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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. Item type samples are available on the Pearson Vue CAS webpage.

### 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.

### Point and Click

An image is presented after a problem where the candidate must identify the correct area of the image by clicking on the correct location in the image.

### Fill in the Blank

One or more blank sections are presented after the problem or within a statement where the candidate must input the correct response(s).

### Matching

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

### Constructed Response

A blank response area is presented after a problem where candidates must 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 the testing guide prior to sitting for your exam to note any differences between the Pearson Vue testing environment and common spreadsheet software (e.g., Excel, Google Sheets).

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## 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.

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

| TASKS (Continued) |
| --- |
| v. **Reinsurance** |
| 1. Adjust primary methods and data to be used for reinsurance reserving. |
| 2. Calculate ceded loss reserves. |
| 3. Describe the function and types of reinsurance. |
| Readings:<br>- Brosius<br>- Clark<br>- Friedland<br>- Hurlimann<br>- Mack – Chain Ladder<br>- Mack – Benktander<br>- Marshall et al.<br>- Meyers<br>- Sahasrabuddhe<br>- Shapland<br>- Siewert<br>- Taylor<br>- Teng and Perkins<br>- Venter Factors<br>- Verrall |

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## 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, A6, 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-A8, 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.<br><br>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-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 (2nd edition)," CAS Monograph #8. Including errata. | Meyers | A9-A11, A14 | **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. Including errata. Supplementary modeling files linked on pages 61-62 will aid in understanding of the method's application. | Shapland | A1, A9-A11, 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 1-6. Including errata. | Taylor | A9-A12 | **OP** |

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| 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

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| **OP** | All text references marked as Online Publications will be available by clicking the hyperlink within the syllabus. |

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