

# Updates

## **VEE Application**

Please use the revised versions of "Application for Approval of Course/Experience for Validation by Educational Experience Credit" and "Application for Validation by Educational Experience Credit" that are available online.

## **VEE-Applied Statistical Methods**

The following tables will be provided to the candidate with the exam: Normal Distribution, Chi-square Distribution, t-Distribution, and F-Distribution. Copies of these tables are available under Web Notes. Since the tables will be included with the examination, candidates will not be allowed to bring copies of the tables into the examination room.

## **VEE-Corporate Finance**

For *Principles of Corporate Finance* by Brealey and Myers, candidates should use the sixth or seventh editions as cited in the 2005 *Syllabus*. The newly published eighth edition has not been approved for the Summer 2005 exam.

## **VEE-Economics Transitional Exam**

The sixth edition (2005) of *Price Theory and Applications* by Landsburg has been published. Candidates may use the sixth edition with the same citations as those for the fifth edition.

## **Exam 2/FM**

The second edition of *Mathematics of Investment and Credit* by Broverman has been removed as an acceptable text for the Fall 2005 exam. Candidates should use the third edition of the Broverman text as cited in the *Syllabus* as an option to *Theory of Interest* by Kellison.

## **Exam 3**

Hoel: The syllabus citation for Section A, Statistics, should be: Hoel, P.G.; Port, S.C.; and Stone, C.J., *Introduction to Statistical Theory*, 1971, Houghton Mifflin Company.

Klugman et al., *Loss Models-From Data to Decisions*: the citation for learning objective F.1. is Chapter 7.2.3, 7.3.1, and 7.3.2.1.

Learning Objective B.7: Knowledge Statement d., "Transient state probabilities," should be deleted from the list of knowledge statements.

Ross, *Introduction to Probability Models* (Eighth Edition): The citation listed in the "Complete Text References for Exam 3" is inconsistent with the citations following the individual learning objectives. The citations following the individual learning objectives are correct and the summary cited in the "Complete Text References for Exam 3" should be: Ross, S.M., *Introduction to Probability Models* (Eighth Edition), 2003, Academic Press, San Diego, Sections 5.3.1-5.3.4, 5.4.1-5.4.2 preceding Example 5.25. [Candidates may also use the seventh edition with the following citation: Sections 5.3.1-5.3.4, 5.4.1-5.4.2 preceding Example 5.25.]

The final compilation of tables that will be included with Exam 3 was posted under Web Notes on 8 March 2005.

The tables that are provided with Exam 3 include "Excerpts from the Appendices to Loss Models: From Data to Decisions." A correction was made to the Inverse exponential distribution in Appendix A in the second edition. The revised edition (dated April 21, 2005 in the online version) has been posted to the CAS Web Site.

#### Exam 4/C

A variety of tables will be provided to the candidate in the Study Note Package and in the examination booklet. These include values for the standard normal distribution, chi-square distribution, and abridged inventories of discrete and continuous probability distributions. Please note that the tables will not include the  $t$  distribution and the  $F$  distribution.

#### Exam 5

Errata for "Insurance to Value" (Second Edition) by Anderson has been issued. The third edition has incorporated the errata. Candidates may use the second edition with the [errata](#) or the [third edition](#). No other changes were made to the third edition.

A copy of the following will be provided to candidates with the exam:

- ISO Personal Automobile Manual (Effective 6-98)
- ISO Personal Automobile Policy (Edition 6-98)

Both will be exact reprints from the 2005 CAS Exam 5 Study Kit. Candidates are expected to know how to use the Policy and Manual as references. Questions will assume that candidates have a thorough understanding of the Policy and Manual prior to taking the exam, as they will not have time to familiarize themselves with them during the exam. A candidate who is familiar with the structure of the Policy and Manual should readily be able to find the pertinent sections.

#### Exam 7-Canada

Facility Association, Plan of Operation, Consolidated June 2002, will be included in the 2005 Update as well as the Study Kit.

#### Exam 7-United States

NAIC, *Official 2004 NAIC Annual Statement Blanks, Property and Casualty*: the Notes to the Financial Statement (pp. 14, 23-27, 32, and 33) are cited for reference only. Candidates are responsible for the Notes as described in "Notes to the Financial Statement" (May 2004) by Feldblum where the Notes are referenced by title.

NAIC, *Accounting Practices and Procedures Manual*, 2004, Preamble: Candidates are responsible for the entire Preamble as cited in the 2005 *Syllabus*.

The Spring 2005 version of Exam 7-United States will not include multiple-choice questions. All questions will require a written response.

### Exam 9

Butsic, “Determining the Proper Interest Rate for Loss Reserve Discounting: An Economic Approach,” Appendix II is excluded from the citation. The revised citation is pp. 147-186, excluding pp. 171-178.

### Languages Other Than English

This section has been updated to note that all translations will be literal translations from the original language to English.

Archive 2005

# Notice to Candidates

## 1. New Name

The name of this publication was changed from *Syllabus of Examinations* to *Syllabus of Basic Education*. The change reflects the requirement of three topics by Validation by Educational Experience (VEE) as described below.

## 2. Validation by Educational Experience (VEE)

The CAS, in conjunction with the CIA and SOA, is implementing a revised structure for preliminary education effective January 2005. The new structure includes the following three topics that were moved from an examination requirement to Validation by Educational Experience:

- VEE-Applied Statistical Methods
- VEE-Corporate Finance
- VEE-Economics

VEE may be accomplished in one of four ways:

- College Course(s)
- Standardized Examination
- Other Educational Experiences that have been approved by the CAS, CIA, and SOA
- Transitional VEE Exams that will be offered through at least 2006

[Details and Transition rules](#) are included in this *Syllabus*.

## 3. Computer-Based Testing for Exam 1

In Spring 2005, Exam 1 will be offered in the traditional pencil-and-paper format. In September 2005, Exam 1 will be offered as a [computer-based test](#). There will not be a November 2005 administration for Exam 1 as Exam 1 will be offered by computer-based testing in early 2006. Starting in 2006, Exam 1 will be offered more than twice a year.

## 4. Only One Registration Deadline-

### No Late Registrations will be Accepted

There is only one registration deadline for each exam. Please allow at least 10 working days for your mailed registration to arrive. No late registrations will be accepted. The deadlines are:

Spring 2005	Registration Deadline
Exams 1, 2, 4	April 1, 2005

Exams 3, 5, 7, 8      March 23, 2005

**Summer 2005      Registration Deadline**

VEE Exams      June 29, 2005

**Fall 2005      Registration Deadline**

Exams 2, 4      September 24, 2005

Exams 3, 6, 9      September 22, 2005

5. [Examination Schedule](#)

6. **Online Registration for Exams 3, 5-9, and Transitional VEE Exams**

Candidates may submit examination registrations online for Exams 3, 5-9, and transitional VEE exams. Before completing an online application, candidates must submit an [Electronic Signature Authorization Form](#) (ESAF). Candidates intending to register online should submit their ESAFs by the end of **February for Spring Exams**, by the end of **May for Summer Exams**, and by the end of **August for Fall Exams**.

7. **Supplemental Exam Materials**

Some examinations may have supplemental material distributed with the exam package. Although the syllabus for some exams may list the supplemental material, supplemental material for other exams may be listed under "[Syllabus Update](#)."

8. **Notice of Examinations Posted in January and July**

The CAS posts the *Notice of Examinations* for Spring Exams in January and the Fall Exams in July. The *Notice* contains important information for the exams as well as information on study aids and review seminars.

9. **Materials for Study**

Please refer to the appropriate examination section for the learning objectives, knowledge statements, and lists of readings. Any changes made after the publication of this *Syllabus* will be posted under [Update](#).

10. **Calculators**

Only [approved calculators](#) may be used for CAS Examinations.

11. **Obtaining Examination Booklet (Exams 3, and 5-9)**

For Exams 3 and 5-9, a candidate wishing to obtain his or her own examination booklet and scrap paper subsequent to the examination should bring a self-addressed stamped envelope to the examination center. The recommended minimum postage is \$2.67 for domestic mail in the U.S. (Candidates taking transitional VEE exams will not be able to receive a copy of the VEE exam.)

12. **Order CAS Publications at CAS Online Store**

All CAS publications available for purchase, including Study Kits and Web Notes, may be bought at the [CAS Online Store](#). The *Syllabus* only provides order information for the study materials.

*Note: This Syllabus is subject to change in the future. The CAS is not responsible for any errors or omissions in the Syllabus.*

## Foreword

Actuarial science originated in England in 1792 in the early days of life insurance. Because of the technical nature of the business, the first actuaries were mathematicians. Eventually, their numerical growth resulted in the formation of the Institute of Actuaries in England in 1848. Eight years later, in Scotland, the Faculty of Actuaries was formed. In the United States, the Actuarial Society of America was formed in 1889 and the American Institute of Actuaries in 1909. These two American organizations merged in 1949 to become the Society of Actuaries.

In the early years of the 20th century in the United States, problems requiring actuarial treatment were emerging in sickness, disability, and casualty insurance—particularly in workers compensation, which was introduced in 1911. The differences between the new problems and those of traditional life insurance led to the organization of the Casualty Actuarial and Statistical Society of America in 1914. Dr. I.M. Rubinow, who was responsible for the Society's formation, became its first president. At the time of its formation, the Casualty Actuarial and Statistical Society of America had 97 charter members of the grade of Fellow. The Society adopted its present name, the Casualty Actuarial Society, on May 14, 1921.

The purposes of the Society are to advance the body of knowledge of actuarial science applied to property, casualty, and similar risk exposures, to establish and maintain standards of qualification for membership, to promote and maintain high standards of conduct and competence for the members, and to increase the awareness of actuarial science. The Society's activities in support of this purpose include communication with those affected by insurance, presentation and discussion of papers, attendance at seminars and workshops, collection of a library, research, and other means.

Since the problems of workers compensation were the most urgent at the time of the Society's formation, many of the Society's original members played a leading part in developing the scientific basis for that line of insurance. From the beginning, however, the Society has grown constantly, not only in membership, but also in range of interest and in scientific and related contributions to all lines of insurance other than life, including automobile, liability other than automobile, fire, homeowners, commercial multiple peril, and others. These contributions are found principally in original papers prepared by members of the Society and published annually in the *Proceedings of the Casualty Actuarial Society*. The presidential addresses, also published in the *Proceedings*, have called attention to the most pressing actuarial problems, some of them still unsolved, that have faced the industry over the years.

The membership of the Society includes actuaries employed by insurance companies, industry advisory organizations, national brokers, accounting firms, educational institutions, state insurance departments, and the federal government. It also includes independent consultants. The

Society has three classes of members, Fellows, Associates, and Affiliates. Fellows and Associates require successful completion of examinations as described in this *Syllabus*. Affiliates are qualified actuaries who practice in the general insurance field and wish to be active in the CAS but do not meet the qualifications to become a Fellow or Associate.

## Introduction

### **Principles of the Casualty Actuarial Society for Basic Education**

The primary purpose of the Casualty Actuarial Society (CAS) basic education process is to ascertain whether candidates for the CAS designations have satisfied CAS learning objectives. The CAS Board of Directors adopted the following principles on May 6, 2001.

1. Basic education will remain a cornerstone of the CAS.
2. The CAS will assure that its members have the knowledge of those areas needed to practice effectively in the broad and expanding range of property, casualty, and similar business and financial risks (general insurance).
3. The CAS is committed to a depth of knowledge of techniques associated with the broad range of property, casualty, and similar business and financial risks.
4. The CAS will provide the basic education necessary to meet qualification standards to sign statements of actuarial opinion for general insurance and related specialties in at least the U.S. and Canada.
5. The education process will provide a balance among theoretical concepts, practical applications, and business acumen, to prepare our members to deliver high-quality service to meet current and projected future needs of employers and clients.
6. The CAS will approve the syllabus and examination standards used in determining eligibility for CAS membership.
7. Demonstration of mastery of the skill sets required of members is critical to basic education.
8. The CAS is committed to maintaining self-study as one route for attainment of designations.
9. The CAS will pursue strong working relationships with academia and professionals in related fields.
10. The CAS will attract a pool of strong candidates from a variety of backgrounds to the actuarial profession.
11. The CAS supports the goal of developing a global shared foundation of actuarial education, including joint sponsorship of examinations where consistent with other principles.
12. The CAS, as an educator of general insurance and related specialties, will remain a significant contributor to the worldwide actuarial profession.

### **Syllabus Goals and Objectives**

One of the primary objectives of the Casualty Actuarial Society (CAS) is the development of

qualified professionals in the field of casualty actuarial science. The CAS conducts an educational and examination program for prospective members in order to achieve this objective. The syllabus goals and objectives are as follows:

1. To develop a general understanding of the social, political, regulatory, legal, economic, and financial environment of the business of property and casualty insurance and similar risk assessment as well as the historical development of that environment.
2. To develop a thorough understanding of the fundamental mathematical concepts applicable to solving insurance and similar risk assessment problems and to develop a high degree of skill in their applications.
3. To develop a comprehensive understanding of the business of property and casualty insurance, including underwriting, claims, marketing, and finance, as well as how these functions are performed and interrelate.
4. To develop a working knowledge of property and casualty insurance policies and contracts.
5. To develop an expert knowledge of a broad range of techniques to solve problems and to develop the ability to discern the appropriateness of techniques for particular applications based on a knowledge of the underlying assumptions, strengths, and weaknesses.
6. To develop an expert knowledge of a broad range of relevant and standard actuarial practices in order to present a framework for the use of problem-solving techniques.
7. To encourage a sense of inquisitiveness and creativity toward problem solving in order to foster an appreciation of the art in actuarial science.

Note: The items in this *Syllabus* were chosen for their educational value. They are intended to expose the candidate to a wide range of information and to a variety of methods, opinions, and practices in the casualty actuarial field. Inclusion of material in the *Syllabus* does not imply that the CAS endorses the views, methodologies, or techniques therein.

### **Education and Examination System**

The CAS vice president-admissions supervises the CAS education and examination system. The vice president-admissions is supported by the following four admissions committees.

#### ***CAS Education Policy Committee***

The [Education Policy Committee](#) establishes the goals and objectives of the CAS education and examination system to ensure that the needs of the Society, its members, and its potential members are met. The committee also monitors the operations of the other educational and examination committees to ensure continued effectiveness.

#### ***CAS Syllabus Committee***

The [Syllabus Committee](#) determines the scope and content of the CAS *Syllabus* and course of readings for CAS Examinations.

A chairperson supervises the committee that is composed of Fellows who represent a broad spectrum of CAS members including insurers, consultants, regulators, and academicians. At least one representative of the Canadian Institute of Actuaries (CIA) also serves on the committee; usually at least one of the representatives is a member of the CIA Education and Examination



Committee. One or more members specialize in the material for each examination part. These specialists recommend changes to the *Syllabus*; however, recommendations must be approved by the entire committee.

The [Materials for Study](#) are reviewed regularly by members of the Syllabus Committee. Both short- and long-term goals for improvement are developed. Textbooks and articles may be designated for inclusion. If the committee determines that new study material needs to be developed or that existing material needs to be revised, the committee may commission the creation of Study Notes for inclusion. Every effort is made to develop material that is appropriate, relevant, up-to-date, concise, and well-written. Suggestions for improvement are always welcome and should be directed to the Syllabus Committee at the CAS Office address.

### ***CAS Examination Committee***

The [Examination Committee](#) organizes, manages, administers, and grades the CAS Examinations. The committee also establishes the standards to be achieved by successful candidates.

The chairperson supervises the committee and is responsible for the overall administration of the CAS Examinations. The chairperson is assisted by several senior committee officers with the title of general officer. The committee is subdivided into Examination Part Committees, each headed by an examination part chairperson.

The committee work is similar for both the jointly administered Exams 1, 2, and 4 and the CAS-specific Exams 3, 5-9. The following provides details about the CAS-specific examinations:

- The responsibility for each CAS Examination is assigned to a part committee that writes, grades, and maintains the standards for that examination. Each part committee is assisted by two examination consultants who are CAS members and are experts on the material covered by that examination. The part committees are also assisted by a proofreader who concentrates on uniformity and grammar. In addition, some part committees are assisted by academic consultants who are independent experts from the academic community.
- Each examination is drafted by the responsible Examination Part Committee to test candidates' knowledge of the items listed in the "Materials for Study." The individual part committee, examination consultants, one of the Examination Committee general officers, the Examination Committee chairperson, and, in some cases, academic consultants review each examination to assure its quality.
- Every effort is made to ensure that the questions fall within the scope of the "Materials for Study." Complete coverage of all material is not practical for every examination every year. The goal is to produce examinations that contain representative, high-quality questions that test candidates' knowledge of the material. Trick questions are deliberately avoided, and the wording of each question is considered carefully to eliminate possible ambiguities. Preliminary versions of each examination are thoroughly reviewed in relation to all of these factors before the final examination is approved.

### ***CAS Candidate Liaison Committee***

The [Candidate Liaison Committee](#) strives to focus on issues of importance to candidates who are

taking CAS Examinations. The committee serves as a direct point of contact for candidates to voice individual or group concerns regarding the education and examination process. It also provides a means for an exchange of information between candidates and the admissions committees via *Future Fellows*, a quarterly newsletter. Candidate representatives who are actively involved in the examination process serve as advisors to the committee.

## Summary

### Associateship Requirements

#### *Validation by Educational Experience*

[VEE-Applied Statistical Methods](#)

[VEE-Corporate Finance](#)

[VEE-Economics](#)

#### *Examinations*

- 1\* [Probability](#)
- 2\* [Financial Mathematics](#)
- 3 [Statistics and Actuarial Models](#)
- 4\* [Construction and Evaluation of Actuarial Models](#)
- 5 [Introduction to Property and Casualty Insurance and Ratemaking](#)
- 6 [Reserving, Insurance Accounting Principles, and Reinsurance](#)
- 7† Nation-Specific: Annual Statement, Taxation, and Regulation- [Canada](#) or [U.S.](#)

#### *Course on Professionalism*

#### **Fellowship Examinations**

- 8 [Investments and Financial Analysis](#)
- 9 [Advanced Ratemaking, Rate of Return, and Individual Risk Rating Plans](#)

\* Preliminary Actuarial Examinations administers the jointly sponsored Exams 1, 2, and 4 of the Canadian Institute of Actuaries, Casualty Actuarial Society, and the Society of Actuaries.

† Candidates must specify their U.S. or Canadian specialty at the time of [application](#).

# Schedule

Spring 2005

EXAM	DATE	ZONE	START TIME	FINISH TIME
1	May 25, 2005*	All time zones	8:30 a.m.	11:30 a.m.
2	May 26, 2005*	All time zones	8:30 a.m.	10:30 a.m.
3 ^	May 4, 2005	North and South America	9:30 a.m.	1:30 p.m.
3 ^	May 4, 2005	Europe, Africa, Asia, Australia	1:00 p.m.	5:00 p.m.
4	May 18, 2005*	All time zones	8:30 a.m.	12:30 p.m.
5	May 6, 2005	North and South America	9:30 a.m.	1:30 p.m.
5	May 6, 2005	Europe, Africa, Asia, Australia	1:00 p.m.	5:00 p.m.
7	May 3, 2005	North and South America	9:30 a.m.	1:30 p.m.
7	May 3, 2005	Europe, Africa, Asia, Australia	1:00 p.m.	5:00 p.m.
8	May 5, 2005	North and South America	9:30 a.m.	1:30 p.m.
8	May 5, 2005	Europe, Africa, Asia, Australia	1:00 p.m.	5:00 p.m.

Summer 2005

TRANSITIONAL VEE EXAMS	DATE	ZONE	START TIME	FINISH TIME
VEE-Economics	August 10, 2005	All time zones	9:30 a.m.	11:00 a.m.
VEE-Corporate Finance	August 10, 2005	All time zones	12:30 p.m.	2:00 p.m.
VEE-Applied Statistical Methods	August 10, 2005	All time zones	3:30 p.m.	5:00 p.m.
<b>COMPUTER-BASED TESTING</b>				
Exam 1 will be offered by <a href="#">computer-based testing (CBT) in September 2005</a> . Beginning in early 2006, Exam 1 will be offered by CBT more than twice a year.				

### Fall 2005

EXAM	DATE	ZONE	START TIME	FINISH TIME
2	November 9, 2005*	All time zones	8:30 a.m.	10:30 a.m.
3 ^	November 1, 2005	North and South America	9:30 a.m.	1:30 p.m.
3 ^	November 1, 2005	Europe, Africa, Asia, Australia	1:00p.m.	5:00 p.m.
4	November 7, 2005*	All time zones	8:30 a.m.	12:30 p.m.
6	November 2, 2005	North and South America	9:30 a.m.	1:30 p.m.
6	November 2, 2005	Europe, Africa, Asia, Australia	1:00 p.m.	5:00 p.m.
9	November 3, 2005	North and South America	9:30 a.m.	1:30 p.m.
9	November 3, 2005	Europe, Africa, Asia, Australia	1:00 p.m.	5:00 p.m.

Starting time for examinations is local time for the specified zone.

\*Updated information for exams that are jointly administered by the [Casualty Actuarial Society](#) at (703) 276-3100, or the [Society of Actuaries](#) at (847) 706-3500.

^ The exam for SOA Course M will be offered on May 19, 2005, and November 8, 2005.

# Hints on Study and Exam Techniques

*Editor's Note: These hints do not include any material on which candidates will be examined, but are provided by members of the CAS Syllabus and Examination Committees to encourage candidates to do their best when sitting for CAS Examinations.*

*"Hints On Study and Exam Techniques" is largely based on the experience and advice of others and was originally prepared for Society of Actuaries candidates by James L. Clare. Later, it was adapted by G.D. Morison for use by CAS candidates and was updated in 1992. The CAS will be glad to consider incorporating further comments and suggestions periodically. If you have any changes to suggest, please send them to the [CAS Office](#).*

## **Motivation**

Motivation is the single most important ingredient in learning-and in passing examinations. Motivation suffers when candidates worry about or are preoccupied with personal matters or other problems. This suggests that candidates should keep studying and examination taking at the very top of their lists of priorities, and should always have a constructive attitude about their studying. In particular, candidates should approach the examination as an opportunity to enhance their knowledge and understanding of actuarial science, rather than as an obstacle in their paths to membership in the CAS.

Motivation is increased by incentives, such as the following:

- Passing actuarial examinations requires many hours of study-more for some people and less for others-but often more than many candidates realize. Putting in enough hours can actually save a candidate time. Suppose, for example, that mastering the syllabus for one examination will take a candidate 400 study hours, and that one candidate only puts in 300 hours and fails the examination the first time. He or she then puts in a second 300 hours and passes the examination the second time. That candidate will have spent 600 hours, when by studying 400 hours the first time around, he or she would have saved 200 hours, not to mention passing one year sooner. It is recommended that candidates decide for themselves how many hours they really need to study, and then do that much studying-the first time around.

- Candidates can increase their motivation level by regarding the examinations as a stepping stone to greater responsibility at their places of employment, to opportunities for getting more done on their own, and to greater results and rewards from their work.
- Candidates can also increase their motivation through sufficiently intensive and sustained study so that they come to appreciate more fully the fascination of the various subjects, and the interrelationship between them.

A number of doctors, educators, executives, and personnel people all agree that motivation can be greatly increased by having a goal in mind. Candidates must determine their goals and keep them in mind.

### **Techniques**

It has been proven many times in various countries, both by individuals and by controlled groups, that improved study and examination techniques can strengthen a candidate's mastery of a subject and increase his or her examination scores significantly. Provided that the candidate is motivated and spends enough hours studying, techniques such as those given here may often make the difference between failing or passing an examination.

Each person has his or her own strengths and weaknesses, so candidates are advised to work out their own personal sets of techniques which will work best for them. What follows is merely a set of suggestions to help candidates in getting started in building up their own techniques.

### **The Challenge**

It is easy to underestimate the effort that is required because substantial changes may be needed to switch from college or university life to successful study of actuarial examinations.

University courses often stress understanding, and usually do much to smooth the path for the student with lectures, personal contacts, organized places of study, and a focus on learning.

By contrast, actuarial candidates must work a great deal on their own and generally must make a "long and grueling" journey to reach their goals. Much actuarial studying is normally fit in after a full day's work, or is done on a weekend when one's friends are free to do as they please. Making adequate time available for studying requires sustained self-discipline and is a purely individual and personal responsibility.

### **Schedule of Study**

There is only one substitute for hours of study time omitted one week—at least as many additional hours of study in another week. An unavoidably "necessary condition" for success in studying (though not necessarily "sufficient condition") is simply spending enough total hours studying.

Candidates must decide how many hours in total they need to study. Then they need to set out their schedules in writing, specifically stating the weekday evening and weekend periods allocated to studying. They then should total the number of hours made available. If the total hours scheduled are less than the total hours necessary, candidates should expand their schedules until they at least have equalled the required total time plus an additional cushion for absorbing time that will inevitably be lost along the way on account of illness, work pressures, etc.

Then candidates should fit all the segments of the *Syllabus* into their schedules so that they will thoroughly cover the course of reading in good time before the examination, with time left over for a thorough final review. It is important for candidates to spread their time over the entire *Syllabus* in some deliberate way, for example, in proportion to the pages of reading material on the *Syllabus*.

Candidates may find it helpful to study several subjects within an examination, or all of them in parallel. This gives them more variety each week, and may give them a combination of both study that is more appealing and study that requires greater effort and concentration. Particularly demanding study may be best left for weekends when candidates are less fatigued from regular work.

It is a good idea for candidates to keep a record of the hours they spend studying. Even if candidates are completely confident that they know the *Syllabus* before putting in their required total hours, there is much to be said for carrying out the full schedule and completing the total time quotas.

### **Retention**

As part of human nature, our memories forget facts and ideas most rapidly during the time immediately following our study of them. For a given number of study hours, therefore, candidates will remember more if they review promptly and frequently. It is recommended that candidates review what they have learned as part of ending their study for the day. As they begin their next study session, candidates should review what they learned the last time and what they learned during other recent sessions. Then they can recall points they have learned during odd spare moments in between study sessions. It is important for candidates to leave time for a thorough final review before the examination.

In their study for the mathematical sections of the Associateship examinations, candidates are advised to work out as many examples as possible in order to acquire facility in the application of the mathematical principles and methods to specific problems.

There are some analogies that can be made between preparing for an actuarial examination and learning to drive a car. Most inexperienced drivers have good motivation for learning to drive and have a strong goal clearly in mind. Yet they still need to practice their driving skills until they become "second nature." This is easier to do if they keep practicing their driving in the days immediately after a lesson. Candidates should equally be the master of their actuarial studies by the time they enter the examination room. Experienced drivers should be able to pass a driving test not just on a few familiar streets, but over any legal route. In the same way, actuarial candidates should be able to pass any set of examination questions which has been drawn from the *Syllabus*.

Candidates should note the considerable emphasis in actuarial examinations on knowledge. However, they should remember that the best way to learn facts by heart is to understand the whole subject, and to tie together ideas that are related. They should look at any single subject from several different angles, relating what they learn to what they know already. Candidates

should look for as many connections as they can between their actuarial work and their actuarial studies.

As humans, we learn by doing. While the extent of a candidate's notes will be a matter of his or her own personal tastes, taking thorough notes will be a good investment of time for most people. For candidates, "translating" the subject matter into their own words helps their memories, and forces to their attention those items that they do not really understand and require further study. Upon reviewing their notes, if candidates find gaps in their knowledge or in their understanding, they should bear down on those areas and master them.

Another study technique candidates might want to try is to test themselves as they go along. They can review previous examinations when they start to study to get an idea of the mastery of the *Syllabus* expected. Candidates can also take these as "trial examinations" to help them in testing their knowledge and understanding of the course of reading, and in improving their examination speed and confidence. Some candidates deliberately test themselves; others prefer not to do so.

Candidates should expect a gradual gathering of momentum as they begin their study for a particular examination. By keeping at it, according to their plans, candidates will find their rate of progress speeding up after the first few weeks.

When a candidate finds himself or herself getting very "stale," one possibility is to stop studying altogether for, perhaps, three days. Then the candidate should continue on with his or her study plan, no matter how he or she feels, for at least the next month or six weeks. A candidate's study plan should have enough spare time available in it to allow for such occasional "down time." A mixed schedule, with a weekly combination of subjects that the candidate likes and subjects that he or she finds difficult, will help to minimize staleness.

Discussing the *Syllabus* with friends taking the same examination, or with others who have passed the examination, will help candidates remember the material firmly and to understand it. It also helps candidates to realize their own gaps and difficulties. If effective study circles and tuition courses can be found, they will give candidates a different slant on the subject, give them a chance to review and to practice, keep them moving through the *Syllabus*, and help to combat lethargy and self-satisfaction.

Candidates should beware, however, of someone else doing their own thinking for them. It is imperative that they develop and maintain their own command and understanding of each subject. When reading, candidates should challenge the author in their minds and debate with him or her, rather than merely swallowing everything whole.

## **Formulating Answers**

### ***Multiple-Choice Questions***

Candidates can definitely improve their speed and mastery by seriously practicing on sample examination-type questions before the examination. It helps to have a good understanding of the subject material. Candidates can also develop valuable shortcuts, such as eliminating impossible



answers by checking out boundary conditions or by inspecting other aspects of certain suggested solutions, or by substituting numerical values and cutting out some answers. Since questions are varied, candidates will need a variety of techniques to cope with them.

In a multiple-choice examination, speed is an important factor. Candidates increase their chances of passing if they are able to seriously attempt each question on the entire paper at least once. It may help them to determine the proportionate number of questions to answer in the first half-hour of the examination, to check how much ground they cover in that time, and then accordingly either speed up, or slow down and dig more deeply.

When pressed for time, it may pay for candidates to omit a few multiple-choice questions which they expect to take more time than average, so as to have time for a larger number of more quickly-answered questions. For example, a cluster of questions may have a common introduction which a candidate does not readily grasp, in which case he or she might skip the entire cluster at a first attempt.

Candidates may find it helpful to keep a list of the number of the questions not answered so that they quickly can get an idea of how many they are omitting. This will allow the candidate to quickly return to these questions.

Candidates should change their answers only if they are sure that their first solution was wrong.

### *Essay Questions*

The model response to the typical essay question is brief, less than one-half of a written page. Be concise—candidates do not need to answer in complete sentences when a well-composed outline format is more appropriate. Candidates should not waste time on obscure details. They should show that they have learned the relevant material and that they understand it. They should state the obvious, if it is part of the answer.

For questions which require candidates to work a numerical solution, candidates should take the time to set up the problem so that they document their understanding. They should set forth relevant equations or formulae, then enter appropriate values. They should lay out complicated calculations in tables which demonstrate their understanding of the correct solution.

Candidates should keep each answer relevant to the precise question being asked. They should make sure they first understand exactly what is wanted before they begin to answer a question. When they have written part or all of their answer, they should take another look at the question and make sure they have answered—not their own question—but the question as set on the examination page.

If candidates are asked to “discuss” a proposal, they should list all significant arguments both for and against it.

If a candidate believes that a question is ambiguous, or that it does not provide all the information necessary to answer the question, the candidate should state how he or she interprets the question and/or what assumptions are made to answer it.

Candidates should take time to write legibly, since examiners can only give credit for what they can read. They should try to “organize” their answer. Then, their main aim is to get down as much relevant material as they can.

There is no advantage to answering the questions in any particular order. Candidates may answer the questions in the order given if they wish. Alternatively, candidates can quickly read over the whole paper, warm up with whichever question comes easily to them, gradually work into the questions they find more challenging, and end on a question that they think can be answered readily even though, by that time, their energy and concentration may be falling off.

Note that since each question is graded separately, each answer must be self-contained. Candidates should not say, “Part of my answer to question 1 is found in my answer to question 3.”

It is important that candidates remember that they have limited time. Candidates will find that it is worth checking their progress to assure that they have an opportunity to respond to every question. If they know that a question will take too much time, they can pass it and return to it later, if time permits.

### **Final Mental Preparations**

Olympic and professional athletes often vary their training schedules as a major contest approaches. They often ease up on endurance training, and shift their aim to sharpening their alertness, their effectiveness, and their will to win.

In any examination, it is just as important that candidates be alert and effective, with all their wits about them, and with an eager desire to do their best.

Some candidates fail in the first half-hour or so of an examination. Perhaps it would be more accurate to say they “defeat themselves” in that time. They become pessimistic and discouraged, and think too much about the possibility of their having made a bad start in answering the questions.

Other candidates, with the same ability, knowledge, and preparation—and making bumbles just as bad in parts of the examination as the first type of candidates—nevertheless succeed in passing the same examination. As in life itself it is also true of actuarial examinations, the difference between failure and success is often linked to a person’s attitude. Confidence and optimism, based on mastery of the subject through hard work and many hours of study, will help a candidate to keep going.

Instead of wasting time and energy worrying about how badly they believe they are doing, candidates should do something constructive on another question. They can always come back later to the weak answer, time permitting.

Candidates should never give up in the examination room. They should use every minute and every second of the available time. They should not “grade their own papers,” and decide not to hand in an answer to a question or two because they feel it is all wrong. They should hand in all

of their answers, and let the examiners do the grading. At least one candidate has not handed in some answer pages which he or she had condemned in his or her own mind, only to find out later that the work was correct, and to find out still later that he or she had narrowly failed to pass.

### **Books to Read**

Some candidates may find it a good investment of their time to read one or more books discussing study and examination techniques. On the other hand, many candidates have successfully completed all their examinations without reference to such texts. These texts will be of little value to a candidate with solid study habits. For those candidates who have not developed good study habits, then these types of texts are more likely to be worthy of their consideration.

It is up to the candidate to decide for himself or herself on a single strategy to follow, especially if he or she refers to more than one book. While all books will have a common thrust, there may be some differences between them on certain points, such as on the most desirable level of the extensiveness of the notes a candidate should take. It is important for candidates to not chop and change from one technique to another during the time they are studying. Rather, they should read such books as they wish, and decide for themselves a single, clear path to travel—and then stick to it.

# Study Resources

## Study Notes for Exams 1, 2, and 4

Official Study Notes are published to help candidates prepare for the examinations. In some instances, Study Notes are the principal references; in others, they are designed to coordinate the subject for the candidate or to complement other readings. Sample examinations, illustrative solutions, and answer keys for Exams 1, 2, and 4 are available as part of the set of Study Notes. Introductory Study Notes (ISN) contain important information about the examinations, including any changes to the course of readings, changes in examination times or dates, errata, and descriptions of examination formats. Occasionally, the course of reading for an examination may be changed after publication of the *Syllabus*. Such a change will be announced on the CAS and SOA Web Sites and in the ISN for the affected examinations. If any conflict exists between information contained in this *Syllabus* and that contained in the ISN, the ISN will govern.

Study Notes may be downloaded at no charge from the CAS [Web Notes](#) and from the [SOA Web Site](#). Information on purchasing a hard copy of the Study Notes is available below.

## Study Kits and Web Notes for Exams 3, 5-9

Many required readings may be downloaded free-of-charge from the Exams section of the CAS Web Site. These readings are listed as "[Web Notes](#)."

The Study Kit contains other required readings not owned by the CAS but for which the CAS has been granted permission to include in the Study Kit. Study Kits and the printed version of the Web Notes will be available December 1, 2004. To order Study Kits, visit the [Online Store](#).

