

**1987 VALUATION
ACTUARY HANDBOOK**

VALUATION ACTUARY HANDBOOK

Table of Contents

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
<u>Chapter I</u>	<u>Life Insurance Company Statutory Valuation</u>	I-1
Section 1	Introduction by Forest Allen Spooner, FSA	I-1
Section 2	Background (Edited from the Report of the ACLI Task Force on the Valuation Actuary.)	I-2
Section 3	The Concept of the Valuation Actuary in the United Kingdom and Canada (Edited from the Report of the ACLI Task Force on the Valuation Actuary.)	I-5
Section 4	The Concept of the Valuation Actuary in the United States (Edited from the Report of the ACLI Task Force on the Valuation Actuary.)	I-8
Section 5	What is the Concept of a "Valuation Actuary"? by Jeffrey D. Miller, FSA	I-14

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
Section 6	Emerging Statutory Valuation Perspectives by Jeffrey D. Miller, FSA	I-17
	Valuation Implications of New Products and Marketing Approaches	I-18
	Focus on Customers Rather Than Policies	I-22
	Interest Sensitivity	I-26
	Product Flexibility	I-30
	Movement from Statutory Minimums to Statutory Guidelines	I-31
	Qualification Standards	I-33
	Conclusion	I-34
 <u>Chapter II</u>	 <u>Methods of Analyzing Cash Flows to Test for Reserve Adequacy</u>	 II-1
Section 1	Introduction by James A. Geyer, FSA	II-1
Section 2	Basic Tools for Analyzing Cash Flows by James A. Geyer, FSA	II-2
	Macaulay Duration	II-2
	Option Theory Duration	II-6
	Scenario Testing	II-7
	Accumulation Approach	II-8
	Present Value Approach	II-9
Section 3	Discounting Cash Flows by Richard M. Wenner, FSA	II-13
	Progressive Accumulation Approach	II-17
	Accumulation Factor Approach	II-18
	Discount Factor Approach	II-19
	Valuation Considerations	II-21
	Comments	II-23

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
Section 4	Testing Interest-Sensitive Cash Flows by Joseph J. Buff, FSA	II-26
	4.1 Introduction	II-26
	4.2 Market Value Accounting	II-27
	4.3 Duration	II-29
	4.4 Usefulness of Duration	II-33
	4.5 Effectiveness of Duration Matching	II-36
	4.6 Pitfalls of Macaulay Duration	II-39
	4.7 Sample Applications of Duration	II-42
	4.8 Limitations of Duration Analysis	II-45
	4.9 Advantages of Duration Analysis	II-46
	4.10 Conclusion	II-47
<u>Chapter III</u>	<u>C-3 Risk</u> by Peter B. Deakins, FSA, Stanley B. Tulin, FSA	III-1
<u>Chapter IV</u>	<u>Interrelationships of Various Life Insurance Company Valuations</u> by Robert W. Stein, FSA	IV-1
Section 1	Introduction	IV-1
Section 2	Audiences for Insurance Company Financial Information	IV-2
	2.1 Regulators	IV-2
	2.2 Company Management	IV-2
	2.3 Policyholders	IV-3
	2.4 Investors	IV-3
	2.5 Creditors	IV-3
	2.6 Potential Customers	IV-4
	2.7 Potential Acquisitors	IV-4
	2.8 Internal Revenue Service	IV-5
	2.9 Employees	IV-5

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
Section 3	Types of Valuations	IV-5
Section 4	Defining the Basis of Actuarial Valuations	IV-7
Section 5	Relationships Between Statutory and GAAP Valuations	IV-8
Section 6	Relationships Between GAAP and Modified GAAP Valuations	IV-13
Section 7	Relationships Between Tax and Other Valuations	IV-14
Section 8	Relationships Between Economic Appraisals and Reserve Valuations	IV-15
Section 9	Other General Considerations	IV-17
Section 10	Relationship Between the Valuation and Financial Management Process	IV-18
Section 11	Relationships Between the Valuation and Pricing Processes	IV-21
Section 12	Summary	IV-23
<u>Chapter V</u>	<u>Advising Management on Solvency and Solidity</u> by Terrence M. Owens, FSA, Ralph F. Verni	V-1
Section 1	Operating within a Changing Valuation Perspective	V-1

