Under Which Conditions is an Insurance Guaranty Fund Beneficial for Policyholders?

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Customer protection through securing institutions’ liquidity

• Current financial crisis and insolvency costs reveal the necessity for a reconsideration of regulation design and solvency measurement. → *Development of the European Solvency II*, e.g. CEIOPS (2009).

• Aim of solvency regulation and supervision is to reduce insurers’ default probability to a predefined small, yet still positive level. → *Further questions arise with regard to an insurance company default and coverage of associated insolvency costs.* → *Apparently no system in-place for controlled run-off.*

• Possible response: Guaranty fund (entirely) financed by all companies. → *Forces internalization of the entire industry’s insolvency costs.*

• However, since inhomogeneity of companies’ risk, calculation of risk-based premiums and definition of fund’s pay-outs crucial. → *Typically not considered in insurance practice.*
Literature review of selected scientific contributions

• Costs connected with insolvency as main reason for regulation.
  → E.g. Mayes (2004) (with special focus on the banking sector).

• Guaranty fund should demand risk-based premium payments to avoid adverse incentives.
  → See Cummins (1988); Duan and Yu (2005).

• Risk-subsidy effect: insurers increase market value by raising the volatility of their assets.
  → See Lee et al. (1997) (empirical significance; but no influence of monitoring effect when charging ex-post risk-inadequate fees).

• Ex-post charges cannot be organized in a risk-based way because the insolvent company, which may have been the riskiest one, is typically not charged at all.
  → See Han et al. (1997); Brewer-III et al. (1997); Downs and Sommer (1999); Sommer (1996).
What is the contribution of this work?

• If a contingent claim approach is applied to value the claims of an insurance company’s stakeholders, policyholders cannot be made better off by the introduction of a fairly designed guaranty fund.

• In an incomplete market setting, it is shown under which conditions a fund is advantageous for risk-averse policyholders:
  ▶ Possible diversification benefits measured by an increase in the utility of the policyholders.
  ▶ Correlation between the fund’s payoff and the insurer’s assets as well as the premium level in the fund are important in order to draw benefits.

• Homogeneous companies: If diversification benefits arise, the increase in utility is equally allocated to all participating policyholders.

• Heterogeneous companies: Fund is in general no longer beneficial – at least not to the same extent – for all policyholders.
  → Concept of utility-based premium calculations.
Model framework

- Set $\mathcal{C} = \{1, \ldots, M\}$ of $M$ mutual companies.
  \rightarrow \text{Oneness of policyholders and owners.}

- Analysis in a one-period model.

- Hypotheses:
  - Identical investment strategies of companies and fund.
  - Guaranty scheme funded solely by companies
  - No (additional) transaction costs due to the fund.

- In the arbitrage-free setting of the contingent claims approach, the pooling of insurance claims in an insurance guaranty fund does not change the wealth situation of either policyholders or shareholders.
  \rightarrow \text{Also see Doherty and Garven (1986); Cummins (1988).}

- More precisely, if both stakeholder groups apply the same form of present value calculus and the stakes are priced in a fair way (present value of future cash flow equals the initial contribution), there will be no advantage from an insurance guaranty fund.
Summary of cash flows and stakeholder positions

\[
W_i^{(0)} \quad \longleftrightarrow \quad \tilde{P}_i^{(1)} + \tilde{E}_i^{(1)}
\]

\[
W_i^{(0),f} \quad \longleftrightarrow \quad \tilde{P}_i^{(1),f} + \tilde{E}_i^{(1),f}
\]

\[
\tilde{F}_i^{(1)} = \tilde{P}_i^{(1)} + \tilde{E}_i^{(1)}
\]

\[
\pi_i^{(0)}
\]

--- Setup without fund --- Setup with fund
Summary of notations

- $W_i^{(0)}$, $W_i^{(0),f} = \text{aggregated premium paid by the policyholders without/with fund at } t = 0.$
- $\tilde{P}_i^{(1)}$, $\tilde{P}_i^{(1),f} = \text{insureds' position without/with fund at } t = 1.$
- $\tilde{E}_i^{(1)}$, $\tilde{E}_i^{(1),f} = \text{owners' stake without/with fund at } t = 1.$
- $\pi_i^{(0)} = \text{premium charged by the fund at } t = 0.$
- $\tilde{P}_i^{(1)} = \text{claims against the fund at } t = 1.$
- $\tilde{E}_i^{(1)} = \text{equity stake in the fund at } t = 1.$
2. Model framework