2005 Study Kits and Web Notes	Price
Exam 3 Web Notes	\$16
Exam 5 Study Kit	\$52
Exam 5 Web Notes	\$94
Exam 6 Study Kit	\$25
Exam 6 Web Notes	\$84
Exam 7-Canada Study Kit	\$126

Exam 7-Canada Web Notes	\$13
Exam 7-Canada 2005 Update to the 2004 Study Kit	\$42
Exam 7-U.S. Study Kit	\$73
Exam 7-U.S. Web Notes	\$53
Exam 7-U.S. 2005 Update to the 2004 Study Kit	\$22
Exam 8 Study Kit	\$37
Exam 8 Web Notes	\$12
Exam 8 2005 Update to the 2004 Study Kit	\$8
Exam 9 Study Kit	\$28
Exam 9 Web Notes	\$79
Exam 9 2005 Update to the 20043 Study Kit	\$11

Canadian residents must add 7% for GST; Virginia residents must add 5% sales tax. For deliveries outside the U.S. or Canada, add 50% of the total cost for shipping. Candidates should check the Study Kits for completeness (i.e., defective pages and/or omissions).

**Please allow four to six weeks for delivery. NO RETURNS. NO REFUNDS.**

### Sample Examination Questions

#### *Exams 1, 2, and 4*

[Sample examination questions for Exams 1, 2, and 4](#) are available. The sample examinations, illustrative solutions, and answer keys also are included in the complete set of Study Notes. (Order from the [CAS Online Store](#).)

#### *Exams 3 and 5-9*

[Past copies](#) (last three sittings) of Exams 3, 5-9 with answers are available. (Exam 3 may contain three nonconsecutive exams.) Sample essay answers are actual responses that received credit and are illustrative of successful answers, although they may not be considered perfect answers. For those who do not have access to the Web site, a printed three-sitting "Set of Examinations" is available at a charge of \$25. Because sample answers are not available until July 31 for Spring Examinations and January 31 for Fall Examinations, the printed "Set of Examinations" will not be updated until after these dates. Order using the [CAS Online Store](#).

**NO RETURNS. NO REFUNDS.**

Exams 3 and 5-9 will be posted online approximately one week after these examinations have been administered. They will include a *preliminary* list of multiple-choice and true/false answers. Sample essay answers and final multiple-choice and true/false answers will be posted on July 29, 2005, for Spring Examinations and January 31, 2006, for Fall Examinations.

In referring to a published prior examination, candidates should keep in mind that the questions were based on the course of readings in effect for that particular examination and may not reflect the current course of readings. Candidates may also expect future examinations to vary somewhat as to the proportions of question styles and subjects. New forms of questions may appear from time to time, and the total number of questions may vary from one exam sitting to the next.

### ***Transitional VEE Exams***

In general, the transitional VEE exams will not be released to candidates. The August 2005 VEE exams, however, will be posted online for use as sample exams. The transitional VEE exams administered in 2006 will not be released.

### **CAS Web Site**

This section of the CAS Web Site contains the following resources for CAS examinations:

- [Syllabus of Basic Education](#)
- [Updates to the Syllabus of Basic Education](#)
- [All readings listed as Web Notes](#)
- [Copies of sample/past examinations](#)
- [Notice of Examinations](#)
- [Any change regarding the examination](#)
- [Order forms for study materials](#)
- [Registration forms for all CAS examinations](#)
- [Discussion Forum](#)
- [Archives of the E-mail Study Groups](#)
- [Candidates' examination status](#)
- [The Future Actuary newsletter](#)
- [Future Fellows newsletter](#)
- [Frequently Asked Questions](#)

### **E-mail Study Groups**

The CAS has available e-mail study groups for those preparing for CAS examinations. To join a study group, go to <http://www.casact.org/admissions/studygroups.cfm>. Study group messages are archived at <http://www.casact.org/discuss/index.cfm?fa=archivist>. Please direct any questions to the CAS Webmaster at [webmaster@casact.org](mailto:webmaster@casact.org).

### **CAS Library**

The CAS Library has available for loan all the books marked with an "L" in this *Syllabus*. Candidates registered for CAS Examinations and all members of the CAS have access to the library facilities. The CAS Library is located at the CAS Office in Arlington, Virginia.

Books and manuals may be withdrawn from the Library for a period of one month without charge. In general, not more than two references may be in the hands of one borrower at a time. Requests must be in writing and must include the borrower's complete name, address, and telephone number. Address requests for library books to:

Casualty Actuarial Society  
Library Service  
1100 North Glebe Road, Suite 250  
Arlington, VA 22203-4798  
Fax: (703) 276-3108  
E-Mail: [library@casact.org](mailto:library@casact.org)

The CAS Office ships the requested book(s) in the United States and Canada via United Parcel Service (UPS) and internationally via Air Mail. Due to delays in the mail system, the CAS requires all shipments of books returned to the CAS Office to be shipped via UPS or an equivalent carrier with tracking capabilities. Please do not use the United States Postal Service. Overdue books will be charged at a cost of 25¢ per day.

Books that are not available through the CAS Library may be obtained by contacting the organizations listed in the [Publishers and Distributors](#).

Archive 2005

# Validation by Educational Experience (VEE)

- [Introduction](#)
- [Four Ways to Get VEE Credit](#)
- [VEE-Applied Statistical Methods](#)
- [VEE-Corporate Finance](#)
- [VEE-Economics](#)

## Introduction

The CAS, in conjunction with the CIA and SOA, is implementing a revised structure for preliminary education effective January 2005. The new structure consists of three topics that will require Validation by Educational Experience (VEE) in addition to four examinations:

- VEE-Applied Statistical Methods
- VEE-Corporate Finance
- VEE-Economics
- Joint Exam 1, Probability
- Joint Exam 2, Financial Mathematics
- CAS Exam 3, Statistics and Actuarial Models (or SOA Course M, Actuarial Modeling)
- Joint Exam 4, Construction and Evaluation of Actuarial Models

In addition to the preliminary education requirements listed above, Exams 5-7 and the CAS [Course on Professionalism](#) will be required for Associateship. The syllabi for the examinations are provided in the "[Materials for Study](#)" section. Details about the process for obtaining credit for the VEE topics are provided below. VEE topics are not prerequisites for the preliminary examinations and may be fulfilled independently of the preliminary exam process.

## Four Ways to Get VEE Credit

Validation by Educational Experience can be accomplished in one of four ways:



1. **College Course(s):** Complete one or more courses offered by a college or university and approved by the CAS, CIA, and SOA. Candidates must receive a grade of B- or better in each course. If the institution does not use letter grading, an appropriate translation will be determined.
2. **Standardized Examination:** Achieve a pre-set score on a standardized examination as determined by the CAS, CIA, and SOA. Specified score minimums on the Advanced Placement (AP) and College Level Examination Program (CLEP) tests for micro and macroeconomics will be accepted as VEE credit for economics. The VEE Administration Committee (VEEAC) will determine which other examinations qualify and the score required for credit.
3. **Other Educational Experiences:** Complete other educational experiences as approved by the CAS, CIA, and SOA. Approved educational experiences will be posted on the Web sites of the [CAS](#), [CIA](#), and [SOA](#).
4. **Transitional VEE Exams:** Achieve a passing grade on a CAS transitional VEE exam that will be offered beginning in August 2005 through at least 2006. The syllabi for the three transitional VEE exams are provided in the [Appendix](#).

### **Step 1: Approval of Courses/Experiences**

The VEE Administration Committee will determine which college courses, standardized exams, and other educational experiences are appropriate for VEE credit. Before a candidate may submit an application to receive individual credit for a VEE topic, the course or educational experience itself must first be approved.

For course/experience approval, an **official application form** must be completed and submitted with the required documentation. The VEEAC will review the course/experience. All approved courses/experiences will be listed in the "[Directory of Approved VEE Courses/Experiences](#)" that will be posted on CAS, CIA, and SOA Web Sites. The directory will identify the educational institution, the approved courses/experiences by VEE topic, a unique approval code for each course/experience, and the years for which the courses/experiences were approved.

The guidelines that the VEE Administration Committee will use to determine whether specific courses or educational experiences are appropriate to fulfill the VEE requirements are provided in the next three sections of this Syllabus.

### **Step 2: Approval of Individual VEE Credits for Candidates**

Beginning in January 2005, candidates who have credit for at least two actuarial examinations may submit an application for their own VEE credits. In addition to the application, candidates will be required to arrange for an official transcript to be submitted to the VEE administrator. The "[Application for Validation by Educational Experience Credit](#)" includes specific directions. Only courses/experiences that are listed in the online "[Directory of Approved VEE Courses/Experiences](#)" may be used for VEE credit. If a course/experience is not on the approved list, the candidate may submit the course for approval according to the procedures described in Step 1 above beginning January 2005.

Once a candidate's application and documentation of the required grade on an approved course/experience has been validated, credit for the specific VEE topic will be granted. The candidate will be sent a written response to each application.

### **VEE-Applied Statistical Methods**

The following guidelines for the Validation by Educational Experience (VEE) requirement for Applied Statistical Methods will be used by the VEE Administration Committee to determine whether specific courses or educational experiences are appropriate to fulfill the VEE requirements. The "Directory of Approved VEE Courses/Experiences" will be posted on the [CAS](#), [CIA](#), and [SOA](#) Web Sites.

Courses that meet the requirement for VEE-Applied Statistical Methods may be taught in the mathematics, statistics, or economics department, or in the business school. In economics departments, this course may be called Econometrics. The material could be covered in one course or two. The level of mathematical sophistication of these courses will vary widely and all levels are intended to be acceptable. Most of the topics listed below should be covered:

#### **Regression analysis**

1. Least square estimates of parameters
2. Single linear regression
3. Multiple linear regression
4. Hypothesis testing and confidence intervals in linear regression models
5. Testing of models, data analysis, and appropriateness of models

#### **Time series/forecasting**

1. Linear time series models
2. Moving average, autoregressive, and/or ARIMA models
3. Estimation, data analysis, and forecasting with time series models
4. Forecast errors and confidence intervals

### **VEE-Corporate Finance**

The following guidelines for the Validation by Educational Experience (VEE) requirement for Corporate Finance will be used by the VEE Administration Committee to determine whether specific courses or educational experiences are appropriate to fulfill the VEE requirements. Details about submitting a course for approval as well as obtaining individual VEE credit are provided. The "Directory of Approved VEE Courses/Experiences" will be posted on the [CAS](#), [CIA](#), and [SOA](#) Web Sites.

The typical corporate finance program covers the topics below in two semesters. Where this is done as a very high-level introductory semester followed by a more advanced semester, the second course may be the only course evaluated. Where the topics are split across two semesters or courses, both semesters will be evaluated. The exceptional case where the corporate finance topics are covered in only one course will also be considered.

Most of the topics in each category listed below should be covered:

### **Finance**

- Definitions of key finance terms: stock company; capital structure
- Key finance concepts: financing companies; characteristics and uses of financial instruments; sources of capital; cost of capital; dividend policy; personal and corporate taxation
- Factors to be considered by a company when deciding on its capital structure and dividend policy
- Impact of financial leverage and long/short term financing policies on capital structure
- Characteristics of the principal forms of financial instruments issued or used by companies, and the ways in which they may be issued
- How a company's cost of capital relates to the investment projects the company wishes to undertake

### **Investment**

- Key finance concepts: option pricing theory and stock valuation
- Definitions of key finance terms: financial instruments - bond, stock, basic options (calls, puts); dividends; price to earnings ratio
- Structure of a stock company and the different methods by which it may be financed
- Calculate value of stocks
- Calculate value of options
- Measures of financial performance: balance sheet; income statement; statement of cash flows; financial ratios (e.g. leverage, liquidity, profitability, market value ratios); net present value: the payback, discounted payback models; internal rate of return and profitability index models
- Assessment of financial performance using various measures: balance sheet; income statement; statement of cash flows, financial ratios (e.g. leverage, liquidity, profitability, market value ratios); net present value; the payback, discounted payback models; internal rate of return and profitability index models

### **VEE-Economics**

The following guidelines for the Validation by Educational Experience (VEE) requirement for Economics will be used by the VEE Administration Committee to determine whether specific courses or educational experiences are appropriate to fulfill the VEE requirements. Details about submitting a course for approval as well as obtaining individual VEE credit are provided. The "Directory of Approved VEE Courses/Experiences" will be posted on the CAS, CIA, and SOA Web Sites.

Typically, the VEE requirement for Economics will be met if a candidate has completed two economics courses, one course covering microeconomics and the other covering macroeconomics. Most of the topics listed below should be covered:

### **Microeconomics**

1. Interaction between supply and demand in the provision of a product and the way in which equilibrium market prices are determined
2. Elasticity of demand and supply and the effects on a market of different levels of elasticity
3. How rational utility maximizing agents make consumption choices
4. How profit-maximizing firms make short-run and long-run production choices
5. Different types of competition, or lack of it, and the practical effect on supply and demand

### **Macroeconomics**

1. Structure of public sector finances of an industrialized economy
2. GDP, GNP, and Net National Product: How these concepts are used in describing the economy and in making comparisons between countries, and the limitations of these concepts
3. Propensity to save or to consume by the private sector or the corporate sector and how it affects the economy
4. Impact of fiscal and monetary policy and other forms of government intervention on different aspects of the economy, and in particular on financial markets
5. Role of exchange rates and international trade in the economy and the meaning of the term balance of payments
6. Major factors affecting the rate of inflation, the level of interest rates, the exchange rate, the level of unemployment, and the rate of economic growth in the economy of an industrialized country

# Materials for Study

## Introduction

The syllabus for the CAS-specific Exams 3 and 5-9 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 ones that may not be possible to perform on an examination, such as complex simulations, but that the candidate would still be expected to explain in an examination setting.

**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.

Thus, the learning objectives, knowledge statements, and readings complement each other. The learning objectives define the purpose, 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 individual learning objective weights. 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 individual learning objective weights, 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. It is suggested that the candidate cover the learning objectives and readings in the order listed. Complete text references are provided at the end of each exam section.

### Key

<b>L</b>	May be purchased from the publisher or bookstore or borrowed from the CAS Library.
<b>NEW</b>	Indicates new/updated material or modified citation.
<b>SK</b>	Represents material included in the 2005 CAS Study Kit.
<b>SKU</b>	Represents material included in the 2005 CAS Study Kit <b>AND</b> the 2005 Update to the 2004 Study Kit.
<b>W</b>	Represents material that is available free-of-charge from the <a href="#">CAS Web Site</a> .

The suggested reading material is designed to acquaint candidates with the respective subjects and should not be interpreted as representing views endorsed by the CAS. Although the CAS Library has many of the *Syllabus* readings available for loan (citations indicated with a bold **L**), some must be obtained by contacting the organizations listed in the [Publishers and Distributors](#) section. (Some booksellers may not indicate the official copyright date of a specific edition. Please use the edition number as a guide.)

If a new edition of any text becomes available after publication of this *Syllabus*, candidates should check the [Syllabus Update](#) or contact the [CAS Office](#) for instructions regarding its acceptability and the appropriate chapters or pages in the new edition that correspond to the published study requirements.

### Associateship Examinations

- [Exam 1: Probability](#)
- [Exam 2: Financial Mathematics](#)
- [Exam 3: Statistics and Actuarial Models](#)
- [Exam 4: Construction and Evaluation of Actuarial Models](#)

- [Exam 5: Introduction to Property and Casualty Insurance and Ratemaking](#)
- [Exam 6: Reserving, Insurance Accounting Principles, and Reinsurance](#)
- [Exam 7-Canada Nation-Specific Examination: Annual Statement, Taxation, and Regulation](#)
- [Exam 7-United States Nation-Specific Examination: Annual Statement, Taxation, and Regulation](#)

#### **Fellowship Examinations**

- [Exam 8: Investments and Financial Analysis](#)

## **Appendix Transitional VEE Exams**

#### *Syllabus for the:*

- [VEE-Applied Statistical Methods Transitional Exam](#)
- [VEE-Corporate Finance Transitional Exam](#)
- [VEE-Economics Transitional Exam](#)
- [Application Form](#) (Deadline: June 29, 2005)

#### **VEE-Applied Statistical Methods Transitional Exam**

This 90-minute, multiple-choice examination is administered by the CAS to satisfy the Validation by Educational Experience (VEE)-Applied Statistical Methods requirement for candidates who have not otherwise satisfied this VEE requirement.

The following [tables](#) will be provided to the candidate with the exam: Normal Distribution, Chi-square Distribution, t-Distribution, and F-Distribution. Copies of these tables are available under [Web Notes](#). Since the tables will be included with the examination, candidates will not be allowed to bring copies of the tables into the examination room.

#### **LEARNING OBJECTIVES**

The candidate is expected to demonstrate an understanding of the terminology and underlying assumptions of regression and time series models, and to be able to apply and analyze an appropriately selected model when solving insurance related problems. Specifically, the candidate is expected to be able to perform the tasks listed in the learning objectives below.

##### **A. Regression**

1. Estimate the parameters of linear regression models.
2. Test hypotheses and construct confidence intervals for the parameters of linear regression models.

3. Determine the appropriateness of a regression model by analyzing residuals and applying the F-test.
4. Calculate elasticities and partial correlations.
5. Apply appropriate measures when the data is observed to possess one or more of the following characteristics:
  - a. Heteroscedasticity
  - b. Serial correlation
  - c. Multicollinearity
  - d. Nonlinearity
6. Estimate and determine confidence intervals for future observations using linear regression models.
7. Demonstrate familiarity with inherently nonlinear regression models and set up equations that would be used in estimating parameters of such models.

#### **B. Time Series**

1. Distinguish between regression and time series models.
2. Distinguish between and apply deterministic and stochastic time series models.
3. Recognize characteristics of stationary time series and compute autocorrelation functions.
4. Analyze data using a random walk model.
5. Estimate the parameters of ARIMA models, and the simpler models AR, MA, and ARMA as special cases.
6. Run diagnostic checks to validate a specified time series model.
7. Generate forecasts using ARIMA, and simpler, models and develop confidence intervals for the forecasts.
8. Demonstrate familiarity with the properties of ARIMA forecasts.

#### **READINGS**

Pindyck, R.S.; and Rubinfeld, D.L., *Econometric Models and Economic Forecasts* (Fourth Edition), 1998, Irwin McGraw-Hill, Boston, Chapters 1, 3, 4, 5, 6 (excluding Appendix 6.1), Sections 8.1, 8.2, 10.1, Chapters 15, 16 (excluding Appendix 16.1), 17 (excluding Appendix 17.1), and 18.

#### **Publishers and Distributors**

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

ACTEX Publications (Mad River Books), 140 Willow Street, Suite One,  
P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860)  
379-5470; fax: (860) 738-3152; e-mail: [retail@actexamdriver.com](mailto:retail@actexamdriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800)  
582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site:  
[www.actuarialbookstore.com](http://www.actuarialbookstore.com).



Pindyck, R.S.; and Rubinfeld, D.L., *Econometric Models and Economic Forecasts* (Fourth Edition), 1998, Irwin McGraw-Hill, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

### **VEE-Corporate Finance Transitional Exam**

This 90-minute, multiple-choice examination is administered by the CAS to satisfy the Validation by Educational Experience (VEE)-Corporate Finance requirement for candidates who have not otherwise satisfied this VEE requirement.

The purpose of this examination is to test the candidate's basic knowledge of concepts from corporate finance. These concepts are fundamental to understanding the general business environment. Basic knowledge of calculus and probability is assumed.

### **LEARNING OBJECTIVES**

9. Candidates should understand and be able to analyze financial statements including balance sheets, income statements, and statements of cash flow. Candidates should be able to calculate discounted cash flows, internal rate of return, present and future values of bonds, and apply the dividend growth model and price/earnings ratios concept to valuing stocks.
10. Candidates must be able to assess financial performance using net present value and the payback, discounted payback models, internal rate of return, and profitability index models. Candidates should be able to analyze statements and identify what should be discounted, what other factors should be considered, and the possible interactions between models.
11. Candidates should understand the trade-off between risk and return, the implications of the efficient market theory to the valuation of securities, and be able to perform the following:
  - Apply measures of portfolio risk and analyze the effects of diversification, systematic and unsystematic risks. Calculate portfolio risk and analyze the impact of individual securities on portfolio risk
  - Identify efficient portfolios and apply the CAPM to firm cost of capital measures
  - Value cash flows and analyze the certainty equivalent versus risk-adjusted discount rates using assumptions for inflation, the term structure of interest rates, and default risk correctly in their calculations

Candidates should understand the following concepts and be able to use them to analyze financial structures:

- Efficient markets and their effect on security prices
- Capital structure and the impact of financial leverage and long- and short-term financing policies on capital structure

- Sources of capital and the definitions of techniques for valuing basic options such as calls and puts

Candidates should understand and be able to analyze financial performance by evaluating financial statements and financial ratios such as leverage, liquidity, profitability, market value ratios and analysis of accounting return versus economic return.

Candidates should understand and be able to apply the basic principles of option pricing theory including:

- Black-Scholes formula
- Valuation of basic options

Note: Concepts, principles, and techniques needed for VEE-Corporate Finance are covered in the references listed below. Candidates and educators may use other references, but candidates should be very familiar with the notation, terminology, and viewpoints espoused in the listed references. A table of values for the normal distribution and the Black-Scholes formula will be provided with the examination.

## READINGS

Brealey, R.A.; and Myers, S.C., *Principles of Corporate Finance* (Seventh Edition), 2003, McGraw-Hill, Chapters: 1, Finance and the Financial Manager; 4, The Value of Common Stocks; 5, Why Net Present Value Leads to Better Investment Decisions than Other Criteria; 6, Making Investment Decisions with the Net Present Value Rule; 7, Introduction to Risk, Return, and the Opportunity Cost of Capital; 8, Risk and Return; 9, Capital Budgeting and Risk; 10, A Project is Not a Black Box; 11, Where Positive Net Present Values Come From; 12, Making Sure Managers Maximize NPV; 13, Corporate Financing and the Six Lessons of Market Efficiency; 14, An Overview of Corporate Financing; 15, How Corporations Issue Securities; 16, The Dividend Controversy; 17, Does Debt Policy Matter?; 18, How Much Should a Firm Borrow?; 19, Financing and Valuation; 20, Understanding Options; 21, Valuing Options; 22, Real Options; and 29, Financial Analysis and Planning. [Candidates may also use the sixth edition, Chapters 1, 4-21, and 28.]

## Publishers and Distributors

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

ACTEX Publications (Mad River Books), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexmadriver.com](mailto:retail@actexmadriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Brealey, R.A.; and Myers, S.C., *Principles of Corporate Finance* (Seventh

Edition), 2003, McGraw-Hill, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

### **VEE-Economics Transitional Exam**

This 90-minute, multiple-choice examination is administered by the CAS to satisfy the Validation by Educational Experience (VEE)-Economics requirement for candidates who have not taken the required courses.

The purpose of this examination is to test the candidate's basic knowledge of concepts from microeconomics and macroeconomics. These concepts are fundamental to understanding the general business environment. Basic knowledge of calculus and probability is assumed.

### **LEARNING OBJECTIVES**

#### Microeconomics

- . Candidates should be able to use the following microeconomic principles to build models to increase their understanding of the framework of contingent events and to use as a frame for activities such as pricing:
  - The shape of the Demand Curve, demand versus quantity demanded, changes in demand, and market demand
  - The supply versus quantity supplied equilibrium and the point of equilibrium and changes in the equilibrium point
  - Tastes, indifference curves, and the Marginal Rate of Substitution
  - Changes in income and the budget line, the Engel Curve
  - Changes in price and changes in the budget line, the Demand Curve
  - Income and substitution effects, the Compensated Demand Curve, why Demand Curves slope downward
  - Decisions under uncertainty such as the following: attitudes toward risk, and the theory of rational expectations
  - Adverse selection and moral hazard
- a. Candidates should be able to use knowledge of the following microeconomic principles to increase their understanding of the markets in which we operate and of the regulatory issues. Candidates should also be able to use the following microeconomic principles to increase their understanding of the ramification of strategic decisions:
  - The competitive firm, the competitive industry in the short run, revenue, costs and supply, elasticity of supply, and competitive equilibrium

- The competitive firm, the competitive industry in the long run, long-run costs, supply, profits, constant/decreasing-cost industries, and equilibrium
- Sources of monopoly power: natural, patents, resources, and legal barriers
- Oligopoly, contestable markets, a fixed number of firms
- Collusion, game theory, the prisoner's dilemma and the breakdown of cartels
- Monopolistic competition, product differentiation, and the economics of location
- Consumers' and producers' surplus economics, theories of value
- Adverse selection and moral hazard

Macroeconomics Candidates should understand the following macroeconomic principles and use them in developing economic models and/or economic assumptions and understanding the business cycle:

- The general accounting conventions and data sources used in tracking economic activity
- The simplified Keynesian model, without adjustments for changes in price level or money supply, as it applies to changes in GDP caused by changes in investment, government spending, and net exports
- The relationship among interest rates, demand for money, consumption and investment using concepts such as the IS/LM curve, fiscal and monetary policy, and how foreign exchange rates affect GDP/NI
- The instruments and processes that shape the money supply including the money multiplier and the role of central banks, and their impact on inflation
- The relationship of price level, money demand, total demand, and total supply under the Keynesian Model

Note: Concepts, principles, and techniques needed for VEE Economics are covered in the references listed below. Candidates and educators may use other references, but candidates should be very familiar with the notation, terminology, and viewpoints espoused in the listed references.

## READINGS

Landsburg, S.E., *Price Theory and Applications* (Fifth Edition), 2002, International Thomson Publishing. Chapters: 1, Supply, Demand, and Equilibrium; 2, Prices, Costs and the Gains from Trade; 3, Behavior of Consumers; 4, Consumers in the Marketplace; 5, The Behavior of Firms; 7, Competition; 8, Welfare Economics and the Gains from Trade; 9, Knowledge and Information (9.3 only-Topics in the Economics of Information); 10, Monopoly; 11, Market Power, Collusion, and Oligopoly; and 14, Common Property and Public Goods. ( Candidates may also use the Sixth Edition, 2005, with the same citations.)

**W** Wachtel, P., "[Macroeconomics](#)," Society of Actuaries Study Note 2-21-00 (Third

or Fourth Printing, [including the errata](#)).

### Source Key

<b>W</b>	Represents material that is available free-of-charge from the CAS Web Site.
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### Publishers and Distributors

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ACTEX Publications (Mad River Books), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexmadriver.com](mailto:retail@actexmadriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Landsburg, S.E., *Price Theory and Applications* (Fifth Edition), 2002, International Thomson Publishing, Order Department, P.O. Box 6904, Florence, KY 41022; telephone: (800) 347-7707.

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

Society of Actuaries, 475 N. Martingale Road, Suite 250, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: [www.soa.org](http://www.soa.org).

## Publishers and Distributors

Many required readings may be downloaded free of charge from [Web Notes](#). These readings are listed as Web Notes in this Syllabus and are indicated with a bold **W**. Other readings, indicated with a bold **SK** or **SKU**, are available in the CAS Study Kits that may be purchased from the CAS Office. Some text references must be purchased from the publisher or a bookstore. Material that is new in 2005 will be made available by December 1, 2004.

The following information is furnished for those who wish to purchase the text references cited in the examination descriptions. Publishers and distributors are independent and listed for the convenience of candidates; inclusion does not constitute endorsement by the CAS.

The exam codes for the transitional VEE exams are: VS (Applied Statistical Methods), VF (Corporate Finance), and VE (Economics).

EXAM	CONTACT INFORMATION
All	ACTEX Publications (Mad River Books), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: <a href="mailto:retail@actexamadriver.com">retail@actexamadriver.com</a> .
All	Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (US only) or (603) 430-1252; fax: (603) 430-1258; Web site: <a href="http://www.actuarialbookstore.com">www.actuarialbookstore.com</a> .
7-U.S.	<i>Actuarial Digest</i> , P.O. Box 1127, Ponte Vedra, FL 32004.
5, 6	Actuarial Standards Board, American Academy of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173; telephone: (847) 706-3513; fax: (847) 706-3599.

7-C	A.M. Best Canada Ltd., Suite 600, 133 Richmond Street West, Toronto, Ontario M5H 2I3, Canada; telephone: (416) 363-8266; Web site: <a href="http://www.ambest.ca">www.ambest.ca</a> .
5, 6, 7-C, 7-U.S.	American Institute for Chartered Property Casualty Underwriters, Order Department, P.O. Box 3016, 720 Providence Road, Malvern, PA 19355-0716; telephone: (610) 644-2100; fax: (610) 640-9576.
1	Anderson, J.F.; and Brown, R.L., "Risk and Insurance" (SN 1-21-05), 2005, Society of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: <a href="http://www.soa.org">www.soa.org</a> .
7-U.S.	<i>Association Form of the Annual Statement Blanks</i> , Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103.
7-C	Baer, M.G.; and Rendall, J.A., <i>Cases on the Canadian Law of Insurance</i> (Fifth Edition), 1995, Carswell, Attention: Customer and Order Services, One Corporate Plaza, 2075 Kennedy Road, Scarborough, Ontario M1T 3V4, Canada; telephone: (416) 609-3800 or (800) 387-5164; fax: (416) 298-5082; Web site: <a href="http://www.carswell.com">www.carswell.com</a> .
1	Bean, M.A., <i>Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering</i> , 2001, Brooks/Cole Publishing Company, a division of Thomson Learning, Order Department, 7625 Empire Drive, Florence, KY 41042; telephone: (800) 354-9706; Web site: <a href="http://training.thomsonlearning.com">http://training.thomsonlearning.com</a> .
8	Bodie, Z.; Kane, A.; and Marcus, A.J., <i>Investments</i> (Sixth Edition), 2005, Irwin McGraw-Hill, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.
3	Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; and Nesbitt, C.J., <i>Actuarial Mathematics</i> (Second Edition), 1997, Society of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: <a href="http://www.soa.org">www.soa.org</a> .
7-C, 7-U.S.	Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103 ( <i>for the NAIC Annual Statement Blanks, Property and Casualty</i> ).
VF	Brealey, R.A.; and Myers, S.C., <i>Principles of Corporate</i>

	<i>Finance</i> (Seventh Edition), 2003, McGraw-Hill, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.
2	Broverman, S.A.; <i>Mathematics of Investment and Credit</i> (Third Edition) 2004, ACTEX Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: <a href="mailto:retail@actexamdriver.com">retail@actexamdriver.com</a> .
7-C	Brown, C.; <i>Canadian Insurance Contracts Law in a Nutshell</i> , 1995, Carswell, Attention: Customer and Order Services, One Corporate Plaza, 2075 Kennedy Road, Scarborough, Ontario M1T 3V4, Canada; telephone: (416) 609-3800 or (800) 387-5164; fax: (416) 298-5082; Web site: <a href="http://www.carswell.com">www.carswell.com</a> .
7-C	Canadian Institute of Actuaries, Secretariat, Suite 820, 360 Albert Street, Ottawa, Ontario K1R 7X7, Canada; telephone: (613) 236-8196; fax: (613) 233-4552; Web site: <a href="http://www.actuaries.ca">www.actuaries.ca</a> .
4-9	Casualty Actuarial Society <i>Forum, Foundations of Casualty Actuarial Science</i> (Fourth Edition), <i>PCAS</i> , and <i>Discussion Paper Program</i> , 1100 N. Glebe Road, Suite 600, Arlington, VA 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: <a href="mailto:office@casact.org">office@casact.org</a>
8	Chew, D.H., editor, <i>The New Corporate Finance: Where Theory Meets Practice</i> (Third Edition), 2001, McGraw-Hill/Irwin, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.
9	Cummins, J.D.; Smith, B.D.; Vance, R.N.; and VanDerhei, J.L., <i>Risk Classification in Life Insurance</i> , 1983, Kluwer Nijhoff Publishing, 101 Philip Drive, Norwell, MA 02061; telephone: (781) 871-6600; fax: (781) 871-6528.
7-C	Ettlinger, K.H.; Hamilton, K.L.; and Krohm, G., <i>State Insurance Regulation</i> (First Edition), 1995, Insurance Institute of America, 720 Providence Road, Malvern, PA 19355-0770; telephone: (610) 644-2100.
8	Fabozzi, F.J., <i>The Handbook of Fixed Income Securities</i> (Sixth Edition), 2001, McGraw-Hill, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.
7-C	Facility Association, 151 Yonge Street, 18th Floor, Toronto,



	Ontario M5C 2W7, Canada; telephone: (416) 863-1750 or (800) 268-9572; fax: (416) 868-0894.
6	Financial Accounting Standards Board, 401 Merret 7, P.O. Box 5116, Norwalk, CT 06856-5116; telephone: (203) 847-0700.
7-C	<i>Financial Institutions Act</i> , "Insurance Companies Act," Chapter 47, The Federal Publication, 388 King Street West, Toronto, Ontario M5V 1K2, Canada; telephone: (416) 860-1611.
7-C	Financial Services Commission of Ontario, 5160 Yonge Street, P.O. Box 85, North York, Ontario M2N 6L9, Canada; telephone: (416) 250-7250; fax: (416) 590-7070; Web site: <a href="http://www.ontarioinsurance.com">www.ontarioinsurance.com</a> .
4, 5, 6, 7-C, 7-U.S.	<i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), 2001, Casualty Actuarial Society, 1100 N. Glebe Road, Suite 600, Arlington, VA 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: <a href="mailto:office@casact.org">office@casact.org</a> .
1	Ghahramani, S., <i>Fundamentals of Probability with Stochastic Processes</i> (Third Edition), 2005, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: <a href="http://vig.prenhall.com">vig.prenhall.com</a> .
7-C	Greenan, J. (Ed.), <i>The Handbook of Canadian Pension and Benefit Plans</i> (Twelfth Edition), 2002, CCH Canadian Limited, 90 Shepherd East, Suite 300, North York, Ontario M2N 6X1, Canada; telephone: (416) 224-2248; fax: (800) 461-4131; Web site: <a href="http://www.ca.cch.com">www.ca.cch.com</a> .
1	Hassett, M.; and Stewart, D., <i>Probability for Risk Management</i> , 1999, ACTEX Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: <a href="mailto:retail@actexamdriver.com">retail@actexamdriver.com</a> .
5	Health Insurance Association of America, <i>Group Life and Health Insurance-Part C</i> (Third Edition), 1992, HIAA Distribution Center, 9050 Junction Drive, Annapolis, MD 20701; telephone: (800) 828-0111 or (301) 317-4422; fax: (301) 206-9789; Web site: <a href="http://www.hiaa.org">www.hiaa.org</a> .
4	Herzog, T.N., <i>Introduction to Credibility Theory</i> (Third Edition), 1999, ACTEX Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail:

	<a href="mailto:retail@actexmadriver.com">retail@actexmadriver.com</a> .
3	Hogg, R.V.; Craig, A.T.; and McKean, J.W., <i>Introduction to Mathematical Statistics</i> (Sixth Edition), 2004, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: <a href="http://vig.prenhall.com">vig.prenhall.com</a> .
3	Hogg, R.V.; and Tanis, E., <i>Probability and Statistical Inference</i> (Sixth Edition), 2000, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: <a href="http://vig.prenhall.com">vig.prenhall.com</a> .
8	Hull, J.C., <i>Options, Futures, and Other Derivatives</i> (Fifth Edition), 2003, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: <a href="http://vig.prenhall.com">vig.prenhall.com</a> .
6, 7-C, 7-U.S.	Insurance Accounting and Systems Association, <i>Property-Casualty Insurance Accounting</i> (Eighth Edition), 2003, IASA Fulfillment Center, P.O. Box 51008, Durham, NC 27717; telephone: (800) 817-4272 or (919) 489-0991; fax: (800) 668-4272; Web site: <a href="http://www.iasa.org">www.iasa.org</a> .
7-C	Insurance Bureau of Canada, 240 Duncan Mill Road, Suite 700, Toronto, Ontario M3B 1Z4, Canada; telephone: (416) 445-5912; fax: (416) 445-2183.
7-U.S.	Insurance Expense Exhibit, Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103.
6, 7-U.S.	Insurance Institute of America, 720 Providence Road, Malvern, PA 19355-0716; telephone: (610) 644-2100; fax: (610) 640-9576.
5, 7-U.S., 9	Insurance Services Office, Inc., 545 Washington Boulevard, Jersey City, NJ 07310-1686; telephone: (800) 888-4476.
7-U.S.	<i>Journal of Insurance Regulation</i> , National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO 64105; telephone: (816) 842-3600.
7-U.S., 8	<i>Journal of Risk and Insurance</i> , The American Risk and Insurance Association, 716 Providence Road, P.O. Box 3028, Malvern, PA 19355; telephone: (610) 640-1997; fax: (610) 725-1007; Web site: <a href="http://www.aria@cpcuia.org">www.aria@cpcuia.org</a> .

