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Institute and Faculty of Actuaries

# Reinventing the life annuity

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

19 April 2018

# Overview

- Background
- Focus on life annuity
- Mortality risk pooling – features and some ideas

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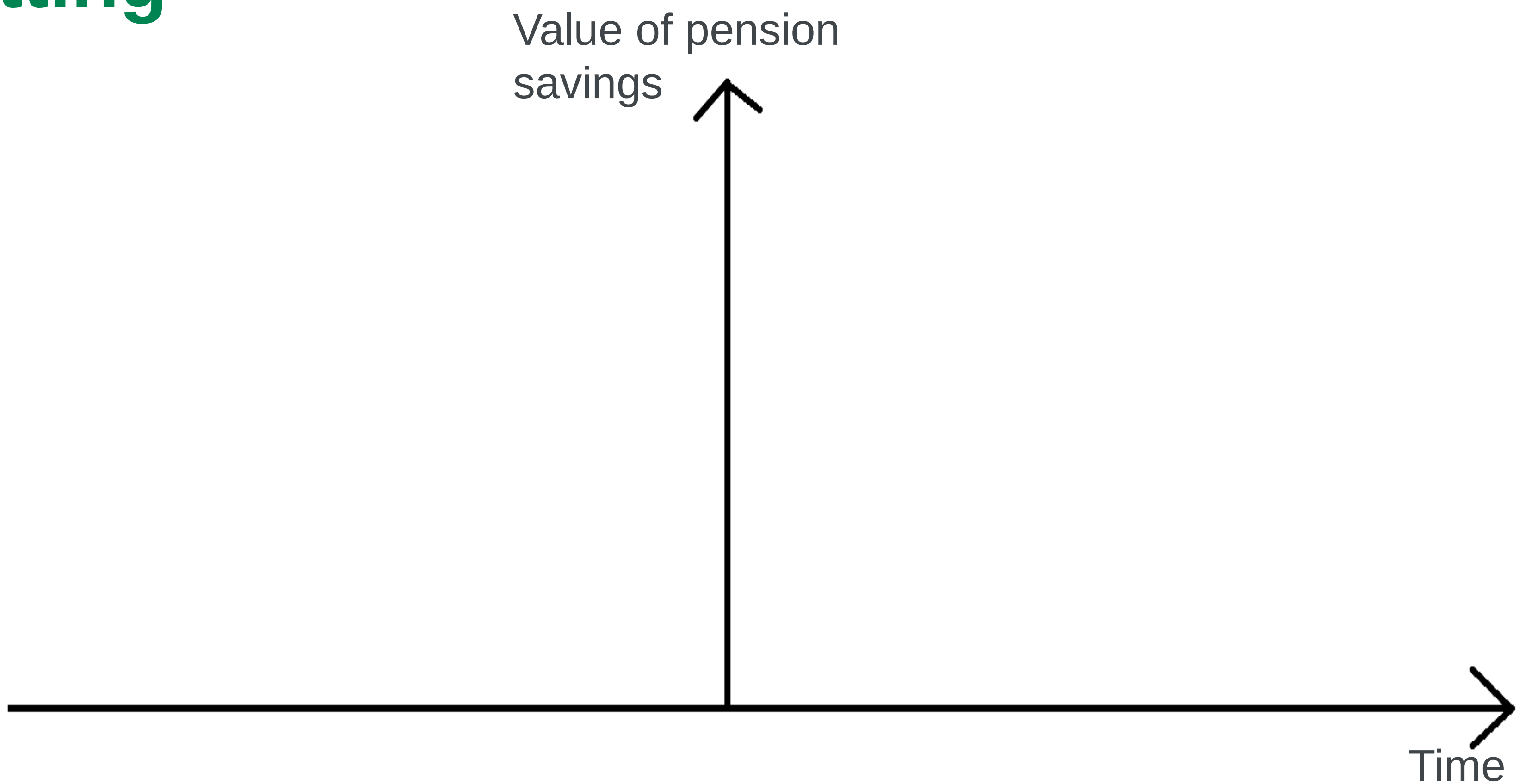
# Setting



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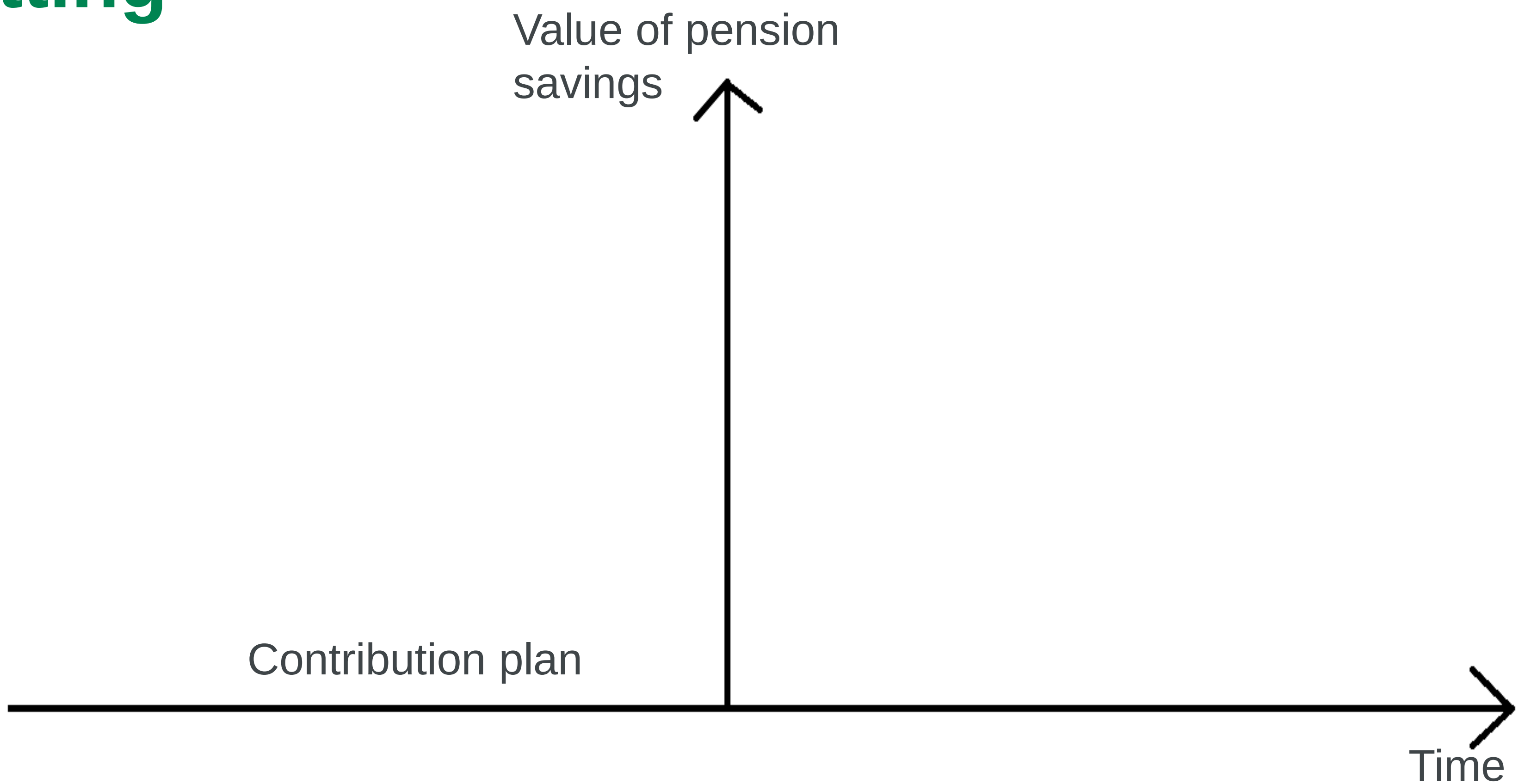


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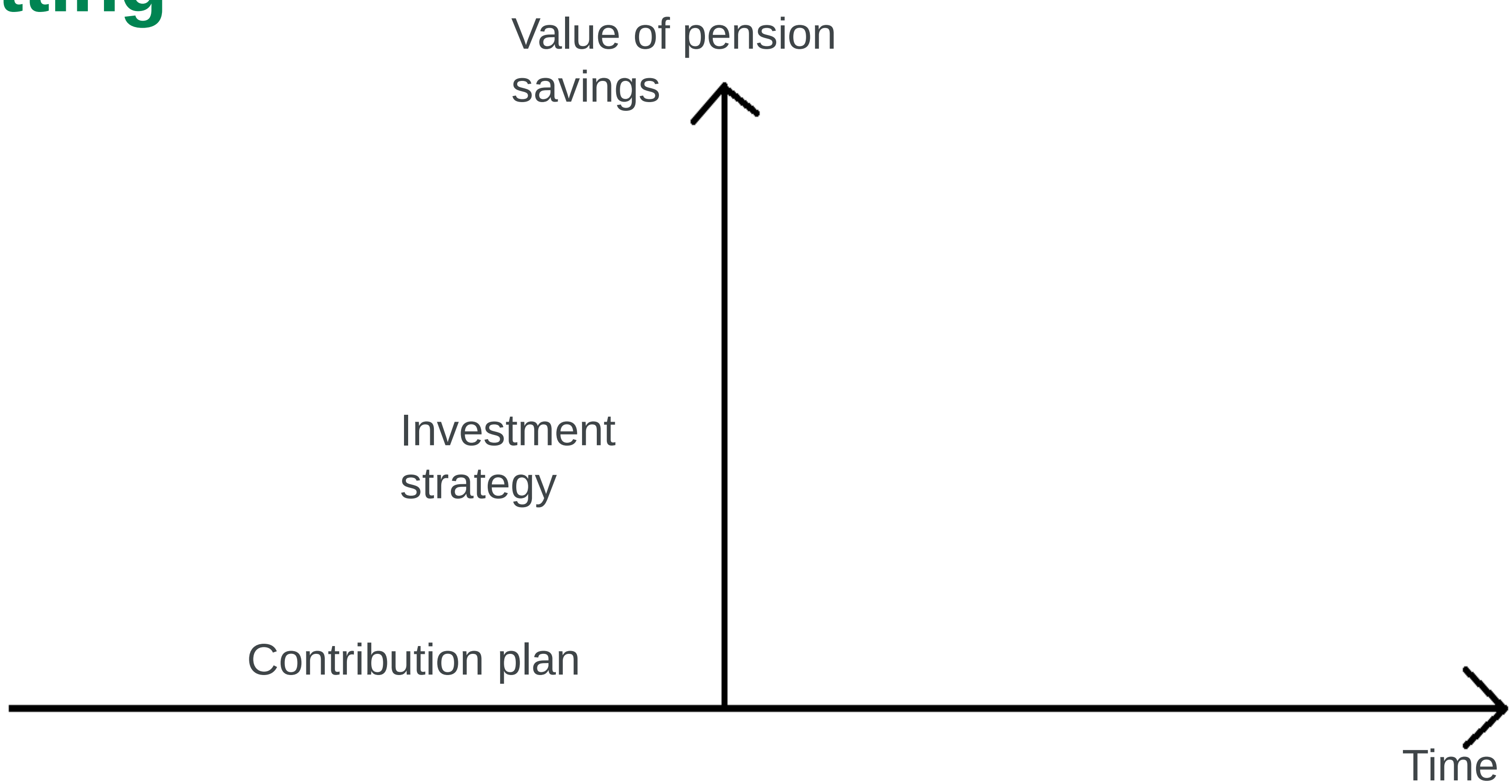
Value of pension savings
Investment strategy
Contribution plan
Time

