Institute of Insurance Economics

University of St.Gallen

Maximizing the Return on Risk-Adjusted Capital: A Performance Perspective Under Solvency II

Alexander Braun, Hato Schmeiser, Florian Schreiber

August 2015

Overview – Research Question & Procedure

Research Question

- How does Solvency II influence asset management decisions?
- Which influences have the Solvency II capital requirements on the common performance measure “Return on Risk-Adjusted Capital (RoRAC)”?

Procedure

1. Starting Point: Construction of a large number of asset portfolios
2. Calculation of the associated capital charges under the Standard Formula
3. Calculation of the insurer’s profit and the resulting RoRAC

Empirical Data

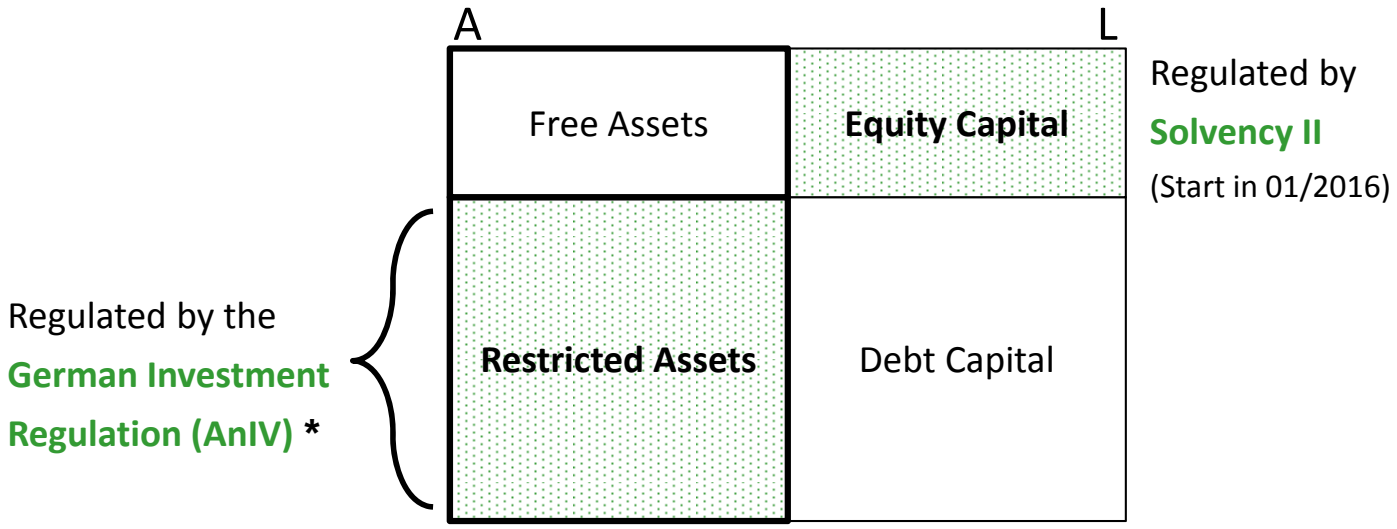
Three asset classes

- Discrete returns for 25-year period from 07/1990 until 12/2014

Stocks	▪ EURO STOXX 50 Total Return Index
Government Bonds	▪ German Stock Exchange REX Performance Index (REXP)
Real Estate	▪ Real Estate *"Grundbesitz"* Europa Fund (adjusted for dividends)

Stocks	Expected Return (percent):	8.67
	Standard Deviation (percent):	18.48
Government Bonds	Expected Return (percent):	6.20
	Standard Deviation (percent):	3.28
Real Estate	Expected Return (percent):	5.03
	Standard Deviation (percent):	1.67

Investment Limits under the German Investment Regulation (AnlV)



*Investment Limits:	Stocks:	20%
	Government Bonds:	none
	Real Estate:	25%

Construction of Asset Portfolios (1/2)

Criteria

- Budget Constraint (portfolio)
- Short-Sale Constraints (asset class)
- Investment Limits Constraint according to AnlV (asset class)