2	Kellison, S.G., <i>Theory of Interest</i> , 1991, Irwin/McGraw-Hill, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.
7-C	Klar, L.N.; Linden, A.M.; Cherniak, E.A.; and Kryworuk, P.W., <i>Remedies in Tort</i> , 1997 (Release 6), Volume 4, Carswell, Attention: Customer and Order Services, One Corporate Plaza, 2075 Kennedy Road, Scarborough, Ontario M1T 3V4, Canada; telephone: (416) 609-3800 or (800) 387-5164; fax: (416) 298-5082; Web site: <a href="http://www.carswell.com">www.carswell.com</a> .
3, 4	Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., <i>Loss Models: From Data to Decisions</i> (Second Edition), 2004, John Wiley and Sons, One Wiley Drive, Somerset, NJ 08875; telephone: (800) 225-5945 or (732) 469-4400.
VE	Landsburg, S.E., <i>Price Theory and Applications</i> (Fifth Edition), 2002, International Thomson Publishing, Order Department, P.O. Box 6904, Florence, KY 41022; telephone: (800) 347-7707.
7-C	Linden, A.M., <i>Canadian Tort Law</i> (Seventh Edition), 2001, Butterworths, The Butterworths Group of Companies, 75 Clegg Road, Markham, Ontario L6G 1A1, Canada; telephone: (905) 479-2665; fax: (905) 479-2826; Web site: <a href="http://www.butterworths.ca">www.butterworths.ca</a> .
1	Miller, I; and Miller, M, <i>John E. Freund's Mathematical Statistics with Applications</i> (Seventh Edition), 2004, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: <a href="http://vig.prenhall.com">vig.prenhall.com</a> .
7-U.S.	<i>NAIC Annual Statement Blanks, Property and Casualty</i> may be obtained from Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103.
7-C, 7-U.S.	National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO 64105; telephone: (816) 842-3600.
9	National Council on Compensation Insurance, 901 Peninsula Corporate Circle, Boca Raton, FL 33487; telephone: (800) NCCI-123.
7-U.S.	New York (State) Insurance Department, Publications Unit, Agency Building 1, Empire State Plaza, Albany, NY 12257; telephone: (518) 474-1203.

7-U.S	New York (State) Laws, Statutes, etc., from New York Insurance Law may be obtained from the West Publishing Company, a division of International Thomson Publishing, Order Department, P.O. Box 6904, Florence, KY 41022; telephone: (800) 347-7707.
7-C	Office of the Superintendent of Financial Institutions Canada, 255 Albert Street, Ottawa, Ontario K1A 0H2 Canada; telephone: (613) 990-7788; fax: (613) 952-8219; Web site: <a href="http://www.osfi-bsif.gc.ca">www.osfi-bsif.gc.ca</a> .
VS	Pindyck, R.S.; and Rubinfeld, D.L., <i>Econometric Models and Economic Forecasts</i> (Fourth Edition), 1998, Irwin McGraw-Hill, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.
1, 2, 3, 4	Preliminary Actuarial Examinations, P.O. Box 95600, Chicago, IL 60694-5600; telephone: (847) 706-3500; fax: (847) 706-3599.
7-U.S.	Rejda, G.E., <i>Social Insurance and Economic Security</i> (Sixth Edition), 1999, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: <a href="http://vig.prenhall.com">vig.prenhall.com</a> .
1	Ross, S.M., <i>A First Course in Probability</i> (Sixth Edition), 2001, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: <a href="http://vig.prenhall.com">vig.prenhall.com</a> .
3	Ross, S.M., <i>Introduction to Probability Models</i> (Eighth Edition), 2003, Academic Press, 6277 Sea Harbor Drive, Attn: Customer Service (Fifth Floor), Orlando, FL 32887; telephone: (407) 345-3800.
4	Ross, S.M., <i>Simulation</i> (Third Edition), 2002, Academic Press, 6277 Sea Harbor Drive, Attn: Customer Service (Fifth Floor), Orlando, FL 32887; telephone: (407) 345-3800.
All	SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: <a href="http://www.sliderulebooks.com">www.sliderulebooks.com</a> .
3, VE	Society of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: <a href="http://www.soa.org">www.soa.org</a> .
All	Texas Instruments, Attention: Order Entry, P.O. Box 650311,

	Mail Station 3962, Dallas, TX 75265; telephone: (800) 842-2737; Web site: <a href="http://www.ti.com">www.ti.com</a> .
2	Wachtel, P., "Macroeconomics," SOA Study Note 2-21-00, Society of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: <a href="http://www.soa.org">www.soa.org</a> .
1	Wackerly, D.; Mendenhall III, W.; and Scheaffer, R., <i>Mathematical Statistics with Applications</i> (Sixth Edition), 2002, Duxbury Press; telephone: (800) 354-9706; Web site: <a href="http://www.duxbury.com">www.duxbury.com</a> .

## Key Deadlines

### Exams 1, 2, and 4

All correspondence and accompanying forms of payment for Exams 1, 2, and 4 must reach Preliminary Actuarial Examinations by the stated deadlines. No exceptions will be made.

### Spring 2005

Registration	April 1, 2005
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Change of Center	April 1, 2005
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Refund Request	June 30, 2005
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### Fall 2005\*

Registration	September 24, 2005
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Change of Center	September 24, 2005
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Refund Request	December 31, 2005
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\* Deadlines for the Fall administration of Exam 1 as a computer-based test will be posted online.

### Exams 3, 5-9, and Transitional VEE Exams

All correspondence and accompanying forms of payment for Exams 3, 5-9, and transitional VEE Exams must reach the CAS Office by the stated deadlines. No exceptions will be made.

### Spring 2005

Registration March 23, 2005

Change of Center March 23, 2005

Refund Request June 30, 2005

### Fall 2005

Registration September 22,  
2005

Change of Center September 22,  
2005

Refund Request December 31, 2005

## Exam 1

### Probability

This three-hour, multiple-choice examination is administered by Preliminary Actuarial Examinations and is identical to SOA Course P. [Webnotes](#) are available.

In May 2005, this exam will be offered in the traditional pencil-and-paper format. In September 2005, Exam 1 will be offered as a [computer-based test](#).

The purpose of this examination is to develop a knowledge of the fundamental probability tools for quantitatively assessing risk. The application of these tools to problems encountered in actuarial science is emphasized. Knowledge of calculus is assumed.

A [table of values](#) for the normal distribution will be included with the examination booklet.

### LEARNING OBJECTIVES

Candidates should be able to use and apply the following concepts in a risk management context:

1. General Probability
  - Set functions including set notation and basic elements of probability
  - Mutually exclusive events
  - Addition and multiplication rules
  - Independence of events
  - Combinatorial probability
  - Conditional probability
  - Law of total probability
  - Bayes' Theorem

2. Univariate probability distributions (including binomial, negative binomial, geometric, hypergeometric, Poisson, uniform, exponential, chi-square, beta, Pareto, lognormal, gamma, Weibull, and normal)
  - Probability functions and probability density functions
  - Cumulative distribution functions
  - Mode, median, percentiles, and moments
  - Variance and measures of dispersion
  - Moment generating functions
  - Transformations
3. Multivariate probability distributions (including the bivariate normal)
  - Joint probability functions and joint probability density functions
  - Joint cumulative distribution functions
  - Central Limit Theorem
  - Conditional and marginal probability distributions
  - Moments for joint, conditional, and marginal probability distributions
  - Joint moment generating functions
  - Variance and measures of dispersion for conditional and marginal probability distributions
  - Covariance and correlation coefficients
  - Transformations and order statistics
  - Probabilities and moments for linear combinations of independent random variables

## READINGS

There is no single required text for this exam. The texts listed below may be considered as representative of the many texts available to cover material on which the candidate may be examined.

Not all the topics may be covered adequately by just one text. Candidates may wish to use more than one of the following or other texts of their choosing in their preparation. Earlier or later editions may also be adequate for review.

The candidate is expected to be familiar with the concepts introduced in the Study Note below.

## Required Study Notes

**W** Anderson, J.F.; and Brown, R.L., "[Risk and Insurance](#)," 2005, Society of Actuaries  
**NEW** (SOA Study Note P-21-05).

**W** "[Course P Introductory Study Note](#)," Society of Actuaries (SOA Study Note P-05-  
**NEW** 05).

## Additional Study Note

**W** "[Course P Sample Exam Questions and Solutions](#)," Society of Actuaries (SOA  
**NEW** Study Note P-09-05).

## Suggested Texts

Bean, M.A., *Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering*, 2001, Brooks/Cole Publishing Company, Chapters 1-9.

Ghahramani, S., *Fundamentals of Probability with Stochastic Processes* (Third Edition), 2005, Prentice Hall, Chapters 1-11.

Hassett, M.; and Stewart, D., *Probability for Risk Management*, 1999, ACTEX Publications, Chapters 1-11.

Miller, I.; and Miller, M., *John E. Freund's Mathematical Statistics with Applications* (Seventh Edition), 2004, Prentice Hall, Chapters 1-8.

Ross, S.M., *A First Course in Probability* (Sixth Edition), 2001, Prentice Hall, Chapters 1-8.

Wackerly, D.; Mendenhall III, W.; and Scheaffer, R., *Mathematical Statistics with Applications* (Sixth Edition), 2002, Duxbury Press, Chapters 1-7.

## Key

<b>W</b>	Represents material that is available at no charge under <a href="#">Web Notes</a>
<b>NEW</b>	Indicates new or updated material or modified citation.

## Publishers and Distributors

Contact information is furnished for those who wish to purchase the text references cited for Exam 1. Publishers and distributors are independent and listed for the convenience of candidates; inclusion does not constitute endorsement by the CAS.

ACTEX Publications (Mad River Books), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexamadriver.com](mailto:retail@actexamadriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Anderson, J.F.; and Brown, R.L., "Risk and Insurance" (SN 1-21-05), 2005, Society of Actuaries, 475 N. Martingale Road, Suite 250, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: [www.soa.org](http://www.soa.org).

Bean, M.A., *Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering*, 2001, Brooks/Cole Publishing Company, a division of Thomson Learning, Order Department, 7625 Empire Drive, Florence, KY 41042; telephone: (800) 354-9706; Web site: <http://training.thomsonlearning.com>.

Ghahramani, S., *Fundamentals of Probability* (Third Edition), 1999, Prentice-Hall, Inc.; telephone: (800) 374-1200 or (515) 284-6751; Web site: <http://vig.prenhall.com>.

Hassett, M.; and Stewart, D., *Probability for Risk Management*, 1999, ACTEX



Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; [retail@actexmadriver.com](mailto:retail@actexmadriver.com).

Miller, I; and Miller, M, *John E. Freund's Mathematical Statistics with Applications* (Seventh Edition), 2004, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; <http://vig.prenhall.com>.

Ross, S.M., *A First Course in Probability* (Sixth Edition), 2001, Prentice-Hall, Inc.; telephone: (800) 282-0693 or (515) 284-6751; Web site: <http://vig.prenhall.com>

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

Wackerly, D.; Mendenhall III, W.; and Scheaffer, R., *Mathematical Statistics with Applications* (Sixth Edition), 2002, Duxbury Press; telephone: (800) 354-9706; Web site: [www.duxbury.com](http://www.duxbury.com).

## Exam 2

### Financial Mathematics

This two-hour, multiple-choice examination is administered by Preliminary Actuarial Examinations and is identical to SOA Course FM. [Webnotes](#) are available.

The goal of the Financial Mathematics exam is to provide an understanding of the fundamental concepts of financial mathematics, and how those concepts are applied in calculating present and accumulated values for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, duration calculation, asset/liability management, investment income, capital budgeting, and valuing contingent cash flows.

### Learning Objectives

The following learning objectives are presented with the understanding that candidates are allowed to use specified calculators on the exam. The education and examination of candidates should reflect that fact. In particular, such calculators eliminate the need for candidates to learn and be examined on certain mathematical methods of approximation.

1. Candidates will know **definitions** of key terms of financial mathematics: inflation; rates of interest [simple, compound (interest and discount), real, nominal, effective, dollar-weighted, time-weighted, spot, forward], term structure of interest rates; force of interest (constant and varying); equivalent measures of interest; yield rate; principal; equation of value; present value; future value; current value; net present value; accumulation function; discount function; annuity certain (immediate and due); perpetuity (immediate and due); stocks (common and preferred); bonds (including zero-coupon bonds); other financial instruments such as mutual funds, and guaranteed investment contracts.

Specifically, candidates are expected to demonstrate the ability to:

- a. Choose the term, given a definition
  - b. Define a given term
  - c. Determine an equation of value, given a valuation problem involving one or more sets of cash flows at specified times
2. Candidates will understand key **procedures** of financial mathematics: determining equivalent measures of interest; discounting; accumulating; determining yield rates; estimating the rate of return on a fund; and amortization.

Specifically, candidates are expected to demonstrate the ability to:

- a. Calculate the equivalent **annual** effective rate of interest, given a nominal annual rate and a frequency of interest conversion, discrete or continuous, other than annual.
- b. Calculate the equivalent effective rate of interest per payment period given a payment period different from the interest conversion period.
- c. Estimate the interest return on a fund
- d. Calculate the appropriate equivalent **single** value (present value, net present value, future (accumulated) value or combination), given a set of cash flows (level or varying), an appropriate term structure of interest rates, the method of crediting interest (e.g. portfolio or investment year) as necessary, an appropriate set of inflation rates as necessary, and accounting for reinvestment interest rates as necessary; for example:
  - i. Calculate the loan amount or outstanding loan balance, given a set of loan payments (level or varying) and the desired yield rate (level or varying)
  - ii. Calculate the price of a bond (callable or non-callable), given the bond coupons, the redemption value, the term of the bond (constant or varying), the coupon interest rate, and the desired yield rate (level or varying)
  - iii. Calculate the value of a stock, given the pattern of dividends and the desired yield rate (level or varying)
  - iv. Calculate the net present value, given a set of investment contributions and investment returns
- e. Calculate a unique yield rate, when it exists, given a set of investment cash flows
- f. Calculate the amount(s) of investment contributions, given there is more than one contribution, and given a set of yield rates, the amount(s) and timing of investment return(s), and the desired timing of the investment contributions
- g. Calculate the amount(s) of investment returns, given there is more than one return, and given a set of yield rates, the amount(s) and timing of investment contribution(s) and the desired timing of the investment returns; for example:
  - i. Calculate loan payments, given the loan amount(s), the term of the loan, and the desired yield rate (level or varying)
  - ii. Calculate the principal and interest portions of a loan payment, given the loan amount, the set of loan payments (level or varying), and a set of interest rates (level or varying).
  - iii. Calculate bond coupons or redemption values, given the bond price, the term of the bond, and the desired yield rate (level or varying)

- h. Calculate the term of an investment, given a set of cash flows (level or varying), and a set of interest rates (level or varying); for example:
    - i. Calculate the length of time required to accumulate a given amount, given the yield rate and an initial amount
    - ii. Calculate the length of time to repay a given loan amount, given the loan payments and the loan interest rate(s)
    - iii. Calculate the time to maturity of a bond, given the price of the bond, the coupon payments, redemption value, and yield rate
3. Candidates will know **definitions** of key terms of modern financial analysis at an introductory and intuitive level, and be able to complete basic calculations involving such terms: yield curves, spot rates, forward rates, duration, convexity, immunization, and short sales. Specifically, candidates are expected to demonstrate the ability to:
- a. Choose the term, given a definition
  - b. Write the definition, given a term
  - c. Perform calculations such as:
    - i. yield rate on a short sale
    - ii. measuring interest rate risk using duration and convexity
    - iii. basic immunization calculations

Note that probability-based calculations for applications of financial mathematics are in Exam 3.

### Text References for Exam 2

Knowledge and understanding of the Financial Mathematics concepts are significantly enhanced through working out problems based on those concepts. Thus, in preparing for the Financial Mathematics exam, whichever source textbooks candidates choose to use, candidates are encouraged to work out the textbook exercises related to the listed readings.

Candidates may use either course of reading shown below:

#### Option A

Kellison, S., *Theory of Interest* (Second Edition) 1991, Irwin/McGraw-Hill, Chapters 1; 2; 3 (3.1-3.5, and 3.7-3.9); 4 (p. 95; Examples 4.1 and 4.2; 4.4-4.8); 5 (5.1-5.7); 6 (6.1-6.4, and 6.6); 7 (7.1-7.7, and 7.10); 8 (8.7-8.8 excluding Options, Futures, Forwards and Swaps); 9 (9.4, 9.6, and 9.8-9.10); and Appendix VIII, Full Immunization.

#### Option B

Broverman, S.A.; *Mathematics of Investment and Credit* (Third Edition) 2004, ACTEX Publications, Chapters 1 (1.1-1.6); 2 (2.1-2.4 excluding 2.4.2, and 2.4.3); 3 (3.1-3.3 excluding pages 188-189); 4 (4.1-4.3.1); 5 (5.1-5.3 excluding 5.1.3, 5.1.4, and 5.3.2); 6 (6.1-6.3 excluding 6.2); 7 (7.1-7.2); and 8 (8.2.1, 8.2.2, 8.2.4, and 8.3.1-8.3.3).

### Study Notes

- W ["Course FM Introductory Study Note"](#) (SOA Study Note FM-05-05).
- W ["Course FM Sample Exam Questions and Solutions"](#) (SOA Study Note FM-09-05).
- W ["Review of Calculator Functions for the Texas Instruments BA-35"](#) (SOA Study Note FM-22-05).
- W ["Review of Calculator Functions for the Texas Instruments BA II Plus"](#) (SOA Study Note FM-23-05).

### **Publishers and Distributors**

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Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Broverman, S.A.; *Mathematics of Investment and Credit* (Third Edition) 2004, ACTEX Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexamdriver.com](mailto:retail@actexamdriver.com).

Kellison, S.G., *Theory of Interest*, 1991, Irwin/McGraw-Hill, P.O. Box 182605, Columbus, OH 43218-2605; telephone: (800) 262-4729.

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

## Exam 3

Updates indicated by

### Statistics and Actuarial Models

Before commencing study for this four-hour, multiple-choice examination, candidates should read the introduction to [Materials for Study](#). Items marked with a bold W are available at no charge under [Web Notes](#).

The CAS will grant credit for CAS Exam 3 to those who successfully complete SOA Course M in the current education structure.

This examination develops the candidate's knowledge of the theoretical basis of actuarial models and the application of those models to insurance and other financial risks. A thorough knowledge of calculus, probability, and interest theory is assumed. Knowledge of risk management at the level of Exam 1 is also assumed.

The candidate will be required to understand, in an actuarial context, what is meant by the word "model," how and why models are used, and their advantages and their limitations. The candidate will be expected to understand what important results can be obtained from these models for the purpose of making business decisions, and what approaches can be used to determine these results.

A [variety of tables](#) will be provided to the candidate with the exam. Copies of the specific tables are available under [Web Notes](#). They include values for the standard normal distribution, illustrative life tables, abridged inventories of discrete and continuous probability distributions, Chi-square Distribution,  $t$ -Distribution, and  $F$ -Distribution. Since they will be included with the

examination, candidates will not be allowed to bring copies of the tables into the examination room.

The CAS will test the candidate's knowledge of the material, but may decide not to include questions from every reading on a particular exam. A guessing adjustment will be used in scoring Exam 3.

**A. Statistics**

*Range of weight for Section A: 20-25 percent*

Candidates should be able to apply statistical theory to solve business problems.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>1. Perform point estimation of statistical parameters using the following statistical methods:</p> <ul style="list-style-type: none"> <li>▪ Maximum likelihood estimation ("MLE")</li> <li>▪ Method of moments</li> </ul> <p>Apply criteria to the estimates such as:</p> <ul style="list-style-type: none"> <li>▪ Consistency</li> <li>▪ Unbiasedness</li> <li>▪ Minimum variance</li> <li>▪ Mean square error</li> </ul> <p><i>Range of weight: 5-10 percent</i></p>	<ul style="list-style-type: none"> <li>b. Equations for MLE of mean, variance from a sample</li> <li>c. Estimation of mean and variance based on sample</li> <li>d. General equations for MLE of parameters</li> <li>e. Equations for estimation of parameters using method of moments for means, variances, and higher moments</li> <li>f. Recognition of consistency property of estimators and alternative measures of consistency</li> <li>g. Application of criteria for measurement when estimating parameters through minimization of variance, mean square error</li> <li>h. Definition of statistical bias and recognition of estimators that are unbiased or biased</li> </ul>
<p>2. Test statistical hypotheses including Type I and Type II errors using:</p> <ul style="list-style-type: none"> <li>▪ Neyman-Pearson lemma</li> <li>▪ Likelihood ratio tests</li> </ul> <p>Apply Neyman-Person lemma to construct</p>	<ul style="list-style-type: none"> <li>b. Presentation of fundamental inequalities based on general assumptions and normal assumptions</li> <li>c. Definition of Type I and Type II errors</li> <li>d. Significance levels</li> </ul>

<p>likelihood ratio equation.</p> <p><i>Range of weight: 5-10 percent</i></p>	<ul style="list-style-type: none"> <li>e. One-sided versus two-sided tests</li> <li>f. Estimation of sample sizes under normality to control for Type I and Type II errors</li> <li>g. Determination of critical regions</li> <li>h. Definition and measurement of likelihood ratio tests</li> <li>i. Determining parameters and testing using tabular values</li> <li>j. Recognizing when to apply likelihood ratio tests versus chi-square or other goodness of fit tests (statistics)</li> </ul>
<p>3. Calculate order statistics of a sample and use critical values from a sampling distributions to test means and variances.</p> <p><i>Range of weight: 3-7 percent</i></p>	<ul style="list-style-type: none"> <li>c. General form for distribution of <math>n^{\text{th}}</math> largest element of a set</li> <li>d. Application to a given distributional form</li> <li>e. Recognition of random variables from sample that behave as t-stat or F-stat</li> <li>f. Determination of parameters when applying these tests and obtaining tabular values</li> <li>g. Presentation of hypotheses testing from above for mean and variances</li> </ul>
<p>4. Perform a linear regression using the least squares method.</p> <p><i>Range of weight: 3-7 percent</i></p>	<ul style="list-style-type: none"> <li>d. Presentation and calculation of equations for regression statistics</li> </ul>

### READINGS

There is no single required text for Section A. The texts listed below may be considered as representative of the many texts available to cover the material on which the candidate may be examined based on the learning objectives and knowledge statements:

- Hoel
- Hogg and Tanis
- Hogg et al.
- Mood et al.

## B. Survival and Severity Models

*Range of weight for Section B: 30-35 percent*

Candidates should be able to work with discrete and continuous univariate probability distributions for failure time random variables. They will be expected to set up and solve equations in terms of life table functions, cumulative distribution functions, survival functions, probability density functions, and hazard functions (e.g., force of mortality), as appropriate. They should have similar facility with models of the joint distribution of two failure times (multiple lives) and the joint distribution of competing risks (multiple decrement).

Candidates should be able to define severity distributions and be able to use the parameters and moments of these distributions. Candidates also should be able to work with the families of distributions generated by algebraic manipulation and mixing of the basic distributions presented.

Candidates should be able to use Markov Chains in order to determine state probabilities and transition probabilities.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>4. For discrete and continuous univariate probability distributions for failure time random variables, develop expressions in terms of the life table functions, <math>l_x</math>, <math>q_x</math>, <math>p_x</math>, <math>{}_nq_x</math>, <math>{}_np_x</math>, and <math>{}_{m n}q_x</math>, for the cumulative distribution function, the survival function, the probability density function and the hazard function (force of mortality), and be able to:</p> <ul style="list-style-type: none"><li>• Establish relations between the different functions</li><li>• Develop expressions, including recursion relations, in terms of the functions for probabilities and moments associated with functions of failure time random variables, and calculate such quantities using simple failure time distributions</li><li>• Express the effect of explanatory variables on a failure time distribution in terms of proportional hazards and accelerated failure time models</li></ul> <p>The distributions may be left-truncated, right-censored, both, or neither.</p>	<p>d. Failure time random variables</p> <p>e. Life table functions</p> <p>f. Cumulative distribution functions</p> <p>g. Survival functions</p> <p>h. Probability density functions</p> <p>i. Hazard functions</p> <p>j. Relationships between the above variables in the above functions</p>



<i>Range of weight: 3-7 percent</i>	
<b>READINGS</b>	
Bowers, Chapter 3 (excluding 3.6)	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>2. Assuming a uniform distribution of deaths, define the continuous survival time random variable that arises from the discrete survival time random variable.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Life table function forms under uniform distribution of deaths assumption</p>
<b>READINGS</b>	
Bowers, Chapter 3.6	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>3. Given the joint distribution of two failure times:</p> <ul style="list-style-type: none"> <li>• Calculate probabilities and moments associated with functions of these random variables' variances.</li> <li>• Characterize the distribution of the smaller failure time (the joint life status) and the larger failure time (the last survivor status) in terms of functions analogous to those in the Learning Objective above, as appropriate.</li> <li>• Develop expressions, including recursion relations, for probabilities and moments of functions of the joint life status and the last survivor status, and express these in terms of the univariate functions in Learning Objective above (assuming independence of the two failure times).</li> </ul> <p><i>Range of weight: 3-7 percent</i></p>	<p>c. Joint distribution of failure times</p> <p>d. Probabilities and moments</p>
<b>READINGS</b>	
Bowers, Chapter 9.1-9.5	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>4. Based on the joint distribution (pdf and cdf) of the time until failure and the cause of failure in the competing risk (multiple decrement) model</p>	<p>d. Time until failure</p> <p>e. Competing risk (multiple decrement)</p>

<p>and in terms of the functions <math>l_x^{(t)}</math>, <math>{}_tq_x^{(t)}</math>, <math>{}_tp_x^{(t)}</math>, <math>{}_td_x(t)</math>, <math>{}_tm_x^{(t)}(t)</math>:</p> <ul style="list-style-type: none"> <li>• Establish relations between the functions</li> <li>• Calculate probabilities and moments associated with functions of these random variables, given the joint distribution of the time of failure and the cause of failure.</li> </ul> <p><i>Range of weight: 3-7 percent</i></p>	models
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### READINGS

Bowers, Chapter 10.1-10.3

### LEARNING OBJECTIVES

5. For the transformed beta, transformed gamma, inverse transformed gamma, lognormal and inverse Gaussian following families of loss (severity) distributions:
- Describe how changes in the parameters values affect the distribution.
  - Calculate their moments.
  - Apply the following techniques for creating new families of distributions: multiplication by a constant, raising to a power, exponentiation, and mixing.
  - Identify the applications in which these distributions are used and the reasons why they are used.
  - Apply the distribution to an application, given the parameters of a distribution.
  - Calculate the various measures of tail weight and interpret the results to compare the tail weights of the listed distributions.

*Range of weight: 8-12 percent*

### KNOWLEDGE STATEMENTS

- e. Applications of loss distributions
- f. Parameters of loss distribution
- g. Moments of loss distributions
- h. Creation of new distributions
- i. Tail weight measures: existence of moments, limiting density ratios, and hazard rate/mean residual life patterns

### READINGS

Klugman et al., Chapters 1-3, 4.1-4.5

### LEARNING OBJECTIVES

6. Interpret and produce graphical representations of loss and counting distributions.

### KNOWLEDGE STATEMENTS

- f. Lee diagrams
- g. Policy terms and modifications of policy

<p>Using either a graphical presentation of a distribution or an equation describing a distribution, identify or calculate, respectively, amounts that are:</p> <ul style="list-style-type: none"> <li>• Eliminated by a deductible</li> <li>• Covered under an insurance contract</li> <li>• Excess of the coverage provided by an insurance contract</li> </ul> <p><i>Range of weight: 0-5 percent</i></p>	<p>terms</p>
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**READINGS**

Lee (first principle applications of severity amount models)

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

7. For homogenous and non-homogenous discrete-time Markov chain models:
- Define each model.
  - Calculate probabilities of being in a particular state at a particular time.
  - Calculate probabilities of transitioning between states.

- g. Markov chains
- h. Transition probability matrix
- i. Discrete-time Markov chains

*Range of weight: 3-7 percent*

**READINGS**

Daniel, Chapters 1 and 3

**B. Frequency Models**

*Range of weight for Section C: 13-17 percent*

Candidates should be able to define frequency (counting) distributions, and be able to use the parameters and moments of these distributions. Candidates should be able to work with the families of distributions generated by algebraic manipulation and mixing of the basic distributions presented.

Candidates should learn to solve problems using stochastic processes. They should learn how to determine the probabilities and distributions associated with these processes. Specifically, candidates should be able to use a Poisson process in these applications.

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

7. For the following counting distributions

- g. Applications of

<p>(frequency distributions): Poisson, mixed Poisson, negative binomial, binomial, geometric, and mixture distributions:</p> <ul style="list-style-type: none"> <li>• Describe how changes in the parameters values affect the distribution.</li> <li>• Calculate their moments.</li> <li>• Identify the applications for which these distributions are used and the reasons why they are used.</li> <li>• Apply the distribution to an application given the parameters of a distribution.</li> </ul> <p><i>Range of weight: 8-12 percent</i></p>	<p>frequency distributions</p> <p>h. Parameters of frequency distribution</p> <p>i. Moments of frequency distributions</p>
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**READINGS**

Klugman et al., Chapters 1-3, 4.6.1-4.6.4, 4.6.5 (through the first full paragraph following definition 4.41), 4.6.7 (excluding Example 4.46, Theorem 4.49, Example 4.53 and following), 4.6.11

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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<p>2. Describe the properties of Poisson processes:</p> <ul style="list-style-type: none"> <li>• For increments in the homogeneous case</li> <li>• For interval times in the homogeneous case</li> <li>• For increments in the non-homogeneous case</li> <li>• Resulting from special types of events in the Poisson process</li> <li>• Resulting from sums of independent Poisson processes</li> </ul> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Poisson process</p> <p>c. Nonhomogeneous Poisson process</p>
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<p>3. For any Poisson process and the interarrival and waiting distributions associated with the Poisson process, calculate:</p> <ul style="list-style-type: none"> <li>• Expected values</li> <li>• Variances</li> <li>• Probabilities</li> </ul> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. Probability calculations for Poisson process</p>
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**READINGS**

Ross, Chapters 5.3.1-5.3.4 and 5.4.1

## B. Aggregate (Compound) Models

*Range of weight for Section D: 10-15 percent*

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Describe properties of aggregate loss models and calculate probabilities associated with a compound distribution.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>c. Collective risk models d. Individual risk models</p>
<p>2. Adjust the calculations described in Learning Objective B5, C1, and D1 for the effect of policy modifications such as deductibles, policy limits, and coinsurance.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>b. Impact of deductible, policy limits, and coinsurance</p>
<b>READINGS</b>	
Klugman et al., Chapters 5, 6.1-6.7, 6.11.1, 6.11.2	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. For a compound Poisson process, calculate moments associated with the value of the process at a given time</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. Compound Poisson process</p>
<b>READINGS</b>	
Ross, Chapter 5.4.2 preceding Example 5.25	

## B. Life Contingency Models

*Range of weight for Section E: 13-17 percent*

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Apply a principle to a present value model to associate a cost or pattern of costs (possibly contingent) with a set of future contingent cash flows.</p> <p><i>Range of weight: 5-10 percent</i></p>	<p>c. Principles include: equivalence, exponential, standard deviation, variance, and percentile d. Models including those listed in Learning Objectives B2-B4 e. Principle applications include: life insurance,</p>

	annuities, health care, credit risk, environmental risk, consumer behavior (e.g., subscriptions), and warranties
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**READINGS**

Bowers, Chapters 4.1-4.3, 5.1-5.3, 6.1-6.3, 9.7

**LEARNING OBJECTIVES**

2. Analyze present value of future loss random variables for life insurances and annuities and determine net liabilities using prospective and retrospective methods.

*Range of weight: 3-7 percent*

**KNOWLEDGE STATEMENTS**

- b. Life insurance liability calculations  
c. Prospective and retrospective methods

**READINGS**

Bowers, Chapter 7.1-7.4

**LEARNING OBJECTIVES**

3. Using present-value-of-benefit random variables and present-value-of-future-loss random variables extended to discrete time Markov chains, calculate:
- Actuarial present values of cash flows at transitions between states
  - Actuarial present values of cash flows while in a state
  - Considerations (premiums) using the Equivalence Principle
  - Liabilities (reserves) using the prospective method

*Range of weight: 0-5 percent*

**KNOWLEDGE STATEMENTS**

- c. Cash flows at transition  
d. Triple product summation  
e. Transition probabilities

**READINGS**

Daniel, Chapters 2 and 3

**B. Ruin Theory**

*Range of weight for Section F: 3-7 percent*

Candidates should be able to analyze the probability of ruin using various models. Other topics covered in this section include determining the distribution characteristics of the amount of surplus (deficit) at the first time below the initial level as well as the impact of

reinsurance. (Knowledge regarding reinsurance terminology is not assumed. Cash flows from reinsurance will be determinable based on the description of the reinsurance provided on the examination.)

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. For a ruin model:</p> <ul style="list-style-type: none"> <li>Describe the considerations included in a ruin model</li> <li>Calculate ruin probabilities for discrete time surplus processes</li> </ul> <p><i>Range of weight: 3-7 percent</i></p>	c. Ruin models
READINGS	
Klugman et al., Chapter 7.2.3, 7.3.1, and 7.3.2.1.	

