

Simplifying Retirement By Aligning Communication With Retirement Outcomes

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About the speaker



- **Catherine Donnelly**
- Associate Professor
- Co-PI for project '**Minimising Longevity and Investment Risk while Optimising Future Pension Plans**'



- **Risk Insight Lab, Heriot-Watt University**
- The research programme is being funded by the Actuarial Research Centre, Institute and Faculty of Actuaries, UK.

Overview

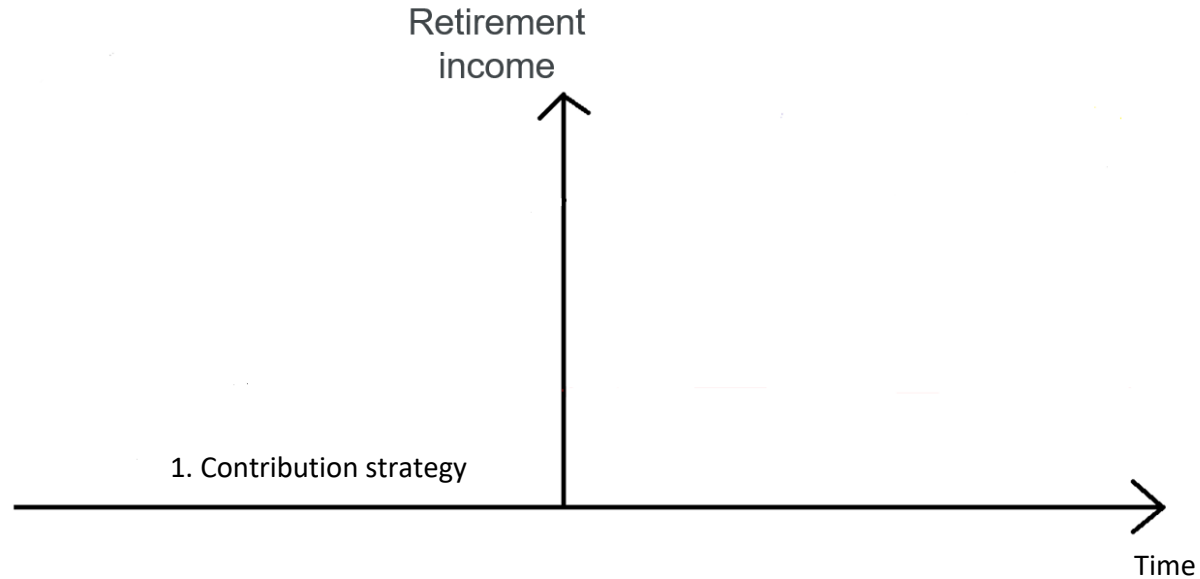


- Background
- Improving communication by product design
- Numerical investigation

