Implementing a menu of options in decumulation-only CDC plans

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Research programme: "Optimising future pension plans"

- Pooled annuity funds

    - Type of CDC scheme.

    - Decumulation-only.

    - Pool longevity risk only, no investment risk-sharing.

- Collective defined contribution (CDC) schemes.

- Outputs: https://www.actuaries.org.uk/learn-and-develop/research-and-knowledge/actuarial-research-centre-arc/current-research/optimising-future-pension-plans-phase-ii

Today's talk

- Why pooled annuity funds?

- What must they be able to do?

- Investment strategies.

- Joint life benefits.

Current situation – ONS data
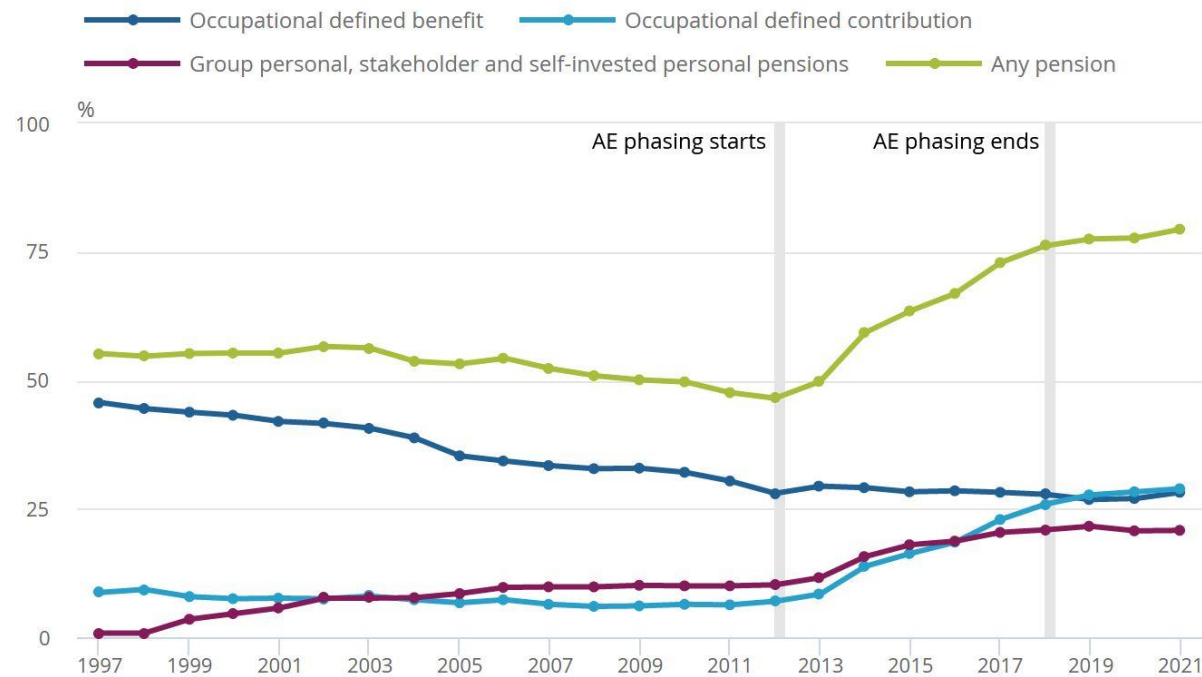
- 22.6 million workers saving into work-place pension.

Proportion of employees with workplace pension by type of pension, UK, 1997 to 2021

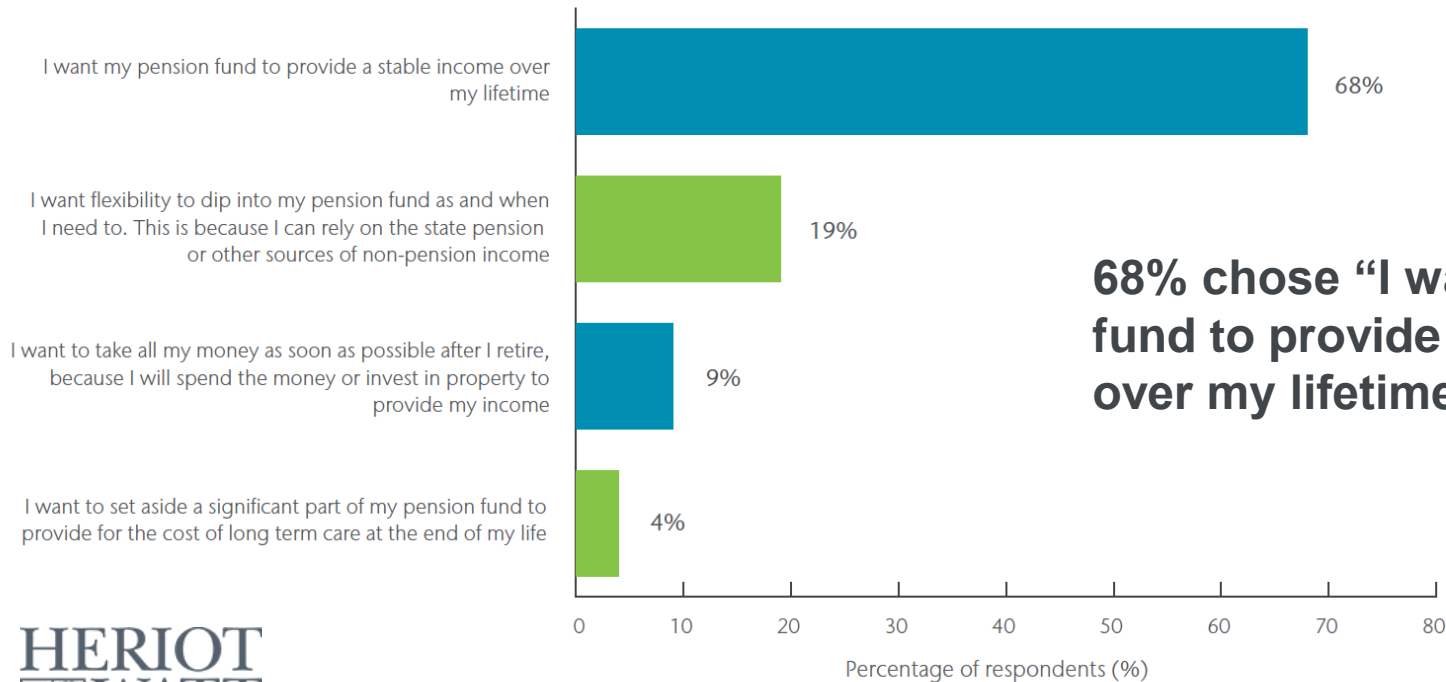23 May 2023

What do people want financially in retirement?

Chart 9 – Using retirement savings

Which of the following statements best describes your attitude towards how you might spend your pension fund?

I want my pension fund to provide a stable income over my lifetime — 68%

I want flexibility to dip into my pension fund as and when I need to. This is because I can rely on the state pension or other sources of non-pension income — 19%

I want to take all my money as soon as possible after I retire, because I will spend the money or invest in property to provide my income — 9%

I want to set aside a significant part of my pension fund to provide for the cost of long term care at the end of my life — 4%

Percentage of respondents (%)

68% chose "I want my pension fund to provide a stable income over my lifetime"

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Are pooled annuity funds the answer?

- Pooled annuity fund:

  – Join at retirement with lump-sum contribution.

  – Paid a lifelong income in retirement.

  – Earn investment returns + longevity credits

- Sharing longevity risk makes a lot of sense.

  – Don't have to guess for how many years you will live…

  – …Reduce significantly/eliminate idiosyncratic risk.

  – Still left with systematic longevity risk...

  – …But overall have a reduction in longevity risk.

