

# Pension Scheme with Bounds on Returns

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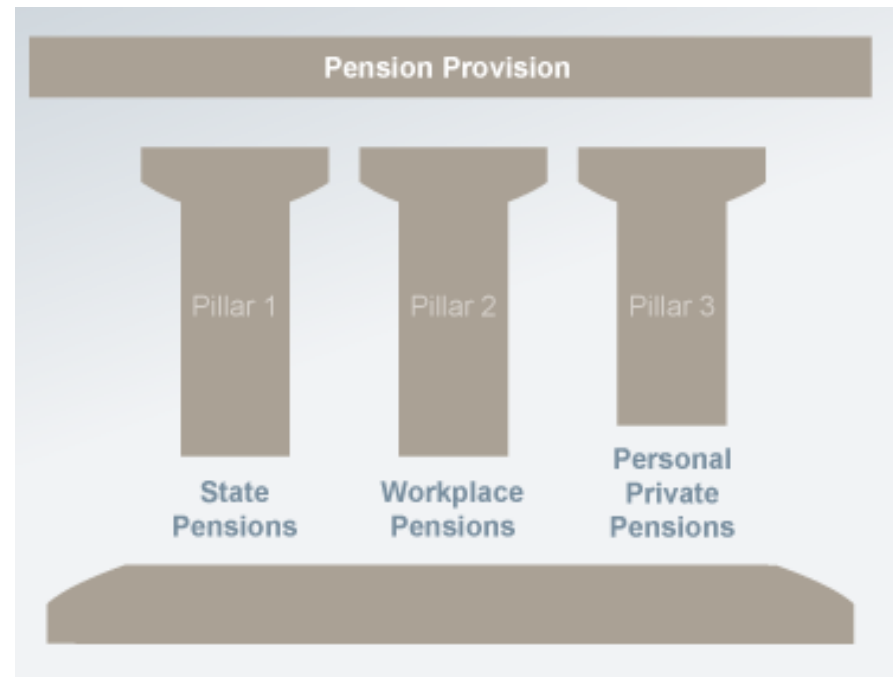
05-07-2018

Netspar Theme Conference: Design of  
Pension Contracts in Incomplete Markets  
and under Uncertainty



# Introduction

- Pension debate in the Netherlands.
- Three pillars.
- Sustainability of second pillar.