Procedure

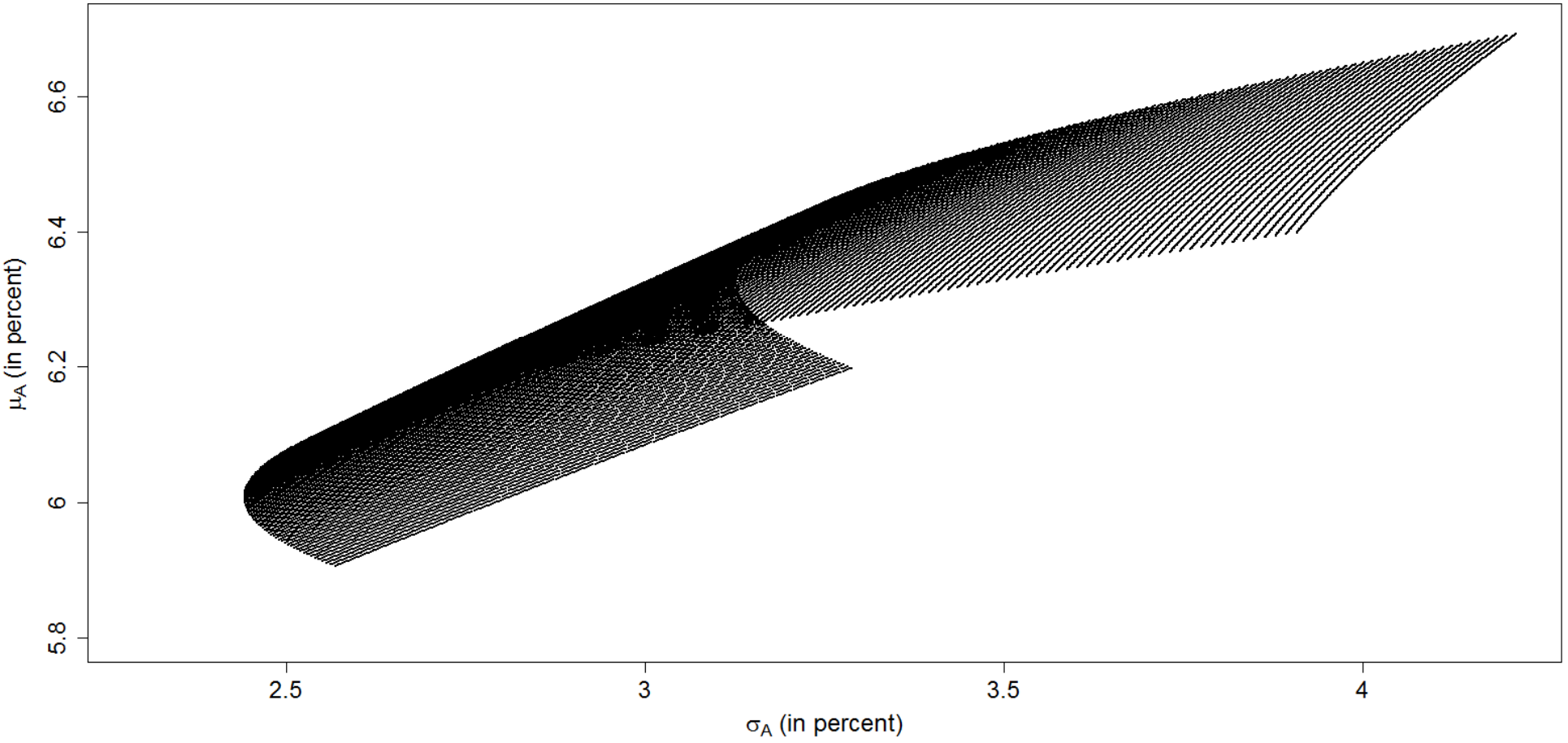
- Discrete increment of 0.1 percent (fixed)
- Open up tree with government bonds
- Insert stocks and real estate sub-portfolios

Construction of Asset Portfolios (2/2)

Government Bonds	Stocks	Real Estate
0.000	0.000	0.000
0.001	0.001	0.001
0.002	0.002	0.002
⋮	⋮	⋮
1.000	0.200	0.250

- Max. # of possible combinations: 50,501,451 portfolios
- Reduce matrix to fulfill the budget constraint
- Final # of portfolios: 50,451

Portfolios in Mean-Variance Space



Overview – Solvency II

- Solvency II (01/2016) as new regulatory framework for European insurers:
  - Protection of the policyholders
  - Uniform standards within European insurance landscape
  - Uniform supervisory practice in Europe
- Three-Pillar approach (as Basel II)
- “Two level approach”
  - Definition of minimum capital requirement
  - Definition of Solvency capital requirement (standard formula)