Decumulation options
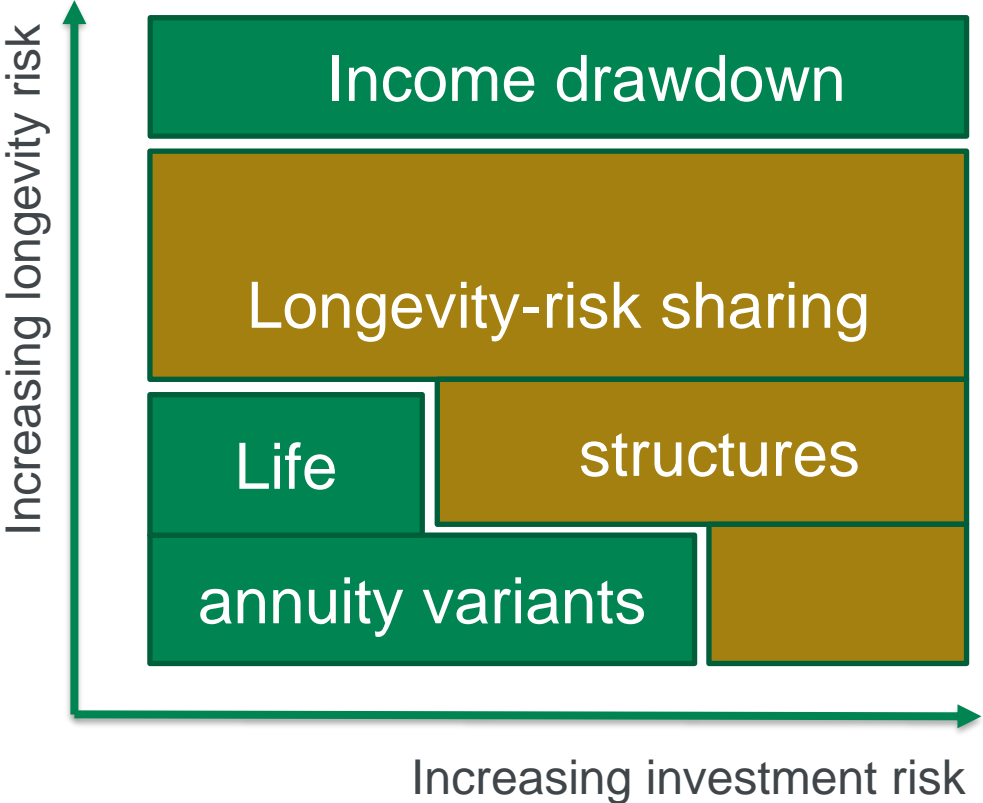
Summary of data

- Typical DC pension saver:

  - Works in the private sector.

  - Has a small amount of DC pension savings.

- If pooled annuity funds are the answer, what must they be able to do?

  - Offer joint life benefits.

  - Perhaps offer a choice of investment funds.

  - Perceived value-for-money, e.g. death benefit reflecting return of funds less income received.

  - Plus…

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Real-world examples of pooled annuity funds

QSuper
Part of Australian Retirement Trust

Key features of a Lifetime Pension

- Fortnightly payments for life
- Spouse protection option
- Potential Age Pension benefits
- Time to decide if it suits you (six-month cooling-off period)
- Money-back protection

Longevity
by Purpose

Longevity Pension Fund

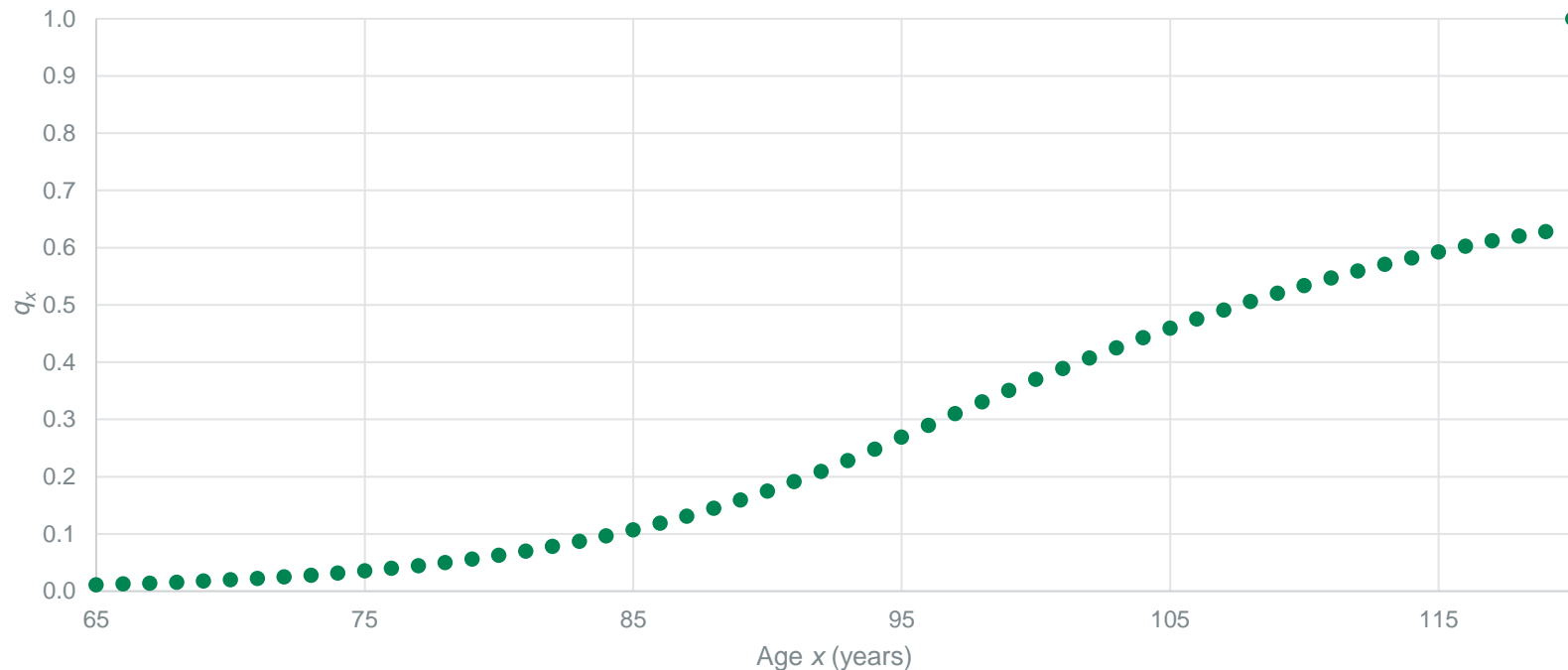**Fund Overview**   Income Policy & Distributions

How to Invest

Retire confidently with income for life

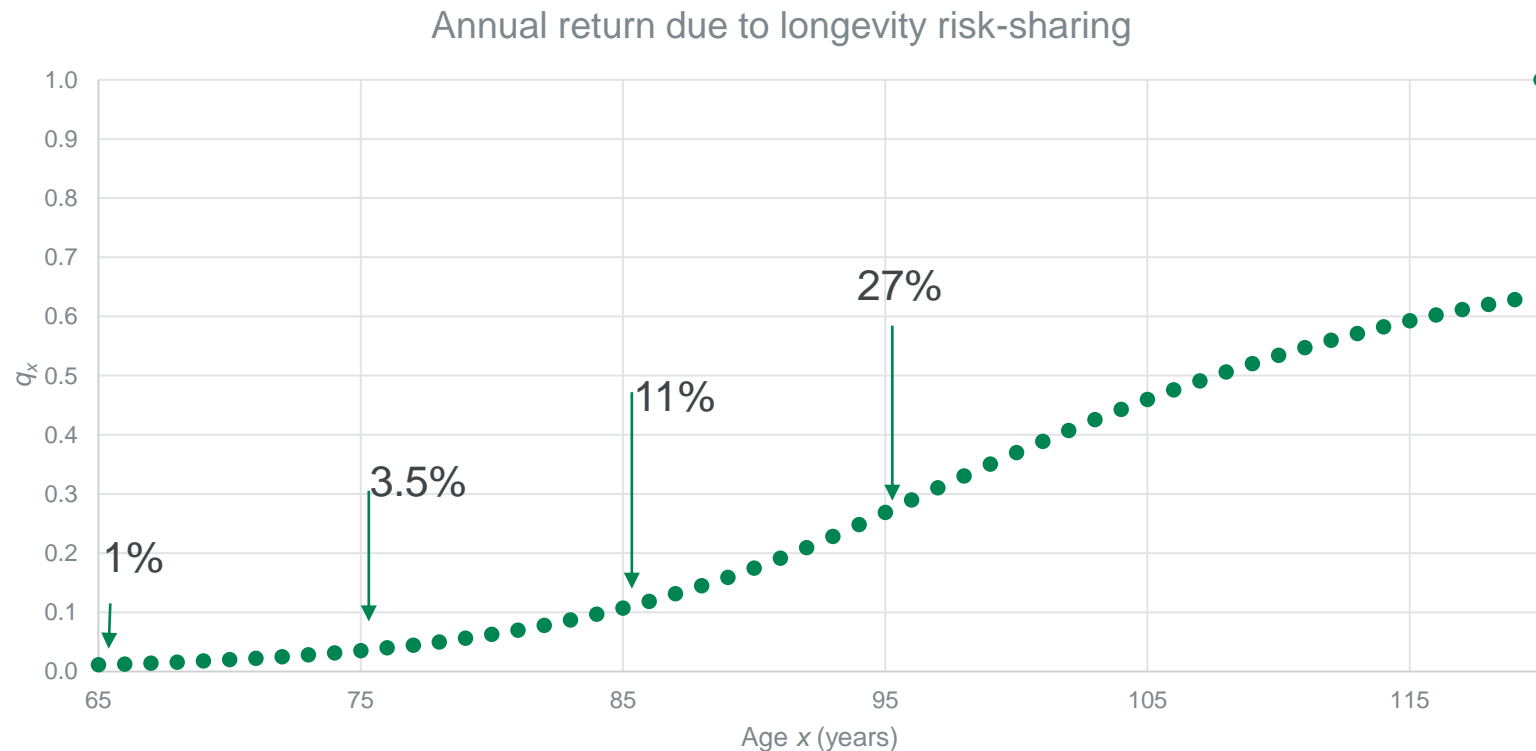The Longevity Pension Fund is a mutual fund trusted by experts

