SFU SIMON FRASER UNIVERSITY

Lifetime pension pools: A research-informed look at design choices

Jean-François Bégin, PhD, FSA, FCIA

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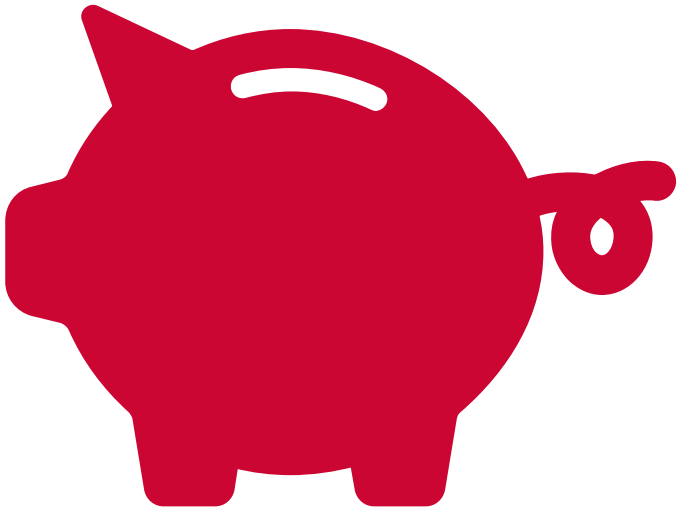
Lifetime pension pools

What are lifetime pension pools?

- Lifetime pension pools allow retiring individuals to convert a lump sum into **income for life**
- It does not guarantee a specific level of income; instead, the pension payable varies with the **investment and mortality experience** of the group

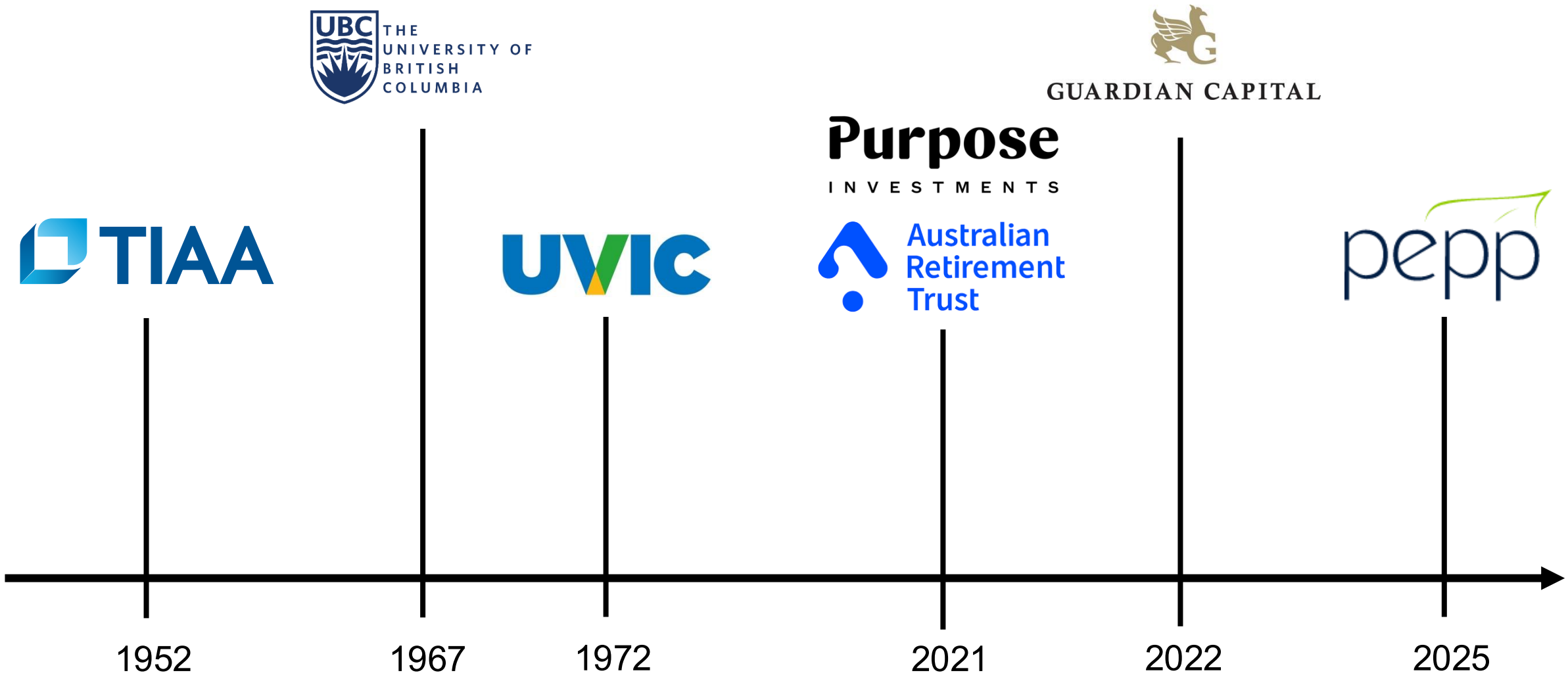


Same same, but different

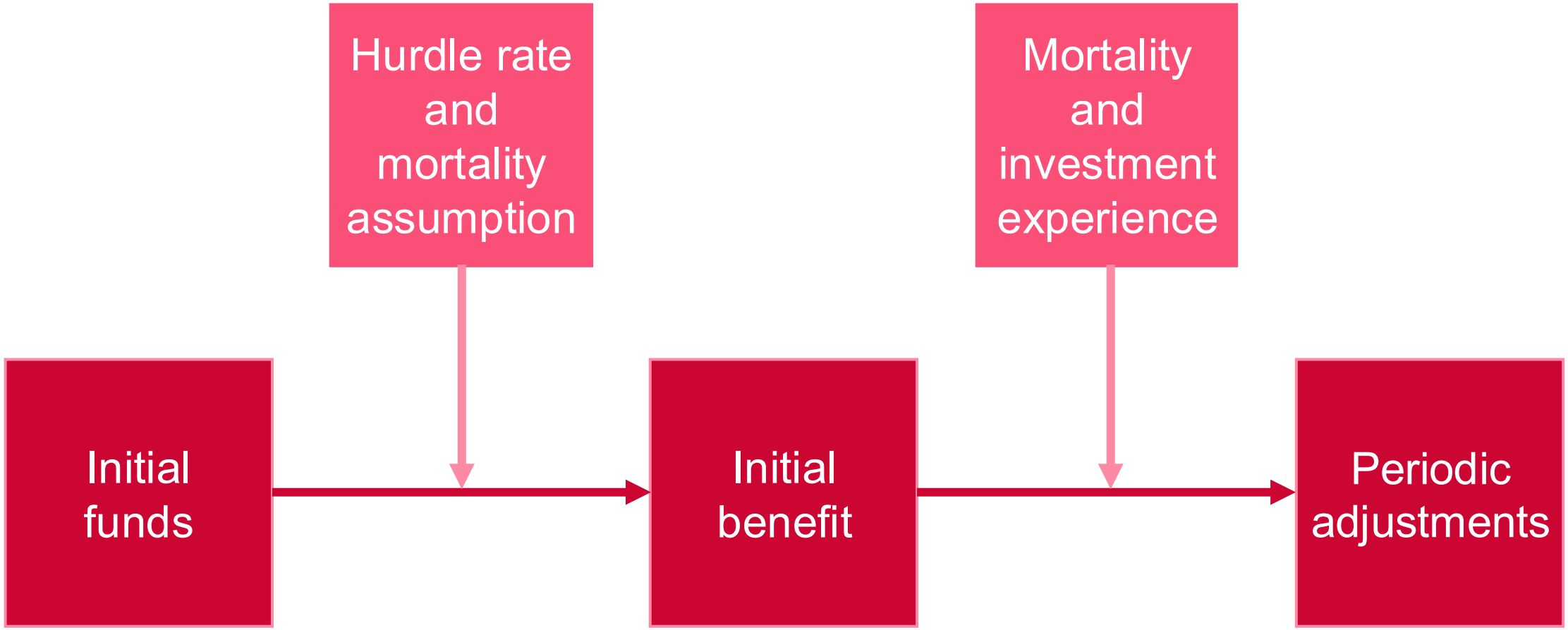
Very broad definition that matches **different designs**:

