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行政院國家科學委員會補助專題研究計畫成果報告

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認知歧異下的最適保險契約

摘要

本篇論文延伸Marshall (1991)的研究，探討當投保人與保險公司對風險發生的機率分配有認知歧異時，此項認知歧異對最適保險契約的影響。本篇論文以機率比隨機優越提出一個對認知歧異的新定義，並利用此一新定義，描述最適保險契約的內涵，並進一步研究風險增加對最適保險契約的比較靜態。

Abstract

This paper extends Marshall (1991) to study the impact of deviant beliefs on the optimal insurance contract. While Marshall (1991) focusing more on the deviant beliefs in loss frequency, we try to explore the impact of the deviant beliefs in loss severity. Instead of using second-degree stochastic dominance as Marshall (1991), we use monotonic likelihood-ratio dominance to define the pessimism of the agents. By this new index of pessimism, we characterize the optimal contract and further examine the comparative static of an increase in risk.

計畫緣由與目的

Since Borch (1962) pioneered to study the risk exchange among insurers, the optimal insurance policy has remained one of key issues in research of insurance theory. Raviv (1979) made another contribution to show that the optimal insurance contract between a risk averse insurer and a risk averse insured involves a deductible and coinsurance above the deductible. Following Raviv (1979), Huberman, Mayers, and Smith (1983), Gollier (1987a, 1987b), and Kaplow (1994) investigate the impact of transaction costs on the optimal insurance policy. Gollier (1996) took another angle to examine the optimal insurance contract when the losses and the claims follow different distributions. Although these researches have provided many ingenious findings in the theory of optimal insurance contract, they share the same assumption, that the insurer and the insured have the same belief in the loss distribution.

Marshall (1991) first addressed this issue, that the insurer and the insured may have deviant beliefs in the loss distribution. He found that the optimal insurance contract can have almost any form, if the pessimism is measured by second-degree stochastic dominance defined by Rothschild and Stiglitz (1971). He further studied the optimal insurance contract when the insured and the insurer attach different probability to the occurrence of the loss but they agree on the probability density function of loss amounts.

This paper is an extension of Marshall (1991). Our paper is different to Marshall (1991) in three ways. First, we assume that both the insurer and the insured have different beliefs in the probability density distribution of the loss amounts rather than the probability of the loss occurrence. Unlike Marshall (1991) focusing more on the impact of the deviant beliefs in loss frequency, we try to explore the impact of deviant beliefs in loss severity (as a distribution). Second, instead of using second-degree stochastic dominance as Marshall (1991), we use monotonic likelihood-ratio dominance to define the pessimism of the agents. The definition of monotonic likelihood-ratio dominance not only provide us more understanding about the interaction of agent's risk preference and agent's pessimism on the optimal contract but also generate unambiguous comparative static of an increase in risk.

結果與討論

Following the approach in Raviv (1979), the optimal policy can be developed by the following Equation.

$$\underset{I(x),P}{Max} \quad EU_b = \int_0^T u(w - x + I(x) - P) f(x) dx$$

$$s.t. \qquad EV_s = \int_0^T v(w_0 - I(x) + P - c(I(x))) g(x) dx \geq K$$

$$0 \leq I(x) \leq x,$$

where K is a constant and $K \geq v(w_0)$.

The first proposition is obtained.

The Proposition

The optimal coverage function under a fixed premium will depend on the range of the difference of the insurer's and insured's likelihood-ratio on loss distribution. The optimal coverage function will be

$$I^*(x) = 0, \text{ if } x \leq \overline{x_1}$$

$$0 < I^*(x) < x, \text{ if } x > \overline{x_1}, \textbf{\textit{and}}$$

$$I^{*\prime}(x) = \frac{R_u(A) + \dfrac{f'(x)}{f(x)} - \dfrac{g'(x)}{g(x)}}{R_u(A) + R_v(B)(1 + c') + c''/(1 + c')},$$

where $A = w - x + I^*(x) - P$,

$B = w_0 - I^*(x) + P - c(I^*(x))$ ***under*** $0 < I^*(x) < x$.

Comparing this result with Raviv's (1979), the difference of likelihood-ratio for the insurer and the insured plays a significant role on the optimal marginal coverage function. Obviously, Raviv's model is a special case where the insurer and insured have the same belief about risk and thus $\dfrac{f'(x)}{f(x)} = \dfrac{g'(x)}{g(x)}, \forall x$.

From the Proposition, we know that the optimal insurance policy is not only determined by absolutely risk averse index of the insurer and insured, but also $\frac{f'(x)}{f(x)}-\frac{g'(x)}{g(x)}$. Let $\theta(x)=\frac{f'(x)}{f(x)}-\frac{g'(x)}{g(x)}$. $\theta(x)$ can be explained as a relative pessimistic index between the insured and the insurer. $\theta(x)\geq 0,\forall x$ means that the insurer's belief on loss distribution is monotonic likelihood-ratio dominated by the insured's belief on loss distribution. According to theories in stochastic dominance [Landsberg and Meilijson (1990) and Ormiston and Schlee (1993)], monotonic likelihood-ratio dominance implies first-degree stochastic dominance and of course second-degree stochastic dominance.

Marshall (1991) found that the optimal insurance contract can have almost any form, if the optimism is defined as second-degree stochastic dominance. Unlike Marshall (1991), our Proposition shows that the optimal insurance policy is deductible with coinsurance above the deductible, as long as the insured is more pessimism defined as monotonic likelihood-ratio dominance.

成果自評

計畫成果對風險歧異下的最適保險契約提供一個完整的整理，我們發現許多契約存在的理由可能部分原因是因爲保險公司與投保人的認知歧異，我們同時也發現保險市場可能因爲保險公司與投保人的認知歧異而瓦解。計畫成果對風險歧異下的最適保險契約提供更深入的理解。

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