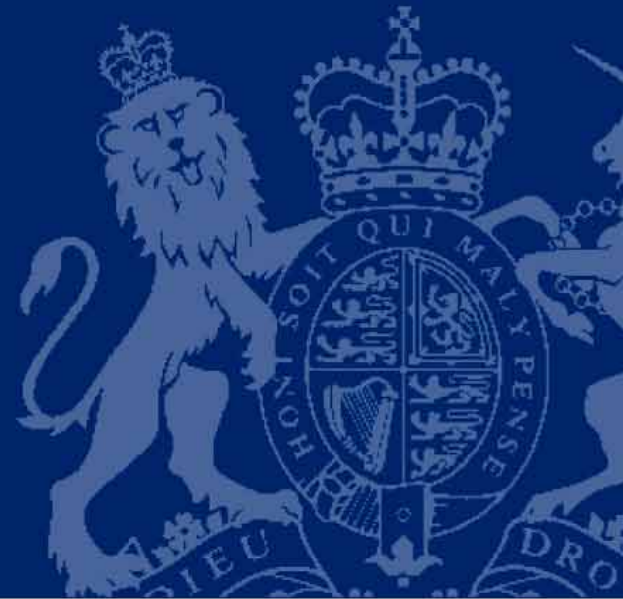


Annuities and decumulation phase of retirement



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CASH LUMP SUM AT RETIREMENT

CASH INSTEAD OF PENSION

- > popular with pension scheme members
- > can be used to pay off mortgage on house...
- > ...or to buy a retirement home, car, etc.
- > gives flexibility for investing as individual wishes
- > may facilitate handing money on to children
- > favourable tax treatment in some countries...
- > ... although amount may be restricted
- > but it is not directly “income in retirement”
- > and may be spent or “squandered”

MAIN FEATURES

- > keep accumulated individual fund invested
- > maintain investment control
- > withdraw money regularly from fund as pension
- > purchase annuity at some later date (perhaps)
- > also known as “draw-down” ...
- > ...or “programmed withdrawal”
- > may be available as flexible withdrawal from fund
- > or as a specific regulated product (as in UK)

ADVANTAGES

- > allows investment in equities, etc. for longer period
- > permits greater investment flexibility
- > permits flexibility in amounts taken each year
- > not obliged to withdraw whole fund
 - > when market value of fund is depressed, or
 - > when annuity rates are low
- > avoids handing whole fund to insurer
- > can pass to survivors what is left in fund at death

DISADVANTAGES

- > risk of outliving assets
- > risk of drawing money down too quickly...
- > ...or too slowly!!
- > mortality drag
- > rising cost of annuities and selection problems
- > risk of investment returns below expectation
- > expenses of contract or of managing assets

INCOME WITHDRAWAL

MORTALITY DRAG

The cost of an annuity due can be expressed as follows:

$$\ddot{a}_x = 1 + (v \cdot \ell_{x+1} + v^2 \cdot \ell_{x+2} + \dots v^{\omega-x} \cdot \ell_{\omega}) / \ell_x$$

