Superannuation and Longevity Risk: Ensuring Retirement Preparedness

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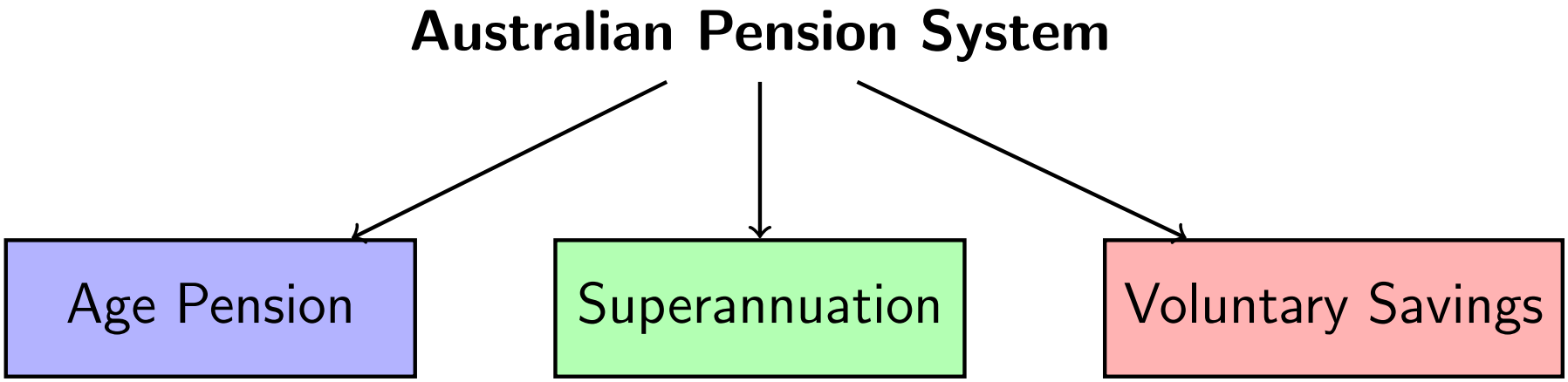
What is Superannuation?

- A compulsory retirement savings system in Australia, designed to ensure individuals accumulate savings throughout their working lives.
- Consists of two phases:
  - **Accumulation phase**: Savings and investment grow through employer and voluntary contributions.
  - **Decumulation phase**: Individuals draw from these savings to fund their retirement.
- Retirees may outlive their savings!

Importance



- By 2023, the superannuation system holds over $3.6 trillion in assets, making it the fourth largest globally (APRA, 2023).

The Longevity Challenge in Retirement Planning

- **What is Longevity Risk?**
  - **Longevity risk** refers to the risk that individuals will outlive their retirement savings.
  - Advances in healthcare have led to longer life expectancies, increasing the time people spend in retirement.
- **Why is Longevity Risk a Concern?**
  - Retirement spending is difficult to plan for the unknown duration of retirement.
  - Despite concerns about outliving savings, 84% of retirees are still invested in account-based pensions that do not adequately manage longevity risk (APRA, 2022).
  - Around 50% of retirees choose the minimum drawdown rate, relying on self-insurance rather than longevity protection products (RiceWarner, 2020).

Superannuation Growth and Transition to Retirement

- Currently, 1.6 million Australians aged 65 and over are receiving income from a superannuation product.
- In the next decade, 2.5 million Australians will shift from the accumulation phase to the decumulation phase.
- With this massive transition, the importance of managing retirement savings and mitigating longevity risk is increasing.
- Policymakers need to address the low uptake of lifetime income products and consider introducing default options with longevity protection.

This Study

- This preliminary study explores:
  1. Whether superannuation participants are adequately prepared for retirement.
  2. Potential strategies to mitigate longevity risk.
- Key findings from **UniSuper** data:
  - A significant portion of participants lack sufficient savings for a comfortable retirement.
  - Asset pooling benefits most retirees.
  - Deferred annuities benefit wealthier retirees but are less suitable for those with smaller account balances.

Literature Review: Superannuation Research

- **Household Savings**
  - Superannuation's effect on household wealth accumulation and portfolio composition (Connolly and Kohler, 2003; Connolly, 2007).
- **Fund Performance and Asset Allocation**
  - Evaluation of the performance of superannuation funds and optimal asset allocation strategies (Drew and Stanford, 2001; Cummings, 2016).
- **Behavioural Economics and Retirement Savings Decisions**
  - How social norms and default options influence superannuation savings behavior (Croy et al., 2010; Dobrescu et al., 2018).

Literature Review: Superannuation Research

- **Role of Superannuation in National Saving and Retirement Income**
  - Assessing the macroeconomic and welfare effects of superannuation on retirement income systems (Gruen and Soding, 2011; Kudrna and Woodland, 2013).
- **Governance and Regulation of Superannuation Funds**
  - Examining the governance structures of superannuation funds and implications for regulatory policies (Cooper and Cooper, 2010; Bateman and Piggott, 2010).

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Data

- **UniSuper**: The superannuation fund for academic and professional staff in Australia's higher education sector.
- UniSuper manages $70 billion in net funds across 400,000 members at 37 universities.
- Covers two fund types: Defined Contribution (DC) and Defined Benefits (DB).
  - Both types involve pension accounts, but they differ in how the account values accumulate.
- Key fields: Total Balance, Age, Date Joined, Salary, and Staff Category.
- Data range: 2016 to 2018.

Data (continued)

- Additional fields include: Member Contribution Rate, Active Flag, Insurance, Service Fraction, and Benefit Salary (averages over 3 or 5 years).