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
Section 2	Surplus Layers	V-3
	2.1 Market Value Surplus	V-5
	2.2 Solvency Surplus	V-7
	2.3 Solidity Surplus	V-10
	2.4 Growth Surplus	V-13
Section 3	Implications for the Future	V-14
<u>Chapter VI</u>	<u>A Potential Approach to Valuation of Reserves and Surplus in Statutory Financial Statements</u> by Donald D. Cody, FSA	VI-1
Section 1	Introduction	VI-1
Section 2	Concepts and Definitions	VI-2
	2.1 Solvency on the Valuation Date	VI-2
	2.2 Scenario	VI-3
	2.3 Solvency along a Scenario	VI-3
	2.4 Solidity	VI-3
	2.5 Reasonable Deviations from Expected and Ruin Probability p_1	VI-3
	2.6 Plausible Deviations from Expected and Ruin Probability p_2	VI-4
	2.7 Vitality	VI-4
	2.8 Reserves	VI-4
	2.9 Surplus Needed for Capacity Utilized by Inforce	VI-4
	2.10 Cash Flow Based Surplus (CFS)	VI-5
	2.11 Vitality Surplus	VI-6
	2.12 Net Premium Reserves	VI-7
	2.13 Categories of Risk	VI-8
	2.14 Correlations Among Risks	VI-9

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
Section 3	The New Environment for Assets, Reserves and Surplus Needed	V-10
Section 4	Mathematics Underlying Ruin Probabilities, Scenarios and Combination of Risks	VI-13
	4.1 Relationship of Worst Scenarios of Reasonable and Plausible Deviations to Ruin Probability Levels	VI-13
	4.2 Simplification of the Combination of Risks Procedures	VI-16
	4.3 Comments on Determination of Surplus Needed for Each Separate Risk	VI-18
Section 5	Procedures	VI-19
	5.1 C-3 Risk on Products with Large C-3 Risk	VI-19
	5.2 Products without a Large C-3 Risk	VI-21
	5.3 C-1 Risk	VI-21
	5.4 C-2 Risk	VI-24
	5.5 Further Comments on Products with Large C-3 Risks	VI-27
Section 6	Coordination of Investment Policy and Product Policy	VI-28
Section 7	Aggregate Reserves and Surplus Needed	VI-28
Section 8	Simplification	VI-29
Section 9	Financial Planning for Growth and Change - Corporate Vitality	VI-30
	9.1 Pricing	VI-30
	9.2 Management Basis Financial Planning and Accounting System	VI-30
Section 10	Reinsurance	VI-33

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
Chapter VII	<u>An Analysis of the Legal Implications of the Valuation Actuary Concept</u> by Gary D. Simms	VII-1
Section 1	The Current Regulatory System	VII-1
Section 2	The Valuation Actuary Concept	VII-5
	2.1 Procedural and Substantive Components	VII-5
	2.2 Proposed Statement of Actuarial Opinion	VII-8
	2.3 The Issue of Reliance	VII-16
	2.4 Review for Reasonableness	VII-17
	2.5 Enhanced Potential Liability	VII-18
Section 3	Personal Liability and the Valuation Actuary	VII-20
	3.1 Professional Liability Defined	VII-20
	3.2 Legal Theories of Liability	VII-22
	3.3 Primary and Secondary Liability	VII-23
	3.4 Liability to Third Parties	VII-23
	3.5 Comparative Negligence	VII-26
	3.6 Appropriate Professional Techniques	VII-27
	3.7 Professional Liability and the Actuary	VII-28
Section 4	Conclusions	VII-37

LIST OF APPENDICES

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
<u>Appendix 1</u>	<u>Theory Behind Macaulay Duration and Illustrative Examples</u> by James A. Geyer, FSA	A1-1
	Definition of Duration	A1-1
	Example of Duration	A1-1
	Duration: Theoretical Development	A1-3
	Other Properties of Duration	A1-8
	Shortcomings of Duration	A1-11
	Call and Withdrawal Options	A1-15
	Term Structure of Interest Rates	A1-16
	(This material is an appendix to Chapter II.)	
<u>Appendix 2</u>	<u>Cash Flow-Based Surplus</u> by James A. Geyer, FSA, Michael E. Mateja, FSA	A2-1
	Introduction	A2-1
	Summary of Findings	A2-1
	Definitions	A2-3
	Calculation of CFS	A2-5
	Interpretation of CFS	A2-11
	Model Output	A2-16
	Uses of CFS	A2-18

(This material is an appendix to Chapter II.)