at rate of interest i , where ω is the limit of life

$$= 1 + v \cdot \ell_{x+1} \cdot \ddot{a}_{x+1} / \ell_x$$

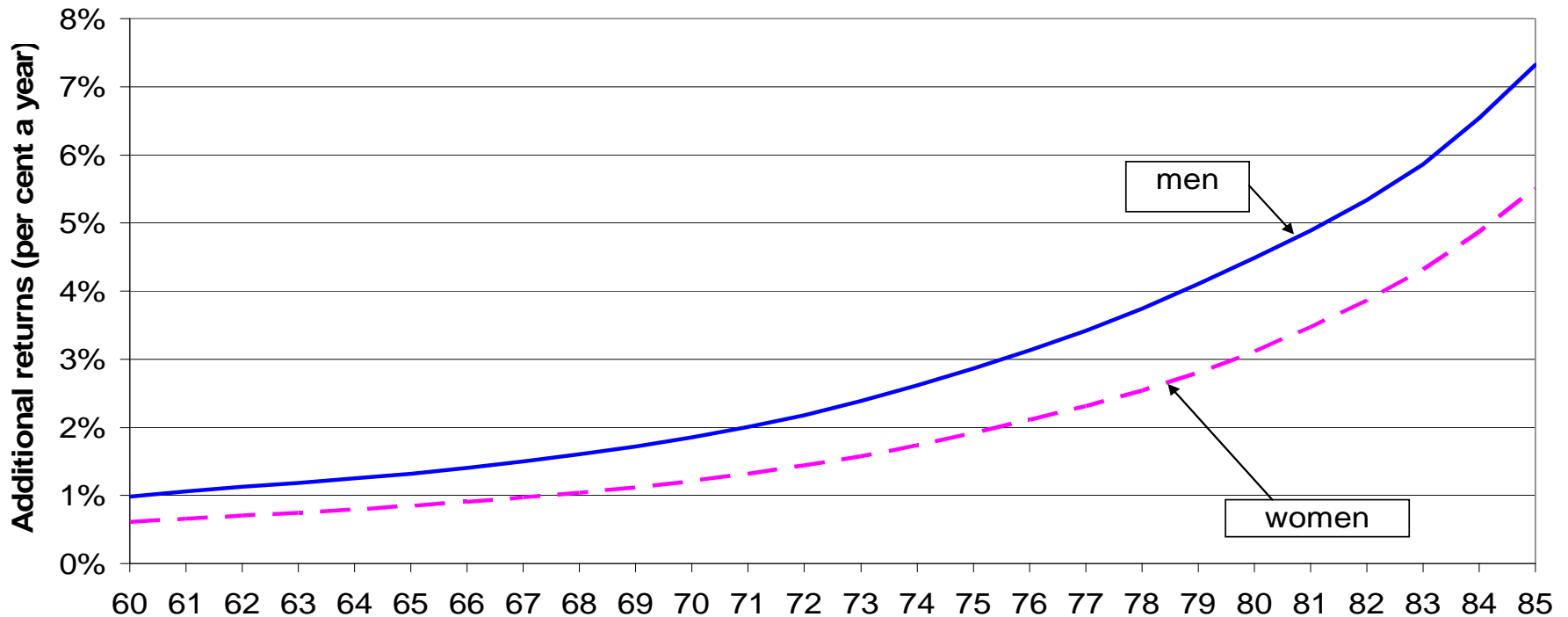
The extra cost of taking a withdrawal of 1 at age x and then buying an annuity at age $x+1$, instead of buying an annuity at age x is:

$$v \cdot \ddot{a}_{x+1} - (\ddot{a}_x - 1) = v \cdot \ddot{a}_{x+1} [1 - \ell_{x+1} / \ell_x] = v \cdot q_x \cdot \ddot{a}_{x+1}$$

The extra cost is effectively the loss of the risk-sharing which would arise under the annuity in respect of those who do not survive from age x to age $x+1$.

INCOME WITHDRAWAL - MORTALITY DRAG

Figure 7 The additional returns required in drawdown to compensate for mortality drag for person attaining age 60 in 2006



Mortality underlying 2004-based population projections, UK - source: Government Actuary's Department

NOT JUST MORTALITY DRAG

- > apart from overcoming mortality drag...
- > there is also the possibility that the terms of annuity pricing might move against the individual
 - > because of falling interest rates
 - > or because of reassessment of mortality
- > to gain from deferral the yield on the fund needs to be sufficiently more than the yield implicit in the original annuity pricing basis to overcome these two factors
- > the probability of not achieving this can be high

ARGUMENTS FOR

- > spreads risk of longevity
- > efficient use of assets to provide lifetime income
 - > individual cannot draw down income to provide stable lifetime income as lifetime is uncertain
- > ensures pension fund money is used to provide pension
- > avoids reliance on State benefits (means-tested)
- > ensures that money is received as income ...
- > ...and hence can be taxed

ARGUMENTS AGAINST

- > stops the pensioner leaving money to survivors
- > if he or she dies early, they “lose all their money”
 - > but guarantees, survivors’ annuities, cash on retirement are an offset to this
- > annuities are seen as poor value
 - > annuitants tend to live longer than average
 - > those in poor health may get a bad deal
- > pension income depends too heavily on investment yields on day of retirement