Age	25^{th} percentile	50^{th} percentile	75^{th} percentile	Mean	Number of Members
25–35	$27,317	$49,140	$80,422	$59,269	4709
35–45	$97,251	$161,296	$252,608	$190,862	7251
45–55	$261,699	$461,201	$705,812	$513,829	3892
55–65	$780,424	$1,114,837	$1,417,736	$1,133,874	696

Table: Summary statistics for pension fund balances for academic staff as of 30 June 2017

Pension Fund Balances

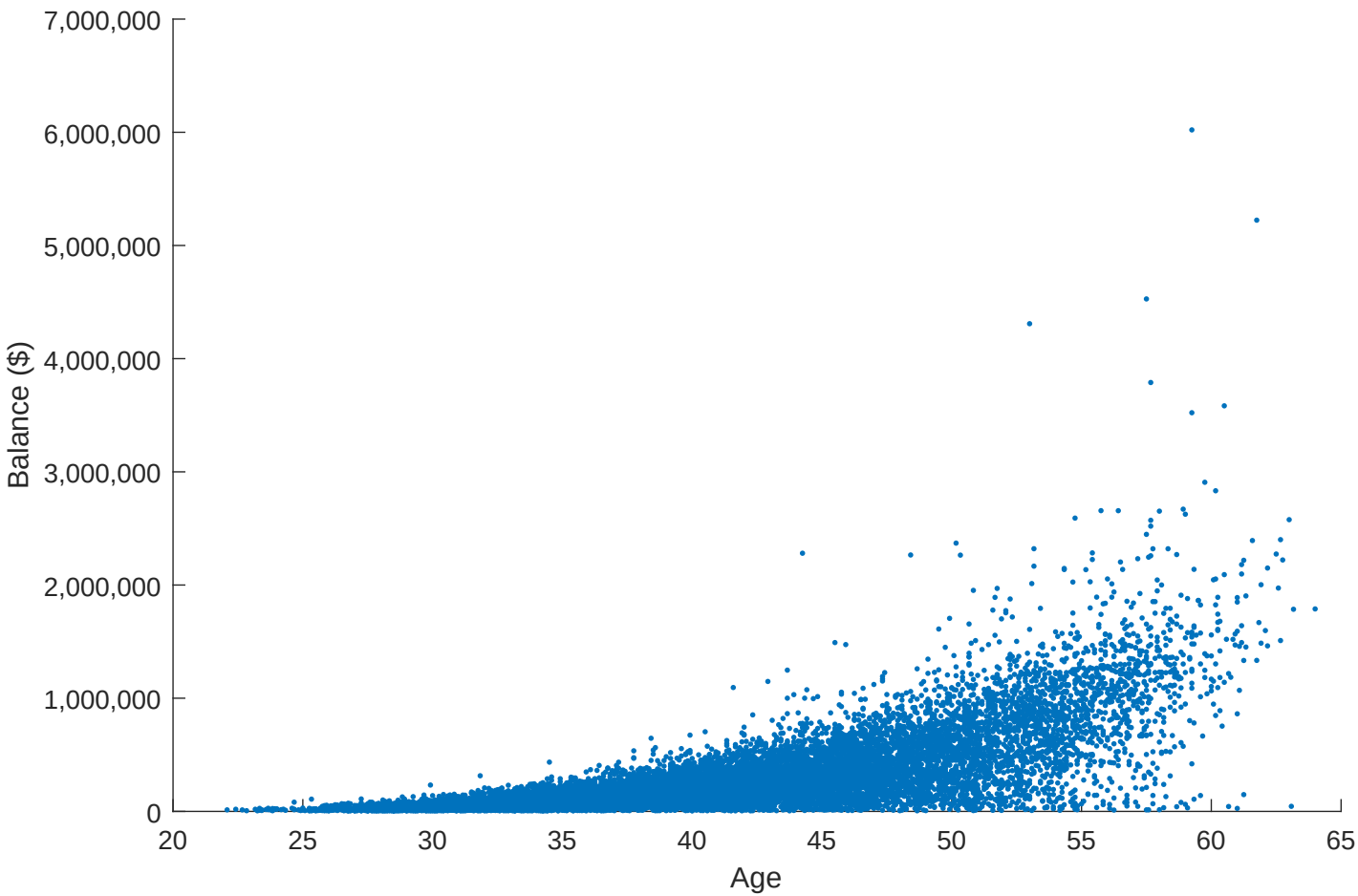

Figure: Pension fund balances for academic staff by age on 30 June 2017

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Overview of Methodology

- We simulate individual survival status and account values over time.
- A fixed annual withdrawal amount is specified, which could be a modest retirement lifestyle ($27,648 in 2018) or a comfortable lifestyle ($43,317 in 2018).
- For each retiree, we compute the probability that their pension account balance becomes insufficient to cover these withdrawals before they pass away.

Scenarios Considered

1. **Benchmark Analysis**:
   - Retirees withdraw the specified amount annually until their pension account is depleted or they pass away.
2. **Asset Pooling**:
   - Upon death, the deceased's remaining balance (up to $100,000) is redistributed among surviving participants.
3. **Deferred Annuity**:
   - A deferred annuity is purchased at retirement (age 65) and begins paying at age 90, matching the specified annual withdrawal amount.
4. **Combination of Asset Pooling and Deferred Annuity**

Simulation Setup

- **Survival Status Simulation**: Based on the Lee-Carter model fitted to Australian mortality data:

$$\log m_{x,t} = a_x + b_x k_t + \epsilon_{x,t}$$

- **Investment Return Simulation**:

$$r_{excess,t} \sim N(\mu_{diff}, \sigma^2_{diff})$$

Here, μ_{diff} and σ^2_{diff} are derived from the difference between historical ASX returns and the consumer price index (CPI) over the last 30 years.

- **Account Balance Evolution**:

$$Balance_{x+1} = \max(Balance_x - C, 0) \times (1 + r_{excess,t})$$

where C is the annual withdrawal amount.

Asset Pooling Strategy

- **Key Concept**: Redistribute the deceased's remaining balance (up to \$100,000) to survivors.
- Steps:
  - Total transfer amount:

$$T_j = \sum_d \min(Balance_{x,d,j}, 100,000)$$

  - Survivors with higher balances receive:

$$x_j = \frac{T_j}{N_{high} + \sum_{s \in low} \frac{Balance_{x,s,j}}{100,000}}$$

  - Survivors with lower balances receive:

