Presentation Pension Day

Investment strategies for the pre-retirement and retirement phase of IDC pensions

A.W.M. van Ool

Master Quantitative Finance
& Actuarial Sciences
Netspar Track specialization

October 14, 2016

Table of contents

Introduction

- Individual Defined Contribution (IDC) pension scheme
- New legislation: 'Wet verbeterde premieregeling'
  - Start date: September 1, 2016
- Investment policy
  - Life-cycle
  - Investment after retirement
    - Higher expected pension: accumulation & decumulation phase
    - No guarantee
- Pension benefit payment policy
  - Assumed interest rate (AIR)
  - Financial smoothing

Research questions

1. *Which life-cycles are suitable for a participant with certain risk preferences?*
2. *What is the influence of the assumed interest rate on the development of the pension benefit level during retirement?*
3. *What is the influence of financial smoothing on the optimal life-cycle design and assumed interest rate?*

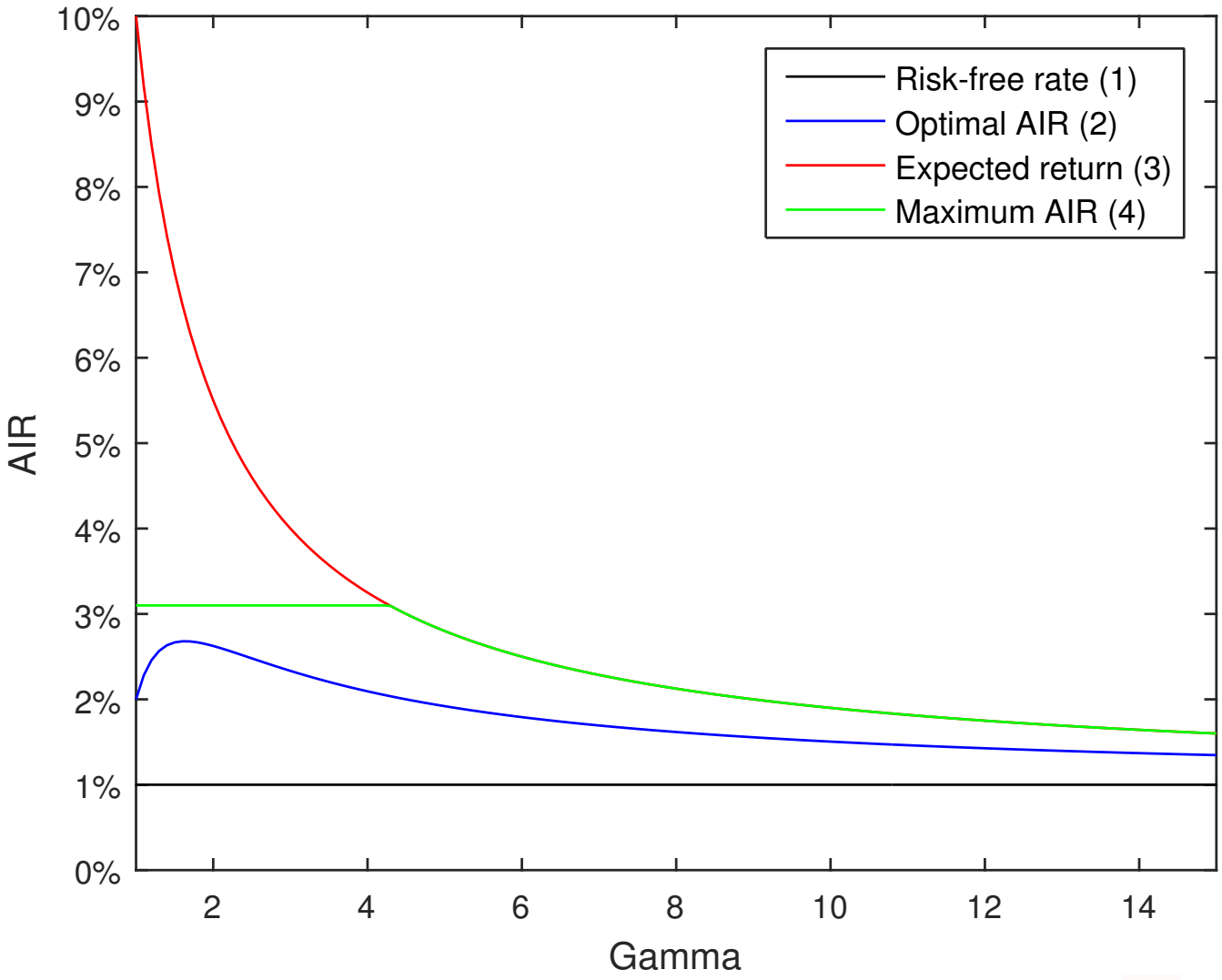
Assumptions model analysis

- Merton model
- Black-Scholes financial market
- Risk-free human capital
- Career pattern + AOW included
- Starting age 25, retirement age 67, CBS mortality table
- CRRA utility: constant risk preferences
  - Less risk averse participant ($\gamma = 4$)
  - Default participant ($\gamma = 7$)
  - More risk averse participant ($\gamma = 12$)
- 3% DC fiscal maximum premium ladder
- Variable pension payments via PPR ('Personal Pensions with Risk sharing') mechanism