- Group self-annuitization schemes (e.g., Piggott et al., 2005; Qiao and Sherris, 2013; Hanewald et al., 2013)
- Modern retirement tontines (e.g., Milevsky and Salisbury, 2015, 2016; Fullmer, 2019; Chen et al., 2021)
- Pooled annuity funds (e.g., Stamos, 2008; Donnelly et al., 2013)
- Variable annuities (e.g., Balter et al., 2020; Balter and Werker, 2020)
- Variable payment life annuities (e.g., MacDonald et al., 2020; Sanders and Bégin, 2025)
- Variable payout annuities (e.g., Horneff et al., 2010)

Examples of lifetime pension pools

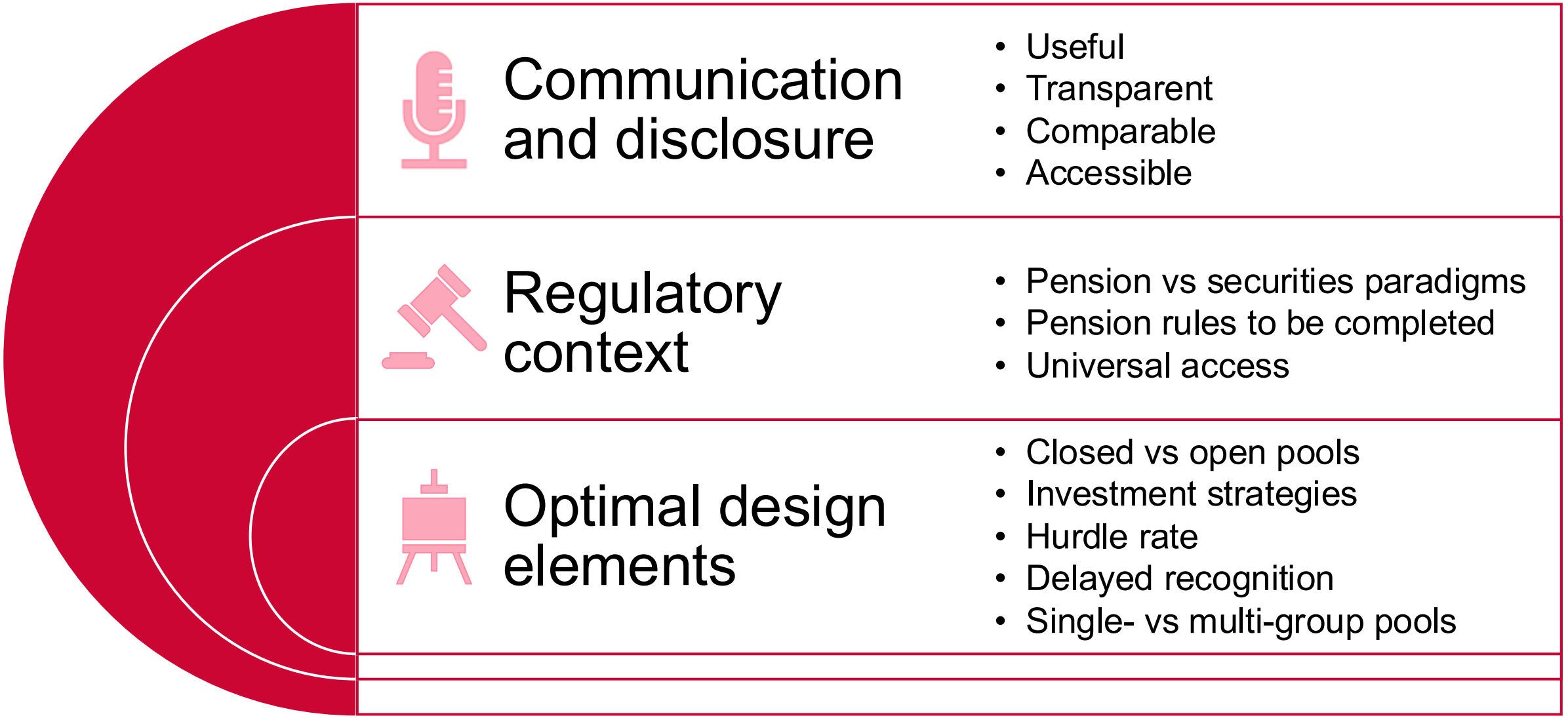


How do lifetime pension pools work?



Adapted from MacDonald, B.-J., Sanders, B., Strachan, L., and Frazer, M. (2021). *Affordable Lifetime Pension Income for a Better Tomorrow*. Global Risk Institute and National Institute on Ageing.

