

**Note:** The 2009 *Syllabus of Basic Education* is available as PDF files with the exception of Web Notes and Syllabus Update that are in HTML.

- Syllabus Updates
- Complete Table of Contents
- Notices to Candidates for 2009
- Foreword
- Introduction
- 2009 CAS Basic Education Summary
- 2009 CAS Examination Schedule
- Examination Rules
  - Examination Registration
  - The Examination
  - Grades and Accreditation
  - CAS Code of Professional Ethics for Candidates
- Hints on Study and Exam Techniques
- Study Resources
  - Web Notes
- Validation by Educational Experience
- Materials for Study

### **Associateship Examinations**

- Exam 1—Probability
- Exam 2—Financial Mathematics
- Exam 3—Actuarial Models: (3F) Financial Economics and (3L) Life Contingencies and Statistics
- Exam 4—Construction and Evaluation of Actuarial Models
- Exam 5—Introduction to Property and Casualty Insurance and Ratemaking
- Exam 6—Reserving, Insurance Accounting Principles, Reinsurance, and Enterprise Risk Management
- Exam 7—Canada—Nation-Specific Examination: Law, Regulation, Government and Industry Insurance Programs, and Financial Reporting
- Exam 7—United States—Nation-Specific Examination: Law, Regulation, Government and Industry Insurance Programs, and Financial Reporting and Taxation

### **Fellowship Examinations**

- Exam 8—Investments and Financial Analysis
- Exam 9—Advanced Ratemaking, Rate of Return, and Individual Risk Rating Plans
- Computer-Based Testing Rules and Procedures
- Exam Registration and Online Store

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

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# NOTICES TO CANDIDATES FOR 2009

## 1. Fall 2009 Changes to Exams 3F and 4

It is anticipated that Exam 4/C will be offered by computer-based testing (CBT) beginning in November 2009. Some syllabus changes will be implemented simultaneously. A change will be to move the material covered in *Derivatives Markets* from Exam 4/C to Exam 3F/MFE. Therefore, Exams 3F/MFE and 4/C will have both a May 2009 syllabus and a November 2009 syllabus. The syllabi for the November 2009 exams will be released in January 2009.

## 2. Exam 6 Syllabus Release

The 2009 Exam 6 syllabus will be released in late December 2008.

## 3. New Education Structure Announced for 2011

The CAS Board of Directors approved changes to the CAS basic education structure that will affect current Exams 5-9. It is expected that these changes will take several years to implement, with implementation occurring no sooner than 2011. The following education requirements will replace current Exams 5-9:

- Two Internet Modules
- Exam 5: Basic Ratemaking and Reserving
- Exam 6-Canada: Regulation and Financial Reporting
- Exam 6-US: Regulation and Financial Reporting
- Exam 7: Advanced Reserving, Reinsurance, and ERM
- Exam 8: Advanced Ratemaking
- Exam 9: Investments and Rate of Return

Details, including transition rules, are provided in the “Admissions/Exams” section of the CAS Web Site.

## 4. Details for Computer-Based Testing

Because there are distinct rules and procedures for exams administered by computer-based testing (CBT), additional information is available in the “Computer-Based Testing Rules and Procedures” section of the CAS Web Site. In 2009, Exams 1/P and 2/FM will be offered by CBT with Exam 4/C moving to CBT in November 2009.

## 5. Exam Registration

Candidates may find online exam registration and related information in the “Exam Registration and Online Store” section of the CAS Web Site. Prior to completing an online application for Exams 3L, and 5-9, candidates must submit an Electronic Signature Authorization Form—details are available in the same section.

There is only one registration deadline for each exam. **No late registrations will be accepted.** The exam dates and registration deadlines are available in the “2009 CAS Examination Schedule” section. Please allow at least 10 working days for your mailed application to reach its destination. Whether payment is made by personal or company check, **it is the candidate’s responsibility to ensure that the application and fee are received by the stated deadline. Exceptions will not be made.**

## 6. Refund Deadlines

For exams offered by CBT, a candidate must both cancel the appointment by noon of the second business day before the appointment at the test center *and* submit a refund request to arrive by the published deadline. For all other exams, the refund request must arrive by the published deadline. Refund deadlines are included in the “2009 CAS Examination Schedule” section of this *Syllabus*.

## 7. Calculators

Only approved calculators may be used for CAS Examinations. Details are in the “Examination Rules—The Examination” section.

## 8. Supplemental Exam Materials

Some exams may have supplemental material distributed with the exam package. This *Syllabus* lists the supplemental material for some of the exams. For other exams, however, the decision to include supplemental material with the exam package may be made after release of this *Syllabus*. It is the candidate’s responsibility to check “*Syllabus Update*” section for any changes.

## 9. Notice of Examinations

The CAS posts the *Notice of Examinations* for each exam session in the “Admissions/Exams” section of the CAS Web Site. The *Notice* contains important information for the exams as well as information on study aids and review seminars.

## 10. Changes to the 2009 *Syllabus*

Any changes to the 2009 *Syllabus of Basic Education* will be listed in the “*Syllabus Updates*” section of the CAS Web Site and will be noted as a change in the affected section of the *Syllabus*.

## 11. Obtaining Examination Booklet (Exams 3L and 5-9)

For Exams 3L 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 \$2.87 for domestic mail in the U.S.

## 12. CAS Online Store

All CAS publications available for purchase, including Study Kits, Updates, and Web Notes, may be purchased at the CAS Online Store.

## 13. CAS Centennial Celebration—2014

In 2014, the CAS will celebrate its 100th anniversary. The CAS Centennial Steering Committee plans to host a grand commemoration in November 2014 during the CAS Annual Meeting in New York City. Because all members will be encouraged to participate in the centennial celebration, no Spring Meeting will be held in 2014. All new Fellows and Associates for 2014 will be formally recognized at the Annual Meeting that year.

