Institute of Insurance Economics

University of St.Gallen

Insurance Pricing: Stock vs. Mutual Insurers

Working Paper by

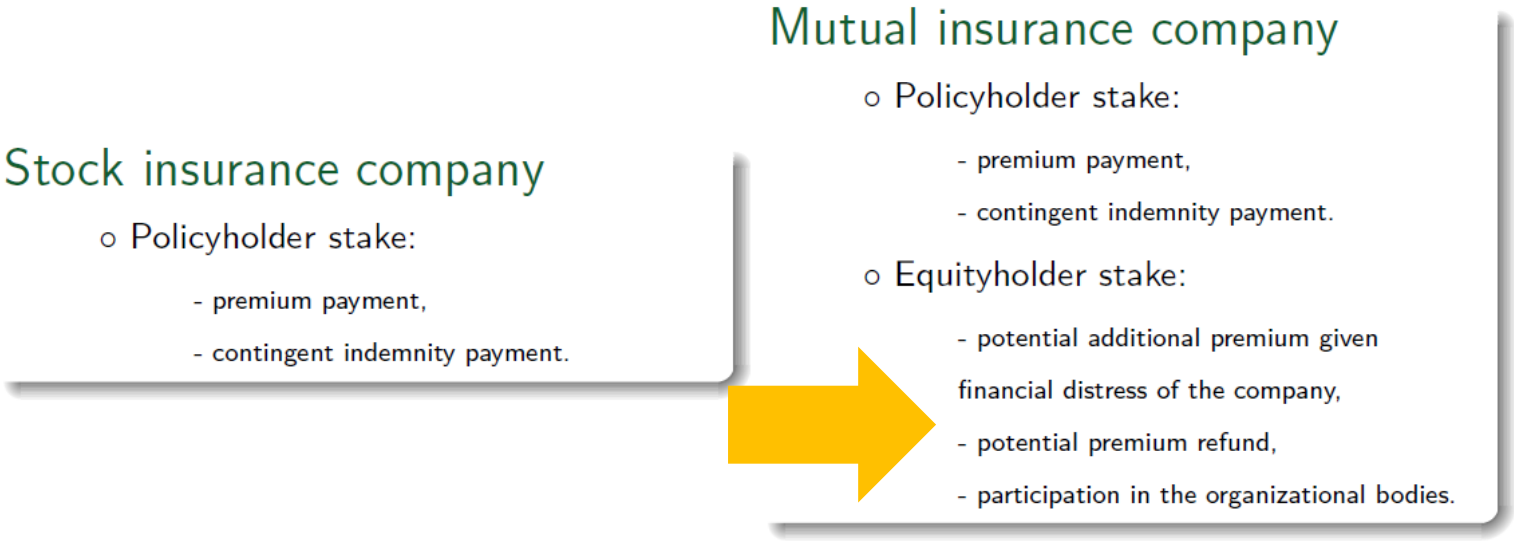
A. Braun, P. Rymaszewski, and H. Schmeiser

Structure

- **Introduction**
- **Model framework**
- **Comparison of competitive premia**
- **Empirical Results and Economic Implications**

Introduction

Mutuals vs. Stock insurance companies: Different rights and obligations should theoretically imply diverging marginal insurance premiums



Aim of the paper: Pricing and breakdown of the competitive insurance premium in a contingent claims setting

Reflection with empirical findings: Comparing the competitive premium with market premiums

Related literature

Structure

- **Introduction**
- **Model framework**
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Stock insurer

No frictional costs

Equityholder stake

$$EC_0^S = e^{-r}\mathbb{E}_0^{\mathbb{Q}}\left(\max\left[A_1 - L_1; 0\right]\right)$$
$$= e^{-r}\mathbb{E}_0^{\mathbb{Q}}\left(A_1 - L_1\right) + DPO_0^S$$

Default put option

$$DPO_0^S = e^{-r}\mathbb{E}_0^{\mathbb{Q}}\left(\max\left[L_1 - A_1; 0\right]\right)$$

Policyholder stake

$$P_0^S = e^{-r}\mathbb{E}_0^{\mathbb{Q}}\left(L_1\right) - DPO_0^S$$

Stock insurer

Frictional costs

Three forms of market frictions are included (cf. Jensen and Meckling,1976)

1. Agency costs of outside equity

Owner manager conflict

2. Agency costs of debt

Shareholders have incentives to prompt management to change the com-pany's risk strategy after policyholders have bought their contracts ("asset substitution problem")