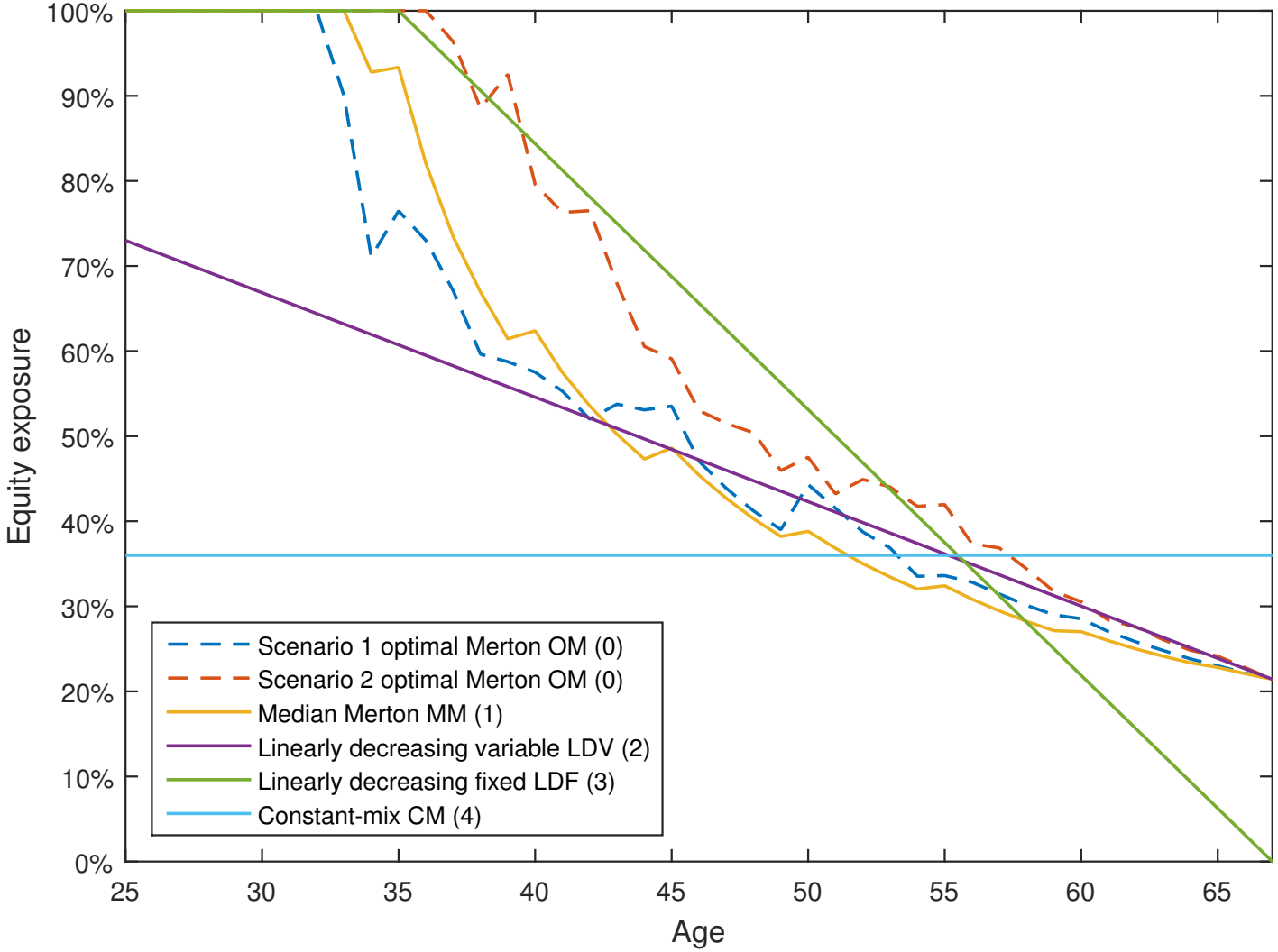
Time periods

	Age	Initial wealth	Focus	Annuity	AIR
Period 1: Accumulation period	25-67	€0	Design life-cycle until retirement	Fixed annuity	Risk-free rate
Period 2: Conversion period	57-100	€175,000	Design life-cycle around and during retirement	Fixed annuity and Variable annuity	Risk-free rate
Period 3: Decumulation period	67-100	€300,000	Distribution pension payments over retirement period Financial smoothing	Variable annuity	- Risk-free rate - Optimal AIR - Expected return - Maximum AIR

Assumed Interest Rate (AIR)



Life-cycle strategies period 1



Results period 1

Conclusion: a decreasing life-cycle is preferable.

Welfare losses life-cycles relative to optimal Merton strategy

