The Impact of Introducing Insurance Guaranty Schemes on Pricing and Capital Structure

Prof. Dr. Joël Wagner

AFIR Colloquium
Madrid, June 2011
Basic idea of Insurance Guaranty Schemes (IGS): customer protection through securing claims

Starting position

Solvency II: Run-off of financial services companies is intended as transfer of portfolio at the respective market price

Implications

- Protection of policyholders interests mainly through the protective function of the solvency regulation (protection of the institution insurance)
- Reduction of the insurer's ruin probability to a very low but still positive level
- Policyholders interests are not fully protected
Structure of insurance guaranty schemes

Exemplary illustration

In this example:

- Insurance company pays premium to guaranty fund
- Ex-ante payment to fund
- Fund contribution is percentage of policyholders' premium $P_0$
## Overview of existing insurance guaranty funds

<table>
<thead>
<tr>
<th>Country</th>
<th>Since</th>
<th>Segments</th>
<th>Contributions</th>
<th>Ex</th>
<th>RW</th>
<th>Compensation</th>
<th>Further funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>1972</td>
<td>NL*</td>
<td>Once 1.4 Mio. EUR</td>
<td>Ante</td>
<td>No</td>
<td>100%</td>
<td>Ex-post</td>
</tr>
<tr>
<td>Canada</td>
<td>1988</td>
<td>L&amp;H, P&amp;C</td>
<td>n/a</td>
<td>Ante</td>
<td>No</td>
<td>85%, 70%, both w/cap</td>
<td>Ex-post, borrowing power</td>
</tr>
<tr>
<td>Denmark</td>
<td>2003</td>
<td>NL</td>
<td>Fixed per policy*</td>
<td>Ante</td>
<td>No</td>
<td>100%</td>
<td>State-guaranteed loans</td>
</tr>
<tr>
<td>Finland</td>
<td>1997</td>
<td>NL*, H</td>
<td>Cap 2% of premiums</td>
<td>Ante</td>
<td>No</td>
<td>100%</td>
<td>Ex-post (policyholders)</td>
</tr>
<tr>
<td>France</td>
<td>1999</td>
<td>L, NL, H</td>
<td>0.05% math. prov.*</td>
<td>Ante</td>
<td>No</td>
<td>100% w/cap, 90%*</td>
<td>Borrowing power</td>
</tr>
<tr>
<td>Germany</td>
<td>2002</td>
<td>L, H</td>
<td>0.02% net reserves*</td>
<td>Ante, Post</td>
<td>Yes*</td>
<td>100%*</td>
<td>Ex-post*</td>
</tr>
<tr>
<td>Ireland</td>
<td>1964</td>
<td>NL</td>
<td>Cap 2% of premiums</td>
<td>Post</td>
<td>No</td>
<td>65% w/cap</td>
<td>Borrowing power</td>
</tr>
<tr>
<td>Italy</td>
<td>2006</td>
<td>NL*</td>
<td>5% of premiums</td>
<td>Ante</td>
<td>No</td>
<td>100% w/cap</td>
<td>None</td>
</tr>
<tr>
<td>Japan</td>
<td>1998</td>
<td>L, NL</td>
<td>% of premiums</td>
<td>Ante</td>
<td>No*</td>
<td>80 – 100%</td>
<td>None</td>
</tr>
<tr>
<td>Korea</td>
<td>1996</td>
<td>L, NL</td>
<td>% of premiums</td>
<td>Ante</td>
<td>No</td>
<td>100% w/cap</td>
<td>None</td>
</tr>
<tr>
<td>Latvia</td>
<td>1999</td>
<td>L, NL, H</td>
<td>1% of gross premiums</td>
<td>Ante</td>
<td>No</td>
<td>100%, 50%, both w/cap</td>
<td>None</td>
</tr>
<tr>
<td>Malta</td>
<td>1986</td>
<td>L, NL</td>
<td>0.125% of gross prem.</td>
<td>Ante</td>
<td>No</td>
<td>75% w/cap*</td>
<td>Borrowing power</td>
</tr>
<tr>
<td>Norway</td>
<td>1996</td>
<td>NL</td>
<td>1% of gross premiums</td>
<td>Ante</td>
<td>No</td>
<td>90 – 100%</td>
<td>None</td>
</tr>
<tr>
<td>Poland</td>
<td>1991</td>
<td>L, NL</td>
<td>1% of gross premiums*</td>
<td>Post*</td>
<td>No</td>
<td>50%, 100%, both w/cap</td>
<td>None</td>
</tr>
<tr>
<td>Romania</td>
<td>2001</td>
<td>L, NL</td>
<td>0.3%, 0.8% of gross pr.*</td>
<td>Ante</td>
<td>No</td>
<td>100%</td>
<td>None</td>
</tr>
<tr>
<td>Spain</td>
<td>2004</td>
<td>L, NL</td>
<td>0.3-3% of premiums*</td>
<td>Ante*</td>
<td>No</td>
<td>Up to 100% w/cap*</td>
<td>None</td>
</tr>
<tr>
<td>U.K.</td>
<td>2001</td>
<td>L, NL</td>
<td>Cap 0.8% of net prem.</td>
<td>Ante</td>
<td>No</td>
<td>90%*</td>
<td>Borrowing power</td>
</tr>
<tr>
<td>U.S.</td>
<td>1983</td>
<td>L&amp;H, P&amp;C</td>
<td>% of premiums*</td>
<td>Post*</td>
<td>No</td>
<td>100% w/cap*</td>
<td>National associations/funds</td>
</tr>
</tbody>
</table>

