}^{N}}{\text{Max}} \left[\left(U(C_s) - \beta_s \alpha G\left(L^*_s\right)\right) + (1-q_{s+1})^{(1-\beta_{s+1})}(1+\rho)^{-1} E_s(V_{s+1}(A_{s+1}|\left\{L^*_t\right\}_{t=1}^{M}))\right] \tag{11}$$

for all $s = 1, N–1$, where $\beta_s = 1$ if $t \leqslant M$, 0 otherwise.

Equation (11) simplifies the lifetime maximization problem into a series of two-period problems which can be solved numerically by working backwards from the final period N, subject to the constraints (2) and (3). We can now model how consumption, and hence welfare, responds to political risk within the context of a conditional (on labour supply) demand model that is common in consumer demand studies (see e.g. Browning and Meghir 1991; Blundell *et al.* 1994).

Given the assumed functional form for $U(C_t)$, the first-order conditions for a maximum of (11) indicate that the following relationship holds between optimal consumption in consecutive periods (using Merton's (1969) result that the value function takes the same functional form as the utility function in the case of HARA-class utility functions):[7]

$$C^*_{t+1} = \left(\frac{1+\rho}{1+r_{t+1}}\right)^{-\frac{1}{\gamma}} C^*_t \equiv \phi_t C^*_t \tag{12}$$

Substituting (12) into budget constraints (2) and (3), iterating forward and taking expectations gives optimal consumption as a function of optimal expected net lifetime wealth:

$$C_t^* = \left(\sum_{s=t}^{N} \bar{\phi}^{s-t} \left(\prod_{\upsilon=t}^{s} (1-q_\upsilon)^{(1-\beta_\upsilon)} \right) E_1 \left(\prod_{\upsilon=t}^{s} (1+r_\upsilon) \right)^{-1} \right)^{-1} \bar{H}_t^* \equiv \theta_t \bar{H}_t^* \tag{13}$$

where

$$E_1 \left(\prod_{\upsilon=t}^{s} (1+r_\upsilon) \right)^{-1} = \exp\left(-\bar{r} + 0.5\sigma^2\right)(s-t), \tag{14}$$

$$\bar{\phi} = E_1(\phi_t) = (1+\rho)^{-\frac{1}{\gamma}} \exp\left(\bar{r} + 0.5\sigma^2\right)^{\frac{1}{\gamma}}, \tag{15}$$

where $\bar{H}_t^*$ is optimal expected net lifetime wealth or human capital. This is defined as the discounted value of optimal expected gross lifetime income from work (optimally supplied) and the state and personal pension schemes less the discounted value of social security taxes and contributions to the PPS:[8]

$$\begin{aligned} \bar{H}_s^* = & \sum_{t=s}^{M} w_t (1-\tau_t-\varsigma_t) L_t^* E_s \left(\prod_{\upsilon=s}^{t} (1+r_\upsilon) \right)^{-1} + \\ & \sum_{t=M+1}^{N} \left(\prod_{\upsilon=M+1}^{t} (1-q_\upsilon) \right) (B_t + P) E_s \left(\prod_{\upsilon=s}^{t} (1+r_\upsilon) \right)^{-1} \end{aligned} \tag{16}$$

for all $s = 1, N-1$. Political risk affects consumption via changes in τ_t, M, B_t and ς_t. The value function is evaluated by substituting (9), (10) and (13) into (1).

The optimal weight given to risky assets in both the DC pension fund and the non-pension savings account is constant (Merton 1969):

$$\omega_t = \frac{\bar{k} - k_s}{\gamma \sigma_k^2} \ \forall t \tag{17}$$

This feeds into the expected returns in equations (6), (14), (15) and (16) above.

We are now in a position to assess the impact of the three main types of political risk both in financial terms and in utility-adjusted terms. We examine the impact on the internal rate of return (IRR) from participation in the SPS and the PPS. The IRR is an expected value measure that ignores risk. It does not take into account the insurance value that individuals receive from the elimination of longevity risk as a result of annuitization. In order to assess the welfare effect of a change in policy, it is necessary to embed the policy change in a utility-based model. This is achieved by calculating the expected-utility-adjusted internal rate of return. The EUA IRR is the unadjusted IRR, scaled by the ratio of the value function after the policy reform to the value function for the original unreformed scheme, where the value function in (1) is evaluated at $t = 1$.[9] The EUA IRR depends on the level of relative risk aversion of the scheme member.

I use the following parameterization:

- The annual contribution rate into the Basic State Pension (BSP) is 2% of the Lower Earnings Limit for that year.[10]
- The annual contribution rate into the State Earnings-Related Pension Scheme (SERPS) (or its successor the State Second Pension Scheme) is the combined employer–employee contracted-out National Insurance rebate plus any age-related addition or other bonus for that year.[11]
- The annual contribution rate into the PPS is the combined employer–employee contracted-out National Insurance rebate plus any age-related addition or other bonus for that year plus any tax relief on employee contributions.[12]
- $\gamma = 2$: this is derived from the Blundell *et al.* (1994) mid-range estimate of the intertemporal elasticity of substitution of consumption for the UK of around –0.5.
- $\rho = 0.03$: this is derived from Blake (2004).
- $\alpha = 0.2$: this is based on Blundell *et al.* (1994).
- $\varepsilon = 0.2$: this is a mid-range estimate derived from Pencaval (1986).
- $M = 40$ for men and 35 for women (initially).
- $k_s = 1\%$, $k_L = 2\%$, $\bar{k} = 4\%$ and $\sigma_k = 14\%$: these are based on the average real yields on UK Treasury bills and on UK long-term gilts, and on the average total real returns on a mutual fund invested 70% in UK long-term gilts and 30% in UK equities,[13] respectively, over the postwar period (Barclays Capital 2004); on the basis of equation (17) and $\gamma = 2$, $\omega_t = 0.77$; and the expected real return on the optimal portfolio is $\bar{r} = 3.3\%$ with a standard deviation of $\sigma = 10.7\%$.
- Real wages are assumed to grow at a constant rate of 2% per annum, equal to the postwar average growth rate (Department of Employment (1971) British Labour Statistics Historical Abstract and Yearbooks).
- Mortality rates in retirement (q_t) are from *English Life Tables* 14 (based on mortality experience in England and Wales between 1980 and 1982).