Aggregated policyholders’ position at time $t = 0$

- Without guaranty fund

$$W_i^{(0)} = P_i^{(0)} + E_i^{(0)}$$
$$= \text{PV}[\min(\tilde{A}_i^{(1)}, \tilde{S}_i^{(1)})] + \text{PV}[\max(\tilde{A}_i^{(1)} - \tilde{S}_i^{(1)}, 0)] = \text{PV}[\tilde{A}_i^{(1)}]$$

$$\rightarrow \max(\tilde{S}_i^{(1)} - \tilde{A}_i^{(1)}, 0) \text{ stands for the insolvency put option.}$$

- With guaranty fund

$$W_i^{(0)} = W_i^{(0), f} = P_i^{(0), f} + E_i^{(0), f} + P_i^{(0)} + E_i^{(0)}$$
$$= \text{PV}[\min(\tilde{A}_i^{(1), *}, \tilde{S}_i^{(1)})] + \text{PV}[\max(\tilde{A}_i^{(1), *} - \tilde{S}_i^{(1)}, 0)] + \text{PV}[\tilde{F}_i^{(1)}]$$

where $A_i^{(0), *} = \text{PV}[\tilde{A}_i^{(1), *}] = \text{PV}[\tilde{A}_i^{(1)}] - \text{PV}[\tilde{\pi}_i^{(1)}] = A_i^{(0)} - \pi_i^{(0)}$.

- If $\text{PV}[\tilde{F}_i^{(1)}] = \pi_i^{(0)}$, the present value of the policyholders’ claims with respect to the fund equals the initial contribution.

$\rightarrow$ This is fulfilled in an arbitrage-free market; otherwise systematic wealth transfers between different insurers would take place.
Utility of policyholders’ wealth positions at time $t = 1$

- Without guaranty fund

$$
\phi_i^{(1)} = \langle \tilde{W}_i^{(1)} \rangle - \frac{a_i}{2} \text{var}(\tilde{W}_i^{(1)}) = \langle \tilde{A}_i^{(1)} \rangle - \frac{a_i}{2} \text{var}(\tilde{A}_i^{(1)}),
$$

where $a_i$ defines the risk aversion parameter.

- With guaranty fund

$$
\phi_i^{(1),f} = \langle \tilde{W}_i^{(1),f} \rangle - \frac{a_i}{2} \text{var}(\tilde{W}_i^{(1),f})
= \langle \tilde{A}_i^{(1),*} + \tilde{F}_i^{(1)} \rangle - \frac{a_i}{2} \text{var}(\tilde{A}_i^{(1),*} + \tilde{F}_i^{(1)})
= \langle \tilde{A}_i^{(1)} - \tilde{\pi}_i^{(1)} + \tilde{F}_i^{(1)} \rangle - \frac{a_i}{2} \text{var}(\tilde{A}_i^{(1)} - \tilde{\pi}_i^{(1)} + \tilde{F}_i^{(1)}).
$$

- Absolute change in utility due to the introduction of the guaranty fund

$$
\Delta a \phi_i^{(1)} = \phi_i^{(1),f} - \phi_i^{(1)}
= \langle \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)} \rangle - \frac{a_i}{2} \left[ \text{var}(\tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)}) + 2\text{cov}(\tilde{A}_i^{(1)}, \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)}) \right].
$$
Minimum requirement: Self-supporting guaranty fund

- Cash flow $\tilde{F}_i^{(1)}$ dependent on
  - the number of companies $M$,
  - their asset and claim distributions,
  - the correlation structures between assets and claims,
  - the premiums charged and their stochastic distribution at time $t = 1$.

- Minimal requirement: the fund has to be self-supporting

$$\sum_{i \in C} \langle \tilde{F}_i^{(1)} \rangle = \sum_{i \in C} \langle \tilde{\pi}_i^{(1)} \rangle.$$ 

$\rightarrow$ No external agent (e.g., taxpayer) has to cover a part of the default risk through (contingent) payments to the fund.

