A Continuous-Time Optimal Insurance Design with Costly Monitoring under Moral Hazard and Adverse Selection

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Abstract

This paper provides a theoretical framework to study optimal insurance properties with monitoring under two information problems: moral hazard and adverse selection. It explores continuous-time optimal insurance arrangements for general utility forms in an environment in which an insurer cannot observe directly either the effort or the outcome of an insured firm but can verify the outcome via a costly monitoring technology. It shows that, due to the technology, the insurer can write explicitly the optimal insurance contract that differentiates the two information problems. Particularly, when the firm's outcome is low, adverse selection is removed whereas moral hazard is reduced.

Keywords: Insurance, Costly monitoring, Moral hazard, Adverse selection.

JEL Classification: D82, D86, G22, G32.

1 Introduction

In practice, most firms purchase corporate insurance to hedge against various business risks. On the other hand, in theory, we know that, under perfect markets, there would be no rationale for such corporate insurance. Thus the actual demand for corporate insurance should be due to market imperfections such as default costs, agency problems, information problems, and tax asymmetries (for example, see MacMinn and Garven [11]). Among the imperfections, this paper looks at how equilibrium insurance properties are influenced by two information problems: moral hazard and adverse selection.

The two information problems coexist in actual insurance practices. Meanwhile, in contract theory, the conclusion in the basic moral hazard problem is essentially close to the one in the adverse selection problem, except for an inverted causality, from a static (i.e., cross-sectional) viewpoint (Chiappori [4]). Specifically, in both cases, controlling for observables, the choice of a contract will be correlated with the probability of bad corporate outcome – more comprehensive coverage being associated with high risk. This implies that, when observing firms' poor outcomes in static data, the insurer is not sure if it would be due to their low abilities or to their laziness. Accordingly, the insurer faces difficulty with writing appropriate insurance contracts to distinguish adverse selection and moral hazard, although they are essentially different issues.

Against such difficulty, much of the insurance literature has differentiated moral hazard and adverse selection by making use of some different dynamic properties of the incentive structures between the two information problems in insurance contracts for various *exogenous* cases (typically, a reform of regulatory framework), without using dynamic optimal (i.e., *endogenous*) insurance properties (e.g., Abbring et al. [1]). Furthermore, most of the literature assumes only costless reporting as a communication method, as usual in contract theory.[1] On the other hand, however, in insurance practices, insurance companies verify the

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[1]In the previous contract-theory literature, communication games with costless reporting have been studied a lot in finite-horizon (typically, two or three period) discrete-time models. There are a few exceptions in a literature on insurance fraud (e.g., Dionne, Giuliano and Picard [6], Picard [13]).