3. Bankruptcy costs (costs of financial distress)

Transactions costs are assumed to be financed by the remaining value of the firm's assets

Bankruptcy costs rise with the probability of default and are primarily of concern to the policyholders, since they reduce their payoffs in those states where the shareholders' claims on the firm are already forfeit

Stock insurer

Frictional costs

1. Agency costs of outside equity

Starting point in a competitive market

$$A_0 = \mathcal{EC}^{\mathrm{S}} + \Pi^{\mathrm{S}} = EC_0^{\mathrm{S}} + P_0^{\mathrm{S}}$$

Agency costs of equity AC faced by the stockholders

$$\begin{aligned} AC_0^{\mathrm{S}} &= e^{-r}\mathrm{E}^{\mathbb{Q}}\left(AC_1^{\mathrm{S}}\right) \\ &= e^{-r}\mathrm{E}^{\mathbb{Q}}\left(\alpha_S \max\left[A_1 - L_1, 0\right]\right) \\ &= \alpha_S e^{-r}\mathrm{E}^{\mathbb{Q}}\left(A_1 - L_1 + \max\left[L_1 - A_1, 0\right]\right) \\ &= \alpha_S\left(e^{-r}\mathrm{E}^{\mathbb{Q}}\left(A_1 - L_1\right) + DPO_0^{\mathrm{S}}\right) \end{aligned}$$

Present value of the equity capital in the presence of AC

$$\begin{aligned} EC_0^{\mathrm{Sf}} &= EC_0^{\mathrm{S}} - AC_0^{\mathrm{S}} \\ &= (1 - \alpha_S)\left(e^{-r}\mathrm{E}^{\mathbb{Q}}\left(A_1 - L_1\right) + DPO_0^{\mathrm{S}}\right) \end{aligned}$$

Consequences?

Stock insurer

Frictional costs

2. Agency costs of debt

In this context, owner-policyholder conflict can not result in "real" costs (cf. Gavish and Kalay, 1983) but may lead to a wealth transfer. For instance, let us assume

$$EC_0^{\mathrm{S}}(\sigma_H) > EC_0^{\mathrm{S}}(\sigma_L)$$

$$P_0^{\mathrm{S}}(\sigma_H) < P_0^{\mathrm{S}}(\sigma_L)$$

Using the high risk strategy “H”, shareholders provide an initial contribution in line with the present value of future cash flows based on “H” (and not “L”)

Rational policyholders should adjust their initial contribution (premium) too

If not: wealth transfer will take place

Stock insurer

Frictional costs

3. Bankruptcy costs

$$\begin{aligned} BC_0^{\mathrm{S}} &= e^{-r}\mathrm{E}^{\mathbb{Q}}\left(BC_1^{\mathrm{S}}\right) \\ &= e^{-r}\mathrm{E}^{\mathbb{Q}}\left(\beta L_1 \mathbf{1}_{A_1<L_1} - \beta \max\left[L_1 - A_1, 0\right]\right) \\ &= \beta e^{-r}\mathrm{E}^{\mathbb{Q}}\left(L_1 \mathbf{1}_{A_1<L_1} - \max\left[L_1 - A_1, 0\right]\right) \\ &= \beta\left(BPO_0^{\mathrm{S}} - DPO_0^{\mathrm{S}}\right) \end{aligned}$$

Interpretation

$$\begin{aligned} P_0^{\mathrm{Sf}} &= P_0^{\mathrm{S}} - BC_0^{\mathrm{S}} \\ &= e^{-r}\mathrm{E}^{\mathbb{Q}}(L_1) - (1-\beta)DPO_0^{\mathrm{S}} - \beta BPO_0^{\mathrm{S}} \end{aligned}$$

Summary

$$A_0 = \underbrace{EC_0^{\mathrm{Sf}}}_{\mathcal{EC}^{\mathrm{Sf}}} + \underbrace{P_0^{\mathrm{Sf}} + BC_0^{\mathrm{S}} + AC_0^{\mathrm{S}}}_{\Pi^{\mathrm{Sf}}}$$

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Frictional costs are carried by the policyholders
Policyholders need to be risk-avers and cannot replicate future payoffs

Mutual insurer

No frictional costs

Equityholder stake

$$EC_0^{\mathrm{M}} = e^{-r}\mathrm{E}^{\mathbb{Q}}\left(A_1 - L_1\right) + RO_0^{\mathrm{M}} + DPO_0^{\mathrm{M}}$$