Main challenges in lifetime pension pools



Design considerations

Stability

- Central role in lifetime pension pools
- Budgets are often inflexible, making it difficult to absorb unexpected reductions

Fairness

- The present value of benefits should be equal to the present value of contributions
- Might not hold for each member in lifetime pension pools

Sustainability

- Ability to continue paying benefits
- With immediate recognition, it is not a main concern
- With delayed recognition, it could matter more

Investment strategies

Importance of investment strategies

- It is a **core design lever** that directly shapes stability

Conservative portfolios
- More stable
- Decreased expected benefits

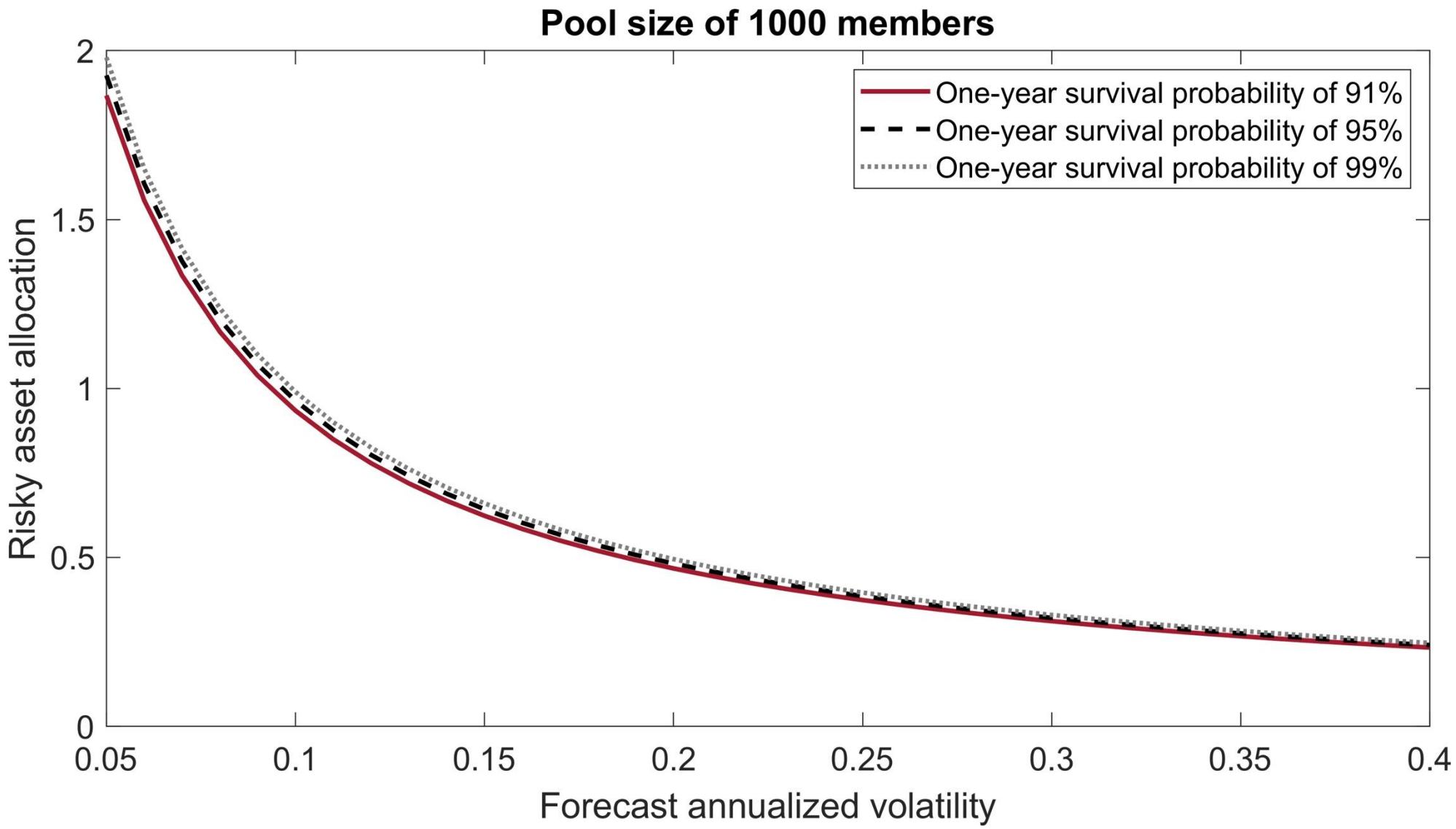
Aggressive portfolios
- Less stable
- Increased expected benefits

- Most existing studies use simple or static strategies

Benefit volatility targeting

- Improves the investment performance while reducing volatility and downside risk (Olivieri et al., 2022; Li et al., 2022)
- Our research considers both investment and mortality risks **at the same time**
- The strategy systematically reduces exposure to risky assets when
  - Market risk increases
  - Longevity risk increases
  - Pooling benefits weaken

Benefit volatility targeting



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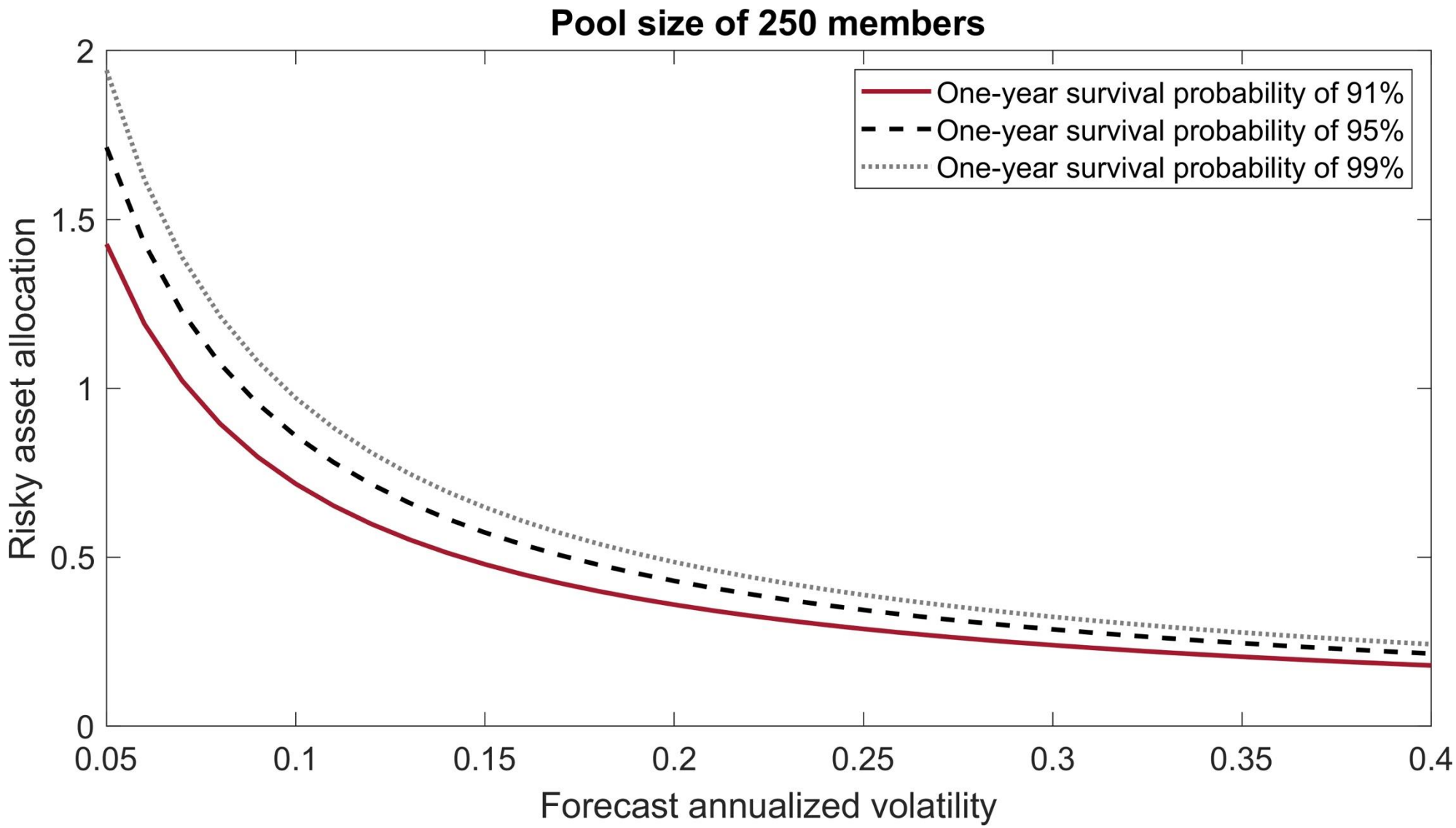
Benefit volatility targeting



