# Bargaining for Over-The-Counter Risk Redistributions: The Case of Longevity Risk

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## Abstract

In this paper, we define a cooperative game-theoretic model for the optimal redistribution of risk between economic agents. Gerber and Pafumi (1998) show that Pareto optimal redistributions of risk are obtained by pooling the risks, and then reallocating them to the agents in a proportional way with side-payments. First, we extend this result by allowing for the fact that agents may have heterogeneous beliefs regarding the underlying probability distributions. Second, we model the reallocation problem as a Non-Transferable Utility (NTU) game, and show that the core of this game is non-empty. We then show how the model can be used to determine optimal redistributions of longevity risk. Longevity risk is the risk faced by insurers and pension providers due to the fact that survival probabilities of the insured's change in an unpredictable way. Because there are to date relatively little opportunities to hedge this risk via capital markets solutions, an attractive alternative may be to mitigate the adverse effects of the risk via redistributions between pension funds, who face the risk that participants live longer than expected, and death benefit insurers, who face the risk that individuals live shorter than expected. In this setting, heterogeneous beliefs regarding the underlying probability distributions may arise from the use of different models to predict future mortality rates. We consider a \real-life" setting, and use the model to quantify the potential benefits from redistributing the risk. In line with the Solvency II regulations, the goal is to reduce the volatility of the net asset value (value of the assets minus value of the liabilities) on a one-year horizon. We find that the benefits from redistribution can be substantial.