II. Quantifying the Political Risk in State and Personal Pension Schemes

The empirical analysis involves three steps. First, the reforms to the SPS are described and categorized according to the dominant source of political risk. Second, the extent to which the changes affect SPS contributions and benefits are measured in terms of their effects on internal rates of return (IRRs). Third, expected-utility-adjusted internal rates of return (EUA IRRs) are calculated. The same analysis is then conducted for PPSs.

Pension reforms since 1980

Reforms to the SPS since 1980[14] have resulted in the following cases of political risk.

Demographically induced political risk[15] includes:

- switching the indexation of the flat-rate, first-pillar BSP in payment from national average earnings to retail prices, saving around 2% per annum (Social Security Act 1980);
- switching the indexation of the second-pillar SERPS pension in payment from national average earnings to retail prices, saving around 2% per annum (Social Security Act 1980);
- reducing the benefit accrual amount on the SERPS pension from 25% of average revalued band earnings (between the Lower Earnings Limit (LEL) and the Upper

Earnings Limit (UEL)) over the best 20 years to 20% of average revalued band earnings over the full career (Social Security Act 1986);
- reducing the annual revaluation factor for band earnings for SERPS by the product of the LEL and the difference between the rate of change in national average earnings and retail prices (Pensions Act 1995);[16]
- reducing the surviving spouse's pension from 100% of the member's pension to 50% over an eight-year transitional period beginning in October 2002 (Social Security Act 1986 and Welfare Reform and Pensions Act 1999);[17]
- raising the state pension age for women from 60 to 65 over a ten-year period beginning in 2010, thereby reducing the cost of state pensions by £3bn per annum (Pensions Act 1995);
- raising the state pension age for both men and women from 65 to 66 between 2024 and 2006, from 66 to 67 between 2034 and 2036, and from 67 to 68 between 2044 and 2046 (Pensions Bill 2006, following Department for Work and Pensions 2006).

Economically induced political risk[18] includes:

- raising the effective contribution rate into SERPS (as measured by the total contracted-out National Insurance contribution (NIC) rebate) by introducing (i) an extra 2% NIC rebate for all PPSs contracting out of SERPS between April 1988 and April 1993 (Social Security Act 1986); (ii) a 1% age-related NIC rebate to members of contracted-out PPSs aged 30 or more to discourage them from recontracting back into SERPS between April 1993 and April 1997, with age-related NIC rebates that increase heavily with age from April 1997 (Social Security Act 1993); and (iii) further separation of the age-related rebates into three bands from April 2002 (Child Support, Pensions and Social Security Act 2000).

Pure political risk[19] includes:

- replacing the earnings-related SERPS pension in April 2002 by the State Second Pension (S2P): S2P was originally also earnings-related, but the benefits were much more generous for low-income workers than SERPS was[20] (Welfare Reform and Pensions Act 1999 and Child Support, Pensions and Social Security Act 2000);
- a Minimum Income Guarantee from April 1999 which was subsumed into a Pension Credit[21] from October 2003, both favouring poorer people (Welfare Reform and Pensions Act 1999 and Child Support, Pensions and Social Security Act 2000);
- relinking the indexation of the BSP to earnings from 2012 (Pensions Bill 2006, following Department for Work and Pensions 2006[22]);
- reducing the number of qualifying years needed to receive the BSP: from 44 for men and 39 for women to 30 for those reaching state pension age from 2010, a change designed to benefit homemakers and carers with interrupted work patterns and hence incomplete NIC records (Pensions Bill 2006, following Department for Work and Pensions 2006);
- reforming S2P so that it becomes a flat-rate top-up[23] to the BSP over a transitional period between 2010 and 2030 (Pensions Bill 2006, following Department for Work and Pensions 2006);
- targeting the Savings Credit component of the Pension Credit from 2008 on those with small savings. The maximum Savings Credit is 60% of the difference between the Guarantee Credit and the BSP. The difference has widened since the introduction of Pension Credit, because the Guarantee Credit rises in line with earnings, while the (lower) BSP rises in line with prices. The maximum Savings Credit therefore grows at a

faster rate than earnings. Under unchanged indexation rules, 70% of pensioner households will receive some form of Pension Credit by 2050. The government regarded this as both unsustainable and contrary to its objective of targeting resources at the lower paid. From 2008, the government will therefore index the lower threshold of the Savings Credit by earnings. From 2015, the maximum Savings Credit will be frozen in real terms (Pensions Bill 2006, following Department for Work and Pensions 2006).

The principal examples of political risk to PPSs can be listed as follows.