Life-cycle strategy	**MM (1)**	**LDV (2)**	**LDF (3)**	**CM (4)**
Less risk averse ($\gamma = 4$)	0.5%	1.1%	2.7%	5.8%
Default ($\gamma = 7$)	0.5%	1.5%	1.0%	5.0%
More risk averse ($\gamma = 12$)	0.3%	1.2%	0.7%	3.6%

1. Median Merton strategy (MM)
2. Linear decreasing strategy variable annuity (LDV)
3. Linear decreasing strategy fixed annuity (LDF)
4. Constant-mix (CM)

Results period 1

Conclusion: sizes of welfare losses can differ significantly.

Welfare losses inadequate equity exposure median Merton strategy relative to optimal Merton strategy

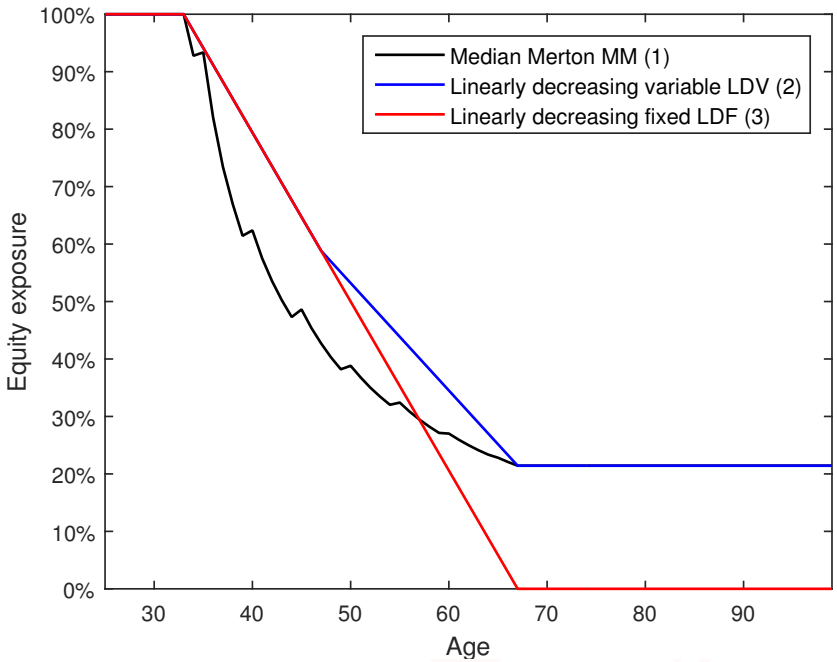
Welfare loss	**Correct equity exposure**	**Inadequate equity exposure**
Less risk averse ($\gamma = 4$)	0.5%	6.8%
More risk averse ($\gamma = 12$)	0.3%	2.0%