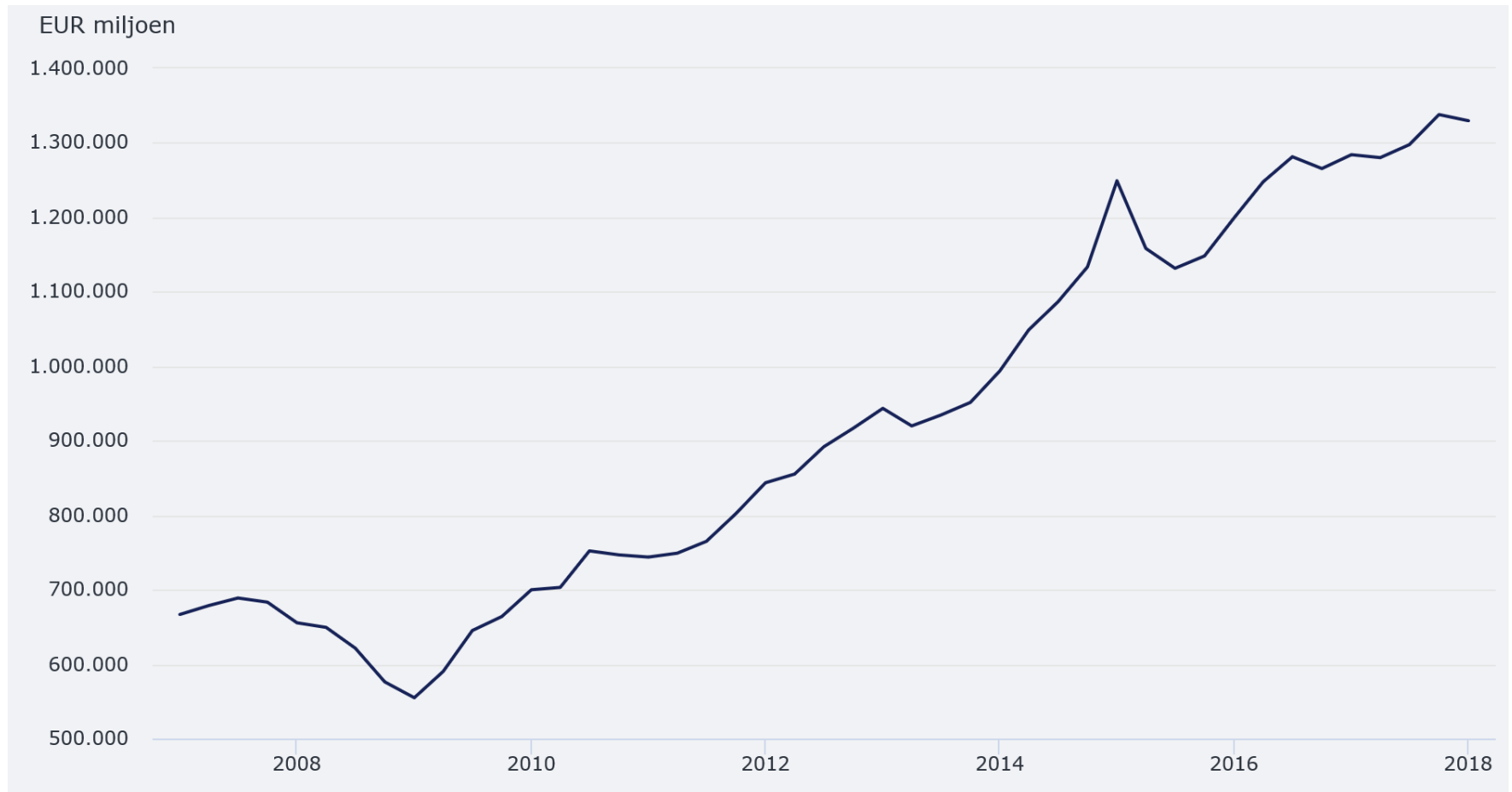
# Outline

- Dutch Pension Reform:
  - Variant I
  - Variant II
  - Variant III
  - Variant IV
- Analysis Variant IV-C-R:
  - Returns
  - Numerical Results
