2015 Exam 5
Basic Techniques for Ratemaking and Estimating Claim Liabilities

The syllabus for this four-hour exam is defined in the form of learning objectives, knowledge statements, and readings.

**LEARNING OBJECTIVES** set forth, usually in broad terms, what the candidate should be able to do in actual practice. Included in these learning objectives are certain methodologies that may not be possible to perform on an examination, such as complex simulations, but that the candidate would still be expected to explain conceptually in the context of an examination.

**KNOWLEDGE STATEMENTS** identify some of the key terms, concepts, and methods that are associated with each learning objective. These knowledge statements are not intended to represent an exhaustive list of topics that may be tested, but they are illustrative of the scope of each learning objective.

**READINGS** support the learning objectives. It is intended that the readings, in conjunction with the material on the lower numbered examinations, provide sufficient resources to allow the candidate to perform the learning objectives. Some readings are cited for more than one learning objective. The Syllabus and Examination Committees emphasize that candidates are expected to use the readings cited in this Syllabus as their primary study materials.

Thus, the learning objectives, knowledge statements, and readings complement each other. The learning objectives define the behaviors, the knowledge statements illustrate more fully the intended scope of the learning objectives, and the readings provide the source material to achieve the learning objectives. Learning objectives should not be seen as independent units, but as building blocks for the understanding and integration of important competencies that the candidate will be able to demonstrate.

Note that the range of weights shown should be viewed as a guideline only. There is no intent that they be strictly adhered to on any given examination—the actual weight may fall outside the published range on any particular examination.

The overall section weights should be viewed as having more significance than the weights for the individual learning objectives. Over a number of years of examinations, absent changes, it is likely that the average of the weights for each individual overall section will be in the vicinity of the guideline weight. For the weights of individual learning objectives, such convergence is less likely. On a given examination, in which it is very possible that not every individual learning objective will be tested, there will be more divergence of guideline weights and actual weights. Questions on a given learning objective may be drawn from any of the listed readings, or a combination of the readings. There may be no questions from one or more readings on a particular exam.

After each set of learning objectives, the readings are listed in abbreviated form. Complete text references are provided at the end of this exam syllabus.

Items marked with a bold **SK** constitute the 2015 CAS Exam 5 Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **OP** (Online Publication) are available at no charge and may be downloaded from the CAS website.

Please check the “Syllabus Updates” section of the CAS Website for any changes to the Syllabus.
A. Basic Techniques for Ratemaking

Range of weight for Section A: 50-60 percent

This section introduces the general principles of ratemaking as well as specific details regarding data requirements, calculations, key assumptions, and implementation-related issues. Candidates require a thorough understanding of basic ratemaking so that they will be able to analyze data, select appropriate techniques, and develop solutions to problems. This section addresses the advantages and disadvantages of the various ratemaking techniques as they are applied to specific situations and different lines of business. Classification of insureds for the purpose of risk stratification and other important ratemaking topics, such as coinsurance and catastrophe provisions, are also examined in this section.

Candidates are also expected to be knowledgeable in the calculation of policy premiums using manual rate pages. Excerpts from the ISO Personal Automobile Manual will be provided with the examination. Candidates are not required to memorize the details, but will be expected to be able to use them during the examination. Since they will be included with the examination, candidates will not be allowed to bring copies of the documents into the examination room.

<table>
<thead>
<tr>
<th>LEARNING OBJECTIVES</th>
<th>KNOWLEDGE STATEMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Calculate a policy premium for a specified risk using the rate pages provided. Range of weight: 0-3 percent</td>
<td>a. How to read and use manual rate pages</td>
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**READINGS**
- ISO PAM
- Werner & Modlin, Chapter 2

<table>
<thead>
<tr>
<th>LEARNING OBJECTIVES</th>
<th>KNOWLEDGE STATEMENTS</th>
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</table>
| 2. Describe, analyze, or design the information requirements for ratemaking related to exposures and demonstrate the use of exposures in ratemaking. Range of weight: 2-6 percent | a. Definition of exposure base  
b. Characteristics of exposure bases  
c. Relationship of exposures to coverage provisions  
d. Organization of data: calendar year, policy year, accident year  
e. Written exposure versus earned exposure versus in-force exposure  
f. Role of exposures in the ratemaking process  
g. Influence of changes in exposures |

**READINGS**
- Werner & Modlin, Chapters 1-4
### LEARNING OBJECTIVES

3. Describe, analyze, or design the information requirements for ratemaking related to premiums and demonstrate the use of premiums in ratemaking.