Calculations based on UK mortality table S1PMA

Annual probability of death for table S1PMA
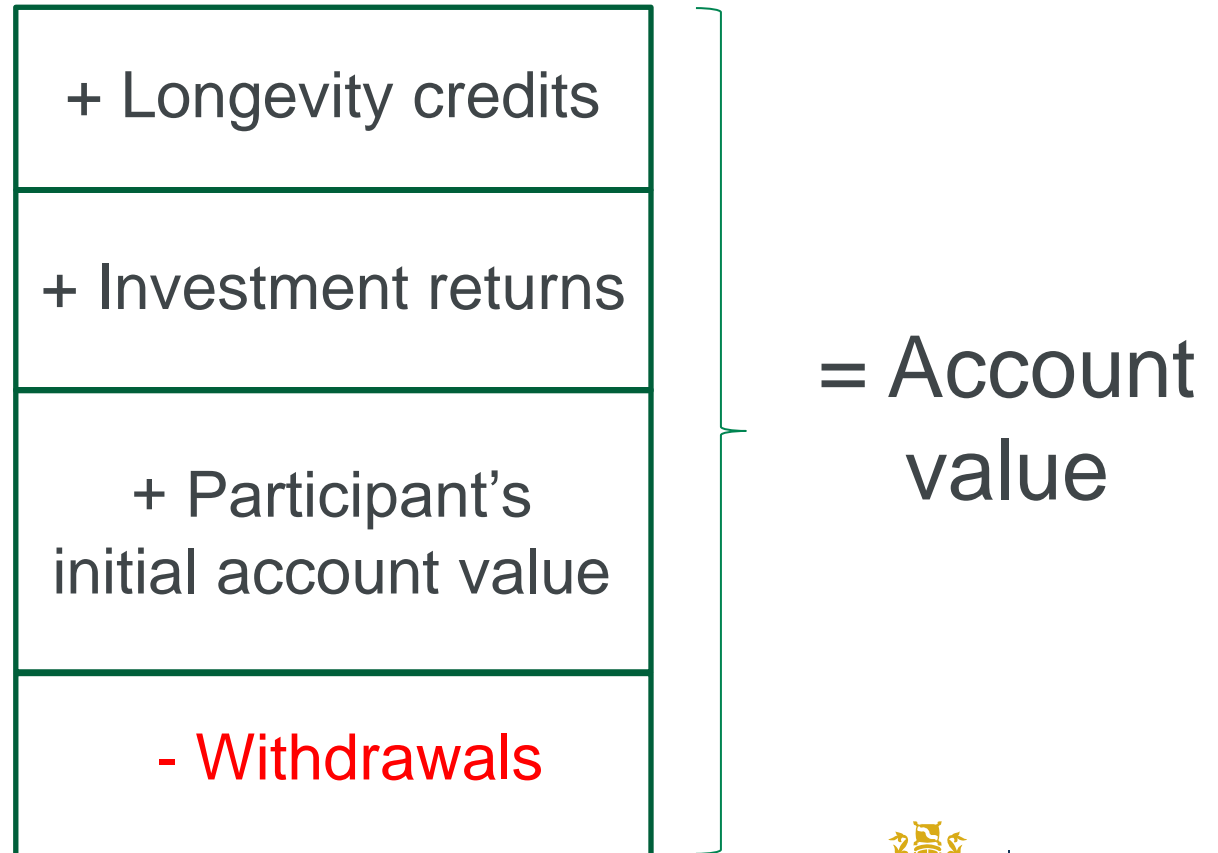
Additional return due to longevity risk-sharing

Annual return due to longevity risk-sharing

What is a pooled annuity fund?

- Structure to pool longevity risk and pay regular income for life.

- Everyone becomes the beneficiary of each other.

- Why?

  – To get a higher and life-long income, compared to income drawdown.

  – To get a higher expected income, compared to a life annuity.

Account structure

+ Longevity credits

+ Investment returns

+ Participant's
initial account value

- Withdrawals

= Account
value

A certain income profile

- An individual retires at age 65 with £100.

- Invest the £100 in line with a chosen investment strategy.

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- Withdraw a constant, monthly income from age 65 to age 75.

- At age 75, buy a life annuity contract with the residual proceeds.

A certain income profile

- An individual retires at age 65 with £100.

- Invest the £100 in line with a chosen investment strategy.

- Withdraw a constant, monthly income from age 65 to age 75.

- At age 75, buy a life annuity contract with the residual proceeds.

- For example, under income drawdown,

    – Invest 100% in risk-free asset earning 5% p.a.

    – Could get an income of ~£6.70 p.a. from age 65 to age 75,

    – Then buy life annuity of ~£5 p.a, paid from age 75.

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A certain income profile – development of the £100 account value

Distribution of the account value over time, for
pooled annuity fund vs income drawdown,
100% in risk−free asset

Legend:
- Pooled annuity fund
- Income drawdown

Axis labels: Account value; Time (years)
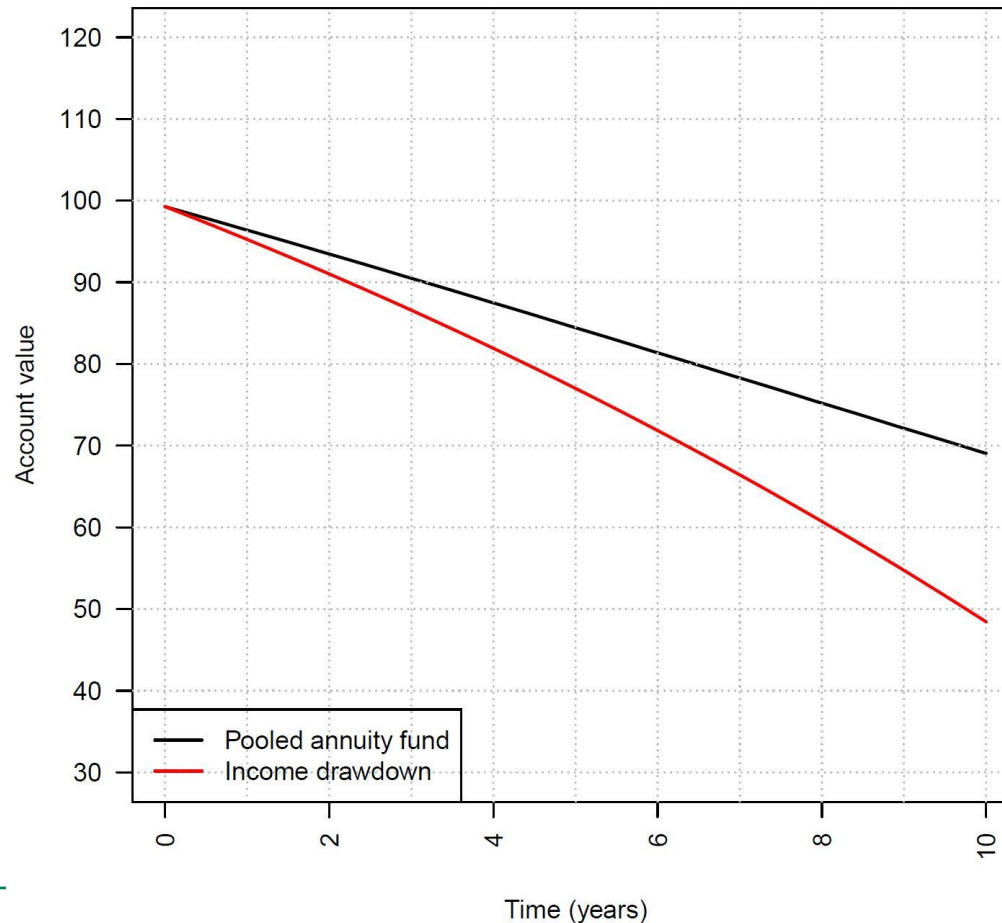
Withdraw £100/$a_{65}^{(12)}$ from age 65 to 75, use residual to buy life annuity income at 75

Annual constant investment return	Which fund gives highest income from age 75?	How much higher than under income drawdown?
2%	Pooled annuity fund	+37%
5%	Pooled annuity fund	+43%
8%	Pooled annuity fund	+50%

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The message

- Pooled annuity funds out-perform income drawdown,

  – Due to longevity credits ≥ 0.

- But note:

  – Comparison is on income only, and

  – Ignores systematic longevity risk.

Improving outcomes

- What investment strategy should the participant in a pooled annuity fund employ?

  - All money in the risk-free asset?

  - Take some investment risk?

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Improving outcomes

- John, 65 years old, starts with £100.

- Could buy a lifetime income of £8.90 per annum at age 65.

- Instead, John withdraws £8.90 p.a. and aims to have a 10% higher income, guaranteed, from age 75.

  - Needs to take investment risk to achieve his goal.

  - The EPV at age 75 of the 10% higher lifetime income is John's target account value.