Results period 1

Conclusion: sizes of welfare losses can differ significantly.

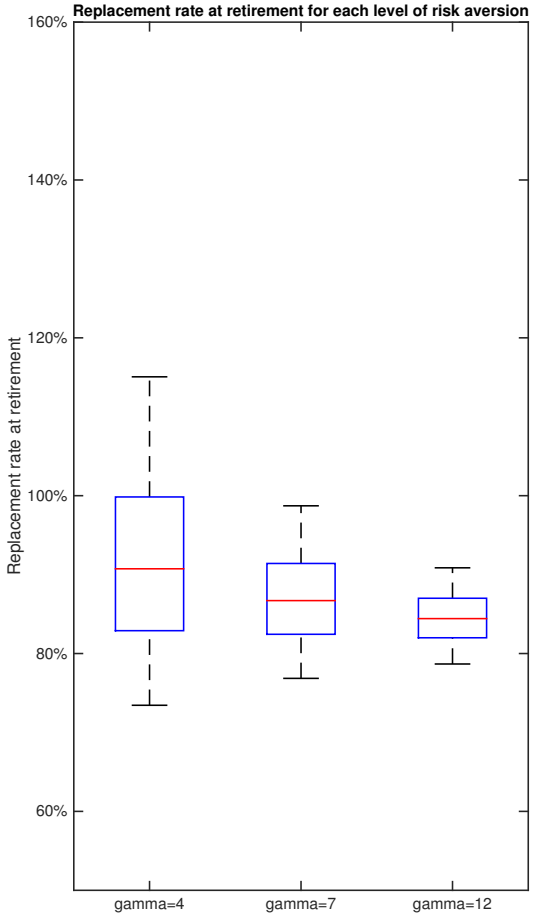
Welfare losses inadequate life-cycles relative to optimal Merton strategy

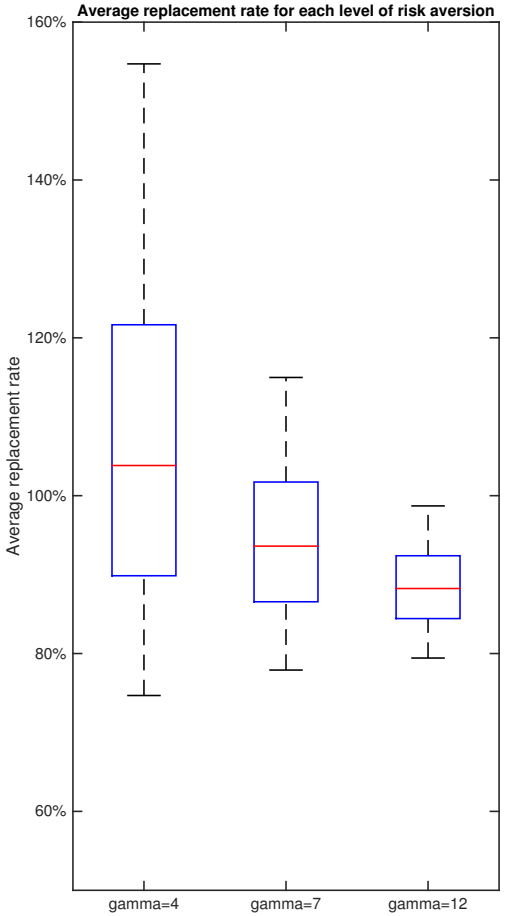
Welfare loss	No investment after retirement	Inadequate life-cycle before retirement
Less risk averse ($\gamma = 4$)	8.8%	3.8%
Default ($\gamma = 7$)	5.5%	0.9%
More risk averse ($\gamma = 12$)	3.6%	-1.0%