Solvency II Standard Formula – Market Risk Module

- Divided into modules (market, health, default, life, non-life, intangibles)
- Market risk accounts for approx. 70 percent of life insurer's capital charges (Fitch, 2011)
- Market risk divided into seven sub-modules: interest rate, equity, property, spread, currency, concentration, illiquidity

Interest Rate Risk

Equity

Property

- In respect to the modelling setup of the standard model, please cf. the paper version

Simplified Insurance Company (1/2)

Assets

Aggregated portfolio return: $\tilde{r}_p = (w_1, w_2, w_3) \begin{pmatrix} \tilde{r}_1 \\ \tilde{r}_2 \\ \tilde{r}_3 \end{pmatrix} = \boldsymbol{w}' \boldsymbol{R}$

Assets at the end of the period: $\tilde{A}_1 = A_0 \cdot \left(1 + \tilde{r}_p\right)$

Liabilities

Liabilities at the end of the period: $\tilde{L}_1 = L_0 \cdot (1 + \tilde{r}_l)$

Simplified Insurance Company (2/2)

Equity Capital

Equity capital at the end of the period: $\widetilde{EC}_1 = \left(\tilde{A}_1 - \tilde{L}_1, 0\right)^+$

Profit

Change in the equity capital:

$$\begin{aligned}\tilde{P} &= \widetilde{EC}_1 - EC_0 \\ &= \tilde{A}_1 - \tilde{L}_1 - (A_0 - L_0) \\ &= A_0 \cdot \tilde{r}_p - L_0 \cdot \tilde{r}_l \\ &= \left(\widetilde{EC}_1 - EC_0, -EC_0\right)^+\end{aligned}$$

- Balance sheet total: **EUR 10 bn**, equity: **12 percent**, D_L: **10**, $\tilde{r}_l$: **1.75 percent**

Risk-Adjusted Performance Measurement

- Business activities associated with risks
- ROE as well as ROI, however, based on book values
- The higher the risk of a business activity, the higher the SCR as demanded by Solvency II
- Return on Risk-Adjusted Capital (RoRAC) defined as :

