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**Tests for the Presence of Moral Hazard in Iranian Car
Insurance Market (The case of Iran Insurance Company)**

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Abstract

Moral hazard refers to the effect of insurance coverages to alter an individual's motive to prevent loss. This influences expenses for the insurer and the cost of coverage for individuals. Moral hazard arises when people behave in ways to satisfy themselves, but because they don't bear the full cost; their behavior comes at the detriment of others. For example, if the contents of our car are fully insured against theft, we will be less diligent in locking it up and taking other precautions against theft. Moral hazard is special case asymmetric information, a situation in which one party in a transaction has more information than another. The party that is insulated from risk generally has more information about its actions and intentions than the party paying for the negative consequences of the risk. Coinsurance and deductibles reduce the risk of moral hazard by increasing the out-of-pocket spending of consumers, which decreases their incentive to consume. Thus, the insured has a financial incentive to avoid making a claim.

Beginning with Arrow (1963) and Pauly (1968), economists have discussed two partial solutions to the problem of moral hazard:

- i) Incomplete coverage against loss
- ii) "Observation" by the insurer of the care taken to prevent loss.

We test for the presence of moral hazard in the car insurance market utilizing the Iranian car insurance data sets. Mainly, we investigate whether the number of policyholders who has a low valued car is quite small in the purchase of collision insurance. For this purpose, in our sample, we use the data of those who purchased two types of coverage and those who purchase only third party insurance. Then, we want to see whether the number of people in the first group is substantially small for low valued cars.

If the percentage of first group (who purchased both types) is relatively high with respect to these who only purchase third party insurance among owners of low-valued cars, we can conclude there may exist moral hazard in automobile insurance market.

This study question which variables influence on moral hazard and basic hypothesis is that moral hazard exists in Iranian automobile insurance market. We expect that policyholders of low-value cars choose only third party insurance if there is no moral hazard.

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Chapter 1

Introduction and Literature Review

1.1 Introduction

Since the seminal papers by Akerlof (1970) and Rothschild and Stiglitz (1976) the informational asymmetries in various market contexts have been one of the main concerns in economics. Before these pioneering researches exploring the catastrophic phenomenon, the general equilibrium theory had been constructed quite solidly at the heart of the mainstream economics.

Needless to say, the presence of informational asymmetries is not only a theoretical problem but also a fairly practical problem in the sense that it has affected economic agents in the society on the daily basis. Although most economists have been aware of the importance of the presence of informational asymmetries in the economic activities and trades between agents, there have been relatively quite few empirical researches on this problem compared with rather flourishing theoretical researches. This has been supposed to be mainly due to the difficulties of obtaining the relevant data set for the empirical works.

The literatures on empirical contract theory have been rapidly growing recently. Particularly, most works have been done with an intensive use of insurance data sets. The primary concern has been detecting the presence of such phenomenon as moral hazard, adverse selection and both. As Chiappori (2000) points out, in practice, the distinction between adverse selection and moral hazard may be crucial from a normative point of view. For instance, if the hidden action is the main cause of the presence of asymmetric information, introduction of stronger incentive system is likely to be useful and justified. However, if the selection is the main driving force, low risk types must sacrifice some desired insurance protection in order to avoid being pooled with high risk types. Thus, the problem is not resolved

without a cost. In this case, the introduction of more sophisticated risk classification mechanism tends to be effective (Lee, 2006).

In this thesis, we attempt to make a contribution to this direction of research using the Iranian car insurance data sets.

1.2 Literature Review

1.2.1 Researches focusing on Moral Hazard together with Adverse Selection

Prescott and et al (1984) in a paper entitled "optima and competitive equilibria with adverse selection and moral hazard" explore the extent to which standard, general equilibrium analysis of Pareto optima and of competitive equilibria can be applied to environments with moral hazard and adverse selection problems. Allowing for lotteries, contracts with random components-he first establishes that an adverse selection insurance economy, a moral hazard insurance economy, a signalling economy and a private-information labor market economy are all special cases of a simple, general structure. He then shows that techniques for characterizing Pareto optimal contracts as solutions to concave programming problems are useful and nice and appear to be broadly applicable; allowing for lotteries, he shows to characteristics the optimal allocations for the adverse - selection insurance and labor market economies. He then shows that standard existence and optimality theorems for competitive equilibria apply in the linear space contracting lotteries if agents with characteristics which are distinct and privately observed at the time of initial trading enter the economy-wide resource constraints in a homogenous way (other kinds of diversity are not critical). For economics with moral hazard which satisfy the homogeneity condition, competitive contract markets single out a subset of the optima and thus can be

consistent with apparent unemployment and with a random allocation of labor supplied though all households are averse to risk. The adverse-selection insurance and signalling economies, however, do not satisfy the homogeneity condition and are difficult to decentralize efficiently with a price system.

