27th International Congress of Actuaries

ICA CANCUN 2002

# Asset Liability Management and Product Design in German Life Assurance


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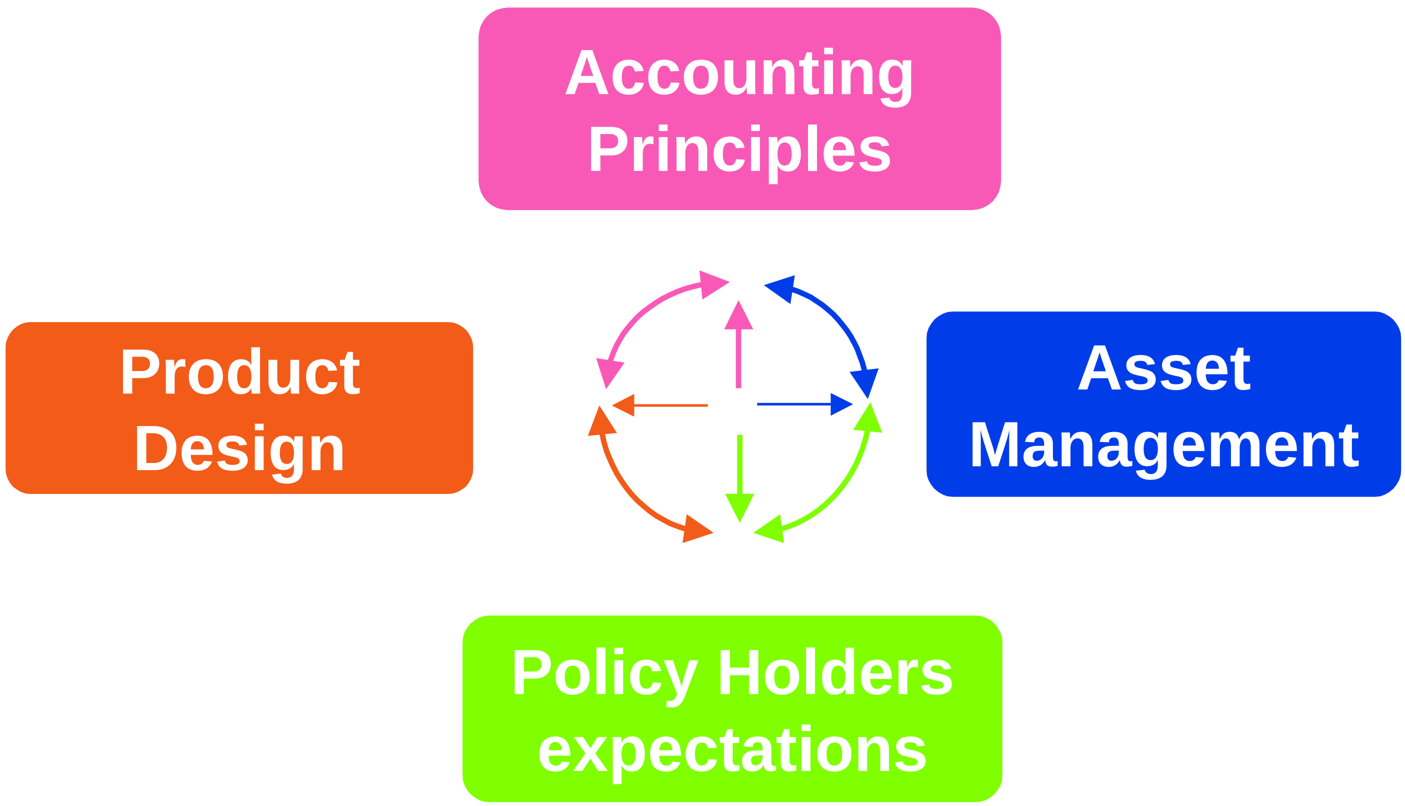
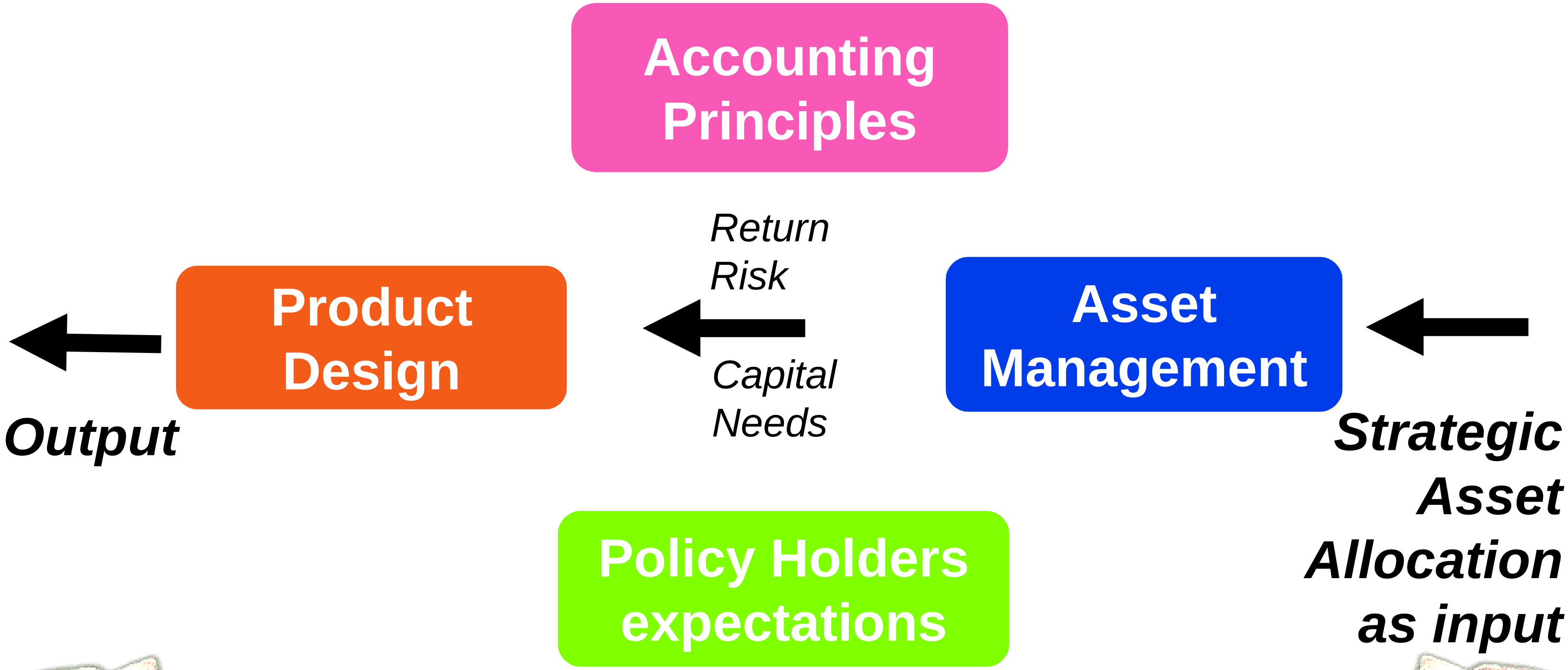
Volker Stieglitz