$$Transfer_{s,j} = x_j \times \frac{Balance_{x,s,j}}{100,000}$$

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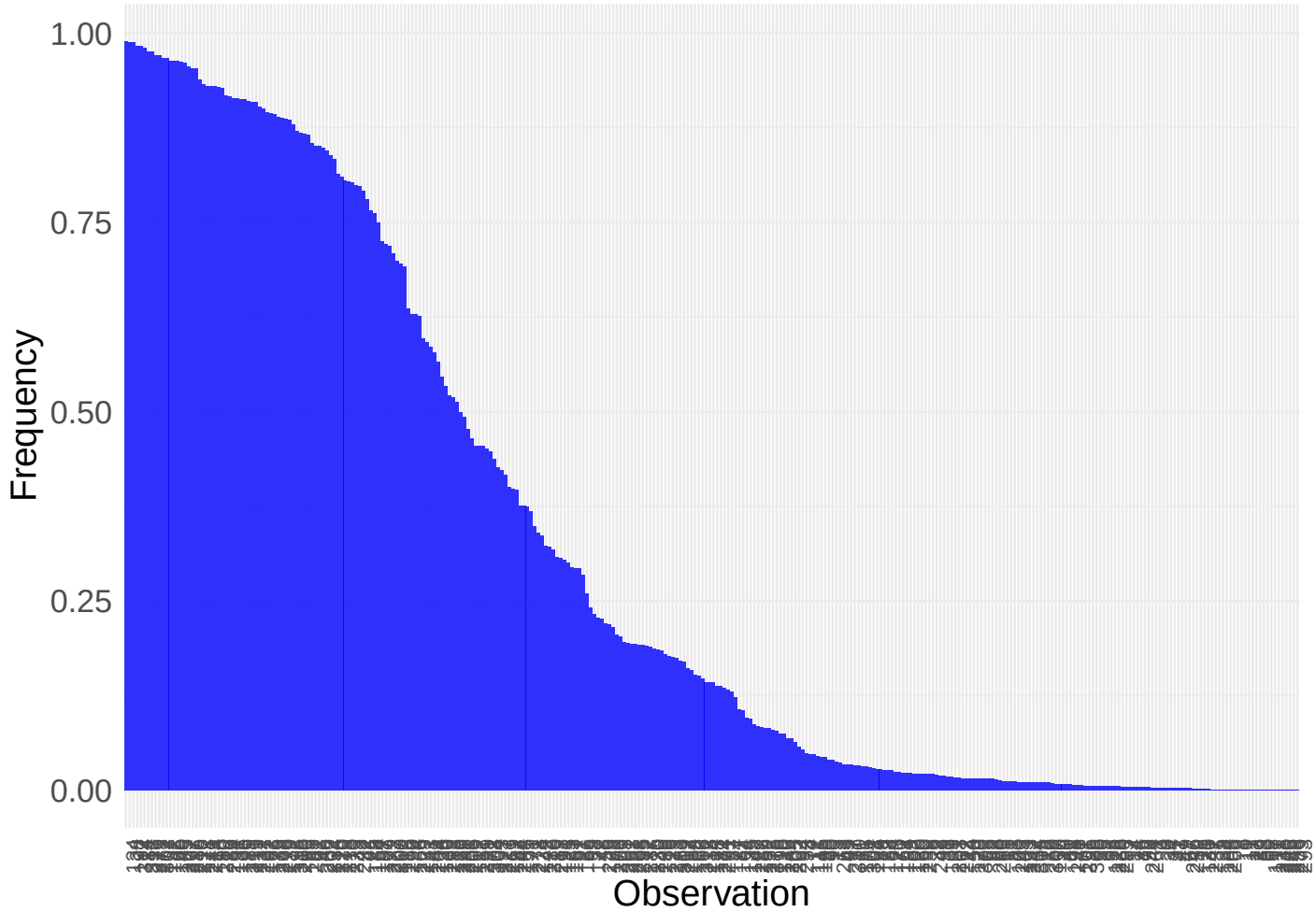
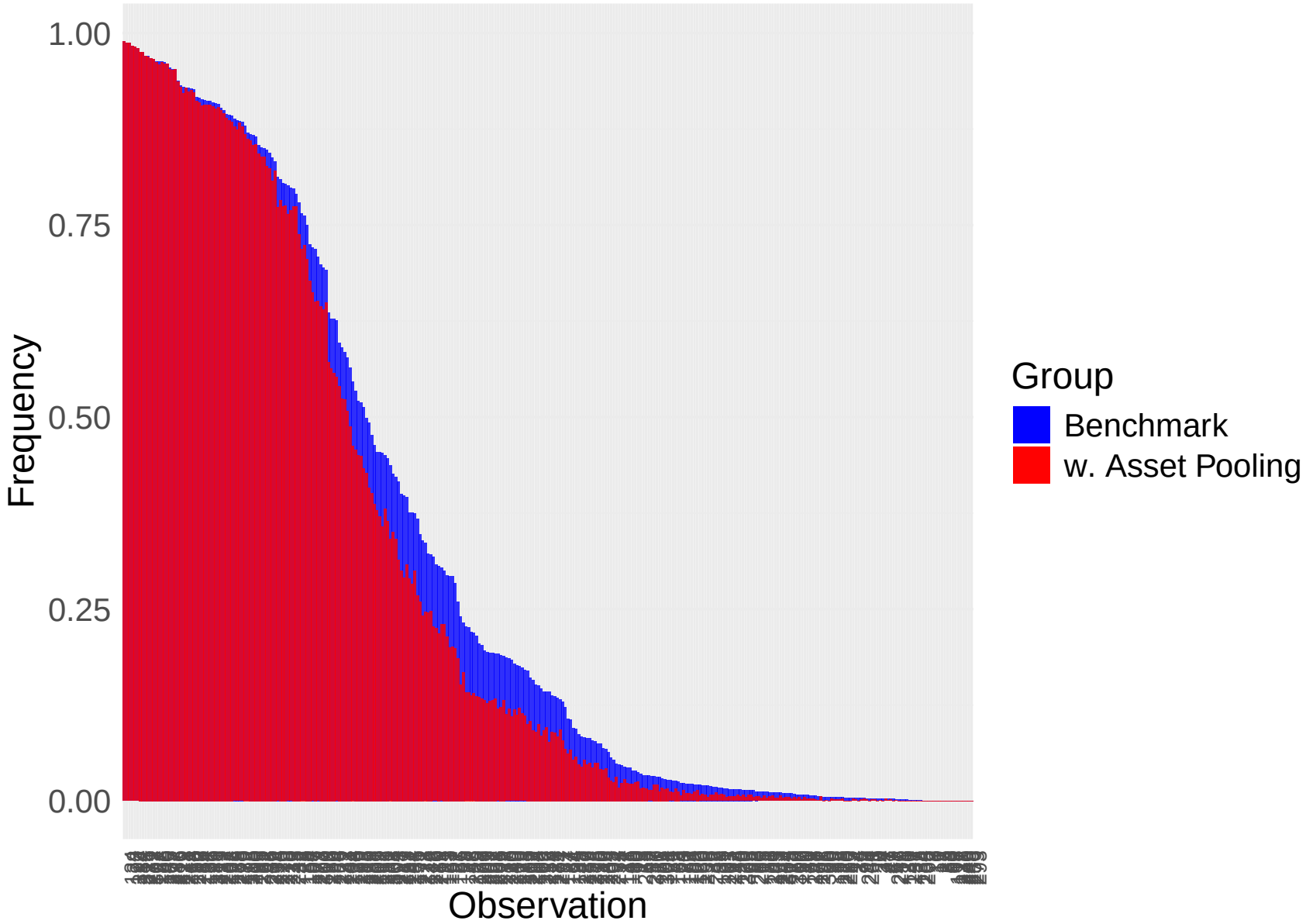
People Entering Retirement (Cohort Age 65)

- Focus on the cohort aged 65 in 2018.
- Consider only individuals with more than 10 years of service.
- Focus on male participants aiming for a modest lifestyle. Results for other groups (e.g., females or a comfortable lifestyle) are qualitatively similar.