1. *Demographically induced political risk*: none[24]
2. *Economically induced political risk*: removing the 20% tax credit on UK dividends at a cost of £5 billion per year (Finance Act 1997).[25]
3. *Pure political risk*: introducing a system of Personal Accounts[26] from 2012 with automatic enrolment for all employees who do not have access to an employer's occupational scheme. Employees contribute 4% of band earnings between the LEL and UEL, employers must contribute 3%, and the government contributes 1% in the form of normal tax relief (Department for Work and Pensions 2006).[27]

I quantify the 'cost' of political risk principally using the case of three male workers who initiated their pension arrangements in 1978 (the year SERPS started) at the age of 25 and will initially work until the age of 65 when they will retire. The base year for my calculations is 2002/03. The men are assumed to have starting salaries equal to, respectively, the Low Earnings Threshold (LET, £10,800 in 2002/03), the Second Earnings Threshold (SET, £24,600, approximately equal to average earnings in 2002/03) and the Upper Earnings Limit (UEL, £30,420 in 2002/03): these salaries are uprated annually in line with national average earnings. Each man is assumed to be married to a woman of the same age: in the event that the man dies, his widow receives a single person's BSP plus (initially) 100% of the SERPS pension. We also examine the cases of three single women who also start their pension arrangements in 1978 on the same starting salaries as the men.

State pension internal rates of return

We begin with SPS pensions. Table 1 shows that the IRR, r_{SP} (see equation (8)) on the original BSP scheme was 13.2% in real terms for married men (row 1) and 13.5% for single women (row 16).[28] These very high rates of return, which are the same across all income ranges, are explained by the following facts: (i) the flat-rate contributions into the BSP scheme are very low, just 2% of the LEL (which equaled £3900 in 2002/03, making the cost of membership of the BSP just £78 in 2002/03), and (ii) the resulting flat-rate pensions (£3926 for a single person and £6276.40 for a married couple in 2002/03) were payable for life (from age 60 for women and 65 for men) and uprated annually in line with national average earnings. The original SERPS pension, which was also uprated annually in line with earnings, generated a lower, but nevertheless still high, real rate of return which varied between 5.1% and 5.7% for married men (row 5) and between 4.7% and 5.4% for single women (row 21).

As indicated above, most of the political risk since 1980 has fallen on the SPS, rather than on PPSs, and most of this has been demographically induced.[29] The change in the uprating of the BSP and SERPS from earnings to prices reduced the IRR for men by around 3 and 0.75 percentage points, respectively (rows 2 and 6).[30] The combined effect of reducing the SERPS

TABLE 1
POLITICAL RISK WITH THE STATE PENSION SCHEME: REAL INTERNAL RATES OF RETURN (%)

	Type of member	Low-paid	Average	High-paid
	Earnings 2002/03 (£)	10,800	24,600	30,420
	Male, 25 years old, married			
1	*Original Basic State Pension Scheme: linked to earnings, retire at 65 (with 40/44ths of full pension)*	*13.195*	*13.195*	*13.195*
2	Revised Basic State Pension Scheme: linked to prices	10.199	10.199	10.199
3	Revised Basic State Pension Scheme: linked to earnings, retire at 68 (with full pension)	12.280	12.280	12.280
4	Revised Basic State Pension Scheme: linked to earnings, retire at 68, qualifying years for full pension reduced to 30	12.401	12.401	12.401
5	*Original SERPS: linked to earnings, retire at 65*	*5.652*	*5.149*	*5.088*
6	Revised SERPS: linked to prices	4.937	4.408	4.343
7	Revised SERPS: accrual rate reduced to 20% of band earnings	4.265	3.734	3.669
8	Revised SERPS: lowering revaluation factor	3.428	3.428	3.428
9	Revised SERPS: spouse's pension reduced to 50%	2.196	2.196	2.196
10	Revised SERPS: raising the effective contribution rate	− 0.399	1.504	1.504
11	SERPS replaced by earnings-related S2P	2.629	1.504	1.504
12	Revised S2P: flat rate	2.629	–0.067	–1.048
13	Revised S2P: flat rate plus MIG/ Pension Credit	6.988	4.426	3.674
14	Revised S2P: flat rate plus Pension Credit, retire at 68	6.216	3.837	3.091
15	Revised S2P: flat rate plus targeted Savings Credit, retire at 68	6.067	2.514	1.235
	Female, 25 years old, single			
16	*Original Basic State Pension Scheme: linked to earnings, retire at 60 (with 35/39ths of full pension)*	*13.519*	*13.519*	*13.519*
17	Revised Basic State Pension Scheme: linked to prices	10.472	10.472	10.472
18	Revised Basic State Pension Scheme: retire at 65	8.819	8.819	8.819
19	Revised Basic State Pension Scheme: linked to earnings, retire at 68 (with full pension)	10.656	10.656	10.656
20	Revised Basic State Pension Scheme: linked to earnings, retire at 68, qualifying years for full pension reduced to 30	10.836	10.836	10.836
21	*Original SERPS: retire at 60*	*5.361*	*4.814*	*4.748*
22	Fully revised SERPS: retire at 65	2.021	2.021	2.021
23	Revised S2P: flat rate plus targeted Savings Credit, retire at 68	6.234	2.688	1.426

Notes:
The table reports real internal rates of return from membership of the first-pillar Basic State Pension Scheme and the second-pillar SERPS/S2P in their original forms and subsequent revised forms for a married male and a single female, both joining the schemes at age 25 in 1978 at three different starting salaries equal to the Low Earnings Threshold (denoted low-paid), the Second Earnings Threshold (approximately equal to average earnings) and the Upper Earnings Limit for membership of SERPS/S2P (denoted high-paid), respectively, for 2002/03. These salaries are assumed to grow annually in line with national average earnings. The male is assumed to be married to a female of the same age, the female is assumed to be unmarried and both are assumed to survive until at least the age of 68.

accrual rate, revaluation factor and spouse's pension was to lower the IRR on SERPS to just 2.2%, which is less than 45% of the original IRR (rows 7–9; cf. row 3). Raising the state pension age for women from 60 to 65 reduces their IRR on the BSP by about 1.7 percentage points (row 18). The combined effect of revising SERPS and raising to 65 the age at which women can draw it reduces the IRR to 2%, which is just 37% of its original level (row 22).