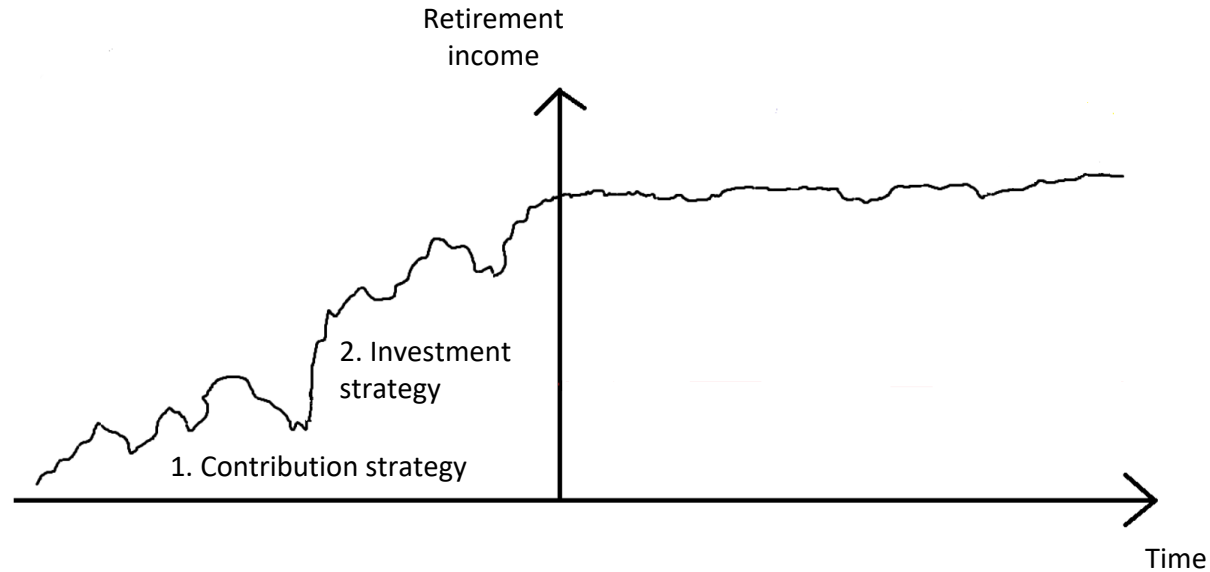
Typical current DC situation



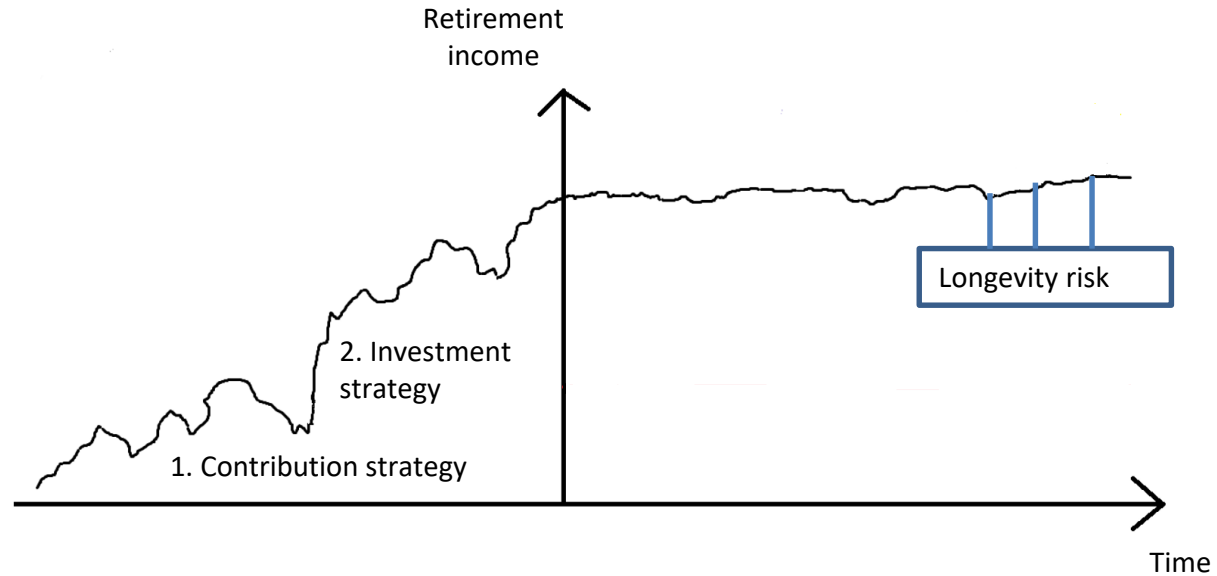
