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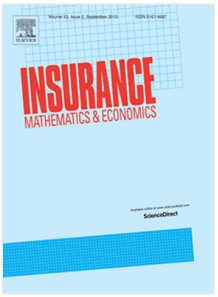

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SOLVENCY CAPITAL ESTIMATION, RESERVING CYCLE AND ULTIMATE RISK

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ABSTRACT. In this paper we propose a stochastic model for the evolution of the reserves for a non-life insurance run-off portfolio that captures the dynamic of the reserving cycle, which consists in years of prudent reserves releases followed by sudden reserves strengthening.

In our model we assume that the relative loss developments over time follow a stochastic process with dependent increments, and that the consequently estimated reserves evolve as a stochastic process with discontinuous paths, which all together could be mathematically described as a geometric fractional Brownian motion with random jumps.

The dependence between increments reflects the first phase of the reserving cycle, i.e. prudent reserve releases, whereas the second phase of the cycle is captured by the jumps. Remarkably in our model a jump in the reserves occurs after a period of systematic under-estimation of the losses, as happens in reality.

As a product of our model we propose practical estimators for the Solvency Capital Requirement and the Risk Margin as defined in the European regulation (Solvency II, [1]), and analogously in the Swiss regulation (SST, [4]), as functions of the ultimate risk.

1. INTRODUCTION

In the Solvency II European regulation [1], which will take effect at the beginning of 2016, the risk and thus the capital for the undertaking reinsurers and insurers will need to be evaluated on a one-year time horizon. This represents a major difference from what requested previously and in other regulations where the risk is measured on an ultimate time horizon, that is, until the end of the run-off.

Within the new European regulation the one-year risk for the insurance liabilities is the risk that the technical provisions in one year will exceed materially the technical provisions today, whereas the ultimate risk is the risk that the technical provisions at the end of the run-off will exceed materially the technical provisions today.

For a non-life insurance portfolio the most widely used actuarial method for the one-year risk estimation is the Merz-Wüthrich formula [6]. Explained in a nutshell the Merz-Wüthrich formula, which is similar to the Mack formula [5], consists in estimating the mean square error of the reserves developments over one year based on claims triangles and reserves computed with the chain-ladder method.

The Merz-Wüthrich formula has became a standard in the insurance industry. Indeed it is used as benchmark by regulators and auditors for the one-year risk estimation of any non-life insurance portfolio, regardless whether its assumptions

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