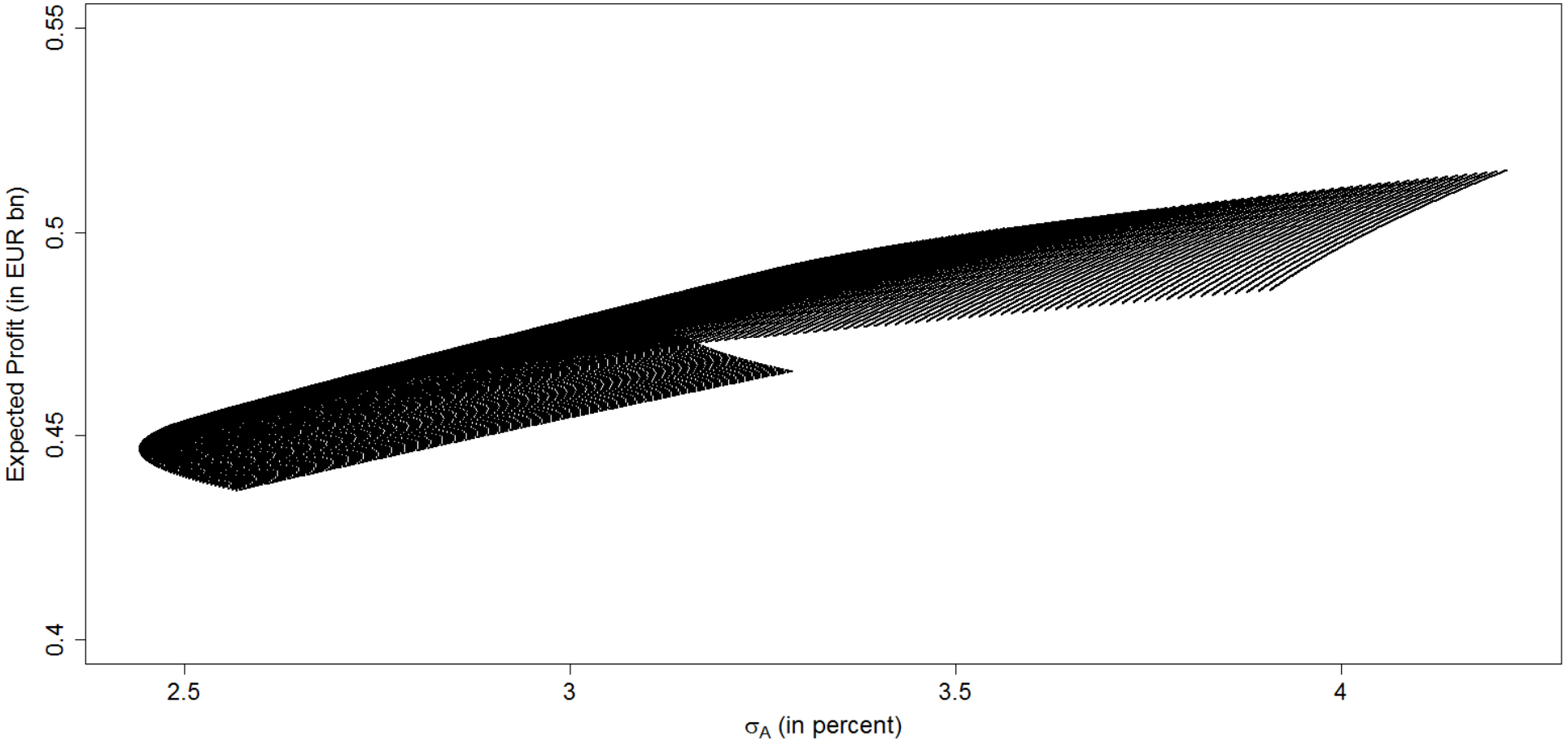
$$RoRAC = \frac{E(\tilde{P})}{SCR_0}$$

- Insurer can influence the RoRAC by changing the asset allocation
- Process:

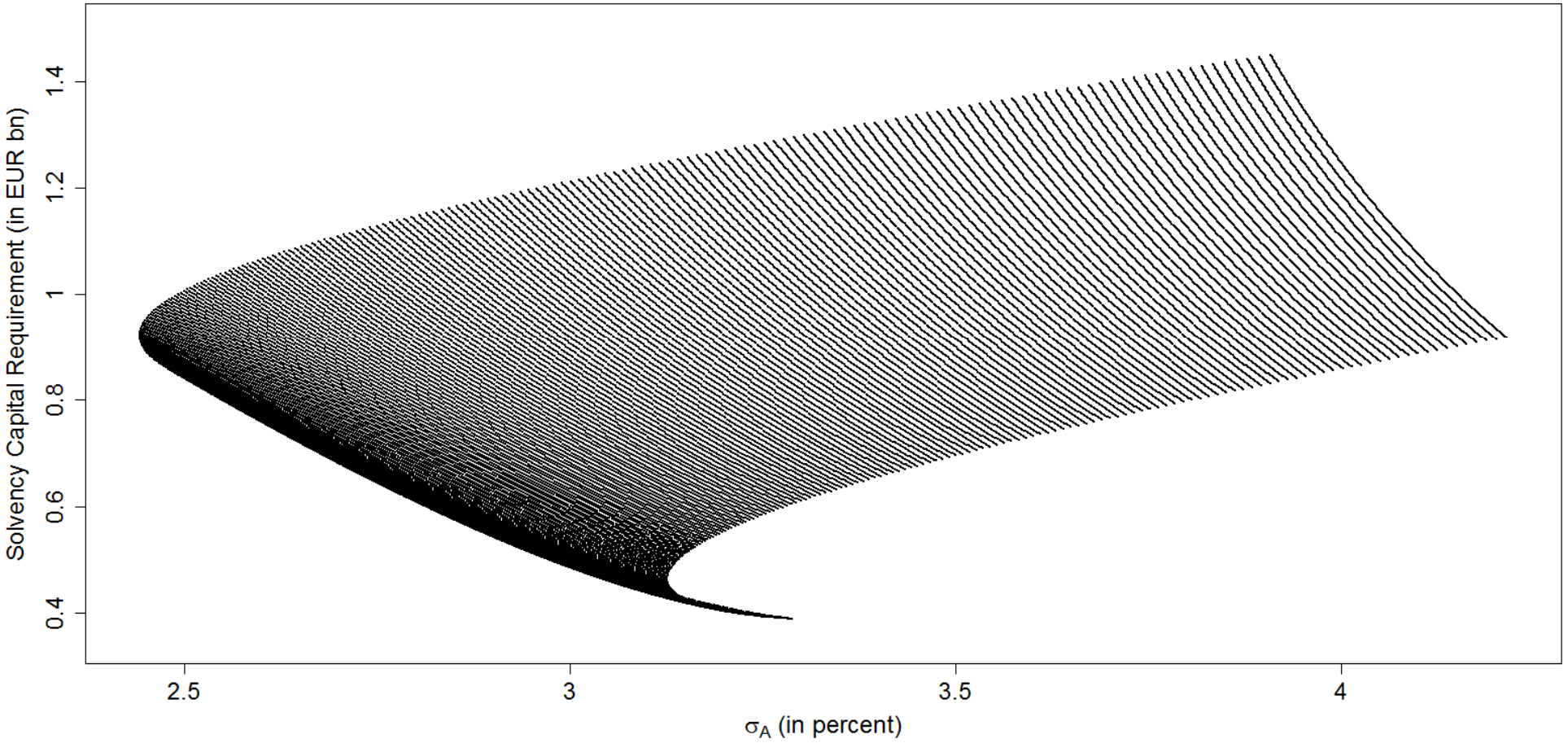
  Asset-Portfolio ⇒ insert in standard model ⇒ calculate SCR, E(P) and RoRAC