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# 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, conducting 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 others involved with actuarial science. These papers were published in the *Proceedings of the Casualty Actuarial Society* but are now being published in *Variance*, the Society’s peer-reviewed journal. The presidential addresses, published in the online *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.

# 2009 CAS BASIC EDUCATION SUMMARY

## Associateship Requirements

### *Validation by Educational Experience*

VEE-Applied Statistical Methods

VEE-Corporate Finance

VEE-Economics

### *Examinations*

Exam 1 Probability (same as SOA Exam P) \*

Exam 2 Financial Mathematics (same as SOA Exam FM) \*

Exam 3 Actuarial Models: Segment 3F, Financial Economics (same as SOA Exam MFE) \* and Segment 3L, Life Contingencies and Statistics

Exam 4 Construction and Evaluation of Actuarial Models (same as SOA Exam C) \*

Exam 5 Introduction to Property and Casualty Insurance and Ratemaking

Exam 6 Reserving, Insurance Accounting Principles, Reinsurance, and Enterprise Risk Management

Exam 7 –Canada, Nation-Specific: Law, Regulation, Government and Industry Insurance Programs, and Financial Reporting

–United States, Nation-Specific: Law, Regulation, Government and Industry Insurance Programs, and Financial Reporting and Taxation

### *Course on Professionalism*

## Fellowship Examinations

Exam 8 Investments and Financial Analysis

Exam 9 Advanced Ratemaking, Rate of Return, and Individual Risk Rating Plans

*Mail application with check or money order to:*

Preliminary Actuarial Examinations/SOA  
P.O. Box 95600  
Chicago, IL 60694-5600

*Send application with credit card payment and  
all overnight deliveries to:*

SOA/Preliminary Actuarial Examinations  
475 N. Martingale Road, Suite 600  
Schaumburg, IL 60173

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

Candidates may submit examination registrations for Exams 3L, and 5-9 by mail or online. Applications must be received before the published deadlines. Candidates submitting a hard copy of their registration should mail them as follows:

*Mail application with check or money order in  
U.S. funds or Canadian equivalent (payable to  
“Casualty Actuarial Society”) to:*

Casualty Actuarial Society  
P.O. Box 425  
Merrifield, VA 22116-0425

*Send application with credit card payment  
(Visa, MasterCard, or American Express) and  
all overnight deliveries to:*

Casualty Actuarial Society  
4350 N. Fairfax Drive, Suite 250  
Arlington, Virginia 22203

Candidates submitting their registrations online for Exams 3L and 5-9 must pay by credit card. All credit card payments will be processed in U.S. funds. Prior to completing an online application, candidates must submit an Electronic Signature Authorization Form (ESAF). By signing the ESAF, candidates agree to be bound by the rules and regulations related to the examinations. It will also provide a signature of record for comparison to signatures on the individual examination envelopes. The ESAF is available in the “Exam Applications and Order Forms” section. Unless the candidate has a name change, the ESAF only needs to be submitted once. Candidates should allow three weeks for their ESAF to be processed. Candidates who intend to register online should submit their ESAFs by the end of February for May Exams and by the end of August for October Exams.

Candidates will be sent an acknowledgment of receipt of their application within three weeks of the date that the application form was received at the CAS Office beginning February 1 for May Examinations and August 1 for October Examinations. This acknowledgment is the candidate’s receipt of exam fees paid. Please retain this acknowledgment for tax purposes if needed. Candidates that have not received an acknowledgment prior to the registration deadline should contact the CAS Office or their accounting department to ensure that their applications reached the CAS Office.

## **Name**

Candidates must use their legal name on all examination registration materials and when corresponding with the CAS. Any change in name must be accompanied by acceptable documentation.

## **Fees**

Examination fees must be paid each time a candidate registers for an exam. Payment options are described in a previous section, “Filing of Applications.” A \$20 surcharge will be assessed for all returned checks. The charts below show the examination fee schedules for 2008 at the time of publication. All fees are listed in U.S. dollars and are subject to change. Other fees that may apply include fees for change of center, refund, and/or a special exam center.

## 2008 Examination Fees

	Candidates	Full-Time Students
Exam 1/P (CBT)	\$175	\$175
Exam 2/FM (CBT)	\$175	\$175
Exam 3F/MFE	\$150	\$120
Exam 3L	\$300	\$240
Exam 4/C	\$375	\$300
Exams 5, 6, 7, 8, and 9	\$550	\$440

**Note:** Fees listed above are per exam.

## Other Fees

Refund	\$100
Change of Exam Center	\$60
Special Exam Center	\$60
CBT Rescheduling Fee between 30 days and 49 hours of appointment (paid directly to Prometric)	\$35

## Computer-Based Testing (Exams 1/P and 2/FM)

Exam 1/P is offered by computer-based testing (CBT) and Exam 2/FM will transition to CBT in 2008. CBT gives candidates more frequent opportunities to take an exam within a standardized environment. Because there are distinctive processes and procedures for CBT exams, additional information is available in the “Computer-Based Testing Rules and Procedures” section. To register for a CBT exam, follow the steps below.

### ***1. Send Application to Preliminary Actuarial Examinations***

Submit an application with payment to Preliminary Actuarial Examinations. All applications must reach Preliminary Actuarial Examinations at the SOA Office prior to the published deadlines (see deadlines on page 7). Application forms are linked from the “Exam Applications and Order Forms” section of this *Syllabus*. A candidate with a formally diagnosed disability who needs special testing arrangements must submit a written request and documentation with the application. Requests for special arrangements and supporting documentation must be submitted, at the applicant’s expense, no later than the registration deadline.

### ***2. Receive and Verify Your Confirmation Letter***

Approximately five weeks prior to the exam, all registered candidates will be e-mailed a confirmation letter. Candidate must confirm that the information on their letter is correct. If there are inaccuracies, candidates should contact the office listed on the confirmation letter.