There has been one case of economically induced political risk involving the SPS, and this has been the strong financial incentives to contract out of SERPS into private-sector schemes. The financial incentives have come in the form of age-related rebates on NICs for contracting out of SERPS. Further, the rebates have increased substantially over time. When SERPS first started in 1978, the combined employee–employer contracted-out rebate was 7% for all workers of all ages with earnings between the LEL and UEL. In 2002, men aged above 51 with earnings between the LEL and LET had a combined contracted-out rebate of 21%. These increases in the contracted-out rebate have raised the effective contribution rate for SERPS membership and, in the case of low-paid workers, have resulted in a negative IRR for SERPS membership, while for higher paid workers the IRR for SERPS membership has been reduced to only 1.5% (row 10).

An example of pure political risk came with the replacement of the earnings-related SERPS with the State Second Pension (S2P) by the Labour Government in 2002. In its original form, S2P was designed to benefit low-paid workers, i.e. natural supporters of Labour, without reducing the benefits of higher-paid workers (row 11). However, it was always intended that the S2P pension would eventually become a flat-rate pension (offering at best only 40% of the LET), while the contributions would remain earnings-related. Once this happens (after 2030), there will be no change to the IRR for low-paid workers, but the IRR for higher-paid workers will become negative (row 12).

At the same time, the Labour Government can be accused of political naiveté. In 1999 it introduced a Minimum Income Guarantee (MIG) for pensioners: by April 2003 the MIG was £100 a week for individuals and £154 for couples. In October 2003 it introduced an additional Pension Credit, which enhances the pension of single pensioners to £135 per week and of couples to £201 per week if they have additional income from other sources such as private pensions and savings. The government's plan was to uprate all these limits in line with national average earnings. This promise would become increasingly expensive to honour over time, because all pensions in payment are uprated in line with prices (capped at 2.5% per annum for private-sector pensions[31]), and therefore over time, larger and larger proportions of the retired population will become eligible for the MIG and Pension Credit. Row 13 of Table 1 shows that the effect of the promise is to raise the real return on the state pension scheme to 7% for low-paid workers and to 3.7% for high-paid workers. The Pensions Commission (2004, 2005) recognized the unsustainability of this promise, as eventually did the government (Pensions Bill 2006, following Department for Work and Pensions 2006).

In an attempt to contain the ever-rising cost of state pensions, the government now plans to raise the state pension age to 68 for both men and women by 2046. This will reduce the IRR of S2P and the Pension Credit by 0.6–0.7 percentage point (row 14). In addition, the government will target the Savings Credit component of Pensions Credit on the low-paid but will also fix it in real terms from 2015. This lowers the real return on S2P marginally to 6.1% for low-paid workers, but substantially for high-paid workers to 1.2% (row 15). Single women end up with slightly higher IRRs from S2P membership (row 23). The rise in state pension age will also help the government pay for its policy of relinking the BSP to earnings. This will raise the IRR of the BSP for men to 12.3% (row 3) and for women to 10.7% (row 19) (and to 12.4% (row 4) and 10.8% (row 20), respectively, when the number of qualifying years are reduced to 30).[32]

TABLE 2
POLITICAL RISK WITH PERSONAL PENSION SCHEMES: REAL INTERNAL RATES OF RETURN (%)

Type of member	Low-paid	Average	High-paid
Earnings 2002/03 (£)	10,800	24,600	30,420
Male, 25 years old, married			
1 *Original PPS: annuity purchased at age 65, no lump sum*	*3.916*	*3.919*	*3.919*
2 Revised PPS: abolition of 20% tax credit on UK dividends	3.900	3.903	3.903
3 Personal Accounts with automatic enrolment	7.880	7.880	NA
Female, 25 years old, single			
4 *Original PPS: annuity purchased at age 65, no lump sum*	*4.236*	*4.200*	*4.200*
5 Revised PPS: abolition of 20% tax credit on UK dividends	4.221	4.185	4.185
6 Personal Accounts with automatic enrolment	8.111	8.111	NA

Notes:
The table reports real internal rates of return from membership of a PPS in its original form and subsequent revised forms for a married male (with a 50% spouse's pension) starting a PPS at age 25 in 1978 at three different starting salaries equal to the Low Earnings Threshold (denoted low-paid), the Second Earnings Threshold (approximately equal to average earnings) and the Upper Earnings Limit for membership of SERPS/S2P (denoted high-paid), respectively, for 2002/03. These salaries are assumed to grow annually in line with national average earnings. The male is assumed to be married to a female of the same age, the female is assumed to be unmarried and both are assumed to survive until at least the age of 68. Annual contributions into the PPS are assumed to equal the annual contracted-out NIC rebates plus any incentive bonuses in operation since 1978. The tax rate is assumed to be 22% (the basic rate) for the low-paid and average worker and 40% (the higher rate) for the high-paid worker.