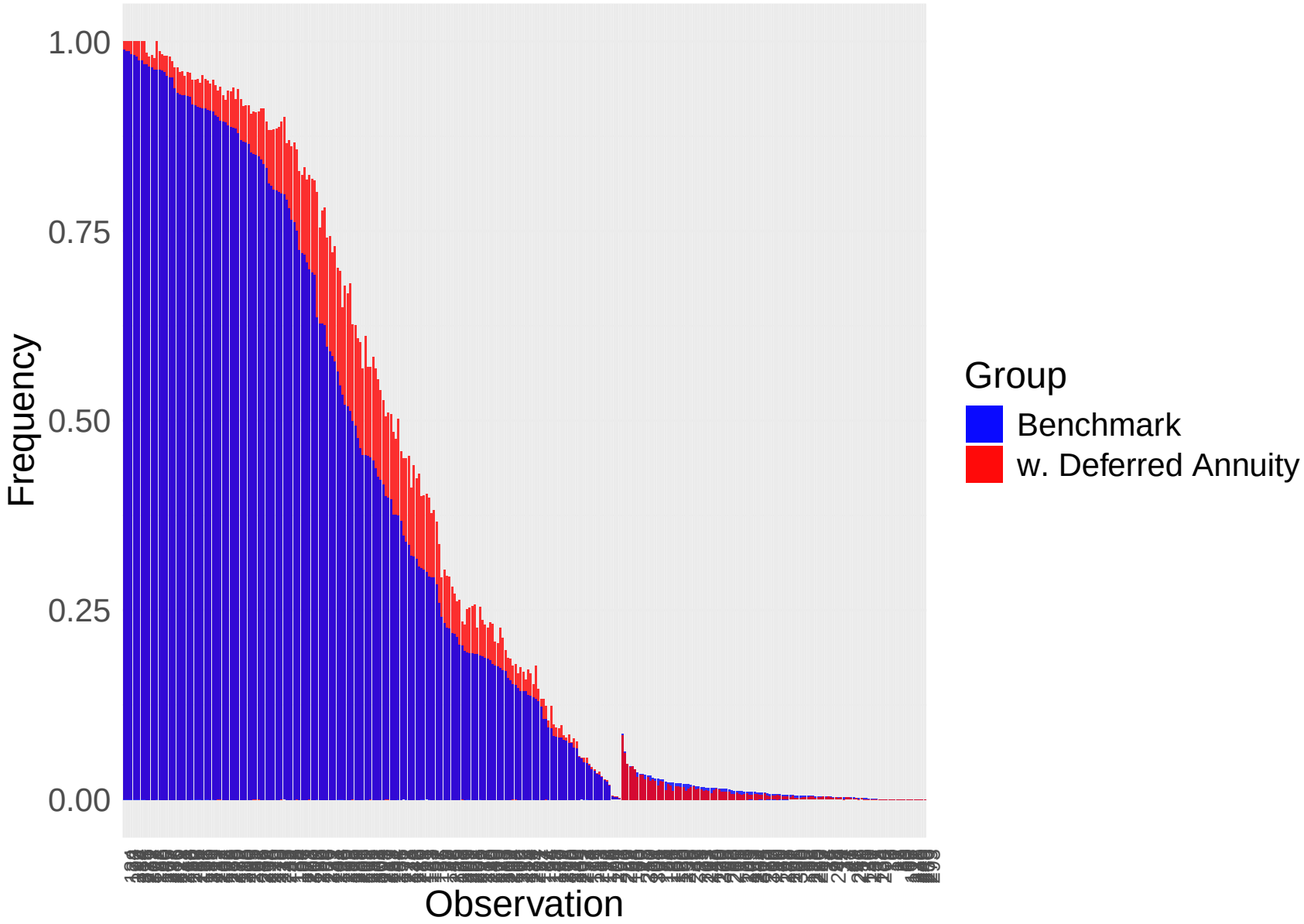
Modest Lifestyle: Benchmark



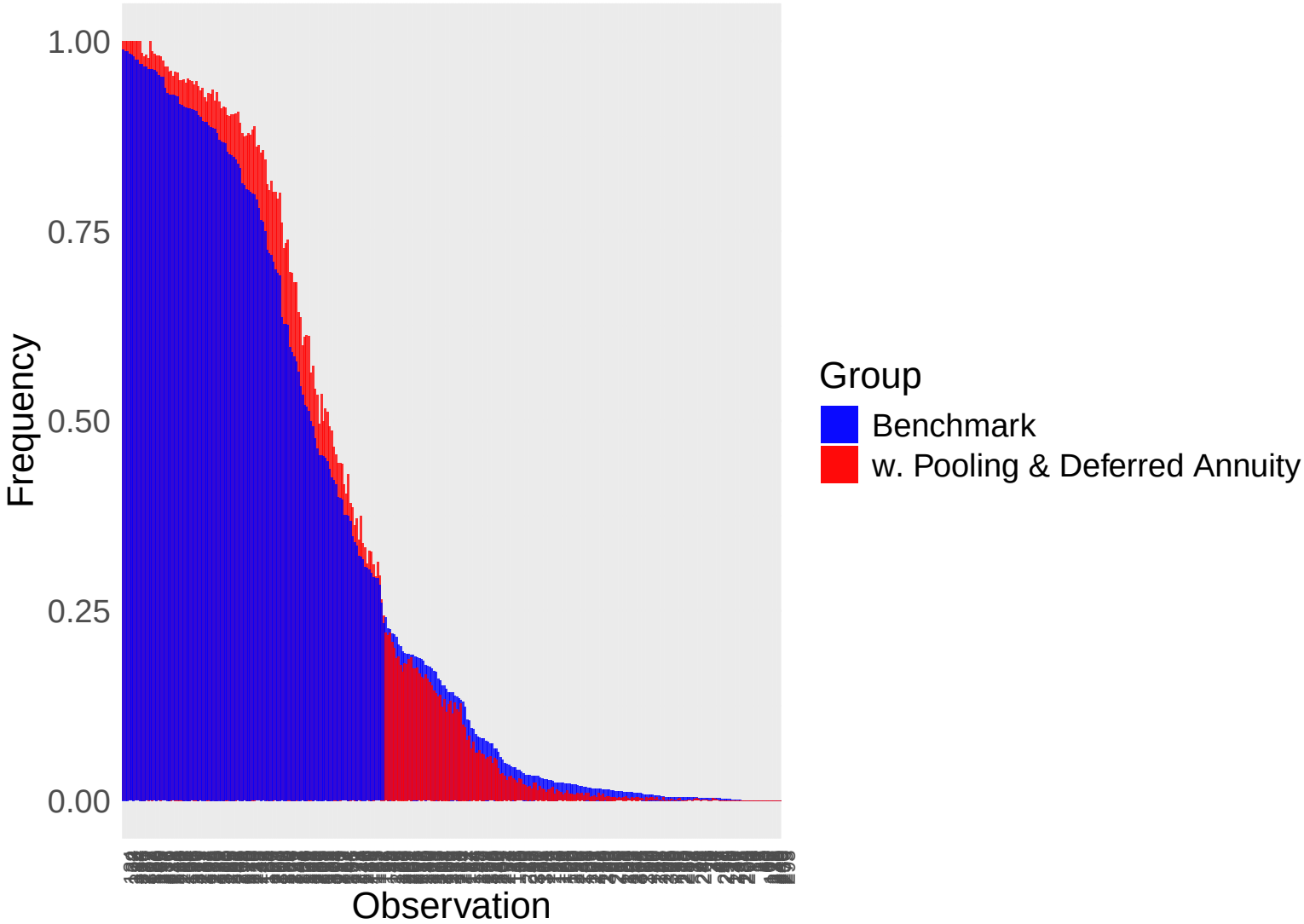
Modest Lifestyle: Asset Pooling



Modest Lifestyle: Deferred Annuity



Modest Lifestyle: Asset Pooling & Deferred Annuity



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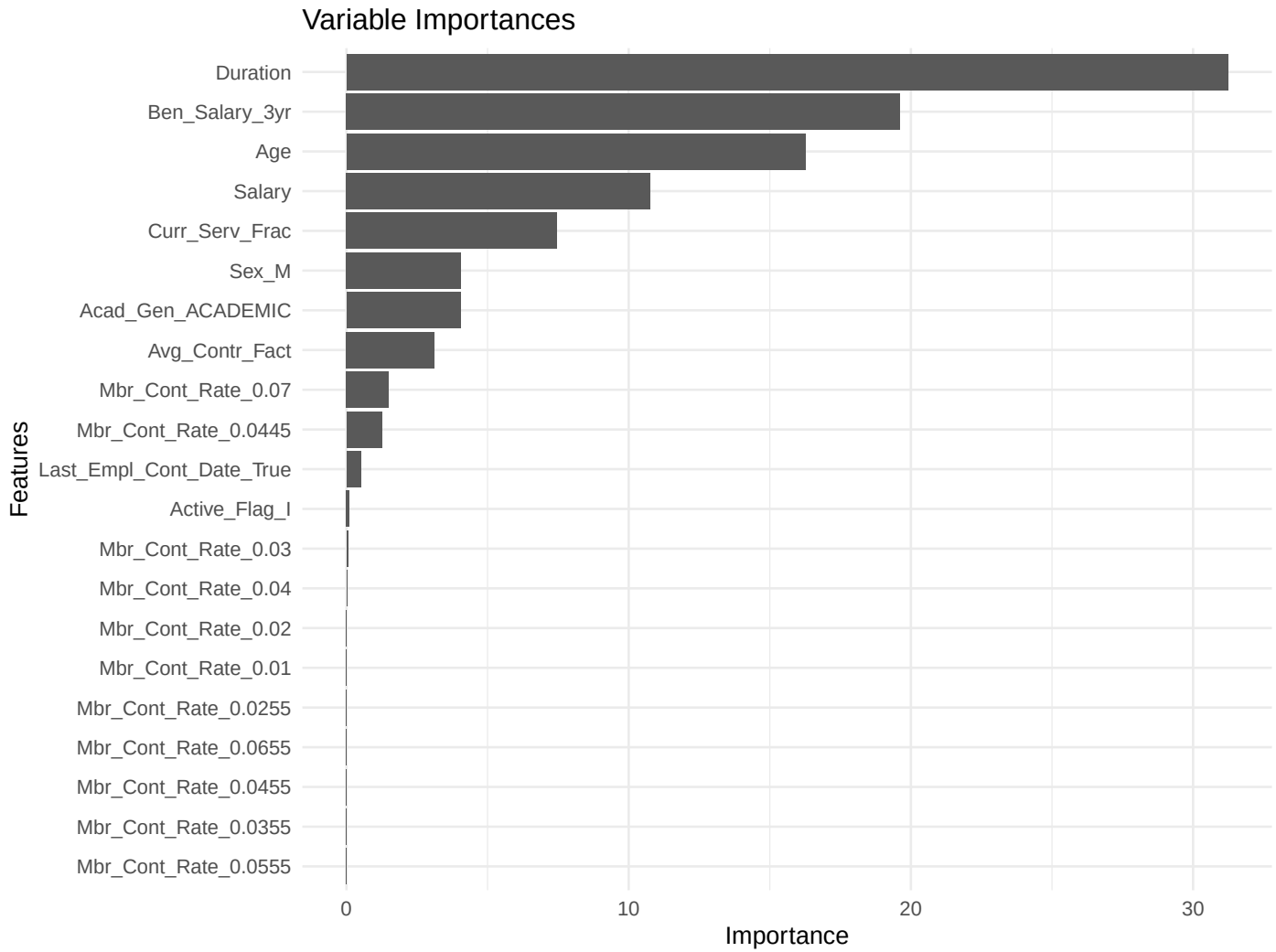
Younger Generation

- A younger cohort aged 35 in 2018 is considered.
- Their account balances at retirement are projected using the CatBoost machine learning algorithm.
- Key Assumptions:
  - No deaths or new entrants before retirement.
  - Real salary grows annually at 1.6%.