Abbring (2003) in paper of "adverse selection and moral hazard in insurance" has 3 ways for testing moral hazard that is following:

Firstly, he tested moral hazard from sequences of accident counts. Secondly, he tested moral hazard from total number of accidents. Finally, he tested moral hazard under experience rating.

Dionne (2004) uses longitudinal data to perform tests of asymmetric information in the French automobile insurance market for the period of 1995-1997. This market is characteristic by the presence of a regulated experience-rating scheme (bonus-malus). He demonstrates that the result of the test depends crucially on how the dynamic process between insurance claims and contract choice is modeled. He applies a Granger causality test controlling for the unobservables. He found evidence of moral hazard which he distinguishes from moral hazard and adverse selection using a multivariate dynamic panel data model. Experience rating appears to lead high risk policyholders to choose contracts that involve less coverage over time. These policyholders respond to contract changes by increasing their unobservable efforts to reduce claims.

Chiappori et al (2005) show that positive correlation between risk and coverage can be extended to much more general setting, generally speaking competitive and non competitive markets. They confirmed a nonnegative correlation between risk and coverage in the French insurance market.

Young (2006) tests the presence of moral hazard and adverse selection in the car insurance market utilizing the Korean car insurance data sets. First, using

regulatory change in the market implemented in 2000 in Korea, he analyzes the changes in the accident probabilities over time, particularly focusing on the time period before and after the change. Assuming that the hidden characteristics are controlled for given an exogenous institutional change, he investigates the presence of moral hazard. Further, he attempts to find out the evidence of moral hazard using a unique identification strategy. He first derives a testable prediction from the simple theoretical model. Then, he implements a nonparametric analysis using bounds to test this prediction. In addition, as a complementary work, he implements a simple statistical work using conditional variance identity to detect the presence of adverse selection. He find out the evidence of the presence of moral hazard phenomenon while he unable to find out adverse selection problem.

Keshavarz (2007) tests asymmetric information using a sample of 69553 policyholders in Iran Insurance Company. Tests were concluded with the conditional independence Bivariate Probit Model and nonparametric Statistics which have been pioneered in chiappori and salanie (2000) and chiappori et al (2005). The distinctive feature of the research is the use of individual data of policyholder in oligopolistic automobile insurance market in Iran. His findings confirm Realistic expectation and Positive correlation in Iran's Automobile Insurance Market, which indicates a strong evidence of adverse selection, moral hazard or both in the market. These results imply inefficiency in Iran automobile insurance market and the presence of informational inconsistent insurance contracts in the insurance industry in Iran; He divides literature about asymmetric information into two types.

1-Classical theories of asymmetric information (moral hazard and adverse selection): These theories predict a positive correlation between risk and coverage. Rothschild, M. and J. Stiglitz (1976), Arnott, R., and Stiglitz, J. (1988), chassagnon,

A., and P.A.chiappori et al (2005) based on different assumptions and in various frameworks, confirm the positive correlation. Although, their arguments are theoretical, Pulez and Snow (1994) and Cohen (2005) verify the hypothesis empirically.

2-Theories which predict a negative or no correlation between risk and coverage are the second stream in the literature. Hemenway (1992) is the pioneer in this stream. He raised propitious Selection, according which the negative correlation holds. De Meza and Webb (2001), jullien et al (1999), and Koufopoulos (2004) shows the non positive correlation, theoretically by using parametric and nonparametric tests, and finally Saito (2006) confirmed asymmetric information empirically.

1.2.2 Research focusing on Moral Hazard

Dionne (1982) presents first the choice of the optimal insurance policy under a state-dependent utility function (S.D.U.F.) when the probabilities of loss are dependent on the actions of the insured. Moral hazard is shown to be an important problem under the S.D.U.F. This paper also verifies whether the problem of moral hazard is more or less important under a S.D.U.F. than under a state-independent utility function (S.I.U.F.). The measure of moral hazard in terms of insurance coverage is a function of two factors: 1) the uncertainty to the individual of the accident or illness and 2) the dependence of the marginal utility of income on the states of the world. The first factor always has a negative effect on moral hazard, but the second may affect moral hazard in different ways. Finally the paper analyses the variation of the deductible with moral hazard and finds that the optimal deductible does not necessarily vary in the same way as moral hazard.