Typical current DC situation



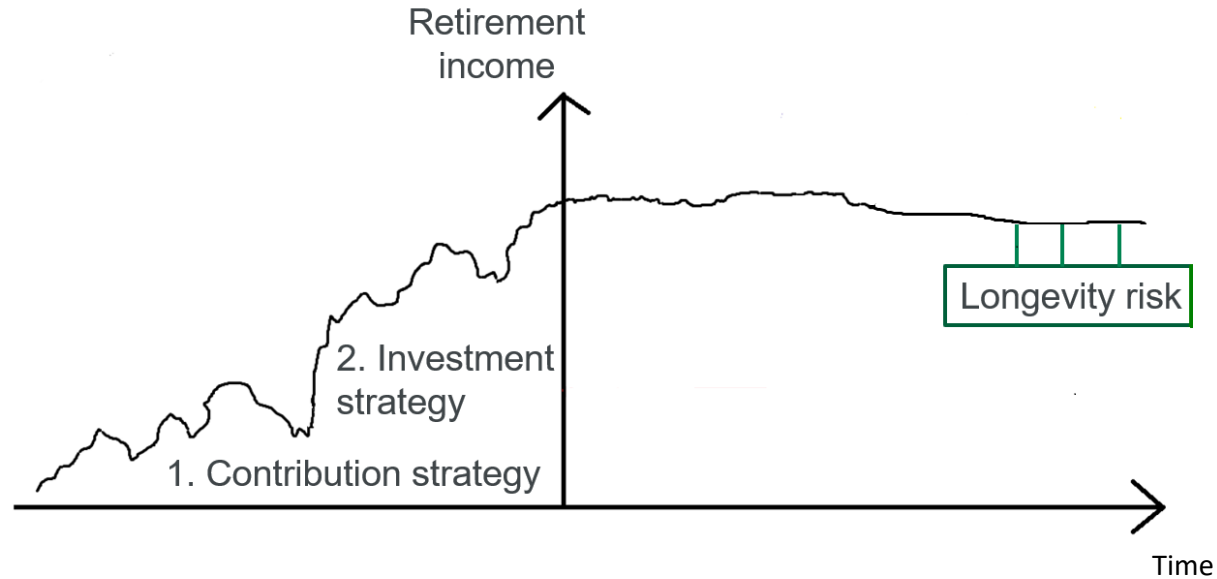
Typical current DC situation



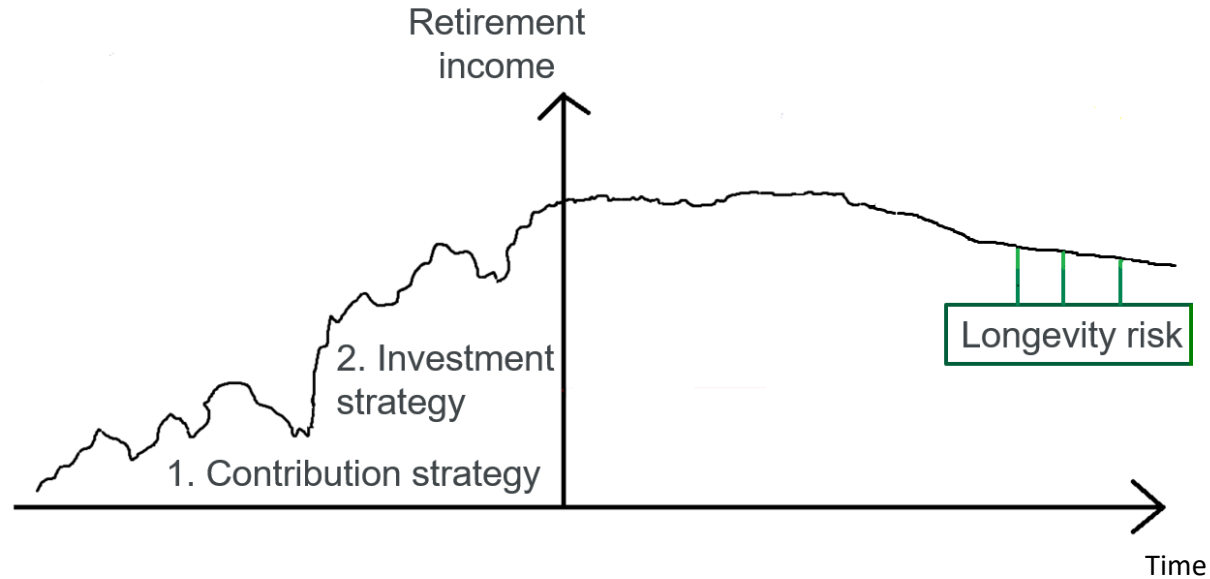