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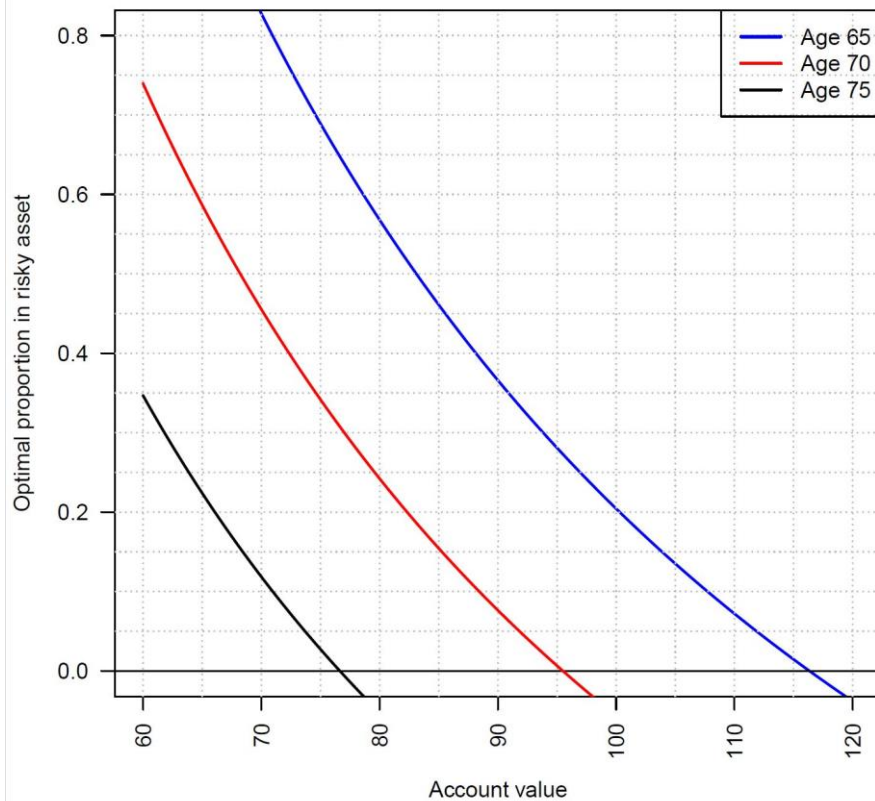Institute and Faculty
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Improving outcomes

- Assume John wants to minimise how far his account value is from the EPV of his goal.

- Use a quadratic loss function.

- Solve in the Black-Scholes model:

  – A risk-free asset earning a constant risk-free interest rate,

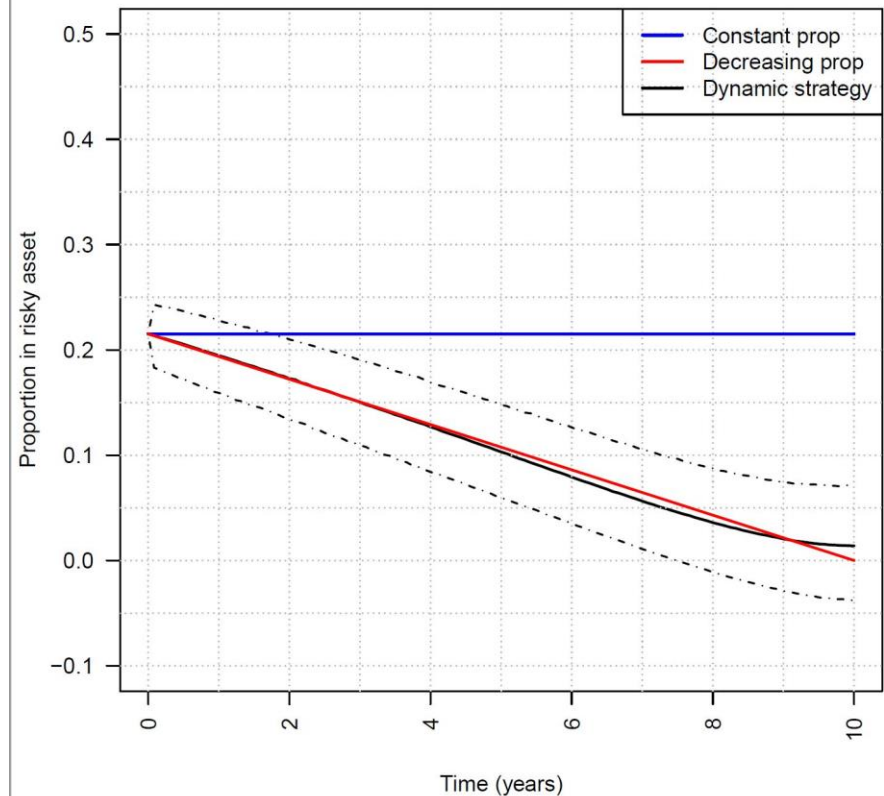 – A risky asset whose price is driven by a Brownian motion.

Improving outcomes

- The solution is a dynamic optimal investment strategy.

- The amount invested in the risky asset changes as John's account value.

  – Invest more in the risky asset, the more that John is below the target.

  – But risk aversion falls over time: John should invest less in the risky asset, the closer he is to age 75.

Improving outcomes: sustainably risk-free income in the first 10 years

Improving outcomes: sustainably risk-free income in the first 10 years

Distribution of the PAF account value over time, showing 5th, median and 95th percentiles

Income bought at age 75 is higher under the dynamic strategy:
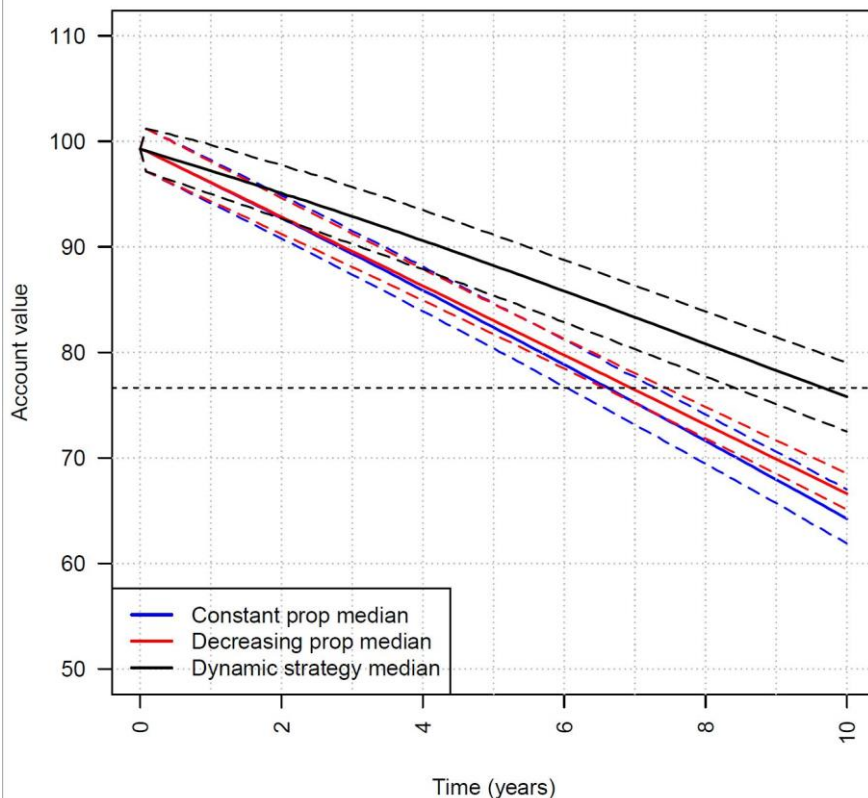
- Median £9.70 p.a. under dynamic strategy,

- +18% higher than constant proportion in risky asset;

- +13% higher than decreasing proportion in risky asset.

- Paid £8.90 p.a. from age 65 to 75.

- Target income was £9.80 p.a. from age 75.