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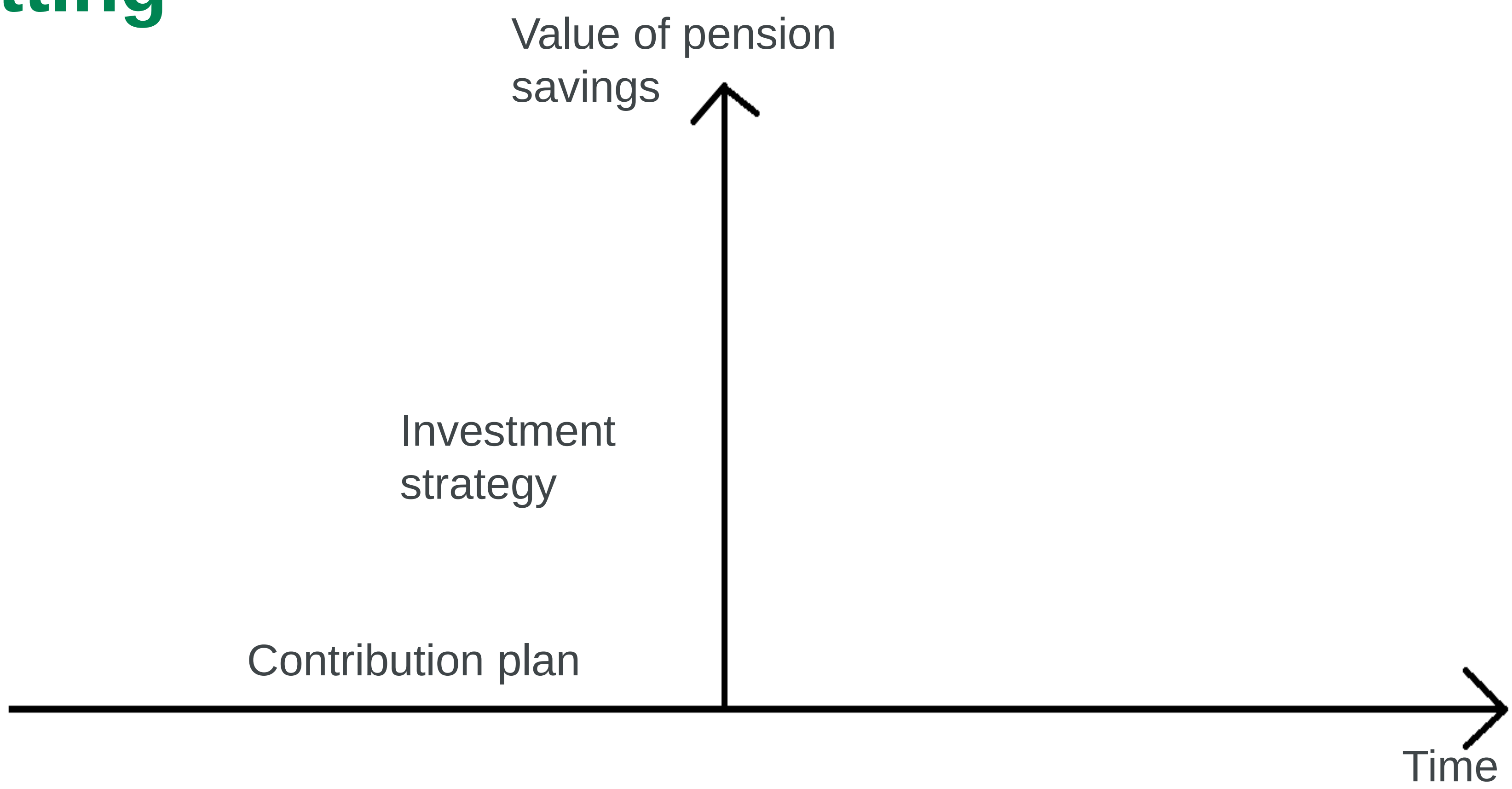


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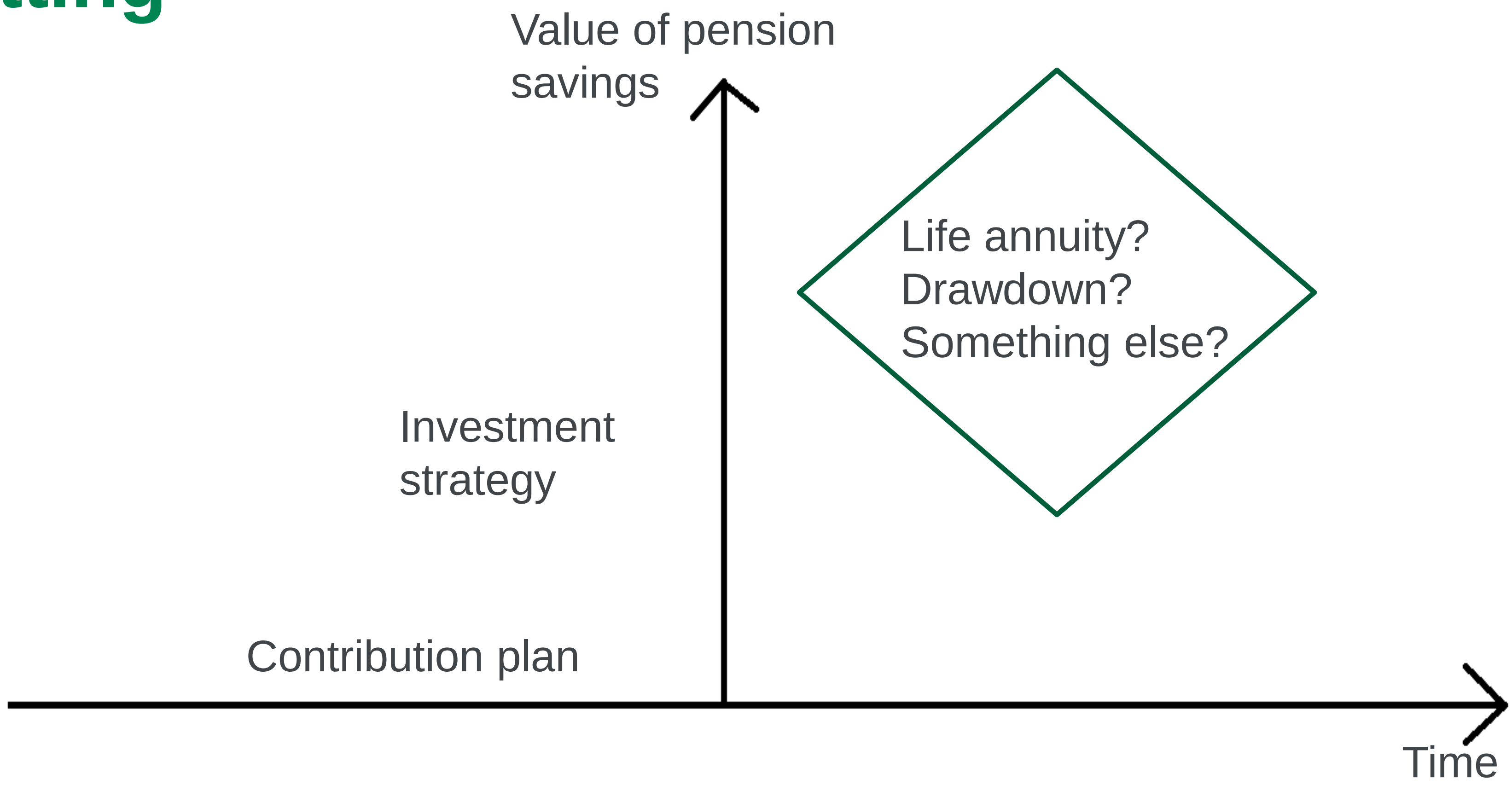


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# The present in the UK – DC on the rise

- DB plans are closing (87% are closed in 2016 in UK).

- Most people are now actively in defined contribution plans, or similar arrangement (97% of new hires in FTSE350).

- Contribution rates are much lower in DC plans

(~21% for DB vs 4% for DC, total, albeit DB includes deficit correcting contributions).

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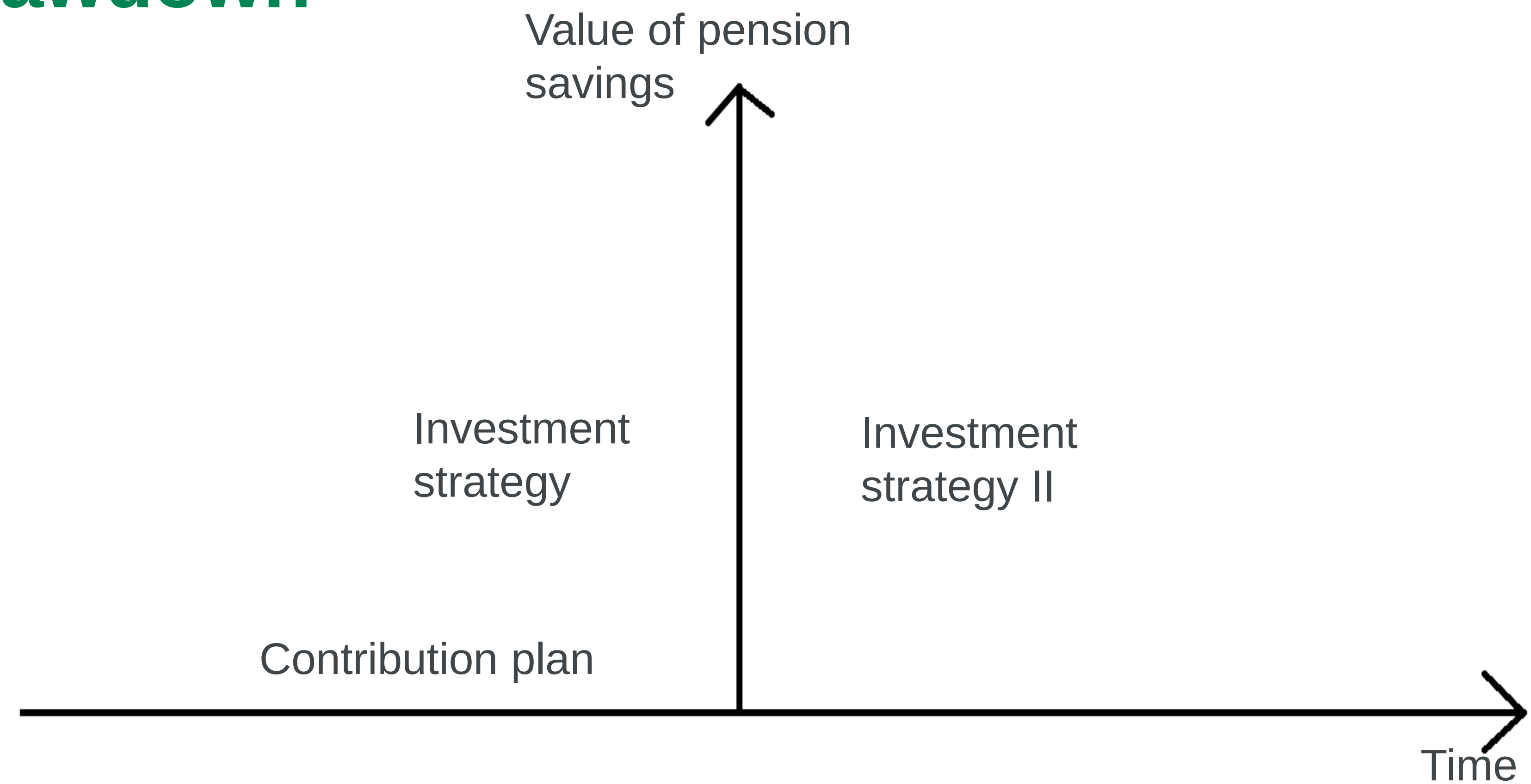
# Size of pension fund assets in 2016
## (Willis Towers Watson)

| Country | Value of pension fund assets (USD billion) | As percentage of GDP | Of which DC asset value (USD billion) |
|---|---:|---:|---:|
| USA | 22’480 | 121.1% | 13’488 |
| UK | 2’868 | 108.2% | 516 |
| Japan | 2’808 | 59.4% | 112 |
| Australia | 1’583 | 126.0% | 1’377 |
| Canada | 1’575 | 102.8% | 79 |
| Netherlands | 1’296 | 168.3% | 78 |