Lee (1992) analyzes the effect of public provision of a loss-preventive good on equilibrium in an insurance market under moral hazard. The primary advantage of public provision lies in its ability to produce information, which alleviates moral hazard since the level of the public good is publicly known. However, public provision entails an efficiency loss since the public good level cannot be tailored to suit individual demands. The analysis formalizes this cost-benefit trade off involved in public provision, and discusses when public provision improves on market equilibrium. While public provision of loss-preventive goods has not been discussed in the literature, casual observation suggests that sometime public loss-preventive goods play much more important roles in the insurance market than private loss-preventive goods do.

Litton (1995) illustrates the concept of moral hazard with two empirical studies bearing on moral hazard as perceived by insurance underwriters –accident-proneness and social class differences. The focus of the article then switches from the basis of ascription towards consideration of the existence of insurance fraud. An empirical study suggests that insurance fraud may be more prevalent than generally recognized—a view which is supported by the results of two surveys conducted by insurance organization themselves. Many statements are made, and views held within insurance, about both moral hazard and insurance fraud and these are usually thought to influence insurer's actions. Moral hazard is about insurers making judgments; insurance fraud is about the behavior of policyholders.

Cummins (1996) and et al provide new evidence on moral hazard in insurance markets by analyzing the frequency of automobile bodily injury liability (BIL) claims. He conducts cross-sectional regressions of statewide BIL claims frequency rates on variables representing state economic, demographic, and legal characteristics that affect the marginal costs and benefits of filing claims. As an

indicator of moral hazard, he uses survey data on consumer attitudes toward various types of dishonest behavior relating to insurance claims. The results provide strong support for the hypothesis that attitudes toward dishonest behavior are related to BIL claims frequency, and thus provide evidence of significant moral hazard in automobile insurance markets.

Prescott (1999) in paper of "A primer on Moral-Hazard Models" uses another approach to analyzing moral-hazard models whereby he computes solutions to numerical examples. There are two advantages to this approach. First, it can be used to study problems that are not amenable to analytical methods. Indeed, the methods for computing numerical examples in this article succeed in cases in which the standard analytical simplification does not apply. The second advantage to computing solutions is that it gives one the ability to answer quantitative questions. In this article, he uses linear programming as the computational technique for solving moral-hazard programs. He concludes that numerical methods should become an increasingly effective way to study moral-hazard and other private-information problems.

Browne and puelz (1999) study the economic consequence of tort reform. First, they test the relationship between tort reforms and claim severity for an automobile liability incident. Second, they test the proposition that tort reforms, by reducing the damages available at trial, have reduced the likelihood that an injured party will seek legal remedy. Using logit model, they confirm that the presence of the reform is associated with a reduction in the likelihood of a claim being filed.

Chiaporri (2000) argued from a specific test for moral hazard. He suggests there that the dynamics of contracts, especially through experience rating, could provide tests in which moral hazard and adverse selection generate opposite predictions. However, such tests require panel data, which are not available at the moment.

This test is based on a peculiarity of the French regulation. Many young drivers face a simple choice. If the car they drive is declared as their personal belonging, they will pay whatever premium the insurance company will charge a young driver. However, they may also declare the car as belonging to one of their parents; the parent is then allowed to lend them the car, at an extra cost that reflects the extra premium required for young drivers to benefit from their parents' bonus coefficient. There possible stories can be considered :(1) Assume, first, that the parents' performances are positively correlated with the child's. Then the 50 percent bonus signals a better driver and should be negatively correlated with accident probability.(2) A second possibility is that the parents' performances are uncorrelated with the child's, and there is no moral hazard. Then the 50 percent bonus is allocated randomly and should not matter for accident probabilities. (3) finally, assume that parent's and child's performances are uncorrelated but there is some moral hazard.

Cohen (2001) states that finding a correlation between deductibles and risk type is also a necessary condition for the presence of moral hazard. His findings that such a correlation exists indicate that the rejection of moral hazard in this market by recent work was premature. Thus, the findings of this paper, while consistent with adverse selection, could be all produced by moral hazard.