- Self-supporting requirement implies that the derivation of an adequate structure for the payoff scheme is strongly determined.
  $\rightarrow$ However, in general, various schemes can be derived, thereby implying different incentives for the market participants.
3. Utility-based approach

Risk-neutral investors

- Assumption: policyholder collective of company $j$ does not adjust for risk while making its financial decisions.
  \[ \text{\textit{Indifference between both setups, without or with the guaranty fund, i.e. } } \phi_j^{(1)} = \phi_j^{(1),f}. \]

- Implication:
  \[ \Delta a \phi_j^{(1)} = \phi_j^{(1),f} - \phi_j^{(1)} = 0. \]

- Since $a_j = 0$:
  \[ \Delta a \phi_j^{(1)} = \langle \tilde{F}_j^{(1)} - \tilde{\pi}_j^{(1)} \rangle = 0 \iff \langle \tilde{F}_j^{(1)} \rangle = \langle \tilde{\pi}_j^{(1)} \rangle. \]

- Condition $\phi_j^{(1)} = \phi_j^{(1),f}$ is fulfilled if and only if $\langle \tilde{F}_j^{(1)} \rangle = \langle \tilde{\pi}_j^{(1)} \rangle$.

- Since the guaranty fund is supposed to be self-supporting, the latter condition is always accounted for on an aggregated level.
  \[ \text{\textit{If all investors are risk-neutral, there is no possibility to achieve a utility-based Pareto enhancement by introducing a guaranty fund.}} \]
3. Utility-based approach

Risk-averse policyholders, $a_i > 0$, $\forall i \in C$

- Pooling of claims in a fund is beneficial if

$$\Delta a \phi_i^{(1)} > 0 \iff \langle \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)} \rangle - \frac{a_i}{2} \left[ \text{var}(\tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)}) + 2\text{cov}(\tilde{A}_i^{(1)}, \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)}) \right] > 0$$

$$\iff \langle \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)} \rangle - \frac{a_i}{2} \left[ \text{var}(\tilde{F}_i^{(1)}) + \text{var}(\tilde{\pi}_i^{(1)}) - 2\text{cov}(\tilde{F}_i^{(1)}, \tilde{\pi}_i^{(1)}) ight. \right. \left. \left. + 2\text{cov}(\tilde{A}_i^{(1)}, \tilde{F}_i^{(1)}) - 2\text{cov}(\tilde{A}_i^{(1)}, \tilde{\pi}_i^{(1)}) \right] > 0$$

$$\iff \langle \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)} \rangle + a_i \left[ \text{cov}(\tilde{A}_i^{(1)}, \tilde{\pi}_i^{(1)}) + \text{cov}(\tilde{F}_i^{(1)}, \tilde{\pi}_i^{(1)}) - \text{cov}(\tilde{F}_i^{(1)}, \tilde{A}_i^{(1)}) ight. \right. \left. \left. - \frac{1}{2} \text{var}(\tilde{F}_i^{(1)}) - \frac{1}{2} \text{var}(\tilde{\pi}_i^{(1)}) \right] > 0.$$  

- Investigation of the inequality:

  - Value $\langle \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)} \rangle = \langle \tilde{F}_i^{(1)} \rangle - \langle \tilde{\pi}_i^{(1)} \rangle$ is dependent on the premiums paid by the companies and the payoff scheme $\tilde{F}_i^{(1)}$.

  - Correlation $\rho(\tilde{A}_i^{(1)}, \tilde{\pi}_i^{(1)}) = 1$, and $\rho(\tilde{F}_i^{(1)}, \tilde{\pi}_i^{(1)}) = \rho(\tilde{F}_i^{(1)}, \tilde{A}_i^{(1)})$, since same asset allocation is assumed.
Risk-averse policyholders II

- Condition cannot be fulfilled whenever both the insurance company and the fund are investing only in risk-free assets.
  \[\text{For diversification, a positive asset return volatility is needed.}\]
- Complex relationship between \(\tilde{F}_i^{(1)}\) and the asset \(\tilde{A}^{(1)}\), claim \(\tilde{S}^{(1)}\), and premium distributions \(\tilde{\Pi}^{(1)}\) of all companies.
  \[\text{Explicit derivation of necessary conditions for a positive diversification benefit is not practicable without loss of generality.}\]
- Changes in utility implied by the existing guaranty funds are not, in general, identical for all market players.
  \[\text{No guarantee that different policyholder groups profit equally from a utility increase or decrease.}\]
3. Utility-based approach