The confirmation letter contains information for scheduling an appointment—the candidate number and dates when the candidate may schedule the exam. The examination must be scheduled on a date listed on the confirmation letter.

### ***3. Make an Appointment at a CBT Center***

To increase the likelihood of testing at the candidate’s center of choice, each candidate should schedule an appointment (online or by phone) immediately upon receiving the letter of admission. A list of CBT centers is linked from the “Computer-Based Testing Rules and Procedures” section.

#### **• To Schedule Online**

After receiving a confirmation letter, the candidate may schedule his or her test appointment on the Internet by going to: [www.Prometric.com/SOA](http://www.Prometric.com/SOA). The system allows the candidate access to real-time scheduling 24 hours a day, 7 days a week. Canadian and U.S. candidates are able to select their preferred testing date. All candidates are able to select their preferred location, receive immediate on-screen confirmation, and a follow-up e-mail confirmation of their appointment details.

Candidates requiring special needs accommodations cannot make an appointment on the Internet but should call the Special Accommodations Department at Prometric to schedule an examination. The appropriate telephone number is available in the “Computer-Based Testing Rules and Procedures” section.



- **To Schedule by Telephone**

After receiving a confirmation letter, the candidate may schedule his or her test appointment by calling Prometric’s Candidate Services Contact Center (CSCC). Telephone numbers are available in the “Computer-Based Testing Rules and Procedures” section. Candidates requiring Special Needs Accommodations should call the Special Accommodations Department at Prometric to schedule their test appointments.

#### ***4. Procedures for Changing or Canceling a Test Appointment***

To reschedule or cancel an appointment, candidates must do *both* of the following:

- Call the test center where you are scheduled to take the exam by noon of the second business day before the appointment (for example, to cancel an examination for Tuesday, you must notify the test center by noon on the Friday before the Tuesday appointment). Notification must be left directly with the administrator at the test center. Do *not* leave a message on the answering machine—this does not constitute official notification. Special needs candidates must call the Special Conditions Coordinator to reschedule or cancel a test appointment. A \$35 rescheduling fee must be paid directly to Prometric if the test is rescheduled between 30 days and 49 hours of the appointment.
- If canceling an appointment, the candidate must notify Preliminary Actuarial Examinations at the SOA Office by e-mail (cbtrefund@soa.org).

A cancellation at the test center does not automatically ensure a refund. You must *both* cancel the appointment by noon of the second business day before the appointment and you must request a refund from Preliminary Actuarial Examinations/SOA before the refund deadline (see the “Refunds” section below). If a candidate fails to arrive for a scheduled appointment or cancels without giving the required notice as described above, no refund will be given.

### **Exam 1/P Fee Reimbursement Program in the U.S.**

The Joint CAS/SOA Committee on Minority Recruiting sponsors a program to reimburse qualified minority candidates for their Exam 1/P fee if they pass the exam on their first or second attempt. Eligible candidates are members of specified groups that are underrepresented in the actuarial profession in the United States, including African-Americans, Hispanics, and Native North Americans who are sitting for actuarial exams. The Exam 1/P reimbursement application is available in the “Minority Programs” section of the actuarial career Web site at [www.BeAnActuary.org](http://www.BeAnActuary.org).

### **Fee Discount Program in Qualified Countries**

The CAS and SOA sponsor a program to provide financial relief to candidates of qualified countries. Eligible candidates must be current residents of a qualified country and verify that they are personally paying for exam fees and study materials without assistance from employers or other entities. Candidates must write their exams in a qualified country. Information, including a list of qualified countries and the application, is available in the “Admissions/Exams” section of the CAS Web Site.

### **Examination Centers**

CAS examination centers are listed in the “Exam Applications and Order Forms” section. Centers are determined by the number of candidates near a center and the availability of proctors. Special examination centers may be arranged at the discretion of the CAS or Preliminary Actuarial Examinations if the request is received by the registration deadline. The additional fee for a special center is \$60. Candidates will be sent the exact location of their examination center at least three weeks before the examination.

### ***Letter of Admission (Only for Exams 3F/MFE and 4/C—and the Paper-and-Pencil Versions of Exams 1/P and 2/FM)***

For Exams 3F/MFE and 4/C, as well as the paper-and-pencil administrations of Exams 1/P and 2/FM, candidates will be sent an automated letter of admission upon completion of their registration. The letter of admission indicates the exam for which the candidate is registered and contains the candidate number as well as the exam center name and number. **This letter of admission must be brought to the examination center.** A candidate may reprint his or her ticket of admission/acknowledgement letter at any time by going to <http://www.soa.org/education/exams/edu-exams-detail.aspx> and clicking on “Get your acknowledgement letter/ticket of admission.” Candidates should retain this letter as a receipt if needed for tax purposes.

### ***Change of Center***

Details for changing a CBT center are provided in the “Computer-Based Testing Rules and Procedures” section. For all other exams, any registered candidate who requests a change in examination center must pay a change-of-center fee. No requests will be accepted after the registration deadline. If a request for a change of center occurs, every effort will be made to have the candidate’s records and supplies on hand at the appropriate center in time for the examination. If this effort fails, however, the administering organizations are not responsible. If either a candidate’s registration and fees, or request for change of center are received so late that it is not feasible to arrange for the candidate to write the examination, the fees will be refunded in full. The administering organizations are not responsible for difficulties caused by postal service delays or inadequate postage.

## **Languages Other Than English**

### ***Exams 1/P, 2/FM, 3F/MFE, and 4/C***

Examination questions and instructions will be printed, and examinations administered, in English except in Canada where the examinations will be printed in both French and English.