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Improving outcomes: sustainably risk-free income in the first 10 years

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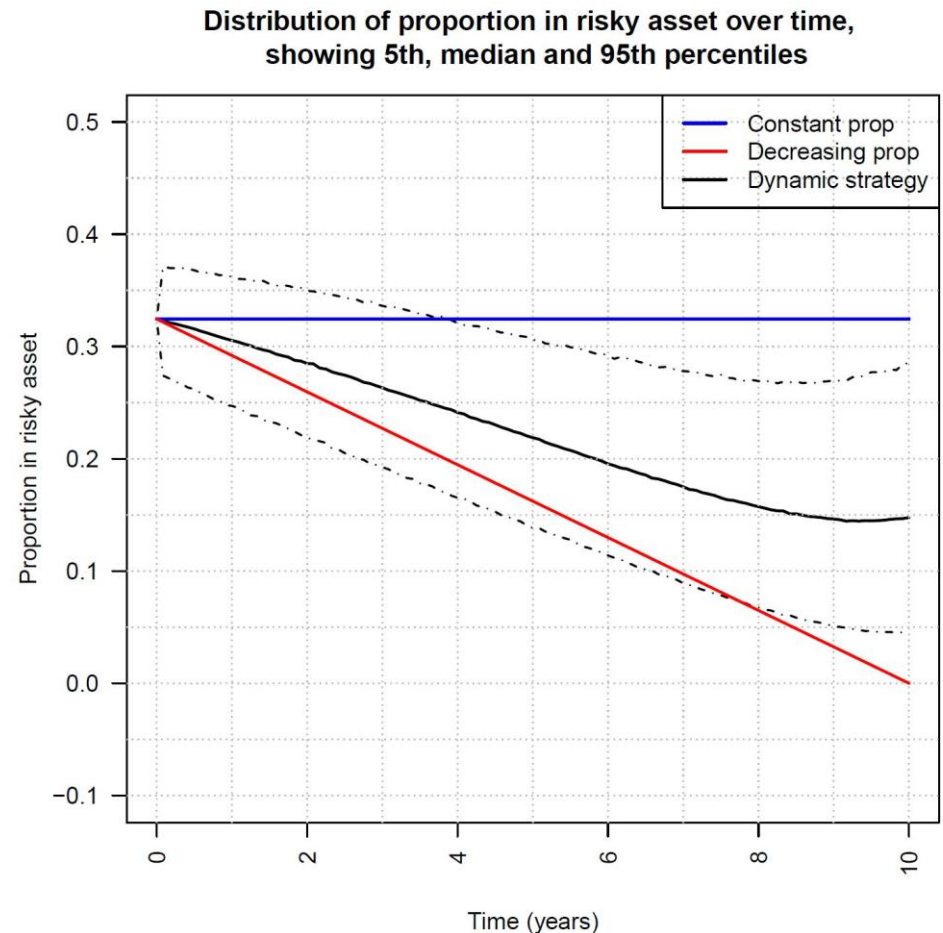
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Changing the problem: higher income in the first 10 years

- Would like 10% higher than £8.90 p.a. from age 65 to 75.

- Pay John £9.80 p.a. from age 65 to 75.

- Would like to pay him £9.80 p.a. from age 75 too.

Distribution of proportion in risky asset over time, showing 5th, median and 95th percentiles

Legend:
- Constant prop
- Decreasing prop
- Dynamic strategy

Y-axis: Proportion in risky asset
X-axis: Time (years)

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Improving outcomes: higher income in the first 10 years

Distribution of the PAF account value over time, showing 5th, median and 95th percentiles
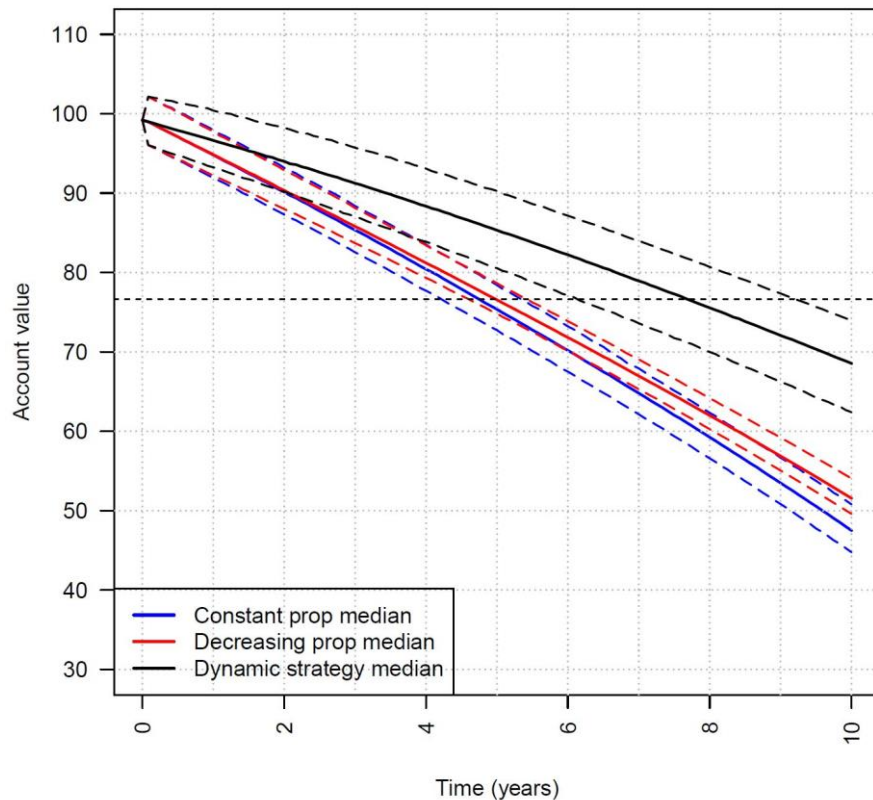
Income bought at age 75 is higher under the dynamic strategy:

- Median £8.75 p.a. under dynamic strategy,

- +32-42% higher than other two strategies;

- Median is lower than desired age 75 income (£9.80 p.a.)

- Paying 10% more than age 65 life annuity from age 65 to 75 has noticeable impact.

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Summary

- Pooled annuity fund provides higher income than income drawdown.

    – In the model considered, significantly higher.

- Dynamic investment strategy does better than the two alternatives.

    – Increases risk appetite when fall below the age 75 target annuity value.

    – Decreases risk appetite as approach annuitization time.

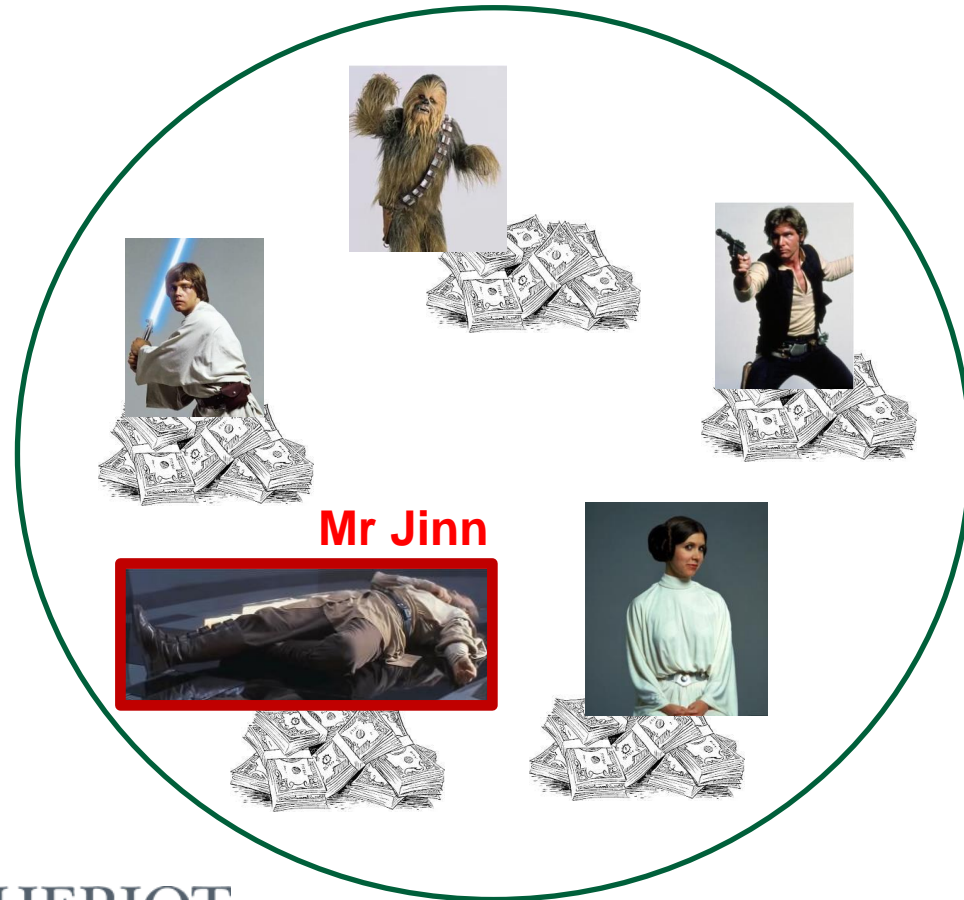- All values are model and problem-dependent!