* see original working paper for details/remarks
Why guaranty schemes?
Point of view of the European Union

- IGS provide **last-resort protection to consumers** when insurance undertakings are unable to fulfill their contractual commitments (e.g., in case of insolvencies)

- **Only a few E.U. member states** have one or more insurance guaranty schemes in place

- **Lack of harmonization** in this area may hinder effective and equal **consumer protection**. This may lead to a **loss of consumer confidence** in the relevant markets and may ultimately put at risk market stability. It may also impede the functioning of the internal insurance market by **distorting cross-border competition**

- In the **banking** and the securities sectors specific directives on guarantee schemes have been adopted **since 1994**

- Recent financial turmoil has made **people** far more **aware of the existence and limits of consumer protection/guarantee schemes** in all financial sectors

---

Review of status quo and current discussions

**Background & status quo**

- Guaranty funds with different coverage in different countries
- In the E.U., 26% of all life and 56% of all non-life insurance policies unprotected
- E.U.-wide harmonization in discussion, in other countries discussion about introduction
- **Fund contributions mostly (premium) volume-based**
  - Why harmonization?
  - Why introduction?
  - Discussion boosted due to financial crisis

**Known incentives**

**Adverse incentives**

- Effects of ex-post premiums
- Non-risk-adequate ex-ante premiums
- Basically danger of wealth transfers among insureds of different insurance companies
- Increase of risk appeared in practice on listed insurers in the U.S. (Lee et al., 1997)
- Difficult interaction with other regulation tools (solvency capital requirements)

**Positiv incentives**

- Strengthening trust / consumer confidence (customer perspective)

**Note: compulsory membership**

- See Akerlof’s argument on adverse selection

---

(Further) reasons for insurance guaranty schemes?

**Systemic risk?**
1. Under What Conditions is an Insurance Guaranty Fund Beneficial for Policyholders?

P. Rymaszewski, H. Schmeiser, J. Wagner
Forthcoming in: The Journal of Risk and Insurance

2. The Impact of introducing Insurance Guaranty Schemes on Pricing and Capital Structure

H. Schmeiser, J. Wagner
I.VW-HSG Working Paper No. 80

3. A Proposal for a Capital Market-Based Guaranty Scheme for the Financial Industry

H. Schmeiser, J. Wagner, A. Zemp
I.VW-HSG Working Paper No. 85
Background: Most IGS contributions are ex-ante and premium volume-based