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

Exam questions and instructions will be printed, and exams administered, exclusively in English. Candidates must submit written responses in English; non-English responses will not be graded with the following exception: Should a candidate for an exam jointly sponsored by the Canadian Institute of Actuaries wish to respond to any or all of the essay questions in French, advanced notice must be provided to the CAS Office when applying to write the exam. Provided such advanced notice was received and a suitable translator is available from the Canadian Institute of Actuaries, responses submitted in French will be translated into English by qualified translators and graded exclusively in translation. All translations will be literal translations from French to English. If advanced notice has not been provided, non-English responses will not be graded. If a suitable translator cannot be engaged before the date of the exam, the candidate will be notified. The CAS cannot guarantee the accuracy of any translation. Appeals based upon errors in translation of candidates’ responses will not be considered. Grade reports for exams requiring translation may be delayed.

## **Special Arrangements for Candidates With a Disability**

A candidate with a formally diagnosed disability who needs special testing arrangements must submit a written request to Preliminary Actuarial Examinations/SOA (for Exams 1/P, 2/FM, 3F/MFE, and 4/C) or the CAS (for Exams 3L and 5-9) for each examination the candidate intends to write. Documentation of the disability (e.g., physician’s statement, diagnostic test results), as well as the need for special arrangements, are required of each candidate; previous accommodations given to the candidate in an educational program or work setting may be considered. Requests for special arrangements and supporting documentation must be submitted at the applicant’s expense at least two weeks before the registration deadline.

## Refunds

### *Exams Administered by Computer-Based Testing*

Any candidate who submits an application for an exam administered by CBT and subsequently decides not to take the examination may receive a refund (less the \$100 refund fee) only by doing **both** of the following:

- Cancel the appointment by noon of the second business day before the appointment at the test center as described in the “Computer-Based Testing Rules and Procedures” section.
- Submit a refund request before the refund deadline to Preliminary Actuarial Examinations at the SOA Office by e-mail (cbtrefund@soa.org). The request must be received by the following refund deadlines: **February 18, 2008**, for the February test window; **May 12, 2008**, for the May test window; **July 21, 2008**, for the July test window; **September 22, 2008**, for the September test window; and **November 3, 2008** (Exam FM/2) and **November 17, 2008** (Exam P/1) for the November test window.

Examination fee refunds will be issued following the testing administration.

### *Exams 2/FM, 3F/MFE, and 4/C*

Any candidate who submits an application for the paper-and-pencil administration of Exams 2/FM, 3F/MFE, or 4/C and subsequently does not write the examination should submit a written request for an examination fee refund. This request must reach Preliminary Actuarial Examinations/SOA not later than **May 8, 2008**, for May Examinations or **October 29, 2008**, for November Examinations. Refund requests may be sent via e-mail to refund@soa.org or by fax to (847) 706-3599. Late requests will not be considered. A \$100 administrative fee per examination is assessed on all refunds. Examination fees for Exams 2/FM, 3F/MFE, and 4/C are only refundable from Preliminary Actuarial Examinations/SOA. Change-of-center fees and special center fees will not be refunded in any case. Fees cannot be transferred from one exam session to another. Examination fee refunds will be issued following the testing administration.

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

Any candidate who submits an application for Exams 3L or 5-9 and subsequently does not write the examination should submit a written request for an examination fee refund. This request must reach the CAS Office not later than **May 7, 2008**, for the May Examinations and **October 27, 2008**, for the October Examinations. Refund requests may be sent via e-mail to refund@casact.org or by fax to (703) 276-3108. Late requests will not be considered. A \$100 administrative fee per examination will be assessed on all refunds. Change-of-center fees, special center fees, and other additional fees will not be refunded in any case. Refunds will be issued one month after the refund deadline. Refunds are issued in the manner that fees were paid (i.e., by credit to a bank card or by check to an individual or company). Fees cannot be transferred from one exam session to another.

# The Examination

## Introduction

The examinations for admission to the Casualty Actuarial Society are designed to establish the qualifications of candidates. The Examination Committee creates exams that follow guidelines developed by the Syllabus Committee. Complete coverage of all readings listed in the *Syllabus* is not practical for every exam every year. The goal is to produce exams that contain representative, high-quality questions that test candidates' knowledge of topics that are presented in the learning objectives. Thus, the candidate should expect that each exam will cover a large proportion of the learning objectives and associated knowledge statements and syllabus readings, and that all of these will be tested at least once over the course of a few years.

The exam questions will be based on the published learning objectives and supporting knowledge statements. It is intended that the readings, in conjunction with the material on the lower numbered examinations, will provide sufficient resources to allow the candidate to perform the learning objectives. The exams will test not only candidates' knowledge of the subject matter, but also candidates' ability to apply that knowledge.

## Order of Examinations and VEE Topics

In the development of the syllabus readings and examination questions, it is assumed that candidates are familiar with material covered on earlier examinations. Therefore, it may be beneficial for candidates to take examinations in numerical order. There are, however, circumstances when another order might be more appropriate. For example, a candidate may wish to study an exam that is closely related to his or her current work.

VEE topics are not prerequisites to taking actuarial exams and may be fulfilled independently of the exam process (i.e., prior to or concurrent with taking actuarial exams). The following insights on VEE topics, however, may be helpful. VEE-Applied Statistical Methods will help strengthen candidates' statistical skills and completing it prior to taking Exams 3 and 4 will make these exams easier to understand. VEE-Economics and VEE-Corporate Finance will help strengthen candidates' understanding of managerial decision making and completing these topics prior to taking Exam 8 will make this exam easier to understand.

To help candidates decide which exam to take, the following chart indicates which exams assume knowledge of material found on prior exams. Most candidates will find it easiest to study for an exam after studying for all of the exams listed in the "prior knowledge" column.