Recovery option

Default put option

$$DPO_0^{\mathrm{M}} = PO_0^{\mathrm{M}} + BPO_0^{\mathrm{M}'}$$

$$PO_0^{\mathrm{M}} = e^{-r}\mathrm{E}^{\mathbb{Q}}\left(\max\left[X - A_1, 0\right]\right)$$

PV of an European put option

$$BPO_0^{\mathrm{M}'} = e^{-r}\mathrm{E}^{\mathbb{Q}}\left(AP^{\max}\mathbf{1}_{A_1<X}\right)$$

Cash-or nothing binary put option

$$X = L_1 - AP^{\max}$$

Mutual insurer

No frictional costs

The PV of the recovery option is given by

$$RO_0^{\mathrm{M}} = DPO_0^{\mathrm{S}} - DPO_0^{\mathrm{M}}$$

Interpretation

Extreme case a): A mutual with no recovery option $AP^{max} = 0$. In this case we simply get

$$PO_0^{\mathrm{M}} = DPO_0^{\mathrm{M}} = DPO_0^{\mathrm{S}}, \text{ and } BPO_0^{\mathrm{M}'} = 0$$

Extreme case b): $AP^{max} = L_1$. DPO of the mutual is worthless, but the recovery option is maximized

Since the DPO of the stock company ceteris paribus perfectly decomposes in two parts in the case of a mutual insurer, the equity capital is the same for both legal forms

Mutual insurer

No frictional costs

Interpretation

Policyholders face ceteris paribus a higher safety level if $AP^{max} > 0$ (in the existence of a recovery option)

Formally because of

$$DPO_0^{\mathrm{M}} < DPO_0^{\mathrm{S}}$$

Intuitively spoken: Each mutual client enters a binding commitment ex ante, before it is revealed whether he or she actually suffers a loss. If due, the additional premium in t = 1 then needs to be paid by all members, not just by those with valid claims. Consequently, the probability that the latter are fully indemnified is greater for a mutual than for a stock firm

Recovery option is equivalent to contingent equity capital and hence can be accounted for by European mutual insurers when calculating their solvency capital charges (Solvency I and II regime)

Mutual insurer

No frictional costs

Ownership stake

In general, no secondary market for ownership stakes exist

Value of ownership stake depends on premium refund policy of the mutual and the ability of the members to prompt an initial public offering of break-up the company

Formal description:

$$\gamma = p_L + (1 - p_L)\delta$$

Thereby, let δ be the premium refund ratio and p_L the probability of demutualization or liquidation of the mutual

Interpretation of γ (ε [0,1]): Expected payoff per unit of equity capital

Mutual insurer

No frictional costs

Ownership stake

Equity stake must be derived into two parts: a) in the present value of the member capital

$$MC_0^{\mathrm{M}} = \gamma \left(e^{-r} \mathrm{E}^{\mathbb{Q}} \left(A_1 - L_1 \right) + RO_0^{\mathrm{M}} + DPO_0^{\mathrm{M}} \right)$$

and in an unrealizable part b) which can not be used by the current members

$$FC_0^{\mathrm{M}} = (1 - \gamma) \left(e^{-r} \mathrm{E}^{\mathbb{Q}} \left(A_1 - L_1 \right) + RO_0^{\mathrm{M}} + DPO_0^{\mathrm{M}} \right)$$

Complex situation in the assumed arbitrage-free setting. The full amount of equity is required in t = 0. However, rational current members are not willing to finance b). Assumption: Capital providers for b), whose repayments is contrac-tually guaranteed, step in

In practice, we face a wealth transfer between policyholder generations

Mutual insurer

No frictional costs

Policyholder stake

$$P_0^{\mathrm{M}} = e^{-r}\mathrm{E}^{\mathbb{Q}}\left(L_1\right) - RO_0^{\mathrm{M}} - DPO_0^{\mathrm{M}}$$

Premium

In the absence of frictions, we have

$$A_0 = \mathcal{FC}^{\mathrm{M}} + \Pi^{\mathrm{M}} = FC_0^{\mathrm{M}} + MC_0^{\mathrm{M}} + P_0^{\mathrm{M}}$$

In general, premiums must be larger within the mutual company because of the ownership stake

Mutual insurer

Frictional costs

1. Agency costs of outside equity

Mayers and Smith, 1981 and 2005, argue that mutual insurance companies are equipped with less efficient governance mechanisms than stock insurers and should therefore be associated with higher agency costs of equity. Consequently, we assume

