ABSTRACT

Usage Based Insurance (UBI) is one of the most recent innovations by auto insurance companies that links the premium rates of customers to their actual driving performance. In this program, the drivers' behaviour is monitored directly while they drive. Then, based on the assessed data, the insurance company offers some discounts to the customers. This paper provides a theoretical model to capture the effects of this monitoring technology on the auto insurance market. We formulate the problem as a dynamic principal-agent model with hidden information and hidden action. An agent (customer) privately knows his type that summarizes his ability as a driver and can make a hidden effort in each period to drive carefully, which affects his subsequent type. The principal (insurer) offers a long-term contract to the agent despite the fact that she observes neither the type of the agent nor the actions taken by him. The driving behaviour of the agent captured through monitoring devices is a noisy signal of his type and effort in each period, which is observable to both the agent and the principal. We characterize the full history-dependent optimal contract for this dynamic adverse selection and moral hazard problem. In order to compute the optimal contract, we develop a general recursive formulation. The underlying system is a Markov decision process, where the evolution of the state of the system (type of the customer) is endogenous, as it depends on his hidden action in the previous period. We develop a dynamic programming algorithm to examine the model analytically and explore structural results about the optimal contract. The model results lead to important and interesting managerial insights for firms considering UBI programs. This study sheds light on how to design the contract to manage a UBI program, the extent to which a UBI policy can outperform a traditional policy, and how the potential gains depend on the demographics of the targeting market.

(Copies of the paper are available in the AOIS Department offices)