Association for Information Systems
AIS Electronic Library (AISeL)

ICIS 1999 Proceedings

International Conference on Information Systems (ICIS)

December 1999

Information Sharing and Regulation Effect in Experimental Insurance Markets

Taeha Kim
University of Arizona

INFORMATION SHARING AND REGULATION EFFECT IN EXPERIMENTAL INSURANCE MARKETS

Taeha Kim
University of Arizona
U.S.A.

Abstract

Recent advances in information technology and regulatory policies have changed the way firms do business in the insurance industry. Information technology has increased insurance companies' access to information about consumer riskiness, thereby enabling the implementation of more effective organizational strategies. For example, health insurance companies may use genetic testing technologies to determine the insured's risk of acquiring specific diseases. In addition, insurance companies may use data mining technology, intelligent search engines, and decision support tools to unravel relationships between consumer behaviors and their riskiness and their risk attitude.

However, recent trends in regulatory policy tend to prohibit insurance companies from using information technology to gather and use such consumer information to price insurance policies. One example of such informational privacy legislation is the NJGPA, which prohibits individual health insurance companies in New Jersey from using any genetic information to price policies or deny coverage.

It is difficult to test the impact of the regulatory policy on the insurability of individuals with real world data, because there are so many unobserved and uncontrolled factors affecting the data. Observations of agents' behavior in a controlled experimental environment might provide insights to the economic impact of these policies. Following experimental economic methods, we test a set of hypotheses in a laboratory.

1. INTRODUCTION

Insurance companies are making IT investments to gain competitive advantage in their industry. According to the META Group Report (1999), insurance companies already use enterprise-wide data repository and data mining technology to develop algorithms that predict an individual's likelihood of developing a medical condition or having an accident, enabling them to segment their consumers and to price policies more effectively. However, recent public regulations may prevent the companies from using information technology to gather the information required by these algorithms or to make accurate predictions. Theoretically, markets become more efficient by providing insurance companies with more accurate assessments.

Will such regulations on the use of information technology or information sharing lead to market outcomes desired by legislature? Answering this question is difficult empirically in real markets since the test needs strict control of the information level of sellers and buyers as well as the elimination of extraneous noise in the market. Hence we examine the issue in a controlled environment using the method of experimental economics.

We want to examine information policy effects on the market outcomes given experimental market settings. This paper consists of three sections. Section 2 proposes research questions and propositions. Section 3 describes the initial experiments designed to test these propositions.

2. RESEARCH QUESTIONS AND PROPOSITIONS

To validate the effect of information sharing and regulation, we design three information regimes: naïve market, public information market, and reputation market (see section 3 for more detail). We notice in the literature that different equilibrium concepts are drawn out of different assumptions on market institutions. Previous work has focused on single period insurance markets with various equilibrium concepts, none of which accurately portray competition among firms in the insurance market (Pauly 1974; Riley 1979; Shapiro 1983; Rothschild and Stiglitz 1976;Wilson 1977). Our market institution deviates from the institutions in that (1) it is multi-period, (2) sellers can post and observe other contracts, and (3) then sellers can update their contracts many times in a given time period.

These differences propose a more realistic market than a single period market with simultaneous policy offer. These major deviations make it too complex to analyze the market equilibrium from the classic theoretic approach, so that we propose a controlled market experiment.

First of all, we test the effect of information sharing on the market outcomes by comparing three information regimes. We differentiate the information of individuals' riskiness given to sellers. Sellers are best informed in the public information market since they share all of the information of individual customers. Sellers in the reputation market can build up their information only by making contracts with individuals. In the naïve market, sellers have no information about individual's riskiness.

> **Proposition 1**: Separating market equilibrium will be achieved in all information regimes.
>
> **Proposition 2**: The public information market will be most efficient among all information regimes. Buyers will be fully insured in the market.
>
> **Proposition 3**: Reputation will play a screening mechanism. Less efficient separating equilibrium will be achieved than in the public information market. Quality signaling will be observed and buyers will expect lower premiums or more coverage in order to make up the signaling cost.

3. EXPERIMENTAL DESIGN

The experimental properties of three experimental markets are listed below. The naïve market is the basic market and the other two markets are the variations of the naïve market.

