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FINANCIAL REPORTING

PRINCIPLES OF VALUATION

REINSURANCE

SN ILA-C625-10
MARKET VALUE MARGINS FOR INSURANCE LIABILITIES IN FINANCIAL REPORTING AND SOLVENCY APPLICATIONS, OCTOBER 1, 2007 (THROUGH PAGE 65)

I. Executive Summary

A. Introduction

1. This report examines the cost of capital method in 2 specific contexts

a. Measuring the fair value of insurance liabilities for financial reporting purposes.
b. Establishing regulatory capital standards for insurers.

B. Overview of the Cost of Capital Method - Inputs required for the calculation

1. Initial Capital Base.
2. Capital Base in Each Subsequent Period Over the Lifetime of the Liability.
3. Cost of Capital Rate per Period.

C. Major Findings

1. Key parameters used in the cost of capital methodology and in pricing practices should be reconcilable.
2. Pragmatic approaches to quantifying risk must be validated.
3. Cost of capital rate must be calibrated.

D. Implications

1. Financial reporting: Fair value estimates should at all times reflect current market environment with respect to assessment of risk and market price for transfer of this risk.

2. Solvency Applications: Same implications apply plus unique challenges.

E. Conclusions

1. Comparison and analysis of relationship of ultimate and one-year risk exposure horizons for insurance risk to capital standards in common use.
2. Review of common pricing methods currently in use.
3. Analysis of investor return expectations and underlying capitalization levels inherent in such expectations.
4. Review of existing literature on application of CAPM, the Fama-French 3-Factor Model and other means of establishing equity returns expected by investors.
5. Development of estimates of factors that may impact appropriate cost of capital rate.
6. Review of capital market transactions to determine implied cost of capital rate as well as potential change in this rate following a market shock or distress scenario.
7. Recognizing on-going debate over appropriateness of using entry prices for calibrating fair value estimates.

II. Introduction

A. Scope of Report

1. Establishing the fair value of insurance liabilities for financial reporting purposes.
2. Establishing regulatory capital standards for insurers.

B. Outline of Report

1. Role of risk margins for financial reporting applications.
2. Overview of cost of capital method.
3. Challenges that industry faces.
4. Importance of ability to properly calibrate risk margins.

C. Additional Considerations

1. Various issues regarding determination of cash flows to be included in liability estimates for financial reporting purposes.
2. Appropriateness of standardized rather than company-specific risk margins for financial reporting.
3. Procedure to ensure consistency between internal models and standard formulas.
4. Appropriateness of one-year solvency time horizon for setting total capital requirements on long-term insurance risks.
5. Components of capital requirements under certain proposed solvency frameworks.

III. Market Value Margins for Financial Reporting

A. Fair Value Financial Reporting Framework

1. 3 components of fair value of insurance liability

a. Best Estimate Liability (BEL).
b. Market Value Margin (MVM).
c. Profit Margin.

2. Separation of the BEL and the MVM

a. BEL may include portion of risk margin attributable to hedgeable risks.
b. MVM reflects only additional risk margin required for non-hedgeable risks.

3. Calculating the MVM for Financial Reporting Using the Cost of Capital Method

a. Determine Capital Base.
b. Determine Time Horizon for Capital Commitment.
c. Determine the Required Rate of Return on Capital per Period.

IV. Initial Capital Base

A. Link Between the Amount of Capital and the Annual Cost of Capital

1. Amount of capital is linked to its cost as a rate per period.

2. For the same BEL a lower amount of capital held should be used along with a higher rate per period.

B. Basis for Initial Capital Base

1. Regulatory Required Capital.
2. Rating Agency Target Capital.
3. Internal Capital Models: Challenges include

   a. Implementation Requirements.
   b. Validation.
   c. Adjustments to the Annual Cost of Capital Rate.

C. Risk Exposure Horizon

1. Definition of Risk Exposure Horizon

   a. Regulatory capital models: capital must cover ultimate liabilities.
   b. Various existing and proposed frameworks: One-year horizon.

2. Ultimate Risk Exposure Horizon Example.
3. One-Year Risk Exposure Horizon Example.
4. 2 Alternative Perspectives on Risk Exposure Horizon

   a. Ultimate risk perspective is that the party assuming risk must be adequately capitalized from inception.
   b. One-year risk perspective assumes that capital can be raised sequentially to fund a series of one-year risks.

5. Determining Capital Base Using Ultimate Risk Exposure Horizon – Effects through time

   a. Exposure declines because number of lives declines.
   b. Potential variability declines over time because of fewer periods left.
   c. Impact of decreased variability is dampened by elimination of diversification benefits
   d. Capital base reflects less discounting for time value of money.