  - Analytical Results
- Conclusion.

# Dutch Pension Reform

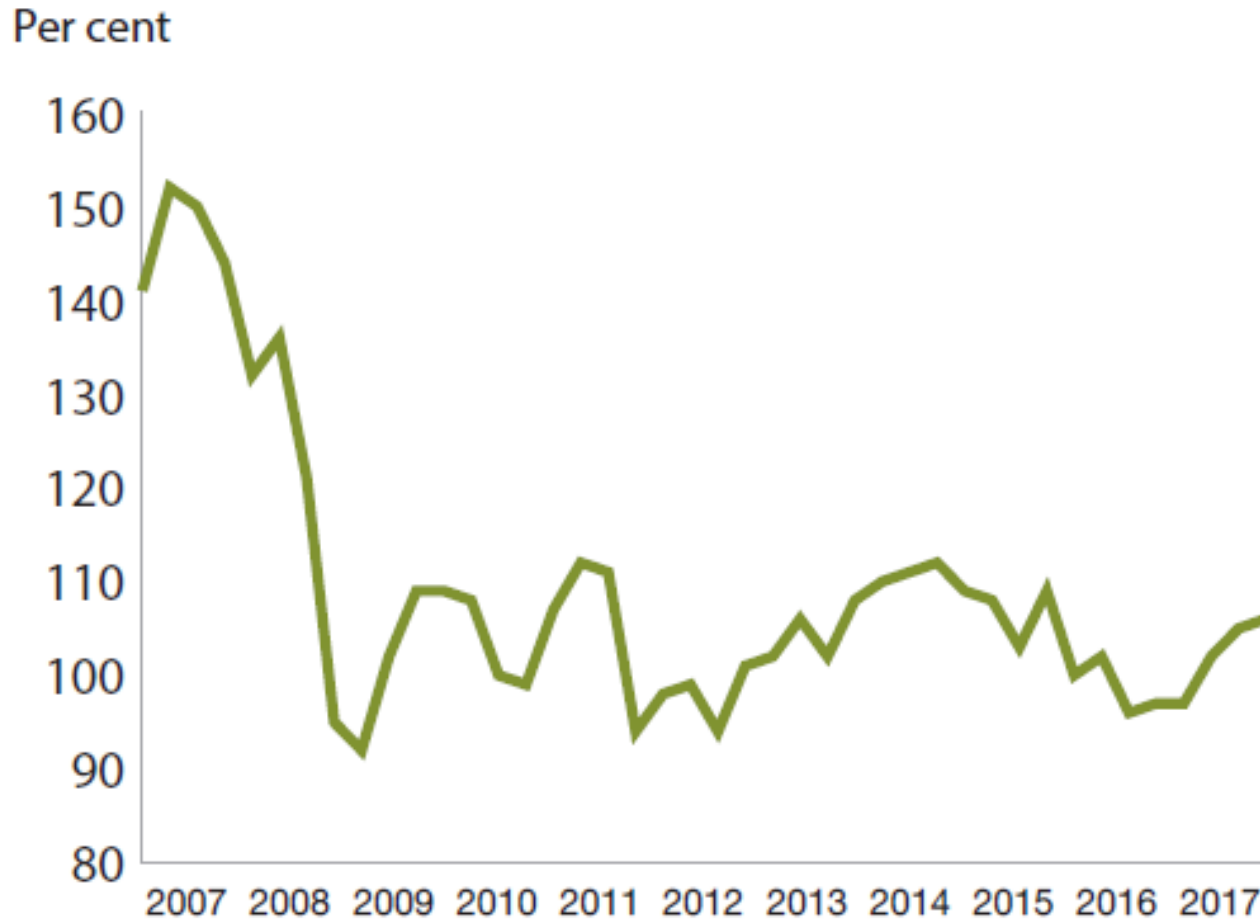
- Defined Benefit pensions.
- Increasing systematic risk.
- Changing demographics.
- Defined Contribution pensions.