# Asset Liability Management Control Cycle



# A changing Asset Allocation results in a changing Product Design



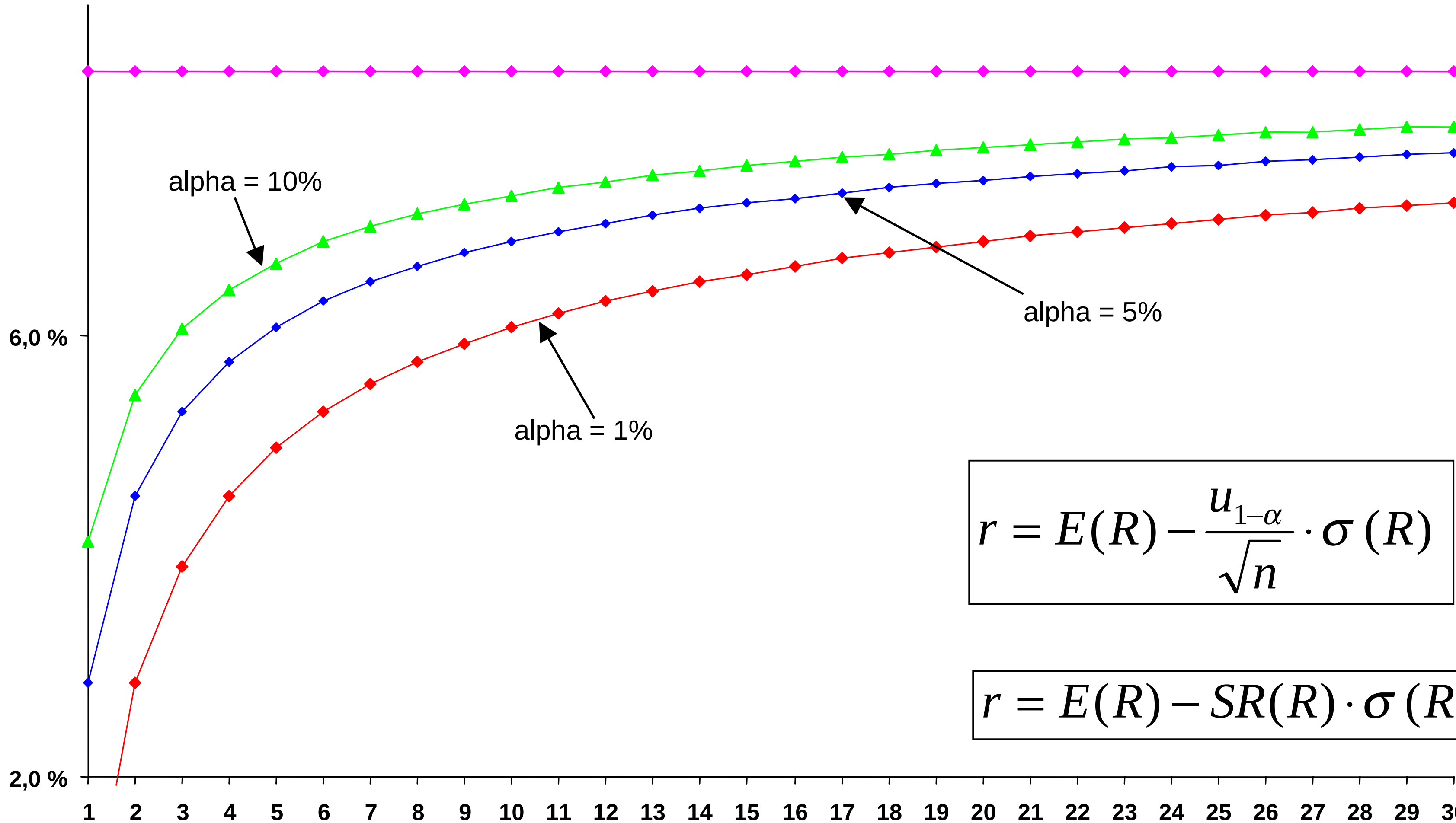
# Notions and Tools needed

- Asset Classes
- Portfolio Model (Markowitz Universe)
- Back Tracking: Model vs. History
- Stress Test
- Capital
  - adjusted to Risk
  - available for Actuarial Steering

# Modelling Philosophy

- **Model Assets & Liabilities Extremely Simple**
  - Deduce Rules of Thumb (Even CEO will understand)
  - Quantify consequences for Product Design
- **Check by Stochastic Simulations**
  - Even your Colleagues will accept
  - Rules of Thumb are valid to a limited extent close to standard situation of German Life Companies
- **Savings Plan**
  - guaranteed Interest Rates
  - Reversionary and Terminal Bonusses
  - „Natural“ Profit Participation System