# Income drawdown

# Drawdown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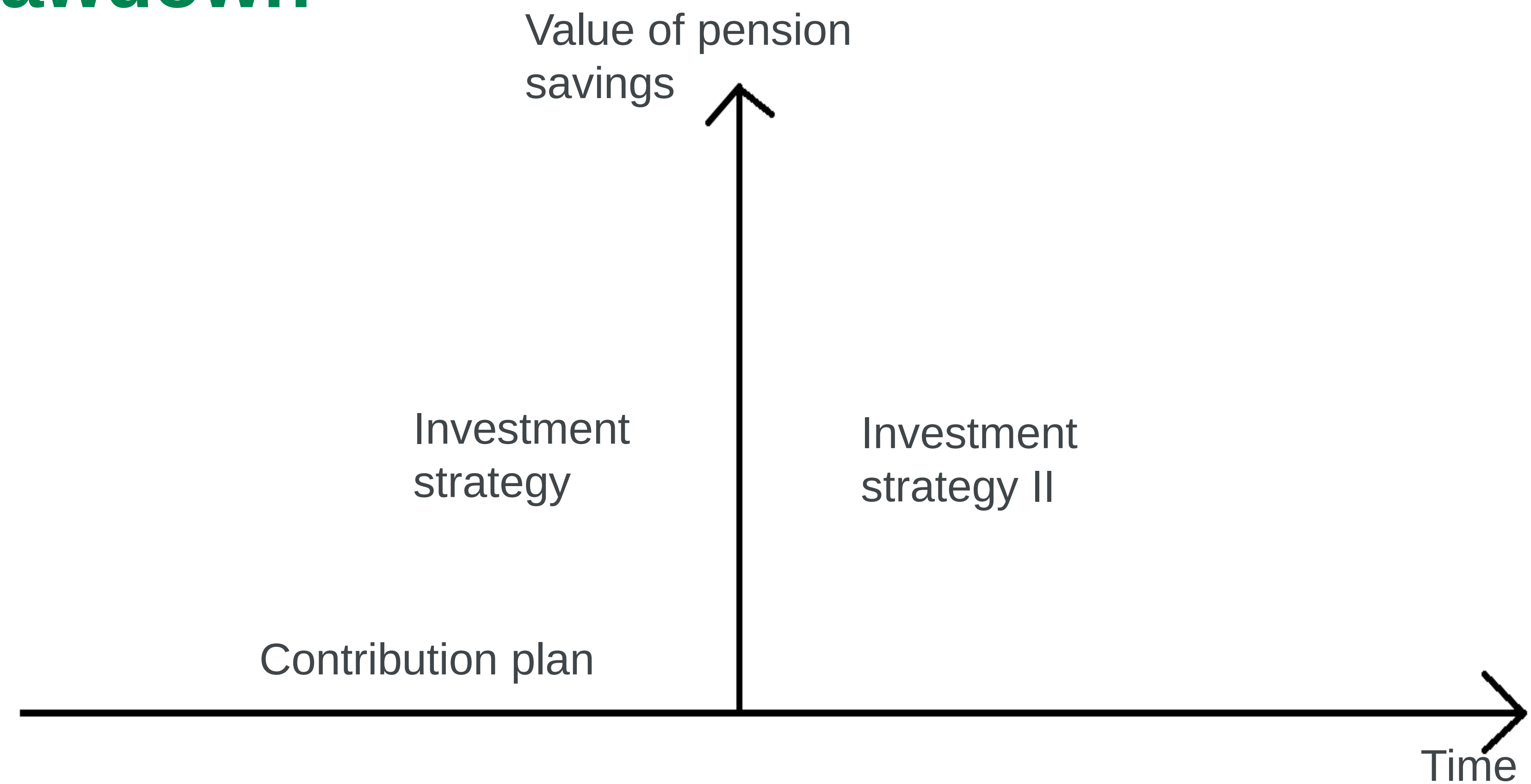
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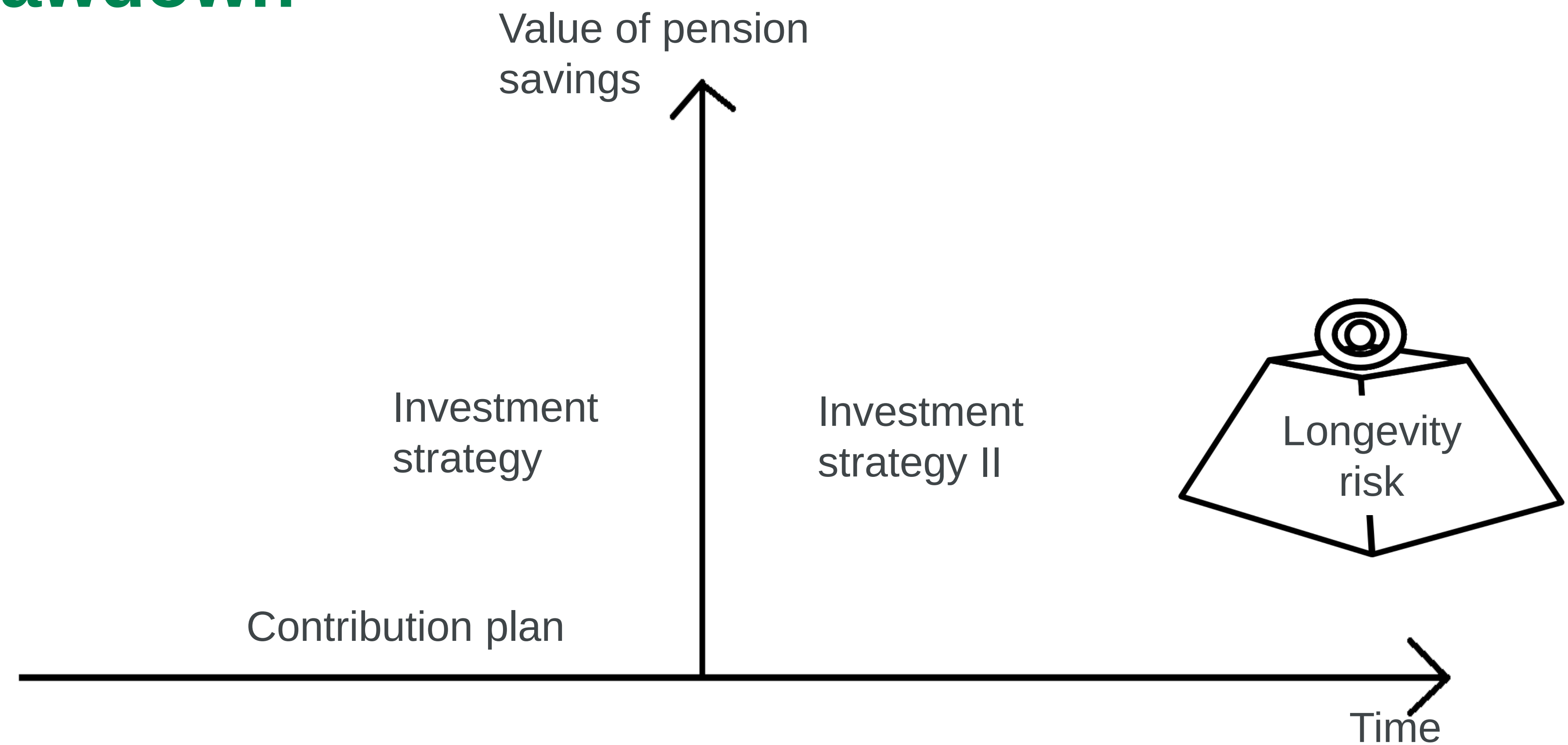


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# Life annuity

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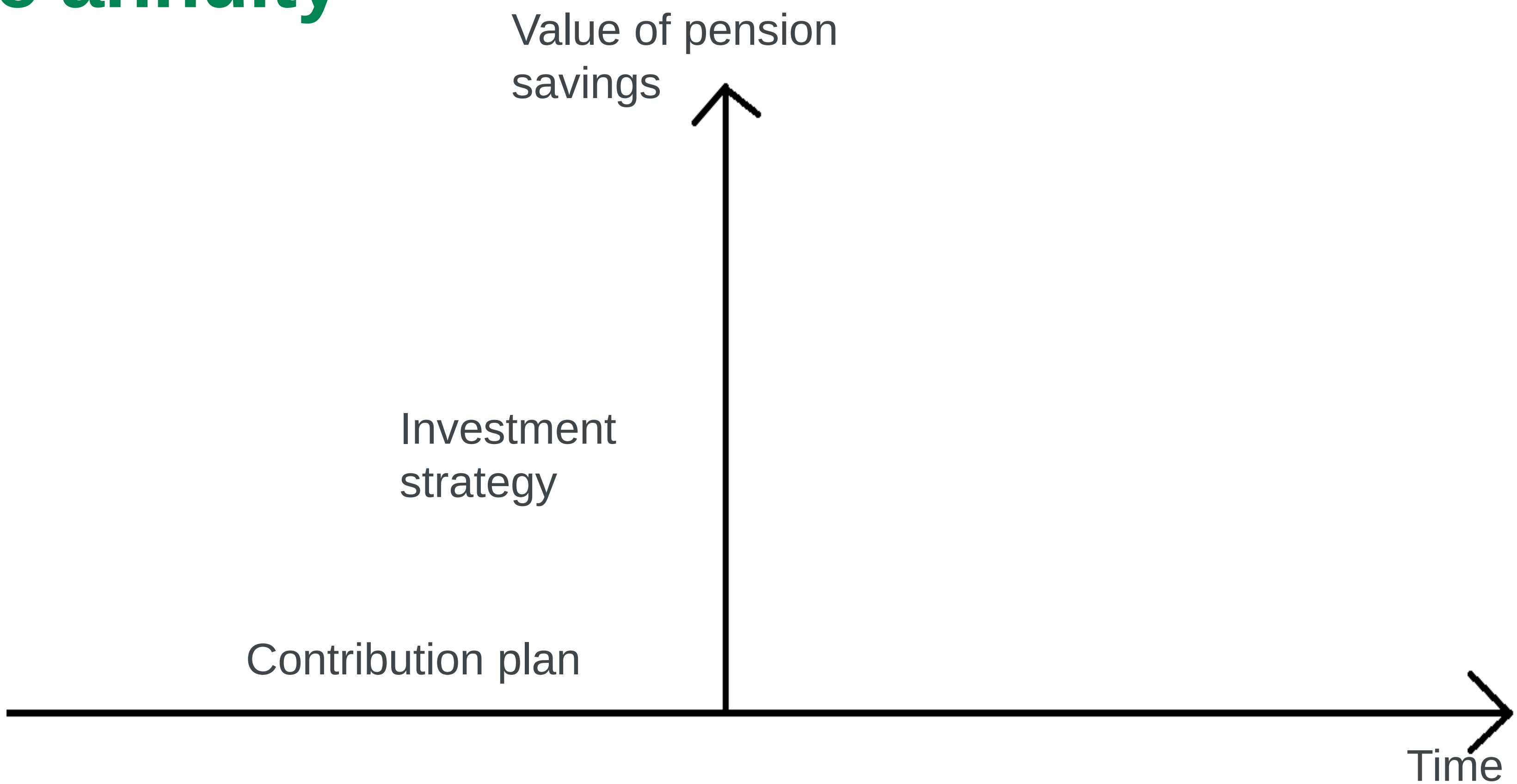