6. Determining Capital Base Using One-Year Risk Exposure Horizon.
7. Applying the Cost of Capital Method

   a. Either perspective could be used mechanically to derive MVM.
   b. Cost of capital rate per period must be adjusted to produce same MVM.

8. Comparison to Existing Pricing Practices

   a. Market will provide only one fair value liability price point.
   b. Many existing internal capital models use ultimate approach.

D. Measuring Capital Base for Non-hedgeable Risks: More practical stress testing performed.
E. Diversification Adjustments: Definition of reference entity is particularly important.

V. Time Horizon for Capital Commitment

A. Approximating the Capital Base Over Time

1. P&C Product Applications

a. Capital Base Over Time Using Ultimate Risk Exposure Horizon
b. Ways to model the release of initial capital base over time

i. Proportional to Loss Reserve Release.
ii. Proportional to Establishment of Reserves.
iii. Implied by Rating Agency Capital Models.

c. Capital Base Over Time Using One-Year Risk Exposure Horizon

2. Life and Annuity Product Applications: Risk measure is not simply proportional.

B. Impact of Diversification is a challenge.

VI. Annual Cost of Capital

A. Basis for Establishing the Cost of Capital Rate

1. Total Return vs. Spread

a. MVM has to provide for the spread over and above the risk free rate of return.
b. This quantity will be referred as the cost of capital rate.

2. Return Requirements of Capital Providers

a. Applicability of Shareholder Based Models.

i. Risk Definition.
ii. Returns for Run-Off/Closed Block.

b. Role of Corporate Debt and the Weighted Average Cost of Capital.
c. Frictional Costs.

B. Impact of Corporate Income Taxes.
C. Calibration to Market Prices

1. Calibration of Property Catastrophe Bond Spreads: Important observations

a. Implied cost of capital rate varies for each sample transaction.
b. Implied cost of capital rate changed significantly after the 2005 hurricane season.
c. Implied (post-Katrina) spreads are significantly in excess of placeholder rates now being used in certain solvency applications of the methodology.

2. Observable rates are Blended Rates for Hedgeable and Non-hedgeable Risks.

VII. Considerations for Solvency Applications

A. Capital Standards for Insurer Solvency

1. Objective of capital standard is to ensure that, under distress scenario, company could restate its liabilities to their fair value and have positive balance in its capital account.
2. To achieve objective, it is necessary to quantify

   a. Current BEL = BEL_0.
   b. Change in BEL = Solvency Capital Requirement for Non-Hedgeable Risks = SCR

      i. It reflects potential change in BEL over a one-year time horizon.
      ii. $BEL_0 + SCR = BEL^{DS}_1$ = Distress scenario BEL.

   c. Current MVM = MVM_0.
   d. Change in MVM such that MVM_0 + Change in MVM = MVM^{DS}_1.
   e. Difference between MVM^{DS}_1 and MVM_0 reflects combined effect of

      i. Market Price per Unit of Risk Changes.
      ii. Perceived Risk Changes in a Distress Scenario.
      iii. Passage of Time Implies Less Remaining Risk.

3. Required Capital and the Change in Fair Value

   a. Potential Change in Fair Value = $FVL^{DS}_1 - FVL_0$. = $\Delta BEL + \Delta MVM$.

4. Change in Net Assets.

B. Implementation of Cost of Capital Method in Solvency Applications

1. Risk Exposure Horizon Used to Estimate the Change in the BEL (one-year).
2. Risk Exposure Horizon Used to Estimate the End of Period MVM

   a. Even when MVM reflects ultimate risk exposure horizon, SCR must reflect one-year risk exposure horizon.
   b. Care should be taken to ensure that approximation of future periods' capital base accurately reflects risks in each period.

3. Appropriate Assumptions for Calculating the MVM in a Distress Scenario

   a. Intent is to capture risk margin that would be appropriate after a distress event.
   b. MVM must be conditional upon extreme change in BEL occurring during period.

4. Appropriate Assumptions for Calculating the End of Period MVM.

VIII. Benchmarking Results - Considerations

A. Using Entry Prices to Calibrate Exit Prices

1. Impact of Portfolio Effects and Diversification: Entry prices often reflect value of policy to individual insured.
2. Change in Valuation Over Time.
3. Exit prices are only meaningful when each of the following is true

   a. They can be calculated consistently across different insurers and different products.
   b. They can be calibrated against objective benchmarks reflecting actual prices at which risks associated with insurance liabilities are transferred in arms-length transactions.
   c. They rely upon parameters and assumptions that can capture both the current market environment for financial reporting purposes and capture the potential future market environment in a distress scenario for solvency purposes.

