Market valuation of financial, actuarial and combined risks

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Abstract:
Many insurance companies sell products which involve financial risks as well as non-financial risks, e.g. actuarial risks. Typical examples are catastrophe bonds or unit-linked insurance products. According to the Solvency II Directive, insurance and reinsurance undertakings should apply a market consistent valuation principle to all their assets and liabilities. The possibility to identify a unique market consistent value depends on the extent to which the asset or liability is readily traded in a deep, liquid and transparent market.

In this paper, we consider a risk that is faced by an insurance company where perfect replication is not possible in the financial market. This implies that markets are incomplete and a unique valuation of the risk is not available. In order to value this risk, we first set up an optimal hedge by using the traded assets in the market. In this way, we eliminate the hedgeable part of the risk. In a second step, the remaining part which cannot be replicated is then priced under a standard actuarial premium principle. This principle results in a unique market consistent value for a given choice for the optimal hedge and the actuarial premium principle. The overall market consistent value is then the market value of the replicating portfolio of the hedgeable part plus the price of the unhedgeable part under the actuarial premium principle.

In case of hedgeable risks or if the hedgeable and the unhedgeable risks are mutually independent, this principle boils down to the traditional technique. New insights are given for products of risks where dependence comes into play.

Keywords: Market consistent valuation, mean-variance hedging, financial risks, actuarial risks, incomplete markets.