  (for all 50,451 portfolios)

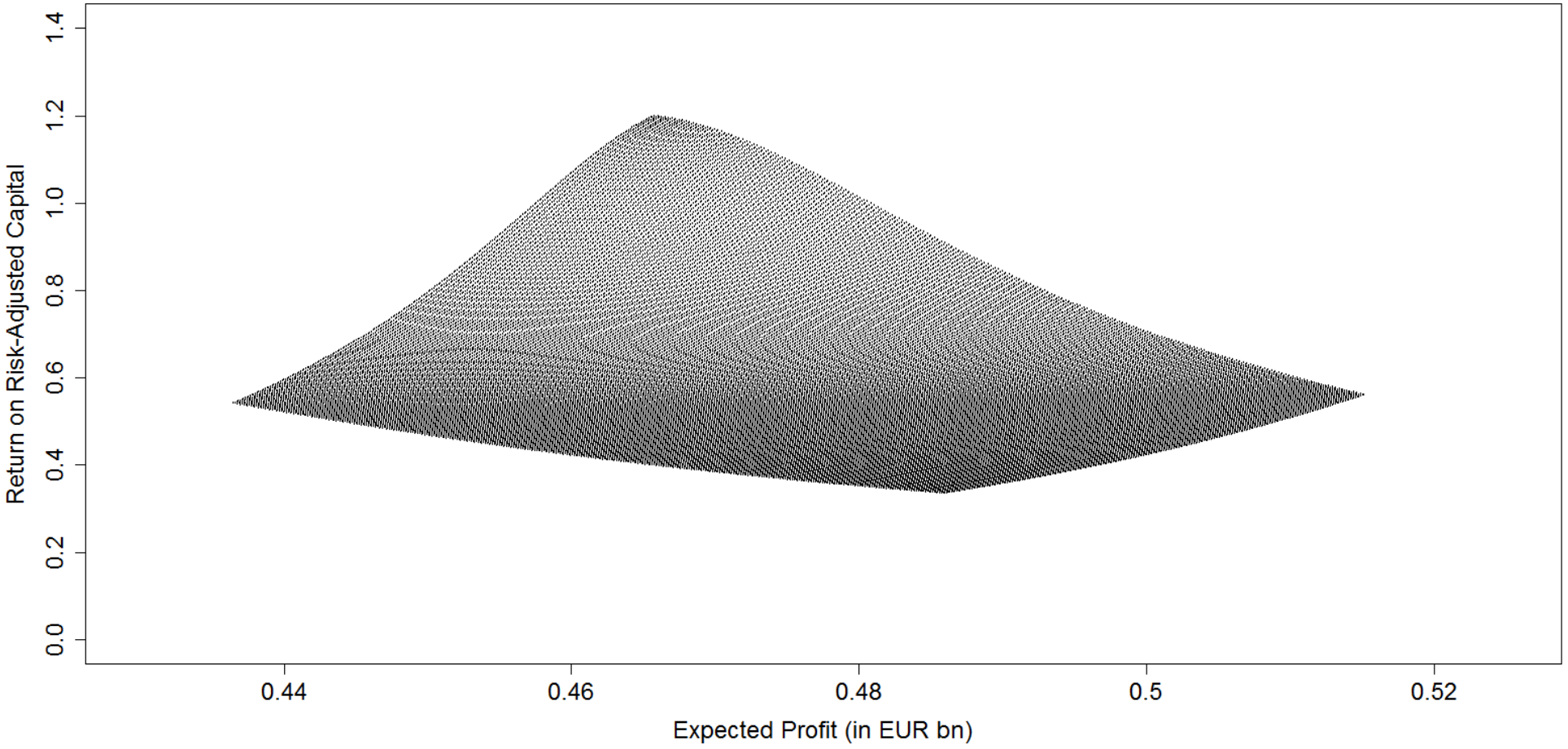
Results (1/6) – Expected Profit vs. Standard Deviation



