Accepted Manuscript

An option pricing approach for measuring Solvency Capital Requirements in Insurance Industry

Mariarosaria Coppola, Valeria D'Amato, Susanna Levantesi

PII: S0378-4371(18)30657-5
DOI: https://doi.org/10.1016/j.physa.2018.05.113
Reference: PHYSA 19653

To appear in: *Physica A*

Received date : 20 September 2017
Revised date : 7 March 2018

Please cite this article as: M. Coppola, V. D'Amato, S. Levantesi, An option pricing approach for measuring Solvency Capital Requirements in Insurance Industry, *Physica A* (2018), https://doi.org/10.1016/j.physa.2018.05.113

Noname manuscript No.
(will be inserted by the editor)

An option pricing approach for measuring Solvency Capital Requirements in Insurance Industry

Mariarosaria Coppola · **Valeria D'Amato** ·
Susanna Levantesi

Received: date / Accepted: date

Abstract Solvency capital requirements indicated by Solvency II against longevity risk involve distortions and inconsistencies caused by the invariance of the longevity shock compared to the age and time assumed by the regulatory model. To overcome the problem we introduce a temporal structure of the time mortality volatility which is included as a driver of longevity shock, by modelling a rolling window affine stochastic model.
We then derive the longevity shock as a function of mortality rate time volatility evolution and time, according to a Black and Scholes environment. The original approach shows that the suggested internal model is able to reflect the risk profile of a specific undertaker by allowing consequently the level of own funds it needs and removing the effects of the invariance longevity shock.
Numerical illustrations are provided in different settings and they highlight the consistency of the new approach.

Keywords Solvency Capital Requirements · Longevity Risk · Option Pricing.

Mariarosaria Coppola
Department of Political Sciences, Federico II University, via L. Rodino' 22, 80138, Naples, Italy
E-mail: m.coppola@unina.it

Valeria D'Amato
Department of Statistics and Economics, Campus di Fisciano, University of Salerno, via Giovanni Paolo II, 132, 84084, Fisciano, Salerno, Italy
E-mail: vdamato@unisa.it

Susanna Levantesi
Department of Statistics, Sapienza University of Rome, Viale Regina Elena 295-G, 00161, Rome, Italy
Tel.: +39-06-49255303
Fax: +39-06-49255315
E-mail: susanna.levantesi@uniroma1.it