A note on the independence between financial and actuarial risks

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Abstract

Probability statements concerning future evolutions of financial and actuarial risks are expressed in terms of the ‘real world’ probability measure $\mathbb{P}$, whereas in an arbitrage-free environment, the prices of these traded risks are expressed in terms of an equivalent martingale measure $\mathbb{Q}$. Although the assumption of independence between financial and actuarial risks in the real world may be quite reasonable in many situations, making such an assumption in the pricing world is convenient but hard to understand from an intuitive point of view. Moreover, it turns out that such an independence that is observed in the $\mathbb{P}$-world can often not be maintained in the $\mathbb{Q}$-world. In this note, we investigate under what conditions it is possible or not to transfer the independence assumption from $\mathbb{P}$ to $\mathbb{Q}$. More generally, we show that a real-world positive dependence structure between financial and actuarial risks may even transform into a negative dependence structure in the pricing world.

Keywords: Independence, real world probability measure $\mathbb{P}$, risk-neutral probability measure $\mathbb{Q}$, financial risks, insurance risks

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