Nash equilibria in Over-The-Counter Bargaining for Risk Redistributions; the Role of a Regulator

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Extended abstract

In this paper, we study bilateral bargaining for optimal risk redistributions. Firms can benefit from sharing risk if their risk is not perfectly correlated. The model that we define can be used in several fields, but its application is most prominent for insurance risk. In this paper, we focus on a class of risk that has low liquidity. For this class of risk, we assume that there do not exist a well-functioning market. The reason is that there is an incomplete market and, also, there are trade frictions. Hence, these risks are typically traded Over-The-Counter (OTC). Trading Over-The-Counter means that firms can only trade when they meet each other. The firms bargain for a fair risk redistribution and a fair price. We study markets where equilibrium prices do not exist. We determine the prices implicitly via a bargaining process. This bargaining process reflects each firm’s alternatives to trade. When two counter-parties meet, their bilateral relationship is strategic. Of key interest for a firm is how to determine their bargaining strategy.

Firms are often enforced to hedge their risk by a regulator. A worst-case scenario should have relatively low consequences for the firm. This makes holding risky portfolios expensive. So, firms want to reinsure themselves for losses in the “tail” of their risk distribution. This means that a part of the losses in the worst-case scenarios is sold to an insurer. An insurer asks typically a high risk premium to hedge the risk, meaning that the firms pay more than the expected payment that is determined by the contract. However, for the class of risk we focus on, the market is illiquid. Finding an insurer does not need to be possible. Therefore, firms could trade Over-The-Counter with each other. Hence, there is an opportunity to redistribute a part of their risk without a high risk premium.

As a key example, we consider catastrophe and longevity risk. For both classes of insurance risk, firms cannot find an exchange market to buy a hedge against their exposure to insurance risk. Reinsurance contracts do exist, but the capacity of reinsurance is limited. Also, the right prices of CAT-bonds and longevity-linked securities are very debatable. Therefore, equilibrium prices do not exist. For this reason, these contracts are mainly traded Over-The-Counter. In this paper, we allow firms to have heterogenous beliefs regarding the underlying probability distribution. This might increase the potential to
benefit for firms (see Boonen et al., 2012).

Of key interest is the question how firms come to an agreement in bargaining for risk redistributions. We focus on the strategic behavior of the firms. First, we parameterize the strategic behavior of firms to redistribute their own risk. This means that a part of their own risk will be transferred to the counter-party. As an example, we suggest that firms use the stop-loss rule or the proportional rule. Firms reinsure themselves in a stop-loss way. This means that the firm pays the stochastic payoff up to a threshold, which is determined in advance. The insurer pays the rest. Then, firms reinsure their worst-case stochastic losses. This treaty is often observed in practice of reinsurance. On the other hand, Firms can use the proportional rule, where firms redistribute their own risks via a quota share.

Using an insurance principle, firms are simultaneously proposing a redistribution of their own risk to the counter-party. The risk will be redistributed if both firms decide to accept after having observed each other’s strategy. Firms use a von Neumann-Morgenstern expected utility function to evaluate their future losses. So, a utility function represents the preferences of a firm. We assume that there is complete information about each other’s utility function. Since there is complete information, one could expect that bargaining will result in a Pareto optimal outcome. However, we show that this does not need to be the case. It is even the case that almost all Nash equilibria are such that the status quo will be retained. This result is in line with the Prisoner’s dilemma.

We provide a cooperative bargaining model to characterize optimal regulation. The regulator is allowed to make binding agreements regarding the strategies of the firms. Since our model satisfies all properties that Nash imposes, we will discuss a widely supported solution concept in cooperative bargaining. In our setting, a solution concept assigns to every risk redistribution bargaining problem an optimal strategy. This strategy is enforced by mandating a firm to keep a part of its original risk. We discuss the Nash bargaining solution (Nash, 1950)

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**References**