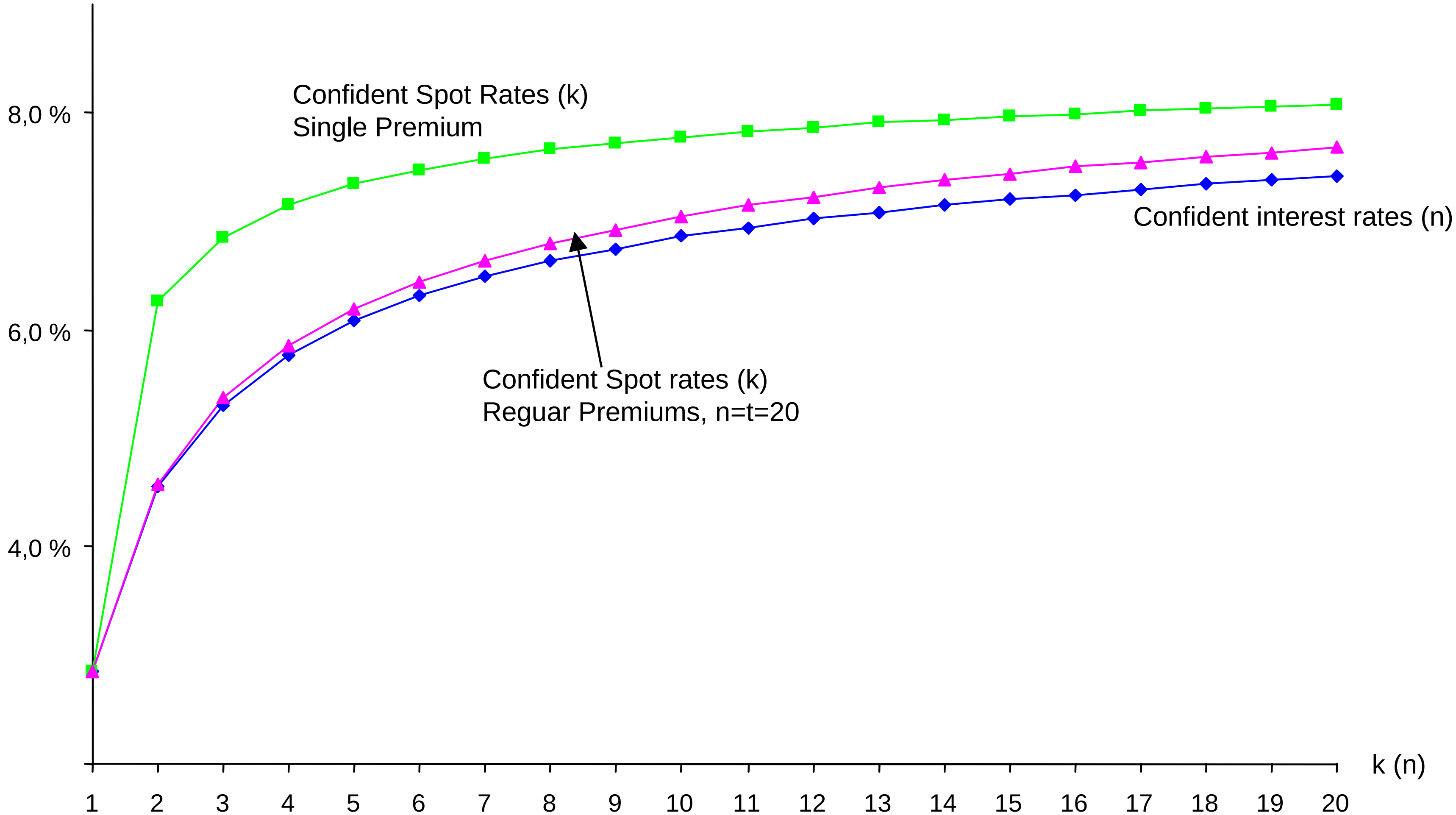
# Confident Interest Rate and Sharpe Ratio