Personal pension internal rates of return

One of the attractions of PPSs is that they are not susceptible to demographically induced political risk. Nevertheless, even without any change in legislation, increases in life expectancy during the accumulation phase will reduce the amount of annual benefits they provide in retirement.

PPSs are, however, susceptible to economically induced political risk. The first example of this was the abolition of the 20% tax credit on UK dividends in 1997. This shaved 16 basis points off the IRR on male PPSs (row 2 compared with row 1 of Table 2) and 15 basis points off the IRR on female PPSs (row 5 compared with row 4 of Table 2).

The government's proposal to introduce Personal Accounts following the recommendation of the Pensions Commission introduces an element of pure political risk into PPSs, but it is rather different from what has been considered so far. This is because it is likely to be the providers of PPSs (i.e. the banks, building societies and insurers) that will lose market share as a consequence of the generous cross-subsidies to low- and middle-income earners with Personal Accounts. The 4% employee contribution attracts an additional compulsory 3% employer contribution and another 1% in the form of tax relief. This leads to Personal Accounts having an IRR of around 8% (rows 3 and 6), almost double that of PPSs (rows 2 and 5).

TABLE 3
POLITICAL RISK WITH THE STATE PENSION SCHEME: EXPECTED-UTILITY-ADJUSTED INTERNAL RATES OF RETURN (%)

	Type of member	Low-paid	Average	High-paid
	Earnings 2002/03 (£)	10,800	24,600	30,420
	Male, 25 years old, married			
1	*Original Basic State Pension Scheme: linked to earnings, retire at 65 (with 40/44ths of full pension)*	*13.1952573*	*13.1952573*	*13.1952573*
2	Revised Basic State Pension Scheme: linked to prices	13.1899204	13.1899204	13.1899204
3	Revised Basic State Pension Scheme: linked to earnings, retire at 68 (with full pension)	13.1952741	13.1952741	13.1952741
4	Revised Basic State Pension Scheme: linked to earnings, retire at 68, qualifying years for full pension reduced to 30	13.1904709	13.1904709	13.1904709
5	*Original SERPS: linked to earnings, retire at 65*	*5.6521514*	*5.1489583*	*5.0879250*
6	Revised SERPS: linked to prices	5.6520922	5.1489318	5.0879035
7	Revised SERPS: accrual rate reduced to 20% of band earnings	5.6520332	5.1489052	5.0878818
8	Revised SERPS: lowering revaluation factor	5.6519799	5.1488966	5.0878765
9	Revised SERPS: spouse's pension reduced to 50%	5.7625794	5.2496263	5.1874093
10	Revised SERPS: raising the effective contribution rate	5.7624215	5.2496061	5.1873926
11	SERPS replaced by earnings-related S2P	5.7625841	5.2496061	5.1873891
12	Revised S2P: flat rate	5.7625841	5.2495772	5.1873578
13	Revised S2P: flat rate plus MIG/Pension Credit	5.7629333	5.2496454	5.1874029
14	Revised S2P: flat rate plus Pension Credit, retire at 68	5.7630291	5.2497221	5.1874692
15	Revised S2P: flat rate plus Targeted Savings Credit, retire at 68	5.7630515	5.2497265	5.1874721
	Female, 25 years old, single			
16	*Original Basic State Pension Scheme: linked to earnings, retire at 60 (with 35/39ths of full pension)*	*13.5185716*	*13.5185716*	*13.5185716*
17	Revised Basic State Pension Scheme: linked to prices	13.5130891	13.5130891	13.5130891
18	Revised Basic State Pension Scheme: retire at 65	13.1301376	13.1301376	13.1301376
19	Revised Basic State Pension Scheme: linked to earnings, retire at 68 (with full pension)	13.5192048	13.5192048	13.5192048
20	Revised Basic State Pension Scheme: linked to earnings, retire at 68, qualifying years for full pension reduced to 30	13.5126851	13.5126851	13.5126851
21	*Original SERPS: retire at 60*	*5.3611624*	*4.8141301*	*4.7483936*
22	Fully revised SERPS: retire at 65	5.3613889	4.8142196	4.7484650
23	Revised S2P: flat rate plus targeted Savings Credit, retire at 68	5.3617452	4.8142643	4.7484831

Notes:
The table reports expected-utility-adjusted internal rates of return from membership of the first-pillar Basic State Pension Scheme and the second-pillar SERPS/S2P in their original forms and subsequent revised forms for a married male and a single female both joining the schemes at age 25 in 1978 at three different starting salaries equal to the Low Earnings Threshold (denoted low-paid), the Second Earnings Threshold (approximately equal to average earnings) and the Upper Earnings Limit for membership of SERPS/S2P (denoted high-paid), respectively, for 2002/03. These salaries are assumed to grow annually in line with national average earnings. In each row, the EUA IRR is equal to the unadjusted IRR from the corresponding row of Table 1, scaled by the ratio of the value function implied by the policy change to the value function associated with the original scheme.