PRICING ANNUITIES

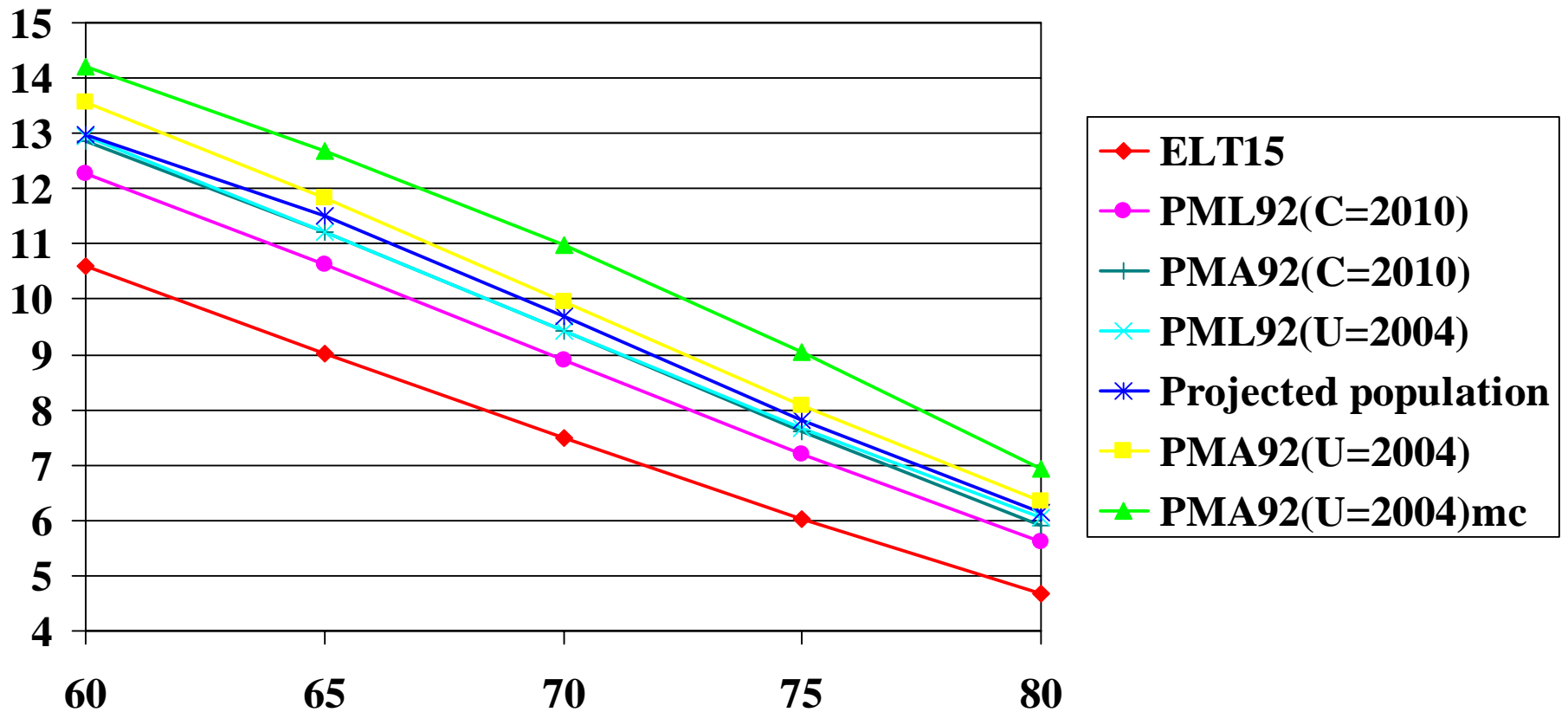
- > pensioner annuitant mortality
 - > allow for selection
 - > allow for lower mortality for higher pensions
 - > allow for improvements in mortality
- > current market redemption yields on bonds
 - > can “match” portfolio by investing in bonds
 - > adjust yields for risk
- > expenses
- > contingency margin and profit

PENSIONERS & ANNUITANTS

- > greater longevity increases costs
- > population mortality is likely to be too heavy
- > strong difference between voluntary/mandatory
- > mortality highly dependent on covered group
- > options, e.g. programmed withdrawal
- > projecting mortality is problematic
- > prudent margins needed for reserving

ANNUITISATION

Annuity rates at 5% on various mortality bases - Males



PENSION INCREASES

- > fixed annuities appear attractive (30-40% higher)
- > if same fund at retirement, increasing or index-linked annuity provides smaller initial pension
- > effect of inflation
 - > after 20 years, with 5% p.a. inflation, cost of living has increased by 165%, €100 pension would only be worth €38 in purchasing power
- > selection, if option
 - > people with increasing annuities healthier
 - > annuities may offer poor value to less healthy

OTHER TYPES OF ANNUITY

- > with-profit
- > unit-linked
- > annuitised fund
- > successive temporary annuities
- > new forms of risk-sharing