Exam or VEE Topic	Assumes Prior Knowledge from the Following Exam(s)
VEE-Applied Statistical Methods	None
VEE-Corporate Finance	None
VEE-Economics	None
Exam 1/P	None
Exam 2/FM	None
Exam 3F/MFE	Exams 1/P and 2/FM
Exam 3L	Exam 1/P
Exam 4/C	Exam 1/P
Exam 5	Exams 1/P and 2/FM
Exam 6	Exams 1/P and 2/FM
Exam 7	Exams 2/FM, 5, and 6
Exam 8	Exams 1/P, 2/FM, 3, 4/C, 5, and 6
Exam 9	Exams 1/P, 2/FM, 3, 4/C, and 5

### ***Notes on Order of Examinations***

- Exams 3F/MFE, 3L, 4/C, and 9 make extensive use of Exam 1/P material. Exams 5, 6, and 8 assume an understanding of Exam 1/P material.
- Both Exams 5 and 6 are approachable without detailed knowledge of the material on Exam 2/FM. A candidate who has studied this material, however, may gain a deeper understanding of the material on Exams 5 and 6 and its foundations.
- Many candidates find it easier to study for the more mathematical Exams 1-4 when they are not too far removed from college math.
- Exam 4/C covers the theory of credibility. Credibility theory is applied in Exams 5 and 6. Candidates who have mastered credibility theory in Exam 4/C may find its application more intuitive on Exams 5 and 6. On the other hand, candidates who have experience applying credibility on Exam 5 (or to a lesser extent Exam 6) may find the theory on Exam 4/C easier to understand.
- There is a great deal of thematic overlap among Exams 7, 8, and 9. Candidates may find their understanding of whichever one they study last enhanced by the material learned on the other two.

### **Requirements for Admission to Examination Center**

To be admitted into an examination center, each candidate must present a positive identification with a signature and a photograph (e.g., driver's license, passport, school or work ID, etc.). If a photo ID is not available, the candidate must present *two* forms of identification with a signature, with at least one form containing a physical description (height, weight, hair color, eye color, etc.). Each candidate will be required to sign in at the examination center. A candidate who does not present positive identification or who refuses or is unable to provide a matching signature will not be permitted to write the examination. For examinations offered by computer-based testing, each candidate must present a valid government-issued photo identification with the candidate's signature (details available in the "Computer-Based Testing Rules and Procedures" section). For the paper-and-pencil administrations of Exams 1/P, 2/FM, 3F/MFE, and 4/C, candidates also must present a valid letter of admission that will be sent by Preliminary Actuarial Examinations/SOA.

Candidates should arrive at the examination center 30 minutes before the scheduled exam time. Candidates may not leave until two hours after the start of the examination. For Exams 3L and 5-9, candidates may not leave during the last 15 minutes of the examination.

### **Conduct of Examinations**

The examinations are recorded exclusively in writing (except for exams that are administered by computer-based testing). Except as is noted in the following paragraphs, no books, papers, typewriters, slide rules, or electronic or mechanical aids for computation of any kind may be brought into the examination room by candidates, nor may any candidate communicate with, or obtain any assistance from, any other candidate during the examination. Candidates must respond to essay questions in English unless advance notice is given (see "Languages Other than English" under "Examination Rules—Registration" above). Examination answer sheets are not returned to candidates.

For Exams 3L and 5-9, a candidate wishing to obtain his or her own examination booklet and scrap paper subsequent to the examination must bring a self-addressed stamped envelope to the examination center. The recommended minimum postage is \$2.87 for domestic mail in the U.S. For Exams 3L and 5-9, approximately one week after all exams have been completed, the exam and a *preliminary* list of multiple-choice answers will be posted in the "Admissions/Exams" section of the CAS Web Site. Sample solutions for essay questions will not be available until they are published on the CAS Web Site on July 31, 2009, for May Examinations and January 29, 2010, for October Examinations.

## Calculators

Electronic calculators will be allowed in the examination room for all examinations. Only the calculators listed below may be brought into the examination room. Books, papers, computers, or other electronic devices may not be brought into the examination room. Candidates may use the battery- or solar-powered models of the following Texas Instruments calculators:

- BA-35
- BA II Plus
- BA II Plus Professional
- TI-30Xa
- TI-30X II (IIS solar or IIB battery)
- TI-30XS MultiView (or XB battery)

Candidates may use more than one of the approved calculators during the examination. **For those using the BA II Plus, BA II Plus Professional, TI-30X II (IIS solar or IIB battery) or TI-30XS MultiView (or XB battery) models, candidates will be required to show examination proctors that the memory has been cleared prior to the start of the examination. For the BA II Plus and BA II Plus Professional, clearing will reset the calculator to the factory default settings.**

Calculator instructions cannot be brought into the examination room. During the examination, the calculator must be removed from its carrying case so the proctor can confirm it is an approved model. **Any unauthorized calculator brought to the examination center will be confiscated for the duration of the examination. Candidates using a calculator other than the approved models will be subject to examination disqualification and other disciplinary action.**

Candidates may purchase calculators from stores or directly from Texas Instruments: telephone: (800) 842-2737; Web site: [www.ti.com](http://www.ti.com).

**It is the candidate's responsibility to see that the calculator used during the examination is in good working order.** For CAS Exams 3L and 5-9, supervisors will have a spare approved calculator available for a candidate whose calculator malfunctions. It is not to be distributed to a candidate without a calculator or whose unauthorized calculator has been confiscated.

## Examination Discipline

Candidates must not give or receive assistance of any kind during the examination. Any cheating, attempt to cheat, assisting others to cheat, participating therein, or engaging in such improper conduct as listed below is a serious violation and will result in the CAS disqualifying the candidate's paper and other disciplinary action as may be deemed appropriate. Candidates have agreed in their applications for examination to be bound by the rules and regulations governing the examinations.