TABLE 4
POLITICAL RISK WITH PERSONAL PENSION SCHEMES: EXPECTED-UTILITY-ADJUSTED INTERNAL RATES OF RETURN (%)

Type of member	Low-paid	Average	High-paid
Earnings 2002/03 (£)	10,800	24,600	30,420
Male, 25 years old, married			
1 *Original PPS: annuity purchased at age 65, no lump sum*	*3.9155339*	*3.9192577*	*3.9192577*
2 Revised PPS: abolition of 20% tax credit on UK dividends	3.9155319	3.9192568	3.9192570
3 Personal Accounts with automatic enrolment	3.9156661	3.9193401	NA
Female, 25 years old, single			
4 *Original PPS: annuity purchased at age 65, no lump sum*	*4.2357865*	*4.2005741*	*4.2005741*
5 Revised PPS: abolition of 20% tax credit on UK dividends	4.2357843	4.2005731	4.2005733
6 Personal Accounts with automatic enrolment	4.2359218	4.2006623	NA

Notes:
The table reports expected-utility-adjusted internal rates of return from membership of a PPS in its original form and subsequent revised forms for a married male (with a 50% spouse's pension) starting the PPS at age 25 in 1978 at three different starting salaries equal to the Low Earnings Threshold (denoted low-paid), the Second Earnings Threshold (approximately equal to average earnings) and the Upper Earnings Limit for membership of SERPS/S2P (denoted high-paid), respectively, for 2002/03. These salaries are assumed to grow annually in line with national average earnings. In each row, the EUA IRR is equal to the unadjusted IRR from the corresponding row of Table 2, scaled by the ratio of the value function implied by the policy change to the value function associated with the original scheme.

Expected-utility-adjusted internal rates of return

The analysis so far has quantified political risk in terms of reduced IRRs, a procedure that is strictly valid only if individuals are risk-neutral. If, as is likely to be the case, individuals are risk-averse, political risk should be quantified in terms of reduced EUA IRRs. This is done in Tables 3 and 4 for the SPS and PPSs, respectively. To ease comparison with Tables 1 and 2, the EUA IRRs for the original schemes prior to reform have been rescaled to equal the corresponding IRRs. EUA IRRs are ordinal not cardinal measures and must be interpreted accordingly. The differences between the rows in Tables 3 and 4 are lower than the corresponding differences in Tables 1 and 2. This follows because IRRs are simple expected return measures and ignore risk, namely the insurance value that individuals derive from being a member of a pension plan that eliminates longevity risk, even if the benefits are being progressively eroded (a similar finding has been observed by Brown (2003)).

In general, the ordinal relationship between the elements of Tables 3 and 4 and those of Tables 1 and 2 are the same, and where this is the case I shall not comment further. Instead, I shall examine some cases in which the IRR and the EUA IRR move in opposite directions.

Compare, for example, row 4 with row 3 (or row 19 with row 18) of Table 3. Although Table 1 shows that the IRR is higher in row 4 than in row 3 (or row 19 than row 18) because of the reduced number of qualifying years to receive a full pension, the EUA IRR is lower. This is because the worker works for 30 years in the case of row 4 (row 19) and for 43 years in the case of row 3 (row 18). The shorter working life lowers human capital (equation (16)), optimal consumption (equation (13)) and hence lifetime utility (equation (1)).

As another example, compare rows 9 and 8 of Table 3. The 50% reduction in the spouse's pension in SERPS lowers the IRR (cf. rows 9 and 8 of Table 1), but increases the EUA IRR. This follows because the survival probabilities in equations (13) and (16) fall from $(1-q_{\upsilon}) = \left(1-q_{\upsilon}^{M}\right) + q_{\upsilon}^{M}\left(1-q_{\upsilon}^{F}\right)$ to $(1-q_{\upsilon}) = \left(1-q_{\upsilon}^{M}\right) + 0.5q_{\upsilon}^{M}\left(1-q_{\upsilon}^{F}\right)$ (where q_{υ}^{M} and q_{υ}^{F} are the male and female mortality rates at time υ). This raises θ_t in equation (13) but lowers $\bar{H}_t^*$ in equation (16). The net effect in this case is to increase consumption and hence lifetime utility.

III. CONCLUSIONS

When William Beveridge laid the foundations for the British welfare state after the Second World War, he hoped to depoliticize state pensions. He attempted to do this in two ways: first, the pensions were set at a level that provided just a minimal safety net, and second, the pensions were to be fully funded through a system of National Insurance.

We have seen how Beveridge's hopes have been dashed. Over the last quarter-century, numerous policy changes have affected the level of state pension benefits and contributions.[33] What does this 26-year rollercoaster of policy changes tell us? It tells us that, in terms of the BSP, although the IRR has fallen as a result of the increase in state pension age, women have come out of it worse than men, largely because of an eight-year increase in retirement age compared with a three-year increase for men; but it still remains a very good investment in real terms for both sexes. In the case of second-pillar state pension provision, the low-paid (men and, especially, women) end up with slightly higher IRRs (although they too have to work extra years for the privilege), but middle- and higher-paid workers are much worse off. This is because a scheme with earnings-related benefits has been replaced by one with flat-rate benefits, although contributions remain earnings-related. The main reason for this reduction in the value of second-pillar provision has been demographic risk, as manifested in the recognition by governments over the last-quarter century that the combination of increasing longevity and declining fertility is fatal for the long-term viability of a pay-as-you-go state pension system without serious cutbacks in its generosity. However, middle- and higher-paid workers, with no private savings would be even worse off without the means-tested Pension Credit. At the same time, governments have used the tax and social security system to provide incentives for individuals to contract out of the second-pillar state scheme into private pension schemes. This has further reduced the attractiveness of state pensions and has been the key example of the economically induced political risk that such schemes face.