Risk-averse policyholders III

- \( \langle \tilde{F}_i^{(1)} \rangle = \langle \tilde{\pi}_i^{(1)} \rangle \) does not hold in general.
  \[ \rightarrow \text{Dependence on payoff-structure and asset and claims distributions.} \]

- Premium principle

  Premiums \( \Pi^{(0)} = (\pi_i^{(0)})_{i \in \mathcal{C}} \) such that \( \langle \tilde{F}_i^{(1)} \rangle = \langle \tilde{\pi}_i^{(1)} \rangle, \forall i \in \mathcal{C} \).

  \[ \rightarrow \text{Even if all participants have the same } a_i > 0, \text{ the effect is different for every insurer.} \]

- Well-known problem of allocation of diversification effects.
  \[ \rightarrow \text{Capital allocation dilemma discussed by, e.g., Phillips et al. (1998); Myers and Read (2001); Sherris (2006); Gründl and Schmeiser (2007).} \]

- Identical change in utility if all companies are homogeneous, i.e. have identical asset and claim distributions, as well as equal correlation structures between assets and claims.
Utility-based premiums in the general case

- Demand premium calculation leading to an equal utility increase for all companies.
  → *Calculation possible, if all can reach the preset utility increase.*

- Premium principle:
  
  Premiums \( \Pi^{(0)} = (\pi^{(0)}_i)_{i \in C} \) such that \( \Delta_a \phi^{(1)}_i (\Pi^{(0)}) = K, \forall i \in C. \)

  → *Change in utility considered as function of all premiums charged.*
  → *Depending on K, a set of premium combinations can be found.*

- Other possible principles could use
  
  - the relative change in utility \( \Delta_r \phi^{(1)}_i = \Delta_a \phi^{(1)}_i / |\phi^{(1)}_i|, \)
  - the marginal change in utility \( \Delta_a \phi^{(1)}_i / \pi^{(0)}_i, \)
  - the ratio \( [\Delta_a \phi^{(1)}_i / |\phi^{(1)}_i|] / \pi^{(0)}_i. \)
4. Exemplary payoff function

Derivation of an exemplary payoff function I

- Policyholder deficit in the setup with an insurance guaranty fund

\[ \tilde{\delta}^{(1)}_i = \tilde{S}^{(1)}_i - \tilde{A}^{(1),*}_i. \]

- With regard to their respective safety levels, companies are classified:

\[ i \in C^\Pi \quad i \in C^0 \quad i \in C^* \]

\[ \tilde{\delta}^{(1)}_i > \tilde{\pi}^{(1)}_i \quad 0 < \tilde{\delta}^{(1)}_i \leq \tilde{\pi}^{(1)}_i \quad \tilde{\delta}^{(1)}_i \leq 0 \]
Derivation of an exemplary payoff function II

- Fund deficit

\[ \tilde{\gamma}^{(1)} = \sum_{i=1}^{M} \left( \tilde{S}^{(1)}_i - \tilde{A}^{(1)},* \right)^+ - \sum_{i=1}^{M} \tilde{\pi}^{(1)}_i. \]

- Fund’s payoff structure at time \( t = 1 \) defined by \( \tilde{F}^{(1)}_i(\tilde{A}^{(1)}, \tilde{S}^{(1)}, \tilde{\pi}^{(1)}_i) \):

\[
\tilde{F}^{(1)}_i = \begin{cases} 
\delta^{(1)}_i & \text{for } i \in C^\Pi \text{ and if } \tilde{\gamma}^{(1)} \leq 0 \\
\tilde{\kappa}^{(1)}_i & \text{for } i \in C^0 \text{ and if } \tilde{\gamma}^{(1)} \leq 0 \\
\frac{\tilde{\pi}^{(1)}_i}{\sum_{j \in C^*} \tilde{\pi}^{(1)}_j} \left[ \sum_{j \in C} \tilde{\pi}^{(1)}_j - \sum_{j \in C^\Pi} \delta^{(1)}_j - \sum_{j \in C^0} \tilde{\kappa}^{(1)}_j \right] & \text{for } i \in C^* \text{ and if } \tilde{\gamma}^{(1)} \leq 0 \\
\frac{\tilde{\delta}^{(1)}_i}{\sum_{j \in (C^\Pi \cup C^0)} \tilde{\delta}^{(1)}_j} \sum_{j \in C} \tilde{\pi}^{(1)}_j & \text{for } i \in C^\Pi \cup C^0, \text{ if } \tilde{\gamma}^{(1)} > 0 \\
0 & \text{for } i \in C^* \text{ and if } \tilde{\gamma}^{(1)} > 0 
\end{cases}
\]

