Testing for Asymmetric Information in Insurance Markets: A test for ex ante moral hazard revisited

Background

In their influential paper “Testing for asymmetric information in insurance markets” Chiappori and Salanié (2000) proposed a test for asymmetric information using a French insurance claims data set, which contained a rich set of controls for the insurer’s information set. In France, the insurer’s information set includes the bonus-malus which is an index that reflects automobile crash history. A bivariate probit model was specified wherein the first probit predicts the level of insurance and the second probit predicts the occurrence of a claim. The null hypothesis of no asymmetric information was tested with two parametric tests of the following hypotheses: (i) \( H_0: \text{cov}(\varepsilon_i, \eta_i) = 0 \) when the two probits are estimated separately and (ii) \( H_0: \rho = 0 \) when the model is estimated as a bivariate probit. To control for the potentially confounding effects of adverse selection, the analysis was limited to a sub-population of beginner drivers. No evidence of asymmetric information was found.

Chiappori and Salanié (2000, p. 72) then specified a test for moral hazard, which exploited “...a kind of natural experiment...” the authors identified. The authors argue that, in France, a beginner driver can ‘inherit’ their parent’s bonus-malus coefficient if they declare that their car is jointly-owned with their parents. The minimum bonus-malus index, which indicates a safe driver, is 0.5. They construct a dichotomous variable. The inherited bonus-malus (IBM) is equal to one if the beginner driver inherits a bonus-malus coefficient of 0.5 from their parent and zero if otherwise. This binary variable IBM is added to the Insurance and Claims probit models. They argue that two processes, moral hazard and familial correlation, enable the sign on the coefficient for IBM in the Claims model to be utilized to test for ex ante moral hazard, as follows (the bold fonts are our emphasis):

Three possible stories can be considered: (1) ... 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) ... 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 parents’ and child’s performances are uncorrelated but there is some moral hazard. Then we are facing a kind of natural experiment, as some drivers face a different incentive scheme for exogenous reasons. Since the
marginal cost (to the insured) of an accident is increasing with the bonus coefficient, one should expect that a lower bonus coefficient decreases incentives and thus leads to larger accident probabilities. (Chiappori and Salanié, 2000, pp. 71-72).

Moreover, the results from this test for ex ante moral hazard continue to be promulgated and in 2013 were represented in the Handbook of Insurance as a quasi-natural experiment (Chiappori and Salanié, 2013).

Analysis

Potentially there are two concerns with this test for moral hazard. The first is analytical and relates to the claim that the two countervailing hypotheses, moral hazard and familial correlation produce three unambiguous effects on the sign on the IBM coefficient ($\alpha_{IBM}$). In Table 1 we construct a two-by-two matrix of all possible interactions between familial correlation and moral hazard to demonstrate that there in fact four possible effects combinations, not three. Cells 1, 2 and 3 correspond respectively to the Options 2, 3 and 1 as hypothesized by Chiappori and Salanié (2000, pp. 71-72). However, the net effect identified in Cell 4 is ambiguous and could correspond to the outcome of cells 1, 2 or 3 if the magnitude of familial correlation is equal to, less than or greater than that of moral hazard, respectively.

Table 1: The effects of familial correlation and moral hazard on probability of a claim

<table>
<thead>
<tr>
<th>Nil Familial Correlation ($FC_0$)</th>
<th>Nil Moral Hazard ($MH_0$)</th>
<th>Moral Hazard ($MH_1$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell 1</td>
<td>MH: Nil correlation</td>
<td>MH: Positive correlation</td>
</tr>
<tr>
<td>Cell 2</td>
<td>FC: Nil correlation</td>
<td>FC: Nil correlation</td>
</tr>
<tr>
<td>Cell 3</td>
<td>Net: Nil correlation</td>
<td>Net: Positive correlation</td>
</tr>
<tr>
<td>Cell 4</td>
<td>MH: Nil correlation</td>
<td>MH: Positive correlation</td>
</tr>
<tr>
<td></td>
<td>FC: Negative correlation</td>
<td>FC: Negative correlation</td>
</tr>
<tr>
<td></td>
<td>Net: Negative correlation</td>
<td>Net: Ambiguous</td>
</tr>
</tbody>
</table>

Thus, the negative coefficient reported for $\alpha_{IBM}$ simply implies that the familial correlation effect is greater than the moral hazard effect. One cannot reject the ex ante moral hazard hypothesis per se. Likewise if $\alpha_{IBM}$ was equal to zero, one cannot conclude the absence of moral hazard and familial correlation. It may simply be that their comparative effects are equal.

A second concern relates to the implicit assumption that the variable IBM was collected, but not used, by insurers to risk rate potential policyholders. Chiappori and Salanié (2000) proposed that the variable IBM be excluded from
the insurer’s information set for the purpose of conducting a natural experiment. However a natural experiment is typically understood as having occurred: "...when some (often unintended) feature of the setup we are studying produces exogenous variation in an otherwise endogenous explanatory variable (Wooldridge, 2002, p. 88).

Contrary to the assertion that the drivers ‘...face a different incentive scheme for exogenous reasons’ (Chiappori and Salanié, 2000, p. 72), there are two plausible reasons why the allocation of the IBM is endogenous and its coefficient negatively correlated with a claim. First, as hypothesized by Chiappori and Salanié (2000), driving skills may be inherited. Second, beginner drivers who operate a jointly owned vehicle may have an additional incentive to exercise preventive effort. The alternative is to assume that young drivers are indifferent between crashing a personal and family car.

We contend that the IBM is an element of insurer’s conditioning set. First, French insurers are observed to collect the parent’s bonus-malus. Second, Chiappori and Salanié (2000, p. 71) reported French insurers use it to price the adult child’s insurance premium. Third, the test for “moral hazard” confirms that IBM is negatively correlated with a claim (Chiappori and Salanié, 2000, p. 72). Thus the evidence suggests that the IBM is used to risk rate potential policyholders and therefore fails the technical requirements of a natural experiment.

Conclusion

We hope that by drawing attention to these issues, other economists may be assisted in the difficult and ongoing task of differentiating ex ante moral hazard and adverse selection empirically.

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References