Hence

$$\alpha_M > \alpha_S$$

with

$$AC_0^{\mathrm{M}} = \alpha_M EC_0^{\mathrm{M}} = \alpha_M \left(MC_0^{\mathrm{M}} + FC_0^{\mathrm{M}}\right)$$

$$\begin{aligned} MC_0^{\mathrm{Mf}} &= MC_0^{\mathrm{M}} - \alpha_M MC_0^{\mathrm{M}} \\ &= (1-\alpha_M)\gamma \left(e^{-r}\mathrm{E}^{\mathbb{Q}}\left(A_1 - L_1\right) + RO_0^{\mathrm{M}} + DPO_0^{\mathrm{M}}\right) \end{aligned}$$

Mutual insurer

Frictional costs

and

$$FC_0^{\mathrm{Mf}} = FC_0^{\mathrm{M}} - \alpha_M FC_0^{\mathrm{M}}$$
$$= (1-\alpha_M)(1-\gamma)\left(e^{-r}\mathrm{E}^{\mathbb{Q}}\left(A_1 - L_1\right) + RO_0^{\mathrm{M}} + DPO_0^{\mathrm{M}}\right)$$

We assume that rational founding capital providers will not cover any part of the frictional costs AC

Hence, the premium is increased by a loading

$$\Pi^{\mathrm{Mf}} = MC_0^{\mathrm{Mf}} + P_0^{\mathrm{M}} + AC_0^{\mathrm{M}}$$

Again: Frictional costs are carried by the policyholders
Policyholders need to be risk-avers and cannot replicate future payoffs

Mutual insurer

Frictional costs

2. Agency costs of debt

Owner-policyholder conflict not relevant here (Garven, 1987). However, giving additional capital providers, we have

$$MC_0^{\mathrm{M}}(\sigma_H) + P_0^{\mathrm{M}}(\sigma_H) < MC_0^{\mathrm{M}}(\sigma_L) + P_0^{\mathrm{M}}(\sigma_L)$$

$$FC_0^{\mathrm{M}}(\sigma_H) > FC_0^{\mathrm{M}}(\sigma_L)$$

To avoid redistribution of wealth between members and additional capital providers, the low risk strategy will be preferred and correctly anticipated by the founding capital providers with

$$\mathcal{FC}^{\mathrm{Mf}} = FC_0^{\mathrm{Mf}}(\sigma_L)$$

Mutual insurer

Frictional costs

3. Bankruptcy costs

We assume that mutual face the same bankruptcy charge β as the stock insurer

$$BC_0^{\mathrm{M}} = \beta \left(BPO_0^{\mathrm{M}''} - PO_0^{\mathrm{M}} \right)$$

PO is again the present value of an European put option and for BPO we have

$$BPO_0^{\mathrm{M}''} = e^{-r} \mathrm{E}^{\mathbb{Q}} \left(X \mathbf{1}_{A_1 < X} \right)$$

Hence, if the insurer's assets turn out to be below the firm's threshold X, a sum of β A_1 is spent for the bankruptcy proceedings. Again, the present value of the mutual insurer's policyholder stake declines

$$\begin{aligned} P_0^{\mathrm{Mf}} &= P_0^{\mathrm{M}} - BC_0^{\mathrm{M}} \\ &= e^{-r} \mathrm{E}^{\mathbb{Q}}(L_1) - RO_0^{\mathrm{M}} - (1-\beta) PO_0^{\mathrm{M}} - BPO_0^{\mathrm{M}'} - \beta BPO_0^{\mathrm{M}''} \end{aligned}$$