3.1 Naïve Market

This experiment consists of 10 period bargains between 10 buyers and five sellers. All agents' trades are anonymous. Each buyer knows her own risk type, which is either high-risk or low-risk. Every buyer has one unit of insurance to buy per period.

Table 1 shows a subject pool of 25% and 10% accident rate. Sellers are informed of the total number of the buyers, types of risk, payoff structure, and the proportion of high-risk buyers. Each seller can post only a single payment-deductible contract and should sell as many units as buyers want in a period.

All subjects will be endowed with 100 units of experimental money, which is $10; they will be informed that bankrupt subjects will immediately be dismissed from the experiment and depart with only the show-up fee of $5.

Sellers move first: they select payment and deductible policies, with the understanding that they must be willing to sell to all buyers who want to purchase the policy. Each seller posts only one policy at a time; he can see others' policies and can update his policy in a given time period. After the given time period, all posting stops and the policies offered are posted on the screen of buyers.

Then buyers move: they can buy any policy posted by sellers in a given time. Each buyer can purchase only one policy. At the end of the period, each buyer's computer draws out a random number. If the number is within the accident interval, the seller pays to his buyer the total loss less deductible. Then the market closes and reopens for the next time period.

Table 1. Two Types of Subjects in the Market

	Buyer 1	Buyer 2	Buyer 3	Buyer 4	…
Accident Rate	25%	10%	25%	10%	…
If No Accident,	10	10	10	10	…
If an Accident Happens,	-20	-20	-20	-20	…

3.2 Public Information Market

All buyers have their nicknames and therefore show their identity to sellers when buyers ask to purchase contracts. Every seller has an option whether to accept or reject a buyer's ask. Sellers share all their trade information about their buyers, so past accidents and contracts of all buyers are common information to sellers.

3.3 Reputation Market

All settings are the same with the public information market except that sellers do not share information. Each seller can build up his buyers' past information only by trading with the buyers.

3.4 Instructions and Interfaces

Experiments do not rely on the "role playing" of each agent; however, we use insurance-specific terms such as "insurer-insureds" and "payment-deductible" because these terms are easier to convey instructions to subjects. In order to minimize extraneous noise in experimental outcomes, all experiments will be conducted in the same way. We give the same interface and instruction to all subjects with small variations according to the different market regimes. A statement of purpose is included in the instruction so that the subjects' curiosity about why we are willing to pay them for participating in this experiment is satisfied.

We will provide examples in the instruction but there is high possibility that some subjects blurt out their private data when they ask clarifying questions to the experimenter, so we try to minimize the possibility by eliminating such private information from the instruction and by warning subjects against revealing it in their own queries.

User interfaces are designed with Visual Basic and both seller's and buyer's interfaces are shown in Figures 1 and 2.

3.5 Experimental Markets and Subject Groups

We propose a 2 × 3 experimental design, so that we need six experimental markets (Table 2.)

Each subject group will have 10 periods total and each period will take up three minutes, so that total time for experiments for each group is estimated one hour, including instructions and payments after the experiments.

3.6 Pilot Experiments

We conducted a pilot experiment in order to develop the design and procedures of new experiments described above. We discovered many things, including ambiguities in the instructions, missing information, unintended leak of information, too much