### Complete Text References for Exam 3

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objectives	Source
Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; and Nesbitt, C.J., <i>Actuarial Mathematics</i> (Second Edition), 1997, Society of Actuaries.	Bowers et al.	B1-B4, E1, E2	L
Daniel, J.W., " <a href="#">Multi-state Transition Models with Actuarial Applications</a> ," Study Note, 2004.	Daniel	B7, E3	W
Hoel, P.G.; Port, S.C.; and Stone, C.J., <i>Introduction to Statistical Theory</i> , 1971, Houghton Mifflin Company [out of print].	Hoel	A1-A4	
Hogg, R.V.; Craig, A.T.; and McKean, J.W., <i>Introduction to Mathematical Statistics</i> (Sixth Edition), 2004, Prentice Hall.	Hogg et al.	A1-A4	
Hogg, R.V.; and Tanis, E., <i>Probability and Statistical Inference</i> (Sixth Edition), 2001, Prentice Hall.	Hogg and Tanis	A1-A4	
Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., <i>Loss Models: From Data to Decisions</i> (Second Edition), 2004, John Wiley and Sons, New York, Chapters 1-3, 4.1-4.5, 4.6.1-4.6.4, 4.6.5 (through the first full paragraph following definition 4.41), 4.6.7 (excluding Example 4.46, Theorem 4.49, Example 4.53 and following), 4.6.11, 5, 6.1-6.7, 6.11.1, 6.11.2, 7.2.3, 7.3.1 and 7.3.2.1.	Klugman et al.	B5, C1, D1, D2, F1	L

Lee, Y.S., " <a href="#">The Mathematics of Excess of Loss Coverages and Retrospective Rating-A Graphical Approach</a> ," Section 1, <i>PCAS LXXV</i> , 1988, pp. 49-54.	Lee	B6	W
Mood, A.M.; Graybill, F.A.; and Boes, D.C., <i>Introduction to the Theory of Statistics</i> (Third Edition), 1974, McGraw-Hill [out of print].	Mood et al.	A1-A4	
Ross, S.M., <i>Introduction to Probability Models</i> (Eighth Edition), 2003, Academic Press, San Diego, Sections 5.3.1-5.3.4, 5.4.1-5.4.2. [Candidates may also use the seventh edition with the following citation: Sections 5.3.1-5.3.4, 5.4.1-5.4.2 preceding Example 5.25.]	Ross	C2, C3, D3	L

### Key

<b>L</b>	May be purchased from the publisher or bookstore or borrowed from the CAS Library.
<b>NEW</b>	Indicates new or updated material or modified citation.
<b>W</b>	Represents material that is available free-of-charge from the CAS Web Site.

### Publishers and Distributors

Contact information is furnished for those who wish to purchase the text references cited for Exam 3. Publishers and distributors are independent and listed for the convenience of candidates; inclusion does not constitute endorsement by the CAS.

ACTEX Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; Web site: [www.actexamdriver.com](http://www.actexamdriver.com); e-mail: [retail@actexamdriver.com](mailto:retail@actexamdriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; and Nesbitt, C.J., *Actuarial Mathematics* (Second Edition), 1997, Society of Actuaries, 475 N. Martingale Road, Suite 250, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: [www.soa.org](http://www.soa.org).

Hoel, P.G.; Port, S.C.; and Stone, C.J., *Introduction to Probability Theory*, 1971, Houghton Mifflin Company, [out of print].

Hogg, R.V.; Craig, A.T.; and McKean, J.W., *Introduction to Mathematical Statistics* (Sixth Edition), 2004, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: [vig.prenhall.com](http://vig.prenhall.com).



Hogg, R.V.; and Tanis, E., *Probability and Statistical Inference* (Sixth Edition), 2001, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: [vig.prenhall.com](http://vig.prenhall.com).

Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., *Loss Models: From Data to Decisions*, (Second Edition) 2004, John Wiley and Sons, One Wiley Drive, Somerset, NJ 08875; telephone: (800) 225-5945 or (732) 469-4400.

Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexamdriver.com](mailto:retail@actexamdriver.com).

Mood, A.M.; Graybill, F.A.; and Boes, D.C., *Introduction to the Theory of Statistics* (Third Edition), 1974, McGraw-Hill [out of print].

Ross, S.M., *Introduction to Probability Models* (Eighth Edition), 2003, Academic Press, 6277 Sea Harbor Drive, Attn: Customer Service (Fifth Floor), Orlando, FL 32887; telephone: (407) 345-3800.

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

## Exam 4

Changes indicated by

### Construction and Evaluation of Actuarial Models

This four-hour, multiple-choice examination is administered by Preliminary Actuarial Examinations and is identical to SOA Course C.

This examination provides an introduction to modeling and covers important actuarial and statistical methods that are useful in modeling. A thorough knowledge of calculus, linear algebra, probability, and mathematical statistics is assumed. The candidate will be required to understand the steps involved in the modeling process and how to carry out these steps in solving business problems. The candidate should be able to: 1) analyze data from an application in a business context; 2) determine a suitable model including parameter values; and 3) provide measures of confidence for decisions based upon the model. The candidate will be introduced to a variety of tools for the calibration and evaluation of the models on Exam 3.

A variety of tables will be provided to the candidate in the [Study Note Package](#) and in the examination booklet. These include values for the standard normal distribution, chi-square distribution, and abridged inventories of discrete and continuous probability distributions. These

tables are also available on the CAS and SOA Web Sites. Since they will be included with the examination, candidates will not be allowed to bring copies of the tables into the examination room.

### **Learning Objectives**

The candidate is expected to apply statistical methods to sample data to quantify and evaluate models presented in CAS Exam 3 or SOA Course M. The candidate is further expected to identify steps in the modeling process, understand the underlying assumptions implicit in each family of models, and recognize which assumptions are applicable in a given business application.

Specifically, the candidate is expected to be able to perform the tasks listed below:

#### **A. Construction of Empirical Models**

1. Estimate failure time and loss distributions using:
  - a. Kaplan-Meier estimator, including approximations for large data sets
  - b. Nelson-Aalen estimator
  - c. Kernel density estimators
2. Estimate the variance of estimators and confidence intervals for failure time and loss distributions.
3. Estimate failure time and loss distributions with the Cox proportional hazards model and other basic models with covariates.
4. In estimating failure time and loss distributions, apply the concepts of:
  - a. Unbiasedness
  - b. Consistency
  - c. Mean squared error in estimating failure time and loss distributions

#### **B. Construction and Selection of Parametric Models**

1. Estimate the parameters of failure time and loss distributions using:
  - a. Maximum likelihood
  - b. Method of moments
  - c. Percentile matching
  - d. Bayesian procedures
2. Estimate the parameters of failure time and loss distributions with censored and/or truncated data using maximum likelihood.
3. Estimate the variance of estimators and the confidence intervals for the parameters and functions of parameters of failure time and loss distributions.
4. Apply the following concepts in estimating failure time and loss distributions:
  - a. Unbiasedness
  - b. Asymptotic unbiasedness
  - c. Consistency
  - d. Mean squared error
  - e. Uniform minimum variance
5. Determine the acceptability of a fitted model using
  - a. Graphical procedures
  - b. Kolmogorov-Smirnov test
  - c. Anderson-Darling test

- d. Chi-square goodness-of-fit test
- e. Likelihood ratio test

**C. Credibility**

1. Apply limited fluctuation (classical) credibility including criteria for both full and partial credibility.
2. Perform Bayesian analysis using both discrete and continuous models.
3. Apply Bühlmann and Bühlmann-Straub models and understand the relationship of these to the Bayesian model.
4. Apply conjugate priors in Bayesian analysis and in particular the Poisson-gamma model.
5. Apply empirical Bayesian methods in the nonparametric and semiparametric cases.

**D. Interpolation and Smoothing**

1. Demonstrate an understanding of the purpose of smoothing data.
2. Apply polynomial splines, and cubic splines in particular, to actuarial data.

**E. Simulation**

1. Simulate both discrete and continuous random variables using the inversion method.
2. Estimate the number of simulations needed to obtain an estimate with a given error and a given degree of confidence.
3. Use simulation to determine the p-value for a hypothesis test.
4. Use the bootstrap method to estimate the mean squared error of an estimator.
5. Apply simulation methods within the context of actuarial models.

**Text References for Exam 4**

Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., *Loss Models: From Data to Decisions* (Second Edition), 2004, John Wiley and Sons, New York, Chapters 1, Modeling (1.1 only); 9, Review of Mathematical Statistics; 10, Estimation for Complete Data; 11, Estimation for Modified Data; 12, Parameter Estimation (excluding 12.5.4, 12.5.5 and 12.6); 13, Model Selection; 15, Interpolation and Smoothing; and 17, Simulation.

For credibility, the candidate may use any of the alternatives shown below.

<b>Option A</b>	
	Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., <i>Loss Models: From Data to Decisions</i> (Second Edition), 2004, John Wiley and Sons, New York, Chapter 16, Credibility (16.3; 16.4 excluding 16.4.7; 16.5 excluding 16.5.3; and 16.1-2 for background only).
<b>Option B</b>	
<b>W</b>	Mahler, H.C.; and Dean, C.G., " <a href="#">Credibility</a> ," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), 2001, Casualty Actuarial Society, Chapter 8, Section 1 (background only) and Sections 2-5. (Also available as SOA Study Note C-21-01.).

<b>W</b>	Dean, C.G., " <a href="#">Topics in Credibility Theory</a> ," 2004 (SOA Study Note C-24-05).
<b>Option C</b>	
	Herzog, T.N., <i>Introduction to Credibility Theory</i> (Third Edition), 1999, Chapters 4, Discrete Frequency-Severity Insurance Model Under Independence; 5, Limited Fluctuation Credibility Approach; 6, Bühlmann's Approach; 7, Bühlmann-Straub Model; and 8, Credibility and Bayesian Inference. Chapters 1-3, 9 are for background only.

### Study Notes

<b>W</b>	" <a href="#">Course C Introductory Study Note</a> " (SOA Study Note C-05-05).
<b>W</b>	" <a href="#">Course C Sample Exam Questions and Solutions</a> " (SOA Study Note C-09-05).

### Key

<b>W</b>	Represents material that is available free-of-charge from the CAS Web Site or the <a href="#">SOA</a> Web Site.
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Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (US only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Casualty Actuarial Society *Foundations of Casualty Actuarial Science* (Fourth Edition), 2001 1100 N. Glebe Road, Suite 600, Arlington, VA 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org)

Herzog, T.N., *Introduction to Credibility Theory* (Third Edition), 1999, ACTEX Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexamdriver.com](mailto:retail@actexamdriver.com).

Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., *Loss Models: From Data to Decisions* (Second Edition), 2004, John Wiley and Sons, One Wiley Drive, Somerset, NJ 08875; telephone: (800) 225-5945 or (732) 469-4400.

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Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

## Exam 5

### Introduction to Property and Casualty Insurance and Ratemaking

Changes indicated by

Before commencing study for this four-hour examination, candidates should read the introduction to [Materials for Study](#). Items marked with a bold **SK** constitute the 2005 CAS Exam 5 Study Kit that is available from the CAS Office for a cost of \$52. Items marked with a bold **W** are available at no charge under [Web Notes](#).

The CAS will test the candidate's knowledge of the material, but may decide not to include questions from every reading on a particular exam.

#### A. Introduction to Property and Casualty Insurance

*Range of weight for Section A: 15-20 percent*

This section is for candidates to develop skills in reading and interpreting the policies they will be pricing or for which they will be developing reserves. The policies covered in the readings should be viewed as representative illustrations of broad categories of property and casualty policies. Candidates will be expected to understand the various parts of the policies, as well as be familiar with typical policy provisions, such as coverages, conditions, exclusions, limitations, duties, etc.

For purposes of this section, each of the following objectives refer to the following lines of business:

- Personal lines (auto, home)
- Commercial (auto, property, general liability, worker compensation, umbrella)

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Explain the basic purpose and structure of the insurance contract, including coverages, exclusions, exceptions, limits, and deductibles.</p> <p><i>Range of weight: 9-13 percent</i></p>	<p>d. Possible exposure to loss:</p> <ul style="list-style-type: none"> <li>• Individual</li> <li>• Company</li> <li>• First party</li> <li>• Third party (legal liability and triggers; state mandated)</li> <li>• Perils covered</li> </ul> <p>e. Lines of insurance that cover each of the exposures to loss</p> <p>f. Basic insurance terminology (e.g., premium, loss, loss adjustment expense)</p> <p>g. Basic policy structure</p> <p>h. Basic policy terminology (e.g., named insured, declarations)</p>

#### READINGS

ISO PAP  
 Malecki and Flitner  
 Malecki et al.  
 Trupin and Flitner  
 Wiening and Malecki  
 Wiening et al.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Identify whether a loss is covered, under which policy/coverage it is covered, the amount of loss, and what portion of the loss is covered.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>b. Lines of insurance that cover each of the exposures to loss based on the contracts</p> <p>c. Coverage effective periods</p> <p>d. Loss versus loss expense</p> <p>e. Liability triggers</p>

#### READINGS

ISO PAP  
 Malecki and Flitner  
 Malecki et al.

Trupin and Flitner  
Wiening et al.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Calculate a policy premium for a specified risk using the rate pages provided.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. Exposure basis and how this is determined</p> <p>d. How to read and use rate pages</p> <p>e. Rating variables (e.g., territory, driver characteristics)</p> <p>f. How individual risk attributes contribute to loss exposure</p> <p>g. How rating variables relate to exposure to loss</p>

**READINGS**

ISO PAM

**B. Insurance Operations**

*Range of weight for Section B: 10-15 percent*

This section covers the operational aspects of insurance companies, including company organization, marketing and distribution systems, underwriting, and claims.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Explain the functions of underwriting, marketing, and claims adjusting within an insurance company.</p> <p><i>Range of weight: 3-8 percent</i></p>	<p>c. Roles and responsibilities within an insurance company of:</p> <ul style="list-style-type: none"> <li>• Underwriting</li> <li>• Marketing</li> <li>• Claims</li> </ul>

**READINGS**

Webb et al.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Given specific actions by underwriting, marketing, and claims adjusting, explain the impact on rate adequacy and ratemaking.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Components of ratemaking (premium, loss, expense)</p> <p>c. New versus renewal business</p> <p>d. Mix of business and changes to it, e.g., adding youthful operators</p> <p>e. Claims, e.g., changes in opening and closing practices</p> <p>f. Outstanding claims versus new claims</p>

**READINGS**

McClenahan

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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3. Explain how different distributional systems affect expenses.  <i>Range of weight: 0-5 percent</i>	c. Distributional systems (brokers, independent agents, direct writers, exclusive agents) d. Expense calculations
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**READINGS**

Webb et al.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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4. Given specific external events or market conditions, explain the effect on insurance operations.  <i>Range of weight: 0-5 percent</i>	d. Measurements of economics of insurance, including retention rate and new business e. Relationship of insurance and economic cycles f. Legal environment and how changes in it can affect exposure to loss g. Regulatory environment
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**READINGS**

Boor 2  
Boor 3

**B. Specialized Lines of Business**

*Range of weight for Section C: 0-5 percent*

This section is intended to give the candidates a high-level view of several additional types of insurance coverages that are not as common as those covered in Section A.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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4. Define the key attributes associated with the following lines of business: <ul style="list-style-type: none"><li>• Medical malpractice</li><li>• Professional liability</li><li>• Health</li></ul> <i>Range of weight: 0-5 percent</i>	d. Loss exposures and policy coverages
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**READINGS**



Bourdon  
 Malecki et al.  
 Wiening et al.

**B. Ratemaking**

*Range of weight for Section D: 35-40 percent*

This section contains objectives covering ratemaking in broad, general principles, as well as specific detail. Candidates should have a thorough understanding of the basic principles of ratemaking, so that they can analyze data, select an appropriate technique, and develop a solution to a numerical problem. In addition, the candidate should be able to compare specific ratemaking techniques in terms of advantages and disadvantages as they are applied to specific situations and for different lines of business.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Explain the role of exposure bases in the ratemaking process.  <i>Range of weight: 0-5 percent</i>	d. Definition of exposure base e. Characteristics of exposure base f. Impact of exposure change g. Coverage provisions
<b>READINGS</b>	
Bouska CAS Principles Feldblum 2 Finger Graves and Castillo Jones McClenahan	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Use appropriate premium data to estimate premium input into the overall rate level indication, adjusting for the following: <ul style="list-style-type: none"> <li>• Coverage and benefit level changes</li> <li>• Rate level changes</li> <li>• Premium trend</li> </ul> <i>Range of weight: 8-12 percent</i>	b. Compilations of experience (Calendar Year/ Policy Year/Accident Year) c. Written versus earned premium d. Rate changes e. Policy terms f. Distributional shifts/changes in volumes (trend over time) g. Parallelogram method h. Extension of exposures i. Definition of exposures j. Impact of law changes
<b>READINGS</b>	

ASOP 13  
 CAS Principles  
 Feldblum 1  
 Feldblum 2  
 Finger  
 Jones  
 McClenahan

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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3. Use appropriate loss and loss adjustment expense data to estimate loss and loss adjustment expense input into the overall rate level indication, adjusting for the following:
- Coverage and benefit level changes
  - Loss trend
  - Loss development
  - Catastrophe provision

*Range of weight: 12-16 percent*

- c. Compilations of experience (Calendar Year/ Policy Year/Accident Year/Report Year)
- d. Incurred versus paid losses
- e. Loss development
- f. Impact of law changes
- g. Frequency and its trend over time
- h. Severity and its trend over time
- i. Pure Premium and its trend over time
- j. Exponential versus linear trend
- k. Relationship between trend and loss development
- l. Changes in mix of business
- m. Allocated versus unallocated loss adjustment expenses
- n. Policy provisions
- o. Credibility criteria
- p. Credibility formulas
- q. Large loss adjustment
- r. Adjustments for catastrophe

READINGS
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ASOP 13  
 Boor 1  
 Bourdon  
 Burger et al.  
 CAS Principles  
 Feldblum 2  
 Finger  
 Graves and Castillo  
 Krakowski  
 Marker and Mohl  
 McClenahan

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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<p>4. Calculate the underwriting expense provisions for estimating an overall rate level indication.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>d. Expense categories:</p> <ul style="list-style-type: none"> <li>• Commission</li> <li>• General</li> <li>• Other acquisition</li> <li>• Tax, license, and fees</li> </ul> <p>e. Profit and contingency provisions</p> <p>f. Sources of data and selection criteria</p> <p>g. Fixed and variable expense</p> <p>h. Expense fee calculation</p> <p>i. Differences in procedures for loss adjustment expenses versus underwriting expenses</p>
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**READINGS**

Brown and Schmitz  
 CAS Principles  
 Feldblum 2  
 Graves and Castillo  
 McClenahan  
 Schofield  
 Werner

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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<p>5. Calculate an overall rate level indication using the pure premium and loss ratio methods.</p> <p><i>Range of weight: 5-10 percent</i></p>	<p>e. Loss ratio formula</p> <p>f. Pure premium formula</p> <p>g. Estimates of formula components</p>
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**READINGS**

Feldblum 2  
 Graves and Castillo  
 McClenahan

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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<p>6. Compare and contrast the loss ratio method and pure premium method in estimating an overall rate level indication.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>f. Loss Ratio method</p> <ul style="list-style-type: none"> <li>• Formula</li> <li>• Advantages/disadvantages</li> <li>• Assumptions and data needs</li> </ul> <p>g. Pure Premium method</p> <ul style="list-style-type: none"> <li>• Formula</li> <li>• Advantages/disadvantages</li> </ul>
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	<ul style="list-style-type: none"> <li>Assumptions and data needs</li> </ul>
<b>READINGS</b>	
CAS Principles McClenahan	

**B. Classification Analysis**

*Range of weight for Section E: 10-15 percent*

This section deals with a number of ratemaking issues surrounding the proper classification of insureds for the purposes of risk stratification.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Explain the purpose and methods for segregating data into homogeneous groups.  <i>Range of weight: 0-5 percent</i>	f. Credibility g. Impact on insurance operations (e.g., underwriting) h. Adverse selection i. Criteria for selection of classification grouping j. Efficiency of class plan
<b>READINGS</b>	
Boor 1 Bouska Burger et al. CAS Principles Feldblum 2 Finger Lange Webb et al.	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Calculate rating factors/relativity for: <ul style="list-style-type: none"> <li>Classification</li> <li>Territory</li> <li>Deductibles</li> <li>Increased limits</li> </ul> <i>Range of weight: 8-12 percent</i>	b. Credibility/complements of credibility c. Off balance d. Capping of changes e. Layers of loss f. Loss elimination g. Basic versus total limits h. Expense adjustments i. Formulas/processes for each rating factor

**READINGS**

CAS Principles  
 Boor 1  
 Bourdon  
 Brown and Schmitz  
 Feldblum 1  
 Feldblum 2  
 Finger  
 Graves and Castillo  
 Lange

**B. Miscellaneous Ratemaking Topics**

*Range of weight for Section F: 15-20 percent*

This section includes special topics related to ratemaking.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Explain the purpose of coinsurance.  <i>Range of weight: 0-5 percent</i>	b. Definition of coinsurance c. Insurance to Value concepts d. Layers of loss e. Coverage issues f. Coinsurance provisions
2. Calculate premium for policies with coinsurance provisions.  <i>Range of weight: 0-5 percent</i>	b. Common policy provisions c. Formula and its components d. Layers of loss
READINGS	
Anderson Kelley	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Explain the impact of catastrophes on insurance company operations and ratemaking.  <i>Range of weight: 0-5 percent</i>	c. Definition of catastrophe d. Concentration of exposure e. Underwriting issues f. Reinsurance g. Loss adjustment issues h. Claim issues i. Risk and profit loads
READINGS	
Burger et al.	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>4. Calculate a catastrophe provision.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>d. Definition of catastrophe</p> <p>e. Formula/process for estimating modeled and non-modeled catastrophes</p> <p>f. Definition of damage ratios</p> <p>g. Coverage terms</p>
<b>READINGS</b>	
<p>Burger et al. Krakowski</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>5. Explain the use of statistical plans.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>e. Purpose of a statistical plan</p> <p>f. Components of a statistical plan</p> <p>g. Limitations of company and industry data</p>
<b>READINGS</b>	
<p>Moncher Prevosto</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>6. Explain the purpose of individual risk rating.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>f. Experience modifications</p> <p>g. Schedule rating</p> <p>h. Credibility</p> <p>i. Manual rating</p> <p>j. Retrospective rating</p> <p>k. Experience period</p>
<b>READINGS</b>	
<p>CAS Principles Sherwood Tiller</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>7. Perform individual risk rating calculations.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>g. Formula for experience modification and components</p> <p>h. Layers of loss</p> <p>i. Credibility</p>

	j. Manual rating
<b>READINGS</b>	
Sherwood Tiller	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
8. Calculate insurance prices using asset share and cash flow techniques for estimating costs.  <i>Range of weight: 3-7 percent</i>	h. Model characteristics and formulas i. Premium j. Loss characteristics (frequency, severity) k. Expenses l. Persistency rates m. Policy durations n. Termination rates
<b>READINGS</b>	
Feldblum 1	

### Complete Text References for Exam 5

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objectives	Source
Actuarial Standards Board of the American Academy of Actuaries, " <a href="#">Actuarial Standard of Practice No. 13, Trending Procedures in Property/Casualty Insurance Ratemaking</a> ."	ASOP 13	D2, D3	W
Anderson, G., " <a href="#">Insurance to Value</a> ," CAS Study Note, Third Edition, February 2005. [The third edition of this study note is the same as the second edition with the <a href="#">errata</a> incorporated. No other changes were made to the third edition.]	Anderson	F1, F2	W NEW
Boor, J.A., " <a href="#">The Complement of Credibility</a> ," PCAS LXXXIII, 1996, pp. 1-40, including errata. Examination questions will not be based directly on Appendices A, B, and C, which were included in this Study Note for completeness.	Boor 1	D3, E1, E2	W
Boor, J.A., " <a href="#">The Impact of the Insurance Economic Cycle on Insurance Pricing</a> " (Second Edition), CAS Study Note, August 2004.	Boor 2	B4	W

Boor, J.A., " <a href="#">A Macroeconomic View of the Insurance Marketplace</a> ," CAS Study Note, 1998.	Boor 3	B4	W
Bourdon, T.W.; Passwater, K.; and Priven, M., " <a href="#">An Introduction to Capitation and Health Care Provider Excess Insurance</a> ," <i>Health Care Issues for Property/Casualty Insurers</i> , Casualty Actuarial Society Discussion Paper Program, 1997, pp. 97-139, including <a href="#">erratum</a> .	Bourdon	C, D3, E2	W
Bouska, A.S., " <a href="#">Exposure Bases Revisited</a> ," PCAS LXXVI, 1989, pp. 1-23.	Bouska	D1, E1,	W
Brown, B.Z.; and Schmitz, M.C., " <a href="#">Study Note Reading on Deductibles</a> ," CAS Study Note, 1998.	Brown and Schmitz	D4, E2	W
Burger, G.; Fitzgerald, B.; Woods, P.; and White, J., "Incorporating a Hurricane Model into Property Ratemaking," Study Note, omitting pp. 42-53. Examination questions will not be based directly on the Appendix and Glossary, which were included in this Study Note for completeness.	Burger et al.	D3, E1, F3, F4	SK
Casualty Actuarial Society Committee on Ratemaking Principles, <a href="#">Statement of Principles Regarding Property and Casualty Insurance Ratemaking</a> , Casualty Actuarial Society.	CAS Principles	D1-4, D6, E1, E2, F6	W
Feldblum, S., " <a href="#">Personal Automobile Premiums: An Asset Share Pricing Approach for Property-Casualty Insurance</a> ," PCAS LXXXIII, 1996, pp. 190-256 (excluding Sections 7-9).	Feldblum 1	D2, E2, F8	W
Feldblum, S., " <a href="#">Workers' Compensation Ratemaking</a> ," CAS Study Note, September 1993. Examination questions will not be based directly on the appendices, which were included in this Study Note for completeness.	Feldblum 2	D1-5, E1, E2	W
Finger, R.J., " <a href="#">Risk Classification</a> ," Foundations of Casualty Actuarial Science (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 6, pp. 287-342, including <a href="#">errata</a> .	Finger	D1-3, E1, E2	W
Graves, N.; and Castillo, R., " <a href="#">Commercial General Liability Insurance Ratemaking for Premises and Operations</a> ," <i>Pricing Issues</i> , Casualty Actuarial Society Discussion Paper Program, 1990, Volume II, pp. 631-696 (excluding section on Minimum Bias Procedures, pp. 673-681).	Graves and Castillo	D1, D3, D4, D5, E2	W
Insurance Services Office, Inc., Personal	ISO PAM	A3	SK



Automobile Manual (Effective 6-98), General Rules 1-6 only. The entire manual is included for completeness.			
Insurance Services Office, Inc., Personal Automobile Policy (Edition 6-98).	ISO PAP	A1, A2	<b>SK</b>
Jones, B.D., " <a href="#">An Introduction to Premium Trend</a> ," CAS Study Note, 2002.	Jones	D1, D2	<b>W</b>
Kelley, R., " <a href="#">Homeowners Insurance to Value-An Update</a> ," Casualty Actuarial Society <i>Forum</i> including the Ratemaking Call Papers, 1994, pp. 529-562.	Kelley	F1, F2	<b>W</b>
Krakowski, I., " <a href="#">Quantifying the Impact of Non-Modeled Catastrophes on Homeowners Experience</a> ," Casualty Actuarial Society <i>Forum</i> , Winter 2003, pp. 285-316, including <a href="#">errata</a> .	Krakowski	D3, F3	<b>W</b>
Lange, J.T., " <a href="#">The Interpretation of Liability Increased Limits Statistics</a> ," <i>PCAS LVI</i> , 1969, pp. 163-173.	Lange	E1, E2	<b>W</b>
Malecki, D.S.; and Flitner, A.L., <i>Commercial Liability Insurance and Risk Management</i> (Fourth Edition), American Institute for Chartered Property Casualty Underwriters, 1998, Volume 1, pp. 1-33, 71-123.	Malecki and Flitner	A1, A2	<b>SK</b>
Malecki, D.S.; Horn, R.C.; Wining, E.A.; and Flitner, A.L., <i>Commercial Liability Insurance and Risk Management</i> (Third Edition), American Institute for Chartered Property Casualty Underwriters, 1996, Volume 2, pp. 1-60, 167-180.	Malecki et al.	A1, A2, C	<b>SK</b>
Marker, J.O.; and Mohl, J.J., " <a href="#">Rating Claims-Made Insurance Policies</a> ," <i>Pricing Property and Casualty Insurance Products</i> , Casualty Actuarial Society <i>Discussion Paper Program</i> , 1980, pp. 265-304 and <a href="#">errata</a> . Including discussion of paper: <a href="#">McManus, M.F.</a> pp. 305-322.	Marker and Mohl	D3	<b>W</b>
McClenahan, C.L., " <a href="#">Ratemaking</a> ," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 3, pp. 75-148, including errata.	McClenahan	B2, D1-6	<b>W NEW</b>
Moncher, R.B., " <a href="#">Study Note: NCCI Data Collection Calls and Statistical Plans</a> ," CAS Study Note. Examination questions will not be taken from the history section that was included to	Moncher	F5	<b>W</b>

emphasize the changing nature of data collection activities over time.			
Prevosto, V.R., " <a href="#">Study Note: ISO Statistical Plans</a> ," CAS Study Note. Candidates will not responsible for the details of the Exhibits.	Prevosto	F5	<b>W</b>
Schofield, D., " <a href="#">Going From a Pure Premium to a Rate</a> ," CAS Study Note, 1998.	Schofield	D4	<b>W</b>
Sherwood, M.T., " <a href="#">Individual Risk Rating</a> ," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 4, pp. 149-195.	Sherwood	F6, F7	<b>W</b>
Tiller, M.W., " <a href="#">Individual Risk Rating</a> ," CAS Study Note.	Tiller	F6, F7	<b>W</b>
Trupin, J.; and Flitner, A.L., <i>Commercial Property Insurance and Risk Management</i> (Fifth Edition), American Institute for Chartered Property Casualty Underwriters, 1998, Volume 1, pp. 101-122.	Trupin and Flitner	A1, A2	<b>SK</b>
Webb, B.L.; Harrison, C.M.; and Markham, J.J., <i>Insurance Operations and Regulation</i> (First Edition), American Institute for Chartered Property Casualty Underwriters, 2002, pp. 1.3-1.13, 3.3-3.14 (up to Alternate Marketing Mechanisms), 3.23 (beginning at Market Distribution System Management) - 3.30 (up to Market Shares), 4.3-4.16, 5.3-5.26 (up to Underwriting Other Causes of Loss), 6.3-6.43 (up to Personal Liability Underwriting), 14.3-14.33 (up to Challenges Facing Specific Types of Property Claims), and 15.3-15.30 (up to Challenges Facing Specific Types of Liability Claims).	Webb et al.	B1, B3, E1	<b>SK NEW</b>
Wiening, E.A.; and Malecki, D.S., <i>Insurance Contract Analysis</i> (First Edition), American Institute for Chartered Property Casualty Underwriters, 1992, pp. 4-30, 37-74, 83-91, and 373-382.	Wiening and Malecki	A1	<b>SK</b>
Wiening, E. A.; Rejda, G. E.; Luthardt, C. M.; and Ferguson, C. L., <i>Personal Insurance</i> (First Edition), American Institute for Chartered Property Casualty Underwriters, 2002, pp. 1.3-1.16, 3.3-3.31, 4.3-4.21, 5.3-5.41, 6.3-6.19 (up to Section II-Additional Coverages), and 12.5-12.27.	Wiening et al.	A1, A2, C	<b>L</b>
Werner, G.T., " <a href="#">Incorporation of Fixed Expenses</a> ,"	Werner	D4	<b>W</b>

Casualty Actuarial Society <i>Forum</i> , Winter 2004, pp. 211-249.			<b>NEW</b>
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### Key

<b>L</b>	May be borrowed from the CAS Library.
<b>NEW</b>	Indicates new or updated material or modified citation.
<b>SK</b>	Represents material included in the 2005 CAS Study Kit.
<b>SKU</b>	Represents material included in the 2005 CAS Study Kit and the 2005 Update to the 2004 Study Kit.
<b>W</b>	Represents material that is available free-of-charge from the CAS Web Site.

### Publishers 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.

ACTEX Publications (Mad River Books), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexamdriver.com](mailto:retail@actexamdriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Actuarial Standards Board, American Academy of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173; telephone: (847) 706-3513; fax: (847) 706-3599.

American Institute for Chartered Property Casualty Underwriters, Order Department, P.O. Box 3016, 720 Providence Road, Malvern, PA 19355-0716; telephone: (610) 644-2100; fax: (610) 640-9576.

Casualty Actuarial Society *Forum*, *Foundations of Casualty Actuarial Science* (Fourth Edition), *PCAS*, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org)

Insurance Services Office, Inc., 545 Washington Boulevard, Jersey City, NJ 07310-1686; telephone: (800) 888-4476.

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

# Exam 6

## Reserving, Insurance Accounting Principles, and Reinsurance

Before commencing study for this four-hour examination, candidates should read the introduction to [Materials for Study](#). Items marked with a bold **SK** or **SKU** constitute the 2005 CAS Exam 6 Study Kit that is available from the CAS Office for a cost of \$25. Items marked with a bold **W** are available at no charge under [Web Notes](#).

The CAS will test the candidate's knowledge of the material, but may decide not to include questions from every reading on a particular exam.

