

The Importance of Being Transparent: Theory and Implementation Specifics for an Integrated Risk Measurement Model for P&C Companies

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Abstract

While most property and casualty (P&C) insurance companies have preferred to implement risk management strategies centered on accounting statements and employing ad-hoc rules and ratios, the financial industry successfully embraced value-at-risk (VaR) methodology based on cash flow analysis (RiskMetrics®, CreditMetrics®, etc.). The historical failure of the insurance industry to adopt a modern risk framework has led companies to rely on such capital adequacy standards as risk-based capital (RBC)—a methodology that offers almost no assistance to management regarding such paramount issues as prudent levels of operational capital, sources of risk, appropriate rates of financial return, modeling of future possible economic scenarios and survival under various market stress conditions.

We present a VaR-based platform that allows for integration of assets and liabilities in a rigorous risk management framework. This Enterprise Risk Model (ERM) measures all the major risks faced by P&C companies: insurance risk, interest rate risk, equity risk, credit risk, foreign exchange and operating risk.

This presentation covers in detail ERM's characteristics:

- ERM is closely based on the VaR methodology of RiskMetrics® and CreditMetrics®. ERM extends this methodology to the long-term risks common to the insurance industry. While RiskMetrics' framework is focused on short-term (3–10 days) trading VaR, we employ a much longer horizon of one year.
- ERM methodology incorporates the correlation structure of assets and liabilities to provide enterprise-wide, fully integrated risk analysis.
- ERM risk factors are estimated from the latest market data. In order to ensure stability and statistical significance of the estimates, ERM applies various calibration techniques, such as principal component analysis (PCA) and random matrix theory.
- ERM employs a combination of Monte-Carlo and Quasi Monte-Carlo simulations. The use of the Quasi Monte-Carlo technique guarantees speed and high accuracy of the simulation output.
- ERM estimates the risk of the whole enterprise and of each business segment, domestic and international.

- ERM calculates various risk measures of the net worth uncertainty, including VaR, Incremental VaR (IVaR), Expected Shortfall (TVaR), standard deviation and downside risk. The rate of convergence is significantly accelerated with the help of importance sampling and robust L-estimates.
- ERM allocates capital by apportioning the risk and diversification benefits to each business segment according to its IVaR share of the total VaR.
- ERM calculates risk-adjusted return on capital (RAROC) and economic capital by business segment.
- ERM provides stress testing, such as a stock market crash, and scenario testing, such as M&A, divestiture, yield curve steepening, or inflation pick-up.

Finally, we apply this advanced risk technology to several companies to reveal risk and capital issues that cannot be identified with conventional industry risk technologies. The authors will demonstrate how this new technology can be used to assist companies in maximizing capital efficiency and migrating from a risk management environment that is governed almost exclusively by ad-hoc rules of thumb to one that is governed by true risk management principles.