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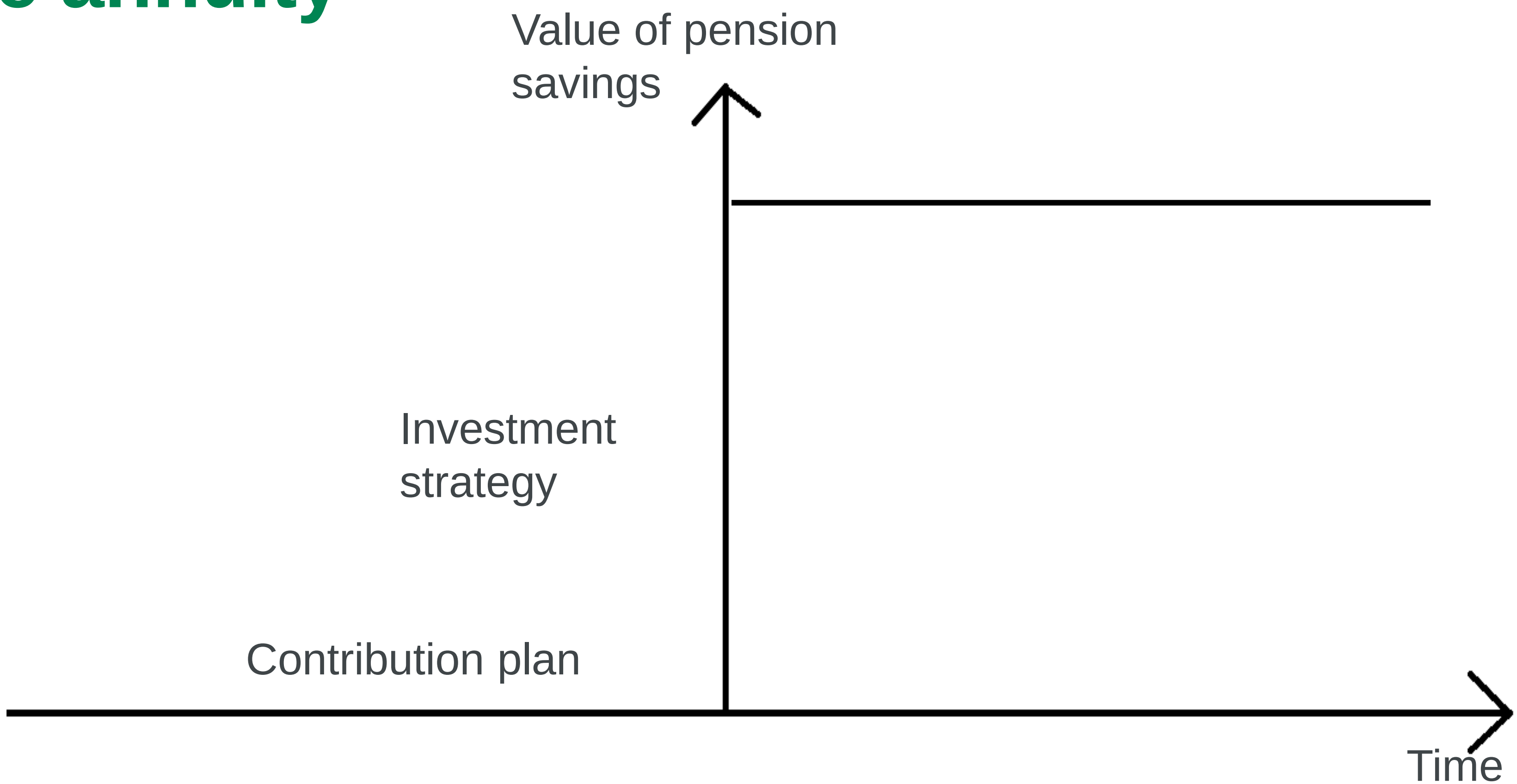
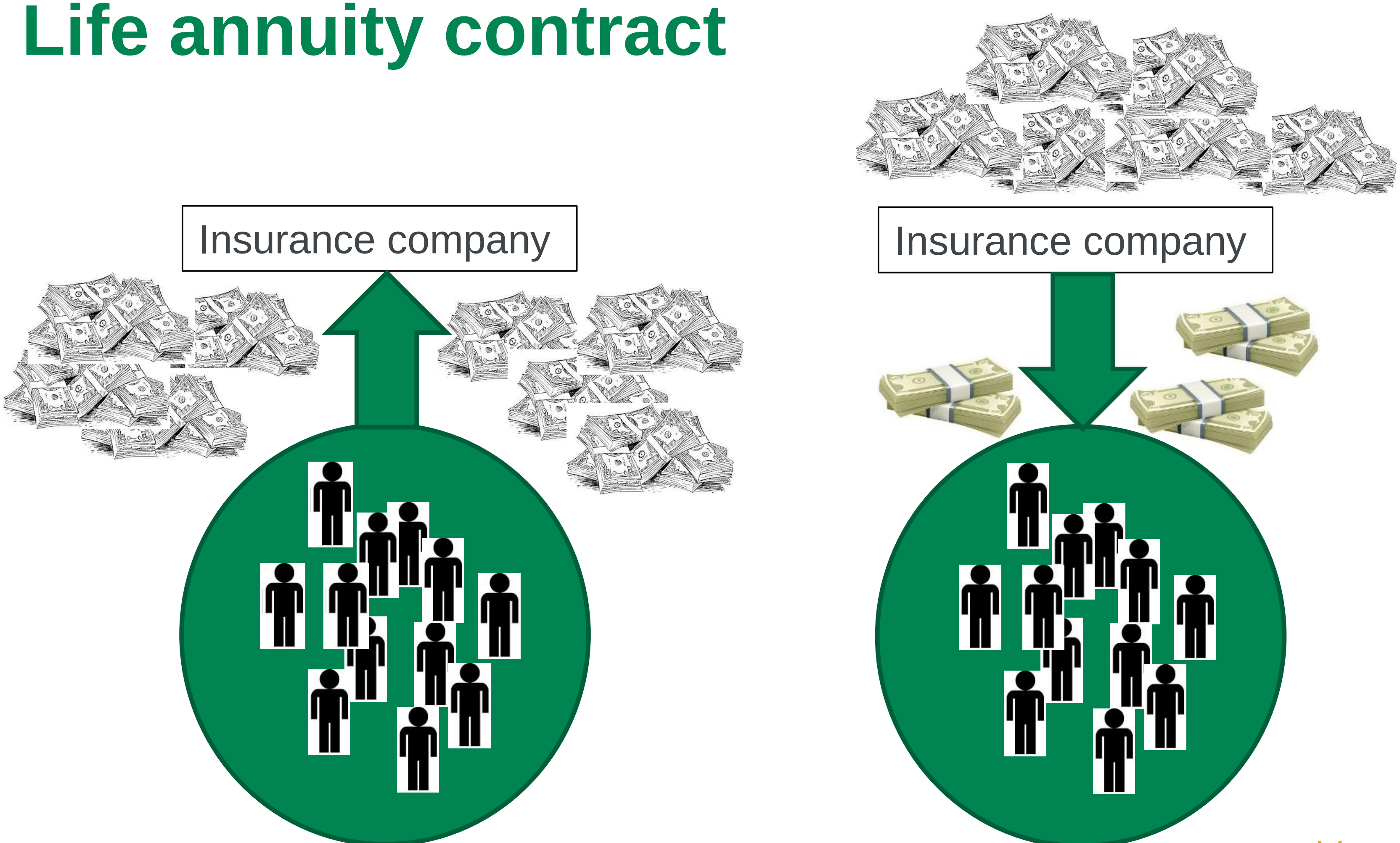