### A. Actuarial Reserves

*Range of weight for Section A: 45-60 percent*

This section introduces the various techniques that the actuary uses to develop or review actuarial reserves that may be established by an insurance entity or by a noninsurance entity that is retaining risk. The principles and standards of practice for reserving will be examined. This section also introduces the concepts of dynamic financial analysis to the candidate.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>1. Calculate reserves using each of the following reserving methods:</p> <ul style="list-style-type: none"> <li>• Age-to-age</li> <li>• Bornhuetter-Ferguson</li> <li>• Frequency/severity models</li> <li>• Unearned premium reserve methods</li> <li>• Loss expense reserve methods</li> <li>• Reserve discounting methods</li> </ul> <p><i>Range of weight: 13-18 percent</i></p>	<ul style="list-style-type: none"> <li>b. Standards of Practice, ASOP No. 9</li> <li>c. Statement of Principles, CAS</li> <li>d. Mechanics associated with each of the methods</li> <li>e. Loss and claims handling process</li> <li>f. Accounting basis of the data</li> <li>g. Application of credibility</li> <li>h. Terms: loss reserves, premium reserves, expense reserves, salvage and subrogation, GAAP reserves, SAP reserves, retrospective premium, IBNR, case reserves, gross and net of reinsurance exposure measures, ULAE, ALAE, DCC, AOE, pay-out pattern, reporting pattern</li> </ul>

**READINGS**

Adler and Kline  
ASB 9  
Berquist and Sherman  
Bornhuetter and Ferguson  
Brosius  
CAS  
Fisher and Lange  
Hayne  
Johnson  
Kittel  
Mack  
Resony  
Wiser et al.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Forecast reserves and their distributions using stochastic models.</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>b. Define formal mathematical model</li> <li>c. Understand calendar year, accident year, and development year trends and their interrelationships</li> <li>d. Select appropriate parameters</li> <li>e. Calculate variance and percentiles of reserve distribution</li> </ul>

**READINGS**

Barnett and Zehnwrith	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Identify strengths and weaknesses of reserving methods for specific situations/data.</p> <p><i>Range of weight: 8-12 percent</i></p>	<p>c. Ways data are organized</p> <p>d. Advantages and disadvantages of various methods</p> <p>e. Terms: age of data, limits, line of business</p> <p>f. Fundamentals of different types of insurance: long-tailed versus short tailed, high frequency, low severity</p>

**READINGS**

Adler and Kline  
 ASB 9  
 Barnett and Zehnwrith  
 Berquist and Sherman  
 Bornhuetter and Ferguson  
 Brosius  
 CAS  
 Fisher and Lange  
 Fisher and Lester  
 Hayne  
 Johnson  
 Kittel  
 Mack  
 Pinto and Gogol  
 Resony  
 Wiser et al.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>4. Adjust data and/or projections for changes in:</p> <ul style="list-style-type: none"> <li>• Case reserve adequacy</li> <li>• Closure rates and insurance programs</li> <li>• Reinsurance programs</li> </ul> <p>Note: focus on the ceding company's perspective.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>d. Accounting basis for the data, e.g., how claims are counted; how claims are grouped; claims-made versus occurrence</p> <p>e. Effect of subrogation and salvage on projections</p> <p>f. How reinsurance works</p>

**READINGS**

Berquist and Sherman  
 Fisher and Lester

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>5. Test results of reserve analysis for adequacy/reasonableness.</p> <p><i>Range of weight: 5-10 percent</i></p>	<p>e. What an adequate reserve is</p> <p>f. Retrospective tests</p> <p>g. Prospective tests</p> <p>h. Credibility of reserves</p> <p>i. Reserve margin definition (confidence interval)</p>
<b>READINGS</b>	
<p>Berquist and Sherman          Brosius          Fisher and Lange          Fisher and Lester          Wisner et al.</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>6. Assess the impact of operating changes on the reserve estimate.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>f. How operating changes affect reserve estimates</p> <ul style="list-style-type: none"> <li>• Underwriting and policy language</li> <li>• Marketing</li> <li>• Claims administration</li> <li>• Reinsurance</li> <li>• Deductibles</li> </ul>
<b>READINGS</b>	
<p>ASB 9          Berquist and Sherman          Fisher and Lester</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>7. Forecast reserves for various layers of loss.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>g. Methods for reserving losses in a deductible layer</p> <p>h. Methods for reserving unlimited losses excess of a threshold</p> <p>i. Methods for reserving losses excess of a retention but bounded by a limit</p> <p>j. Interrelationships between parameters for forecasting deductible, unlimited excess, layer excess and total losses</p>
<b>READINGS</b>	

Pinto and Gogol Siewert	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
8. Forecast reserves for loss-sensitive contract features.  <i>Range of weight: 0-5 percent</i>	h. Forecast reserves for retrospective premiums
READINGS	
Teng and Perkins	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
9. Make specific provisions in the reserve estimate for emerging mass tort liabilities.  <i>Range of weight: 0-5 percent</i>	i. Mass tort liabilities that are emerging, e.g., mold, asbestos, pollution, lead paint j. Methods for estimating the reserves k. Differences between normal or traditional claim development and development of mass torts
READINGS	
Bouska Ollodart	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
10. Describe concepts of dynamic financial analysis.  <i>Range of weight: 0-5 percent</i>	j. Components of financial statements k. Appropriate components to model: <ul style="list-style-type: none"> <li>• Interest rates</li> <li>• Reserves</li> <li>• Pricing</li> <li>• Losses</li> <li>• Assets</li> </ul>
READINGS	
DFA CAS ERM	

## B. Insurance Accounting

*Range of weight for Section B: 10-20 percent*

This section presents the general concepts of insurance accounting to the candidate. The candidate should become familiar with insurance accounting terminology and practice. This includes differences between statutory and Generally Accepted Accounting



Principles (GAAP) accounting, and the impact of reinsurance and reserves on financial statements.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>10. Explain the purposes and origins of accounting standards and regulations.</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>j. Purpose of accounting</li> <li>k. Types of accounting</li> <li>l. Principal financial statements</li> <li>m. Sources of accounting rules</li> <li>n. Selected accounting concepts</li> <li>o. Common accounts for insurance companies</li> <li>p. The ways GAAP and SAP accounting can differ for a particular country (e.g., the United States)</li> </ul>

**READINGS**

Blanchard  
 FAS 5  
 FAS 60  
 Marshall et al.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Analyze balance sheet and income statement to determine financial performance of insurance companies.</p> <p><i>Range of weight: 3-7 percent</i></p>	<ul style="list-style-type: none"> <li>b. Definition and purpose of balance sheet</li> <li>c. Definition and purpose of income statement</li> <li>d. Relevant measures that define financial performance, e.g., profitability, liquidity, leverage, underwriting ratios</li> </ul>

**READINGS**

Balcarek  
 IASA  
 Marshall et al.  
 Troxel and Bouchie

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Determine impact of reserve estimates and changes in reserve estimates on the balance sheet and income statement.</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>c. Definition and purpose of balance sheet</li> <li>d. Definition and purpose of income statement</li> <li>e. Difference between actuarial and financial statement data (calendar year</li> </ul>

	versus accident year) f. Relationship between target reserves and actuarial indications (margin)
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**READINGS**

Balcarek

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

4. Determine impact of reinsurance program on balance sheet and income statement

*Range of weight: 0-5 percent*

- d. Definition and purpose of balance sheet  
 e. Definition and purpose of income statement  
 f. Characteristics and purpose of any given reinsurance program

**READINGS**

IASA  
 FAS 113  
 CAS VFIC

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

5. Create a balance sheet and income statement given major account balances at various points in time.

*Range of weight: 0-5 percent*

- e. Formulas associated with each component of the balance sheet and income statement  
 f. Assignment of items to assets, liabilities, receipts, and expenses according to GAAP and SAP

**READINGS**

Marshall et al.  
 Troxel and Bouchie

**B. Reinsurance**

*Range of weight for Section C: 30-40 percent*

This section provides the candidate with information related to the sharing of risk between an insurer and reinsurer. It introduces the various types of reinsurance, its purposes and how it is marketed and underwritten. It also addresses how actuarial concepts such as pricing and reserving are adapted to apply to reinsurers.

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

5. Explain the meaning of various

- e. XOL  
 f. Quota share

<p>reinsurance terms.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>g. Surplus share</p> <p>h. Treaty</p> <p>i. Facultative</p> <p>j. Rate-on-line</p> <p>k. Subject earned premium</p> <p>l. Commutation</p> <p>m. Finite reinsurance</p> <p>n. Insurance capacity</p> <p>o. Clash</p> <p>p. Ceded, direct, gross, assumed, net</p> <p>q. Catastrophe treaty</p> <p>r. Aggregate excess of loss</p> <p>s. Burning costs</p>
<p>2. Explain the purposes of various reinsurance arrangements.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>b. Capacity</p> <p>c. Surplus relief</p> <p>d. Smoothing of results</p>

### READINGS

Cass et al.  
 Elliott et al. 1  
 Elliott et al. 2  
 IASA

### LEARNING OBJECTIVES

### KNOWLEDGE STATEMENTS

<p>3. Determine the price of reinsurance programs using the appropriate methods.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>c. Loss distributions</p> <p>d. Increased limit factors</p> <p>e. Trend</p> <p>f. Expenses</p> <p>g. Reinsurance pricing methods</p> <ul style="list-style-type: none"> <li>• Burn cost</li> <li>• Exposure method</li> <li>• Experience rating</li> </ul>
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### READINGS

Clark  
 Ludwig

### LEARNING OBJECTIVES

### KNOWLEDGE STATEMENTS

<p>4. Measure the effects on reinsurance pricing of:</p> <ul style="list-style-type: none"> <li>• Sliding scale commissions</li> <li>• Reinstatement clauses</li> <li>• Loss corridors</li> <li>• Retrospective rating</li> </ul>	<p>d. Expenses</p> <p>e. Contract provisions e.g., risk attaching versus losses occurring</p> <p>f. Loss distributions</p> <p>g. Present value</p>
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<ul style="list-style-type: none"> <li>• Commutations</li> <li>• Clash</li> <li>• Catastrophe</li> </ul> <p><i>Range of weight: 3-7 percent</i></p>	<p>h. Fundamentals of retrospective rating</p>
<p><b>READINGS</b></p>	
<p>Clark Ludwig Steeneck</p>	
<p><b>LEARNING OBJECTIVES</b></p>	<p><b>KNOWLEDGE STATEMENTS</b></p>
<p>5. Calculate ceded losses when provided with gross losses using the provisions of the given reinsurance program.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>e. How reinsurance contracts apply</p> <ul style="list-style-type: none"> <li>• ALAE included or excluded</li> <li>• Per occurrence limits</li> <li>• Aggregate limits</li> <li>• Order in which limits apply</li> </ul>
<p><b>READINGS</b></p>	
<p>Cass et al. Elliott et al. 1 Elliott et al. 2</p>	
<p><b>LEARNING OBJECTIVES</b></p>	<p><b>KNOWLEDGE STATEMENTS</b></p>
<p>6. Compare and contrast reinsurance and primary reserving procedures.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>f. Reinsurance and primary reserving methods</p> <p>g. Impact on assumptions because of differences in information available to reinsurers</p> <p>h. Stanard-Buhlmann method</p>
<p>7. Adjust primary methods and data to be used for reinsurance reserving.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>g. Reinsurance and primary reserving methods</p> <p>h. Impact on assumptions because of differences in information available to reinsurers</p> <p>i. Underlying business characteristics e.g., concentration of exposures</p> <p>j. Data structures:</p> <ul style="list-style-type: none"> <li>• Ground up versus excess loss</li> <li>• Accident year versus treaty</li> </ul>

	year
8. Calculate ceded loss reserves using appropriate methods.  <i>Range of weight: 3-7 percent</i>	h. Reinsurance reserving methods i. Adjustments in data (see above) j. Statement of Principles, CAS k. Standards of Practice, ASOP No. 9

### READINGS

Patrik

### LEARNING OBJECTIVES

9. Measure the impact of reinsurance on financial statements (surplus relief).

*Range of weight: 0-5 percent*

### KNOWLEDGE STATEMENTS

- i. How surplus relief works  
j. Impact on unearned premium reserve  
k. Types of reinsurance that apply  
l. Leverage ratios (gross versus net)  
m. FAS 113  
n. NAIC Accounting Handbook Chapter 22

### READINGS

FAS 113  
CAS VFIC  
IASA

### Complete Text References for Exam 6

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objectives	Source
Actuarial Standards Board of American Academy of Actuaries, " <a href="#">Actuarial Standard of Practice No. 9, Documentation and Disclosure in Property and Casualty Insurance Ratemaking, Loss Reserving, and Valuations (Doc. No. 027)</a> ," 1991. Excluding Appendices 1 and 3.	ASB 9	A1, A3, A6	W
Adler, M.; and Kline, C.D. Jr., " <a href="#">Evaluating Bodily Injury Liabilities Using a Claims Closure Model</a> ," <i>Evaluating Insurance Company Liabilities</i> , Casualty Actuarial Society <i>Discussion Paper Program</i> , 1988, pp. 1-66.	Adler and Kline	A1, A3	W

Balcarek, R.J., " <a href="#">Effect of Loss Reserve Margins in Calendar Year Results</a> ," <i>PCAS</i> LIII, 1966, pp. 1-16. Including discussion of paper: <a href="#">Longley-Cook, L.H.</a> , <i>PCAS</i> LIII, 1966, pp. 17-18.	Balcarek	B2, B3	W
Barnett, G.; and Zehnwirth, B, " <a href="#">Best Estimates for Reserves</a> ," <i>PCAS</i> LXXXVII, 2000, pp. 245-303.	Barnett and Zehnwirth	A2, A3	W NEW
Berquist, J.R.; and Sherman, R.E., " <a href="#">Loss Reserve Adequacy Testing: A Comprehensive, Systematic Approach</a> ," <i>PCAS</i> LXIV, 1977, pp. 123-184. Including discussion of paper: <a href="#">Thorne, J.O.</a> , <i>PCAS</i> LXV, 1978, pp. 10-33.	Berquist and Sherman	A1, A3, A4, A5, A6	W
Blanchard, R.S., " <a href="#">Accounting Concepts for the Actuary</a> ," CAS Study Note, June 2003.	Blanchard	B1	W
Bornhuetter, R.L.; and Ferguson, R.E., " <a href="#">The Actuary and IBNR</a> ," <i>PCAS</i> LIX, 1972, pp. 181-195. Including discussions of paper: <a href="#">Cooper, W.P.</a> , <i>PCAS</i> LX, 1973, pp. 161-164; and <a href="#">White, H.G.</a> , <i>PCAS</i> LX 1973, pp. 165-168.	Bornhuetter and Ferguson	A1, A3	W
Bouska, A.S., " <a href="#">From Disability Income to Mega-Risks: Policy-Event Based Loss Estimation</a> ," <i>Casualty Actuarial Society Forum</i> , Summer 1996, pp. 291-320.	Bouska	A9	W
Brosius, E., " <a href="#">Loss Development Using Credibility</a> ," CAS Study Note, March 1993.	Brosius	A1, A3, A5	W
Cass, R.M.; Kensicki, P.R.; Patrik, G.S.; and Reinartz, R.C., <i>Reinsurance Practices</i> (Second Edition), Insurance Institute of America, 1997, Volume 1, Chapter 5; Volume 2, Chapters 9, 10, and 11.	Cass et al.	C1, C2, C5	L
Casualty Actuarial Society Enterprise Risk Management Committee, " <a href="#">Overview of Enterprise Risk Management</a> ," <i>Casualty Actuarial Society Forum</i> , Summer 2003, Section 3 and Appendix B.	CAS ERM	A10	W
Casualty Actuarial Society, " <a href="#">Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Reserves</a> ," May 1988.	CAS	A1, A3	W
Casualty Actuarial Society Valuation, Finance, and Investments Committee, " <a href="#">Accounting Rule Guidance Statement of Financial Accounting Standards No. 113-Considerations in Risk Transfer Testing</a> " <i>Casualty Actuarial Society Forum</i> , Fall 2002, pp. 305-338, excluding Section 7, Beyond	CAS VFIC	B4, C9	W

VaR Tests.			
Clark, D.R., " <a href="#">Basics of Reinsurance Pricing</a> ," CAS Study Note, 1996.	Clark	C3, C4	<b>W</b>
Dynamic Financial Analysis Committee of the Casualty Actuarial Society, "Overview of Dynamic Risk Modeling," DFA Research Handbook, CAS Web Site ( <a href="http://www.casact.org/research/dfa/dfahbch1.pdf">www.casact.org/research/dfa/dfahbch1.pdf</a> ), Chapter 1.	DFA	A10	<b>W</b>
Elliott, M.W.; Webb, B.L.; Anderson, H.N.; and Kensicki, P.R., <i>Principles of Reinsurance</i> (Second Edition), Insurance Institute of America, 1995, Volume 1, Chapter 1, 2 (pp. 47-60), 3 (pp. 78-82), and 6.	Elliott et al. 1	C1, C2, C5	<b>L</b>
Elliott, M.W.; Webb, B.L.; Anderson, H.N.; and Kensicki, P.R., <i>Principles of Reinsurance</i> (Second Edition), Insurance Institute of America, 1995, Volume 2, pp. 107-113.	Elliott et al. 2	C1, C2, C5	<b>SK</b>
Financial Accounting Standards Board, "Statement of Financial Accounting Standards No. 5, Accounting for Contingencies," Paragraphs 1-4, 8-11, 15, 40-45.	FAS 5	B1	<b>SK</b>
Financial Accounting Standards Board, "Statement of Financial Accounting Standards No. 60, Accounting and Reporting by Insurance Enterprises," Paragraphs 1-9, 11, 13-14, 17-18, 20, 27-34, 38-41, 44, 60 a-h.	FAS 60	B1	<b>SK</b>
Financial Accounting Standards Board, "Statement of Financial Accounting Standards, No. 113, Accounting and Reporting for Reinsurance of Short-Duration and Long-Duration Contracts," December 1992, Paragraphs 1-11, 14-25, 34-67, and 70-109. Candidate will not be responsible for material relating to long-duration contracts and/or life insurance.	FAS 113	B4, C9	<b>SK NEW</b>
Fisher, W.H.; and Lange, J.T., " <a href="#">Loss Reserve Testing: A Report Year Approach</a> ," PCAS LX, 1973, pp. 189-207. Including discussions of paper: <a href="#">Skurnick, D.</a> , PCAS LXI, 1974, pp. 73-83; and <a href="#">authors' response</a> , PCAS LXI, 1974, pp. 84-85.	Fisher and Lange	A1, A3, A5	<b>W</b>
Fisher, W.H.; and Lester, E.P., " <a href="#">Loss Reserve Testing in a Changing Environment</a> ," PCAS LXII,	Fisher and Lester	A3, A4, A5, A6	<b>W</b>

1975, pp. 154-171.			
Hayne, R.H., " <a href="#">Unearned Premium Reserves-Change is in the Wind</a> ," <i>Casualty Actuarial Society Forum</i> , Fall 1999, pp. 177-205.	Hayne	A1, A3	<b>W</b>
Insurance Accounting and Systems Association, <i>Property-Casualty Insurance Accounting</i> (Eighth Edition), 2003, Chapters 4, 6, 11 (excluding "Annual Statement Requirements," pp. 11-26 through 11-29), and Appendix F (Glossary of Accounting Terms).	IASA	B2, B4, C1, C2, C9	<b>L NEW</b>
Johnson, W.A., " <a href="#">Determination of Outstanding Liabilities for Unallocated Loss Adjustment Expenses</a> ," <i>PCAS LXXVI</i> , 1989, pp. 111-125. Corrections to Exhibits 2-5 are included.	Johnson	A1, A3	<b>W</b>
Kittel, J., " <a href="#">Unallocated Loss Adjustment Expense Reserves in an Inflationary Economic Environment</a> ," <i>Inflation Implications for Property-Casualty Insurance</i> , <i>Casualty Actuarial Society Discussion Paper Program</i> , 1981, pp. 311-331. Including discussion of paper: <a href="#">Bill, R.</a> , pp. 332-343.	Kittel	A1, A3	<b>W</b>
Ludwig, S.J., " <a href="#">An Exposure Rating Approach to Pricing Property Excess-of-Loss Reinsurance</a> ," <i>PCAS LXXVIII</i> , 1991, pp. 110-145. Includes discussion: <a href="#">Feldblum, S.</a> , <i>PCAS LXXX</i> , 1993, pp. 380-395.	Ludwig	C3, C4	<b>W</b>
Mack, T. " <a href="#">Credible Claims Reserve: The Benktander Method</a> ," <i>ASTIN Bulletin</i> , 2000, pp. 333-337.	Mack	A1, A3	<b>W</b>
Marshall, D.H.; McManus, W.W.; and Scoles, K.N., Jr., <i>Accounting and Finance for Insurance Professionals</i> (Second Edition), American Institute for Chartered Property Casualty Underwriters, 2001, Chapters 5 and 11 (pp. 11.1-11.6, 11.26-11.39, 11.45). Note: Although other portions of the text will not specifically be tested, candidates may find this text to be useful as basic accounting background.	Marshall et al.	B1, B2, B5	<b>SK</b>
Ollodart, B.E., " <a href="#">Loss Estimates Using S Curves: Environmental and Mass Tort Liabilities</a> ," <i>Casualty Actuarial Society Forum</i> , Winter 1997, pp. 111-132.	Ollodart	A9	<b>W</b>
Patrik, G.S., " <a href="#">Reinsurance</a> ," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition),	Patrik	C6, C7, C8	<b>W</b>



Casualty Actuarial Society, 2001, Chapter 7, pp. 434-464 (section on Reinsurance Loss Reserving).			
Pinto, E.; and Gogol, D.F., " <a href="#">An Analysis of Excess Loss Development</a> ," <i>PCAS LXXIV</i> , 1987, pp. 227-255. Including discussions of paper: <a href="#">Levine, G.M.</a> , <i>PCAS LXXIV</i> , 1987, pp. 256-271; and <a href="#">Bear, R.A.</a> , <i>PCAS LXXIX</i> , 1992, pp. 134-148.	Pinto and Gogol	A1, A3	<b>W</b>
Resony, A.V., " <a href="#">Allocated Loss Expense Reserves</a> ," <i>PCAS LIX</i> , 1972, pp. 141-149. Including discussion of paper: <a href="#">Petz, E.F.</a> , <i>PCAS LX</i> , 1973, pp. 157-160.	Resony	A1, A3	<b>W</b>
Siewert, J.J., " <a href="#">A Model for Reserving Workers Compensation High Deductibles</a> ," <i>Casualty Actuarial Society Forum</i> , Summer 1996, pp. 217-244.	Siewert	A7	<b>W</b>
Steenek, L., " <a href="#">Commutation of Claims</a> ," CAS Study Note, 1998.	Steenek	C4	<b>W</b>
Teng, M.T.S.; and Perkins, M.E., " <a href="#">Estimating the Premium Asset on Retrospectively Rated Policies</a> ," <i>PCAS LXXXIII</i> , 1996, pp. 611-647. Including discussion of paper: <a href="#">Feldblum, S.</a> , <i>PCAS LXXXV</i> , 1998, pp. 274-315. Candidates will not be held responsible for specific Annual Statement notation but will be responsible for concepts presented.	Teng and Perkins	A8	<b>W</b>
Troxel, T.E.; and Bouchie, G.E., <i>Property-Liability Insurance Accounting and Finance</i> (Fourth Edition), American Institute for Chartered Property Casualty Underwriters, 1995, Chapters 2 and 3 (pp. 126-131).	Troxel and Bouchie	B2, B5	<b>SK</b>
Wiser, R.F.; Cockley, J.E; and Gardner A., " <a href="#">Loss Reserving</a> ," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 5, pp. 197-285.	Wiser et al.	A1, A3, A5	<b>W</b>

### Key

<b>L</b>	May be purchased from the publisher or bookstore or borrowed from the CAS Library.
<b>NEW</b>	Indicates new or updated material or modified citation.
<b>SK</b>	Represents material included in the 2005 CAS Study Kit.
<b>SKU</b>	Represents material included in the 2005 CAS Study Kit and the 2005 Update to the 2004 Study Kit.
<b>W</b>	Represents material that is available free-of-charge from the CAS Web Site.

## Publishers and Distributors

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ACTEX Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; Web site: [www.actexamdriver.com](http://www.actexamdriver.com); e-mail: [retail@actexamdriver.com](mailto:retail@actexamdriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Actuarial Standards Board, American Academy of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173; telephone: (847) 706-3513; fax: (847) 706-3599.

American Institute for Chartered Property Casualty Underwriters, Order Department, P.O. Box 3016, 720 Providence Road, Malvern, PA 19355-0716; telephone: (610) 644-2100; fax: (610) 640-9576.

Casualty Actuarial Society *Forum*, *Foundations of Casualty Actuarial Science* (Fourth Edition), *PCAS*, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org).

Financial Accounting Standards Board, 401 Merret 7, P.O. Box 5116, Norwalk, CT 06856-5116; telephone: (203) 847-0700.

Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Eighth Edition), 2003, IASA Fulfillment Center, P.O. Box 51008, Durham, NC 27717; telephone: (800) 817-4272 or (919) 489-0991; fax: (800) 668-4272; Web site: [www.iasa.org](http://www.iasa.org).

Insurance Institute of America, 720 Providence Road, Malvern, PA 19355-0716; telephone: (610) 644-2100; fax: (610) 640-9576.

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: [www.sliderulebooks.com](http://www.sliderulebooks.com).

## Exam 7- Canada

### **Nation-Specific Examination: Annual Statement, Taxation, and Regulation**

Before commencing study for this four-hour examination, candidates should read the introduction to [Materials for Study](#). Items marked with a bold **SK** or **SKU** constitute the 2005 CAS Exam 7-Canada Study Kit that is available from the CAS Office for a cost of \$126. Items marked with a bold **W** are available at no charge under [Web Notes](#).

The CAS will test the candidate's knowledge of the material, but may decide not to include questions from every reading on a particular exam.

Section A of this examination includes a comprehensive presentation of Canadian tort law in the perspective of the insurance business in Canada. Section B focuses on insurance regulation and insurance contract law while Section C presents an overview of government and industry insurance programs. Finally, Section D covers financial reporting and solvency issues. It includes insurance accounting and its relevant laws, regulations, and standards of practice. It also deals with solvency monitoring systems such as the Dynamic Capital Adequacy Testing of the Canadian Institute of Actuaries. All sections are complemented, where appropriate, with information from other countries.

## A. Background Law and Insurance

*Range of weight for Section A: 13-18 percent*

The legal foundation of tort law is a subject that is not strictly actuarial in nature, but that affects many areas of an actuary's work. Since no prior legal knowledge is assumed, this first section includes a comprehensive presentation of Canadian tort law including functions of tort law, negligence, strict liability, products liability, government liability, occupiers liability, and damages and remedies. The material in this section should provide background and a basic understanding of how tort law gives rise to the need for insurance.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>1. Identify and describe the key components of tort law.</p> <p><i>Range of weight: 3-8 percent</i></p>	<p>b. Functions of tort law</p> <p>c. Negligence theory including standard of care, duty, remoteness of damage and proximate cause, defenses</p> <p>d. Strict liability</p> <p>e. Products liability</p> <p>f. Government liability</p> <p>g. Occupiers' liability</p>
<b>READINGS</b>	
Baer and Rendall Linden	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Identify and describe the underlying principles of insurance law.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Utmost good faith</p> <p>c. Fortuity</p> <p>d. Indemnity</p> <p>e. Consumer protection</p> <p>f. Compensation</p>
<b>READINGS</b>	
Brown	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Discuss major elements of insurance contract law</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. Disclosure during negotiation</p> <p>d. Insurable interest</p> <p>e. Policy interpretation</p> <p>f. Relief from forfeiture, waiver, and estoppel</p> <p>g. Dispute resolution</p> <p>h. Liability insurance claims</p>

	i. Salvage and subrogation
<b>READINGS</b>	
Baer and Rendell Brown	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Distinguish between the different types of damages with respect to remedies in tort.  <i>Range of weight: 0-5 percent</i>	d. Nominal damages e. Contemptuous damages f. Real damages g. Punitive or exemplary damages h. Aggravated damages i. Parasitic damages
5. Discuss the measurement of damages and the elements of personal injury damages.  <i>Range of weight: 0-5 percent</i>	e. General and special damages f. Restitution in integrum g. Mitigation h. Non-pecuniary loss i. Pecuniary loss j. Structured settlements and judgments k. Survival of actions
<b>READINGS</b>	
Klar et al.	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Discuss options for tort reform.  <i>Range of weight: 0-5 percent</i>	f. Options for tort reform
<b>READINGS</b>	
BC Civil Liability CMPA	

## B. Regulation of Insurance

*Range of weight for Section B: 13-18 percent*

Candidates should understand the role of the insurance business as a supplier of an essential service. Because of the essential and highly technical nature of insurance, a system of regulatory controls has been established to require the industry to demonstrate that it is providing fair and reliable services in accordance with the statutes and regulations of the jurisdiction.

The material in this section presents the historical development of insurance regulation in Canada as well as the fundamentals of insurance regulation. This section also includes a comprehensive review of Canadian insurance contract law. Judicial decisions affect insurance regulation to the extent they interpret the law and thereby modify regulatory behavior. Therefore, candidates are presented with a number of Canadian cases that have contributed to the development of legal precedents.

Candidates are also provided with a broad overview of the history, objectives, and current issues surrounding rate regulation in the United States.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>6. Describe the reasons and the objectives of insurance regulation.</p> <p><i>Range of weight: 3-8 percent</i></p>	<p>f. Solvency g. Economics h. Contract regulation i. Market conduct j. Rate regulation</p>
<b>READINGS</b>	
<p>Baer and Rendall Ettlinger et al. McDonald</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Describe both the historical development and the current state of insurance regulation, including the division of responsibility between federal and state/provincial regulators.</p> <p><i>Range of weight: 3-8 percent</i></p>	<p>b. British North America Act c. Privy Council d. Insurance Companies Act e. Role of CCIR f. Federal and provincial regulation, legislation, and case law g. Federal, foreign, and provincial companies h. U.S. rate regulation</p>
<b>READINGS</b>	
<p>Baer and Rendall Brown Ettlinger et al. McDonald</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Compare and contrast different types of rate filing approaches; discuss</p>	<p>c. Prior approval d. File and use e. Use and file</p>

state/provincial rate filing guidelines.  <i>Range of weight: 0-5 percent</i>	f. Open competition g. State mandated
<b>READINGS</b>	
Ettlinger et al. FSCO	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Discuss the issues, outcome, rationale and implications of landmark decisions for the insurance industry.  <i>Range of weight: 0-5 percent</i>	d. Specific court cases noted in the Readings section directly below.
<b>READINGS</b>	
Baer and Rendall Landmark Legal Linden McDonald	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. Describe the structure of the insurance industry in Canada.  <i>Range of weight: 0-5 percent</i>	e. Types of insurance carriers f. Nature of competition g. Insurance industry organizations h. Types of insurance (social and private, marine and non-marine, indemnity and non-indemnity, group and individual)
<b>READINGS</b>	
Baer and Rendall	

## B. Government and Industry Insurance Programs

*Range of weight for Section C: 20-25 percent*

Government plans are an intrinsic part of the overall insurance system. The actuary should have a general understanding of Canadian federal and provincial plans.

Candidates are expected to be familiar with the basic principles and concepts underlying Canadian Employment Insurance and the Canadian pension programs. Candidates are not expected to have detailed knowledge of the current levels of benefits or the formulae used to calculate such benefits. This section also includes material regarding Canadian earthquake guidelines. Candidates are responsible for a general understanding of Canadian provincial health plans. An understanding of the workers compensation system in Canada is also required. In the statutory automobile insurance area, candidates should

understand Canadian automobile insurance programs, including no-fault concepts and residual market requirements. Finally, candidates are introduced to provincial guaranty funds.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>5. Describe the origin and purpose of the following government and industry insurance programs:</p> <ul style="list-style-type: none"> <li>• Flood insurance</li> <li>• Crop insurance</li> <li>• Unemployment</li> <li>• Medicare/Health Care</li> <li>• Residual markets (e.g., auto, workers compensation, property)</li> <li>• Crime and riot</li> <li>• Workers Compensation</li> <li>• Automobile</li> <li>• Pension Plans</li> <li>• Guaranty Funds</li> </ul> <p><i>Range of weight: 5-10 percent</i></p>	<p>e. Reason for inception            f. Major historical developments            g. Philosophy of program</p>
<p>2. Describe the operations and risk transfer process for each government/industry program listed in Section C.1, and the interactions of government/industry insurance programs and the voluntary private insurance sector.</p> <p><i>Range of weight: 5-10 percent</i></p>	<p>b. Funding mechanisms/sources            c. Allocation/assignment of exposures and associated costs            d. Eligibility provisions            e. Loss payment provisions            f. Claim settlement provisions            g. Welfare (subsidization) versus insurance principles            h. Insurance coverage provisions            i. Private response to gap in government program (e.g., Medigap, supplementary health)            j. Government response to gap in private program (e.g., FWUA, Canadian Public Auto)</p>
<p>3. Evaluate the effectiveness of a government/industry program (actual, as listed in Section C.1, or hypothetical).</p> <p><i>Range of weight: 5-10 percent</i></p>	<p>c. How to measure performance of programs:</p> <ul style="list-style-type: none"> <li>• Solvency</li> <li>• Efficiencies</li> <li>• Stability</li> <li>• Viability/longer term prospects</li> </ul>



	<ul style="list-style-type: none"> <li>d. How well program meets its purpose</li> <li>e. Impact of external factors (e.g., economic conditions, weather, regulation, etc.)</li> </ul>
<b>READINGS</b>	
<ul style="list-style-type: none"> <li>Agricultural Programs</li> <li>CIA: Health Care</li> <li>FA</li> <li>FSCO</li> <li>Greenan</li> <li>Greene</li> <li>Groupement des assureurs automobiles (Plan and By-Law 7)</li> <li>Hamilton and Ferguson</li> <li>IBC Alberta Automobile</li> <li>IBC Availability</li> <li>KPMG, et al. 1 and 2</li> <li>New Brunswick Auto</li> <li>OSFI Earthquake</li> <li>PACICC 1</li> <li>PACICC 2</li> </ul>	

## **B. Financial Reporting and Taxation**

*Range of weight for Section D: 40-50 percent*

This section covers finance and solvency issues. The intent is to address Canadian and global issues. The lack of Canadian literature on certain subjects led to the use of U.S. material. In the long run, the core of the syllabus will be on Canadian matters with an overview of other countries' relevant differences.

Candidates should have detailed familiarity with the contents, purposes, and recent changes in the Annual Return. This includes recent guidelines from the Office of the Superintendent of Financial Institutions (OSFI) and the provincial regulatory bodies. Candidates should be prepared to discuss professional guidelines and standards of practice applicable to financial reporting.

Candidates should understand the details of, and the reasons for the differences between, the Statutory and Generally Accepted Accounting Principles (GAAP) accounting methods.

This section is complemented by readings on solvency monitoring systems such as the Minimum Capital Test and the Dynamic Capital Adequacy Testing of the Canadian Institute of Actuaries.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Evaluate the financial health of an insurance entity.</p> <p><i>Range of weight: 19-21 percent</i></p>	<p>c. Annual Statement and Annual Return</p> <ul style="list-style-type: none"> <li>• Balance sheet</li> <li>• Income statement</li> <li>• Change in surplus</li> <li>• Notes to financial statements</li> <li>• Cash flow exhibit</li> <li>• Actuarial liabilities</li> <li>• Reinsurance accounting</li> </ul> <p>d. Risk-Based Capital, Minimum Capital Test</p> <p>e. Dynamic Capital Adequacy Testing</p> <p>f. Rating Agencies</p> <p>g. IRIS Ratios</p>

#### READINGS

A.M. Best  
 Cantin and Trahan  
 CCIR Instructions  
 CIA CSOP (2500)  
 CIA DCAT  
 CIA Discounting  
 CIA Min Capital  
 CIA Valuation  
 Feldblum  
 Gorvett  
 IASA  
 NAIC Accounting  
 NAIC Annual Statement  
 OSFI MCT  
 OSFI Reinsurance  
 PwC  
 Uniform Annual Return

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Complete specific schedules and exhibits of Annual Statements/Annual Returns:</p> <ul style="list-style-type: none"> <li>• Balance sheet</li> <li>• Income statement</li> <li>• Schedule P</li> <li>• Insurance Expense Exhibit</li> </ul>	<p>b. Valuation of assets and liabilities</p> <p>c. Schedule P</p> <p>d. Calculation of change in surplus</p> <p>e. Calculation of net income</p> <p>f. Calculation of Insurance Expense Exhibit</p> <p>g. Calculation of reinsurance</p>

<ul style="list-style-type: none"> <li>Net Claims and Adjustment Expenses Runoff</li> </ul> <p><i>Range of weight: 5-7 percent</i></p>	<ul style="list-style-type: none"> <li>penalties</li> <li>h. Calculation of excess (deficiency) ratio from page 60.40 of the Annual Return</li> <li>i. Direct Expense Report</li> </ul>
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**READINGS**

CCIR Instructions  
 CIA Runoff  
 IASA  
 IBC Expense  
 NAIC Annual Statement  
 Uniform Annual Return

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

<p>3. Calculate the MCT and interpret its results.</p> <p><i>Range of weight: 4-6 percent</i></p>	<ul style="list-style-type: none"> <li>c. MCT Formula</li> <li>d. Definition of components of MCT</li> </ul>
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**READINGS**

CIA Min Capital  
 OSFI MCT

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

<p>4. Differentiate between different accounting reporting principles (e.g., GAAP, SAP, IAS)</p> <p><i>Range of weight: 3-5 percent</i></p>	<ul style="list-style-type: none"> <li>d. U.S. Statutory Accounting Principles</li> <li>e. Generally Accepted Accounting Principles</li> <li>f. Adjustments to go from SAP to GAAP</li> <li>g. Canadian Statutory Accounting Principles</li> <li>h. Actuarial Liabilities</li> <li>i. Fair value of claims liabilities</li> <li>j. International Accounting Standards</li> </ul>
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**READINGS**

CAS Fair Value  
 CIA Discounting  
 CIAA Fair Value  
 Conger et al.  
 Feldblum  
 IASA  
 Littmann et al.