Typical current DC situation



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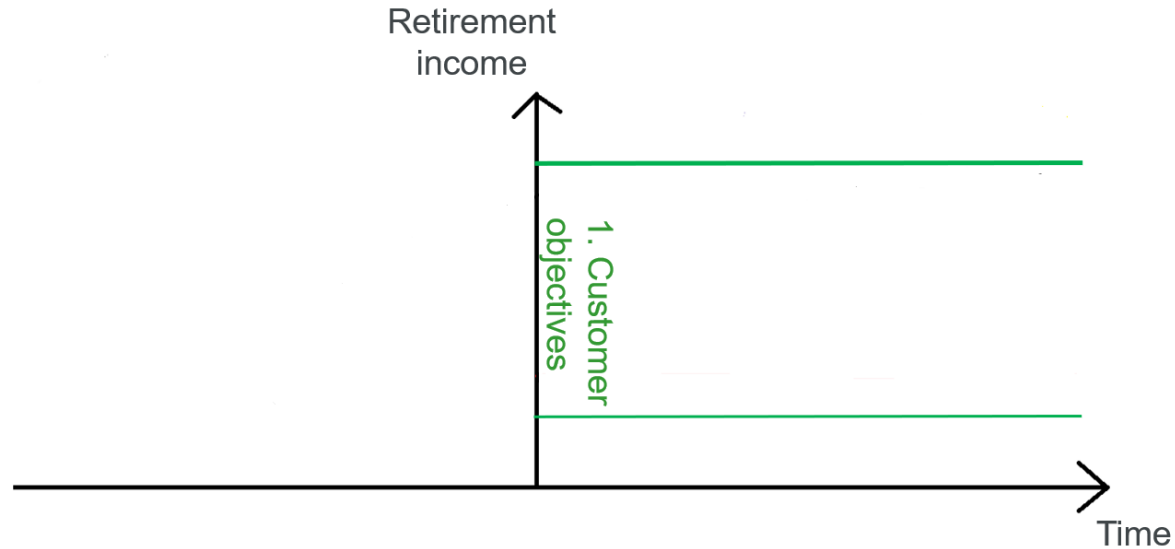