<table>
<thead>
<tr>
<th>Country</th>
<th>Since</th>
<th>Segments</th>
<th>Contributions</th>
<th>Ex</th>
<th>RW</th>
<th>Compensation</th>
<th>Further funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>1972</td>
<td>NL*</td>
<td>Once 1.4 Mio. EUR</td>
<td>Ante</td>
<td>No</td>
<td>100%</td>
<td>Ex-post</td>
</tr>
<tr>
<td>Canada</td>
<td>1988</td>
<td>L&amp;H, P&amp;C</td>
<td>n/a</td>
<td>Ante</td>
<td>No</td>
<td>85%, 70%, both w/cap</td>
<td>Ex-post, borrowing power</td>
</tr>
<tr>
<td>Denmark</td>
<td>2003</td>
<td>NL</td>
<td>Fixed per policy*</td>
<td>Ante</td>
<td>No</td>
<td>100%</td>
<td>State-guaranteed loans</td>
</tr>
<tr>
<td>Finland</td>
<td>1997</td>
<td>NL*, H</td>
<td>Cap 2% of premiums</td>
<td>Ante</td>
<td>No</td>
<td>100%</td>
<td>Ex-post (policyholders)</td>
</tr>
<tr>
<td>France</td>
<td>1999</td>
<td>L, NL, H</td>
<td>0.05% math. prov.*</td>
<td>Ante</td>
<td>No</td>
<td>100% w/cap, 90%*</td>
<td>Borrowing power</td>
</tr>
<tr>
<td>Germany</td>
<td>2002</td>
<td>L, H</td>
<td>0.02% net reserves*</td>
<td>Ante</td>
<td>No</td>
<td>100%*</td>
<td>Ex-post*</td>
</tr>
<tr>
<td>Ireland</td>
<td>1964</td>
<td>NL</td>
<td>Cap 2% of premiums</td>
<td>Post</td>
<td>No</td>
<td>65% w/cap</td>
<td>Borrowing power</td>
</tr>
<tr>
<td>Italy</td>
<td>2006</td>
<td>NL*</td>
<td>5% of premiums</td>
<td>Ante</td>
<td>No</td>
<td>100% w/cap</td>
<td>None</td>
</tr>
<tr>
<td>Japan</td>
<td>1998</td>
<td>L, NL</td>
<td>% of premiums</td>
<td>Ante</td>
<td>No*</td>
<td>80 – 100%</td>
<td>None</td>
</tr>
<tr>
<td>Korea</td>
<td>1996</td>
<td>L, NL</td>
<td>% of premiums</td>
<td>Ante</td>
<td>No</td>
<td>100% w/cap</td>
<td>None</td>
</tr>
<tr>
<td>Latvia</td>
<td>1999</td>
<td>L, NL, H</td>
<td>1% of gross premiums</td>
<td>Ante</td>
<td>No</td>
<td>100%, 50%, both w/cap</td>
<td>None</td>
</tr>
<tr>
<td>Malta</td>
<td>1986</td>
<td>L, NL</td>
<td>0.125% of gross prem.</td>
<td>Ante</td>
<td>No</td>
<td>75% w/cap*</td>
<td>Borrowing power</td>
</tr>
<tr>
<td>Norway</td>
<td>1996</td>
<td>NL</td>
<td>1% of gross premiums</td>
<td>Ante</td>
<td>No</td>
<td>90 – 100%</td>
<td>None</td>
</tr>
<tr>
<td>Poland</td>
<td>1991</td>
<td>L, NL*</td>
<td>1% of gross premiums*</td>
<td>Post*</td>
<td>No</td>
<td>50%, 100%, both w/cap</td>
<td>None</td>
</tr>
<tr>
<td>Romania</td>
<td>2001</td>
<td>L, NL</td>
<td>0.3%, 0.8% of gross pr.*</td>
<td>Ante</td>
<td>No</td>
<td>100%</td>
<td>None</td>
</tr>
<tr>
<td>Spain</td>
<td>2004</td>
<td>L, NL</td>
<td>0.3-3% of premiums*</td>
<td>Ante*</td>
<td>No</td>
<td>Up to 100% w/cap*</td>
<td>None</td>
</tr>
<tr>
<td>U.K.</td>
<td>2001</td>
<td>L, NL</td>
<td>Cap 0.8% of net prem.</td>
<td>Ante</td>
<td>No</td>
<td>90%*</td>
<td>Borrowing power</td>
</tr>
<tr>
<td>U.S.</td>
<td>1983</td>
<td>L&amp;H, P&amp;C</td>
<td>% of premiums*</td>
<td>Post*</td>
<td>No</td>
<td>100% w/cap*</td>
<td>National associations/funds</td>
</tr>
</tbody>
</table>

* see original working paper for details/remarks
Do risk-adequate fund contributions assure advantageousness? – If yes, for whom?

- In the literature / in the current E.U. debate the need for risk-adequate fund contributions is often expressed.
- This is intended to counteract the negative effects of information asymmetries in insurance markets.

- It can be shown that a risk-adequate (source-related) premium assessment is only truly possible in arbitrage-free markets (option pricing framework).
- As far as the guaranty fund stands for diversification of risks, the determination of a risk-adequate (i.e., source-related and arbitrary free) premium is not possible.
- This is due to the fundamental problem of the allocation of (unsystematic) diversification effects.
- Capital transfers between firms are inevitable.