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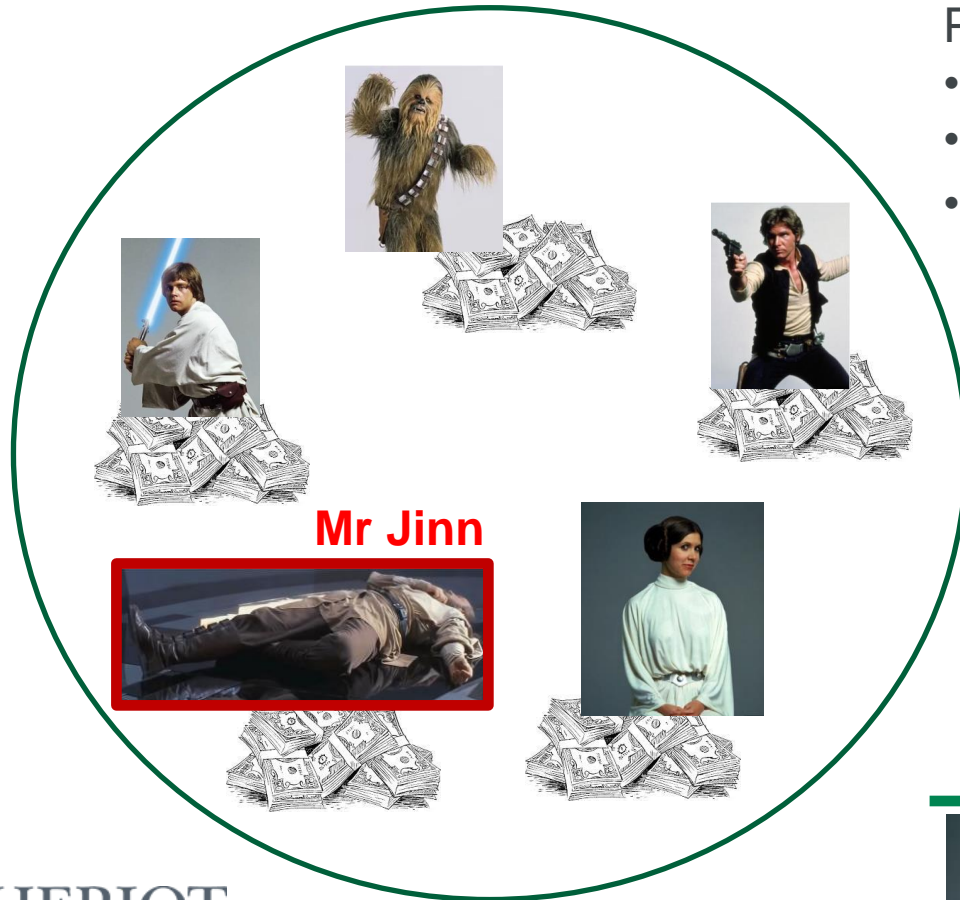of Actuaries

Longevity credit calculation

When someone dies during the year, share out their account value among the survivors.

Longevity credit calculation

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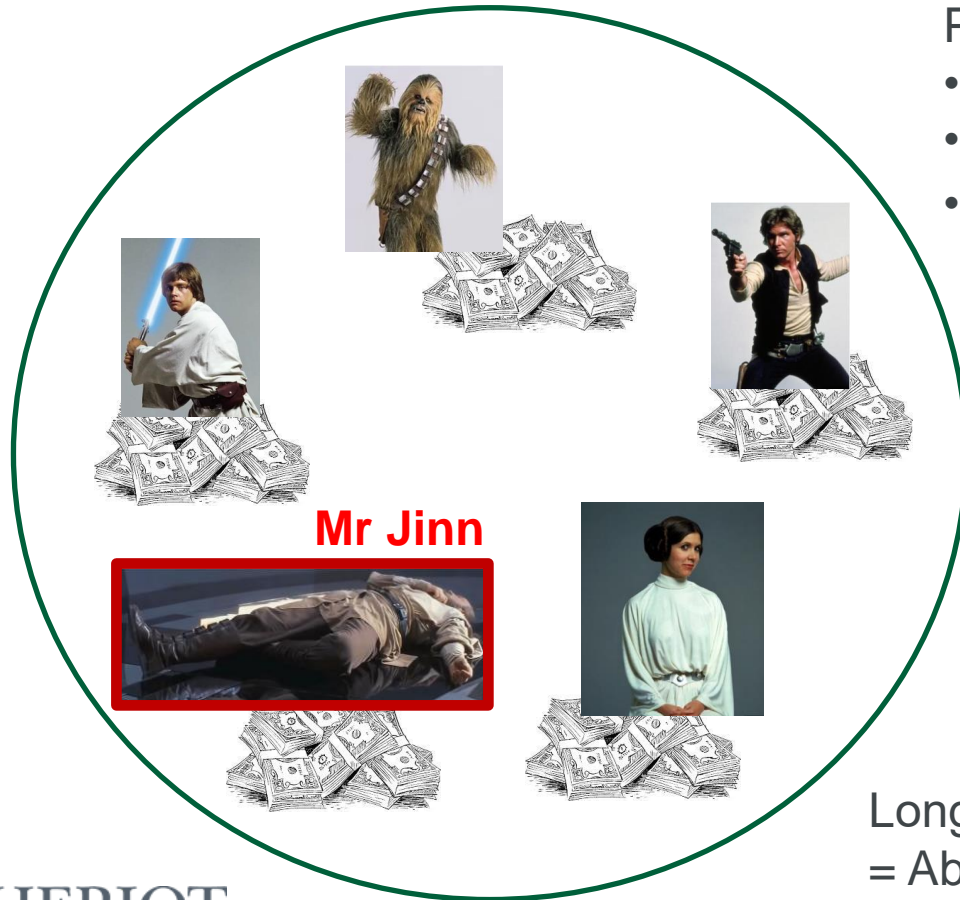Mr Jinn

Longevity credit calculation

Mr Jinn

Participant i has:
- Age $x(i)$ at start of year.
- Probability $q_{x(i)}$ of dying over the year.
- Account value F_i at end of the year.

Han Solo's proportional share of Mr Jinn's account value looks like:

Longevity credit calculation
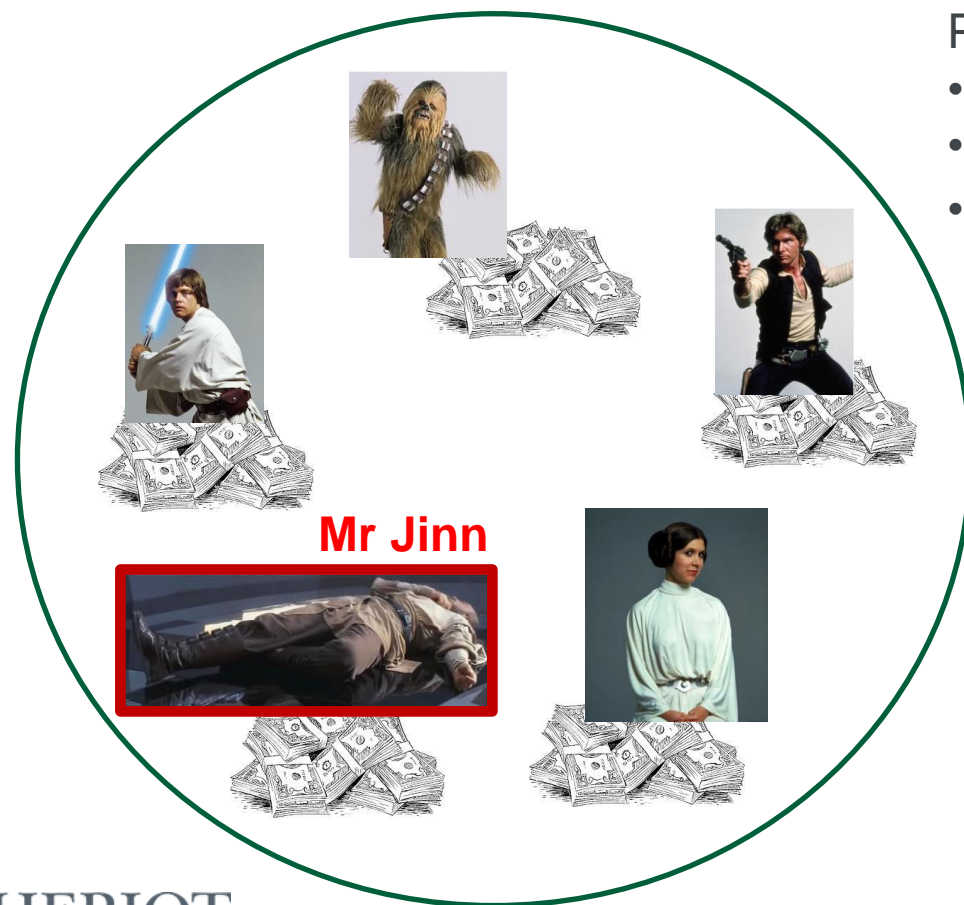

Participant i has:
- Age $x(i)$ at start of year.
- Probability $q_{x(i)}$ of dying over the year.
- Account value F_i at end of the year.

Han Solo's (age 80 at start of year) proportional share of Mr Jinn's account value

$$= \frac{\dfrac{q_{80}}{(1 - q_{80})} \times F_{Han\ Solo}}{\sum_{Survivors\ i} \dfrac{q_{x(i)}}{(1 - q_{x(i)})} \times F_i}$$

Longevity credit paid to Han Solo's account
= Above fraction × Account value of Mr Jinn.

