Exam Content Outline

Advanced Estimation of Claims Liabilities – Exam 7

Delivery Format

APPOINTMENT TIME: 4.5 HOURS		
Exam Duration	**Scheduled Break**	**Exam Tutorial, Confidentiality Agreement, End of Exam Survey**
4 hours	**15 min**	**15 min**

Exam Item Types

Candidates may see the following item types in the CAS examinations. Candidates should become familiar with these item types and sample questions will be available in 2024.

Multiple Choice

Multiple answer choices are presented after a problem with only one correct answer.

Multiple Selection

Multiple answer choices are presented after a problem with more than one correct answer.

Fill in the Blank

A blank section is presented after a problem where the candidate must input the correct value.

Matching

Content columns presented after a problem where the candidate must correctly match content from one column to another.

Constructed Response

Items without any Answer Option are presented, in which the response area is left blank after a problem. These open-ended questions require candidates to construct and develop their own answer.

Spreadsheet

Spreadsheet-type items are displayed to the candidate in a spreadsheet format and candidates can make use of most spreadsheet functions. Please review testing guide prior to sitting for your exam to note any differences between the Excel and the Pearson testing environment.

Exam Cognitive Level

Each task is tied to a certain type of mental operation or thinking skill, which is called the cognitive level. ACAS and FCAS use four cognitive levels, and every examination item is authored to address both the task and one of the following cognitive levels paired with that task.

Remember: 0-10%

Tests the ability of the candidate to recall or remember knowledge or facts.

Understand and Apply: 40-50%

Measures the candidate's ability to understand and apply ideas and concepts to new situations.

Analyze and Evaluate: 40-50%

Requires the candidate analyze information, combine concepts/ideas, and justify a position resulting from that combination.

Create: 0-10%

Requires the candidate to synthesize conclusions by evaluating the validity of ideas and concepts.

Exam Section Details

DOMAINS	DOMAIN WEIGHT
A. Estimation of Claims Liabilities	100%

A. Estimation of Claims Liabilities

Candidates are expected to apply basic Principles and Standards of Practice for unpaid claim estimation, including evaluating liabilities arising in complex risk transfer agreements common in excess insurance and reinsurance contracts.

TASKS
Data Preparation, Organization, & Analysis
1. Perform data diagnostic analyses and adjust for data issues
Unpaid Claim Point Estimates
2. Calculate unpaid claims estimates
3. Test unpaid claims estimates for reasonableness
4. Estimate unpaid claims for various layers of coverage
5. Forecast premium reserves (e.g., reserves for retrospective premiums)
Unpaid Claim Stochastic Distributions
6. Estimate parameters of unpaid claims distributions
7. Calculate the moments and percentiles of unpaid claim distributions
8. Simulate parameter percentiles and unpaid claims percentiles
9. Calculate the mean and prediction error of a reserve
10. Derive predictive distributions using stochastic methods
Unpaid Claim Output & Diagnostic Analysis
11. Test output of unpaid claim distributions for reasonableness
12. Test assumptions underlying reserving models
13. Develop a range of indications
14. Calculate risk margins

TASKS (Continued)
Reinsurance
15. Adjust primary methods and data to be used for reinsurance reserving
16. Calculate ceded loss reserves
17. Describe the function and types of reinsurance.

Readings:
   - Brosius
   - Clark
   - Friedland
   - Hurlimann
   - Mack – Chain Ladder
   - Mack – Benktander
   - Marshall et al.
   - Meyers
   - Sahasrabuddhe
   - Shapland
   - Siewert
   - Taylor
   - Teng and Perkins
   - Venter Factors
   - Verrall

Complete Text References for Exam 7

Text references are alphabetized by the citation column.