Despite the significant government incentives offered to set up personal pension schemes, these have also been subject to political risk involving consequential reductions in their internal rates of return. Nevertheless, to date, political risk has been considerably lower with personal pension schemes than with the state pension schemes. The difference is explained largely by the differential impacts that demographic changes have had on the two schemes: funded schemes are much less susceptible to (although not immune from) adverse demographic shocks than are pay-as-you-go schemes. The only real ray of sunlight in all of this is the new system of automatically enrolled Personal Accounts for lower-income workers in the form of a mandatory 3% contribution cross-subsidy from employers. But even this modest element of compulsion has led to claims that it could bring down much of what is left of British industry, and that many firms may 'persuade'

their workers not to enrol. ('Compulsion would be a step too far, says CBI' according to a headline in *Pensions Week* on 12 December 2005.[34])

Most workers are risk-averse, and so will value membership of a pension plan that eliminates longevity risk even if there is a systematic decline in the plan's benefits. The cuts in state pension benefits do lead to reductions in expected utilities, but the reductions are, as anticipated, lower in percentage terms than in the case of internal rates of return.

The above analysis has two important lessons.

1. British workers in the private sector now face a range of very stark choices regarding their future pensions. Over a period of just five years, they have seen the end of a system of final salary pensions that took a century and a half to establish. Such workers will find that, in line with Beveridgean principles, the state will provide only minimal support in old age. Further, they will find that they have little alternative but to establish personal pension schemes (even if this is done via their company's defined contribution scheme that replaced the previous defined benefit scheme) and to assume all the attendant financial, mortality and, indeed, political risks.
2. Continental European workers have become used to the high unfunded state pensions that are a hallmark of the Bismarckian model of social welfare that underlies the European Union. However, the continental population is aging even more rapidly and the fertility rate is even lower than in the United Kingdom (United Nations 2000; McMorrow and Röger 2003). Initially, virtually every proposal by continental governments to reduce state pensions, however minor, was met with political unrest (usually in the form of street protest), which tended to lead to the proposal being withdrawn. At the same time, there has been great hostility on the Continent to the pre-funding of pensions, and in particular to personal pensions, which are deemed to be inconsistent with European 'social solidarity'. The present analysis suggests that continental European workers face enormous political risk in respect of their pension entitlements, and that they too are likely to find in the near future that a government pension promise is as volatile on the Continent as it is in the UK.[35]

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NOTES

1. Association of Consulting Actuaries (2006). It is likely that DB will remain the predominant form of provision in the public sector for some time.
2. Hewitt Associates (2006).
3. Some of these risks can be mitigated, e.g. through the purchase of index-linked gilts and annuities.
4. UK studies that discuss this issue, if only tangentially, include Attanasio and Rohwedder (2003), Disney (2004), Disney and Emmerson (2005), Miles (1999) and Miles and Sefton (2003).
5. Inevitably, there will be some arbitrariness to the assignment of a particular source of political risk to a particular reform. I selected the assignments below on the basis of my understanding of how the reforms were explained at the time. However, readers are free to choose a different set of assignments.
6. This age was chosen to coincide with the Government's policy to increase the state pension age to 68 by 2046 (Pensions Bill 2006; see http://www.publications.parliament.uk/pa/cm200607/cmbills/012/2007012.pdf, following Department for Work and Pensions 2006).
7. As Yaari (1965) showed, the Euler equation with lifetime uncertainty is the same as in the case of no lifetime uncertainty.
8. Note that, since $\bar{H}_t^*$ depends on L_t^*, which in turn depends, via (10), on C_1^*, optimal consumption in (13) must be determined implicitly using (13), (16) and (10). In the case where labour supply is exogenous,

optimal consumption is given explicitly by (13), and θ_t can be interpreted as the marginal propensity to consume out of human capital.