Range of weight: 4-8 percent

#### KNOWLEDGE STATEMENTS

- a. Organization of data: calendar year, policy year, accident year
- b. Written premium versus earned premium versus in-force premium
- c. Relationship between earned premium and earned exposure
- d. Policy terms
- e. Effect of law changes
- f. Effect of rate changes
- g. Determinations of and application of premium trend
- h. Adjustment for coverage and benefit level changes
- i. Distributional shifts and changes in volume (i.e., trend over time)
- j. Parallelogram method
- k. Extension of exposures

### READINGS

- ASOP 13
- Werner & Modlin, Chapters 1-3, 5, and Appendices A-D

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### LEARNING OBJECTIVES

4. Describe, analyze, or design the information requirements for ratemaking related to loss and loss adjustment expenses and demonstrate the use of loss and loss adjustment expenses in ratemaking.

Range of weight: 8-12 percent

#### KNOWLEDGE STATEMENTS

- a. Organization of the data: calendar year, policy year, accident year, report year
- b. Policy provisions
- c. Occurrence coverage
- d. Claims-made coverage:
  - report lag
  - coverage triggers
  - principles of claims-made policies
  - retroactive date
  - tail coverage
- e. Reported losses versus paid losses
- f. Claim counts
- g. Loss adjustment expense (allocated and unallocated expenses)
- h. Loss development
- i. Frequency trend
- j. Severity trend
- k. Pure premium trend
- l. Approaches to determining trend (e.g., exponential and linear analyses)
- m. Relationship between trend and loss development
- n. Effect of law changes
- o. Effect of changes in mix of business
- p. Adjustment for coverage and benefit level changes
- q. Credibility criteria and formulae
- r. Large loss adjustment
- s. Reinsurance recoveries
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<tr>
<th>LEARNING OBJECTIVES</th>
<th>KNOWLEDGE STATEMENTS</th>
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<tr>
<td>t. Reinsurance costs</td>
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<tr>
<td>u. Catastrophe adjustment</td>
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<tr>
<td>READINGs</td>
<td>ASOP 13</td>
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<td></td>
<td>Werner &amp; Modlin, Chapters 1, 3, 6, 12, 16, and Appendices A-D</td>
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</table>

**LEARNING OBJECTIVES**

5. Calculate the underwriting expense provisions underlying the overall rate level indication.  
Range of weight: 0-5 percent  

**KNOWLEDGE STATEMENTS**

- a. Expense categories (e.g., commission, general, other acquisition, taxes, licenses, and fees)  
- b. Sources of data and selection criteria  
- c. Profit and contingency provisions  
- d. Net cost of reinsurance  
- e. Cost of capital  
- f. Fixed expenses and variable expenses  
- g. Differences in procedures for loss adjustment expenses versus underwriting expenses

**READINGs**  
Werner & Modlin, Chapters 1, 7, and Appendices A-D

**LEARNING OBJECTIVES**

6. Calculate the overall rate level indication using the pure premium and loss ratio methods and argue the merits of each.  
Range of weight: 3-6 percent  

**KNOWLEDGE STATEMENTS**

- a. Statement of Principles, CAS  
- b. Assumptions of each method  
- c. Mechanics associated with each method (including organization of the data)  
- d. When each method works and when it does not

**READINGs**  
CAS Principles  
Werner & Modlin, Chapters 1, 8, and Appendices A-D

**LEARNING OBJECTIVES**

7. Describe, analyze, and validate the considerations beyond the calculated cost-based estimate of the rate when selecting a final rate change to implement.  
Range of weight: 0-5 percent  

**KNOWLEDGE STATEMENTS**

- a. Calculated cost-based rate  
- b. Regulatory constraints  
- c. Operational constraints  
- d. Marketing constraints:  
  - Competitive comparisons  
  - Close ratios  
  - Retention ratios  
  - Growth  
  - Distributional analysis  
  - Policyholder dislocation analysis  
- e. Lifetime value analysis  
- f. Optimized pricing  
- g. Underwriting cycles

**READINGs**  
Werner & Modlin, Chapter 13

**LEARNING OBJECTIVES**

8. Explain the purpose for segregating data  

**KNOWLEDGE STATEMENTS**

- a. Risk Classification Statement of Principles, AAA
into homogeneous groups and summarize the considerations for determining such groups.

