

Table of Contents

MODELS FOR LIFE CONTINGENCIES

A STUDY GUIDE FOR SOA EXAM MLC

G.V. RAMANATHAN, Ph.D., A.S.A.

Contents

Preface	iv
Chapter 1: Basic Concepts of Life Contingencies	
1.1. The fundamental calculation	1
1.2. An illustrative example	4
1.3. Some formalism	12
1.4. Some generalization	21
<i>Main results</i>	26
<i>Problems</i>	27
Chapter 2: Multiple State Models	
2.1. Continuous-time Markov chains	38
2.2. Rates and the Kolmogorov Equation	45
2.3. Discrete-time Markov chains	49
<i>Main results</i>	60
<i>Problems</i>	62
Chapter 3: Two-state Model: Survival functions for a single life	
3.1. Continuous model	77
3.2. Force of mortality	81
3.3. Discrete model	85
3.4. Interpolation	90
3.5. Moments	95
3.6. Select and ultimate tables	98
<i>Main results</i>	101
<i>Problems</i>	102
Chapter 4: Three states - Disability Model	
4.1. Permanent disability model - continuous case	123
4.2. Temporary disability model - continuous case	126
4.3. Three-state model - discrete case	85

<i>Main results</i>	130
<i>Problems</i>	131
Chapter 5: Four States - Two Lives	
5.1. Two lives - continuous case, general	135
5.2. Independent lives	141
5.3. Common shock model	143
5.4. Joint Distributions	147
<i>Main results</i>	149
<i>Problems</i>	150
Chapter 6: Several States - Multiple Decrements	
6.1. Continuous case	162
6.2. Discrete case	170
<i>Main results</i>	173
<i>Problems</i>	174
Chapter 7: Insurance	
7.1. Various types of insurance and notation	182
7.2. Variance Calculations	194
7.3. Multiple lives and multiple decrements	197
7.4. Payment at the end of a period other than a year	203
<i>Summary of results</i>	206
<i>Problems</i>	208
Chapter 8: Annuities	
8.1. Various types of annuities and notation	230
8.2. Multiple Lives	242
<i>Main results</i>	245
<i>Problems</i>	246
Chapter 9: Premiums	
9.1. The Equivalence Principle revisited	262
9.2. Variance of the loss variable	269
9.3. Individual policy and portfolio percentile premiums	269
<i>Main results</i>	276
<i>Problems</i>	277

Chapter 10: Reserves

10.1. Reserve calculations	262
10.2. A recursion relation	298
10.3. Expense reserve	304
10.4. Benefit reserves at fractional durations	307
<i>Main results</i>	308
<i>Problems</i>	310

Chapter 11: Asset Shares, Profit Testing, Universal Insurance

11.1. Asset shares	327
11.2. Profit testing	333
11.3. Universal insurance	337
<i>Main results</i>	342
<i>Problems</i>	343

Chapter 12: Interest Rate Risk

12.1. Basic ideas	349
12.2. Diversifiable and non-diversifiable risks	333
<i>Main results</i>	357
<i>Problems</i>	358

Solutions to End of the Chapter Problems	365-436
---	---------