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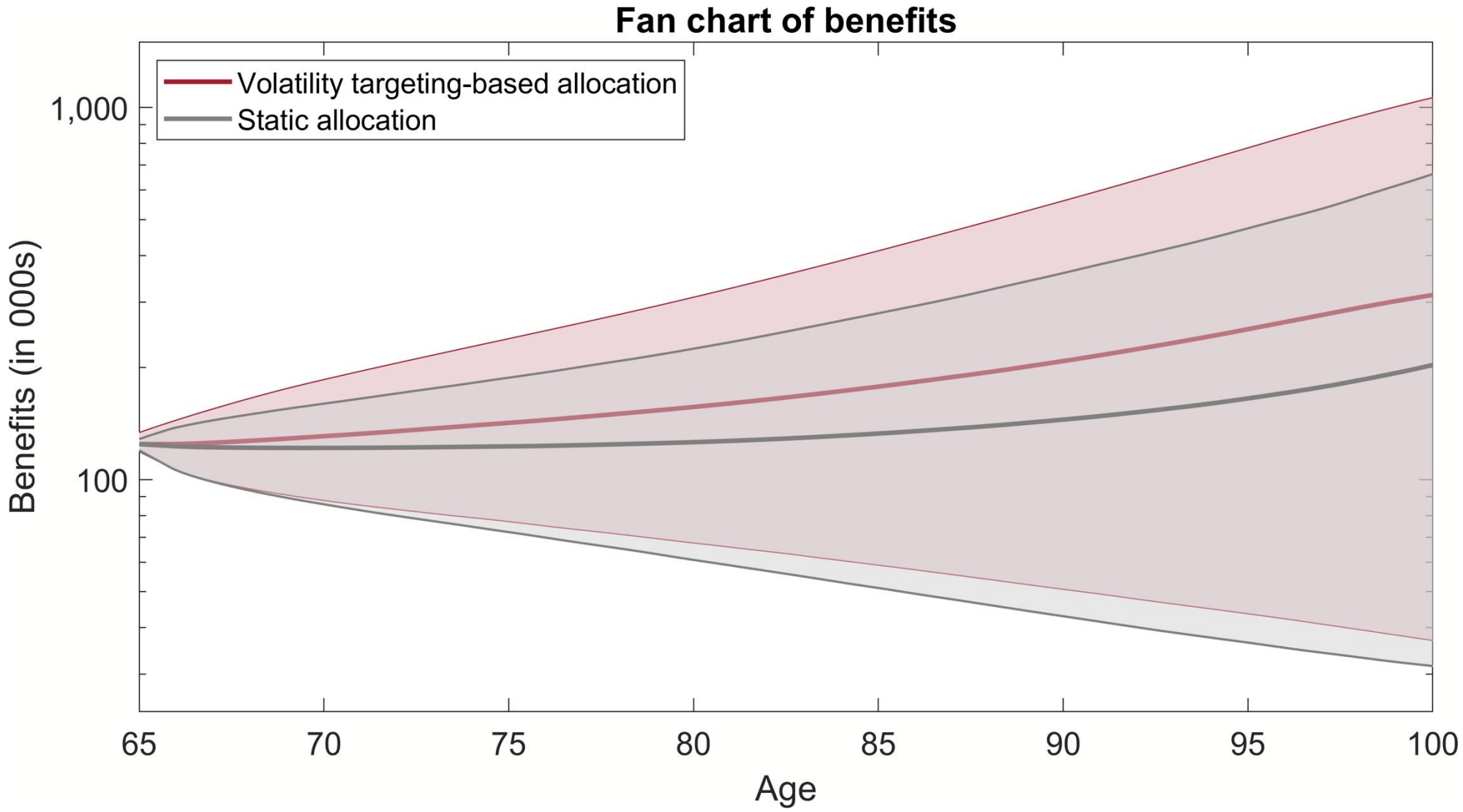