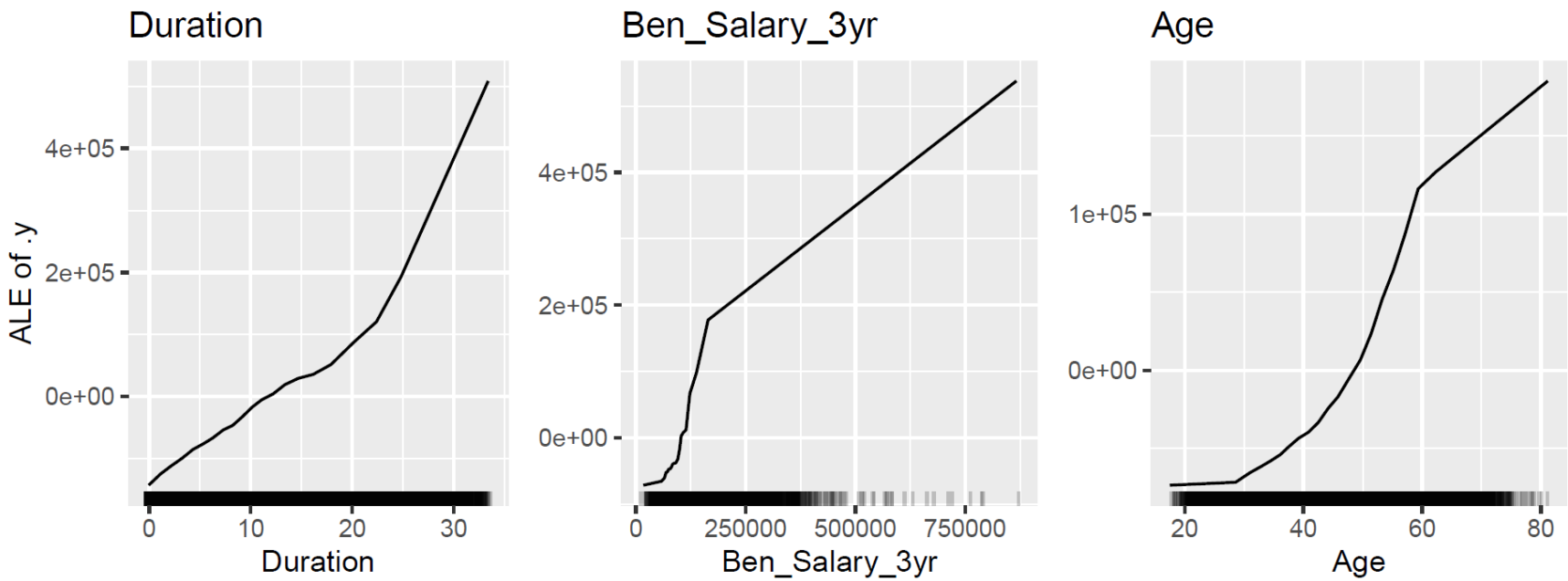
CatBoost

- **CatBoost** is an implementation of gradient boosting on decision trees (Hancock and Khoshgoftaar, 2020).
- **Key Features**:
  - Can model complex relationships in continuous data using decision trees.
  - Reduces overfitting through ordered boosting.
  - Involves minimal hyper-parameter tuning.
  - Often outperforms other boosting algorithms (e.g., XGBoost, LightGBM) in terms of accuracy.