NAIC Accounting	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>5. Explain the responsibilities of an actuary as defined by standards of practice, regulators and insurance laws for financial reporting.</p> <p><i>Range of weight: 9-11 percent</i></p>	<p>e. Statutory Actuarial Opinion  f. Contents of Statutory Report of the Actuary  g. Standards of Practice  h. Educational Notes  i. Insurance Companies Act  j. Actuary and auditor relationship</p>
<b>READINGS</b>	
<p>CIA CSOP 1630, 2100, 2200, 2400  CIA Discounting  CIA Min Capital  CIA External Review  CIA Runoff  CIA Valuation  ICA  OSFI Memorandum  OSFI Peer Review</p>	

**Complete Text References for Exam 7-Canada**

*Text references are alphabetized by the citation column.*

<b>Citation</b>	<b>Abbreviation</b>	<b>Learning Objectives</b>	<b>Source</b>
Agriculture and Agri-Food Canada, <i>Canada's Agricultural Business Risk Management Programs</i> , pages 1-8.	Agricultural Programs	C1, C2, C3	<b>SKU NEW</b>
A.M. Best Company, <i>Best's Key Rating Guide, Property/Casualty, United States &amp; Canada</i> , 2004, Preface, excluding Sections XII (Financial Size Categories) and XIII (Rating Distributions). Candidates are not expected to memorize the details of published insurance statistics.	A.M. Best	D1	<b>SKU NEW</b>
Baer, M.G.; and Rendall, J.A., <i>Cases on the Canadian Law of Insurance</i> (Fifth Edition), Carswell, 1995, pp. 23-28, 33-34, 36-44, 59-88 (excluding tables on pp. 62-67), 90-97, 277-279, 423-426, 507-519, 742-748 and 750-752. Candidates are responsible for the following	Baer and Rendall	A1, A3, B1, B2, B5	<b>SK</b>

cases: <i>R. v. Anderson and Teskey</i> ; <i>R. v. Parks</i> ; <i>Gray v. Kerlake</i> ; <i>Glenn v. Scottish Union and National Insurance Company Ltd.</i> (Chapter 1); <i>Regal Films Corporation Ltd. v. Glens Falls Insurance Company</i> (Chapter 2); <i>Berkowitz v. MPIC</i> (Chapter 7); <i>Fletcher v. MPIC</i> (Chapter 8); <i>Broadhurst and Ball v. American Home</i> ; and <i>Dillon v. Guardian Insurance</i> (Chapter 11).			
British Columbia, Ministry of Attorney General, "Civil Liability Review, Consultation Paper," April 2002; and "Civil Liability Review, Summary of Responses," February 2003, Executive Summary only.	BC Civil Liability	A6	<b>SK</b>
British Columbia, Ministry of Attorney General, "Civil Liability Review, Consultation Paper," April 2002; and "Civil Liability Review, Summary of Responses," February 2003, Executive Summary only.	BC Civil Liability	A6	<b>SK</b>
Brown, C., <i>Canadian Insurance Contracts Law in a Nutshell</i> , Carswell, 1995 Edition, Chapters 1-3, 5, 6, 9, 11, 12 (Sections 5 and 6 only) and 13.	Brown	A2, A3, B2, B4	<b>L</b>
Canadian Council of Insurance Regulators, <i>Annual Statement Instructions P&amp;C-1</i> , Sections I, III, IV, V and VI, excluding instructions for Annual Return pp. 30.40, 30.45, and 40.10-40.60. [Note: Page numbers refer to the 2003 statement. The Web version of the <i>Syllabus</i> and the <i>Notice of Examinations</i> will contain updated page references for the 2004 statement.]	CCIR Instructions	D1, D2	<b>L NEW</b>
Canadian Institute of Actuaries, Consolidated Standards of Practice, 1630, 2100, 2200, 2400, and 2500.	CIA CSOP	D1, D5	<b>SK</b>
Canadian Institute of Actuaries, "Educational Note: Review of Work of an Actuary," September 2003.	CIA Peer Review	D5	<b>SKU NEW</b>
Canadian Institute of Actuaries, "Educational Note: DCAT - Minimum Regulatory Capital Requirement," July 2003.	CIA Min Capital	D1, D3, D5	<b>SKU NEW</b>
Canadian Institute of Actuaries, "Educational Note: Valuation of Policy Liabilities P&C Insurance Considerations Regarding Claim	CIA Valuation	D1, D5	<b>SKU NEW</b>

Liabilities and Premium Liabilities," June 2003.			
Canadian Institute of Actuaries, "Educational Note: Discounting," April 1999.	CIA Discounting	D1, D4, D5	<b>SK</b>
Canadian Institute of Actuaries, "Educational Note: Dynamic Capital Adequacy Testing-Life, Property and Casualty," June 1999. Candidates are not responsible for details related to life insurance companies.	CIA DCAT	D1	<b>SK</b>
Canadian Institute of Actuaries, "Educational Note: Evaluation of the Runoff of Claims Liabilities when the Liabilities are Discounted in Accordance with Accepted Actuarial Practice," March 2003.	CIA Runoff	D2, D5	<b>SK</b>
Canadian Institute of Actuaries, "Submission to the Commission on the Future of Health Care in Canada," January 2002.	CIA Health Care	C1, C2, C3	<b>SK</b>
Canadian Insurance Accountants Association, Professional Development Program, The Insurance Accountants' Information Circular MDR-31, <i>Fair Value of Claims Liabilities</i> , Joe S. Cheng & Partners Inc.	CIAA Fair Value	D4	<b>SK</b>
The Canadian Medical Protective Association, "Proceedings of the Tort Reform Conference," Toronto, Ontario, November 5, 1998, pp. 24-38 and Appendix C.	CMPA	A6	<b>SK</b>
Cantin, C.; and Trahan, P.; " <a href="#">Study Note on the Actuarial Evaluation of Premium Liabilities</a> ," CAS Study Note, 1999. Candidates will be responsible for Exhibits but not for Appendices.	Cantin and Trahan	D1	<b>W</b>
Casualty Actuarial Society, CAS Task Force on Fair Value Liabilities, <a href="#">White Paper on Fair Valuing Property/Casualty Insurance Liabilities, Executive Summary</a> , pages i-viii.	CAS Fair Value	D4	<b>W NEW</b>
Conger, R.F.; Hurley, J.D.; and Lowe, S.P., " <a href="#">How Might the Presentation of Liabilities at Fair Value Have Affected the Reported Results of U.S. Property Casualty Insurers</a> ," <i>Fair Value of P&amp;C Liabilities: Practical Implications</i> , Casualty Actuarial Society, 2004, pp. 3-8.	Conger et al.e	D4	<b>W NEW</b>
Ettlinger, K.H.; Hamilton, K.L.; and Krohm, G., <i>State Insurance Regulation</i> (First Edition), Insurance Institute of America, 1995, Chapter 4	Ettlinger et al.	B1, B2, B3	<b>SK</b>

(including Exhibits 4-1 and 4-3). Candidates will not be tested on material that appears only in the exhibits unless the exhibit is specifically identified in the <i>Syllabus</i> .			
Facility Association, <i>Plan of Operation</i> , Consolidated June 2002, pp. 1-10, and 23-41.	FA	C1, C2, C3	<b>SKU NEW</b>
Feldblum, S., " <a href="#">Statutory Surplus: Computation, Pricing and Valuation</a> ," CAS Study Note, June 2003.	Feldblum	D1, D4	<b>W NEW</b>
Financial Services Commission of Ontario, <i>Section 410 Filing Guidelines-Major for Proposed Revisions to Automobile Insurance Rates and Risk Classification Systems</i> , February 2001, Part A, Part B, Part C (Sections 3 - 7 and 10), Appendices B1 and B2.	FSCO	B3, C1, C2, C3	<b>SK</b>
Gorvett, R.W.; Tedeschi, J.L.; and Ward, K.A., " <a href="#">Special Issues: Data Sources</a> ," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 10, pp. 787-796.	Gorvett	D1	<b>W</b>
Greenan, J. (Ed.), <i>The Handbook of Canadian Pension and Benefit Plans</i> (Twelfth Edition), 2002, CCH Canadian Limited, Chapters 3, 12, 13-15.	Greenan	C1, C2, C3	<b>L</b>
Greene, M., "Government Insurers," <i>Issues in Insurance</i> (Fourth Edition), American Institute for Property and Liability Underwriters, 1987, Volume I, Sections I and VI.	Greene	C1, C2, C3	<b>SK</b>
Groupe des assureurs automobiles, <i>Risk Sharing Plan-Procedures Manual; By-Law No.7-Risk Sharing Plan</i> , October 2003, Sections 1.1, 1.11, 2.1 to 2.4, 2.7 to 2.9, 3.1 to 3.3, 3.5 to 3.9, 4.1 to 4.3, 4.11 to 4.16, 5.1 to 5.5, 7.1 to 7.6, 8.1 to 8.3, and 9.1 to 9.6.	Groupe des assureurs automobiles: By-Law 7	C1, C2, C3	<b>SKU NEW</b>
Groupe des assureurs automobiles, <i>Risk Sharing Plan-Procedures Manual; General Description of the Plan</i> , October 2003, Sections 15A to 15E and 15G.	Groupe des assureurs automobiles: Plan	C1, C2, C3	<b>SKU NEW</b>
Hamilton, K.L.; and Ferguson, C.L., <i>Personal Risk Management and Property-Liability Insurance</i> (First Edition), American Institute for Chartered Property Casualty Underwriters,	Hamilton and Ferguson	C1, C2, C3	<b>SK</b>

2002, pp. 6.20-6.34 and 9.36-9.40.			
Insurance Accounting and Systems Association, <i>Property-Casualty Insurance Accounting</i> (Eighth Edition), 2003, Chapters 2, 5, 9, 10, and 18. Candidates will not be responsible for additional material from references to "Relevant Literature."	IASA	D1, D2, D4	<b>L NEW</b>
Insurance Bureau of Canada, Direct Expense Report, Instructions, Forms and Results, Parts I; and II, Sections A, D, E, and K.	IBC Expense	D2	<b>L</b>
Insurance Bureau of Canada, " <a href="#">Insurance Bureau of Canada Submission to Alberta Finance on the Automobile Insurance Consultation Paper</a> ," January 24, 2003.	IBC Alberta Automobile	C1, C2, C3	<b>SK</b>
Insurance Bureau of Canada, "Residential Insurance Availability," October 2001.	IBC Availability	C1, C2, C3	<b>SK</b>
"Insurance Companies Act," <i>Financial Institutions Act</i> , Chapter 47, Sections 165(1), 165 (2), 203, 331(1), 331(2), 331(4), 346, 357-370, 464, 465, 476-478, 516(1), 516(4), 517, 581, 626-632, 641, 664, 665, 667(1), 667(2), and 674 (assented to December 13, 1991).	ICA	D5	<b>SK</b>
Klar, L.N.; Linden, A.M.; Cherniak, E.A.; and Kryworuk, P.W., <i>Remedies in Tort</i> , Carswell, 1997 (Release 6), Volume 4, pp. 27-45 to 27-162.42, excluding pp. 162.2-162.26. Candidates will not be tested on material included in "Additional Authorities" sections. However, candidates might find it helpful to read these sections for further clarification of concepts on which they will be tested. Candidates will not be responsible for text included in references. Candidates will not be responsible for any cases cited in this text.	Klar et al.	A4, A5	<b>SK</b>
KPMG, Eckler Partners Ltd. & Exactor Insurance Services, Inc., "Motor Vehicle Insurance in British Columbia-At the Crossroads, Volume I: The Case for Change," Section I, Parts A, B, and C; Section II, Parts A, B, and C. Candidates will not be responsible for information in exhibits.	KPMG et al. 1	C1, C2, C3	<b>SK</b>
KPMG, Eckler Partners Ltd. & Exactor	KPMG et al. 2	C1, C2, C3	<b>SK</b>



Insurance Services, Inc., "Motor Vehicle Insurance in British Columbia-At the Crossroads, Volume II: Options and Choices," Section II. Candidates will not be responsible for information in exhibits.			
"Landmark Legal Insurance Cases in Canada."	Landmark Legal	B4	<b>SKU NEW</b>
Linden, A.M., <i>Canadian Tort Law</i> (Seventh Edition) (paperback), Butterworths, 2001, pp. 1-32, 101-116, 119-127, 129-151, 160-164, 233-243, 267-276, 280-282, 296-298, 323-328, 344-346, 370-372, 445-447, 451-460, 469-474, 478-481, 486-489, 491-495, 503-514, 553-563, 567-581, 585-599, 607-609, 611-621, 629-635, 637-643, and 650. Candidates are responsible for the following cases: <i>Rylands v. Fletcher</i> (Chapter 14); <i>Donaghue v. Stevenson</i> (Chapter 16); and <i>Just v. British Columbia</i> (Chapter 17).	Linden	A1, B4	<b>L</b>
Littmann, M.W.; Thomas, D.E.; Tarrant, M.; and Gutterman, S., " <a href="#">An Investigation of Practical Matters Related to Implementing Fair Value Accounting for Property/Casualty Loss Reserves</a> ," <i>Fair Value of P&amp;C Liabilities: Practical Implications</i> , Casualty Actuarial Society, 2004, pp. 115-124.	Littmann et al.	D4	<b>W NEW</b>
McDonald, B.R., <i>Life Insurance Laws of Canada (Common Law Provinces)</i> , Life Underwriters Association of Canada, 1995, pp. A1-1, A2-1 to A2-9, B1-1 to B1-2, B2-1 to B2-3, and B4-1 to B4-3. Candidates are responsible for all cases cited in this text.	McDonald	B1, B2, B4	<b>SK</b>
National Association of Insurance Commissioners, <i>Official NAIC Annual Statement Blanks, Property and Casualty</i> , 2004 (both individual and consolidated basis), pp. 2-4, Schedule P. Candidates will be expected to have knowledge of other sections of the annual statement that are discussed in other <i>Syllabus</i> readings. [Note: Page numbers refer to the 2003 statement. The updated page references for the 2004 statement will be noted when available.]	NAIC Annual Statement	D1, D2	<b>L NEW</b>
National Association of Insurance Commissioners, <i>Accounting Practices and</i>	NAIC Accounting	D1, D4	<b>SKU NEW</b>

<i>Procedures Manual</i> , 2004, Preamble.			
New Brunswick, " <a href="#">Auto Insurance for New Brunswick-Final Report of the Select Committee on Private Passenger Automobile Insurance</a> ," November 2002, pp. 7-21; and " <a href="#">New Brunswick Canada-Government Response to the Report of the Select Committee on Private Passenger Automobile Insurance</a> ," March 28, 2003.	New Brunswick Auto	C1, C2, C3	<b>SK</b>
Office of the Superintendent of Financial Institutions Canada, "2004 Memorandum for Actuarial Reports on Property and Casualty Business," Fall 2004.	OSFI Memorandum	D5	<b>SKU NEW</b>
Office of the Superintendent of Financial Institutions Canada, Guideline E-15 "Appointed Actuary: Legal Requirements, Qualifications and External Review," August 2003.	OSFI External Review	D5	<b>SKU NEW</b>
Office of the Superintendent of Financial Institutions Canada, "Earthquake Exposure Sound Practices Guideline," 1997, including Appendices 1 and 2. Candidates are not responsible for the tables in Appendix 2.	OSFI Earthquake	C1, C2, C3	<b>SK</b>
Office of the Superintendent of Financial Institutions Canada, "Guideline-Minimum Capital Test (MCT) for Property and Casualty Insurance Companies," pp. 1-9, 17-22, July 2003; and "Notes on the Development of the Minimum Capital Test (MCT)," pp. 1-7, July 2003.	OSFI MCT	D1, D3	<b>SK</b>
PricewaterhouseCoopers, "Financial Reporting for the Property & Casualty Insurance Industry," 1999.	PwC	D1	<b>SK</b>
Property and Casualty Insurance Compensation Corporation, "Options to ensure another fifteen successful years of service," March 4, 2003 (excluding Annex D, PACICC member questionnaire).	PACICC 1	C1, C2, C3	<b>SK</b>
Property and Casualty Insurance Compensation Corporation, "A Proactive vision for PACICC in a challenging business environment," April 29, 2003 (excluding Annex A and Annex B).	PACICC 2	C1, C2, C3	<b>NEW SKU</b>
Uniform Annual Return (2004) approved by the	Uniform Annual	D1, D2	<b>L</b>

Canadian Council of Insurance Regulators-P&C-1, pp. 10.40-10.42, 10.60, 20.10-20.52, 30.70-30.71, 40.05, 60.10-60.50, 67.10, 67.20-67.30, 70.10-70.21, 70.38, 80.10-80.20, and 99.10. [Note: Page numbers refer to the 2003 statement. The updated page references for the 2004 statement will be posted when they are available.]	Return		<b>NEW</b>
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### Key

<b>L</b>	May be borrowed from the CAS Library.
<b>NEW</b>	Indicates new or updated material or modified citation.
<b>SK</b>	Represents material included in the 2005 CAS Study Kit.
<b>SKU</b>	Represents material included in the 2005 CAS Study Kit and the 2005 Update to the 2004 Study Kit
<b>W</b>	Represents material that is available free-of-charge from the CAS Web Site.

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A.M. Best Canada Ltd., Suite 600, 133 Richmond Street West, Toronto, Ontario M5H 2I3, Canada; telephone: (416) 363-8266; Web site: [www.ambest.ca](http://www.ambest.ca).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

American Institute for Chartered Property Casualty Underwriters, Order Department, P.O. Box 3016, 720 Providence Road, Malvern, PA 19355-0716; telephone: (610) 644-2100; fax: (610) 640-9576.

Baer, M.G.; and Rendall, J.A., *Cases on the Canadian Law of Insurance* (Fifth Edition), 1995, Carswell, Attention: Customer and Order Services, One Corporate Plaza, 2075 Kennedy Road, Scarborough, Ontario M1T 3V4, Canada; telephone: (416) 609-3800 or (800) 387-5164; fax: (416) 298-5082; Web site: [www.carswell.com](http://www.carswell.com).

Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072;

telephone: (800) 223-3103 (for the *NAIC Annual Statement Blanks, Property and Casualty*).

Brown, C.; *Canadian Insurance Contracts Law in a Nutshell*, 1995, Carswell, Attention: Customer and Order Services, One Corporate Plaza, 2075 Kennedy Road, Scarborough, Ontario M1T 3V4, Canada; telephone: (416) 609-3800 or (800) 387-5164; fax: (416) 298-5082; Web site: [www.carswell.com](http://www.carswell.com).

Canadian Institute of Actuaries, Secretariat, Suite 820, 360 Albert Street, Ottawa, Ontario K1R 7X7, Canada; telephone: (613) 236-8196; fax: (613) 233-4552; Web site: [www.actuaries.ca](http://www.actuaries.ca).

Casualty Actuarial Society *Forum, Foundations of Casualty Actuarial Science* (Fourth Edition), *PCAS*, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org).

Ettlinger, K.H.; Hamilton, K.L.; and Krohm, G., *State Insurance Regulation* (First Edition), 1995, Insurance Institute of America, 720 Providence Road, Malvern, PA 19355-0770; telephone: (610) 644-2100.

Facility Association, 151 Yonge Street, 18th Floor, Toronto, Ontario M5C 2W7., Canada; telephone: (416) 863-1750 or (800) 268-9572; fax: (416) 868-0894.

*Financial Institutions Act, "Insurance Companies Act," Chapter 47*, The Federal Publication, 388 King Street West, Toronto, Ontario M5V 1K2, Canada; telephone: (416) 860-1611.

Financial Services Commission of Ontario, 5160 Yonge Street, P.O. Box 85, North York, Ontario M2N 6L9, Canada; telephone: (416) 250-7250; fax: (416) 590-7070; Web site: [www.ontarioinsurance.com](http://www.ontarioinsurance.com).

Greenan, J. (Ed.), *The Handbook of Canadian Pension and Benefit Plans* (Twelfth Edition), 2002, CCH Canadian Limited, 90 Shepherd East, Suite 300, North York, Ontario M2N 6X1, Canada; telephone: (416) 224-2248; fax: (800) 461-4131.

Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Eighth Edition), 2003, IASA Fulfillment Center, P.O. Box 51008, Durham, NC 27717; telephone: (800) 817-4272 or (919) 489-0991; fax: (800) 668-4272; Web site: [www.iasa.org](http://www.iasa.org).

Insurance Bureau of Canada, 240 Duncan Mill Road, Suite 700, Toronto, Ontario M3B 1Z4, Canada; telephone: (416) 445-5912; fax: (416) 445-2183.

Klar, L.N.; Linden, A.M.; Cherniak, E.A.; and Kryworuk, P.W., *Remedies in Tort*, 1997 (Release 6), Volume 4, Carswell, Attention: Customer and Order Services, One Corporate Plaza, 2075 Kennedy Road, Scarborough, Ontario M1T 3V4, Canada; telephone: (416) 609-3800 or (800) 387-5164; fax: (416) 298-5082; Web site: [www.carswell.com](http://www.carswell.com).

Linden, A.M., *Canadian Tort Law* (Seventh Edition), 2001, Butterworths, The Butterworths Group of Companies, 75 Clegg Road, Markham, Ontario L6G 1A1, Canada; telephone: (905) 479-2665; fax: (905) 479-2826; Web site: [www.butterworths.ca](http://www.butterworths.ca).

*NAIC Annual Statement Blanks, Property and Casualty* may be obtained from Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103.

National Association of Insurance Commissioners, 120 W. 12<sup>th</sup> Street, #1100, Kansas City, MO 64105; telephone: (816) 842-3600.

Office of the Superintendent of Financial Institutions Canada, 255 Albert Street, Ottawa, Ontario K1A 0H2 Canada; telephone: (613) 990-7788; fax: (613) 952-8219; Web site: [www.osfi-bsif.gc.ca](http://www.osfi-bsif.gc.ca).

## Exam 7- United States

### **Nation-Specific Examination: Annual Statement, Taxation, and Regulation**

Changes indicated by

Before commencing study for this four-hour examination, candidates should read the introduction to [Materials for Study](#). Items marked with a bold **SK** or **SKU** constitute the 2005 CAS Exam 7-U.S. Study Kit that is available from the CAS Office for a cost of \$73. Items marked with a bold **W** are available at no charge under [Web Notes](#).

The CAS will test the candidate's knowledge of the material, but may decide not to include questions from every reading on a particular exam.

Section A of this examination covers U.S. tort law as it affects the property-casualty business. Section B covers insurance regulation with regards to property-casualty coverages, ratemaking, and pricing. Section C covers markets, coverages, and private and governmental programs for the property-casualty business in the United States. Section D covers the aspects of statutory and GAAP insurance accounting and taxation as these affect reserving and statutory reporting in the United States.

**A. Background Law**

*Range of weight for Section A: 5-10 percent*

U.S. tort law, while not a strictly actuarial subject, affects many areas of an actuary's work. No prior knowledge is assumed in this area and the readings should provide background and a basic understanding of how tort law gives rise to the need for insurance. The judicial role in the development of tort law is also covered.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>1. Describe the different theories of tort law as applied to insurance.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>b. Types of negligence</p> <p>c. Causation</p> <p>d. Immunities</p> <p>e. Common law principles (e.g., assumption of risk)</p> <p>f. Theories of liability</p> <p>g. Criteria for torts</p>
<b>READINGS</b>	
<p>Hensler et al. Keeton Mallor et al.</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Describe the difference between tort systems and no-fault systems.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Tort</p> <p>c. No fault (workers compensation, auto)</p> <p>d. History of no fault</p> <p>e. Type of threshold</p> <p>f. Advantages and disadvantages of each</p> <p>g. Experience of individual systems</p>
<b>READINGS</b>	
<p>Hensler et al. Keeton</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS

<p>3. Discuss the trends in tort litigation.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. Trends in litigation d. Jury awards e. Litigation costs f. Asbestos litigation</p>
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**READINGS**

Biggs  
Hensler et al.  
Keeton

**B. Regulation of Insurance**

*Range of weight for Section B: 25-30 percent*

Candidates should understand that insurers are regulated by various governmental agencies because insurance is a valuable public service. An understanding of the dual U.S. state and federal regulatory system is required, along with the various state systems of regulation. The major areas of regulation for rate, contract terms, and solvency should be understood, as should the role of antitrust law as it pertains to insurance regulation.

Regulation as it affects insurance ratemaking in the U.S. is covered. The regulator's view of insurer profitability and the concept of excess profit regulation are covered. Regulatory and political aspects of risk classification are also covered. Some learning objectives extend the topic to the regulation and governmental actions to enhance the availability of insurance.

This section also covers the regulation for solvency in the U.S., including financial ratios tested by the National Association of Insurance Commissioners (IRIS tests) and guaranty fund mechanisms set up by the various states. Also covered are risk-based capital calculations from the statutory blank and how they are used to monitor solvency.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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<p>3. Describe the reasons and the objectives of insurance regulation.</p> <p><i>Range of weight: 8-12 percent</i></p>	<p>c. Solvency d. Market conduct e. Rate regulation</p>
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**READINGS**

Bartlett et al.  
Brady et al.  
Ettlenger et al.  
Ghezzi  
Feldblum (NY Law)  
Harrington  
NAIC Rating

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Describe both the historical development and the current state of insurance regulation including the division of responsibility between federal and state/provincial regulators.</p> <p><i>Range of weight: 3-7 percent</i></p>	<ul style="list-style-type: none"> <li>b. SEC reporting and regulation</li> <li>c. McCarran-Ferguson</li> <li>d. Basis of insurance regulation</li> <li>e. Solvency, including RBC, insurance department examination, NAIC regulatory tests</li> <li>f. Functions of NAIC</li> <li>g. Antitrust provisions</li> <li>h. Landmark cases</li> </ul>

**READINGS**

Brady et al.  
 Ettlenger et al.  
 Feldblum (RBC)  
 Feldblum (Schedule P), pp. 38-41  
 Harrington  
 Troxel and Bouchie  
 Wagner

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Compare and contrast different types of rate filing approaches; discuss state rate filing guidelines.</p> <p><i>Range of weight: 5-10 percent</i></p>	<ul style="list-style-type: none"> <li>c. Prior approval</li> <li>d. File and use</li> <li>e. Use and file</li> <li>f. Open competition</li> <li>g. State mandated</li> </ul>

**READINGS**

A.M. Best  
 Brady et al.  
 Ettlenger et al.  
 Harrington  
 Harrington and Doerpinghaus  
 Krohm  
 Wagner  
 Williams

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>4. Discuss the issues, outcome, rationale and implications of landmark decisions for the insurance industry.</p>	<ul style="list-style-type: none"> <li>d. Sherman Antitrust</li> <li>e. McCarran-Ferguson</li> <li>f. Southern Underwriters</li> </ul>



<i>Range of weight: 0-5 percent</i>	g. Montrose Claims
<b>READINGS</b>	
Harrington Wagner	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. Describe the different treatment and rationale of that treatment of domestic, foreign, and alien insurers.  <i>Range of weight: 0-5 percent</i>	e. Licensing f. Capital Requirements g. Branch versus domestic
<b>READINGS</b>	
A.M. Best Brady et al. Wagner	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Describe the regulatory issues related to catastrophe and other modeling.  <i>Range of weight: 0-5 percent</i>	f. Acceptance of models by regulators g. Proprietary issues
<b>READINGS</b>	
Musulin	

## B. Government and Industry Insurance Programs

*Range of weight for Section C: 10-15 percent*

From this section, candidates should gain a detailed knowledge of the U.S. Social Security and Medicare systems. Candidates also should gain a working knowledge of the regulations concerning insurance for catastrophic events. An understanding of the regulatory environment surrounding the U.S. workers compensation system is required. Other federal, state, and industry programs are also covered.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Describe the origin and purpose of the following government and industry insurance programs: <ul style="list-style-type: none"> <li>• Social Security</li> <li>• Flood insurance</li> <li>• Crop insurance</li> <li>• Unemployment</li> <li>• Medicare/Health Care</li> </ul>	f. Reason for inception g. Major historical developments h. Philosophy of program

- Residual markets (e.g., auto, workers compensation, property)
- Crime and riot
- Nuclear
- Workers compensation
- Automobile
- Pension plans
- Guaranty funds

*Range of weight: 3-7 percent*

**READINGS**

Ettlinger et al.  
Greene  
Hamilton and Ferguson  
Jenkins  
Rejda  
Wiening et al.  
Wilcox

**LEARNING OBJECTIVES**

2. Describe the operations and risk transfer process for each government/industry program, and the interactions of government/industry insurance programs and the voluntary private insurance sector.

*Range of weight: 5-10 percent*

**KNOWLEDGE STATEMENTS**

- b. Funding mechanisms/sources
- c. Allocation/assignment of exposures and associated costs
- d. Eligibility provisions
- e. Loss payment provisions
- f. Claim settlement provisions
- g. Welfare (subsidization) versus insurance principles
- h. Insurance coverage provisions
- i. Private response to gap in government program (e.g., Medigap, supplementary health)

**READINGS**

Bartlett et al.  
Ettlinger et al.  
Greene  
Hamilton and Ferguson  
Rejda  
Weining et al.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Evaluate the effectiveness of a government/industry program (actual or hypothetical)</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. How to measure performance of programs</p> <p>d. Solvency</p> <p>e. Efficiencies</p> <p>f. Stability</p> <p>g. Viability/longer term prospects</p> <p>h. How well program meets its purpose</p> <p>i. Impact of external factors (e.g., economic conditions, weather, regulation, etc.)</p>
READINGS	
<p>Bartlett et al.  Ettlinger et al.  Greene  Hamilton and Ferguson  Jenkins  Rejda  Weining et al.</p>	

## B. Financial Reporting and Taxation

*Range of weight for Section D: 50-55 percent*

This section covers the aspects of statutory and GAAP insurance accounting and taxation as they affect reserving and statutory reporting in the U.S. Candidates should gain a thorough knowledge of U.S. statutory accounting forms presented in the NAIC blanks and the Insurance Expense Exhibits. A detailed knowledge of reserves and values required in the blank is needed. Knowledge of federal income tax treatment, including reserve discounting, should also be mastered.

Related to these areas, this section covers the codification of statutory accounting, differences in the accounting treatment for GAAP, tax, and statutory uses, audits of insurance companies, and some aspects of Canadian accounting for insurance companies.

The material in this examination assumes a working knowledge of general accounting such as that which would be gained from Exam 6. If needed, a review of the following material, or other general accounting material, may enhance the understanding of the U.S.-specific material presented on this examination: sections of the IASA text; the Exam 6 reading, "Accounting Concepts for the Actuary," by R.S. Blanchard; *Accounting and Finance for Insurance Professionals*; by Marshall et al. (the old CPCU 8 book); or the CPCU Course 540 text, *Fundamentals of Corporate Finance*.

As background reading for the responsibilities of actuaries, it is highly recommended that the candidate study [ASOP 36](#). The candidate will only be tested on those portions of the ASOP as mentioned in the COPLFR Practice Note.