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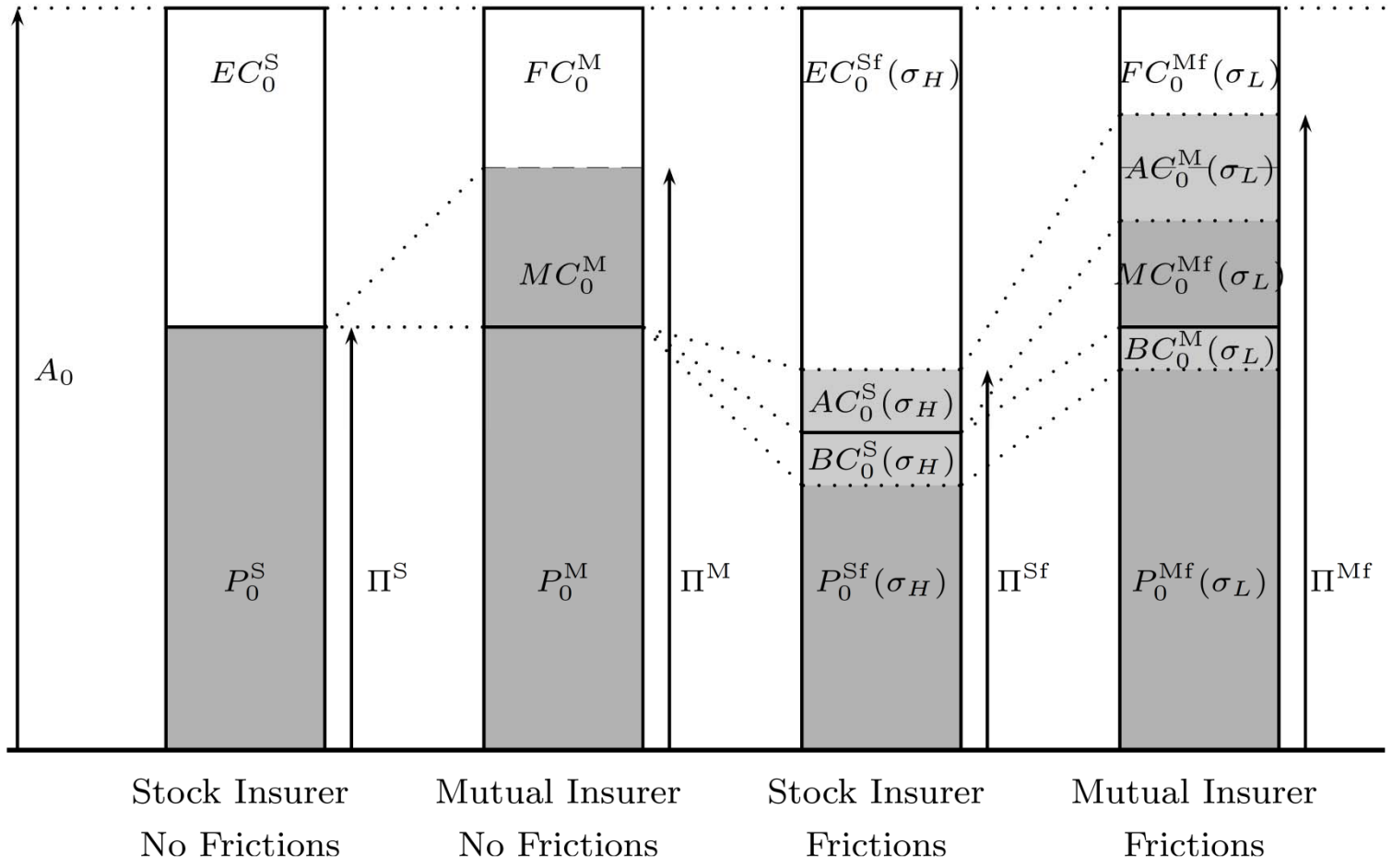
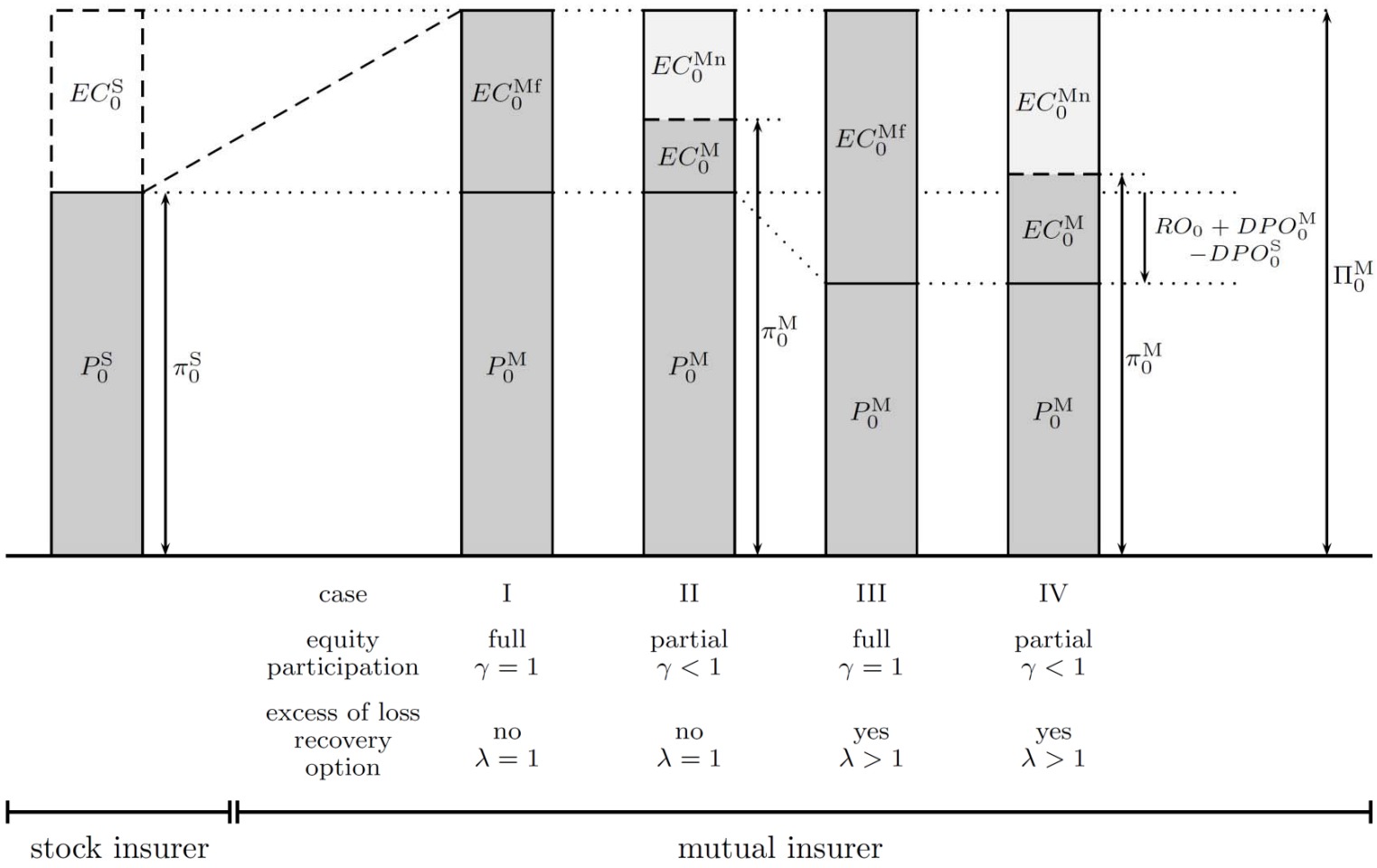
Schematic overview