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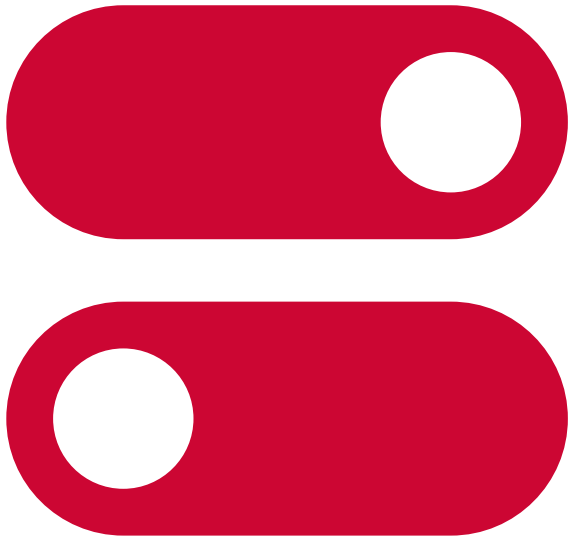
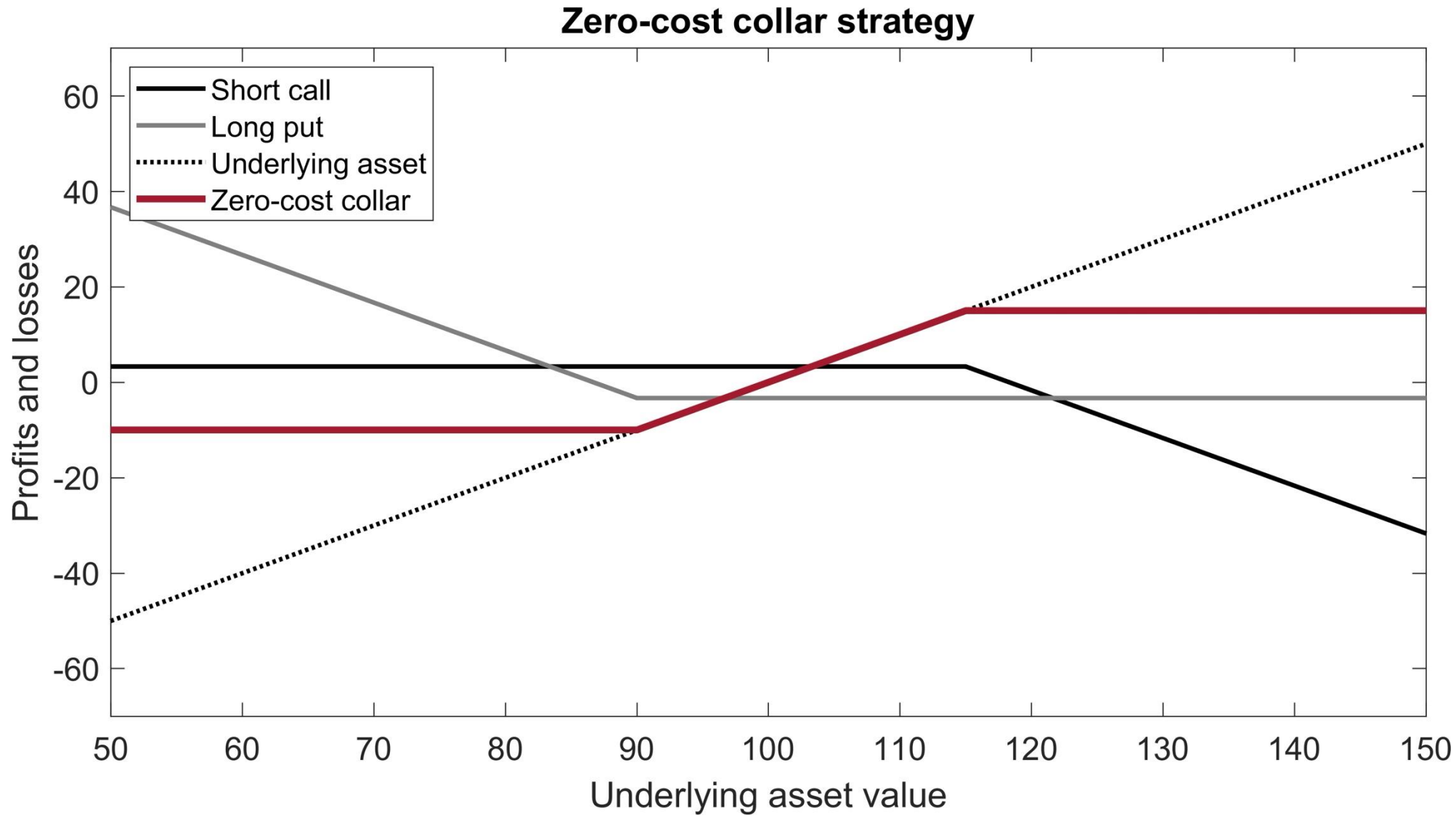
Option overlay



- Option-based strategies reduce downside risk and benefit volatility while preserving some upside potential (Kabuche et al., 2025)
- A common approach is a **zero-cost collar**
  - Buy put options to protect against losses
  - Finance the cost by selling call options
- Options are rarely available on the exact portfolio held by the pool
  - Hedging must rely on correlated assets
  - As a result, hedge effectiveness is imperfect, leading to **basis risk**

Option overlay



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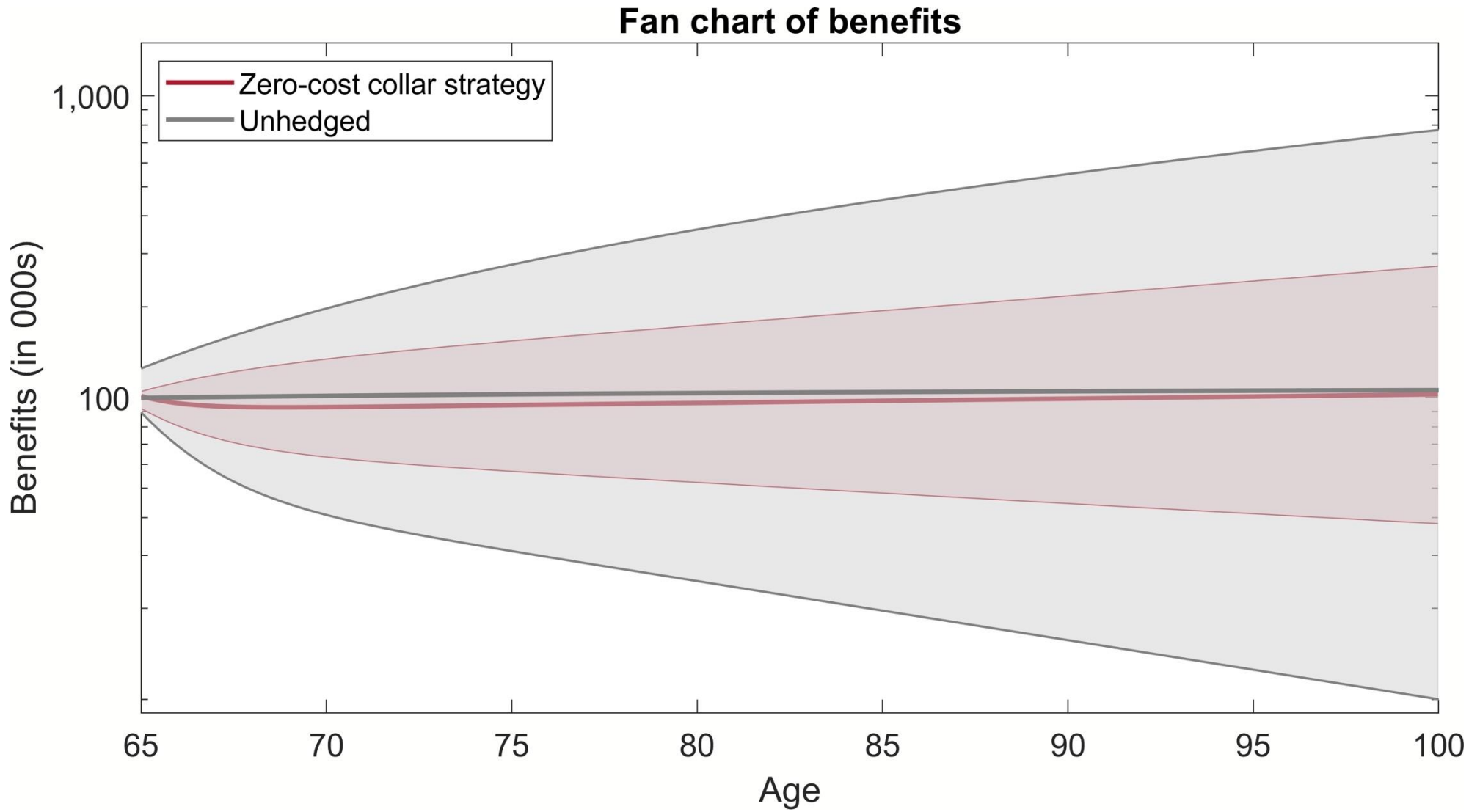
Option overlay