Range of weight: 0-5 percent

b. Criteria for selection of classification grouping
c. Credibility
d. Adverse Selection
e. Efficiency of class plan

**READINGS**

AAA
Werner &Modlin, Chapter 9

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<tr>
<th>LEARNING OBJECTIVES</th>
<th>KNOWLEDGE STATEMENTS</th>
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| 9. Develop rating differentials for classification and territory and relativity for deductibles and increased limits. Range of weight: 8-12 percent | a. Formulae and process for each rating differential or relativity
b. Credibility and complements of credibility
c. Off balance
d. Capping of change
e. Loss elimination
f. Basic limits versus total limits
g. Layers of loss
h. Expense adjustments
i. Fundamentals of univariate and multivariate relativity analyses |

**READINGS**

Werner &Modlin, Chapters 9-12, 15 and Appendices E-F

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| 10. Assess the considerations for implementing rates to achieve an organization’s goals. Range of weight: 0-3 percent | a. Rating algorithms
b. Rating variables and differentials
c. Fixed expenses, if applicable
d. Expense fee calculation
e. Calculation of final base rates
f. Minimum premiums
g. Non-pricing solutions |

**READINGS**

Werner & Modlin, Chapter 14

<table>
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<tr>
<th>LEARNING OBJECTIVES</th>
<th>KNOWLEDGE STATEMENTS</th>
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</table>
| 11. Calculate premium for policies with coinsurance provisions. Range of weight: 0-5 percent | a. Definition of coinsurance
b. Insurance to value
c. Common policy provisions
d. Layers of loss
e. Coverage issues
f. Guaranteed replacement cost
g. Formula |

**READINGS**

Werner & Modlin, Chapter 11
LEARNING OBJECTIVES | KNOWLEDGE STATEMENTS
--- | ---
12. Perform basic individual risk rating calculations. | a. Purpose of individual risk rating  
b. Schedule rating  
c. Manual rating  
d. Retrospective rating  
e. Experience modification  
f. Composite loss-rated risks  
g. Formulae  
h. Experience period  
i. Credibility  
j. Layers of loss

Range of weight: 0-5 percent

READINGS
Werner & Modlin, Chapter 15

B. Estimating Claim Liabilities

Range of weight for Section B: 40-50 percent

This section explores basic techniques that actuaries use to estimate unpaid claims for both insurance entities and also for non-insurance entities that retain risk. The CAS Principles and the American Academy of Actuaries’ Standards of Practice related to the estimation of unpaid claims are also examined in this section.

LEARNING OBJECTIVES | KNOWLEDGE STATEMENTS
--- | ---
1. Describe, analyze, and validate the information requirements for estimating unpaid claims. | a. Types of data and their sources  
b. Role of homogeneity and credibility of data in the process of estimating unpaid claims  
c. Fundamentals of different types of insurance (e.g., long tail versus short tail lines of business, low frequency versus high frequency lines)  
d. Organization of data: calendar year, accident year, policy year, underwriting year, report year  
e. Insurer’s environment  
f. Importance of accurate estimates of unpaid claims

Range of weight: 2-6 percent

READINGS
Friedland, Chapters 1, 3, and 4, and Appendices A and B

LEARNING OBJECTIVES | KNOWLEDGE STATEMENTS
--- | ---
2. Build and analyze claim development triangles. | a. Purposes of the development triangle  
b. Development triangle as a diagnostic tool  
c. Examples and uses of diagnostic development triangles:  
  • Claim and claim count  
  • Ratio of premium to claims  
  • Average values  
  • Ratios of claims and counts

Range of weight: 2-6 percent

READINGS
Friedland, Chapters 5 and 6
### LEARNING OBJECTIVES

3. Construct and appraise unpaid claims estimates using each of the following estimation techniques:
   - Development technique, including case outstanding technique
   - Expected claim technique
   - Bornhuetter-Ferguson technique
   - Cape Cod technique
   - Frequency-Severity techniques

   Range of weight: 12-16 percent

### KNOWLEDGE STATEMENTS

- Standards of Practice, ASOP 43
- Statement of Principles, CAS
- The claim process
- Assumptions of each estimation technique
- Mechanics associated with each technique (including organization of the data)
- Reporting and payment patterns
- When each techniques works and when it does not
- Key terms: case outstanding, paid claims, reported claims, incurred but not reported, ultimate claims, claims related expenses, reported and closed claim counts, claim counts closed with no payment, insurance recoverables, exposures, experience period, maturity or age, and components of unpaid claim estimates