Is an IGS beneficial for policyholders, for the insurance company / equity holders, or for the guaranty scheme (state, tax payers)?
Research focus: Analysis of the impact / incentives following the introduction of IGS

Definition of model framework and analyses

- Model framework with two stakeholders: **policyholders** and **equity holders**
- Consideration of **premium payments** and **claims**, as well as **equity capital endowment**; default risk is explicitly considered
- Starting position: **competitive market with equity-premium equilibrium**

- Risk-adequate equilibrium disturbed by the **introduction of a guaranty scheme**, requiring **ex-ante premium based contributions**
- **Scheme guarantees complete protection (100%) of policyholders claims without cap**
- **Assumption**: **Guaranty funds remains solvent**, if necessary through additional contributions from a third source (e.g., state, tax payers)

- **Incentives for policyholders and insurance companies** immediately after the introduction of the fund
- Implications on the **safety level** of the companies
- **Analysis of three situations with different origin and magnitude of the contributions**
Basic contingent claim model

Policyholders

\[ P_1 = \min(L_1, A_1) = L_1 - (L_1 - A_1)^+ \]

\[ \Pi_0^P = PV[P_1] = PV[L_1] - PV[(L_1 - A_1)^+] = \Pi_0^L - \Pi_0^{DPO} \]

Insurance company

\[ E_1 = A_1 - P_1 = (A_1 - L_1)^+ \]

\[ \Pi_0^E = PV[E_1] = PV[(A_1 - L_1)^+] \]

\[ P_0 = \Pi_0^P \iff E_0 = \Pi_0^E \]

Notes on model / assumptions

- Model Doherty/Garven (1986)
- Complete and arbitrage-free markets
- Risk-adequate positionig of all stakeholders (policyholders, insurer, IGS)

Valuation using Margrabe/Fischer option pricing formula

Safer companies should pay c.p. lower premiums in the IGS – in a volume-based system this can be reversed!
Results (I/III): Premium-based contribution from insurer incentivizes equity capital reduction

### Situation A

- **Policyholders**: $P_0^* = P_0$
- **Equityholders / Insurance company**: $P_1^* = \alpha P_0^*$
- **Insurance Guaranty Fund**: $C_0^* = \alpha P_0^*$

#### Implications and incentives

- Insureds pay the same premium as before IGS introduction (and get full 100% protection)
- Insurance company pays contribution of $\alpha$ percent of its premium volume
- In case of insurer's insolvency, the guaranty fund pays remaining policyholders claim

For the insurance company to get a "fair" risk-adequate return on the invested capital, an **incentive to reduce the equity capital** arises.

Note on minimum equity capital requirements – companies may stop business / industry may disappear!
Results (II/III): Contributions by policyholders can incentivize changing insurance company

**Situation B**

- Policyholders pay premium to insurer and fund contribution equal to a fraction $\alpha$ of the premium (see, e.g., special motor liability insurance schemes)
- Insurance company / equity holders not affected directly
- In case of insurer's default, guaranty fund pays remaining policyholders claim

**Implications and incentives**

From the policyholders perspective the situation strongly depend on the magnitude of the contribution: hence, if the latter exceeds the risk-adequate premium, **insureds are incentivized to choose an insurance company with lowest premium**, i.e. lower safety level / equity capital – to the **detriment of the fund**
Results (III/III): Contribution magnitude defines overall safety level of the insurance companies

Situation C

- Policyholders pay default risk-free premium to the insurer
- Insurance company pays a contribution calculated as a fraction $\alpha$ of the premium volume
- In case of insurer's insolvency, guaranty fund pays remaining policyholders claim