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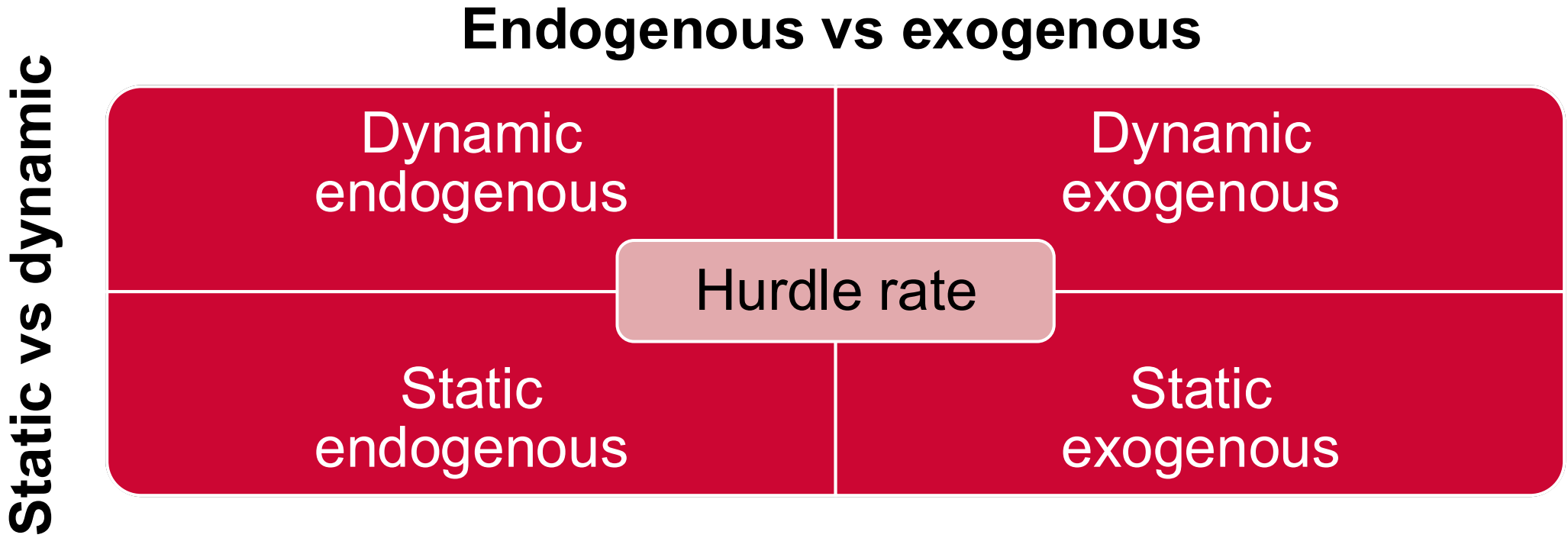
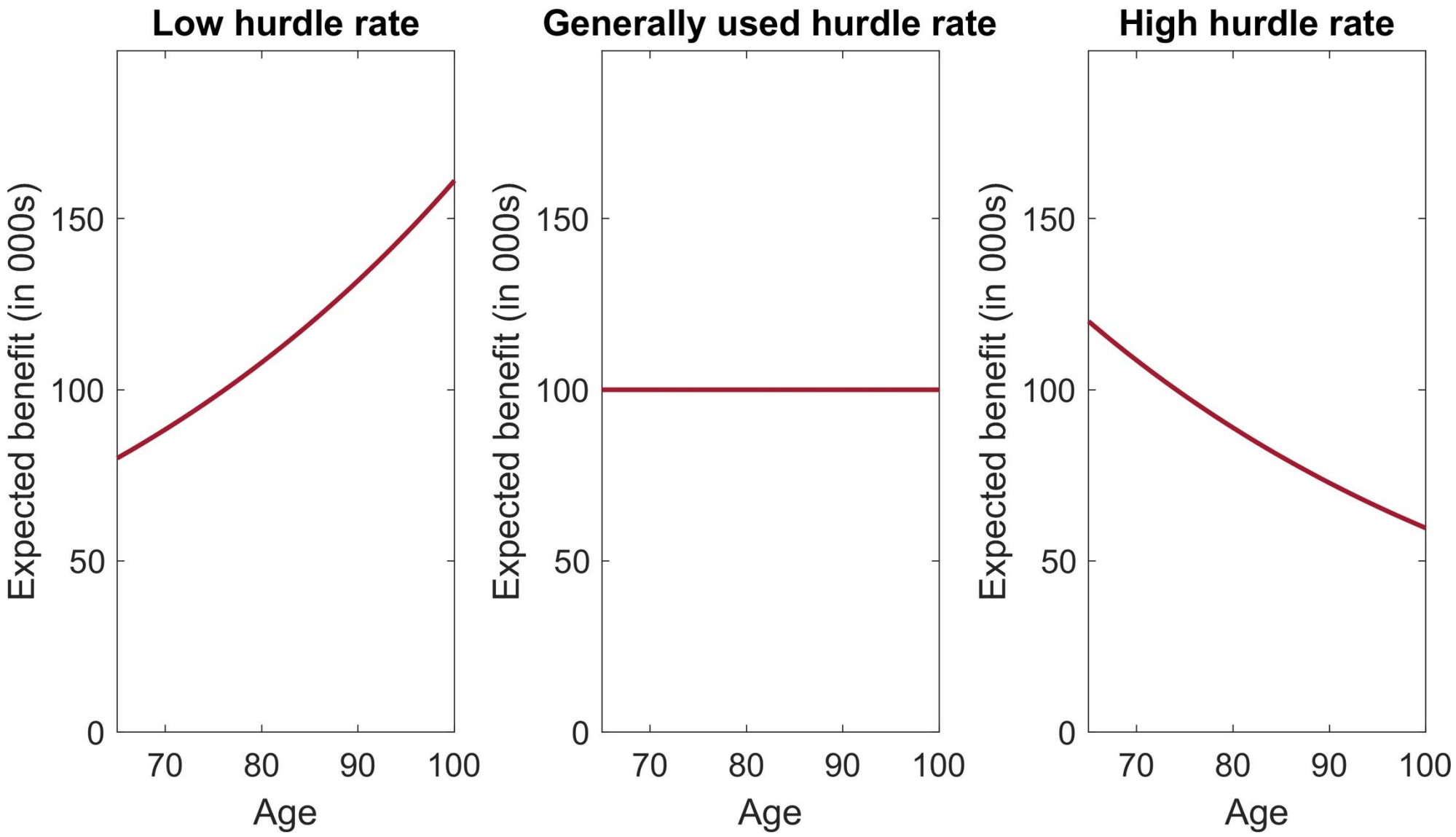
Hurdle rate

Hurdle rate

- Often assumed **without justification**
  - Generally assumed to be the expected return on assets



Impact of hurdle rate on expected benefits



Bégin, J.-F., Sanders, B., and Sun, Y. (2026). Optimal hurdle rate and investment policy in lifetime pension pools. *ASTIN Bulletin,* Accepted.