Results period 2

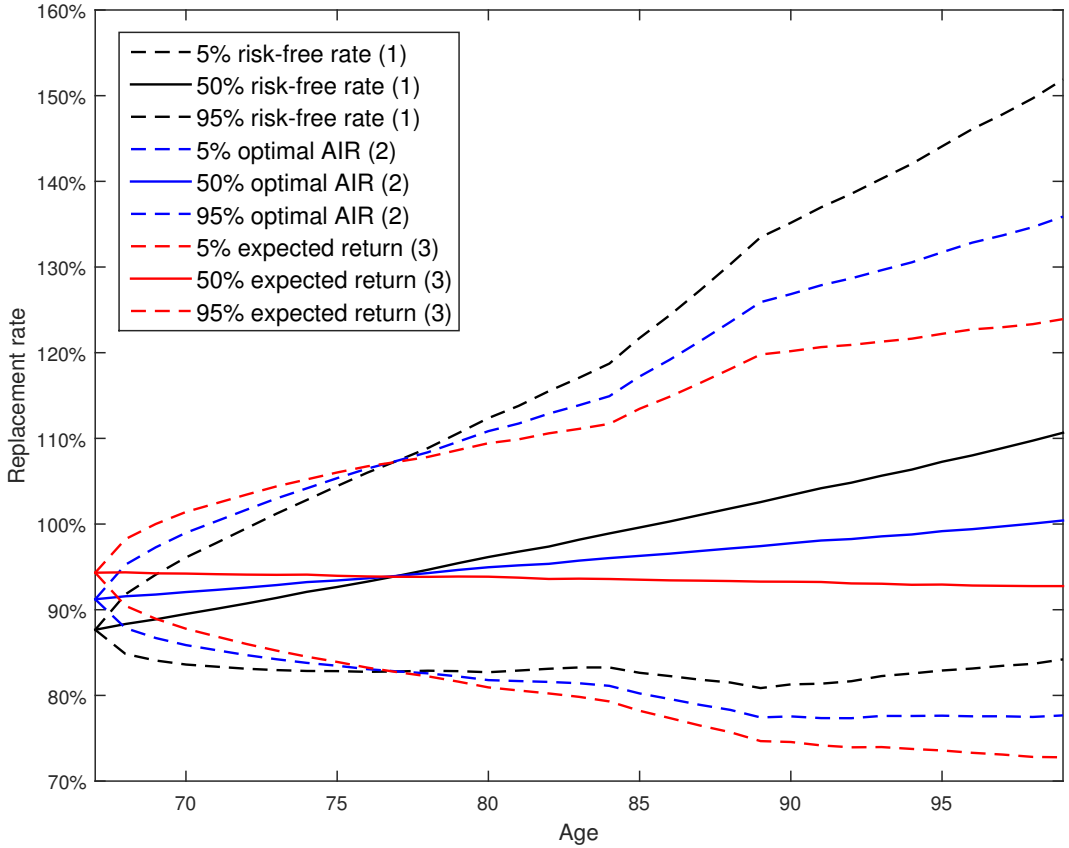
Conclusion: the dispersion in the average replacement rate is significant.