Citation	Abbreviation	Domains/Task	Source
Brosius, E., "Loss Development Using Credibility," CAS Study Note, March 1993	Brosius	A1-A3, A, A11	**OP**
Clark, D. R., "LDF Curve Fitting and Stochastic Reserving: A Maximum Likelihood Approach," Casualty Actuarial Society *Forum*, Fall 2003.	Clark	A2-A3, A6-8, A11	**OP**
Friedland, J. F., "Reserving for Reinsurance," CAS Study Note, 2022.	Friedland	A15-A17	**OP**
Hürlimann, W., "Credible Loss Ratio Claims Reserves: The Benktander, Neuhaus and Mack Methods Revisited," *ASTIN Bulletin* 39(1), 2009, pp. 81-99. Including errata. Candidates are not responsible for mathematical proofs.	Hurlimann	A1-A3, A6, A11	**OP**
Mack, T., "Measuring the Variability of Chain Ladder Reserve Estimates," Casualty Actuarial Society *Forum*, Spring 1994.	Mack – Chain Ladder	A2, A6-A8	**OP**
Mack, T., "Credible Claims Reserve: The Benktander Method," *ASTIN Bulletin*, 2000, pp. 333-337.	Mack – Benktander	A1, A2-A3, A9, A11-A12	**OP**
Marshall, K.; Collings, S.; Hodson, M.; and O'Dowd, C., "A Framework for Assessing Risk Margins," Institute of Actuaries of Australia 16th General Insurance Seminar, 9-12 November 2008, Coolum, Australia.	Marshall et al.	A14	**OP**
Meyers, G., "Stochastic Loss Reserving Using Bayesian MCMC Models," CAS Monograph #1.	Meyers	A9-A10	**OP**
Sahasrabuddhe, R., "Claims Development by Layer: The Relationship between Claims Development Patterns, Trend and Claim Size Models," Casualty Actuarial Society *E-Forum*, Fall 2010, Volume 1 (revised January 2, 2013). Including errata.	Sahasrabuddhe	A4	**OP**
Shapland, M., "Using the ODP Bootstrap Model: A Practitioner's Guide," CAS Monograph #4. Supplementary modeling files linked on pages 61-62 will aid in understanding of the method's application.	Shapland	A1, A9-A10, A13	**OP**
Siewert, J. J., "A Model for Reserving Workers Compensation High Deductibles," Casualty Actuarial Society Forum, Summer 1996, pp. 217-244.	Siewert	A4	**OP**
Taylor, G. and McGuire, G., "Stochastic Loss Reserving Using Generalized Linear Models," CAS Monograph #3, Chapters 1-3. Including errata.	Taylor	A9-A10	**OP**

Citation	Abbreviation	Domains/ Task	Source
Teng, M. T. S., and Perkins, M. E., "Estimating the Premium Asset on Retrospectively Rated Policies," *PCAS* LXXXIII, 1996, pp. 611-647, excluding Section 5. Including discussion of paper: Feldblum, S., *PCAS* LXXXV, 1998, pp. 274-315, Sections 1 and 2 only. Candidates will not be held responsible for specific Annual Statement notation but will be responsible for concepts presented.	Teng and Perkins	A5	**OP**
Venter, G. G., "Testing the Assumptions of Age-to-Age Factors," *PCAS* LXXXV, 1998, pp. 807-847. Including errata.	Venter Factors	A2, A6, A12	**OP**
Verrall, R. J., "Obtaining Predictive Distributions for Reserves Which Incorporate Expert Opinion," *Variance*, Vol. 1, Issue 1, 2007, Casualty Actuarial Society. Including errata.	Verrall	A9, A13	**OP**

Source Key

B	Book – may be purchased from the publisher or bookstore.
BO	Book (Optional) – may be purchased from the publisher or bookstore.
DSK	Material included in the 2023 Digital Study Kit.
NEW	Indicates new or updated material.
OP	All text references marked as Online Publications will be available by clicking the hyperlink within the syllabus.
SK	Material included in the 2023 Study Kit.
SKU	Material included in both the 2023 CAS Study Kit and the 2023 Update to the 2022 Study Kit.

Items printed in **red** indicate an update, clarification, or change.