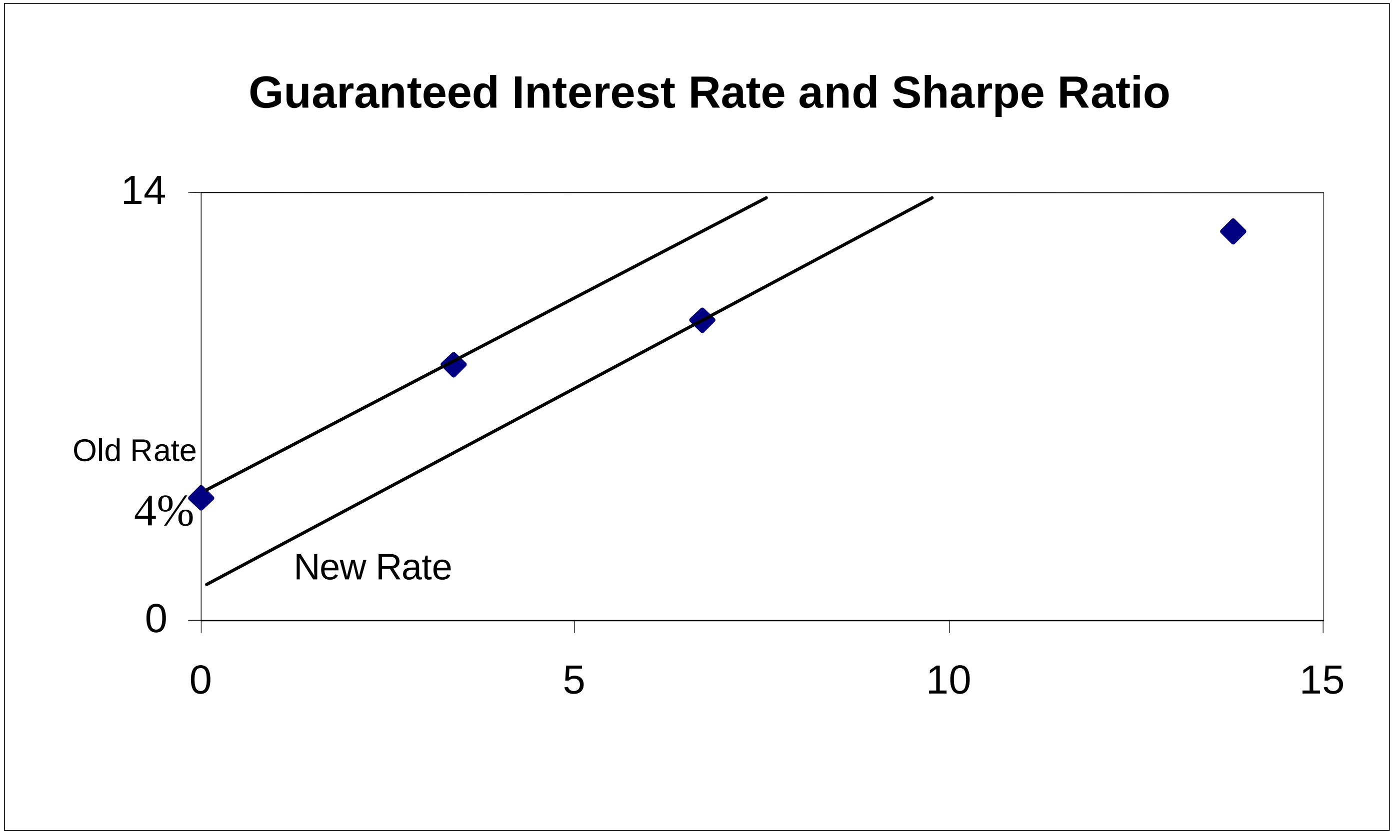

$$r = E(R) - \frac{u_{1-\alpha}}{\sqrt{n}} \cdot \sigma(R)$$

$$r = E(R) - SR(R) \cdot \sigma(R)$$

# Confident Spot Rates



# Keeping Sharpe Ratio constant in a Risk Return Chart when changing Portfolio Asset Allocation




Sharpe Ratio 1 - 1.3 / Confidence Level 85 - 90%

# Guaranteed Interest Rate *r*
# Reversionary Bonus Rates *Br*
# Terminal Bonus Rates *Sr*

- Choose *r* and *Br* as confident interest rates
  at appropriate levels of confidence
- Determine *Sr* as Mean Return - Profit Margin
- Stochastic Simulations show Comparable Probabilities of Ruin

| | **10 years (1989-1998)** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | buy and hold | | | | | | Constant Proportion | | | | | |
| | $\mu$ | $\sigma$ | *r* | *Br* | *Sr* | *r+Br* | $\mu$ | $\sigma$ | *r* | *Br* | *Sr* | *r+Br* |
| 15% Shares | 8,746 | 4,475 | 4,000 | 2,846 | 1,500 | 6,846 | 8,376 | 3,384 | 4,000 | 2,939 | 1,037 | 6,939 |
| 30% Shares | 10,358 | 8,558 | 1,281 | 5,443 | 3,234 | 6,724 | 9,801 | 6,708 | 1,127 | 5,825 | 2,449 | 6,952 |

# Terminal Bonusses improve financial strength substantially

- Declaring Reversionary Bonusses yields to an increase in capital needs (lock - in - effect)
- Declaring Terminal Bonuses increases the available capital

| | Terminal Bonus | 1 | 5 | 10 | 15 | 20 |
|---|---|---|---|---|---|---|
| 15% Shares | without | 100,00% | 98,70% | 91,50% | 85,20% | 81,50% |
| | with | 100,00% | 99,80% | 99,60% | 99,60% | 99,50% |
| 30% Shares | without | 99,50% | 87,30% | 72,00% | 64,00% | 58,40% |
| | with | 99,90% | 98,40% | 97,10% | 97,00% | 97,00% |

*Probabilities of Ruin*