Longevity credit calculation

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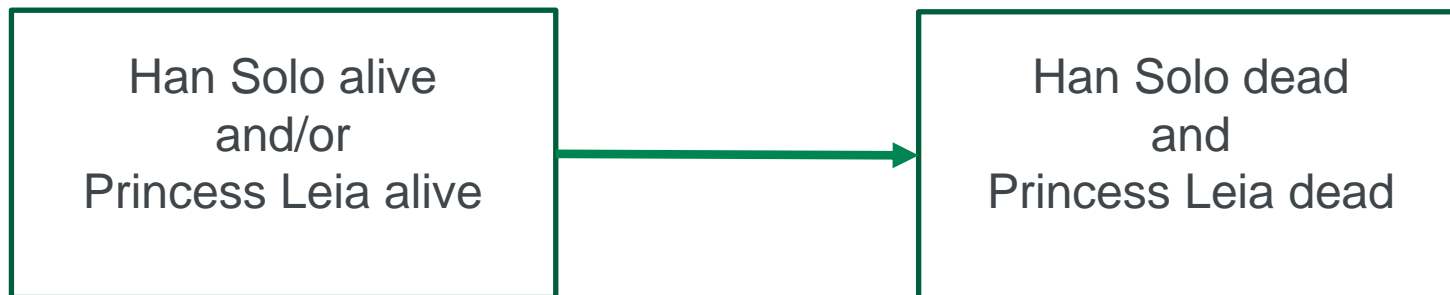
Joint life benefits

- How to pay a joint life benefit? E.g. Pay

  - £100 p.a. while Han Solo and Princess Leia are alive,

  - £50 p.a. if only Han Solo is alive,

  - £50 p.a. if only Princess Leia is alive,

  - Zero if both are dead.
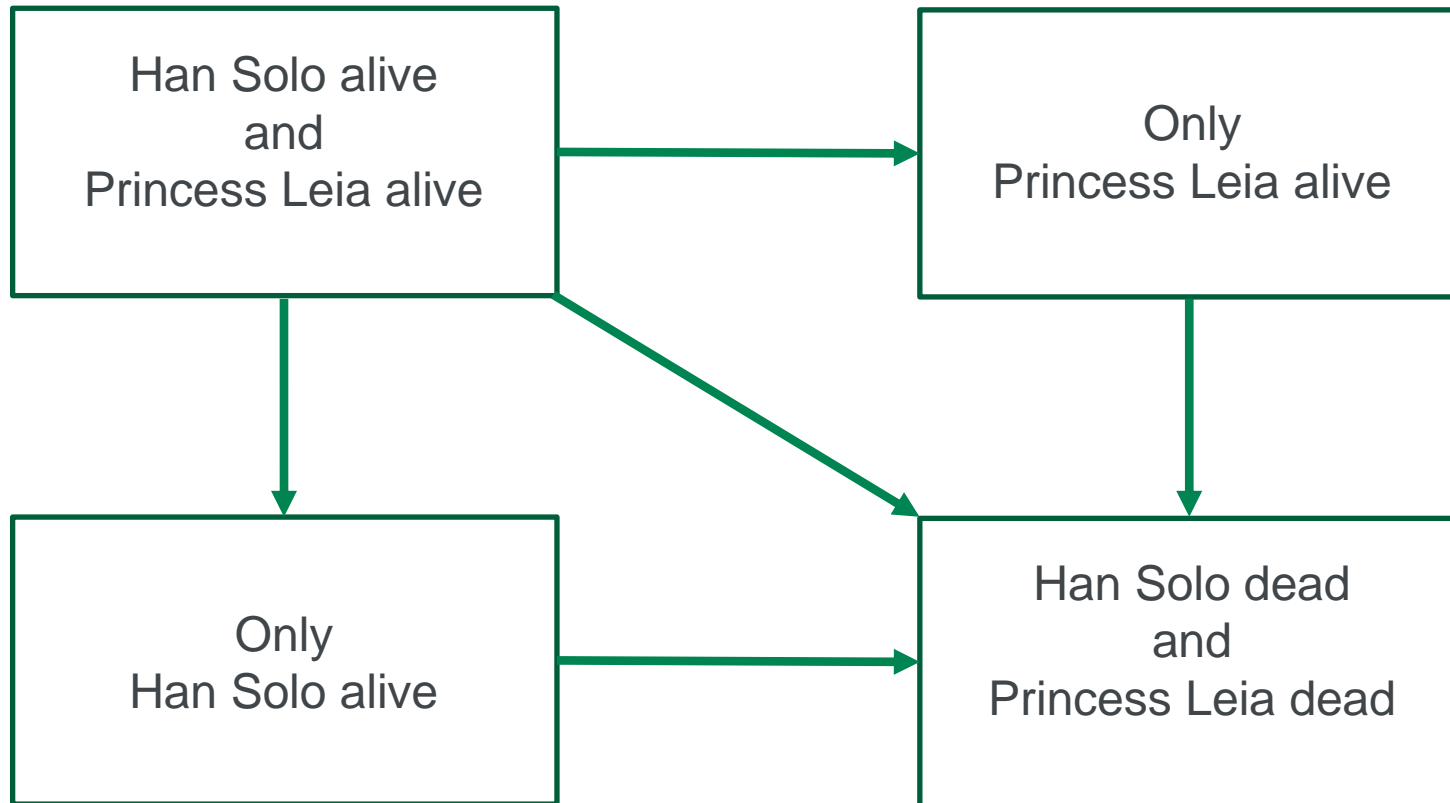
- Reminder of the single life longevity credit calculation…

Underlying single life model

```
┌─────────────────────┐                    ┌─────────────────────┐
│                     │                    │                     │
│    Han Solo alive   │ ─────────────────> │    Han Solo dead    │
│                     │                    │                     │
└─────────────────────┘                    └─────────────────────┘
```

Model for last survivor benefit

Model for joint life benefit

Model for joint life benefit

Han Solo alive
and
Princess Leia alive
Pay £100 p.a.

Only
Princess Leia alive
Pay £67 p.a.

Only
Han Solo alive
Pay £67 p.a.