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
<u>Appendix 3</u>	<u>Committee Report of Advisory Subgroup I for Regulations on Actuarial Opinion and Memorandum in New York</u> by Donna R. Claire, FSA	A3-1
Section 1	Background Information	A3-1
	Historical Background in New York	A3-2
	Differences Anticipated Between Proposed Regulations, and Recommendations of the American Academy of Actuaries	A3-4
	Confidentiality of Actuarial Memorandum	A3-5
	Date of Filing Actuarial Opinion and Memorandum	A3-5
	Definition of Qualified Actuary	A3-7
	Appointment of the Actuary to Sign Opinions	A3-8
	Actuary(ies) Designated to Sign Actuarial Opinions and Memorandum	A3-12
	Scope of Business	A3-13
	Reliance	A3-14
	Investment Strategies	A3-14
	Actuarial Opinion	A3-15
	General Description of Actuarial Memorandum	A3-17
	Consistency of Assumptions	A3-17
	Alternatives to Cash Flow Analysis	A3-19
	Identification of Liabilities and Assets	A3-19
	Projection of Cashflow	A3-20
	Investment Quality	A3-23
	Aggregate Reserve Tests	A3-24
	Scenarios to be Tested	A3-27
	Additional Considerations in Regard to Lapse Rates	A3-31
	Methodology	A3-32
	Numerical Summary	A3-32
	Description of Asset Sufficiency	A3-32
	Macaulay Duration	A3-33
	Appropriate Reserve Vis-a-Vis Minimum Statutory Valuation Reserves	A3-35

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
Section 2	Actuarial Opinion Pursuant to Section 4217 of the New York State Valuation Law RST Insurance Company Valuation Date: December 31, 1988	A3-39
Section 3	Actuarial Memorandum Supporting the Actuarial Opinion Pursuant to Section 4217 of the New York Valuation Law RST Insurance Company Valuation Date: December 31, 1988	A3-43
<u>Appendix 4</u>	<u>A Summary of the Positions of Various Industry Groups with Regard to the Valuation Actuary Concept as of January 1987</u>	A4-0
<u>Section 4.1</u>	<u>Excerpts from the Report of the Task Force on the Valuation Actuary to the ACLI Board of Directors -- August 1986</u> by American Council of Life Insurance	A4-1
Section 1	Introduction	A4-1
Section 6	Industry Issues Considered by the Task Force	A4-2
	Appointment of Valuation Actuary	A4-4
	Responsibility of the Valuation Actuary	A4-5
	Quality of Assets	A4-5
	Reliance on Opinion of Others	A4-6
	Malpractice Considerations	A4-6
	Specific Scenarios of Future Events	A4-7
	Surplus Management	A4-7
	Cost of the Concept of the Valuation Actuary	A4-8

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
Section 7	Alternatives to the Concept of the Valuation Actuary	A4-8
Section 8	Recommendations	A4-9
Attachment A	Current Responsibilities of Actuaries in Connection with Statement of Actuarial Opinion in Statutory Annual Statement (Based on Annual Statement Instructions, and Recommendations and Interpretations of American Academy of Actuaries.)	A4-12
Attachment B	Organization of the Actuarial Profession to Implement the Valuation Actuary Concept (This material is an appendix to Chapter I.)	A4-19
<u>Section 4.2</u>	<u>Final Report of the Joint Committee on the Role of the Valuation Actuary</u>	A4-22
<u>Section 4.3</u>	<u>Preliminary Report to NAIC Life and Health Actuarial Task Force from Surplus and Solvency Subcommittee of NAIC Standing Technical Advisory Committee October 9 and 10, 1986</u>	A4-40
<u>Section 4.4</u>	<u>Draft Recommendation 7 (American Academy of Actuaries Paper)</u>	A4-45

<u>Chapter & Section</u>	<u>Title</u>	<u>Page</u>
<u>Appendix 5</u>	<u>Literature Available for Continuing Education of Valuation Actuary (1984-1985)</u>	A5-1
	by Donald D. Cody, FSA	
	General	A5-1
	SOA	A5-2
	AAA Committee on Life Insurance	
	Financial Reporting	A5-4
	NAIC and State Insurance Departments	A5-5
	Canada	A5-6