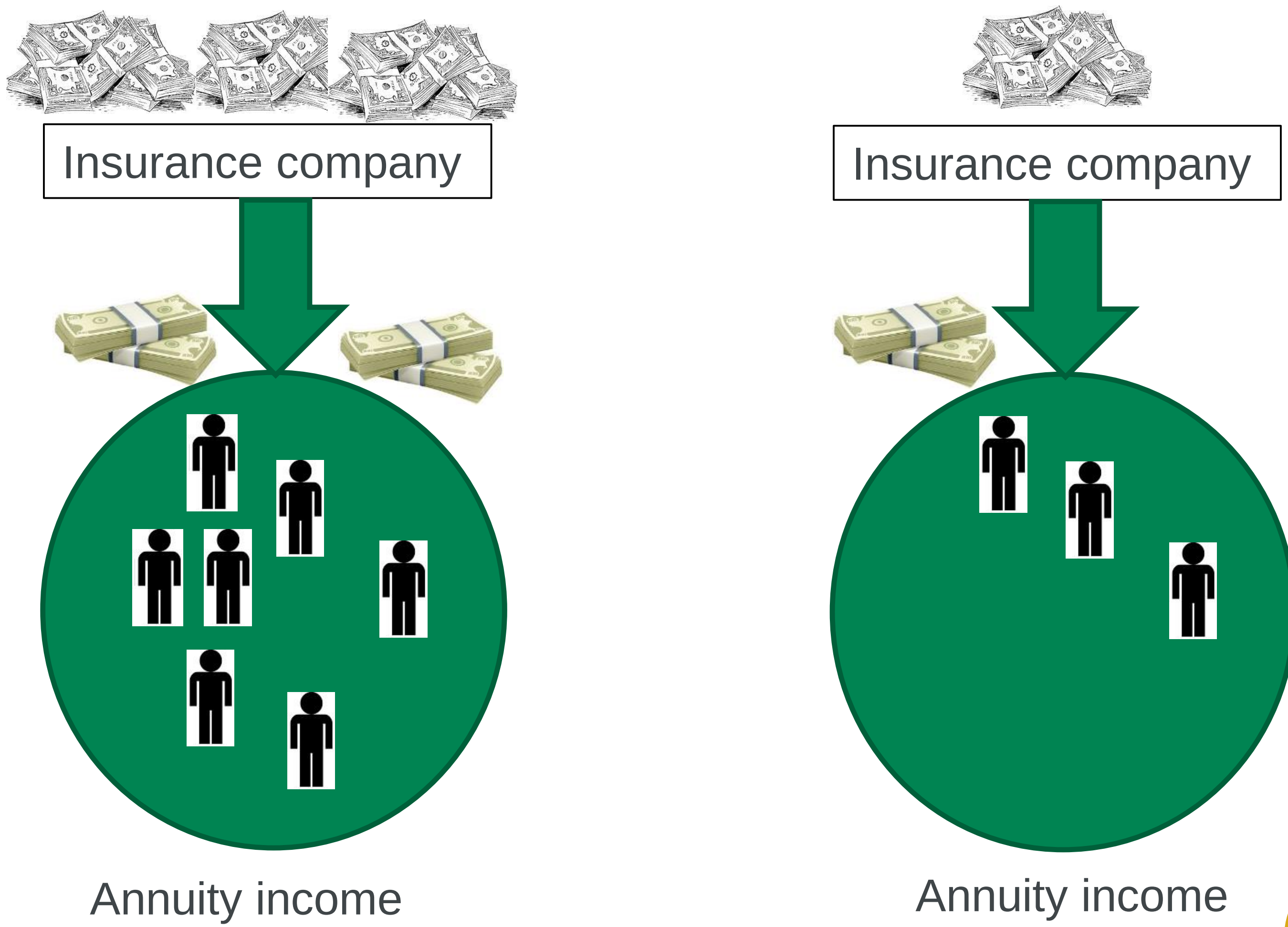
# Life annuity contract




Purchase of the annuity contract

Annuity income

# Life annuity contract

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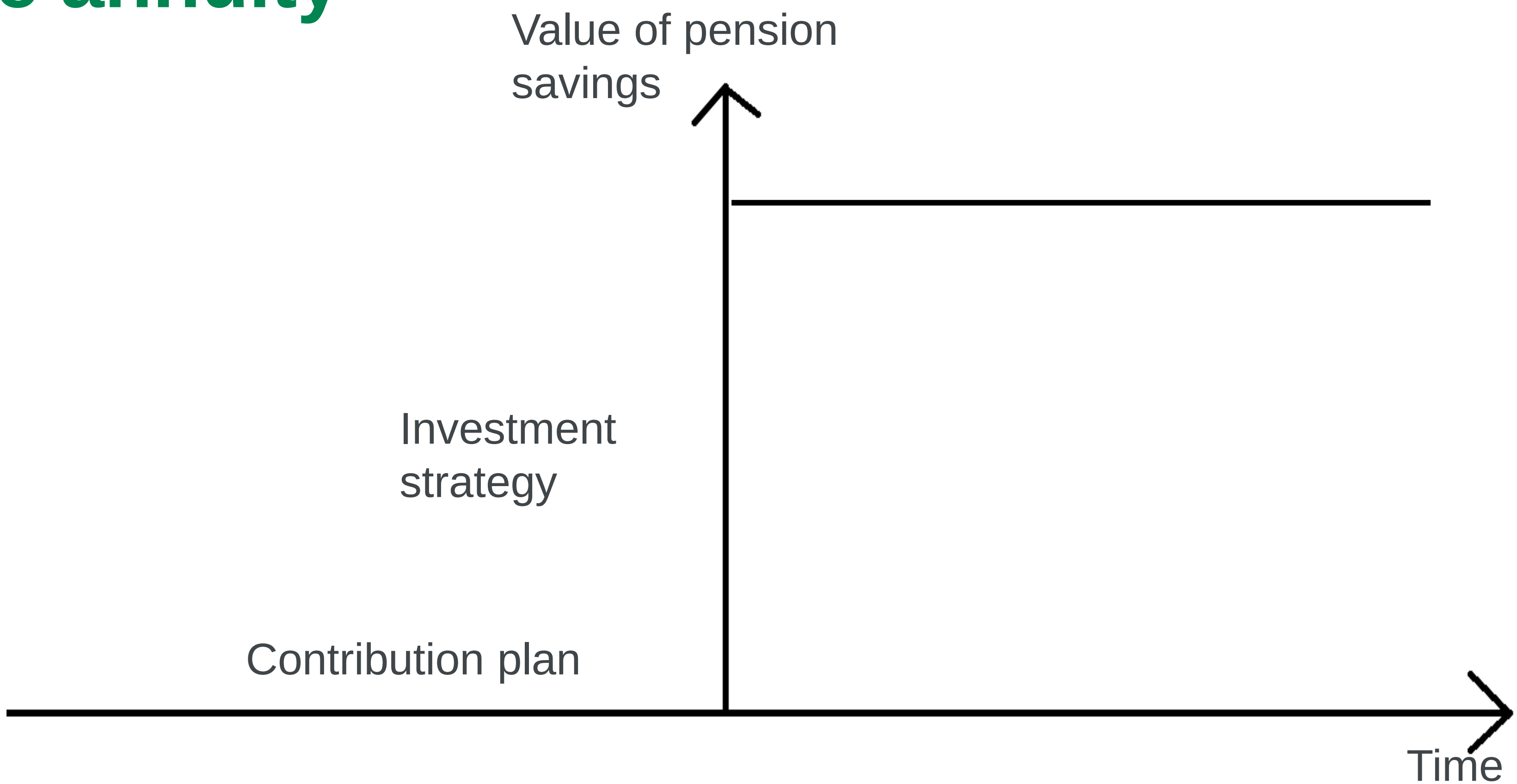

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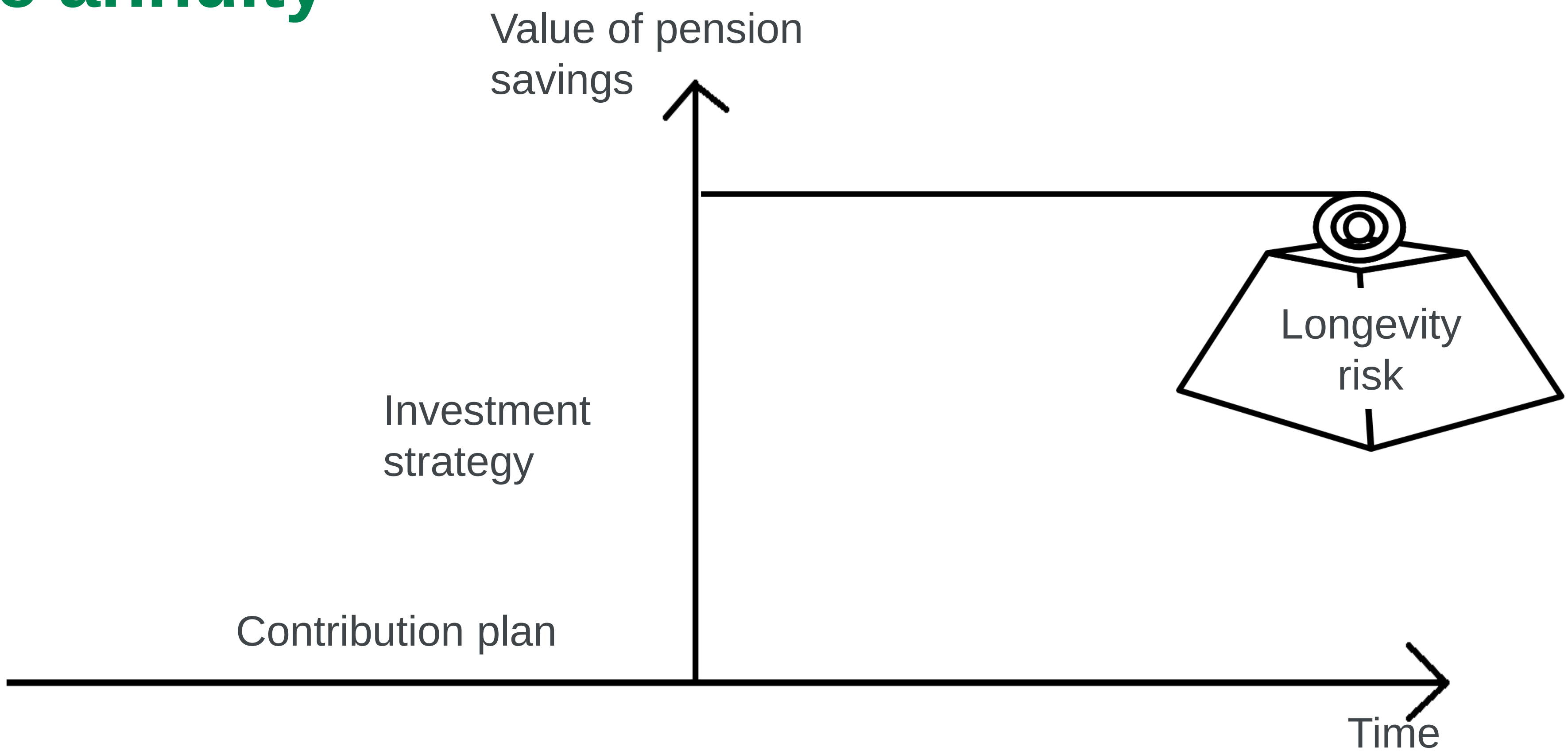


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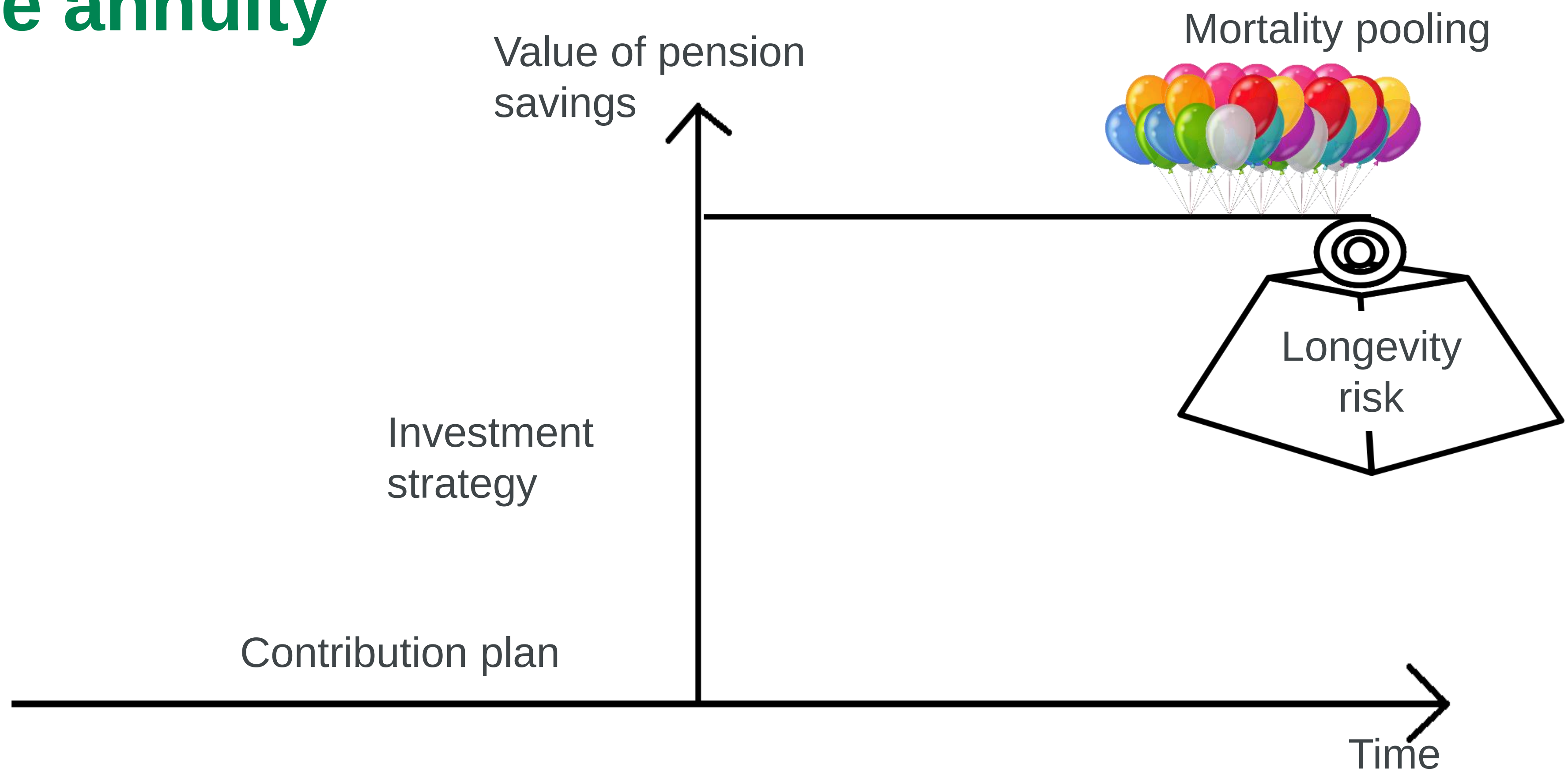