Dionne et al (2001) in the paper "Role of Memory in Long-term Contracting with Moral Hazard" test the efficiency associated with the role of memory in long-term contracting. Bonus –malus schemes in automobile insurance are examples of contracts that use memory. During the eighties different contributors showed how multi-period contracting under moral hazard improves resource allocation. However, Allen (1985), fudenberg et al. (1990), Rey and salanie (1990) and chiappori et al. (1994) stressed the fact that the above models did not consider the

possibility of savings. Indeed it can be shown that the optimal level of action (or safety in automobile insurance) can be a function of the agent's saving activity. Consequently, it is not clear that introducing a bonus- malus scheme in automobile insurance will work efficiency to reduce moral hazard. His empirical result shows, however, that the introduction of the new bonus-malus scheme in the Quebec automobile insurance industry reduced accidents and traffic violations. This structural change was a transition from a contract regime without memory and can be interpreted as a laboratory experiment to test for the efficiency of the role of memory in reducing moral hazard.

Erfani (2003) in paper "Insurance and Moral hazard problem and Symmetric and Asymmetric Information" considers Moral hazard as an impact of insurance on insured. He express the fact that people after getting insurance for their properties, pay less attention to their insured property. For this reason, the cost of insurance companies has been raised sharply. To solve this problem, insurance companies are thinking about measures such as coinsurance and deductible. However in order to optimize one insurance contract, symmetric and asymmetric information is required. In the case of symmetric information, insurance contract which maximizes insurance company's profit is of "full insurance" and it has Pareto efficiency. But in case of asymmetric information, the insurance company must provide "full insurance" with low-level effort by insured for maximizing profit. This insurance contract is optimal although it doesn't have Pareto efficiency.

Abbring and colleagues (2003) exploits dynamic features of insurance contracts in the empirical analysis of moral hazard. He first shows that experience rating implies negative occurrence dependence under moral hazard: individual claim intensities decrease with the number of past claims. He then shows that dynamic insurance data allow to distinguish this moral-hazard effect from dynamic selection

on unobservable. He develops nonparametric tests and estimates a flexible parametric model. He found no evidence of moral hazard in French car insurance. His analysis contributes to a recent literature based on static data that has problems distinguishing between moral hazard and selection and dealing with dynamic features of actual insurance contracts. Methodologically, this paper builds on and extends the literature on state dependence and heterogeneity in event-history data.

Abbring (2007) provides an empirical analysis of ex ante and ex post moral hazard in car insurance. Ex ante moral hazard entails that agents respond to changes in incentives by changing the risk of losses. Ex post moral hazard concerns the effects of incentives on claiming actual losses. The distinction between ex ante and ex post moral hazard is important because of their different welfare consequences (e.g. Chiappori, 2001). Moreover, empirical analysis is based on a theory of ex ante and ex post moral hazard that connects moral hazard to data on both claim rates and sizes, and thus facilitates more careful inference on moral hazard. This paper uses longitudinal micro data on claims from a Dutch insurer and develops tests of absence of moral hazard that have power against moral hazard alternatives that are likely to arise under the bonus-malus scheme used in the Netherlands. Also he extends Abbring et al (2003) empirical analysis by analyzing the sizes of claims.

Jenifer L. Wang (2008) uses information on timing and number of claims in a unique data set pertaining to comprehensive automobile insurance with the increasing deductible provision in Taiwan; he provides new evidence for moral hazard. Time-varying correlations between the choice of the insurance coverage and claim occurrence are significantly positive and exhibit a smirk pattern across policy months. This empirical finding supports the existence of asymmetric information. Subsample estimation depicts insured drivers significant responses to

increasing deductibles, which implies the existence of moral hazard. According to the probit regression results, the increasing deductible makes policyholders who have ever filed claims less likely to file additional claims later in the policy year. The empirical findings strongly support the notion that the increasing deductible provision helps control moral hazard.

Bourles (2009) examines moral hazard on dynamic insurance contract. He models primary prevention in a two period model with classification risk. Agent's preferences appear to play an important role in the determination of preventive effort and prepayment. If absolute prudence is larger than twice absolute risk aversion, moral hazard increases prepayment of premium and classification risk. This highlights a tradeoff between prevention and prepayment that arises from the classification risk. An increase in the difference between prudence and twice risk aversion (the degree of "protectiveness") moreover makes dynamic insurance contracts more stable (when competing with spot insurance) if the cost of prevention is low enough when agents preferences exhibit CRRA. Under a formulated utility function with linear reciprocal derivative, he finally shows that an increase in agents' degree of "protectiveness" enhances the stability of dynamic contract and the extent of prepayment.

Chapter 2

The Theory of Asymmetric Information and Moral Hazard

2.1 The Definition of Asymmetric Information