where, \( \tilde{\kappa}^{(1)}_i = \max \left( \delta^{(1)}_i, \frac{\tilde{\pi}^{(1)}_i}{\sum_{j \in C \setminus C^\Pi} \tilde{\pi}^{(1)}_j} \left[ \sum_{j \in C} \tilde{\pi}^{(1)}_j - \sum_{j \in C^\Pi} \delta^{(1)}_j \right] \right) \).
5. Numerical examples

Numerical illustration

- Analysis deployed by means of a Monte Carlo simulation with \( N = 1\,000\,000 \) iterations.

- Use of presented exemplary payoff scheme.

- Asset and claim returns are modeled as normally distributed variables.

- Assets and claims at time \( t = 1 \) follow lognormal distributions:
\[
\begin{align*}
A^{(1)}_i &= A^{(0)}_i e^{\tilde{r}^A_i}, \\
\tilde{\pi}^{(1)}_i &= \pi^{(0)}_i e^{\tilde{r}^A_i}, \\
\tilde{S}^{(1)}_i &= S^{(0)}_i e^{\tilde{r}^S_i}.
\end{align*}
\]

- "Standard case":
\[
\begin{align*}
A^{(0)}_i &= 60, \quad \pi^{(0)}_i = 5, \quad S^{(0)}_i = 40 \\
\langle \tilde{r}^A_i \rangle &= 0.15, \quad \sigma(\tilde{r}^A_i) = 0.2; \quad \langle \tilde{r}^S_i \rangle = 0.1, \quad \sigma(\tilde{r}^S_i) = 0.15 \\
\rho(\tilde{r}^A_i, \tilde{r}^A_j) &= 0.4, \quad \rho(\tilde{r}^S_i, \tilde{r}^S_j) = 0.3 \\
a_i &= 2
\end{align*}
\]
Diversification benefits in the case of homogeneous companies I

\[ \Delta_{\phi}^{(1)} = \rho(\tilde{r}_i^A, \tilde{r}_j^A) - \var(\tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)}) - 2\text{cov}(\tilde{A}_i^{(1)}, \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)}) \]

Correlation between asset returns \( \rho(\tilde{r}_i^A, \tilde{r}_j^A) \)

(a) Sensitivity on \( \rho(\tilde{r}_i^A, \tilde{r}_j^A) \).

Correlation between claim returns \( \rho(\tilde{r}_i^S, \tilde{r}_j^S) \)

(b) Sensitivity on \( \rho(\tilde{r}_i^S, \tilde{r}_j^S) \).

Figure: Sensitivity of the change in utility \( \Delta_{\phi}^{(1)} \) on the correlation between (a) asset returns \( \rho(\tilde{r}_i^A, \tilde{r}_j^A) \), and (b) claim returns \( \rho(\tilde{r}_i^S, \tilde{r}_j^S) \).

→ Less diversification in fund with increasing correlation between assets.
→ Issue, since high asset correlations in capital markets are typically exp.
5. Numerical examples

Benefits in the case of homogeneous companies II

Figure: Sensitivity of the change in utility $\Delta a\phi_i^{(1)}$ on the standard deviation of asset returns $\sigma(\tilde{r}_i^A)$.

$\rightarrow$ Slightly negative effect of pooling when assets are invested risk-free.
5. Numerical examples

Benefits in the case of homogeneous companies III

\[
\Delta_a \varphi_i^{(1)} - \text{var}(\tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)}) - 2\text{cov}(\tilde{A}_i^{(1)}, \tilde{F}_i^{(1)} - \tilde{\pi}_i^{(1)})
\]

(a) Sensitivity on \(\pi_i^{(0)}\).

(b) Sensitivity on \(M\).

Figure: Sensitivity of the change in utility \(\Delta_a \varphi_i^{(1)}\) (a) on the premium \(\pi_i^{(0)}\) charged by the fund and, (b) the number of companies \(M\).