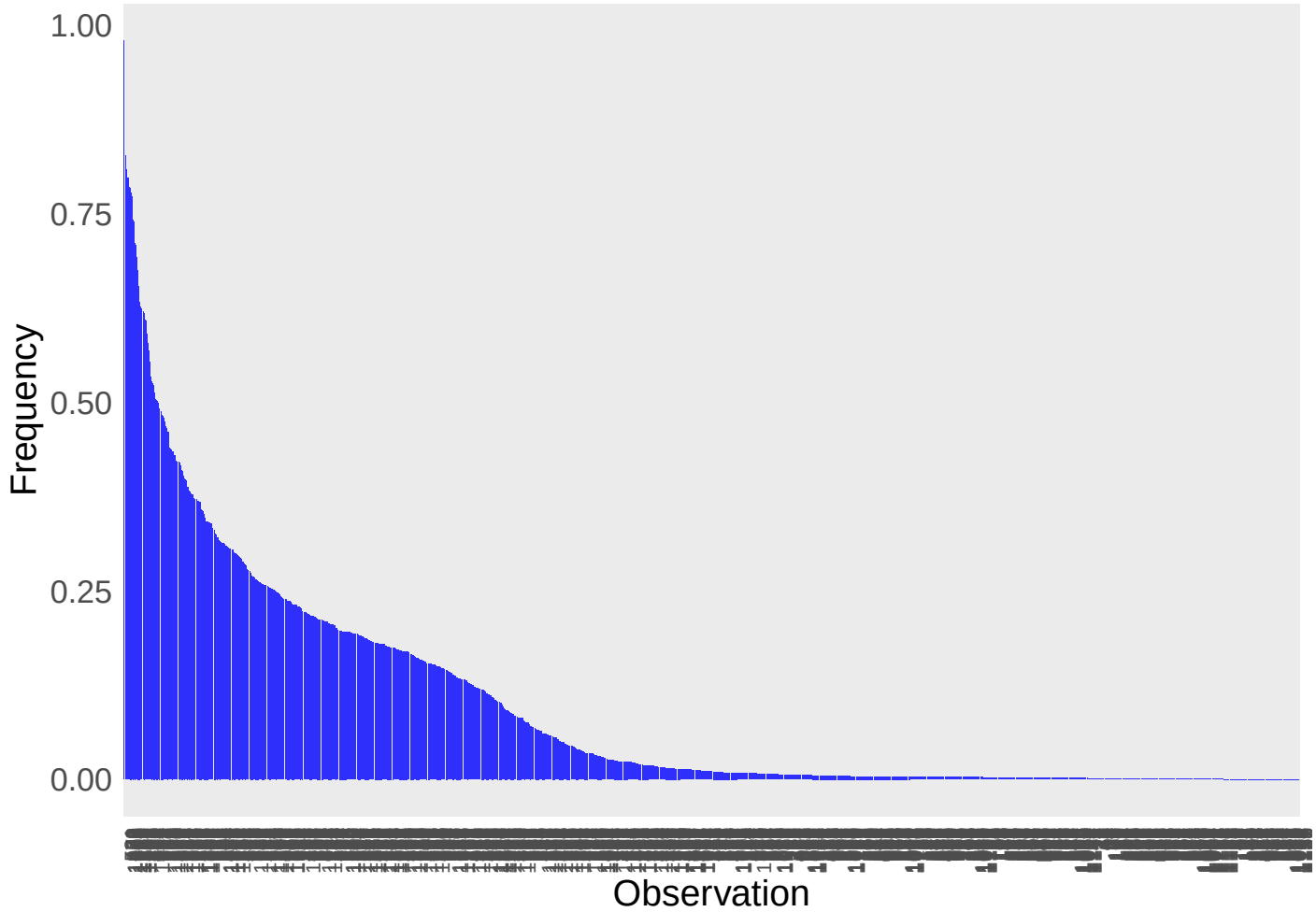
Variable Importance



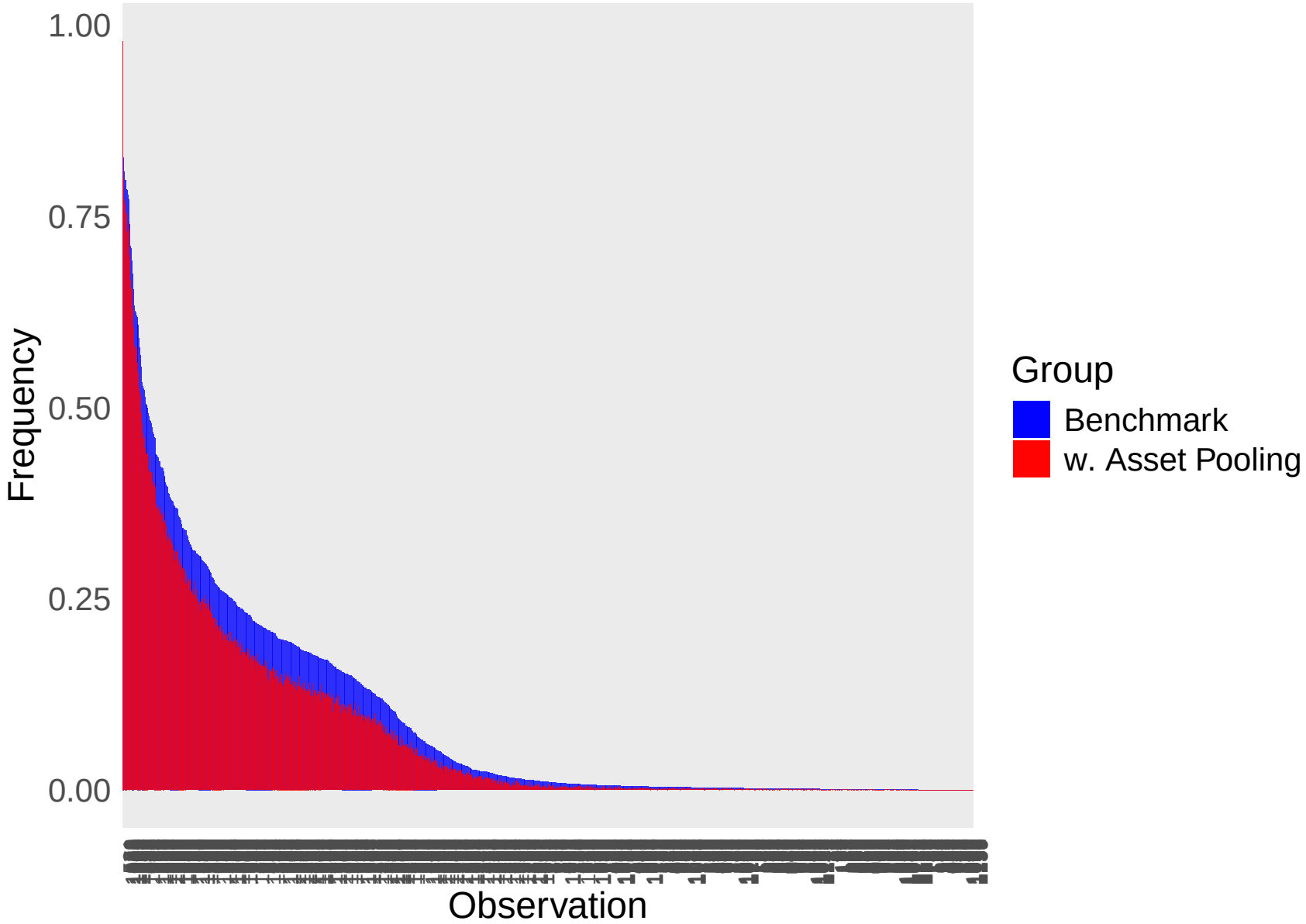
Conditional Impacts



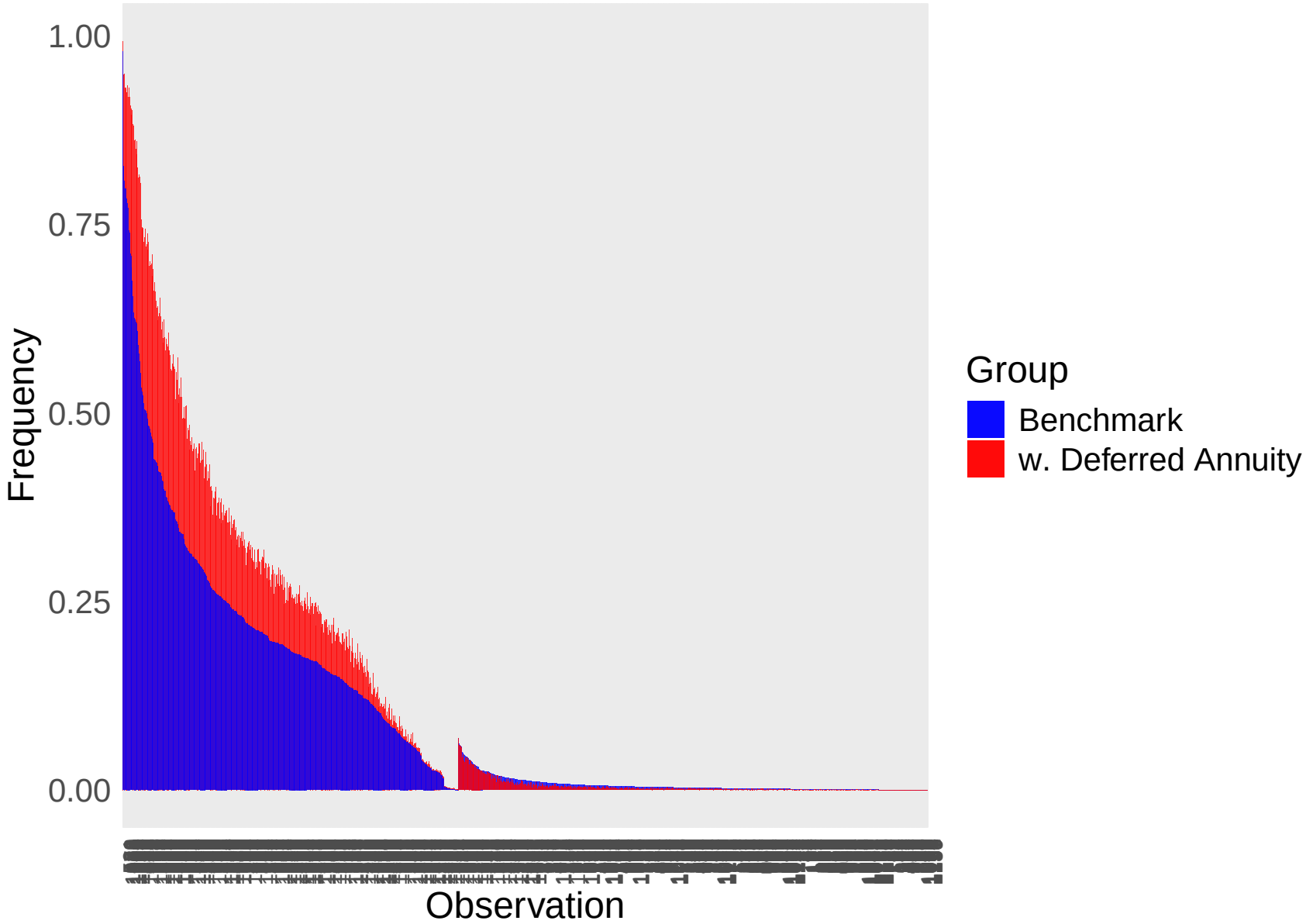
Modest Lifestyle: Benchmark



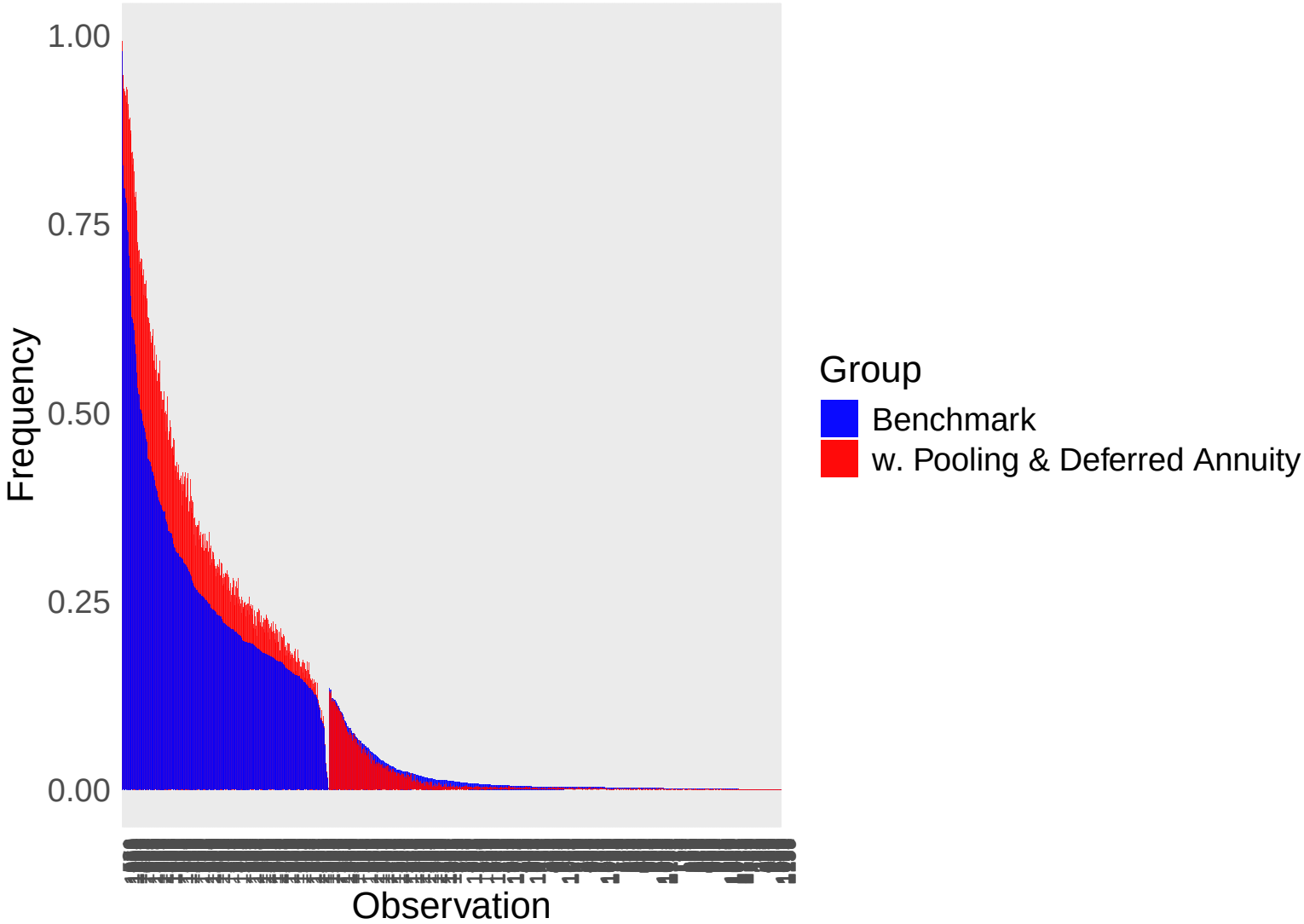
Modest Lifestyle: Asset Pooling



Modest Lifestyle: Deferred Annuity



Modest Lifestyle: Asset Pooling & Deferred Annuity



Conclusion and Next Steps

- This preliminary study investigates:
  - How well superannuation participants are financially prepared for retirement.
  - Strategies to better protect retirees against longevity risk, including asset pooling and deferred annuities.
- Next steps:
  - Explore optimal asset allocation and withdrawal strategies using an expected utility framework.
  - Consider policy implications for future superannuation products.

Thank you for your attention!

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