Examples of improper conduct include but are not limited to:

1. Gaining access to examination questions before the examination or aiding someone else to do so.
2. Using an unauthorized calculator (as defined in the *Syllabus*) or other mechanical aid that is not permitted.
3. Looking in the examination book before the instruction to begin is given.
4. Marking or otherwise writing on the examination book or answer sheet before the instruction to begin is given.
5. Making any changes, additions, deletions, or otherwise marking, erasing, or writing on the examination book or answer sheet after the time for the examination has expired.
6. Having access to or consulting notes or books during the examination.
7. Looking at or copying from another candidate's paper.
8. Enabling another candidate to copy from one's paper.
9. Talking or otherwise communicating with another candidate during the examination.
10. Disturbing other candidates during the examination.

11. Consulting other persons outside the examination room during the examination.
12. Copying questions, answers, or answer choices to take from the examination room.
13. Taking an examination book from the examination room.
14. Taking an examination for another candidate.
15. Arranging to have another person take an examination for the candidate.
16. Threatening or physically or verbally abusing a supervisor or proctor responsible for curbing or reporting improper conduct.
17. Disclosing the contents of an examination to any other person prior to the examination's release. For CAS Exams 3L and 5-9, this would generally apply to the day when the examination is administered.
18. Presenting false information on an examination application.
19. Failing to remain in the examination room for a minimum of two hours during the examination [for examinations with this requirement].
20. Failing to follow other examination instructions.
21. Accessing or using a communication device (PDA, cell phone, etc.) during the exam or while at the exam site.

The CAS Examination Committee, or its designee, will investigate any irregularity or suspected violation of the rules involving the examination process, and a determination will be made regarding the matter. Where there is a determination to invoke a penalty, the candidate is advised by letter. In the case of a candidate who is a member of the CAS, the candidate's conduct will be reported to the Actuarial Board for Counseling and Discipline (ABCD) or to the Canadian Institute of Actuaries (CIA) if the final penalty invoked is more than disqualification of the examination.

Candidates for the CAS Examinations are expected to follow the rules and procedures included in this *Syllabus*, the *Notice of Examinations*, and the "Instructions to Candidates" printed on their examination booklets as well as announcements made by the supervisors at the examination locations. All candidates, on their applications for examinations, are required to read and sign the following statement: "I have read the rules and regulations concerning the examination(s) for which I am applying and agree to be bound by them. I also agree that the results of any examination(s) which I take, and any action taken as a result of my conduct may, at the sole discretion of the Casualty Actuarial Society [and/or the Society of Actuaries for jointly administered exams], be disclosed to any other bona fide actuarial organization that has a legitimate interest in such results and/or actions."

The CAS may, at its sole discretion, disclose to any other bona fide actuarial organization having a legitimate interest, information on the identity of candidates determined to have committed a serious examination violation (those for which the penalty is greater than the simple disqualification/nullification of the examination), and the specific penalties imposed on those candidates.

If an actuarial organization with which the CAS has a working relationship (such as the Society of Actuaries) invokes a penalty against a candidate for improper conduct during an examination for which the CAS is not a joint sponsor, the CAS will invoke the same penalty for all CAS-sponsored examinations. If the CAS takes any disciplinary action, it will notify the other actuarial organizations of that action.

These standards may seem stricter than those which candidates are accustomed to in other examination environments. The CAS maintains these strict standards because the examinations are such a significant part of a candidate's career. Therefore, the equitable administration of the examinations and enforcement of the highest standards of conduct cannot be emphasized too strongly.

Candidates may obtain a copy of the full CAS Policy on Examination Discipline by sending a written request to the CAS Office.

## **Computer-Based Testing**

The Policy on Examination Discipline is the same for those taking exams by computer-based testing or in the traditional paper-and-pencil format. There are some unique rules for the CBT administration that are available in the “Computer-Based Testing Rules and Procedures” section. If there is a discrepancy between specific rules for the traditional paper-and-pencil exam administration and computer-based testing, the computer-based testing rules will govern.

## **Multiple-Choice Questions**

Exams 1-4 consist entirely of multiple-choice questions; other CAS examinations may have a section of multiple-choice questions. Each multiple-choice problem includes five answer choices identified by the letters A, B, C, D, and E, only one of which is correct. For examinations administered by computer-based testing, candidates should click on the appropriate answer. For all other exams, a separate answer sheet provides a row of five ovals for each problem, identified with the letters A, B, C, D, and E, corresponding to the five answer choices. After deciding which answer is correct, candidates should blacken the oval that has the same letter as the appropriate answer. Since the answer sheets are scored by optical scanning equipment, a Number 2 pencil must be used to blacken the ovals. It is important that only one oval be blackened for each question.

## **Guessing Adjustment**

For Exams 1/P, 2/FM, 3F/MFE, and 4/C no guessing adjustment is made to candidates’ scores. Therefore, candidates will maximize their scores on these examinations by answering every question. On Exams 3L and 5-9, multiple-choice questions are scored in such a way that there is no advantage or disadvantage to be anticipated from guessing answers in a purely random fashion as compared with omitting the answers entirely. No additional points will be given for multiple-choice questions left blank, but one-quarter of the point value for each question will be deducted for each incorrect answer.

## **Lost Examinations**

The CAS is not responsible for lost or destroyed examinations. In the case where an examination is lost or destroyed, the examination fee will be refunded. The CAS and other organizations that jointly administer and/or jointly sponsor CAS Examinations will assume no other obligation and candidates must take the examinations with this knowledge. The only exception to this policy is for the paper-and-pencil version of multiple-choice Exams 1/P, 2/FM, 3F/MFE, and 4/C. Whenever reasonably possible, Preliminary Actuarial Examinations/SOA will make use of a candidate’s examination book to reconstruct the answers selected by the candidate. Therefore, candidates may wish to circle or otherwise clearly indicate their answer choices in the examination books. However, additional time in the examination period will not be given for candidates to do this. If a candidate receives a passing grade as a result of the review of the examination book, the examination fee will not be refunded.



