

Near-Miss Accidents

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January 14, 2019

Abstract

Risk preference is a fundamental factor in studies on economic agents' decision-making behavior under uncertainty. Existing empirical work has shown that individuals are very heterogeneous in their risk attitudes, and these attitudes vary with gender, age, and wealth. (Cohen and Einav, 2007; Fang, Keane, and Silverman, 2008). Although standard economic models usually assume that individuals' risk preferences remain the same over time, there is an emerging literature that focuses on the time-varying risk attitudes.

Among papers that investigate whether individuals' risk preferences change after negative shocks such as financial crisis, civil wars, or natural disasters (i.e. hurricane, earthquake, tsunami etc.), the findings are inconclusive. For example, Guiso, Sapienza, and Zingales (2018) find evidence that consumers' risk aversion increases substantially after the 2008 financial crisis. Cohn et al. (2015) also document that investors are more risk averse in financial busts compared to booms using laboratory experiments. While on the other hand, Cameron and Shah (2015), Hanaoka, Shigeoka, and Watanabe (2018) show that individuals become more risk tolerant after the exposure to natural disasters, and the effects are persistent.

The main goal of this paper is to investigate the time-varying patterns of agents' risk preferences. Specifically, we are interested in whether agents become more risk-averse after near-miss accidents. This question is particularly important in auto-insurance markets. In auto insurance, the dominant pricing scheme is experience rating, whereby premiums rise for insurees who experience an at-fault claim. This makes sense in a stationary environment where individuals' risk aversion is constant. However, if drivers become more risk-averse after

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accidents or even near-miss accidents, the experience-rating scheme might not be necessary and could lead to a welfare loss. Therefore, designing optimal dynamic pricing mechanisms in insurance markets requires our knowledge on how agents' risk attitudes evolve after occurrences of undesirable outcomes.

In this paper, we utilize a novel dataset from a Chinese Insurance Tech firm, which tracks and compiles data on users' driving patterns using existing smart phone functions, such as GPS and other sensors. In the dataset, we observe detailed trip information for a nationwide representative sample of more than 69,000 drivers between 2015 and 2018. For each trip, we observe the starting and ending time and location (in latitude and longitude), whether or not near-miss accidents, emergency brakes, aggressive acceleration, or use of cellphones have occurred (if so, the time and location of these incidents are also recorded). In addition, we observe drivers' demographics, the characteristics of their vehicles, as well as their insurance purchase decisions (price and plan coverage details). Unlike datasets that only have claims, this dataset provides direct and much richer information on customers' driving patterns over a significant period of time, both before and after adverse events. This helps us to construct a better measure related to driver's risk preferences over time.

One institutional setting in Chinese auto-insurance markets makes it particularly appealing for studying whether near-miss accidents trigger a higher level of risk aversion. In US auto-insurance markets, the premium paid by the customer adjusts quickly: for example, if a driver has an accident, he/she will be charged a higher premium next month. Given this situation, if we observe different driving patterns before and after an accident, it is hard to disentangle whether the change is induced by a higher price or a different risk attitude. In China, auto-insurance policies are renewed each year, and annual premiums typically prepaid at the initiation of the contract; within the year, however, the premium remains the same no matter how many accidents occur. This institutional setting helps us to identify the real impact of time-varying risk preferences from agents' strategic reactions to price changes.

Compared to the existing literature on time-varying risk aversion, our approach makes the following contributions. Our analysis is, as far as we know, the first to study time-varying risk aversion in insurance markets. Risk attitudes are of central importance for insurance pricing, and understanding the transition process of risk preferences in insurance markets is the key to many important policy questions. Moreover, extrapolating results from insurance markets to other settings where individuals make similar risky decisions may have its own interests. We utilize panel data on individuals' driving patterns, which helps us to take into account unobserved heterogeneity. If only a cross-sectional dataset is available, comparing risk attitudes between drivers who have experienced accidents with those who did not have any accident is problematic, as these two groups may be inherently

different. We estimate risk-preference from actual decisions of regular market participants. This complements existing literature on time-varying risk attitudes, which have primarily utilized survey or experimental data.

In summary, this paper aims to understand time-varying risk aversion and its implication in auto-insurance markets. The unique and novel dataset enables us to estimate agents' risk attitudes from decision-making processes in the field. This research can provide new insights and guidance for the optimal dynamic pricing of insurance contracts.

Keywords: time-varying risk aversion, automobile insurance

JEL Code: G22, D82, D91

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