### READINGS

- Friedland, Chapters 1-12, 15, and Appendices A-B

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### LEARNING OBJECTIVES

4. Assess the influence of operating changes on the estimation of unpaid claims.

Range of weight: 0-5 percent

### KNOWLEDGE STATEMENTS

- How internal operating changes affect estimates of unpaid claims:
  - Claims processing
  - Underwriting and policy provisions
  - Marketing
  - Coding of claim counts and/or claim related expenses
  - Treatment of recoveries such as policyholder deductibles and salvage and subrogation
  - Reinsurance

### READINGS

- Friedland, Part 3 (Chapters 6-15)
<table>
<thead>
<tr>
<th>LEARNING OBJECTIVES</th>
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<tr>
<td>5. Adjust data and/or estimation techniques for changes in the:</td>
<td>a. Effect on estimation techniques due to change in:</td>
</tr>
<tr>
<td>• Internal environment (e.g., claims processes that result in shift in the adequacy of case outstanding or shift in settlement rates, change in mix of business, change in rate level)</td>
<td>rate levels, claim ratio, mix of business</td>
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<td>• External environment (e.g., inflationary or legal environment)</td>
<td>b. Use of trend factors and tort reform factors in estimation techniques</td>
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<td>Range of weight: 3-7 percent</td>
<td>c. Identification of changes in case outstanding adequacy</td>
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<td>d. Adjustment for changes in case outstanding adequacy</td>
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<td>e. Identification of changes in rate of claims settlement</td>
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<td>f. Adjustment for changes in rate of claims settlement</td>
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<tr>
<td>READINGS</td>
<td>Friedland, Chapters 7 - 14</td>
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<th>KNOWLEDGE STATEMENTS</th>
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<tr>
<td>6. Estimate recoveries.</td>
<td>a. Salvage and subrogation</td>
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<td>Range of weight: 0-5 percent</td>
<td>b. Reinsurance</td>
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<td></td>
<td>c. Key assumptions of estimation techniques</td>
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<tr>
<td>READINGS</td>
<td>Friedland, Chapter 14</td>
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<td>7. Estimate unpaid claim adjustment expenses.</td>
<td>a. Organization of the data</td>
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<td>Range of weight: 2-7 percent</td>
<td>b. Estimation of unpaid ALAE</td>
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<td>c. Estimation of unpaid ULAE</td>
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<td>d. Key assumptions of estimation techniques</td>
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<td>e. Strengths and weaknesses of the estimation techniques for claim related expenses</td>
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<tr>
<td>READINGS</td>
<td>Friedland, Chapters 1, 3, 16, and 17</td>
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<tr>
<td>8. Appraise and validate the results of the estimation process for adequacy and reasonableness.</td>
<td>a. Components of evaluation:</td>
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<td>Range of weight: 4-8 percent</td>
<td>• Multiple methods</td>
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<td>• Explanation of differences</td>
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<td>• Test statistics (e.g., claim ratios, severities, pure premiums, frequencies, indicated unpaid claims)</td>
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<td>b. Monitoring and interim valuations</td>
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<tr>
<td>READINGS</td>
<td>Friedland, Chapter 15</td>
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</table>
Complete Text References for Exam 5
Text references are alphabetized by the citation column.

<table>
<thead>
<tr>
<th>Citation</th>
<th>Abbreviation</th>
<th>Learning Objective</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Academy of Actuaries Committee on Risk Classification, “Risk Classification Statement of Principles,” June 1980. (Available at no charge from the American Academy of Actuaries at (202) 223-8196 or on the Academy’s Website at <a href="http://www.actuary.org">www.actuary.org</a>.</td>
<td>AAA</td>
<td>A8</td>
<td>OP</td>
</tr>
<tr>
<td>Insurance Services Office, Inc., Personal Automobile Manual (Effective 6-98), General Rules 1-6 only. The entire manual is included for completeness.</td>
<td>ISO PAM</td>
<td>A1</td>
<td>SK</td>
</tr>
<tr>
<td>Werner, G, and Modlin, C., Basic Ratemaking, Casualty Actuarial Society, Fourth Edition, October 2010. [The Appendices are an integral part of the textbook and will be used for creating questions.]</td>
<td>Werner &amp;Modlin</td>
<td>A1-A12</td>
<td>OP</td>
</tr>
</tbody>
</table>

Source Key

**OP** All text references marked as Online Publications will be available on a web page titled Complete Text References.

**SK** Material in the 2015 CAS Study Kit.

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

Publisher and Distributors

Contact information is furnished for those who wish to purchase the text references cited for Exam 5. Publishers and distributors are independent and listed for the convenience of candidates; inclusion does not constitute endorsement by the CAS.

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