## CAS Code of Professional Ethics for Candidates

The purpose of the Casualty Actuarial Society (CAS) Code of Professional Ethics for Candidates (Candidate Code) is to require actuarial candidates to adhere to the high standards of conduct, practice, and qualifications of the actuarial profession, thereby supporting the actuarial profession in fulfilling its responsibility to the public. An actuarial candidate shall comply with the Candidate Code. An actuarial candidate who commits a material violation of the provisions of the Candidate Code shall be subject to the counseling and discipline procedures of the CAS.

“Actuarial candidates” are those persons who have registered for a CAS specific exam but have yet to fulfill all of the requirements for admission into the CAS. In situations where actuarial candidates perform actuarial work, their “principal” is defined as their client or employer. “Actuarial services” are professional services provided to a principal by an individual acting in the capacity of an actuary. Such services include the rendering of advice, recommendations, findings, or opinions based upon actuarial considerations.

**RULE 1:** An actuarial candidate shall act honestly, with integrity and competence, to uphold the reputation of the actuarial profession.

**RULE 2:** An actuarial candidate shall not engage in any professional conduct involving dishonesty, fraud, deceit, or misrepresentation or commit any act that reflects adversely on the actuarial profession.

**RULE 3:** An actuarial candidate shall perform actuarial services with courtesy and professional respect and shall cooperate with others in the principal’s interest.

**RULE 4:** An actuarial candidate shall adhere to the CAS Policy on Examination Discipline.

**Rule 5:** Actuarial candidates are not authorized to use membership designations of the CAS until they are admitted to membership by the CAS Executive Council.

**RULE 6:** An actuarial candidate shall not disclose to another party any confidential information unless authorized to do so by the principal or required to do so by law, statute, or regulation. Confidential information includes information of a proprietary nature and information that is legally restricted from circulation.

**RULE 7:** An actuarial candidate shall respond promptly, truthfully, and fully to any request for information by, and cooperate fully with, appropriate counseling and disciplinary body of the CAS in connection with any disciplinary, counseling or other proceeding of such body relating to the Candidate Code. The actuarial candidate’s responsibility to respond shall be subject to applicable restrictions listed in Rule 6 and those imposed by law, statute, or regulation.

(The code above was approved by the CAS Board of Directors on November 12, 2006.)

Candidates may obtain a copy of the Casualty Actuarial Society Rules of Procedure for Disciplinary Actions Involving Candidates by sending a written request to the CAS Office.

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# 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 time studying, techniques such as those given here may often make the difference between failing or passing an examination.

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# STUDY RESOURCES

## Study Notes for Exams 1/P, 2/FM, 3F/MFE, and 4/C

Official Study Notes are published to help candidates prepare for the examinations. In some instances, Study Notes are the principal materials for study; in others, they are designed to coordinate the subject for the candidate or to complement other readings. 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.

Study Notes may be downloaded at no charge from the “Study Tools” section of the CAS Web Site and from the SOA Web Site.

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

The readings listed as “Web Notes” in this *Syllabus* may be downloaded at no charge from the “Study Tools” section of the CAS Web Site as well as from the individual syllabus citation. A printed version may be purchased from the CAS Online Store.

The Study Kit contains 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, 2008 and may be purchased from the CAS Online Store.

## Sample Examination Questions

### *Exams 1/P, 2/FM, 3F/MFE, and 4/C*

Sample examination questions for Exams 1/P, 2/FM, 3F/MFE, and 4/C are available at no charge in the “Study Tools” section of the CAS Web Site.

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

Past copies (last three sittings) of Exams 3L and 5-9 with answers are available at no charge in the “Study Tools” section of the CAS Web Site. Sample essay answers are actual responses that received credit and are illustrative of successful answers, although they may not be considered perfect answers.

Exams 3L and 5-9 will be posted in the “Admissions/Exams” section of the CAS Web Site approximately one week after these examinations have been administered. They will include a *preliminary* list of multiple-choice answers. Sample essay answers and final multiple-choice answers will be posted on July 31, 2009, for May Examinations and January 29, 2010, for October 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 learning objectives or 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.

## E-Mail Study Groups

The CAS has available e-mail study groups for those preparing for CAS examinations. Information about joining a study group is available in the “E-Mail Study Groups” section of the CAS Web Site. 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 a limited number of the books marked with a bold **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. For those who reside in East Asia, the Actuaries Office in Hong Kong has CAS Library books available for lending and candidates residing in that area should contact the office in Hong Kong.

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 as well as the complete title(s) and author(s) of the requested book(s). Address requests for library books to:

***For Candidates Outside East Asia:***

Casualty Actuarial Society  
Attention: Library Service  
4350 N. Fairfax Drive, Suite 250  
Arlington, Virginia 22203  
Fax: (703) 276-3108  
E-mail: library@casact.org

***For candidates in East Asia:***

Actuaries Office in Hong Kong  
Attention: Patricia Kum  
2202 Tower Two, Lippo Centre  
89 Queensway  
Hong Kong  
E-mail: hongkonglibrary@casact.org

Candidates are responsible for the cost of returning library books. Books must be returned to the office from which they were borrowed. The CAS ships the requested book(s) in the U.S. 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 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" section at the end of each examination syllabus section.

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# VALIDATION BY EDUCATIONAL EXPERIENCE

## Introduction

As part of preliminary education, there are three topics that require Validation by Educational Experience (VEE). Validation of these topics is required in addition to the four preliminary education exams listed below. The CAS, in conjunction with the Canadian Institute of Actuaries and the Society of Actuaries, has implemented VEE requirements for the following topics:

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

The four preliminary education exams are:

- Exam 1, Probability (same as SOA Exam P)
- Exam 2, Financial Mathematics (same as SOA Exam FM)
- Exam 3, Actuarial Models consisting of Exam 3F, Financial Economics segment (same as SOA Exam MFE) and Exam 3L, Life Contingencies and Statistics segment (or credit for SOA Exam MLC)
- Exam 4, Construction and Evaluation of Actuarial Models (same as SOA Exam C)

In addition to the preliminary education requirements listed above (i.e., VEE requirements and four exams), Exams 5-7 and the CAS Course on Professionalism are required for Associateship. The syllabi for the examinations are provided in the “Materials for Study” section of this *Syllabus*. 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.