Han Solo dead
and
Princess Leia dead
Pay £0 p.a.
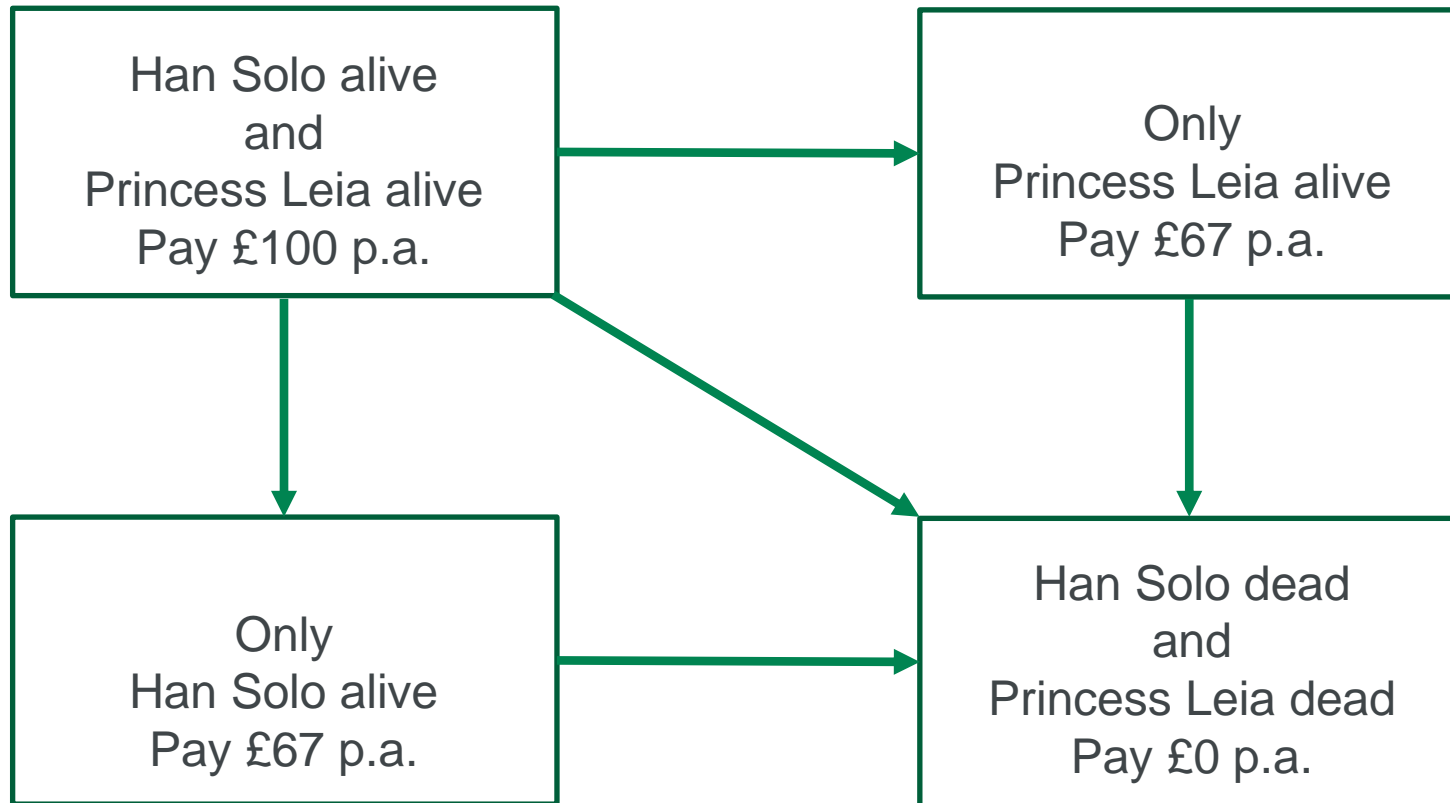
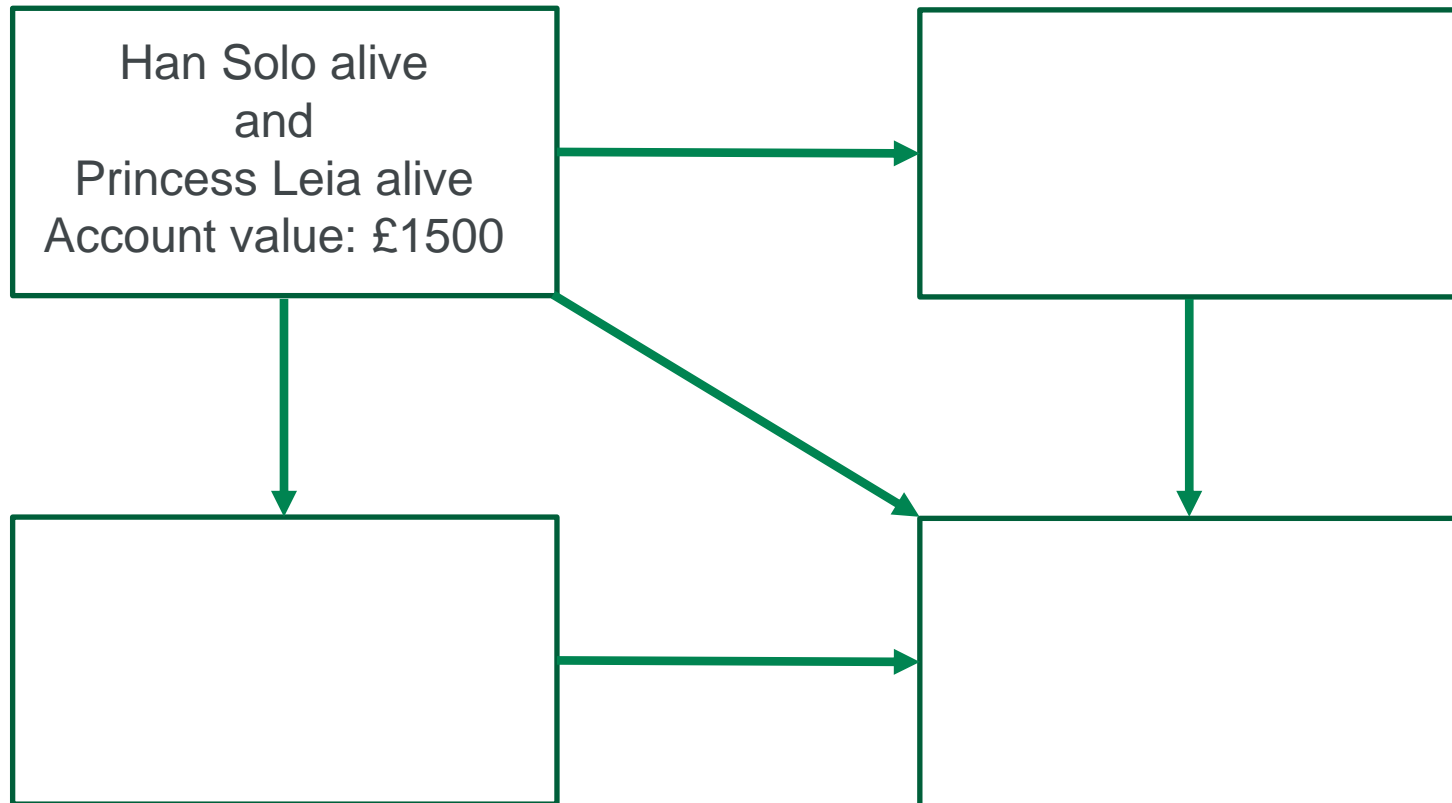# Calculate the longevity credit in "both alive" state

- Shown in ARC paper "Joint Life Income in a Pooled Annuity Fund".

- What do we see?

- Providing joint life benefits leads to an income-based approach to pooled annuity funds.
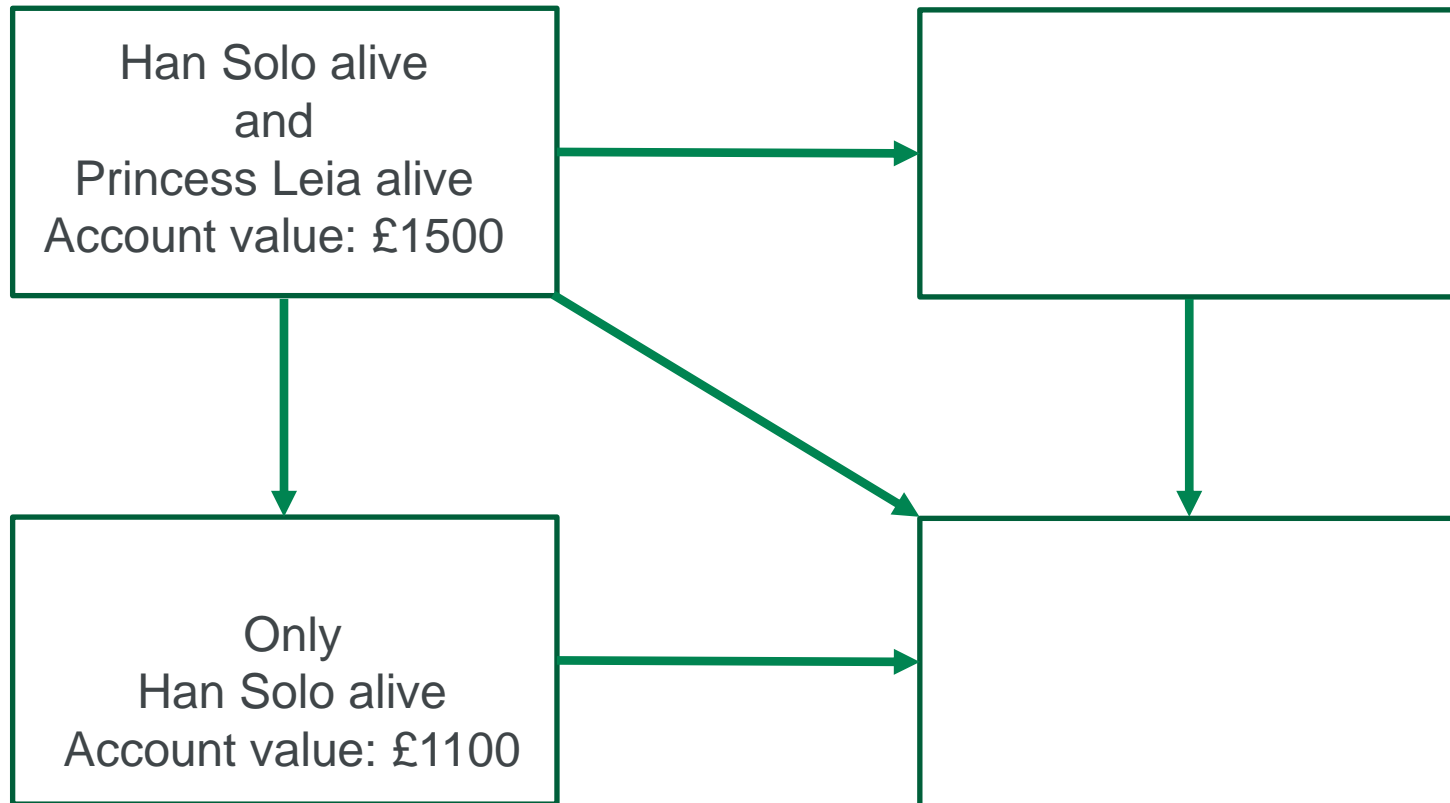
Model for joint life benefit

Han Solo alive
and
Princess Leia alive
Account value: £1500

Model for joint life benefit

Box (top left): Han Solo alive and Princess Leia alive Account value: £1500

Box (bottom left): Only Han Solo alive Account value: £1100

Calculate the longevity credit in "both alive" state

- We see: when one of the couple dies, some of their account value is "lost"…

- ..It is shared out among the surviving couples.

- Han Solo is left with enough money to provide his widower income and no more!

- Providing joint life benefits leads to an income-based approach….

- …to avoid unhappy widows/widowers.

Bibliography

- Donnelly, C. and Zhang, X. (2023). "Joint life income in a pooled annuity fund".
  Found at the IFoA ARC website

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The '**Minimising Longevity and Investment Risk while Optimising Future Pension Plans**' research programme is being funded by the ARC.

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