# Total Assets of Dutch Pension Funds



Source: DNB

# Average Funding Ratio of Dutch Pension Funds



Source: DNB

# Dutch Pension Reform

- Problems current system:
  - Low funding ratio.
  - Aging population.
  - Ownership rights to the assets unclear.
  - No freedom of choice.
  - Not suited for current labour market.

# Dutch Pension Reform

- Varianten:
  - I. Administration agreement with declining accrual.
  - II. National pension scheme.
  - III. Personal pension capital with voluntary risk-sharing.
  - IV. Personal pension capital with collective risk-sharing.



# Variant I: Administration Agreement with Declining Accrual

- Broad intergenerational risk-sharing.
- Level premium system (doorsneesystematiek) → declining pension accrual.
- Interest rate sensitivity:
  - A. Administration agreement with declining accrual.
  - B. Conditional benefit scheme.

## **Variant II: National Pension Scheme**

- Current administration agreement is base.
- Key characteristic: Intergenerational risk-sharing.
- Enforced on entire working population.

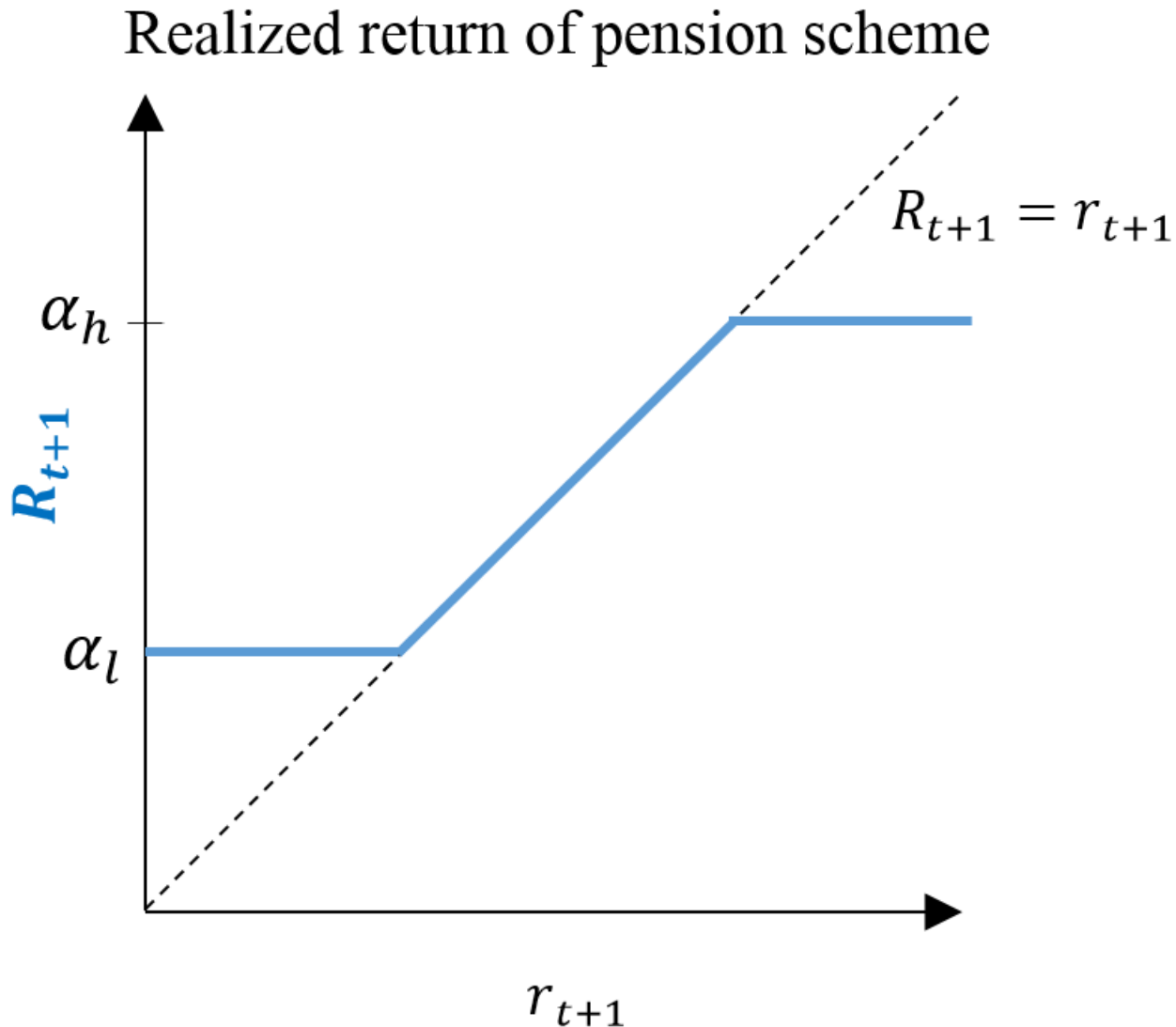
## **Variant III: Personal Pension Capital with Voluntary Risk-Sharing**