Put customer objectives at the centre



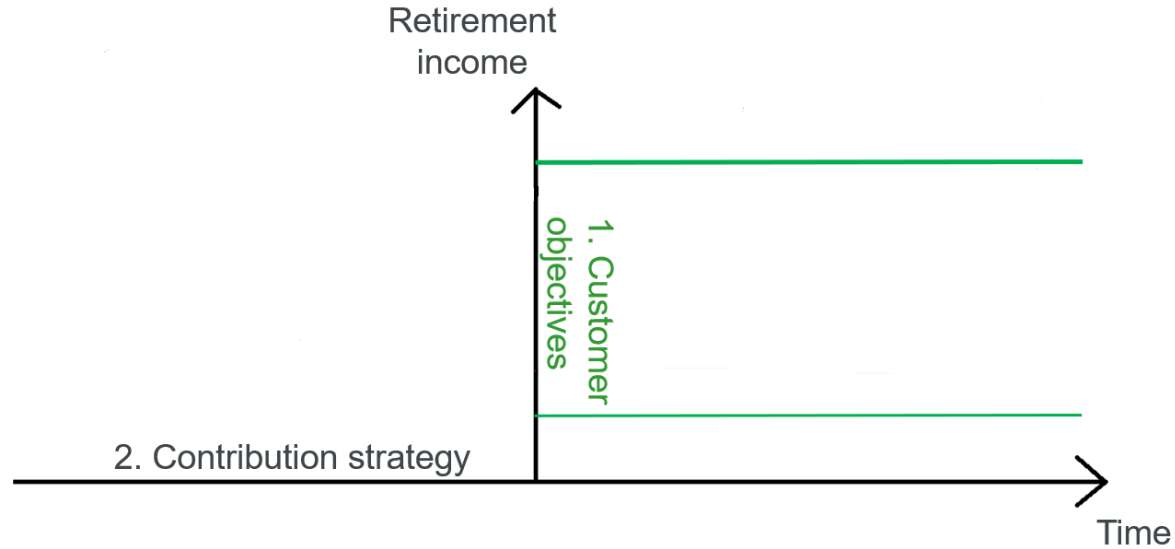
Time

Put customer objectives at the centre



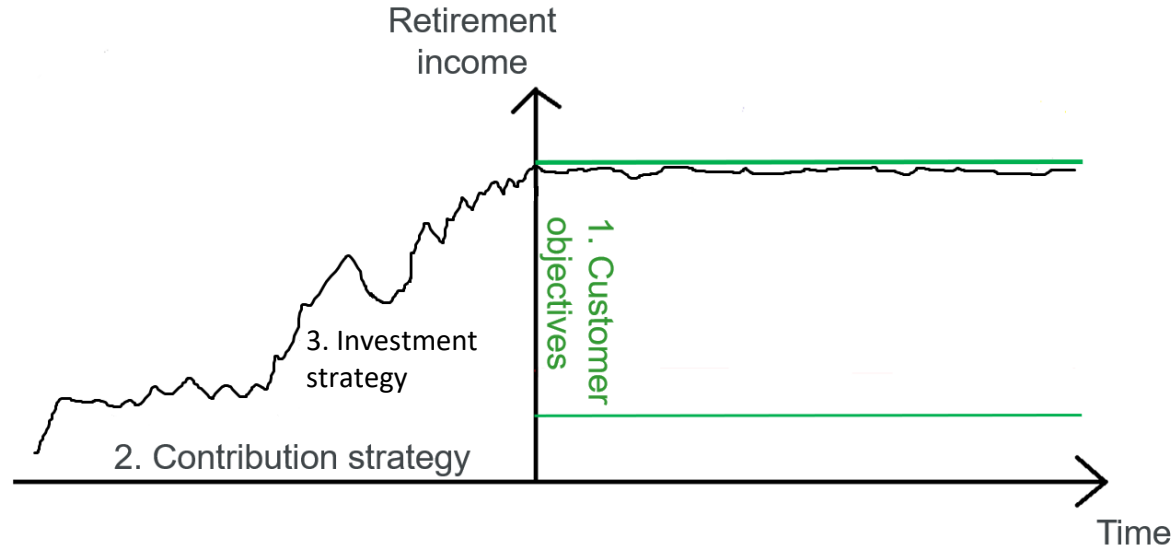
Time

Put customer objectives at the centre



Time

Put customer objectives at the centre



What people want

An inflation-indexed retirement income that lasts for their lifetime.



Robert C. Merton (2014) The Crisis in Retirement Planning. HBR.

- Goal= inflation-increasing income for life.
- Risk = failure to meet goal.
- Align investment strategy with goal.



How are pension outcomes communicated today?



- Big focus on investment values.
- Risk is not generally communicated.
 - e.g. DC pension pot converts to €872 p.a. income at retirement.
 - But what is not shown:
 - Income goes down by 11% if net return goes down by 0.5%,
 - Income goes down by 22% if net return goes down by 1%,...

Improving communication by product design

- Plan today...



- ...for the future, but which one?



Improving communication by product design

- How much income in retirement?
- Target: The income you'd like to live on.
- Minimum: The minimum income that you are happy to live on.



Preliminary “proof-of-concept”

- How much **income in** retirement?
- Target: The **income** you’d like to **live on**.
- Minimum: The minimum **income** that you are happy **to live on**.



Preliminary “proof-of-concept”

- How much **money at** retirement?
- Target: The **money** you’d like to **have at retirement.**
- Minimum: The minimum **money** that you are happy **to have at retirement.**



Preliminary “proof-of-concept”



- How much **money at** retirement?
- Target: The **money** you'd like to **have at retirement.**
- Minimum: The minimum **money** that you are happy **to have at retirement.**

Mr Bean's data

- 55 years old.
- Current value of pension savings = €50000.
- Retiring at age 65.
- For simplicity, no future contributions.



Mr Bean's choices

- Target value of savings at retirement: €61000 (2% p.a.).
- Minimum value of savings: €50000 (0% p.a.).
- Retiring in 10 years' time.



Feedback to Mr Bean

- 42% chance of getting €61,000.
- 14% chance of getting €50,000.
- To increase the chance:
 - Start contributing,
 - Retire later,
 - (Take more investment risk).