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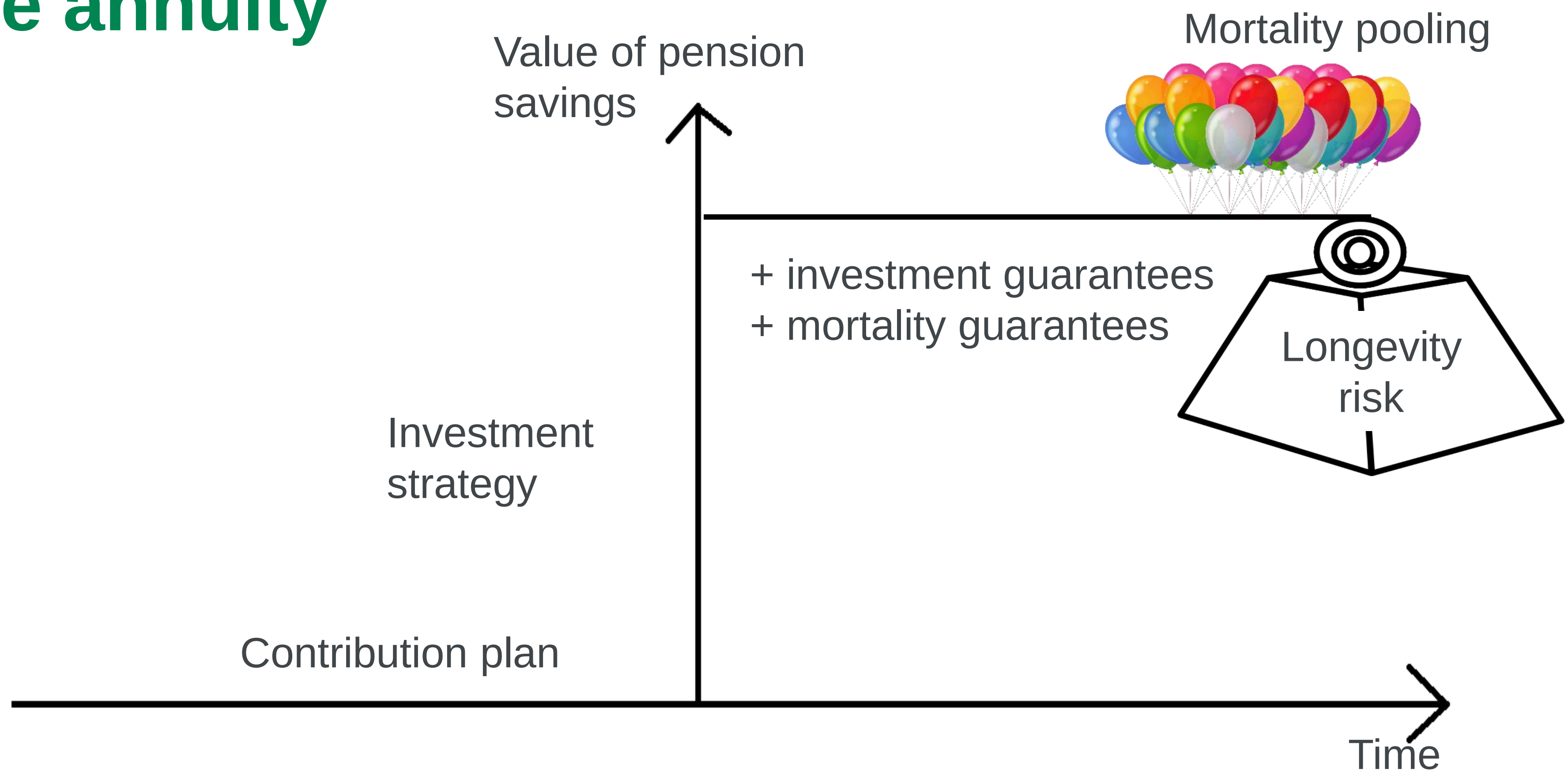


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# Life annuity contract

- Income drawdown vs life annuity: if follow same investment strategy then life annuity gives higher income*

*ignoring fees, costs, taxes, etc.

- Pooling mortality gives a higher income.

- Everyone in the group becomes the beneficiaries of each other, indirectly.

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# Annuity puzzle

- Why don't people annuitize?

- Can we get the benefits of life annuities, without the full contract?

- Focus on mortality pooling.

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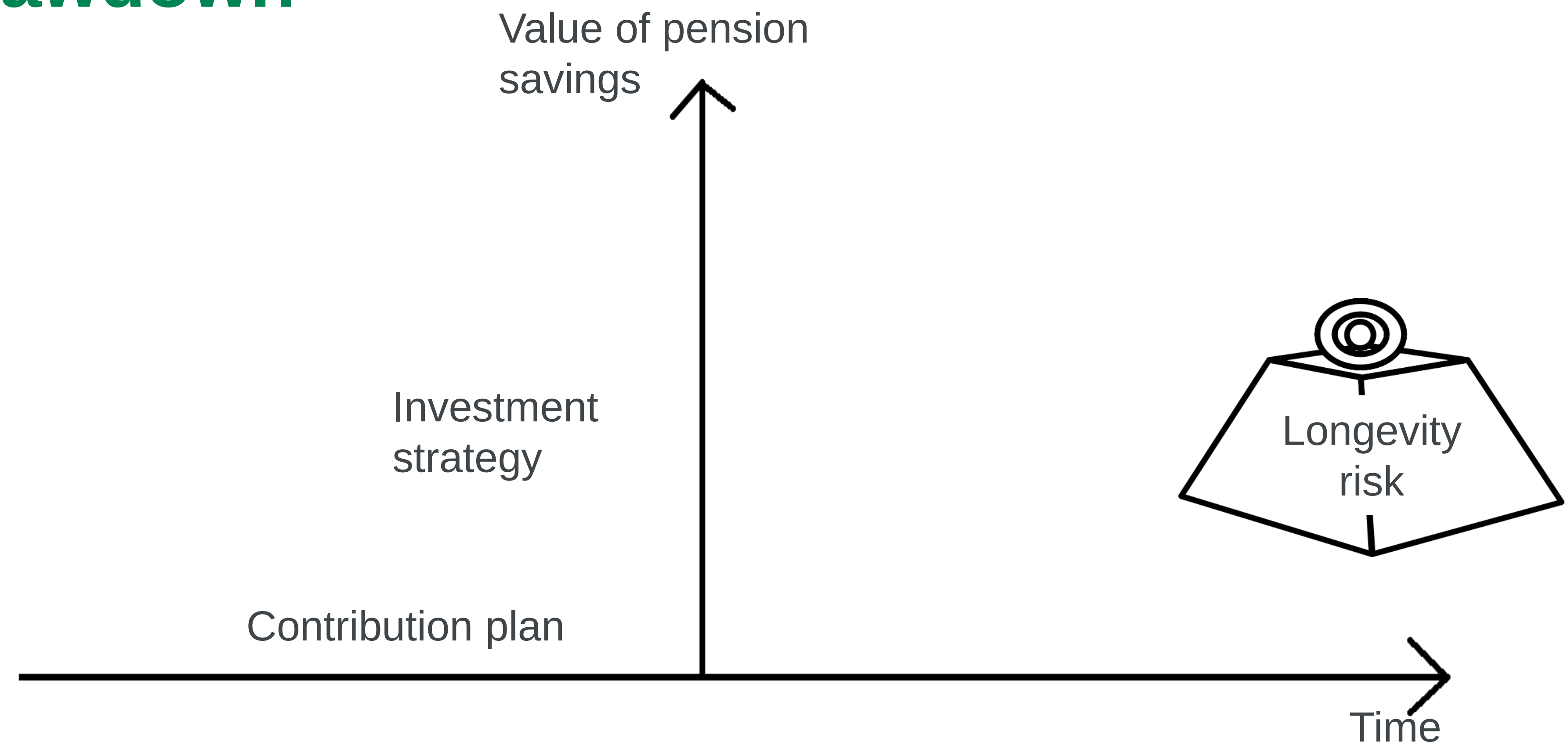
# Drawdown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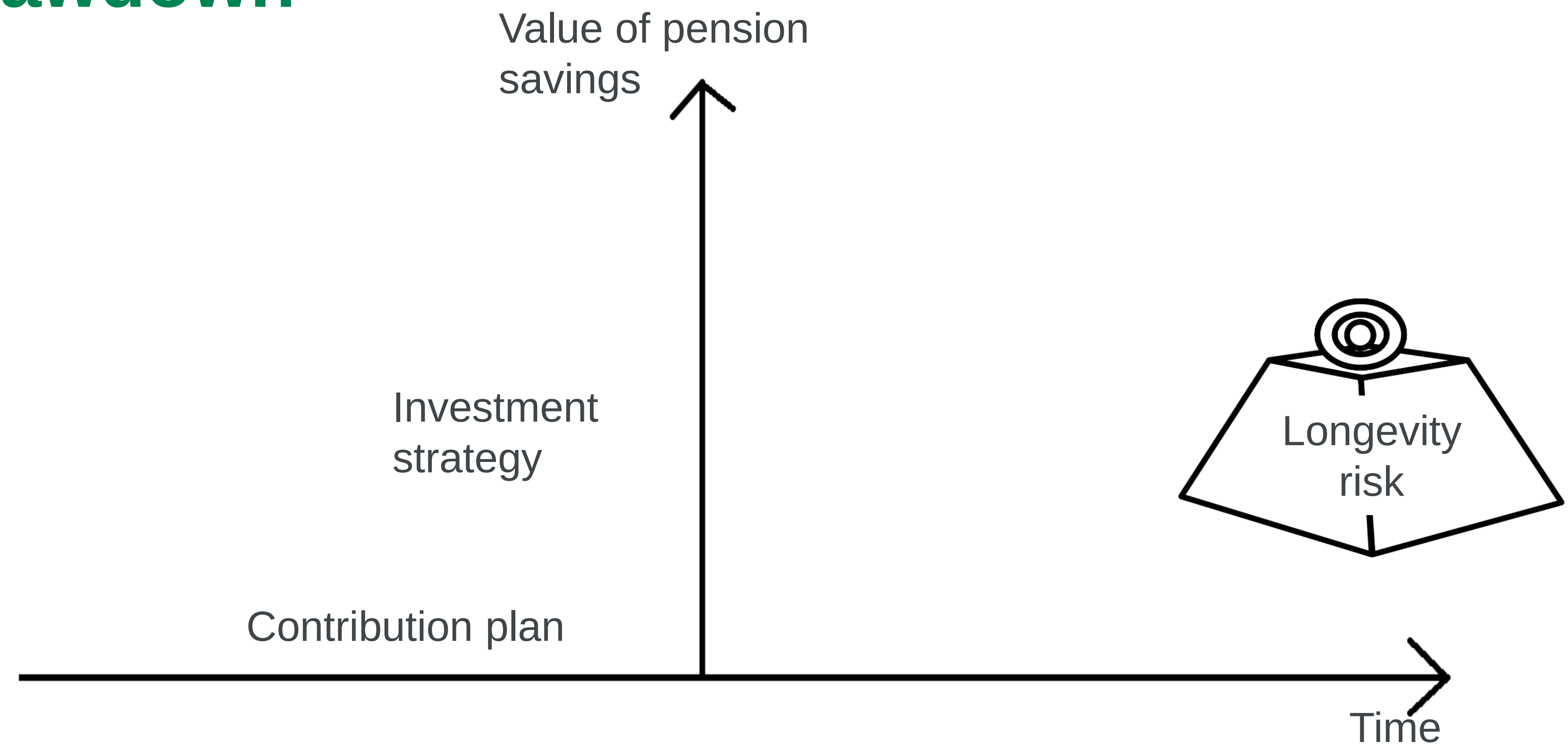