- Defined Contribution pension.
- Supported on voluntary basis by social partners.
- Limited risk-sharing between generations.
- Life-cycle fund.

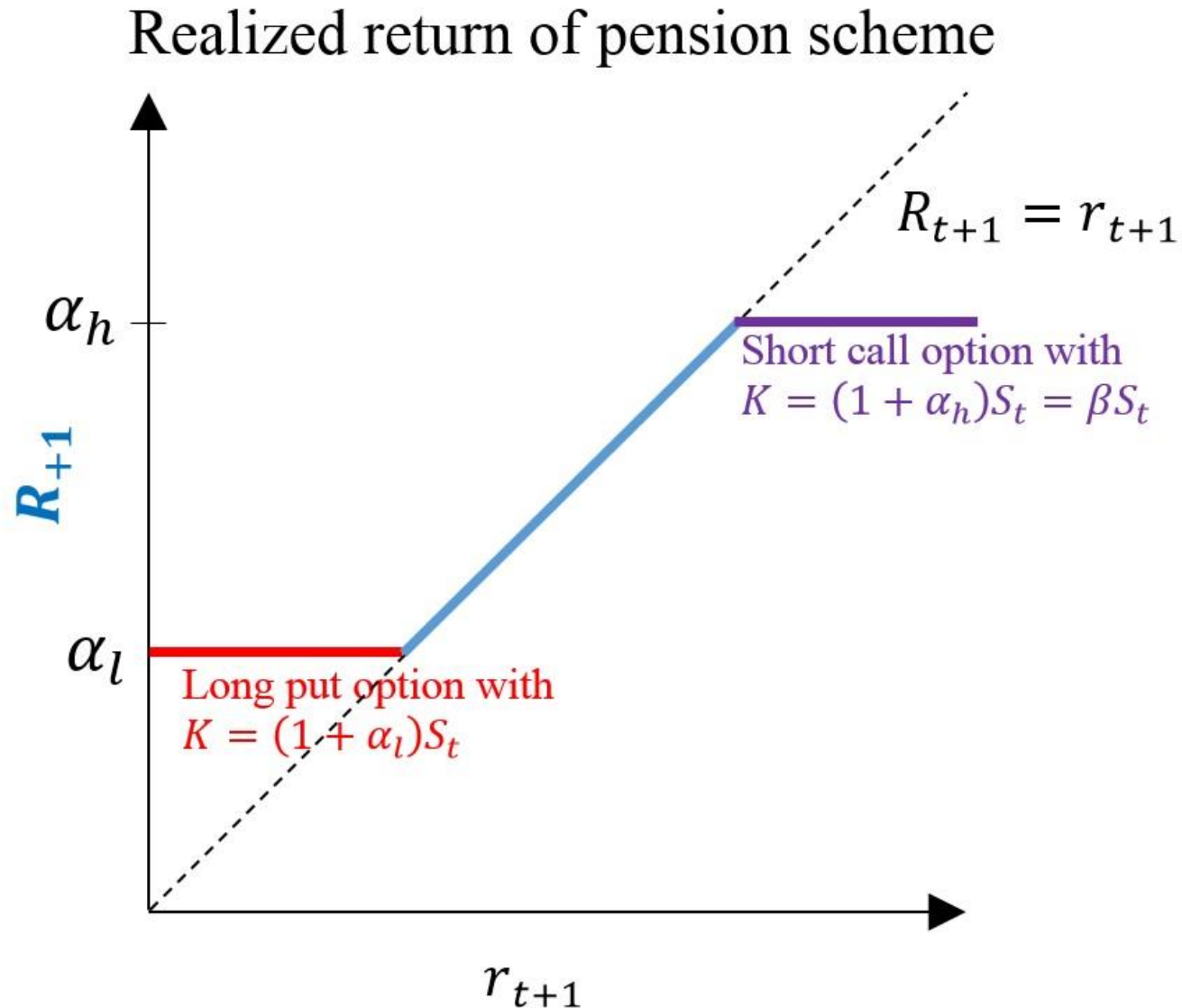
# Variant IV: Personal Pension Capital with Collective Risk-Sharing