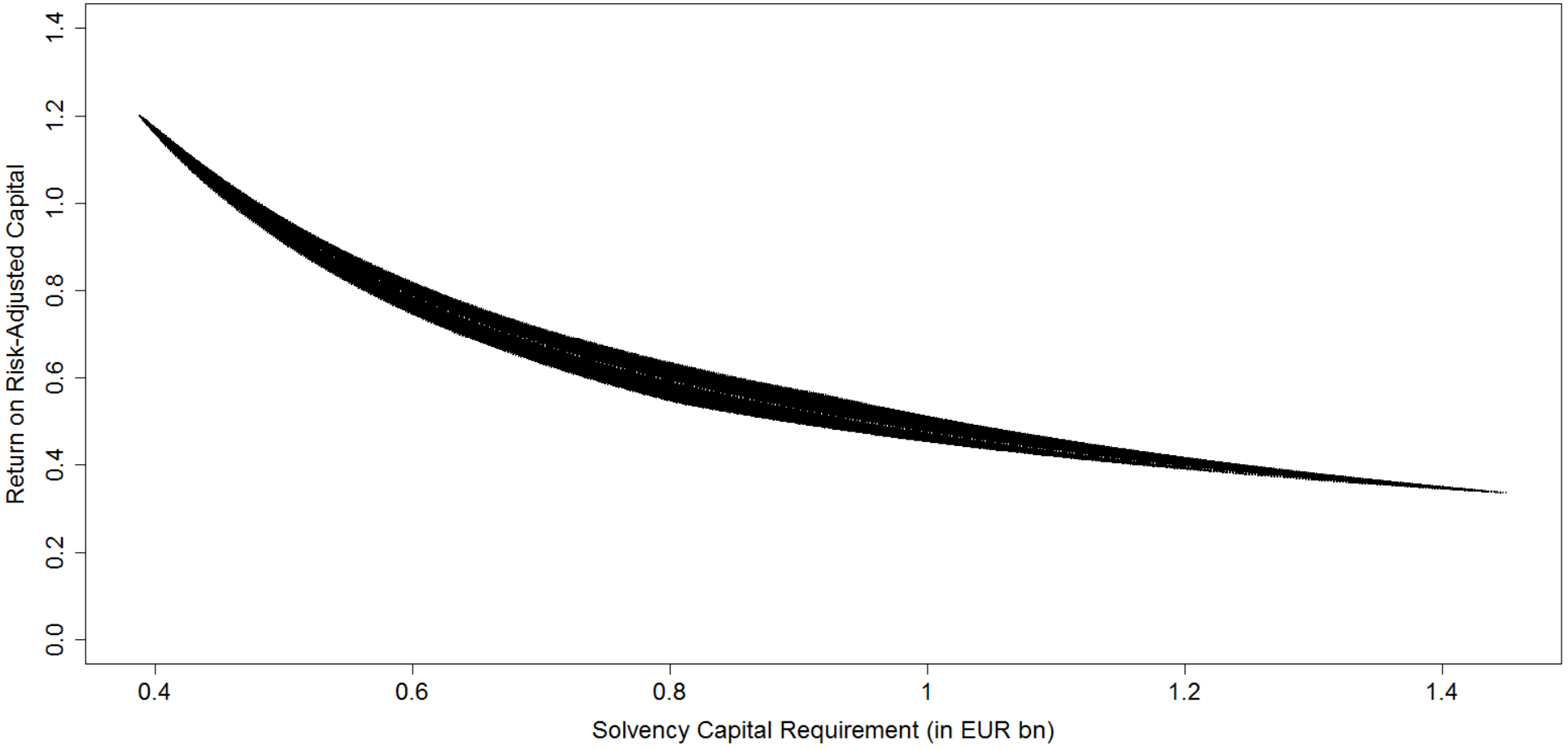
Results (2/6) – SCR vs. Standard Deviation