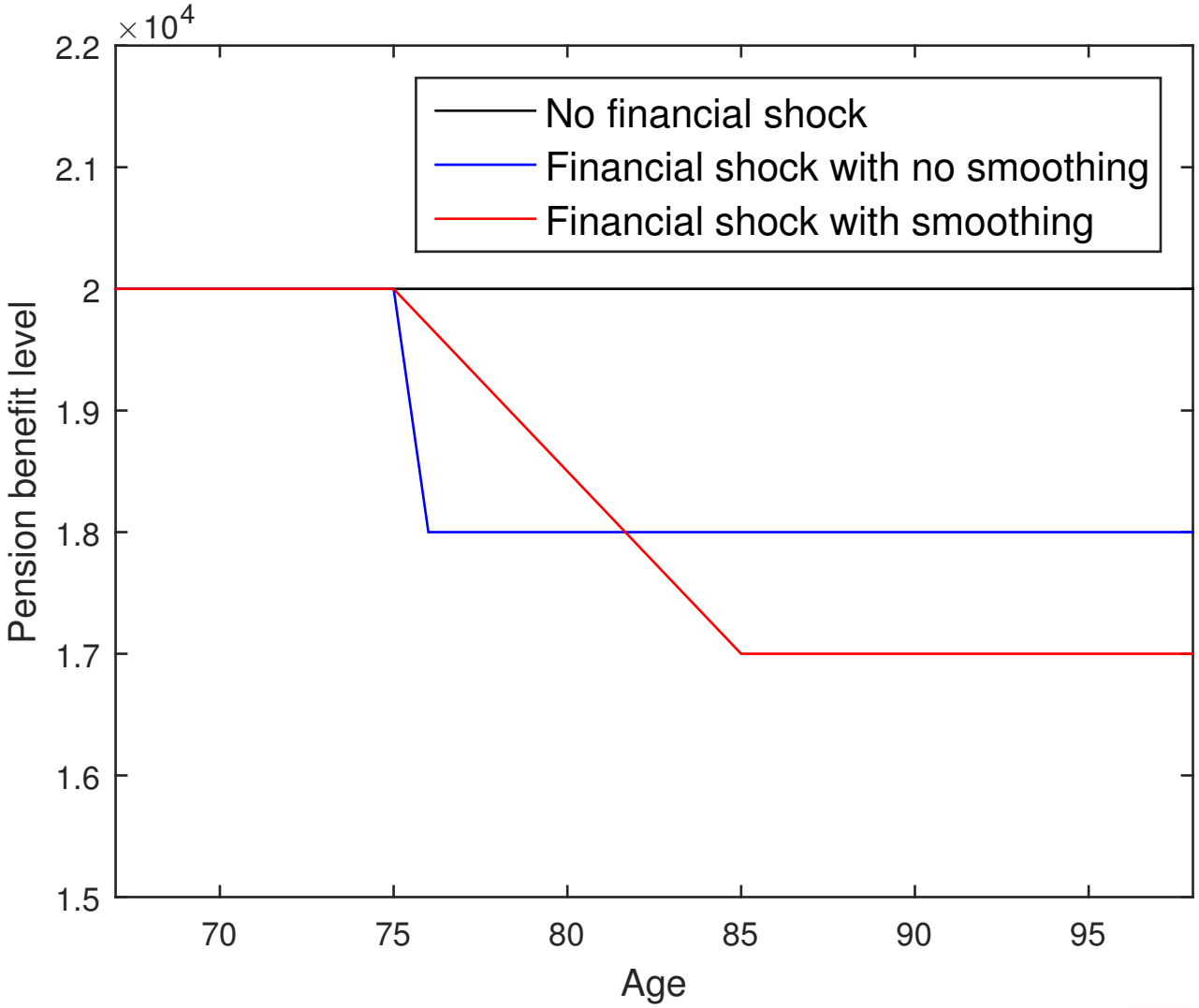


Results period 3

Conclusion: disadvantage of a high AIR becomes visible as of 10 years after retirement.