- Three subcategories:
  - A. Baseline option.
  - B. Hybrid option.
  - C. Option with extensive risk-sharing:
    1. Implicit buffer.
    2. Explicit buffer:
      - Lower and upper bound on returns (Variant IV-C-R).
      - Monetary target.
    3. Swaps between active participants and retirees.

# Returns in Variant IV-C-R

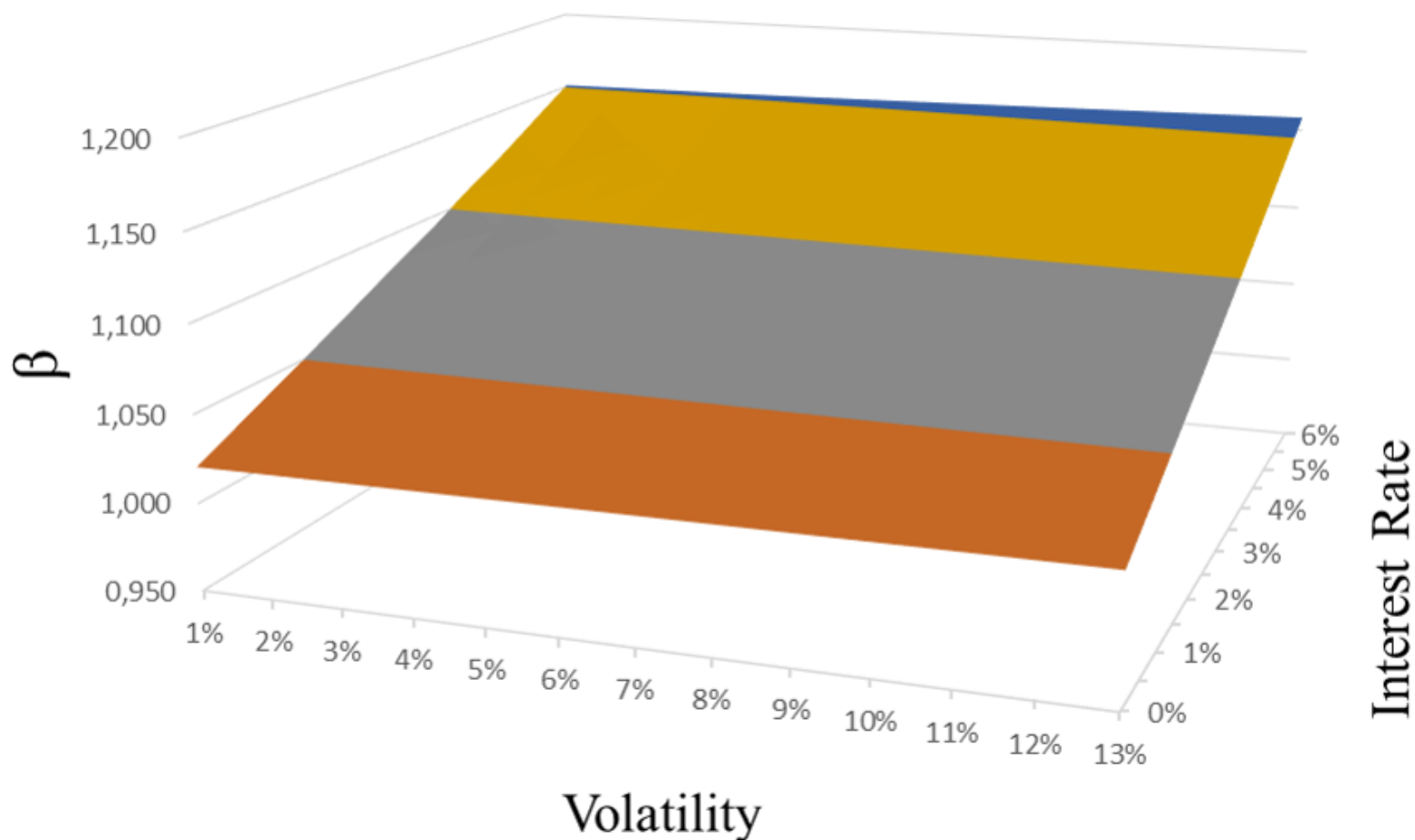