→ No significant benefits can be obtained once the necessary funds for decreasing the default probabilities to a minimum level are collected.
5. Numerical examples

Benefits in the case of homogeneous companies IV

(a) Sensitivity on $\pi_i^{(0)}$.

(b) Sensitivity on $M$.

Figure: Sensitivity of the default probabilities on the premium $\pi_i^{(0)}$ charged by the fund and the number $M$ of participating companies.

→ Default risk for the policyholders reduced to the fund’s default risk.
→ After the fund premium is charged, the company’s default risk increases.
→ Limit for risk, and for charged premium, defined by solvency regulation.
Utility based premiums in the general case I

<table>
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<th>companies</th>
<th>homogeneous</th>
<th>heterogeneous I</th>
<th>heterogeneous II</th>
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<tr>
<td>i</td>
<td>σ(˜r_A)</td>
<td>σ(˜r_S)</td>
<td>σ(˜r_A)</td>
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<tr>
<td>5</td>
<td>—</td>
<td>—</td>
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</tr>
</tbody>
</table>

|                     | 1.00 %     | 1.00 %         | 1.00 %         |
|                     | 2.45       | 2.44           | 2.48           |
|                     | 0.49       | 0.49           | 0.50           |
|                     | 0.00       | 0.24           | 0.27           |
|                     | 2.04 %     | 2.04 %         | 2.00 %         |

Table: Premiums are calculated along the principle Δ_rφ_i^{(1)} fixed to K = 1.00%.

→ All companies can expect an (equal) increase in utility.
→ Relative utility increase per premium similar on aggregate level.
Utility based premiums in the general case II

<table>
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<tr>
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<th>heterogeneous IV</th>
<th>heterogeneous V</th>
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<td>$A_i^{(0)}$</td>
<td>$S_i^{(0)}$</td>
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<td>—</td>
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<td>4</td>
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<td>—</td>
<td>0.33</td>
</tr>
<tr>
<td>5</td>
<td>62</td>
<td>—</td>
<td>0.18</td>
</tr>
<tr>
<td>$\Delta r \phi_i^{(1)}$</td>
<td>1.00 %</td>
<td>1.00 %</td>
<td>1.00 %</td>
</tr>
<tr>
<td>$\sum_{i \in C} \pi_i^{(0)}$</td>
<td>2.50</td>
<td>2.55</td>
<td>3.34</td>
</tr>
<tr>
<td>$\langle \Pi^{(0)} \rangle$</td>
<td>0.50</td>
<td>0.51</td>
<td>0.67</td>
</tr>
<tr>
<td>$\sigma(\Pi^{(0)})$</td>
<td>0.26</td>
<td>0.36</td>
<td>0.36</td>
</tr>
<tr>
<td>$\Delta r \phi_i^{(1)}/\langle \Pi^{(0)} \rangle$</td>
<td>2.01 %</td>
<td>1.96 %</td>
<td>1.49 %</td>
</tr>
</tbody>
</table>

Table: Premiums are calculated along the principle $\Delta r \phi_i^{(1)}$ fixed to $K = 1.00\%$. 
Summary

• Within complete markets, the introduction of a guaranty fund cannot improve the position of the policyholders if all stakes are priced fairly.

• In incomplete markets, risk-neutral investors cannot be made better off through the existence of a self-supporting fund.

• If the roll-out of a fund implies transaction costs, its introduction is detrimental to the insureds.

• Case of risk-averse investors in incomplete markets: potential diversification benefits might be achieved by pooling claims.  
  → Advantages or disadvantage in terms of utility are only equal for all insurers if they are homogeneous (utility function, risk aversion).

• Problem of allocating possible diversification benefits similar to the capital allocation problem.

• Concept of a utility-based premium calculation principle to derive charges for a guaranty fund guarantees equal changes in utility among all participants.
Conclusion & Outlook

• In general, wealth or utility transfers between policyholders of different insurers are unavoidable.

• In our setting, insurance guaranty funds may even be systematically unfavorable for all, if, e.g., all insurers invest solely in risk-free assets or in highly correlated assets.

• In our opinion, mentioned aspects can be seen as arguments against the introduction of a fund.

• However positive influence on the agency problems within insurance markets often pointed out.

• Examination of the interactions between both facets of interest.

• Other solutions leading to a controlled run-off of an insurance company should be analyzed in more details in the future.
Further information

• **Reference for this publication**

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