Optimal hurdle rate

- Assuming a static hurdle rate, we find its optimal value along with an optimal asset allocation
- The objective is to maximize the expected utility for the **entire pool**, based on two parameters:
  - The members' risk aversion
  - A minimum benefit threshold

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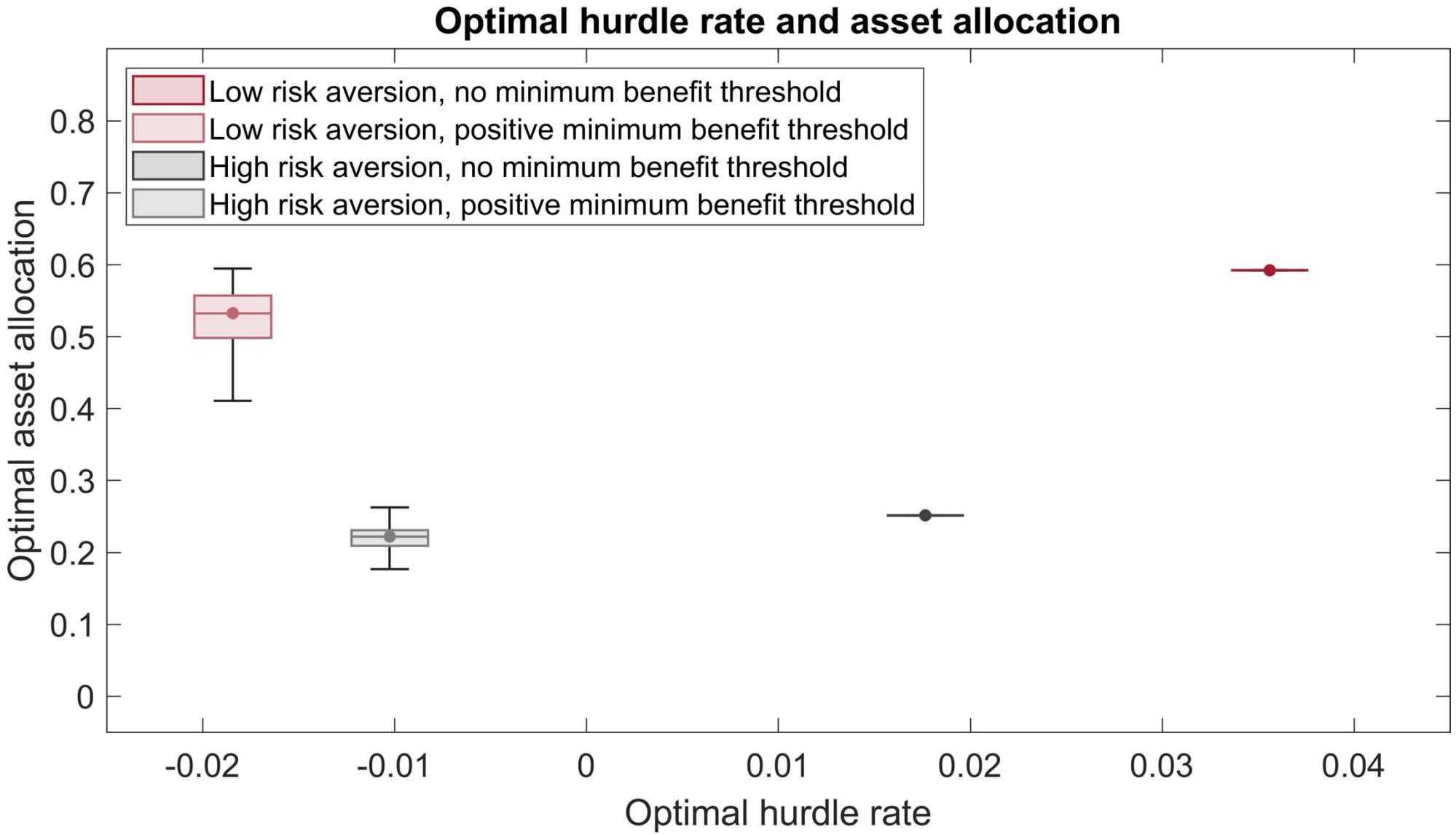
Optimal hurdle rate



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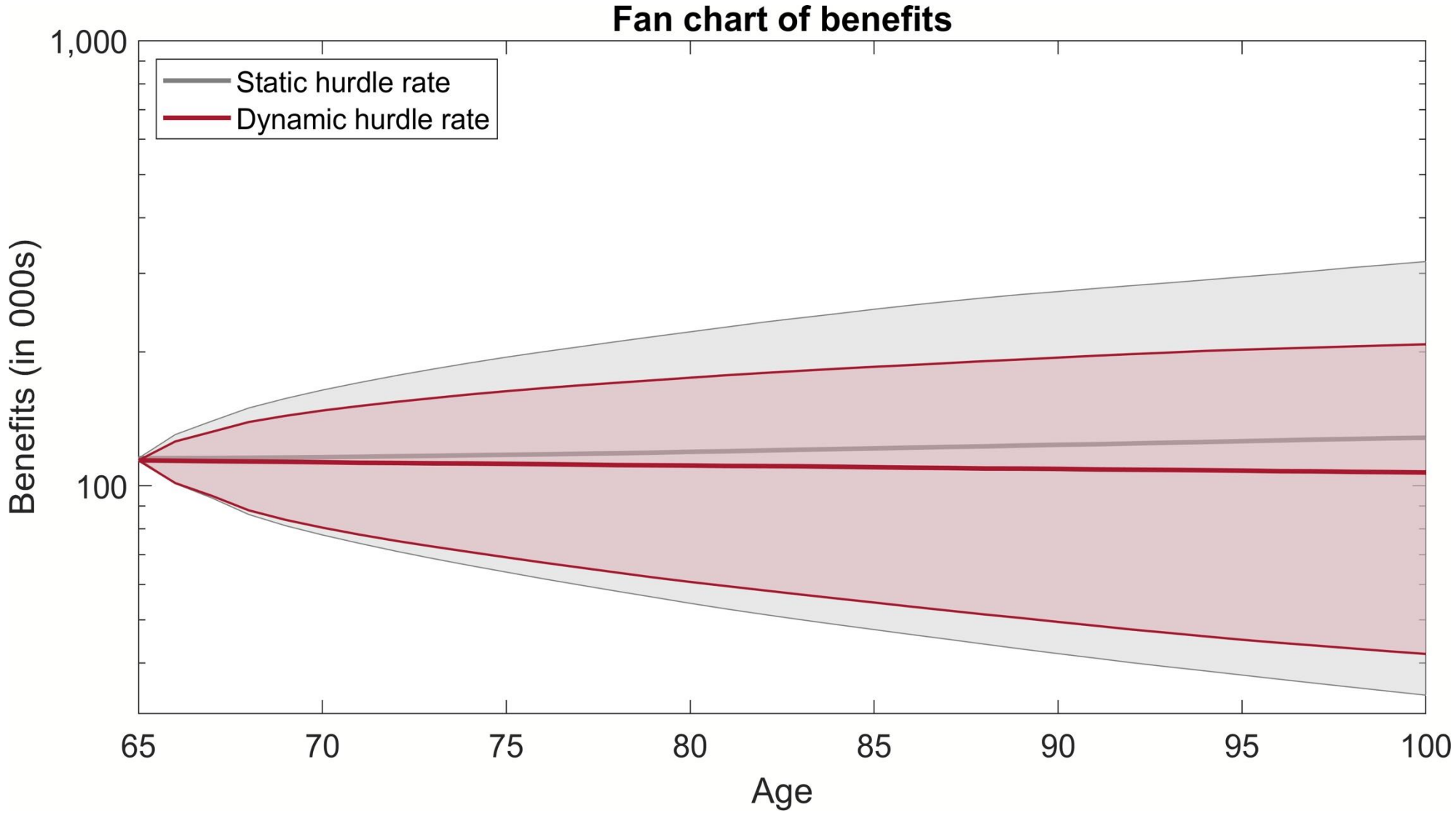
Dynamic hurdle rate