# Self-Financing Buffer Fund



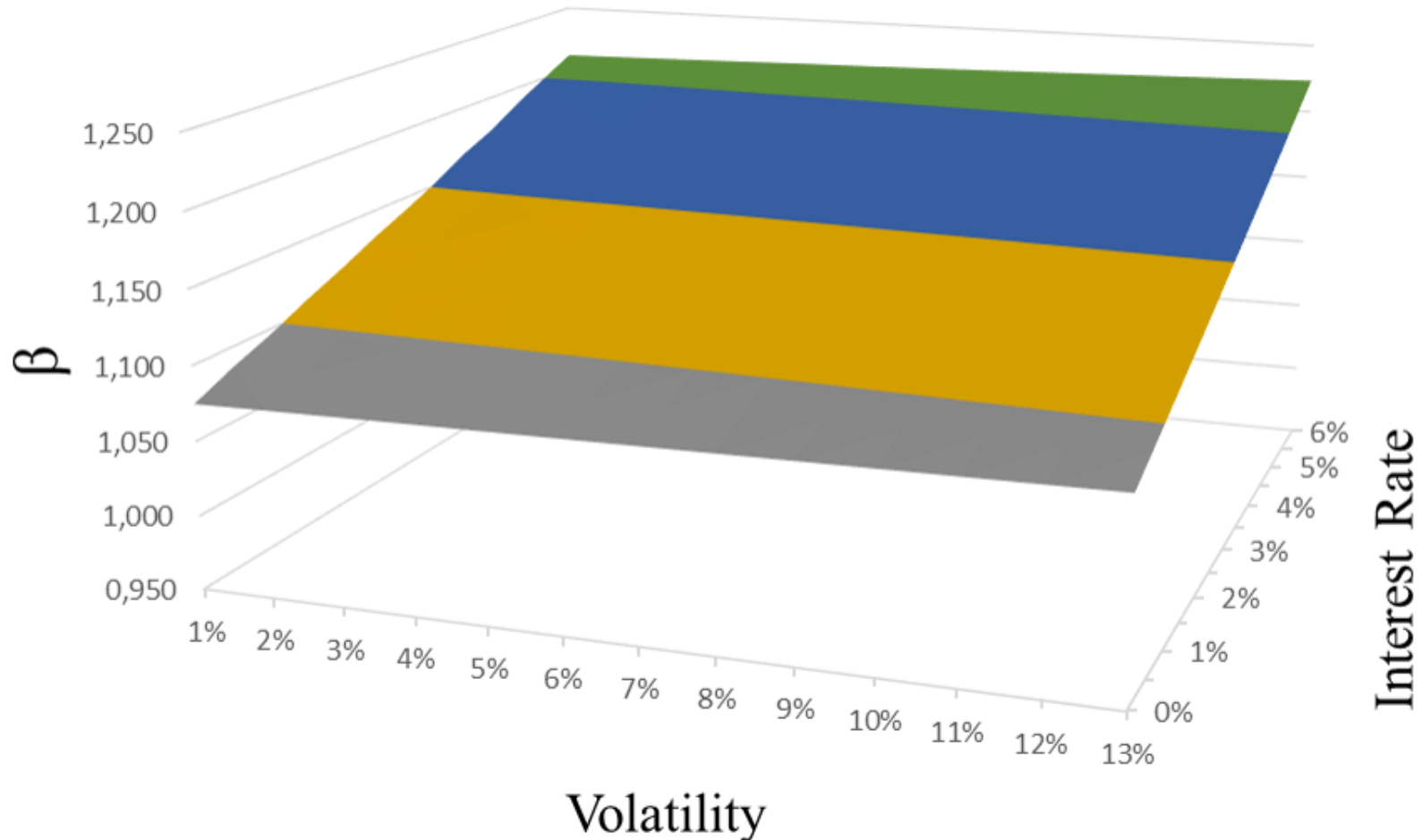
# Numerical Results: $\alpha_l = -2\%$

## Strike Price Factor Call Option



# Numerical Results: $\alpha_l = -7\%$

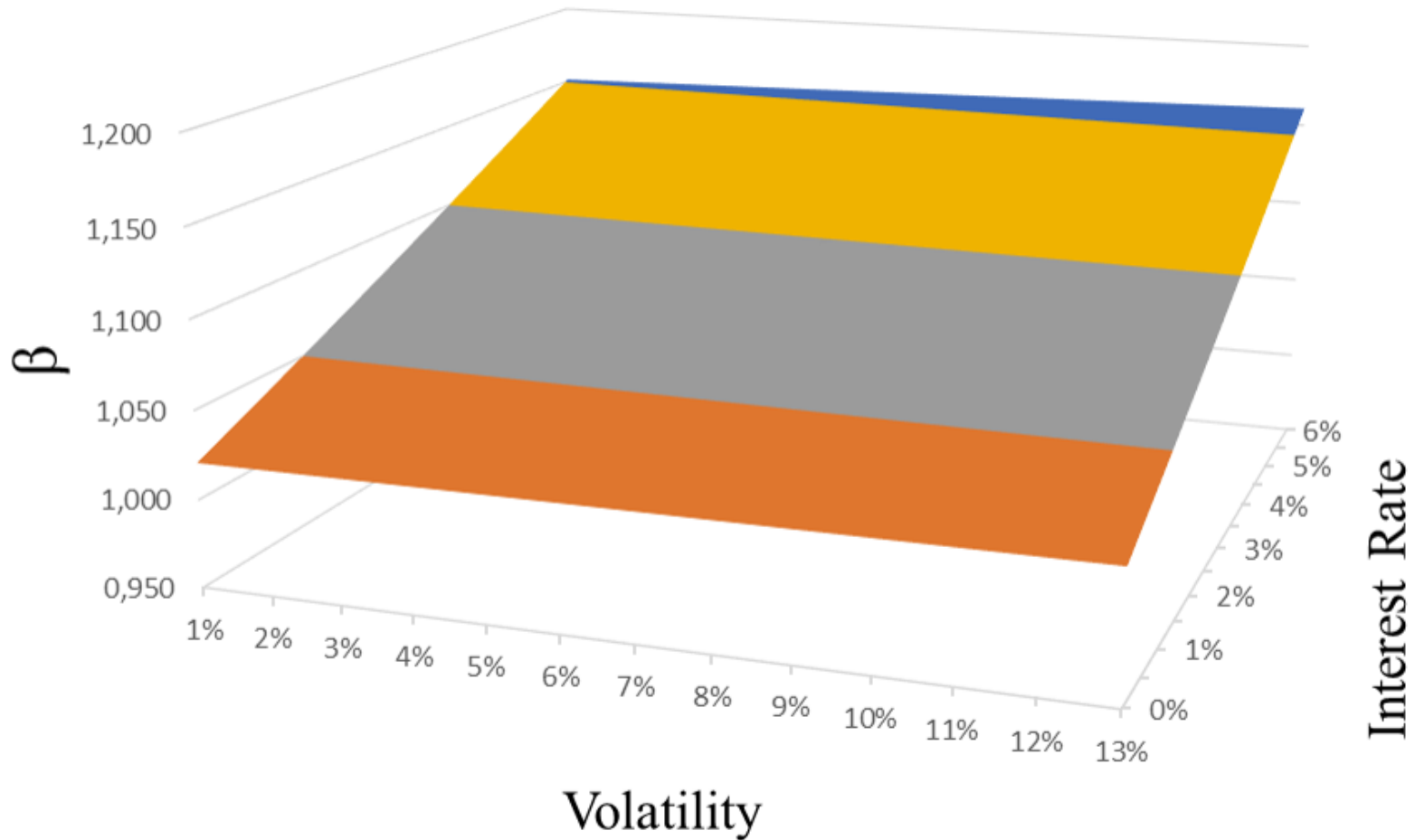
## Strike Price Factor Call Option





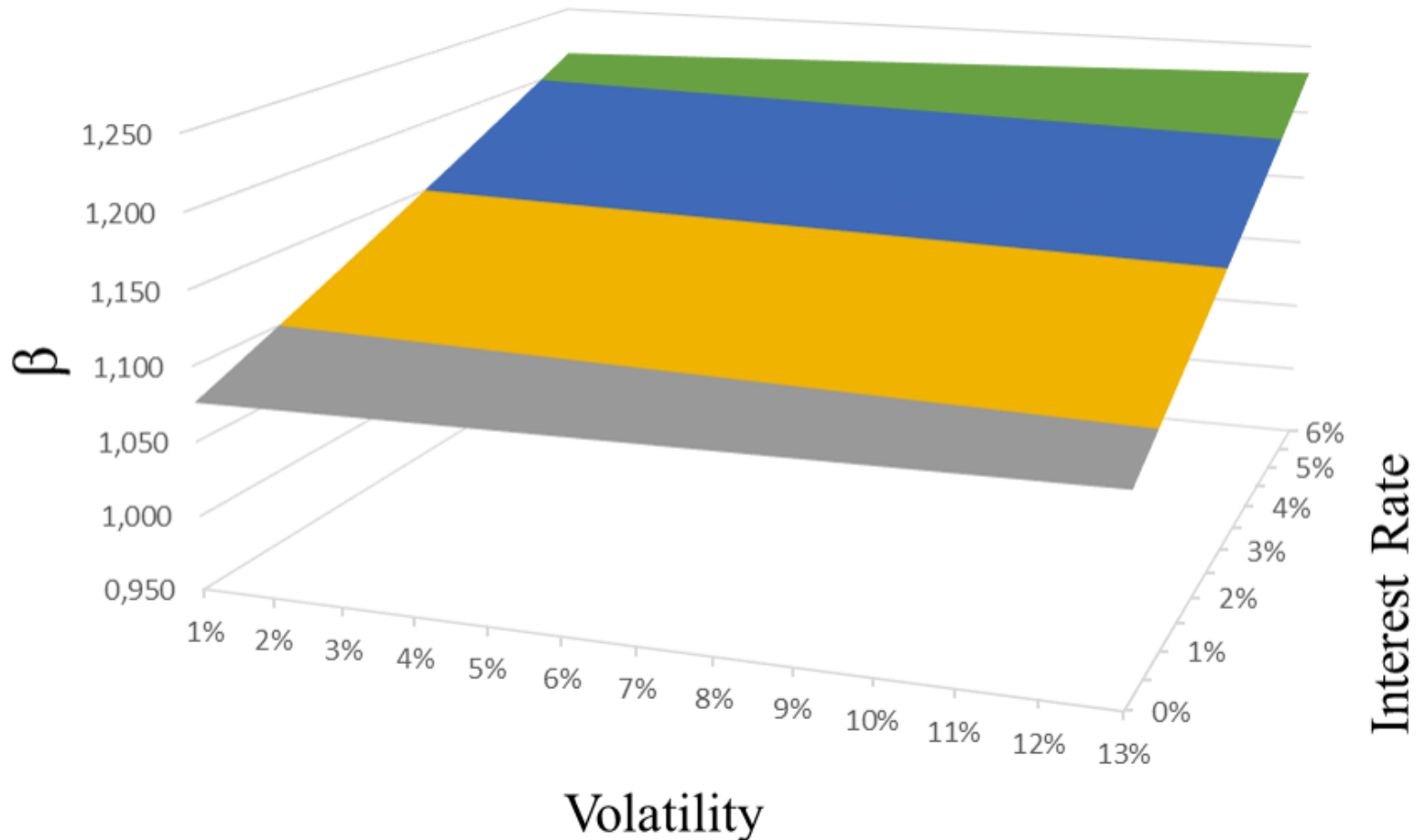
# Analytical Results: $\alpha_l = -2\%$

## Strike Price Factor for Call Option



# Analytical Results: $\alpha_l = -7\%$

## Strike Price Factor for Call Option



# Conclusion

- Recent developments in negotiations.
- Variant IV-C-R needs to be adjusted to incorporate the self-financing buffer fund: either upper or lower bound can be set.
- The strike price factor for the call option increases in the risk-free interest rate and has a small dependence on the volatility.