WITH-PROFIT ANNUITIES

- > basic annuity is guaranteed
- > bonuses awarded at annual actuarial valuation to increase amount of annuity
- > priced to give a margin for the insurer...
- > ...a buffer against adverse experience
- > permits a more flexible investment policy
- > initial pension is lower than for a level annuity

UNIT-LINKED ANNUITIES

- > premium invested in unit fund or funds
- > value of account changes with unit price
- > unit cancellation rate calculated at start as
 - > number of units held by the policyholder
 - > divided by life expectancy at starting age
- > that number of units is then cancelled at each payment point in respect of all those surviving
- > income received depends on current unit price
- > known in USA as TIAA-CREF annuities

ANNUITISATION

UNIT-LINKED ANNUITIES

Consider a batch of annuities sold to ℓ_x individuals aged x , each purchasing N units.
⇒ total number of units in force at age $x = N \cdot \ell_x$.

Unit cancellation rate is defined as N / e_x , e_x being the expectation of life at age x .

After one year, ℓ_{x+1} individuals remain (if mortality follows the assumed table) and the number of units cancelled at age $x + 1 = \ell_{x+1} \cdot N / e_x$

Total number of units in force at age $x+1$ after annuity payments have been made
$$= N \cdot (\ell_x - (\ell_{x+1} / e_x)) = N \cdot (\ell_x / e_x) \cdot (e_x - (\ell_{x+1} / \ell_x)) = \frac{N \cdot \ell_{x+1} \cdot e_{x+1}}{e_x}$$

The number of units runs down with a factor of proportionality $\ell_y \cdot e_y$ ($\rightarrow 0$ as $y \rightarrow \omega$), running down in accordance with the number of survivors from the original group according to the assumed mortality table.

ANNUITISED FUND

- > unitised fund with choice of investment options
- > income withdrawal by cancellation of units...
- > ...between maximum and minimum number
- > maximum might be as for unit-linked annuity
- > units from deaths redistributed to survivors
- > cohort effectively bears own risk of unanticipated improvement in mortality
- > balance in fund used to purchase conventional annuity at advanced age, e.g. 85

SUCCESSIVE TEMPORARY ANNUITIES

- > buy n year temporary annuity with p of fund
- > $(1-p)$ remains invested in choice of funds
- > after n years use q of remaining fund to buy another temporary annuity
- > $(1-p) \cdot (1-q) \cdot F_{x+n} / F_x$ remains invested, where F_x is index of fund size corresponding to age x
- > continue until advanced age at which balance of fund has to be used to purchase life annuity

RISKS FOR RETIREES

- > longevity risk
- > market risk on sale of assets
- > interest rate risk
- > annuity purchase risk
- > expense risk
- > inflation risk
- > long term care risk
- > risk of declining faculties

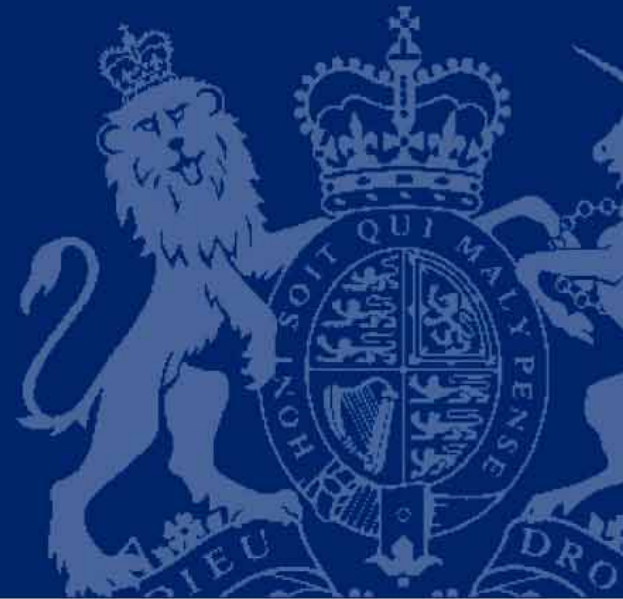
RISKS FOR PROVIDERS

- > mispricing risk
- > selection risk
- > systemic longevity risk
- > risk of limited investment market
- > mismatch risk
- > risk of guarantees
- > expense risk

OTHER FORMS OF RISK-SHARING

- > scope for development of different products
- > differing levels of mortality risk sharing
- > differing approaches to investment choice
- > ...and to controlling investment risk

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