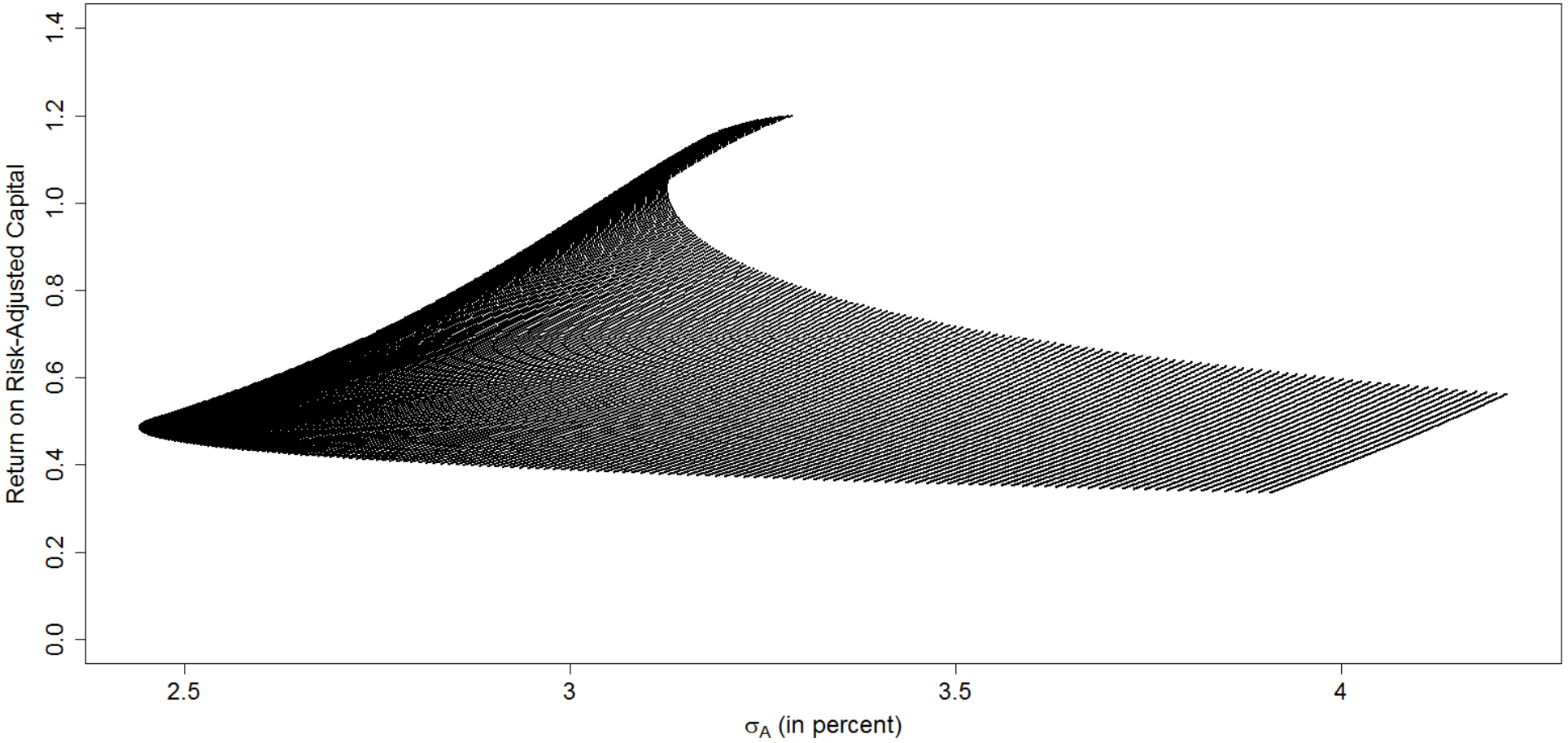
Results (3/6) – RoRAC vs. Expected Profit