Note: The Almagro and Ghezzi text and the new IASA text both discuss Alternative Minimum Tax. The IASA text has the latest rules. The IASA text will prevail if there are differences in a particular rule discussed in both readings.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Evaluate the financial health of an insurance entity.</p> <p><i>Range of weight: 20-25 percent</i></p>	<ul style="list-style-type: none"> <li>c. Annual Statement</li> <li>d. Balance sheet</li> <li>e. Income statement</li> <li>f. Change in surplus</li> <li>g. Notes to financial statements</li> <li>h. Cash flow exhibit</li> <li>i. Reinsurance accounting</li> <li>j. Risk-Based Capital (RBC)</li> <li>k. Rating Agencies</li> <li>l. IRIS ratios</li> </ul>
<b>READINGS</b>	
<p>2004 IEE            Feldblum (RBC, Notes, Surplus, Schedule F, Schedule P, and IEE)            Gorvett            IASA 1            IASA 2            Kurz            NAIC Annual Statement            NAIC SSAP 62            NAIC SSAP 65            OSFI MCT            Troxel and Bouchie</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Complete specific schedules and exhibits of:</p> <ul style="list-style-type: none"> <li>• Annual Statements/Annual Returns</li> <li>• Balance sheet</li> <li>• Income statement</li> <li>• Schedule P</li> <li>• IEE</li> </ul>	<ul style="list-style-type: none"> <li>b. Valuation of assets and liabilities</li> <li>c. Schedule P</li> <li>d. Calculation of change in surplus</li> <li>e. Calculation of net</li> </ul>

<ul style="list-style-type: none"> <li>Schedule F</li> </ul> <p><i>Range of weight: 8-12 percent</i></p>	<p>income</p> <p>f. Calculation of Insurance Expense Exhibit</p> <p>g. Calculation of reinsurance penalties</p>
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**READINGS**

2004 IEE  
 Feldblum (Notes, Surplus, Schedule F, Schedule P, and IEE)  
 IASA 1  
 IASA 3  
 Kurz  
 NAIC Annual Statement  
 NAIC SSAP 53, 62, and 65  
 OSFI MCT

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

<p>3. Calculate the RBC and interpret its results.</p> <p><i>Range of weight: 5-10 percent</i></p>	<p>c. RBC formula</p> <p>d. Definition of components of RBC</p>
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**READINGS**

Feldblum (RBC)

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

<p>4. Differentiate between different accounting reporting principles, e.g., GAAP, SAP, IAS.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>d. U.S. Statutory Accounting Principles</p> <p>e. Generally Accepted Accounting Principles</p> <p>f. Adjustments to go from SAP to GAAP</p> <p>g. Canadian Statutory Accounting Principles</p> <p>h. Fair value of claims liabilities</p> <p>i. International Accounting Standards</p>
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**READINGS**

Conger et al.  
 IASA 1, Chapter 14

NAIC APPM, Preamble OSFI MCT	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. Explain the responsibilities of an actuary as defined by standards of practice, regulators and insurance laws for financial reporting.  <i>Range of weight: 3-7 percent</i>	e. Statutory Actuarial Opinion f. Standards of Practice g. Actuary and auditor relationship
<b>READINGS</b>	
COPLFR P&C Practice Note Feldblum (Schedule P), pp. 69-72	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Calculate specific elements of income tax and evaluate their implications for a property/casualty insurer.  <i>Range of weight: 3-7 percent</i>	f. Discounting g. Elements of income tax calculation h. Book income versus taxable income i. Alternative minimum tax j. DTA and DTL
<b>READINGS</b>	
Almagro and Ghezzi IASA 2 NAIC SSAP 65	

### Complete Text References for Exam 7-United States

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objectives	Source
2004 Insurance Expense Exhibit.	2004 IEE	D1, D2	<b>L NEW</b>
A.M. Best, <i>Annual Review of the Excess and Surplus Lines Industry</i> , September 2001, sections IV and V, pp. 21-32.	A.M. Best	B3, B5	<b>SK</b>
Actuarial Standards Board of the American Academy of Actuaries, " <a href="#">Actuarial Standard of</a>	ASOP 36	D5	<b>W</b>

<a href="#">Practice, No. 36, Statements of Actuarial Opinion Regarding Property/Casualty Loss and Loss Adjustment Expense Reserves."</a>			
Almagro, M.; and Ghezzi, T.L., " <a href="#">Federal Income Taxes-Provisions Affecting Property/Casualty Insurers</a> ," <i>PCAS LXXV</i> , 1988, pp. 95-161. Exclude "Transition Provisions of the Tax Reform Act of 1986" in Appendix A, pp. 138-143.	Almagro and Ghezzi	D6	<b>W</b>
Bartlett, D.K.; Klein, R.W.; and Russell, D.T., "Attempts to Socialize Insurance Costs in Voluntary Insurance Markets: The Historical Record," <i>Journal of Insurance Regulation</i> , Summer 1999, pp. 478-511.	Bartlett et al.	B1, C2, C3	<b>SK</b>
Biggs, J.L., "Statement of Jennifer L. Biggs, FCAS, MAAA, Chairperson, Mass Torts Subcommittee, American Academy of Actuaries," Hearing on "Proposed Resolution Regarding the Need for Effective Asbestos Reform" of the Committee on Property/Casualty Insurance, National Conference of Insurance Legislators, July 10, 2003, pp. 1-9, and 16.	Biggs	A3	<b>SKU NEW</b>
Brady, J.L.; Mellinger, J.H.; and Scoles, K.N., <i>The Regulation of Insurance</i> (First Edition), Insurance Institute of America, 1995, Chapters 2 (pp. 43-49), 3, 4, 5 (excluding "Other Federal Regulation Affecting the Insurance Industry," pp 148-154 but including Exhibit 5-1), and 6 (excluding "Other Interest Groups," pp. 172-177 but including Exhibit 6-5). Candidates will not be tested on material that appears only in exhibits unless the exhibit is specifically identified in the <i>Syllabus</i> .	Brady et al	B1, B2, B3, B5	<b>L</b>
Committee on Property and Liability Financial Reporting, American Academy of Actuaries, " <a href="#">Property and Casualty Practice Note, Statements of Actuarial Opinion on P&amp;C Loss Reserves as of December 31, 2003.</a> "	COPLFR P&C Practice Note	D5	<b>W NEW</b>
Conger, R.F.; Hurley, J.D.; and Lowe, S.P., " <a href="#">How Might the Presentation of Liabilities at Fair Value Have Affected the Reported Results of U.S. Property Casualty Insurers</a> ," <i>Fair Value of P&amp;C Liabilities: Practical Implications</i> , 2004, Casualty Actuarial Society, pp. 13-24.	Conger et al.	D4	<b>W NEW</b>

Ettlinger, K.H.; Hamilton, K.L.; and Krohm, G., <i>State Insurance Regulation</i> (First Edition), Insurance Institute of America, 1995, Chapter 6 (excluding "Monitoring Capital Adequacy Through Risk-Based Capital," pp. 156-161 but including Exhibits 6-1 and 6-3) and Chapter 8. Candidates will not be tested on material that appears only in exhibits unless the exhibit is specifically identified in the <i>Syllabus</i> .	Ettlinger et al.	B1, B2, B3, C1, C2, C3	<b>L</b>
Feldblum, S., "Feldblum, S., <a href="#">"Completing and Using Schedule P"</a> (Eighth Edition), CAS Study Note, June 2003. Candidates are not responsible for end notes.	Feldblum (Schedule P)	B2, D1, D2, D5	<b>W</b>
Feldblum, S., <a href="#">"The Insurance Expense Exhibit and the Allocation of Investment Income"</a> (Fifth Edition), CAS Study Note, May 1997.	Feldblum (IEE)	D1, D2	<b>W</b>
Feldblum, S., <a href="#">"NAIC Property/Casualty Insurance Company Risk-Based Capital Requirements,"</a> PCAS LXXXIII, 1996, pp. 297-389 (excluding Section 11 and related exhibits).	Feldblum (RBC)	B2, D1, D3	<b>W</b>
Feldblum, S., <a href="#">"Notes to the Financial Statement,"</a> CAS Study Note, May 2004.	Feldblum (Notes)	D1, D2	<b>W NEW</b>
Feldblum, S., <a href="#">"Reinsurance Accounting: Schedule F"</a> (Eighth Edition), CAS Study Note, April 2003. Candidates are not responsible for the end notes.	Feldblum (Schedule F)	D1, D2	<b>W</b>
Feldblum, S., <a href="#">"Statutory Surplus: Computation, Pricing and Valuation,"</a> CAS Study Note, June 2003. Candidates are not responsible for the end notes.	Feldblum (Surplus)	D1, D2	<b>W NEW</b>
Feldblum, S., <a href="#">"A Student's Guide to the New York Insurance Law; Article 23: Property/Casualty Insurance Rates,"</a> CAS Study Note, 1995.	Feldblum (NY Law)	B1	<b>W</b>
Ghezzi, T.L., "Actuarial Perspective on Property/Casualty Redlining Issues," <i>Actuarial Digest</i> , Volume 15, No. 1, February/March 1996.	Ghezzi	B1	<b>SK</b>
Gorvett, R.W.; Tedeschi, J.L.; and Ward, K.A., <a href="#">"Special Issues-Data Sources,"</a> <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 10, pp. 787-796.	Gorvett et al.	D1	<b>W</b>
Greene, M. "Government Insurers," <i>Issues in</i>	Greene	C1, C2, C3	<b>SK</b>



<i>Insurance</i> (Fourth Edition), American Institute for Property and Liability Underwriters, 1987, Volume I (excluding Chapters IX and X).			
Hamilton, K.L.; and Ferguson, C.L., <i>Personal Risk Management and Property-Liability Insurance</i> (First Edition), American Institute for Chartered Property Casualty Underwriters, 2002, pp. 6.20 - 6.34 and 9.36-9.40.	Hamilton and Ferguson	C1, C2, C3	<b>SK</b>
Harrington, S.E., "Insurance Rate Regulation in the 20th Century," <i>Journal of Insurance Regulation</i> , Winter 2000, pp. 204-217.	Harrington	B1, B2, B3, B4	<b>SK</b>
Harrington, S.E.; and Doerpinghaus, H.I., "The Economics and Politics of Automobile Insurance Rate Classification," <i>Journal of Risk and Insurance</i> , 1993, pp. 59-84.	Harrington and Doerpinghaus	B3	<b>SK</b>
Hensler, D.R.; Vaiana, M.E.; Kakalik, J.S.; and Peterson, M.A., <i>Trends in Tort Litigation, The Story Behind the Statistics</i> , Rand Institute for Civil Justice, 1987.	Hensler et al.	A1, A2, A3	<b>SK</b>
Insurance Accounting and Systems Association, <i>Property-Casualty Insurance Accounting</i> (Eighth Edition), 2003, Chapters 2, 5, 8, 9, 10, 14, 15, and 18.	IASA 1	D1, D2, D4	<b>L NEW</b>
Insurance Accounting and Systems Association, <i>Property-Casualty Insurance Accounting</i> (Eighth Edition), 2003, Chapter 12 (pp. 12-5 to 12-34, 12-65 to 12-67, and 12-70 to 12-76)	IASA 2	D1, D6	<b>L NEW</b>
Insurance Accounting and Systems Association, <i>Property-Casualty Insurance Accounting</i> (Eighth Edition), 2003, Appendix D, pp. D10, D11, D12, D17, D18, D19, D20, and D21 (Canadian Annual Statement Exhibits).	IASA 3	D2	<b>L NEW</b>
Jenkins, W.O., "National Flood Insurance Program, Actions to Address Repetitive Loss Properties," Testimony before the Subcommittee on Economic Policy, Committee on Banking, Housing, and Urban Affairs, U.S. Senate, March 25, 2004, pp. 1-5.	Jenkins	C1, C3	<b>SKU NEW</b>
Keeton, R. "The Impact on Insurance of Trends in Tort Law," <i>Issues in Insurance</i> (Third Edition), American Institute for Property and Liability Underwriters, 1984, Volume I.	Keeton	A1, A2, A3	<b>SK</b>

Krohmer, G., "Implications of ISO's Change to Loss Cost Filing for Rate Regulation," <i>Journal of Insurance Regulation</i> , March 1990, pp. 316-329.	Krohmer	B3	<b>SK</b>
Kurz, R.M., "Uniform Classification of Expenses for Property and Liability Insurance Companies," <i>Insurance Accounting and Systems Association Proceedings</i> 1979, pp. 290-292.	Kurz	D1, D2	<b>SK</b>
Mallor, J.P.; Barnes, A.J.; Bowers, T.; Phillips, M.J.; and Langvardt, A.W., <i>The Legal Environment of Risk Management and Insurance</i> (First Edition), American Institute for Chartered Property Casualty Underwriters, 2000, pp. 87-88, 107-121, and 125-145.	Mallor et al.	A1	<b>SKU NEW</b>
Musulin, R.T., "Issues in the Regulatory Acceptance of Computer Modeling for Property Insurance Ratemaking," <i>Journal of Insurance Regulation</i> , Spring 1997, pp. 342-359.	Musulin	B6	<b>SK</b>
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2004, Preamble.	NAIC APPM Preamble	D4	<b>SKU NEW</b>
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2004, Statement of Statutory Accounting Principles 53, "Property Casualty Contracts-Premiums," paragraphs 1-17.	NAIC SSAP 53	D2	<b>SKU NEW</b>
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2004, Statement of Statutory Accounting Principles 62, "Property and Casualty Reinsurance," paragraphs 1-71.	NAIC SSAP 62	D1, D2	<b>SKU NEW</b>
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2004, Statement of Statutory Accounting Principles 65, "Property and Casualty Contracts," paragraphs 1-45.	NAIC SSAP 65	D1, D2, D6	<b>SKU NEW</b>
National Association of Insurance Commissioners, <i>Official 2004 NAIC Annual Statement Blanks, Property and Casualty</i> , (both individual and consolidated basis), pp. 2-13; Schedules D (pp. 23-28 and E-08 through E-14), F (pp. 34-41), H (pp. 42-44), P (pp. 45-103). Candidates will be expected to have knowledge of	NAIC Annual Statement	D1, D2	<b>L NEW</b>

<p>other sections of the annual statement that are discussed in other Syllabus readings. [The Notes to the Financial Statement (pp. 14, 23-27, 32, and 33) are cited for reference only. Candidates are responsible for the Notes as described in "Notes to the Financial Statement" (May 2004) by Feldblum where the Notes are referenced by title.]</p>			
<p>National Association of Insurance Commissioners, "Report of the Advisory Committee on Competitive Rating to the National Association of Insurance Commissioners," <i>Proceedings</i>, 1980, Volume II, Chapter III. Candidates will not be responsible for the language of the model rating law itself nor the alternative model laws submitted in the report.</p>	NAIC Rating	B1	<b>SK</b>
<p>New York (State) Laws, Statutes, etc., <i>New York Insurance Law</i>, Article 23 (all sections). Candidates are responsible only for the sections of the law as stated. If studying from publications such as the Consolidated Laws Service, which cite case histories as well as the law itself, candidates are not responsible for the case histories although they may be helpful in gaining an understanding of the law. Candidates will not be tested on those sections of the New York laws dealing exclusively with life insurance and/or annuities.</p>	New York Law 23	B1	<b>SK</b>
<p>Office of the Superintendent of Financial Institutions Canada, "Guideline-Minimum Capital Test (MCT) for Property and Casualty Insurance Companies," pp. 1-9, 17-22, July 2003.</p>	OSFI MCT	D1, D2, D4	<b>SK</b>
<p>Rejda, G.E., "Financing the Social Security Program," <i>Social Insurance &amp; Economic Security</i> (Sixth Edition), Prentice Hall, 1999, Chapter 7 (pp. 148-166).</p>	Rejda	C1, C2, C3	<b>SK</b>
<p>Troxel, T.; and Bouchie, G.E., <i>Property-Liability Insurance Accounting and Finance</i> (Fourth Edition), American Institute for Chartered Property Casualty Underwriters, 1995, pp. 216-236.</p>	Troxel and Bouchie	B2, D1	<b>SK</b>
<p>Wagner, T., "Insurance Rating Bureaus," <i>Journal of Insurance Regulation</i>, Winter 2000, pp. 189-</p>	Wagner	B2, B3, B4, B5	<b>SK</b>

202.			
Wilcox, C.J., "The US Guaranty Association Concept at 25," <i>Journal of Insurance Regulation</i> , Spring 1996, pp. 369-371 (up to The Life and Health Scorecard) and pp. 385-403 (starting with The Property and Casualty Scorecard).	Wilcox	C1	<b>SK</b>
Williams, C.A., "Regulating Property and Liability Insurance Rates Through Excess Profits Statutes," <i>Journal of Risk and Insurance</i> , September 1983, pp. 445-472.	Williams	B3	<b>SK</b>
Weining, E.A.; Rejda, G. E.; Luthardt, C.M.; and Ferguson, C.L.; <i>Personal Insurance</i> (First Edition), American Institute for Chartered Property Casualty Underwriters, 2002, pp. 10.25-10.32 and 12.26-12.33.	Weining et al.	C1, C2, C3	<b>SK</b>

### Key

<b>L</b>	May be purchased from the publisher or bookstore or borrowed from the CAS Library.
<b>NEW</b>	Indicates new or updated material or modified citation.
<b>SK</b>	Represents material included in the 2005 CAS Study Kit.
<b>SKU</b>	Represents material included in the 2005 CAS Study Kit <b>AND</b> the 2005 Update to the 2004 Study Kit
<b>W</b>	Represents material that is available free-of-charge from the CAS Web Site.

### Publishers and Distributors

Contact information is furnished for those who wish to purchase the text references cited for Exam 7-United States. Publishers and distributors are independent and listed for the convenience of candidates; inclusion does not constitute endorsement by the CAS.

ACTEX Publications (Mad River Books), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexamdriver.com](mailto:retail@actexamdriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

*Actuarial Digest*, P.O. Box 1127, Ponte Vedra, FL 32004.

American Institute for Chartered Property Casualty Underwriters, Order Department, P.O. Box 3016, 720 Providence Road, Malvern, PA 19355-0716; telephone: (610) 644-2100; fax: (610) 640-9576.

*Association Form of the Annual Statement Blanks*, Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103.

Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103 (for the *NAIC Annual Statement Blanks, Property and Casualty*).

Casualty Actuarial Society *Forum, Foundations of Casualty Actuarial Science* (Fourth Edition), *PCAS*, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org).

Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Eighth Edition), 2003, IASA Fulfillment Center, P.O. Box 51008, Durham, NC 27717; telephone: (800) 817-4272 or (919) 489-0991; fax: (800) 668-4272; Web site: [www.iasa.org](http://www.iasa.org).

Insurance Expense Exhibit, Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103.

Insurance Institute of America, 720 Providence Road, Malvern, PA 19355-0770; telephone: (610) 644-2100.

*Journal of Insurance Regulation*, National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO 64105; telephone: (816) 842-3600.

*Journal of Risk and Insurance, The*, American Risk and Insurance Association, 716 Providence Road, P.O. Box 3028, Malvern, PA 19355; telephone: (610) 640-1997; fax: (610) 725-1007.

*NAIC Annual Statement Blanks*, Property and Casualty may be obtained from Bowne Insurance Division, 800 Central Boulevard, Carlstadt, NJ 07072; telephone: (800) 223-3103.

National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO 64105; telephone: (816) 842-3600.

New York (State) Insurance Department, Publications Unit, Agency Building 1, Empire State Plaza, Albany, NY 12257; telephone: (518) 474-1203.

New York (State) Laws, Statutes, etc., from New York Insurance Law may be obtained from the West Publishing Company, a division of International Thompson Publishing, Order Department, P.O. Box 6904, Florence, KY 41022; telephone: (800) 347-7707.

Rejda, G.E., *Social Insurance and Economic Security* (Sixth Edition), 1999, Prentice-Hall, Inc.; telephone: (800) 374-1200 Web site: [vig.prenhall.com](http://vig.prenhall.com).

# Exam 8

## Investments and Financial Analysis

Before commencing study for this four-hour examination, candidates should read the introduction to [Materials for Study](#). Items marked with a bold **SK** or **SKU** constitute the 2005 CAS Exam 8 Study Kit that is available from the CAS Office for a cost of \$37. Items marked with a bold **W** are available at no charge under [Web Notes](#).

The CAS will test the candidate's knowledge of the material, but may decide not to include questions from every reading on a particular exam.

Exam 8 focuses on a broad array of finance, investment, and financial risk management topics. The exam can be viewed as having two parts, with Sections A-G covering mostly financial

theory and tools and Sections H-J covering various financial applications. The material in Exam 8 presupposes and builds upon introductory knowledge of finance. It also presupposes knowledge of probability and statistical modeling, liability and reserve risk, and insurance underwriting. 4.

**READINGS**

There are two main texts used for Sections A-G: *Investments* (2005) by Bodie, Kane, and Marcus and *Options, Futures and Other Derivatives* (2003) by Hull. In addition, two chapters from *The Handbook of Fixed Income Securities* (2001) edited by Fabozzi are included. For those candidates wishing to gain a broader exposure to fixed income securities, Fabozzi has a wealth of additional material, although this additional material will not be tested.

The *Investments* (Bodie, Kane, and Marcus) text contains references to various Web sites. Candidates are not responsible for the identity of the Web sites, or the actual content of the Web sites, except to the extent the content is reproduced in the text. Candidates are also not responsible for any aspect of the boxes entitled "E-Investments:..." that are usually placed at or towards the end of a chapter.

While, in general, it is suggested that the candidate cover the learning objectives in the order listed, some text references to later chapters in texts may occur before text references to earlier chapters. In these cases, the candidate may need to review these earlier chapters first and then return to the learning objectives that reference the later chapters.

For Exam 8, the appendices are included unless specifically excluded.

There are various numeric tables scattered throughout the readings, illustrating actual observations or hypothetical examples. Candidates are not responsible for the actual numeric values.

**A. Financial Markets and Instruments**

*Range of weight for Section A: 0-5 percent*

This section provides candidates with an overview of various financial markets and instruments.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Briefly describe the four financial market segments and the key characteristics of securities from each market.  <i>Range of weight: 0-5 percent</i>	b. Money Market c. Bond (Fixed Income) Market d. Equity Markets e. Derivatives Markets
2. Construct equity market indices using time series of prices.  <i>Range of weight: 0-5 percent</i>	b. Price-weighted, value-weighted, and equally weighted indices c. Impact of splits, dividends, and

	composition changes
<b>READINGS</b>	
BKM, Chapter 2 (For background, the candidate may wish to refer to Chapter 1, but no questions will be taken from Chapter 1.)	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Determine pre-tax and post-tax real interest rates given nominal interest rates and inflation rates.  <i>Range of weight: 0-5 percent</i>	c. Real and nominal rates of interest d. Fisher equation
4. Describe the historical relationship between risk and return for different types of securities.  <i>Range of weight: 0-5 percent</i>	d. Average return e. Standard deviation as risk measure
<b>READINGS</b>	
BKM Chapter 5 (For background, the candidate may wish to refer to Chapters 3 and 4, but no questions will be taken from Chapters 3 and 4.)	

### B. Portfolio Theory

*Range of weight for Section B: 3-7 percent*

This section discusses the relationship between the risk and return for different combinations of risky and risk-free investments and discusses the impact of diversification on this relationship. Candidates are introduced to the manner in which investors might select, from those available, a particular portfolio that best suits their individual preferences for risk and return.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Describe the relationship between risk and return and explain how utility scores are used to assess the trade-off between risk and return.  <i>Range of weight: 0-5 percent</i>	d. Utility functions and utility maximization e. Risk aversion f. Mean-variance criterion
<b>READINGS</b>	
BKM, Chapter 6	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>



<p>2. Calculate expected return and standard deviation of return for portfolios consisting of risky and risk-free securities and identify optimal combinations of a risky asset and a risk-free asset for investors with different levels of risk aversion.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>b. Capital allocation line c. Risk aversion d. Complete portfolio</p>
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**READINGS**

BKM, Chapter 7

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

<p>3. Describe the impact of diversification on risk and return measures for portfolios of two or more risky assets and understand the limitations of diversification as a risk management tool.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. Expected return for portfolios of risky and risk-free assets d. Standard deviation of return for portfolios of two or more risky assets e. Standard deviation of return for portfolios of risky and risk-free assets f. Asset allocation versus security selection g. Markowitz's Portfolio Selection Model and the Separation Property h. Insurance principle i. Fallacy of time diversification</p>
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**READINGS**

BKM, Chapter 8

**B. Equilibrium in Capital Markets**

*Range of weight for Section C: 8-12 percent*

This section expands on the portfolio choice results of the previous section and examines how equilibrium market prices are ultimately determined, with a particular emphasis on prices of equity securities. Various equilibrium models are presented, including the Capital Asset Pricing Model, Arbitrage Pricing Theory and Index Models, along with empirical findings regarding their validity. The concept of market efficiency is presented to help candidates understand the factors that move market prices towards and away from the theoretical prices presented in these models.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Explain the Capital Asset Pricing Model, including the major assumptions and examples of its applications and be able to use it to measure expected returns for risky securities with different risk characteristics.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>c. CAPM assumptions  d. Capital market line  e. Security market line  f. CAPM  g. Derivation of standard CAPM and zero-beta CAPM  h. Adjustments to CAPM to reflect liquidity</p>
<b>READINGS</b>	
BKM, Chapter 9	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Use a Single Index Model to measure a security's return variance, CAPM Beta, and other inputs into the Markowitz Portfolio Selection Model such as correlation and covariance with other securities' returns.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Index Models and their relationship to CAPM  c. Beta estimation using single index model  d. Correlation and covariance estimates from index models  e. Industry index models  f. Beta adjustment to reflect tendency to move towards 1.0 and statistical errors  g. Beta forecasting</p>
<b>READINGS</b>	
BKM, Chapter 10	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Use Arbitrage Pricing Theory to determine the expected return for a security given its factor sensitivities and the expected returns on the factor portfolios.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. Arbitrage  d. Factor portfolios  e. Arbitrage Pricing Theory (APT) and its comparison to CAPM  f. Alternative Factors in Multifactor Models-Macroeconomic Factors, Fama and French Factors, Intertemporal (Multi-Factor) CAPM</p>
<p>4. Determine the expected returns on the APT factor portfolios based on the expected returns and factor sensitivities</p>	<p>d. APT  e. APT factor portfolios</p>

of other diversified portfolios.  <i>Range of weight: 0-5 percent</i>	
<b>READINGS</b>	
BKM, Chapter 11	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. Describe the concept of market efficiency, including the three major forms.  <i>Range of weight: 0-5 percent</i>	e. Impact of technical analysis and fundamental analysis on market efficiency f. Event studies
6. Describe various market anomalies, their implications for market efficiency and the potential behavioral interpretations of the observed results.  <i>Range of weight: 0-5 percent</i>	f. Market anomalies, including momentum, P/E effect, small-firm effect, neglected-firm effect, book-to-market effect g. Behavioral Issues-Information processing errors, behavioral biases and limits to arbitrage, including examples from each of these three categories
<b>READINGS</b>	
BKM, Chapter 12	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
7. Describe the use of historical data to test the CAPM and APT, the statistical limitations of these tests, and the key findings of various studies.  <i>Range of weight: 0-5 percent</i>	g. Two-stage test of CAPM h. Statistical limitations, including actual versus expected returns, market index as proxy for market portfolio, measurement error, stochastic volatility i. Important tests of CAPM, including Miller and Scholes; Black, Jensen and Scholes; Fama and Macbeth j. Roll's Critique k. Chen, Roll and Ross tests of APT l. Fama and French's 3-Factor Model
8. Describe the Equity Premium Puzzle, the explanations for the puzzle based on Fama and French's analysis and the	h. Equity Premium Puzzle i. Fama and French's analysis based on the dividend discount model

<p>impact of survivorship bias.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>j. Survivorship bias and its impact on both the equity premium puzzle and tests of market efficiency</p>
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## READINGS

BKM, Chapter 13

### B. Fixed Income Securities

*Range of weight for Section D: 18-22 percent*

This section covers the features of various fixed income securities, including U.S. Government Bonds, Corporate Bonds and Mortgage-Backed Securities, and details of how these securities are valued, including the term structure of interest rates.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>8. Explain and give examples of various types of fixed income securities, including unique aspects of each.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>h. Treasury Notes and Bonds i. Corporate Bonds j. Preferred Stock k. Asset-Backed Securities l. Catastrophe Bonds m. International Bonds</p>

## READINGS

BKM, Chapter 14  
Fabozzi, Chapter 24

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Calculate Treasury bill discount rates and the annualized rate of return given the cash price and the time to maturity.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Use of par value versus price in denominator c. Day count conventions for Treasury bills d. Annualization using simple interest</p>

## READINGS

Hull, Chapter 5

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Determine the quoted price, full price and yield to maturity of U.S. Treasury Bonds.</p>	<p>c. Accrued interest d. Quoted (flat) Price versus Invoice (full) Price e. Different yield measures-current yield, yield-to-maturity, yield-to-call, par</p>

<i>Range of weight: 3-7 percent</i>	<ul style="list-style-type: none"> <li>yield</li> <li>f. Prices and yields for Zero Coupon Bonds</li> <li>g. Holding Period Returns</li> </ul>
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**READINGS**

BKM, Chapter 14  
Hull, Chapter 5

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

<p>4. Describe the process used to rate the default risk on corporate bonds and the various mechanisms used to limit this risk to investors.</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>d. Methods to estimate bond default probabilities, including Financial Ratios and Altman's Z-Score</li> <li>e. Bond indentures including, sinking funds, subordination, dividend restrictions, and collateral</li> </ul>
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**READINGS**

BKM, Chapter 14

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

<p>5. Explain the three different Term Structure Theories.</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>e. Three theories, including Expectations Hypothesis, Liquidity Preference Theory and Segmentation Theory</li> <li>f. Forward rate versus expected spot rate</li> </ul>
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<p>6. Use U.S. Government Bond prices to measure the term structure and calculate spot rates and forward rates for different maturities and time periods.</p> <p><i>Range of weight: 3-7 percent</i></p>	<ul style="list-style-type: none"> <li>f. Determination of Forward Rates from Spot Rates</li> <li>g. Alternative methods for estimating the term structure of interest rates, including using zero-coupon bonds, coupon bonds and statistical approaches to measuring a discount function</li> <li>h. Zero Coupon Curve using both continuous compounding and semi-annual compounding</li> <li>i. LIBOR Rates</li> </ul>
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**READINGS**

BKM, Chapter 15  
Hull, Chapter 5

**LEARNING OBJECTIVES**

**KNOWLEDGE STATEMENTS**

<p>7. Determine the promised (stated) yield and expected yield for Corporate Bonds, taking default risk into account.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>g. Promised (stated) yield h. Expected yield i. Default probability j. Default premium</p>
<p>8. Determine the probability of default for a corporate zero-coupon bond based on its yield, the risk-free yield and an assumed recovery rate.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>h. Expected Loss from Default i. Recovery rates</p>
<p><b>READINGS</b></p>	
<p>BKM, Chapter 14 Altman Hull, Chapter 26 (excluding Appendix)</p>	
<p><b>LEARNING OBJECTIVES</b></p>	<p><b>KNOWLEDGE STATEMENTS</b></p>
<p>9. Describe the results of Altman's historical study of whether default risk was fairly reflected in the promised corporate bond yields during the period of his analysis.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>i. Historical statistics of bond defaults and yields for various rating cohorts j. Bond Mortality k. Marginal and Cumulative Mortality Rates for Bonds l. Explanations for excess historical default premiums, including overcompensation, other risk factors such as liquidity risk and reinvestment risk, overstated recovery rates, systematic default risk, investor constraints m. Risk-Neutral versus Real-World estimates of default probabilities as an explanation of the difference between historical default probabilities and default probabilities implied by bond prices</p>
<p><b>READINGS</b></p>	
<p>Altman Hull, Chapter 26 (excluding Appendix)</p>	
<p><b>LEARNING OBJECTIVES</b></p>	<p><b>KNOWLEDGE STATEMENTS</b></p>
<p>10. Describe the use of Merton's</p>	<p>j. Equity as a call option on the assets of</p>

model to estimate probabilities of default using equity prices and equity volatility.	the firm
<i>Range of weight: 0-5 percent</i>	
<b>READINGS</b>	
Hull, Chapter 26 (excluding Appendix)	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
11. Estimate the cash flows for Mortgage Pass Throughs, Collateralized Mortgage Obligations, and Stripped Mortgage Backed Securities under alternative assumptions regarding mortgage prepayment.	<ul style="list-style-type: none"> <li>k. Types of mortgages and mortgage-backed securities</li> <li>l. Prepayment risk</li> <li>m. Cash-flow characteristics and prepayment risk of various tranches of Collateralized Mortgage Obligations, IOs and POs</li> </ul>
<i>Range of weight: 0-5 percent</i>	
<b>READINGS</b>	
Fabozzi, Chapter 24	

## B. Futures, Forward and Swaps

*Range of weight for Section E: 8-12 percent*

This section covers in detail various derivative instruments, including futures, forwards, and swaps. The emphasis in each case is on understanding their cash-flow characteristics, using the concept of arbitrage to determine the theoretical value of these securities, and managing financial risk through use of these financial instruments.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
11. Use arbitrage arguments to determine equilibrium forward prices for non-dividend paying stocks, dividend paying stocks, currencies, and commodities.	<ul style="list-style-type: none"> <li>k. Arbitrage</li> <li>l. Margins</li> <li>m. Short selling</li> <li>n. Forward prices</li> <li>o. Relationship between forward prices and expected future spot prices</li> <li>p. Cost of carry</li> <li>q. Convenience yields</li> </ul>
<i>Range of weight: 3-7 percent</i>	
<b>READINGS</b>	
Hull, Chapters 2 and 3 (excluding Appendix)	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Determine the values of existing forward contracts and forward rate agreements.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Present value difference of forward price and the delivery price of an existing forward contract</p> <p>c. Continuously compounded spot rates and forward rates</p>
<b>READINGS</b>	
<p>Hull, Chapter 3 (excluding Appendix) Hull, Chapter 5</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>3. Use forward and/or futures contracts to hedge the future purchase or sale of an asset.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>c. Long hedge versus short hedge</p> <p>d. Arguments for and against hedging</p> <p>e. Optimal hedge ratio</p> <p>f. Basis risk</p>
<b>READINGS</b>	
<p>Hull, Chapter 4</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>4. Explain how Treasury Bond Futures contracts are quoted and the unique aspects of the delivery feature of these contracts, including how the cash price is determined for any particular delivery bond.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>d. Cash price of delivery bond</p> <p>e. Cash futures price versus quoted futures price</p> <p>f. Cheapest to deliver bond</p> <p>g. Wild card play</p> <p>h. Conversion factors for Treasury bond futures</p>
<b>READINGS</b>	
<p>Hull, Chapter 5</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>5. Use Interest Rate Swaps or Currency Swaps to alter the interest rate sensitivity or exchange rate sensitivity of an asset or a liability.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>e. Swap cash-flow mechanics</p> <p>f. Role of financial intermediary</p> <p>g. Swap terms, including notional amount, swap rate, day count conventions, business day conventions</p> <p>h. Comparative advantage</p>



	argument for swaps
6. Determine the value of an existing interest rate swap and the equilibrium swap rate.  <i>Range of weight: 0-5 percent</i>	f. Swap rate g. Value as exchange of bonds h. Value as series of forward agreements
<b>READINGS</b>	
Hull, Chapter 6	

## B. Options

*Range of weight for Section F: 18-22 percent*

This section covers options in detail. The emphasis is in understanding their cash-flow characteristics, how to use the concept of arbitrage to determine the theoretical value of these securities, and how options can be used to manage financial risk. Various valuation models are presented and used to determine the values of a variety of options.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
6. Explain the fundamental aspects of put and call options on stocks, including how they are traded and quoted, key contract provisions, and their payoffs at maturity (alone and in combination with other assets and options).  <i>Range of weight: 0-5 percent</i>	f. Effect of cash dividends, stock dividends, and stock splits on stock option contracts g. Wash sale rules, constructive sale rules, and tax planning h. Key determinants of the value of put and call options, including underlying asset price, exercise price, term-to-maturity, risk-free rate and volatility of underlying asset price i. Payoff and profit diagrams for different trading strategies involving options j. Early exercise of American puts and calls
<b>READINGS</b>	
Hull, Chapters 7, 8, and 9	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Use Put-Call Parity to determine the relationship between prices of European Put and Call options and to	b. Arbitrage c. Put-call parity for European options

<p>identify arbitrage opportunities.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>d. Use of short selling to lock in arbitrage profits</p> <p>e. Effect of dividends on put-call parity</p>
<b>READINGS</b>	
Hull, Chapter 8	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>3. Value European and American Put and Call options using the Binomial Model or Risk-Neutral Valuation Model.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>c. Single period and multi-period binomial stock price trees</p> <p>d. Selecting parameters (<math>u</math> and <math>d</math>) for the binomial option pricing model based on the stock volatility</p> <p>e. Risk-neutral valuation method</p> <p>f. Risk-neutral probabilities</p> <p>g. Early exercise of American options</p>
<b>READINGS</b>	
Hull, Chapter 10	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>4. Value European Puts and Calls using the Black-Scholes Option Pricing Model for dividend and non-dividend paying stocks, indices, currencies, and futures contracts.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>d. Geometric Brownian Motion as a model for stock prices</p> <p>e. Estimation of volatility for option pricing purposes and implied volatility</p> <p>f. Put-call parity</p> <p>g. Methods for valuing European and American call options on dividend paying stocks, including Black's Approximation for American options</p> <p>h. Black Model for valuing futures options</p>
<b>READINGS</b>	
Hull, Chapters 11 (excluding Appendix), 12 (excluding Appendices), and 13 (excluding Appendices)	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>5. Explain the impact that various real-world deviations from the standard</p>	<p>Impact of:</p>

<p>Black-Scholes assumptions would have on the accuracy of the Black-Scholes Option Price.</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>e. Changes in volatility</li> <li>f. Jumps in asset prices</li> <li>g. Changes in interest rates</li> <li>h. Borrowing penalties</li> <li>i. Short-selling restrictions</li> <li>j. Trading costs</li> <li>k. Taxes</li> <li>l. Dividends</li> <li>m. Takeovers</li> </ul>
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**READINGS**

Hull, Chapter 12 (excluding Appendices)  
Black

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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<p>6. Describe the significance of the Black-Scholes-Merton Differential Equation and use it to demonstrate that a particular function is a valid formula for the price of a derivative security.</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>f. Ito's Lemma</li> <li>g. Black-Scholes-Merton Differential Equation</li> <li>h. Riskless portfolio</li> </ul>
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<p>7. Explain the difference between warrants and options and describe how the Black-Scholes model could be adjusted to determine the value of warrants.</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>g. Black-Scholes Model</li> <li>h. Adjustments for new shares issued and exercise price paid</li> <li>i. Iterative process to value warrants</li> </ul>
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**READINGS**

Hull, Chapter 12 (excluding Appendices)

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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<p>8. Determine the value of bonds with embedded put or call features using a Binomial Interest Rate Tree.</p> <p><i>Range of weight: 3-7 percent</i></p>	<ul style="list-style-type: none"> <li>h. Binomial interest rate tree for short rate</li> <li>i. Calibrating a binomial interest rate tree using U.S. Government bonds</li> <li>j. Option-adjusted spread</li> </ul>
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**READINGS**

Fabozzi, Chapter 34

## B. International Securities

*Range of weight for Section G: 0-5 percent*

This section introduces the candidate to the impact of global diversification on portfolio risk-return trade-offs and how exchange rate risk and political risk affect the risk of international securities.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
8. Describe sources of risk in investing internationally, including exchange rate risk and country-specific risk.  <i>Range of weight: 0-5 percent</i>	h. Exchange Rate Risk i. Country-specific risk and political risk
8. Describe the sources of potential diversification benefits from investing in international securities.  <i>Range of weight: 0-5 percent</i>	h. EAFE Index i. World Equity Benchmark Shares
READINGS	
BKM, Chapter 25	

## B. Asset-Liability Management

*Range of weight for Section H: 5-10 percent*

This section introduces the candidate to factors that affect the price sensitivity of fixed income securities and presents various ways in which a portfolio manager might manage the interest rate and cash-flow risk in a portfolio of these instruments. This is extended to include a firm's liabilities, as well as its assets, along with strategies to manage the associated net interest rate and cash-flow risks.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
8. Calculate the Macaulay Duration, Modified Duration and Convexity of a bond (or other fixed income security) for various compounding frequencies (semiannual, annual, continuous) and use these risk measures to estimate the percentage change in bond price for a given change in the bond's yield to maturity.  <i>Range of weight: 0-5 percent</i>	h. Macaulay duration i. Modified duration j. Effective duration k. Convexity l. Interest rate risk m. Macaulay duration of loss reserves, equity securities, and property-casualty insurance company surplus
2. Describe how to use various immunization	b. Net worth immunization

<p>strategies, including Net Worth Immunization, Target Date Immunization, Cash-Flow Matching and Contingent Immunization, to manage interest rate risk and cash-flow risk in a bond portfolio and demonstrate the effectiveness of each strategy under different interest rate scenarios.</p> <p><i>Range of weight: 3-7 percent</i></p>	<ul style="list-style-type: none"> <li>c. Target date immunization</li> <li>d. Cash flow matching</li> <li>e. Contingent immunization</li> <li>f. Use of interest rate swaps, mortgage-backed securities, and other derivative securities to manage interest rate risk for a bond portfolio</li> </ul>
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<b>READINGS</b>
<p>BKM, Chapter 16  Hull, Sections 5.13 and 5.14  Feldblum  Noris (excluding sections I, II, V, and VI)</p>

**B. Financial Risk Management**  
*Range of weight for Section I: 15-20 percent*

This section goes beyond the treatment of Asset-Liability Management in Section H to include other sources of financial risk and addresses the theoretical basis for financial risk management. Measures of the price sensitivity of derivative securities and the use of these instruments to manage financial risk are presented. Other measures of financial risk, such as Value at Risk and the Expected Policyholder Deficit, and their uses are presented.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>2. Calculate the sensitivity of an option price to various parameters, including the stock price (delta and gamma), volatility (vega), time (theta), and interest rates (rho).</p> <p><i>Range of weight: 0-5 percent</i></p>	<ul style="list-style-type: none"> <li>b. Delta</li> <li>c. Gamma</li> <li>d. Vega</li> <li>e. Theta</li> <li>f. Rho</li> </ul>
<p>2. Demonstrate how to delta, gamma and vega hedge a portfolio of stocks and options.</p> <p><i>Range of weight: 3-7 percent</i></p>	<ul style="list-style-type: none"> <li>b. Strategies for managing risk of written option contracts (do nothing, cover, stop loss, delta hedging)</li> <li>c. Delta hedging</li> <li>d. Gamma hedging</li> <li>e. Vega hedging</li> <li>f. Delta, gamma, and vega of stocks, futures, and forwards</li> <li>g. Using futures or forwards to delta hedge efficiently</li> </ul>

	h. Portfolio insurance
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### READINGS

Hull, Chapter 14 (excluding Appendix)

#### LEARNING OBJECTIVES

3. Calculate the Value at Risk (VaR) for a portfolio containing a single stock, multiple stocks, fixed income securities, or options.