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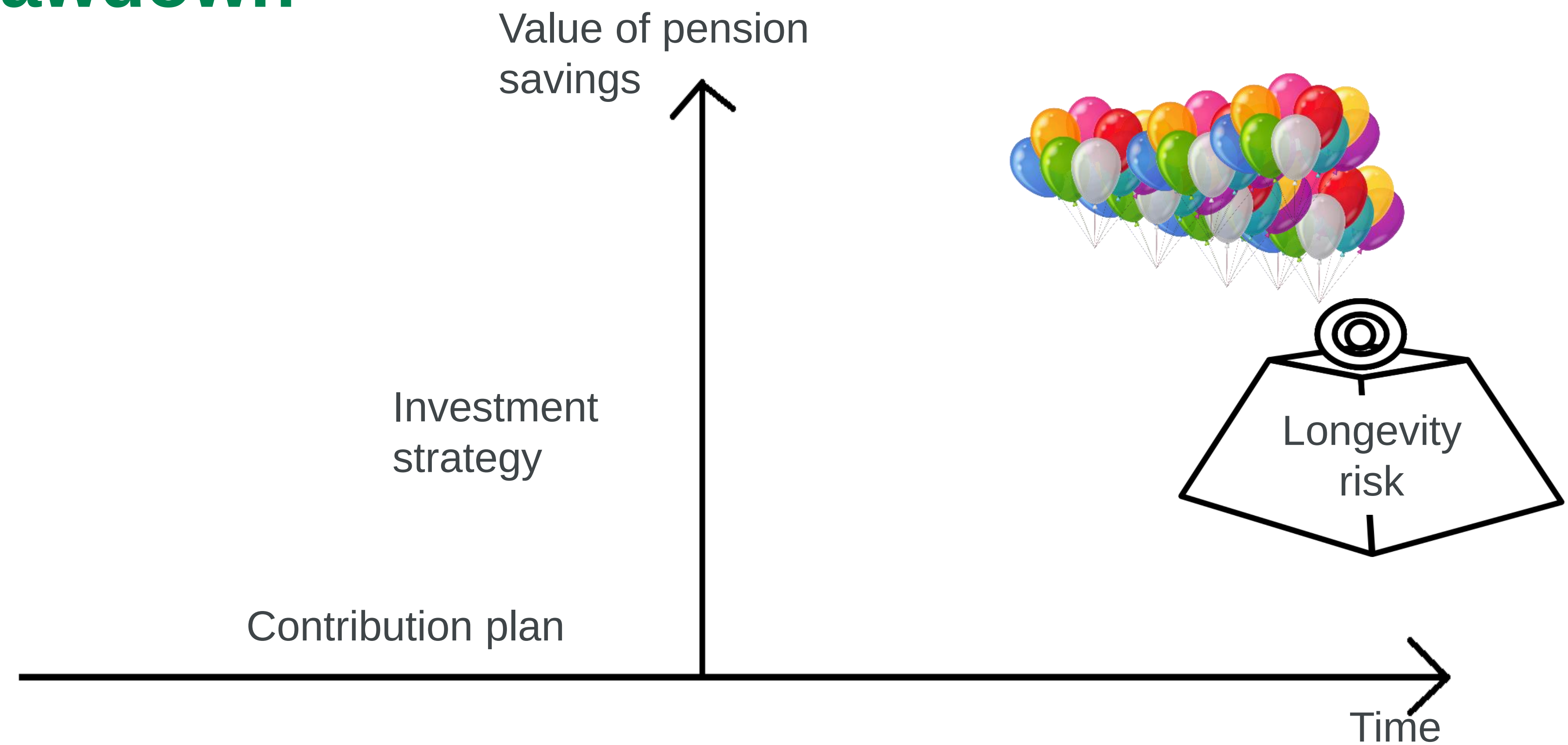
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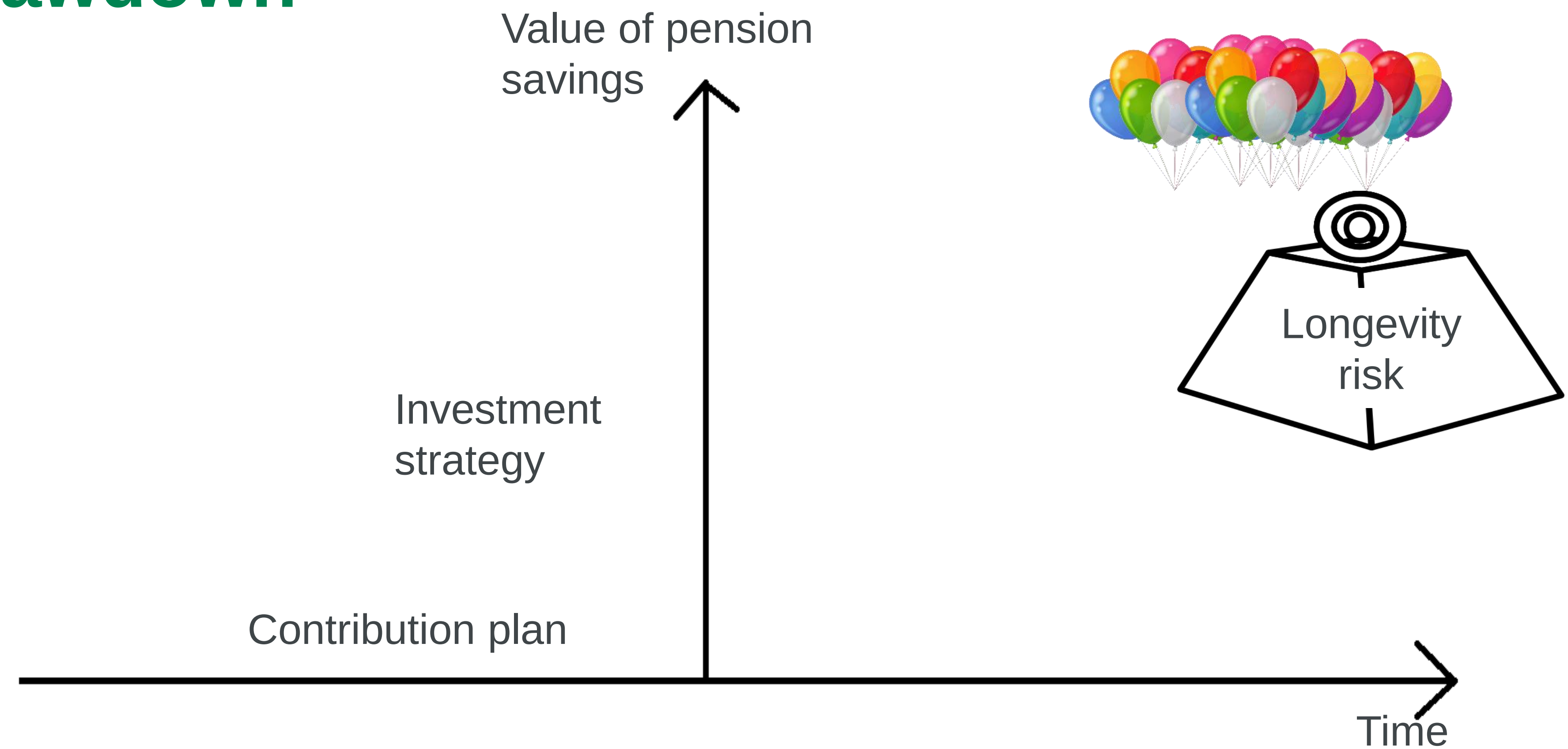


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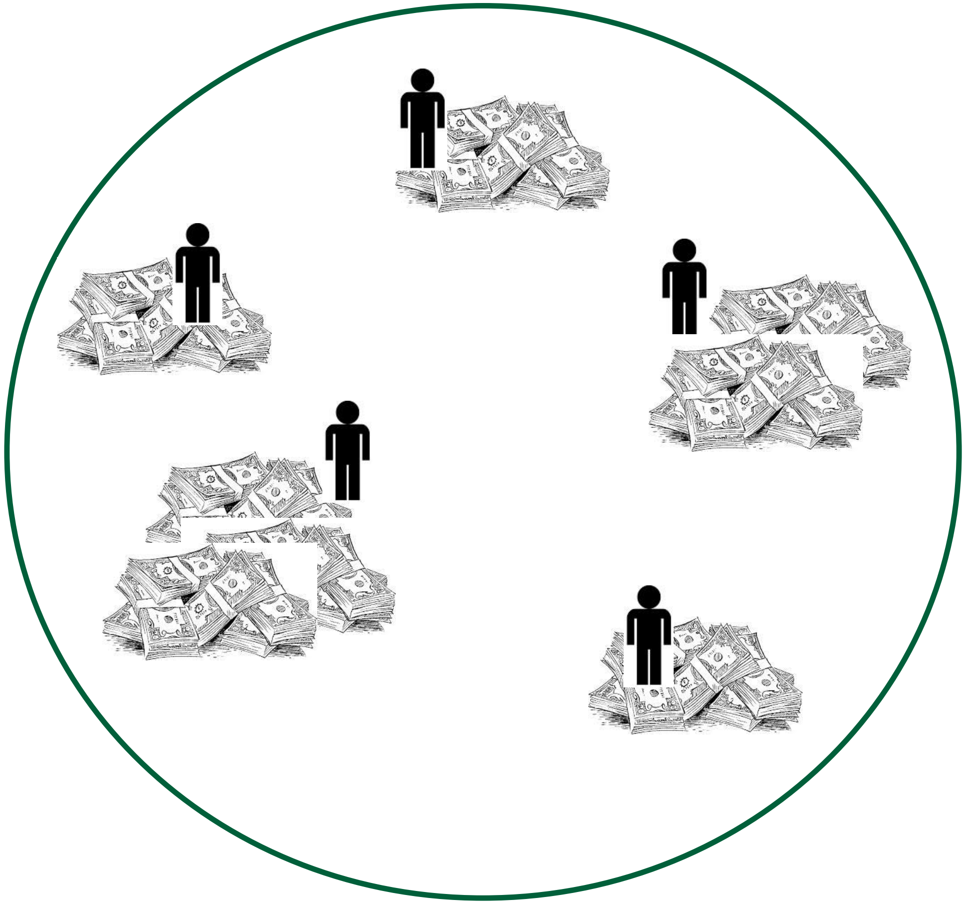
# Mortality risk pooling