Financial smoothing: growth rate approach



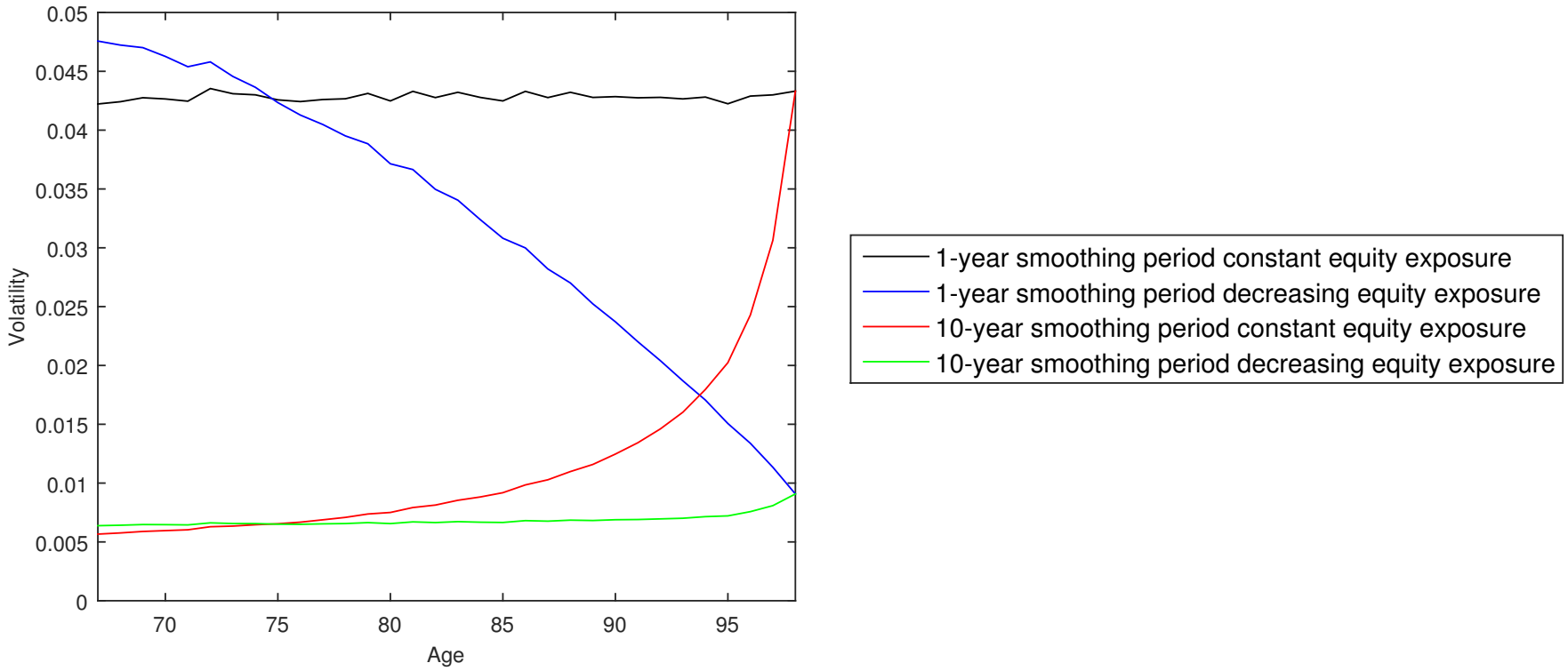
Results financial smoothing

Conclusion: financial smoothing reduces the weighted average year-to-year volatility.