Frictional costs



Back-up: Schematic overview

No frictional costs



Short wrap-up

In the model setting used, it is hard to find a situation in which a mutual should charge lower premiums than a stock insurance company

This could in particular be the case if the mutual company has a very low safety level compared to the stock insurer

The integration of frictional costs rather increase the discrepancy in respect to "fair“ premiums

Result may not be surprising and is in line with the intuition (mutual members enjoy additional (owner) rights)

It is interesting to see that the mutual concept leads almost unavoidable to wealth transfers between different generations of policyholders

Cf. chapter 4 of the working paper – numerical analysis using option pricing theory

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A quick look in the empirical analysis

Annual account figures for the German motor vehicle liability insurance sector

99 stock and 14 mutual insurance companies

Unbalanced panel data covering 532 and 87 firm years for stock and mutual insurance companies respectively

Price measured by the average annual gross premium (amount of losses in the motor insurance line divided by the number of contracts)

We control for various additional factors which are likely to influence the insurance price (too)

Non of the three used tests* find evidences that mutual companies charge higher premiums than stock insurer

* Hausman-Taylor, FEVD (Fixed Effects Vector Decomposition), FE (Fixed Effects Model)

Interpretation and Implications

Given the Figure shown above, the premium charged by a mutual should exceed the one charged by a stock company

This may not be the case, if the capitalization of the mutual companies and the safety levels are very low

Not the case here (data are tested in respect to capitalization); in addition, the same solvency requirements for both legal forms are in force

Possible explanations

Market faced no competitive pricing; wealth transfer between different stakeholder groups and stakeholder generations take place

Asymmetric information: Policyholders are not aware of their rights in a mutual company / in a stock company and hence are not willing to pay different prices

Former mutual members paid for a part of non-realizable assets without being granted in form of an adequate compensation → current market premiums can be lowered → wealth transfer between generations of policyholders in the mutual company take place

Room for additional research!