Pool risk over 10 years

Individuals make their own investment decisions

Individuals withdraw income from their own funds

However, when someone dies at time *T*…

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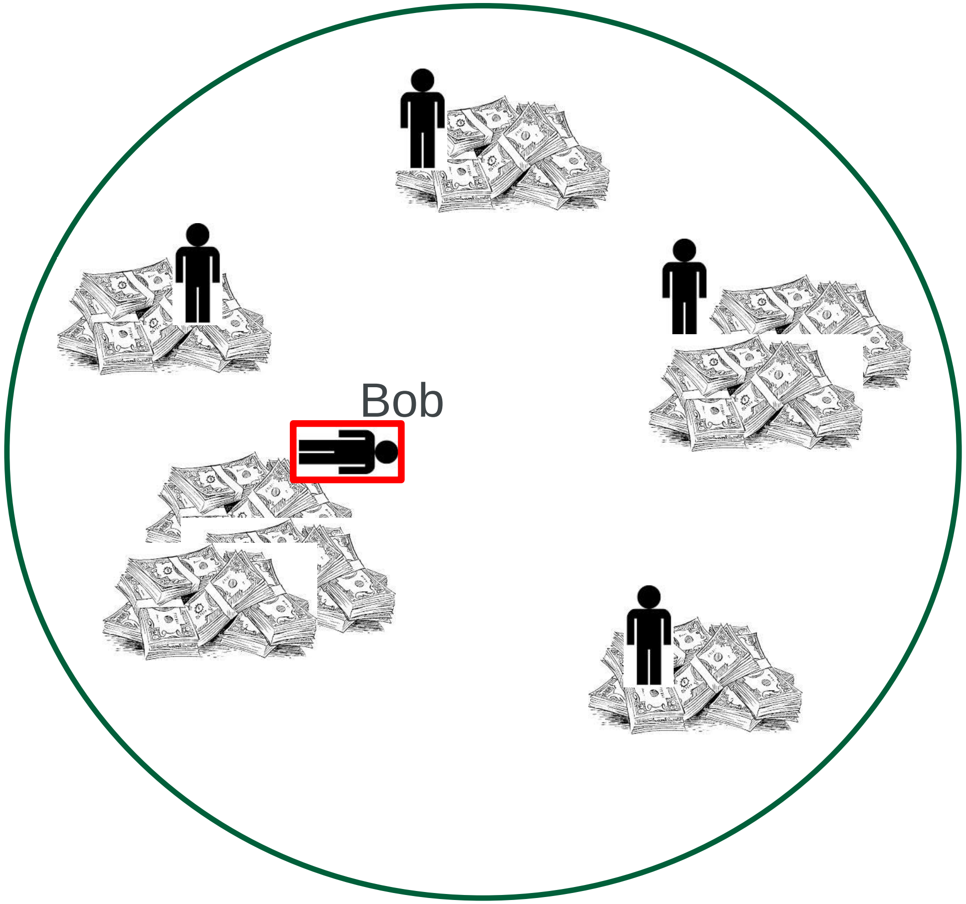
# Mortality risk pooling




Share out remaining funds of Bob.

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# Mortality risk pooling – [DGN]

- $\lambda^{(i)}$ = Force of mortality of $i^{th}$ member at time $T$.

- $W^{(i)}$ = Fund value of $i^{th}$ member at time $T$.

- Payment (longevity credit) to $i^{th}$ member:

$$\frac{\lambda^{(i)} \times W^{(i)}}{\sum_{k \in Group} \lambda^{(k)} \times W^{(k)}} \times \{\text{Bob's remaining fund value}\}$$

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# Mortality risk pooling - features

- Increase expected lifetime income
- Reduce risk of running out of money before death
- Non-negative return, except on death
- Update force of mortality, periodically.

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# Mortality risk pooling - features

- Actuarially fair for any group of people (via payment to Bob, too)

- ``Cost'' is paid upon death, not upfront like life annuity.

- Mitigates longevity risk, but does not eliminate it.

- Anti-selection risk remains, as for life annuity.

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# Mortality risk pooling - features

- Under certain conditions*, can re-create a life annuity.

*e.g. correct forces of mortality, Law of Large Numbers holds,...

- Comparing:
  a) Mortality risk pooling, versus
  b) $\lambda^{(i)}$ x $W^{(i)}$ less Fees,

Fees have to be <0.75% x $W^{(i)}$ for b) to have higher expected return in a moderately-sized, heterogeneous group [DGN].

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# Mortality risk pooling - features

- Splits investment return from mortality “return” – enable:
  - Fee transparency,
  - Product innovation.

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# Simple example

- £100 at age 67, withdraw £5 per annum until funds exhausted.
- Decide at age 67 how much of asset value to pool for rest of life.
- 0% investment return, mortality table S1PMA.
- Longevity credit=its expected value.
- Longevity credit paid at start of each year.

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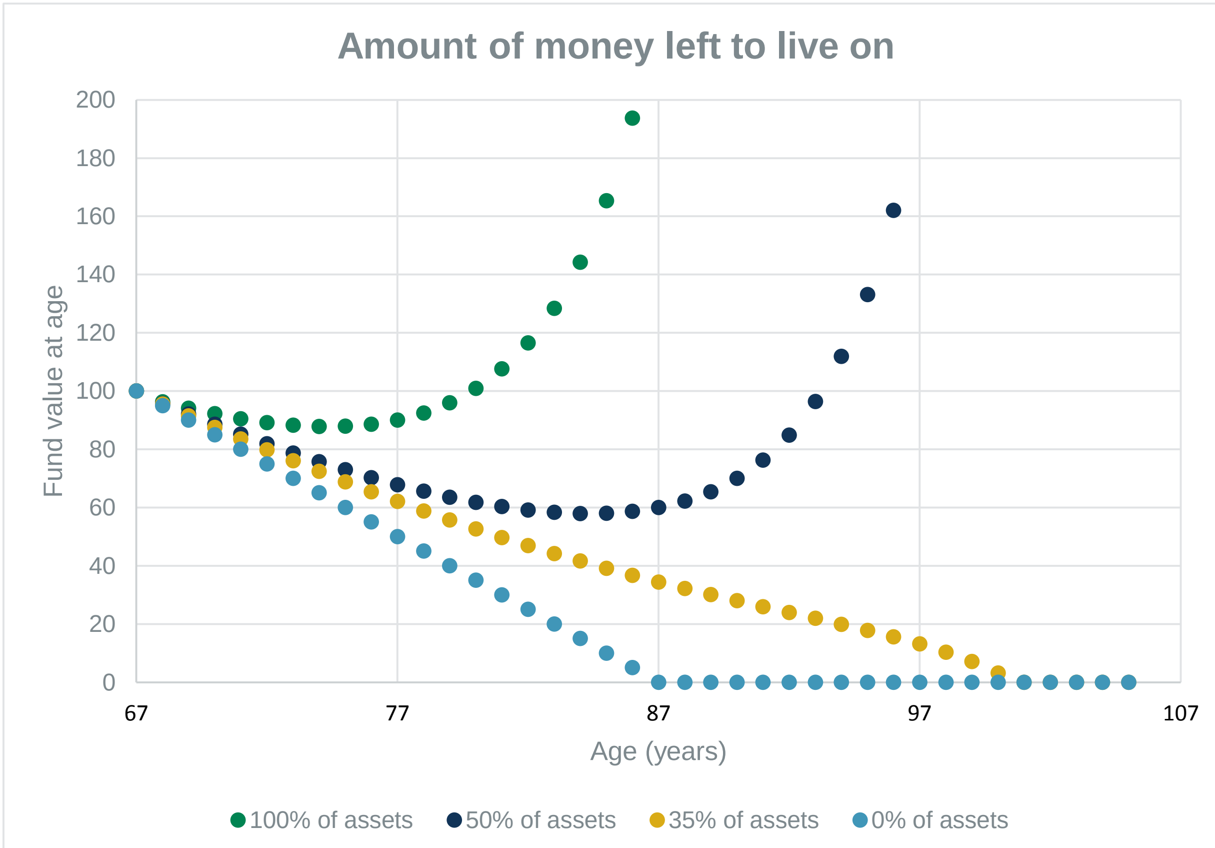
# Simple example

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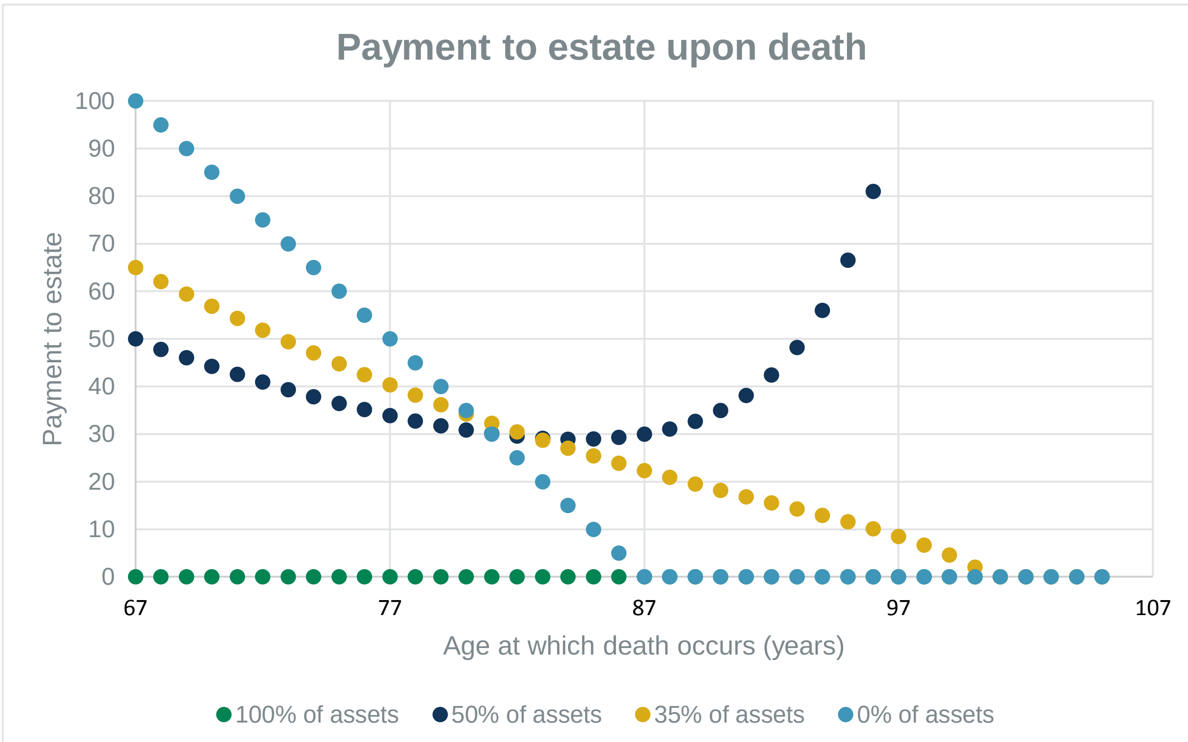
# Simple example

- On death after age 81, higher bequest with only 35%-50% of assets in pool compared to not pooling.

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# Mortality risk pooling – some ideas

- Insurer removes some of the longevity credit volatility, e.g. guarantees a minimum payment for a fee [DY].

- Allow house as an asset – monetize without having to sell it before death [DY].

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# Mortality risk pooling – some ideas

- Pay out a regular income with the features:
  - Each customer has a ring-fenced fund value.
  - Explicitly show investment returns and longevity credits on annual statements.
  - Long waiting period before customer's assets are pooled, to reduce adverse selection risk, e.g. 10 years.
  - More income flexibility.
  - Opportunity to withdraw a lumpsum from asset value.
  - Update forces of mortality periodically.

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# Summary

- Motivation is to provide a higher income in retirement.
- May also result in a higher bequest.
- Reduces chance of running out of money in retirement.
- Transparency may encourage more people to “annuitise”.

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The Actuarial Research Centre (ARC) is the Institute and Faculty of Actuaries' (IFoA) network of actuarial researchers around the world.

The ARC seeks to deliver cutting-edge research programmes that address some of the significant, global challenges in actuarial science, through a partnership of the actuarial profession, the academic community and practitioners.

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

www.actuaries.org.uk/arc

# Bibliography


- [DGN] Donnelly, C, Guillén, M. and Nielsen, J.P. (2014). Bringing cost transparency to the life annuity market. *Insurance: Mathematics and Economics*, 56, pp14-27.
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Questions

Comments

The views expressed in this presentation are those of the presenter.

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