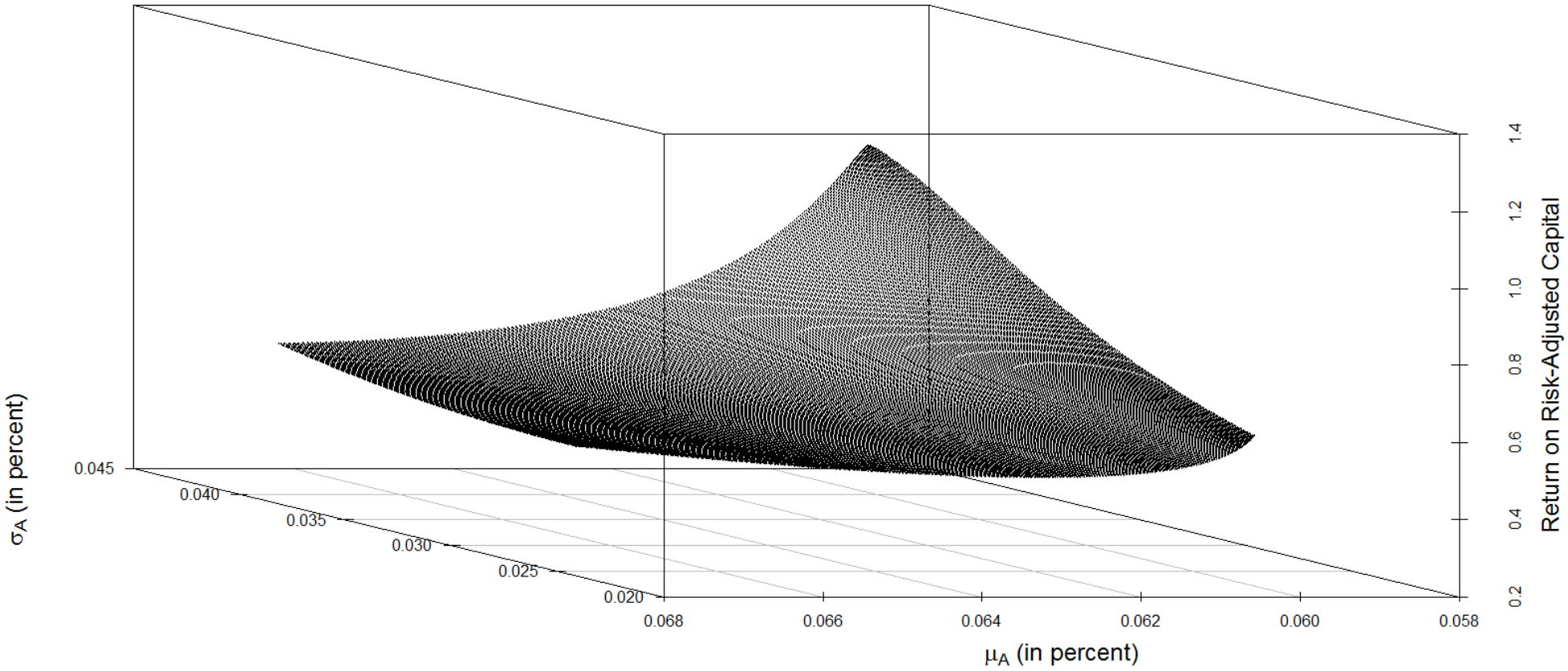
Results (4/6) RoRAC vs. SCR



Results (5/6) – RoRAC vs. Standard Deviation



Results (6/6) – RoRAC vs. Standard Deviation vs. Expected Return



Preliminary Conclusion

- Profit-maximizing portfolio does not result in the maximum RoRAC
- Portfolio with the lowest SCR achieves the highest RoRAC
- Diversified portfolios lead to low RoRAC figures => SCR as main driver of the RoRAC (increased systemic risk?)

Next steps in the paper (to do's)

- Extend the # of asset classes in the portfolio to six and run different scenarios (time horizon)
- More detailed analyses of the portfolios: Compare the optimal RoRAC in the standard model with an internal model given ε = 0,5 %

  => What are differences in RoRAC and in the portfolio structure / level of SCR?