The magnitude of the fund contribution defines the equity capital incentives of the insurers: in the analysed model, the fraction $\alpha$ defines the safety level (equity capital) and sets the target safety equal for all companies
<table>
<thead>
<tr>
<th>Setting</th>
<th>Policyholder position</th>
<th>Equity holder position</th>
<th>Guaranty fund situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Same premium payment $P_0^A = P_0$.</td>
<td>Contribution $C_0^A = \alpha P_0$ to the fund (no charge back to policyholders) leads to negative NPV.</td>
<td>NPV equals $\Pi_0^{DPO} - C_0$.</td>
</tr>
<tr>
<td></td>
<td>Realistic when policyholders are unaware of change of default risk through the introduction of a guaranty fund.</td>
<td>Incentive to lower equity to $E_0^A = E_0^{fair} \leq E_0$ to restore fair situation.</td>
<td>Self-financing only if funds equal insurer’s value of DPO.</td>
</tr>
<tr>
<td></td>
<td>Positive NPV equals value of insurer DPO $\Pi_0^{DPO}$.</td>
<td>If $E_0^A$ is not allowed by solvency requirements, business is discontinued.</td>
<td>In case of positive NPV, additional funding is needed (e.g., from a third source).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Setting</th>
<th>Policyholder position</th>
<th>Equity holder position</th>
<th>Guaranty fund situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Premium $P_0^B = P_0 + C_0^B, C_0^B = \alpha P_0$ as fund contribution.</td>
<td>No contribution to the fund, $E_0^B = E_0$, and NPV is unaffected.</td>
<td>NPV equals $\Pi_0^{DPO} - C_0$.</td>
</tr>
<tr>
<td></td>
<td>NPV equals to $\Pi_0^{DPO} - \alpha \Pi_0^L / (1 - \alpha)$.</td>
<td>In practice insurer would collect policyholder contribution and transfer to fund.</td>
<td>Self-financing only if funds equal insurer’s value of DPO ($\alpha \geq \alpha^{fair}$).</td>
</tr>
<tr>
<td></td>
<td>If $\alpha &gt; \alpha^{fair} = \Pi_0^{DPO} / \Pi_0^L$, incentive to change to insurer with lowest premiums (equity) to restore fair situation.</td>
<td>Reduction of equity to regulatory minimum since policyholders switch to insurers with lowest premiums.</td>
<td>In case of positive NPV, additional funding is needed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Setting</th>
<th>Policyholder position</th>
<th>Equity holder position</th>
<th>Guaranty fund situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Premium $P_0^C = \Pi_0^L = P_0 + \Pi_0^{DPO}$.</td>
<td>Contribution $C_0^C = \alpha P_0$ to the fund, $E_0^C = E_0$.</td>
<td>NPV equals $\Pi_0^{DPO} - C_0$ (see setting A).</td>
</tr>
<tr>
<td></td>
<td>NPV equals to zero.</td>
<td>NPV zero if $C_0^C = \Pi_0^{DPO}$.</td>
<td>If situation for insurers is fair, fund is self-financing (adequate value of assets in system equity holders-guaranty scheme).</td>
</tr>
<tr>
<td></td>
<td>Policyholders pay default risk-free premium and get full protection through the combination of insurer and guaranty scheme.</td>
<td>If situation is unfair, incentive to adapt (lower) equity capital (and hence increase $\Pi_0^{DPO}$) to restore fair situation (if allowed). Parameter $\alpha$ fixes target solvency level.</td>
<td>In case of positive NPV, additional funding is needed.</td>
</tr>
</tbody>
</table>

Fair only if contribution equals value of DPO

Fair only if $\alpha$ is

$$\alpha^{fair} = \frac{\Pi_0^{DPO}}{\Pi_0^L}$$

Fair only if $\alpha$ is

$$\alpha^{fair} = \frac{\Pi_0^{DPO}}{\Pi_0^L}$$

Note: companies are not homogeneous (identical), hence adverse incentives for some
Interaction between Solvency and IGS

- **Numerical illustration of the interaction and relationship**
  Effect of incentives not to be neglected

- **Situation A**
  Incentive: Equity holders lower equity capital in order to reestablish a risk-adequate return with respect to the magnitude $\alpha$ of the IGS contribution

<table>
<thead>
<tr>
<th>Item</th>
<th>Without fund</th>
<th>$\alpha = 0.5%$</th>
<th>$\alpha = 1%$</th>
<th>$\alpha = 2%$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity holder capital</td>
<td>67.5</td>
<td>54.2</td>
<td>46.5</td>
<td>36.9</td>
</tr>
<tr>
<td>Available assets</td>
<td>167.0</td>
<td>153.3</td>
<td>145.0</td>
<td>134.4</td>
</tr>
<tr>
<td>Shortfall probability</td>
<td>0.59%</td>
<td>1.34%</td>
<td>2.17%</td>
<td>3.98%</td>
</tr>
<tr>
<td>Expected policyholder deficit</td>
<td>0.08</td>
<td>0.18</td>
<td>0.30</td>
<td>0.58</td>
</tr>
</tbody>
</table>
Conclusion and outlook

• **Adverse incentives after introducing an insurance guaranty scheme if the contributions are not risk-adequate and not all stakeholders contribute**
  Generally, volume-based contributions, which are identical for all companies / customers, lead to adverse incentives
  (Note: risk-adequate premium calculation only possible in this context)

• **Introduction of a fund in a competitive market and calculation of the contribution to be questioned**
  Existing funds mostly charge volume-based contributions
  Risk-weighting – however defined – is not used (exception: Germany with rudimental adjustement)

• **Incentives partially contrary to minimum capital requirements of solvency regulation**
  Undesired incentives imply in most cases a reduction of the equity capital or customers choosing companies with a lower safety level (equity capital) – to the detriment of the fund
Contact information

Prof. Dr. Joël Wagner
E-Mail joel.wagner@unisg.ch
Phone +41 71 224 36 51

Institute of Insurance Economics
University of St. Gallen
Tannenstrasse 19
CH-9000 St. Gallen
http://www.ivw.unisg.ch