- A dynamic hurdle rate can, in theory, minimize payout volatility while optimizing expected returns (Fullmer et al., 2025)
- This research considers a hurdle rate that changes from valuation to valuation, in line with **changing expectations of future portfolio returns**
- Tend to be more difficult to explain to members

Dynamic hurdle rate



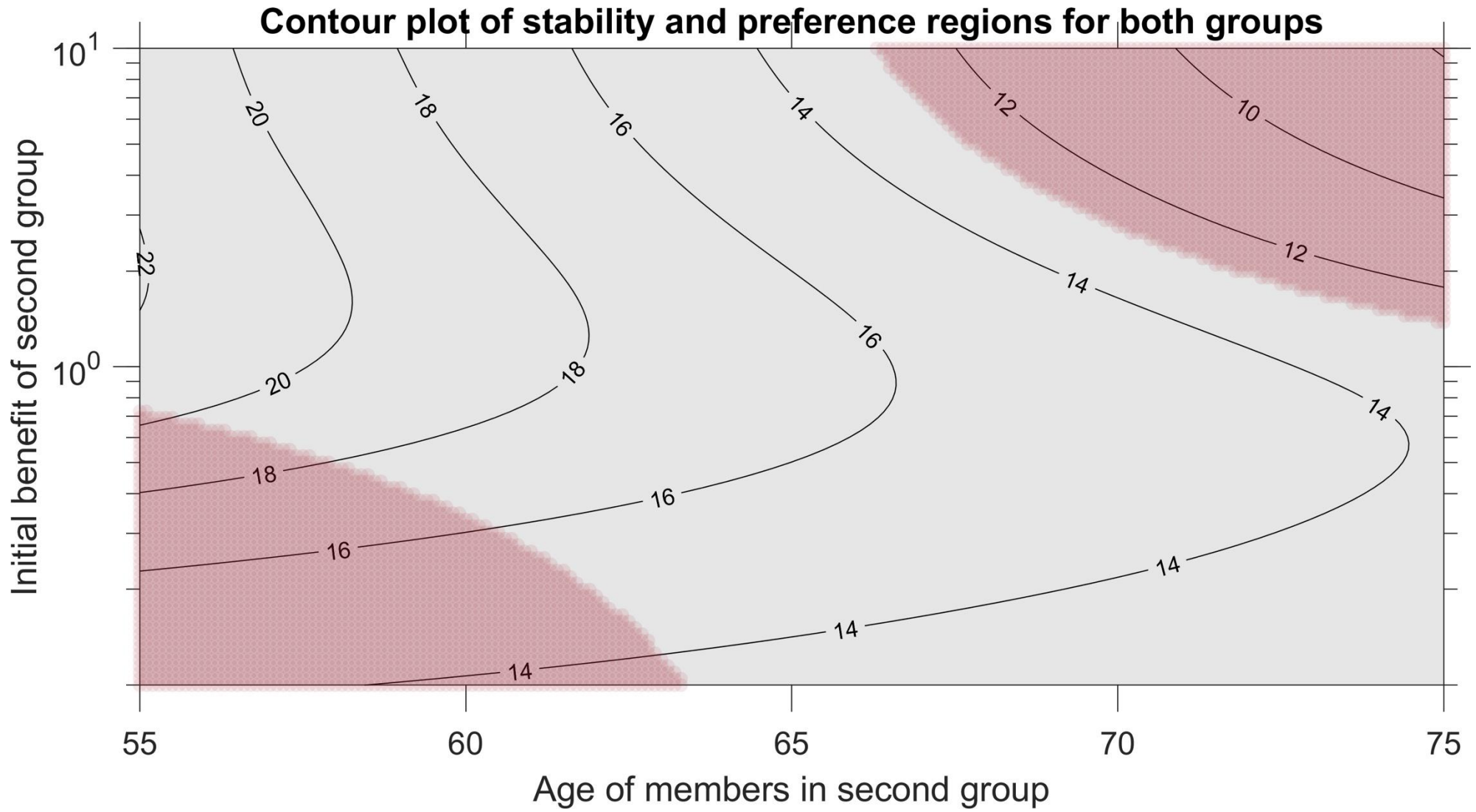
Bégin, J.-F. and Sanders, B. (2023). *Exploration of Lifetime Pension Pool Design Elements*. Society of Actuaries and Canadian Institute of Actuaries.

Single- versus multi-group pools

Impact of heterogeneity

- Lifetime pension pools are often promoted on the basis that ***larger pools are more stable***
- Pool composition matters as much as pool size, if not more
- Poorly balanced heterogeneity can **reduce stability**, complicate governance, and undermine member confidence

Preference regions for a two-group pool



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Concluding remarks

Some policy considerations

1. Adopt **dynamic asset allocation frameworks** that integrate stability and benefit volatility reduction objectives
2. Calibrating the hurdle rate in line with members' **risk preferences** and sensitivity to **minimum benefit levels** can improve welfare
3. Introduce **dynamic hurdle rates** linked to market conditions
4. Limit **extreme heterogeneity** that could undermine stability

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