B. Availability and Granularity of Benchmark Prices – Options that can be considered

1. Primary or Reinsurance Market Premiums with following limitations

   a. Diversity.
   b. Transparency.
   c. Aggregation of BEL and MVM.
   d. Magnitude.

2. Loss Portfolio Transfers and Closed Block Transactions.
3. M&A Transaction Prices with following limitations

   a. These transactions involve diversified portfolios of insurance risks.
   b. A significant component of price paid reflects company's franchise value.

C. Challenges Associated with Capturing Current Market Conditions

1. Include Practicality and Usability.
2. Solvency context requires forward-looking assessment of market conditions.

IX. Appendix A: Percentile Method

A. Description

1. It uses underlying risk distribution to directly determine aggregate fair value of liability as specified percentile of distribution.
2. Subtracting BEL from amount allows determination of MVM.

B. Comparison to Cost of Capital Method

1. Cost of Capital Method Makes the Underlying Assumptions Explicit.
2. Percentile Method requires complete risk distributions.
3. Several challenging aspects of the Cost of Capital Method are still relevant.
4. Calibration and Validation Challenges are not resolved.

X. Appendix B: Introduction to Cost of Capital Method – P&C Liability Application

A. Results depend entirely upon 3 key elements

1. Amount of initial capital base.
2. Time horizon over which that capital must be committed.
3. Required rate of return on capital per period.

XI. Appendix C: SPDA Example

A. Risk in this product is driven by following components

1. Crediting Rate Guarantees.
2. Lapse Rate Variability.
3. Investment Strategy.

B. Risk Modeling Assumptions

1. Product annuitization exercisable 10 years from inception.
2. In-force of 1,000 policyholders with initial balance of 100,000.
3. Crediting rate = reference rate – fixed spread, subject to guaranteed minimum.
4. Lapse rate = base rate + dynamic lapse rate + random lapse rate.
5. No mortality within 10 years.
6. No surrender charges.
7. Expenses are .25% of account value.
8. Stochastic Rate Model.

C. Calculation of BEL using methods to price interest rate derivative securities.
D. Calculation of the Capital Base for Non-Hedgeable Risks

1. Full Stochastic Simulation and the Double-Counting of Risk.
2. Using the Forward Rate Path.
3. Adverse Rate Path.
4. Lapse Rate Shock Scenarios.

E. Comparison of MVM Calculations.

XII. Appendix D: P&C General Liability Risk

A. Assumptions.
B. BEL = PV of expected claim payments.
C. MVM for Financial Reporting

1. Ultimate Risk Exposure Horizon: Assumes portfolio is assessed on a stand-alone basis.
2. One-Year Risk Exposure Horizon.

D. MVM for Solvency Applications.

XIII. Appendix E: Approximating the Capital Base Over Time

A. To demonstrate potential inaccuracy of approximating capital base in future periods using a one-year risk exposure horizon and applying a constant ratio to reserve balances.

B. Commercial auto liability data.

C. Estimated Reserves and Their Variability.

D. Best Estimate Loss Reserve Variability Over “One Year”.

E. Relationship Between the Sequence of One-Year Variability Measures.

F. Relationship Between the Sequence of Capital Measures.

G. Other Lines of Business.

Source: Lombardi, Chapter 16, Risk-based Capital

Question 1
(6 Points)

(a) What is the RBC Ratio of a company that has the following characteristics?

Dividend liability = 10M
Capital = 1 500M
Asset Valuation Reserve = 125M
C_0 = 50M
C_{1a} = 100M
C_{1cs} = 300M
C_2 = 600M
C_{3a} = 100M
C_4 = 50M

Source: Lombardi, Chapter 16, Risk-based Capital

Solution to Question 1
(6 Points)

Statement	**Points**
(a) Calculation of RBC Ratio	**6**
1. RBC Ratio = $\frac{\text{Total adjusted capital}}{\text{Authorized control level RBC resulting from formula}}$	1
2. Total adjusted capital = Capital + Asset Valuation Reserve + 50% x Dividend liability	1
3. Authorized control level RBC = $C_0 + C_4 + \sqrt{(C_{1a} + C_{3a})^2 + C^2_{1cs} + C^2_2}$	1
4. Total adjusted capital = 1 500M + 125M + 50% x 10M = 1 630M.	1
5. Authorized control level RBC = $50M + 50M + \sqrt{(100M + 100M)^2 + 300M^2 + 600M^2}$	
$= 100M + \sqrt{(100M + 100M)^2 + 300M^2 + 600M^2}$	
$= 100M + \sqrt{40\,000M^2 + 90\,000M^2 + 360\,000M^2}$	
$= 100M + 700M = 800M$	1
6. RBC Ratio = 1 630M / 800M = 203.75%.	1
TOTAL POINTS	**6**