Remove target – what happens?

- 42% chance of getting €61000 **and no more.**
- 14% chance of getting €50000.



Remove target – what happens?

- 33% chance of getting €61000 **or more**.
- 21% chance of getting €50000.
(still have the minimum guarantee in place)



Securing a value at retirement

Chance of getting €61K or higher	Target €61K	No target
Minimum €50K	42%	33%
No minimum	51%	41%

Chance of getting €50K or lower	Target €61K	No target
Minimum €50K	14%	21%
No minimum	10%	15%

Securing a value at retirement



- A target increases the chance to hit the target value.
- However, give up upside risk to do this.
- Offsets the cost of the minimum value.

**Initial wealth €50K, no min, values in €000s,
 $r = 0.01$, $\mu = 0.04$, $\sigma = 0.20$, $\gamma = -2$, $T=10$
 years**

p	Target=€58K (1.5% p.a.)	Target=€61K (2% p.a.)	Target=€67K (3% p.a.)	No Target
5%	49.4	47.2	45.8	45.6
25%	57.6	55.0	53.4	52.9
50%	58.0	61.0	59.5	58.8
75%	58.0	61.0	66.2	65.4
95%	58.0	61.0	67.0	76.3
Prob. hit Target	74%	51%	23%	N/A
Quantile uplift	109%	104%	101%	N/A

Conclusion



- Target wealth restriction:
 - Increases certainty of level of retirement wealth,
 - Offsets the cost of a minimum wealth,
 - May aid in communication of risk.
- Plan: do this for an income in retirement:
 - Aim for an income close to a target income, and
 - Income should not fall below a minimum income.

Bibliography



- Donnelly, C, Guillén, M, Nielsen, J.P. and Pérez-Marin, A.M. (2018) [Implementing individual savings decisions for retirement with bounds on wealth](#). *ASTIN Bulletin*, 48(1), pp111-137.
- Donnelly, C, Guillén, M, Gerrard, R. and Nielsen, J.P. (2015) [Less is more: Increasing retirement gains by using an upside terminal wealth constraint](#). *Insurance: Mathematics and Economics*, 64, pp259-267.

Thank you very much for your attention!



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Extra slides if needed



Derivation of the investment strategy

- Black-Scholes market
 - Risky stock price dynamics $\frac{dS(t)}{S(t)} = \mu dt + \sigma dW(t),$
 - Risk-free bond price dynamics $\frac{dB(t)}{B(t)} = r dt,$
 - Process W a standard Brownian motion.

Derivation of the investment strategy

- Initial wealth $x_0 > 0$.
- Find an optimal strategy π^* that maximises

$$E\left[\frac{1}{\gamma} X^{\pi}(T)^{\gamma}\right]$$

subject to $X^{\pi}(T) \in [Minimum, Target]$, a. s.

- An optimal strategy is the hedging strategy that gives wealth
$$X^{\pi^*}(T) = z_0 Z(T) - [z_0 Z(T) - Target]_+ + [Minimum - z_0 Z(T)]_+.$$

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$$X^{\pi^*}(T) = z_0 Z(T) - [z_0 Z(T) - \text{Target}]_+.$$
- For $t \leq T$, $X^{\pi^*}(t) = z_0 Z(t) - \text{call}(t, z_0 Z(t)).$

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- At $t = 0$, $x_0 = z_0 - \text{call}(0, z_0)$.

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- An optimal strategy is the hedging strategy that gives wealth

$$X^{\pi^*}(T) = z_0 Z(T) - [z_0 Z(T) - \text{Target}]_+$$
- At $t = 0$, $x_0 = z_0 - \text{call}(0, z_0) \Rightarrow z_0 \geq x_0$

Interpretation of z_0

- Quantile uplift z_0/x_0 .
- p -quantile

$$Q_p = \inf\{y \in \mathbb{R}: \mathbb{P}[X^\pi(T) \leq y] \geq p\}.$$

- Without Target constraint: $Q_p = x_0\beta_p$
- With Target constraint K : $Q_p = \min\{K, z_0\beta_p\}$