9. This particular measure is easy to compare with the IRR measure of political risk, since the EUA IRR equals the IRR for the original scheme prior to any policy change being made. The proportionate change in expected utility, as a result of the policy change, is independent of the size of the IRR, a property that is consistent with the ordinal nature of expected utility.
10. This contribution rate has been inferred from the structure of National Insurance contributions operating prior to 5 October 1989. All earnings at the Lower Earnings Limit (the minimum earnings level both for paying NI contributions and for eligibility to participate in SERPS) were subject to an 'initial rate' of 2%. While NI contributions are not hypothecated to the provision of any particular social service, the Government Actuary's Department confirmed that it would be reasonable to assess the 'contribution rate' towards the BSP as being 2% of the LEL (Blake and Orszag 1999, p. 402). I have maintained this contribution rate for periods after 5 October 1989, despite changes to the structure of NI contributions which removed the initial rate. It goes without saying that this contribution rate does not reflect the true cost of providing the BSP.
11. Again, I make this assumption even though NI contributions are not hypothecated.
12. In other words, I am considering a minimum-contributions personal pension scheme.
13. This approximates the asset allocation of a typical UK mutual fund.
14. Background on the reforms in the United Kingdom are provided in Blake (2003, chapter 10) and Department for Work and Pensions (2006).
15. All these reforms, which started in 1980, were announced by the Thatcher–Major Conservative and Blair Labour governments and described as addressing the demographic problem of an ageing population, caused by a combination of increased longevity and lower fertility. These were the first governments in the developed world to confront this problem.
16. Originally, each year's earnings within the earnings band for membership of SERPS were revalued to retirement age according to the formula (Earnings $\times$ NAE – LEL $\times$ RPI), where NAE (RPI) is the cumulative increase in national average earnings (retail prices) between the year in question and the retirement year. Following the introduction of the Pensions Act 1995, the annual revaluation factor became (Earnings – LEL) $\times$ NAE, which equals (Earnings $\times$ NAE – LEL $\times$ RPI) – LEL $\times$ (NAE – RPI).
17. The 1986 Act planned for the reduction to take place for members who died after 5 April 2000. The 1999 Act introduced the gradual reduction from October 2002.
18. These reforms were announced as having the aim of incentivizing workers first to contract out of SERPS and then not to contract back in again at a later date.
19. These reforms were announced by the Blair Labour Government as having the aim of improving the state pensions of poorer workers (its natural supporters) at the expense of higher paid workers.
20. The benefit accrual amount is 40% of (revalued LET – revalued LEL) on any earnings between LEL and LET (with every member assumed to have an income equal to at the least the LET whatever his or her actual income), *plus* 10% of (revalued SET – revalued LET) on any earnings between LET and SET, *plus* 20% of (revalued UEL – revalued SET) on any earnings between SET and UEL, where LET is the Low Earnings Threshold and SET is the Second Earnings Threshold. The 2006 Pensions Bill drops the third (i.e. 20%) band from 2010 and increases the size of the second (i.e. 10%) band to cover all earnings between the LET and UEL.
21. Pension Credit has two components. The first, the Guarantee Credit (the new name for the Minimum Income Guarantee) ensures that everyone over 60 has a minimum weekly income of £114.05 in 2006/07 (£174.05 for couples). This has risen in line with average earnings since its introduction in 1999, and the government plans to continue with this uprating policy over the long term. The second is the Savings Credit, which is available to people over 65 who have modest income from an occupational or personal pension scheme or from private savings which takes their total income above the level of the full BSP (£84.25 a week for a single person or £134.75 for a couple in 2006/07). The Savings Credit accrues at the rate of £0.60 for every £1 of qualifying income above the threshold, up to a maximum of £17.88 for a single person and £23.58 for a couple. People with income above the Guarantee Credit level will have their Savings Credit reduced by £0.40 for every £1 of income above that level. The Savings Credit therefore tapers off to zero when the pensioner's weekly income reaches £159 (£233 for couples).
22. Department for Work and Pensions (2006, p. 103) states: 'The state pension system seeks to achieve two objectives – to tackle pensioner poverty, and to provide a foundation for retirement incomes for all. . . .[The government proposes] to ensure that the Basic State Pensions can act as a foundation for further provision, by linking its value to rises in average earnings.' The 2006 Pensions Bill proposals closely follow the recommendations of the Pensions Commission (2004, 2005).
23. The benefit accrual amount will be 40% of (revalued LET – revalued LEL) whatever the member's income level.
24. Nevertheless, there is demographic risk with PPSs. The improvement in longevity between *English Life Tables* 14 (based on mortality experience in England and Wales between 1980 and 1982) and *English Life Tables* 15 (based on mortality experience in England and Wales between 1990 and 1992) shaves around 10 basis points off all the IRRs reported in Table 3 below.

25. Some of the £5 billion also comes from Personal Equity Plan participants (Inland Revenue News Release, 2 July 1997, http://archive.treasury.gov.uk/pub/html/budget97/ir2.html).
26. The Pensions Commission (2005) called this system the National Pensions Saving Scheme (NPSS). Others have called it BritSaver, after KiwiSaver, the New Zealand equivalent upon which it was, in part, based.
27. The Pensions Bill 2006, following Department for Work and Pensions (2006), will abolish contracting out for all defined contribution pension schemes from 2012. This is intended to reduce administrative complexity and remove a key source of confusion for individuals. It will be introduced at the same time as the BSP is reindexed to earnings. The Department for Work and Pensions (2006, p. 92) argues that, 'Given the actuarial assumptions currently used to calculate the level of the rebate, people should generally be no better or no worse off in retirement as a result of the abolition of contracting out for DC pensions.' I therefore do not consider this matter further in this paper.
28. The man, having worked for 40 years will receive 40/44ths of the full BSP, while a woman having worked for 35 years will receive 35/39ths of the full BSP.
29. I will present the long-run equilibrium adjustments to the IRRs as a result of the government's policy reforms.
30. The IRRs are calculated on the assumption that each rule change was introduced in 1978, rather than in the actual year. I therefore disregard transitional issues and present only the steady-state IRRs resulting from each rule change.
31. Pensions Act 2004.
32. The much higher rates for a married man than for a single woman are explained by the fact that, should he die, his widow will receive a single person's pension until she in turn dies.
33. I believe the frequency of changes has been facilitated by the very complexity of the state pension system in the United Kingdom. Very few people understand what all these changes mean and who gains from and who loses out by them. How can anyone be expected to plan a life-cycle savings and consumption programme in the face of such chopping and changing? This contrasts with the much simpler and more transparent US social security system, where there have been no significant changes since it was introduced in the 1930s, despite the best efforts of President George W. Bush.
34. The accompanying article stated (on p. 3) that 'Digby Jones, director general of the Confederation of British Industry, said [Pension] Commission chairman Adair Turner's proposals to force employers to match employee contributions up to 3% may push many smaller firms to the wall. ''Make no mistake, compulsion would be a step too far for smaller firms, who could simply not afford such a hike in the cost of employment'', said Jones.'
35. Recent studies showing the extent of political risk on the Continent include: Schmähl (2003) and Börsh-Supan and Wilke (2004, 2006) on Germany; Blanchet and Legros (2002) and Clark (2003) on France; Palmer (2002) on Sweden; Franco (2002) on Italy; and Lindbeck (2003) and Luxembourg Institute for European and International Studies (2004) on Europe as a whole.

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