Smoothing period	**1-year**	**5-year**	**10-year**
Assumed interest rate (AIR)	**Expected return**		
Equity exposure	**Constant (21.4%)**		
Volatility change replacement rate			
Weighted average year-to-year volatility	2.5%	1.4%	1.2%
Probability (large) decrease benefit level			
Average probability decrease	49.9%	51.6%	51.9%
Average probability large decrease (>5%)	11.7%	1.4%	0.9%
Average relative size decrease	3.3%	1.8%	1.6%

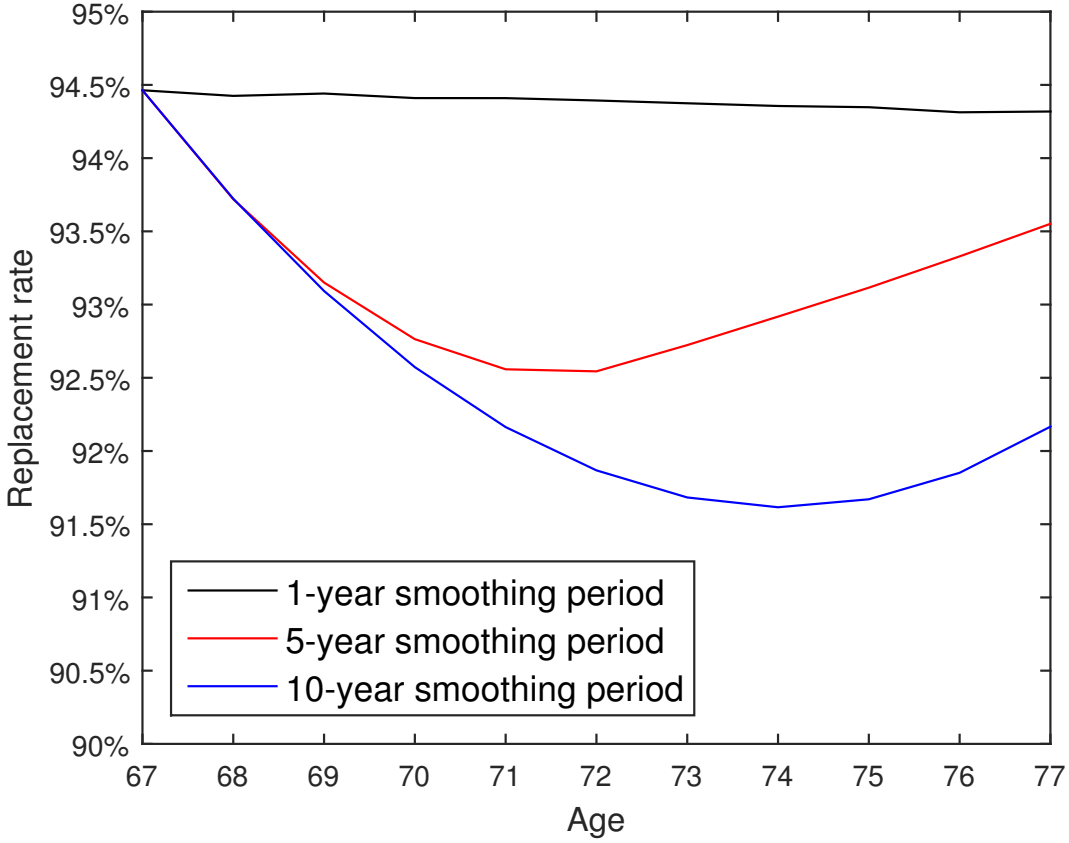
Results financial smoothing

Conclusion: a decreasing life-cycle during retirement is preferable in case of financial smoothing.



Results financial smoothing

Conclusion: the expected replacement rate decreases significantly during the first years after retirement in case of financial smoothing.



Conclusions

- **Investment policy**
  - Decreasing life-cycle is preferable
  - Sizes of welfare losses can differ significantly
- **Pension benefit payment policy**
  - Disadvantage of a high AIR compared to a low AIR becomes visible as of 10 years after retirement
  - In case of financial smoothing a decreasing life-cycle and horizon-dependent AIR are preferable

Recommendations for future research

- Financial market model including interest rate risk and inflation risk
- Impact of more freedom of choice regarding pension contributions
- Utility function including habit formation
- Investigate implementation similarity growth rate approach & money pots approach

Questions