

The 2nd International Conference on Complexity Science & Information Engineering
on Economic Capital Allocation for Property Insurance: from
Aspect of Underwriting Risks in Financial Engineering

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Abstract

Economic capital model embodies many components, of which the measurement is a synthesis of techniques from actuarial science and financial engineering. For insurance company it is an estimate of the level of capital that a firm requires to operate its business. So this article implemented TailVaR model to empirically analyze economic capital of Chinese top six insurance companies in terms of claim ratio on two aspects. One is the measurement of total economic capital. The other is the allocation of economic capital into different lines of business. So the following conclusions can be drawn from this empirical analysis: Firstly, different lines of business should be engineered by different risk management strategies, especially the liability line needs to be improved. Secondly, the effect of “Risk Pool” can reduce the economic capital requirement for unexpected loss. Finally, this article proposed several suggestions on economic capital management for Chinese insurance companies.

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1. Introduction

Economic Capital (EC), called as Capital at Risk (CAR) according to definition of SOA, refers to sufficient surplus to meet potential negative cash flows and reductions in value of assets or increases in value of liabilities, at a given level of risk tolerance, over a specified time horizon. EC is the conception which focuses on the company’s inside capital management that exceeding regulatory requirement. It can not only help to avoid risk, but also create value, which gives the insurance company an approach of capital allocation. So the system economic capital allocation has been becoming a tool of decision-making for insurance company, which plays a significant role in Enterprise Risk Management (ERM) (Hubert Muller, 2005).

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As a financial institute engineering risk pool and diversification, insurance companies face the risk of both policy-holders and insurers, and P&C insurance companies are facing more fluctuated risks than life insurances in terms of loss probability and severity. So how to deal with underwriting risks is the essential issue. Meanwhile, risk management is connected to the capital, which represents the ability of risk aversion and sustainable development of insurance company. So, economic capital management regarded as an advanced tool of financial engineering for risk management, making capital integrated with risk, will lead to the development of insurance sector, of which the research has quite a practical meaning.

There are several researches on economic capital allocation, such as Kimball (1998), who suggested that the allocation of economic capital into different lines will make the total economic capital deviated with the aggregates of separate economic capital lines if the marginal cost analysis not being implemented. H.Markowitz (1987) used mean-variance method to measure the risk of portfolios, which is traditional and classical. The model of VaR (Value at risk) was implemented into economic capital allocation ,which was firstly raised by J.P. morgen corp. TailVaR (Artzner 1999) refers to the loss expectation exceeding $VaR(\alpha)$, being proved as a good coherent risk measurement. Panjer (2001) proposed the capital allocation for different lines of normal distribution on the basis of TVaR. Wang (2002) used “Wang convert” to measure the risk of liabilities in order to quantify capital allocation, which is also named as WX-TVaR. M-P analysis was raised by Merton and Perold (1993), which is on the ground of Black-Scholes Option Pricing Model, and M-P model is regarded as a marginal capital allocation method. Michael Sherris (2004) set up a capital allocation analysis via insolvency put option on the basis of M-R model, which is more specific and practical financial engineering tool since it is consistent with the economic value of the assets and liabilities in balance sheet. Chinese research on EC is just at the beginning. Li Yanghua, Zhang Chengsong, Tang Hongyang (2006) held the point that EC is the trend of risk management for insurance, and analyzed different lines of risks as well as their integration. Cheng Bing (2008) suggested that EC best meet the requirement of risk management for insurance company and it provide a framework of capital allocation.

Comparing the models of EC mentioned above, the conclusions can be: VaR model ignores the losses on the given probability level, lacking the measurement coherence for risk portfolios, and cannot be aggregated. Put option is the model that is set up from the view of supervisors or proposers, which upsets the motivation of insurers to develop it. But the TailVaR model reflects the expected loss on the given level of probability, which meets the requirement of risk coherence and tends to be convenient for empirical analysis. So this article is going to implement TailVaR model to economic capital allocation of underwriting risks on two aspects: One is the calculation of integrated economic capital for china’s P&C insurance companies. The other is the capital allocation for different lines of business of companies’ underwriting risks.

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