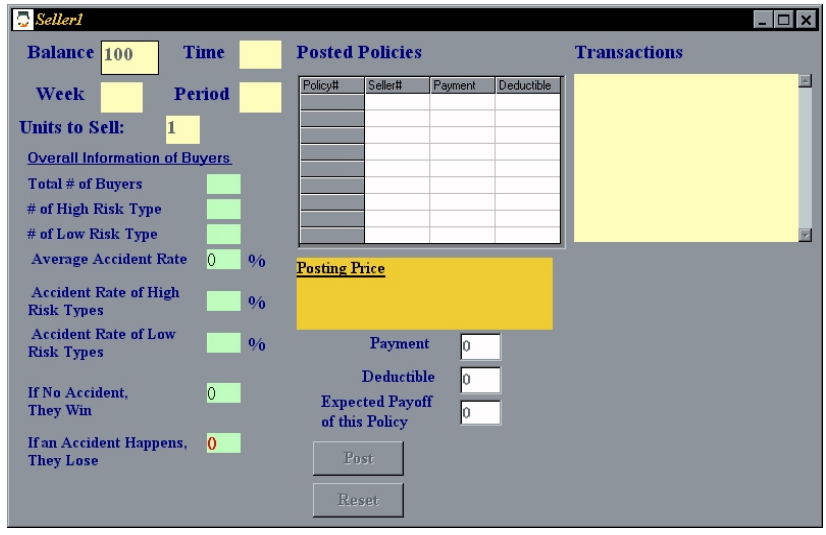

Figure 1. Seller's Interface

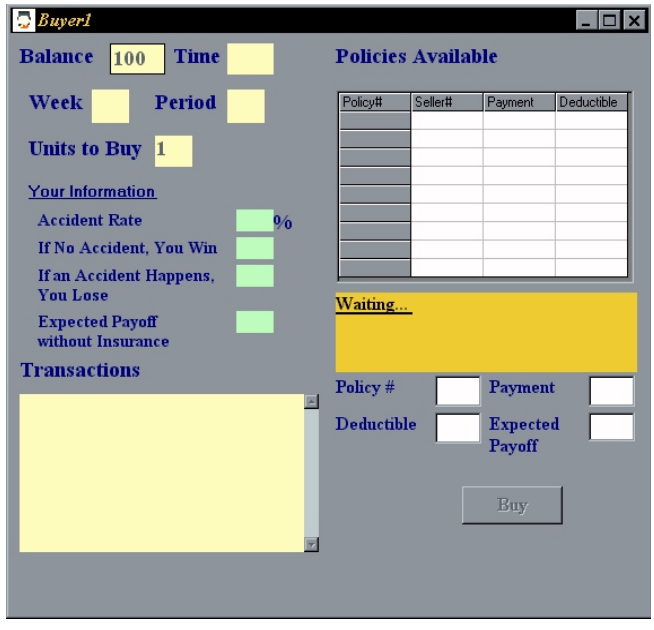

Figure 2. Buyer's Interface

Table 2. 2 × 3 Experimental Markets

	Naïve Market	Reputation Market	Public Provision Market
High Proportion of High-risk Buyers	H	HR	HP
Low proportion of High-risk Buyers	L	LR	LP

time for some activities and too little for others, weakness and errors in software or random number generating devices, insufficiency of assistants, and lack of coordination and timing of tasks.

All data from the pilot was saved and examined to verify all parameters including the number of periods, the number of subjects, and the amount of endowment.

3.7 Analyses

We will investigate the equilibrium for all markets, whether they converge to a pooling or a separating equilibrium, and compare the equilibriums with high proportion and with low proportion of high-risk clients in naïve, reputation, and public provision markets. Graphs and summary statistics from our experiments will be used to test the propositions. All messages among subjects will be captured and summarized.

Both by plotting market outcomes on the graph and by running statistical tests, we expect to test how the data fit to separating or pooling equilibrium. We will compare different markets in the perspective of optimality and market participation. We need to draw market efficiency, i.e., how this market performed in realizing potential seller and buyer surplus. One market may be better in attracting more buyers and sellers than another markets. We will try to find the order of markets in terms of market efficiency. Table 3 shows all comparison needed to analyze.

Table 3. Analyses of Markets
(P: proportional effect; M: market comparison)

Markets	H	HR	HP	LR	LP
L	P			M	M
LR		P			M
LP			P		
H		M	M		
HR			M		

4. REFERENCES

META Group Report, "META Group Announces Critical Healthcare IT Survival Guide," February 16, 1999 (http://www.metagroup.com/).

Pauly, M. V. "Overinsurance and Public Provision of Insurance: The Roles of Moral Hazard and Adverse Selection," *The Quarterly Journal of Economics* (88:1), February 1974, pp. 44-66.

Rothschild, M., and Stiglitz, J. "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," *The Quarterly Journal of Economics* (90:4), November 1976, pp. 629-649.

Shapiro, C. "Premiums for High Quality Products as Returns to Reputation," *The Quarterly Journal of Economics* (98:4), November 1983, pp. 659-680.

Wilson, C. "A Model of Insurance Markets with Incomplete Information," *Journal of Economic Theory* (16), 1977, pp. 167-207.

Riley, J. G. "Information Equilibrium," *Econometrica* (47:2), March 1979, pp. 331-360.