



2017 Enterprise Risk Management Symposium

April 20–21, 2017, New Orleans

**ERM Stochastic Analysis Tools:
Risk Drivers Revealed, Part II:
Conditional Conditional Tail Expectation**

By Steven Craighead

Copyright © 2017 by the Society of Actuaries, Casualty Actuarial Society, and the Canadian Institute of Actuaries.

All rights reserved by the Society of Actuaries, Casualty Actuarial Society, and the Canadian Institute of Actuaries. Permission is granted to make brief excerpts for a published review. Permission is also granted to make limited numbers of copies of items in this monograph for personal, internal, classroom or other instructional use, on condition that the foregoing copyright notice is used so as to give reasonable notice of the Society of Actuaries', Casualty Actuarial Society's, and the Canadian Institute of Actuaries' copyright. This consent for free limited copying without prior consent of the Society of Actuaries, Casualty Actuarial Society, and the Canadian Institute of Actuaries does not extend to making copies for general distribution, for advertising or promotional purposes, for inclusion in new collective works or for resale.

The opinions expressed and conclusions reached by the authors are their own and do not represent any official position or opinion of the Society of Actuaries, Casualty Actuarial Society, or the Canadian Institute of Actuaries or their members. The organizations make no representation or warranty to the accuracy of the information.

ERM Stochastic Analysis Tools: Risk Drivers Revealed, Part II: Conditional Conditional* Tail Expectation

Steven Craighead, CERA, ASA, MAAA

Abstract

Most stochastic Enterprise Risk Management (ERM) models for life insurance examine only the resultant output (specifically the economic capital), and thereby separate the model results from the key input model assumptions, such as the term structure of interest rates. With ERM modeling, the calculation of economic capital (EC) is very expensive due to the complexity of the products and regulatory controls placed on the industry along with the requirement of a large number of scenarios to produce the empirical distribution of EC. Certain techniques have arisen to reduce this modeling cost, such as grid computing and replicating portfolios. Even with these reductions, a high cost is exacted from the enterprise. However, despite all of the resources dedicated to the generation of EC, the analysis of results is frequently limited to the determination of the empirical distribution and an obligatory examination of the relationships of the five worst and five best scenarios to the EC.

In 2012, the use of quantile regression (QR) was introduced to the modeling of the conditional VaR. In this paper, conditional Conditional Tail Expectation (CTE) regression is introduced to develop understanding of how risk drivers affect the average capital or reserves beyond a conditional VaR threshold. This simple technique provides additional tools for EC and reserve dashboards, especially as principle-based approaches (PBA) continue to expand within the insurance industry.

*Though this appears to be a typographical error or form of ‘double-speak’, there is a valid use of the term ‘conditional conditional’ that will be made clear within the paper.

The above is accomplished by applying least squares regression on subsets through the use of residuals from the QR.