*Range of weight: 3-7 percent*

#### KNOWLEDGE STATEMENTS

- c. VaR definition
- d. Analytical VaR for stocks
- e. Analytical VaR for bonds using duration
- f. Cash-flow mapping procedure for bonds
- g. Analytical VaR for options, including the use of the option gamma to improve accuracy

### READINGS

Hull, Chapter 16 (excluding Appendix 16B)

#### LEARNING OBJECTIVES

4. Describe alternative ways to estimate the VaR besides analytical calculations.

*Range of weight: 0-5 percent*

#### KNOWLEDGE STATEMENTS

- d. Alternative methods including Monte Carlo simulation, historical simulation, stress testing, and back testing

### READINGS

Hull, Chapter 16 (excluding Appendix 16B)  
Culp, Miller and Neves (excluding Appendix)

#### LEARNING OBJECTIVES

5. Describe various mechanisms firms can use to reduce their credit risk on derivatives.

*Range of weight: 0-5 percent*

#### KNOWLEDGE STATEMENTS

- e. Loss Given Default (LGD) for derivative positions
- f. Netting
- g. Collateralization
- h. Downgrade triggers
- i. Product design
- j. Diversification

6. Describe the *Credit Risk Plus* and the *CreditMetrics* approaches to estimating Credit Value at Risk.

*Range of weight: 0-5 percent*

- f. Credit Ratings Migration
- g. Credit VaR using simulation
- h. Credit losses from defaults only versus defaults and credit rating changes
- i. Real world versus risk-neutral default

	probabilities
<b>READINGS</b>	
Hull, Chapter 26 (excluding Appendix)	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>7. Describe the limitations of VaR for non-financial firms and the advantages of alternatives such as Cash Flow at Risk, Risk-Based Capital and Shortfall Risk.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>g. Examples of firms experiencing large losses due to poor financial risk management, including Proctor and Gamble, Barings, Orange County, Metallgesellschaft and Daimler Benz</p> <p>h. Cash Flow at Risk</p> <p>i. Risk-Based Capital</p> <p>j. Shortfall Risk</p>
<b>READINGS</b>	
Culp, Miller, and Neves (excluding Appendix) Butsic Cummins	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>8. Describe how Financial Risk Management can enhance the value of a firm.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>Effect of risk management on:</p> <p>h. Bankruptcy costs</p> <p>i. Taxes</p> <p>j. Payments to stakeholders</p> <p>k. Access to capital for new investments</p> <p>l. Capital structure</p> <p>m. Management incentives</p>
<b>READINGS</b>	
Stulz Gorvett Butsic	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>9. Describe how firms can use Risk Adjusted Return on Capital (RAROC) and Economic Value Added (EVA) measures to maximize value creation.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>i. RAROC</p> <p>j. EVA and EVAOC</p>

READINGS	
Nakada Cummins	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>10. Describe strengths and weaknesses of the principal methods insurers can use to allocate capital to lines of business.</p> <p><i>Range of weight: 3-7 percent</i></p>	<p>j. Regulatory Risk-Based Capital</p> <p>k. Value at Risk</p> <p>l. Insolvency Put Option/Expected Policyholder Deficit</p> <p>m. Marginal capital allocation methods reflecting diversification, including Merton-Perold and Myers-Read</p>
<p>11. Describe the three types of friction costs associated with an insurer's capital.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>k. Friction costs, including agency costs, double taxation, and regulation</p>
READINGS	
Cummins	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>12. Calculate the Expected Policyholder Deficit (EPD) for an insurance policy or line of business.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>l. Expected Policyholder Deficit (EPD)</p>
<p>13. Determine the capital required to maintain a constant EPD Ratio when adding a new policy or line of business to an existing portfolio of risks.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>m. EPD ratio</p> <p>n. Alternative assumptions about invested assets (cash versus risky securities)</p>
READINGS	
Butsic Cummins	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>14. Evaluate capital adequacy and risk-adjusted profitability for a property-casualty company using</p>	<p>n. Required (or economic) capital, including how this differs from the available equity capital for a property-</p>



<p>the risk-adjusted return on capital (RAROC) framework.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>casualty insurer</p> <ul style="list-style-type: none"> <li>o. The four steps in implementing the property-casualty RAROC conceptual framework</li> <li>p. Major types of property-casualty asset and liability risks</li> <li>q. The five insights gained from the study conducted by the authors using aggregate industry financial data</li> </ul>
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## READINGS

Nakada

### B. Valuation

*Range of weight for Section J: 5-10 percent*

This section covers the methods used to determine the theoretical value of equity securities and covers issues associated with the valuation of property and casualty insurance companies.

## LEARNING OBJECTIVES

14. Value the equity of a firm based on its expected future cash flows and/or reported financial variables.

*Range of weight: 3-7 percent*

## KNOWLEDGE STATEMENTS

- n. Balance sheet methods
- o. Dividend discount model, using no growth, constant growth, or two-stage growth assumptions
- p. Growth rate estimations based on dividend payout ratios and return on equity
- q. Comparative valuation ratios including price-earnings, price-sales, price-book, price-cash flow
- r. Relationship between the dividend discount model and the price-earnings (P/E) ratio
- s. Valuation of entire firm based on free cash flow, including the distinction between the value of the firm and the value of the equity, the distinction between the firm and equity betas and the impact of interest tax shields

## READINGS

BKM, Chapter 18

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Determine the appraisal value of a property-casualty insurance company by calculating its adjusted net worth, appraisal value of existing business, and appraisal value of future business capacity.</p> <p><i>Range of weight: 0-5 percent</i></p>	<p>b. Adjusted net worth  c. Appraisal value of existing business  d. Appraisal value of future business capacity  e. Valuation considerations according to Actuarial Standard of Practice No.19 and "Statement of Principles Regarding Property and Casualty Valuations"</p>
READINGS	
ASOP 19 CAS Principles BKM, Chapter 18	

### Complete Text References for Exam 8

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objectives	Source
Actuarial Standards Board of the American Academy of Actuaries, " <a href="#">Actuarial Standard of Practice, No. 19, Actuarial Appraisals (Doc. No. 034)</a> ," 1991.	ASOP 19	J2	W
Altman, E.I., "Measuring Corporate Bond Mortality and Performance," <i>The Journal of Finance</i> , Volume 44, No. 4, September 1989, pp. 909-922.	Altman	D7-9	SK
Black, F., "How to Use the Holes in Black-Scholes," <i>The New Corporate Finance: Where Theory Meets Practice</i> (Third Edition), Chew, D.H., editor; McGraw-Hill/Irwin, 2001, Chapter 32, pp. 455-461.	Black	F5	SK
Bodie, Z.; Kane, A.; and Marcus, A.J., <i>Investments</i> (Sixth Edition), McGraw-Hill/Irwin, 2005. Chapter or section citations are listed under the appropriate learning objective.	BKM	A1-4, B1-3, C1-8, D1, D3-8, G1-2, H1-2, J1-2	L NEW
Butsic, R.P., "Solvency Measurement for Property-Liability Risk-Based Capital Applications," <i>The Journal of Risk and</i>	Butsic	I7-8, I12-13	SK

<i>Insurance</i> , Volume 61, No. 4 (December 1994), pp. 656-690.			
Casualty Actuarial Society, " <a href="#">Statement of Principles Regarding Property and Casualty Valuations</a> " as adopted September 22, 1989, Casualty Actuarial Society.	CAS Principles	J2	<b>W</b>
Culp, C.L.; Miller, M.H.; and Neves, A.M.P., "Value at Risk: Uses and Abuses," <i>The New Corporate Finance: Where Theory Meets Practice</i> (Third Edition), Chew, D.H., editor; McGraw-Hill/Irwin, 2001, Chapter 33, pp. 462-471.	Culp, Miller, and Neves	I4, 17	<b>SK</b>
Cummins, J. D., "Allocation of Capital in the Insurance Industry," <i>Risk Management and Insurance Review</i> , American Risk and Insurance Association, Inc., Spring 2000, Vol. 3, No. 1, pp. 7-27.	Cummins	I7, I9-13	<b>SKU NEW</b>
Fabozzi, F.J., <i>The Handbook of Fixed Income Securities</i> (Sixth Edition), McGraw-Hill, 2001, Chapters 24 and 34.	Fabozzi	D1, D11, F8	<b>SK</b>
Feldblum, S., " <a href="#">Asset Liability Matching For Property/Casualty Insurers</a> ," <i>Valuation Issues, CAS Special Interest Seminar</i> , 1989, pp. 117-154.	Feldblum	H1-2	<b>W</b>
Gorvett, R.W., " <a href="#">Insurance Securitization: The Development of a New Asset Class</a> ," <i>Securitization of Risk</i> , Casualty Actuarial Society Discussion Paper Program, May 1999, pp. 133-173.	Gorvett	I8	<b>W</b>
Hull, J.C., <i>Options, Futures, and Other Derivatives</i> (Fifth Edition), Prentice Hall, 2003. Chapter or section citations are listed under the appropriate learning objective.	Hull	D2, D3, D5-10, E1-6, F1-7, H1-2, 1-6	<b>L NEW</b>
Nakada, P.; Shah, H.; Koyluoglu, H.U.; and Collignon, O., "P&C RAROC: A Catalyst for Improved Capital Management in the Property and Casualty Insurance Industry," <i>The Journal of Risk Finance</i> , Fall 1999.	Nakada	I9, I14	<b>SK</b>
Noris, P.D., "Asset/Liability Management Strategies for Property and Casualty Companies," Morgan Stanley, May 1985.	Noris	H1-2	<b>SK</b>
Stulz, R.M., "Rethinking Risk Management,"	Stulz	I8	<b>SK</b>

<i>The New Corporate Finance: Where Theory Meets Practice</i> (Third Edition), Chew, D.H., editor; McGraw-Hill/Irwin, 2001, Chapter 29, pp. 411-427.			
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### Key

<b>L</b>	May be purchased from the publisher or bookstore or borrowed from the CAS Library.
<b>NEW</b>	Indicates new or updated material or modified citation.
<b>SK</b>	Represents material included in the 2005 CAS Study Kit.
<b>SKU</b>	Represents material included in the 2005 CAS Study Kit and the 2005 Update to the 2004 Study Kit.
<b>W</b>	Represents material that is available free-of-charge from the CAS Web Site.

### Publishers and Distributors

Contact information is furnished for those who wish to purchase the text references cited for Exam 8. Publishers and distributors are independent and listed for the convenience of candidates; inclusion does not constitute endorsement by the CAS.

ACTEX Publications (Mad River Books), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: [retail@actexmadriver.com](mailto:retail@actexmadriver.com).

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: [www.actuarialbookstore.com](http://www.actuarialbookstore.com).

Bodie, Z.; Kane, A.; and Marcus, A.J., *Investments* (Sixth Edition), 2005, McGraw-Hill/Irwin, 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262-4729.

Casualty Actuarial Society *Forum*, *PCAS*, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org).

Chew, D.H., editor, *The New Corporate Finance: Where Theory Meets Practice* (Third Edition), 2001, McGraw-Hill/Irwin, 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262-4729.

Fabozzi, F.J., *The Handbook of Fixed Income Securities* (Sixth Edition), 2001, McGraw-Hill, 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262-4729.

Hull, J.C., *Options, Futures, and Other Derivatives* (Fifth Edition), 2003, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: [vig.prenhall.com](http://vig.prenhall.com).

*Journal of Risk and Insurance*, The American Risk and Insurance Association, 716 Providence Road, P.O. Box 3028, Malvern, PA 19355; telephone: (610) 640-1997; fax: (610) 725-1007.

## Exam 9

### Advanced Ratemaking, Rate of Return, and Individual Risk Rating Plans

Changes indicated by

Before commencing study for this four-hour examination, candidates should read the introduction to [Materials for Study](#). Items marked with a bold **SK** or **SKU** constitute the 2005 CAS Exam 9 Study Kit that is available from the CAS Office for a cost of \$28. Items marked with a bold **W** are available at no charge under [Web Notes](#).

Candidates for Exam 9 are expected to have already acquired considerable technical knowledge and practical experience in insurance ratemaking. This examination will assume a working knowledge of basic ratemaking and will deal with advanced problems that fall within the learning objectives. The ability to apply ratemaking knowledge and experience may be tested through questions dealing with problems for which there are no generally recognized solutions.

To some degree, the examination will deal with the types of practical problems that a fully qualified actuary working in ratemaking should be able to solve.

The readings for Exam 9 should be read for illustrations of basic principles and theories, as well as insights into advanced ratemaking problems and their solutions. Some readings are included primarily for their historical significance or to illustrate unique solutions to a ratemaking problem.

**A. Classification Ratemaking**

*Range of weight for Section A: 13-18 percent*

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Identify possible rate classes.  <i>Range of weight: 0-5 percent</i>	b. Characteristics of appropriate classes (Statement of Principles) c. Sampling techniques d. Credibility considerations
2. Measure the statistical significance of possible classes.  <i>Range of weight: 0-5 percent</i>	b. Characteristics of appropriate classes (Statement of Principles) c. Sampling techniques d. Credibility considerations
<b>READINGS</b>	
AAA Bailey and Simon Cummins et al. Mahler Feldblum and Brosius	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Translate the class differences into price differences.  <i>Range of weight: 5-10 percent</i>	c. Multidimensional relativities d. Credibility techniques
<b>READINGS</b>	
Bailey and Simon Feldblum and Brosius	

**B. Cost of Layers of Risk (Excess and Deductible Rating)**

*Range of weight for Section B: 13-18 percent*

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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<p>3. Apply frequency and severity distributions to determine expected losses by layer of insurance.</p> <p><i>Range of weight: 5-10 percent</i></p>	<p>c. Different descriptions of severity distributions: including severity distribution, ILFs, Loss Elimination Ratios (LERs)</p> <p>d. Properties of ILFs</p> <p>e. Interaction among inflation, changes in layer, and losses</p> <p>f. Methods of estimating frequency and severity distributions from losses</p>
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### READINGS

Lee 1  
Miccolis  
Finger  
Gillam and Snader 1

### LEARNING OBJECTIVES

2. Estimate aggregate loss distributions.
- Range of weight: 5-10 percent*

### KNOWLEDGE STATEMENTS

- b. Techniques to estimate aggregate loss distributions directly from aggregate data (e.g., Table M, Table L)
- c. Construction of an aggregate loss distribution from frequency and severity distributions

### READINGS

Gillam and Snader 2  
Lee 2  
Skurnick  
Gillam 1  
Brosius

## B. Pricing of Catastrophic Events

*Range of weight for Section C: 0-5 percent*

This section introduces the methods used to model losses due to catastrophic events in order to generate the catastrophe risk load.

### LEARNING OBJECTIVES

2. Estimate the probability and potential cost of Catastrophic Events.

*Range of weight: 0-5 percent*

### KNOWLEDGE STATEMENTS

- b. Models used to estimate the probability and potential cost of catastrophic events

**READINGS**

Walters and Morin

**B. Rate of Return, Risk Loads, and Contingency Provision***Range of weight for Section D: 30-35 percent*

This section explores the relationship between insurance concepts (such as underwriting profits, premium-to-surplus ratios, and investment income) and financial concepts (such as interest rates, inflation rates, cost of capital, and risk premiums). The readings build on a background of finance as related to the insurance business and deal with specific techniques used by actuaries to develop an appropriate profit loading in insurance prices.

Because insurance claims are fortuitous, the loading for profit in rates may not be realized. The models discussed in Learning Objectives 1 and 2 tend to assume that insured events are predictable in time and amount. Some consideration should be made for uncertainty of claims, particularly where capacity is limited and/or sufficient diversification of exposure is impossible. Learning Objective 3 covers this.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Analyze rate of return.  <i>Range of weight: 10-15 percent</i>	b. Composition of surplus c. Measures of return (including ROE, underwriting profit, IRR) <ul style="list-style-type: none"> <li>• Advantages</li> <li>• Disadvantages</li> <li>• Perspectives of users</li> </ul> d. Sources and types of data used for analysis including calendar year versus accident year
2. Estimate a rate in order to achieve a target rate of return.  <i>Range of weight: 10-15 percent</i>	b. Composition of surplus c. Measures of return (including ROE, underwriting profit, IRR) <ul style="list-style-type: none"> <li>• Advantages</li> <li>• Disadvantages</li> <li>• Perspectives of users</li> </ul> d. Sources and types of data used for analysis including calendar year versus accident year
<b>READINGS</b>	
McClenahan D'Arcy and Dyer Butsic	



Ferrari Robbin Roth Feldblum	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Determine risk load and contingency provision to be included in insurance rates.  <i>Range of weight: 10-15 percent</i>	c. Theory underlying the risk load (including why a risk load is necessary and relationship between risk load and variability)
READINGS	
Miccolis Butsic Ferrari Roth Feldblum Bault Mango	

**B. Individual Risk Rating**

*Range of weight for Section E: 33-38 percent*

One of the important functions performed by an actuary is rating individual risks. Prior to Exam 9, most of the readings were addressed to group or classification risk rating. This part is intended to prepare candidates to design and manage an individual risk rating system.

Individual risk rating consists of two subsections:

3. Prospective rating, in which prior individual risk experience is used to adjust rates prospectively (also known as experience rating);
4. Retrospective and Loss Sensitive rating, in which the insured will pay an amount (in premium or retained loss) that depends on the experience after the policy has been written.

The readings range from those that discuss the theoretical foundation of individual risk rating to those that discuss the application of various rating plans. Candidates can be expected to apply these concepts in a creative and problem-solving manner.

Candidates are also expected to be knowledgeable in the application of individual risk rating plans currently in use and should anticipate answering questions in the manner of an insurance consultant for an insured.

Excerpts from the NCCI *Experience Rating Plan Manual for Workers Compensation and Employers Liability Insurance*, NCCI *Retrospective Rating Plan Manual for Workers Compensation and Employers Liability Insurance*, and ISO *Experience and Schedule Rating Plans Applicable to General Liability* 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.

**Prospective Rating**

(Range of weight: 13-18 percent)

The main idea of experience rating is to adjust an individual risk's rate to reflect the extent to which that risk's own experience identifies it as being different from other risks in the same class. The readings begin with principles and concepts, then move to a discussion of plans in current use.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>5. Adjust class rates based on individual risk exposure and experience.</p> <p><i>Range of weight: 5-10 percent</i></p>	<ul style="list-style-type: none"> <li>. Actuarial principles and concepts underlying development of experience rating plans</li> <li>a. Credibility concepts (e.g., maximum single loss)</li> <li>b. Current NCCI and ISO experience rating plans</li> <li>c. Schedule rating</li> </ul>
<b>READINGS</b>	
<p>Venter Gillam 2 Gillam and Snader 1 NCCI 1 NCCI 2 ISO</p>	
LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Assess effectiveness of experience rating plans.</p> <p><i>Range of weight: 5-10 percent</i></p>	<ul style="list-style-type: none"> <li>b. Off-balance factors</li> <li>c. Evaluation techniques (e.g., quintile test)</li> </ul>
<b>READINGS</b>	
<p>Venter Gillam 2</p>	

### ***Retrospective and Loss Sensitive Rating***

(Range of weight: 15-20)

Retrospective rating allows adjustment of individual risk premium after policy expiration in response to actual loss and expenses associated with the policy. The retrospective rating plans currently in use adjust the premium up or down within limits selected in advance.

Excess and deductible rating is another method that allows the insured to retain loss and loss expense up to limits selected in advance. Instead of adjusting premium after policy expiration to achieve this goal, however, the insured is responsible for the retained portion of loss and loss expense.

Candidates should have a general knowledge and understanding of deductible and excess coverages, and the problems inherent in pricing these coverages for various lines. This section builds on the material covered in Section B, Cost of Layers of Risk.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>3. Construct a retrospectively rated plan.</p> <p><i>Range of weight: 8-13 percent</i></p>	<p>c. Actuarial principles and concepts underlying the construction of a retrospective rating plan (e.g., balance principle, construction of table of insurance charges)</p> <p>d. NCCI retrospective rating plans</p>
<b>READINGS</b>	
<p>Gillam and Snader 2 Lee 2 Skurnick Brosius NCCI 3</p>	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>4. Analyze the elements of a loss sensitive rating plan.</p> <p><i>Range of weight: 3-8 percent</i></p>	<p>d. How the parameters and other elements of the plan affect the final price and potential profitability of product</p> <p>e. How the parameters and other elements of the plan affect cost and cash flow to</p>

	insured
<b>READINGS</b>	
Gillam and Snader 2 Lee 2 Skurnick Fisher	
<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. Calculate the cost of the layer of risk given the loss cost.  <i>Range of weight: 0-5 percent</i>	e. How expenses vary by layer and policy provisions (combined or separate?) f. Large dollar deductible (LDD) and excess policy provisions g. Advantages of LDD and excess policies
<b>READINGS</b>	
Gillam and Snader 3 Fisher Teng	

### Complete Text References for Exam 9

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objectives	Source
American Academy of Actuaries Committee on Risk Classification, " <a href="#">Risk Classification Statement of Principles</a> ," June 1980.	AAA	A1, A2	W
Bailey, R.A.; and Simon, L.J., " <a href="#">An Actuarial Note on the Credibility of Experience of a Single Private Passenger Car</a> ," <i>PCAS</i> XLVI, 1959, pp. 159-164. Including discussion of paper: <a href="#">Hazam, W.J.</a> , <i>PCAS</i> XLVII, 1960, pp. 150-152.	Bailey and Simon	A1, A2, A3	W
Bault, T., Discussion of Feldblum: " <a href="#">Risk Load for Insurers</a> ," <i>PCAS</i> LXXII, 1995, pp. 78-96. Candidates may wish to review the following articles as background to the above, although no questions will be directly drawn from them: Feldblum, S., " <a href="#">Risk Loads for Insurers</a> ," <i>PCAS</i>	Bault	D3	W

LXXVII, 1990, pp. 160-195, including discussions of paper: <a href="#">Philbrick, S.W.</a> , PCAS LXXVIII, 1991, pp. 56-63.			
Brosius, J.E., " <a href="#">Table M Construction</a> ," CAS Study Note, 2002.	Brosius	B2, E3	W
Butsic, R.P., " <a href="#">Determining the Proper Interest Rate for Loss Reserve Discounting: An Economic Approach</a> ," <i>Evaluating Insurance Company Liabilities</i> , Casualty Actuarial Society <i>Discussion Paper Program</i> , 1988, pp. 147-186, excluding pp. 171-178. (Appendix II is excluded.)	Butsic	D1, D2, D3	W
Cummins, J.D.; Smith, B.D.; Vance, R.N.; and VanDerhei, J.L., <i>Risk Classification in Life Insurance</i> , 1983, Kluwer Nijhoff Publishing, Chapter 3. Candidates are not responsible for mathematical proofs.	Cumminset al.	A1, A2	SK
D'Arcy, S.P.; and Dyer, M.A., " <a href="#">Ratemaking: A Financial Economics Approach</a> ," PCAS LXXXIV, 1997. Only Sections 4, 6, and 8 will be directly tested, but the other sections may provide useful background.	D'Arcy and Dyer	D1, D2	W
Feldblum, S., " <a href="#">Pricing Insurance Policies: The Internal Rate of Return Model</a> ," CAS Study Note, May 1992. Only Sections 1, 3, and 6 will be directly tested, but the other sections may provide useful background.	Feldblum	D1, D2, D3	W
Feldblum, S.; and Brosius, J.E., " <a href="#">The Minimum Bias Procedure. A Practitioner's Guide</a> ," CAS Study Note, April 2003, including <a href="#">errata</a> . Formulae in the summary section (pp. 53-54) are for reference only and need not be memorized.	Feldblum and Brosius	A1, A2, A3	W NEW
Ferrari, J.R., " <a href="#">The Relationship of Underwriting, Investment, Leverage, and Exposure to Total Return on Owners' Equity</a> ," PCAS LV, 1968, pp. 295-302. Includes discussion: <a href="#">Balcarek, R.J.</a> , PCAS LVI, 1969, pp. 58-60.	Ferrari	D1, D2, D3	W
Finger, R.J., " <a href="#">Estimating Pure Premiums by Layer</a> ," PCAS LXIII, 1976, pp. 34-52. Including discussion of paper: <a href="#">Steeneck, L.R.</a> , PCAS LXIII, 1976, pp. 53-55.	Finger	B1	W
Fisher, G.K., " <a href="#">Pricing Aggregates on Deductible Policies</a> ," CAS Study Note, 2002.	Fisher	E4, E5	W

Gillam, W.R., " <a href="#">Retrospective Rating: Excess Loss Factors</a> ," <i>PCAS LXXVIII</i> , 1991, pp. 1-40. Candidates are not responsible for loss distribution formulae.	Gillam 1	B2	W
Gillam, W.R., " <a href="#">Workers' Compensation Experience Rating: What Every Actuary Should Know</a> ," <i>PCAS LXXIX</i> , 1992, Sections 1-5, pp. 215-239.	Gillam 2	E1, E2	W
Gillam, W.R.; and Snader, R.H., " <a href="#">Fundamentals of Individual Risk Rating</a> ," National Council on Compensation Insurance (Study Note), 1992, Part I.	Gillam and Snader 1	B1, E1	W
Gillam, W.R.; and Snader, R.H., " <a href="#">Fundamentals of Individual Risk Rating</a> ," National Council on Compensation Insurance (Study Note), 1992, Part II.	Gillam and Snader 2	B2, E3, E4	W
Gillam, W.R.; and Snader, R.H., " <a href="#">Fundamentals of Individual Risk Rating</a> ," National Council on Compensation Insurance (Study Note), 1992, Part III.	Gillam and Snader 3	E5	W
Insurance Services Office, Inc., <i>Experience and Schedule Rating Plans Applicable to General Liability</i> , ISO Circular GL-90-217 (Conversion to Loss Cost Basis). Excerpts from the ISO <i>Experience and Schedule Rating Plans Applicable to General Liability</i> will be provided with the exam. Candidates are not required to memorize the details, but will be expected to be able to use them on the exam. Since they will be included with the exam, candidates will not be allowed to bring copies of the documents into the examination room.	ISO	E1	SK
Lee, Y.S., " <a href="#">The Mathematics of Excess of Loss Coverages and Retrospective Rating-A Graphical Approach</a> ," Sections 1-3, <i>PCAS LXXV</i> , 1988, pp. 49-64.	Lee 1	B1	W
Lee, Y.S., " <a href="#">The Mathematics of Excess of Loss Coverage and Retrospective Rating-A Graphical Approach</a> ," Section 4, <i>PCAS LXXV</i> , 1988, pp. 64-78. Candidates are not responsible for "Other Applications" on pp. 75-76.	Lee 2	B2, E3, E4	W
Mahler, H.C., " <a href="#">An Example of Credibility and Shifting Risk Parameters</a> ," <i>PCAS LXXVII</i> , 1990, pp. 225-282. Candidates will not be tested on the Appendices.	Mahler	A1, A2	W

Mango, D.F, " <a href="#">An Application of Game Theory: Property Catastrophe Risk Load</a> ," PCAS LXXXV, 1998, pp. 157-186. Exam questions will not be drawn from Section 9.	Mango	D3	W
McClenahan, C.L., " <a href="#">Insurance Profitability</a> ," <i>Actuarial Considerations Regarding Risk and Return in Property-Casualty Insurance Pricing</i> , Casualty Actuarial Society, 1999, Chapter 8.	McClenahan	D1, D2	W
Miccolis, R.S., " <a href="#">On the Theory of Increased Limits and Excess of Loss Pricing</a> ," PCAS LXIV, 1977, pp. 27-59. Including discussion of paper: <a href="#">Rosenberg, S.</a> , PCAS LXIV, 1977, pp. 60-73.	Miccolis	B1, D3	W
National Council on Compensation Insurance, <i>The 1998 Adjustment to the Experience Rating Plan: Your Guide to Understanding the Changes</i> .	NCCI 1	E1	SK
National Council on Compensation Insurance, <i>Experience Rating Plan Manual for Workers Compensation and Employers Liability Insurance</i> (as of October 2003). Candidates are responsible for only the excerpted material. Excerpts from the NCCI <i>Experience Rating Plan Manual for Workers Compensation and Employers Liability Insurance</i> will be provided with the examination. Candidates are not required to memorize the details, but will be expected to be able to use them on 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.	NCCI 2	E1	SKU NEW
National Council on Compensation Insurance, <i>Retrospective Rating Plan Manual for Workers Compensation and Employers Liability Insurance</i> (as of July 1, 2004). Candidates are responsible for only the excerpted material. Exclude Part 2, Section III, on cancellation provisions. Excerpts from the NCCI <i>Retrospective Rating Plan Manual for Workers Compensation and Employers Liability Insurance</i> will be provided with the examination. Candidates are not required to memorize the details, but will be expected to be able to use them on 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.	NCCI 3	E3	SKU NEW

Robbin, Ira, " <a href="#">The Underwriting Profit Provision</a> ," CAS Study Note, as updated in 1992.	Robbin	D1, D2	<b>W</b>
Roth, R., " <a href="#">Analysis of Surplus and Rate of Return Without Using Leverage Ratios</a> ," <i>Insurer Financial Solvency</i> , Casualty Actuarial Society <i>Discussion Paper Program</i> , 1992, Volume I, pp. 439-464.	Roth	D1, D2, D3	<b>W</b>
Skurnick, D., " <a href="#">The California Table L</a> ," <i>PCAS</i> LXI, 1974, pp. 117-140. Including discussion of this paper: <a href="#">Gillam, W.R.</a> , <i>PCAS</i> LXXX, 1993, pp. 353-365.	Skurnick	B2, E3, E4	<b>W</b>
Teng, M.T.S., " <a href="#">Pricing Workers' Compensation Large Deductible and Excess Insurance</a> ," <i>Casualty Actuarial Society Forum</i> , Winter 1994, pp. 413-437.	Teng	E5	<b>W</b>
Venter, G.G., "Experience Rating-Equity and Predictive Accuracy," <i>NCCI Digest</i> , April 1987, Volume II, Issue I, pp. 27-35. (Pages are shown as 1-9 in the Study Kit version.)	Venter	E1, E2	<b>SK</b>
Walters, M.A.; and Morin, F., " <a href="#">Homeowners Ratemaking Revisited (Use of Computer Models to Estimate Catastrophe Loss Costs)</a> ," <i>PCAS</i> LXXXIV, 1997, pp. 1-43.	Walters and Morin	C1	<b>W</b>

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Cummins, J.D.; Smith, B.D.; Vance, R.N.; and VanDerhei, J.L., *Risk Classification in Life Insurance*, 1983, Kluwer-Nijhoff Publishing, 101 Philip Drive, Norwell, MA 02061; telephone: (781) 871-6600; fax: (781) 871-6528.

Insurance Services Office, Inc., 545 Washington Boulevard, Jersey City, NJ 07310-1686; telephone: (800) 888-4476.

National Council on Compensation Insurance, 901 Peninsula Corporate Circle, Boca Raton, FL 33487; telephone: (800) NCCI-123.

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