## VEE Process—How to Get VEE Credit

Validation by Educational Experience can be accomplished in any of the following 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. A directory of approved courses is available from the “VEE Information” section of the CAS Web Site.

### 2. Standardized Examinations and Other Educational Experiences

Achieve a pre-set score on a standardized examination or other educational experience as approved by the CAS, CIA, and SOA. A list of approved standardized exams and other educational experiences is available from the “VEE Information” section of the CAS Web Site.

## Step 1: Approval of Courses/Experiences

The VEE Administration Committee (VEEAC) 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 and listed on either the “Directory of Approved Courses” or the “Standardized Exams and Other Educational Experiences” list. Each list identifies 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 are approved.

If a VEE Course/Experience does not appear on either list, approval must be requested by completing an official VEE course/experience approval application form and submitting it along with the required documentation. The application form is available in the “Exam Applications and Order Forms” section.

The VEEAC will review the course/experience.

The guidelines that the VEEAC 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**

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” or the “Standardized Exams and Other Educational Experiences” list 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.

Candidates may combine two approved courses/experiences to complete a VEE topic requirement. For example, an approved microeconomics course from a university may be combined with an approved macroeconomics course from another school or provider. Likewise, an approved regression course may be combined with an approved time series course from two different providers. In these cases candidates should include approval codes from both approved courses on their individual VEE credit application form. **Corporate finance courses, however, must be completed in the combinations shown in the directory. No alternate combinations will be accepted without an additional course approval application process.**

**Note:** Candidates may not submit VEE credit applications for partial credit (e.g., an approved regression course may not be submitted alone, but must be accompanied on the same application by an approved time series course). Candidates may not submit for VEE credit for a topic until they have completed all requirements for that topic. Specific questions may be sent to [vee@soa.org](mailto:vee@soa.org).

Once a candidate’s application and documentation of the required grade on an approved course/experience have 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. Details about submitting a course for approval as well as obtaining individual VEE credit are provided at the beginning of this section on VEE. The “Directory of Approved VEE Courses/Experiences” and the “Standardized Exams and Other Educational Experiences” are available in the “VEE Information” section of the CAS Web Site.

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 at the beginning of this section on VEE. The “Directory of Approved VEE Courses/Experiences” and the “Standardized Exams and Other Educational Experiences” are available in the “VEE Information” section of the CAS Web Site.

The typical corporate finance sequence in a business school consists of an introductory semester followed by an advanced semester. The advanced semester will more likely be the one that aligns with the learning objectives. The exceptional case where the corporate finance material is covered in only one course will also be considered.

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

### Finance

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

### Investment

1. Definitions of key finance terms: financial instruments – bond, stock, basic options (calls, puts); dividends; price to earnings ratio
2. Structure of a stock company and the different methods by which it may be financed
3. Calculate value of stocks
4. 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
5. 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 at the beginning of this section on VEE. The “Directory of Approved VEE Courses/Experiences” and the “Standardized Exams and Other Educational Experiences” are available in the “VEE Information” section of the CAS Web Site.

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

# Associateship Examinations

## Exam 1 Probability

Exam 1 is a three-hour, multiple-choice examination that is administered by Preliminary Actuarial Examinations/SOA and is identical to SOA Exam P. The examination is jointly sponsored and administered by the CAS, SOA, and the Canadian Institute of Actuaries (CIA). The examination is also jointly sponsored by the American Academy of Actuaries (AAA) and the Conference of Consulting Actuaries (CCA).

Exam 1 is administered as a computer-based test. For additional details, please refer to “Computer-Based Testing Rules and Procedures” (<http://www.beanactuary.org/exams/cbt.cfm>).

The purpose of the syllabus for 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. A thorough command of the supporting calculus is assumed. Additionally, a very basic knowledge of insurance and risk management is assumed.

A table of values for the normal distribution is available for candidates under “Study Tools” on the CAS Web Site and on the SOA Web Site. Since the table will be included with the examination, candidates will not be allowed to bring copies of the table into the examination room.

Please check the “Syllabus Updates” section of the CAS Web Site for any changes to the exam or syllabus. Information about Study Notes is available in the “Study Resources” section.

### 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
  - Bayes’ Theorem/ Law of total probability
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 “Risk and Insurance.”

## Text References for Exam 1

### Study Notes

Anderson, J.F.; and Brown, R.L., “Risk and Insurance” (Second Printing), 2005, Society of Actuaries (SOA Study Note).	<b>W</b>
Exam P Sample Questions and Solutions (1-141).	<b>W</b>
Tables for Exam P	<b>W</b>

### Suggested Texts

Bean, M.A., <i>Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering</i> , 2001, American Mathematical Society, Chapters 1-9.
Ghahramani, S., <i>Fundamentals of Probability with Stochastic Processes</i> (Third Edition), 2005, Prentice Hall, Chapters 1-11.
Hassett, M.; and Stewart, D., <i>Probability for Risk Management</i> (Second Edition), 2006, ACTEX Publications, Chapters 1-11.
Miller, I.; and Miller, M., <i>John E. Freund’s Mathematical Statistics with Applications</i> (Seventh Edition), 2004, Prentice Hall, Chapters 1-8.
Ross, S.M., <i>A First Course in Probability</i> (Eighth Edition), 2009, Pearson/Prentice Hall, Chapters 1-8.
Wackerly, D.; Mendenhall III, W.; and Scheaffer, R., <i>Mathematical Statistics with Applications</i> (Seventh Edition), 2008, Duxbury Press, Chapters 1-7.

## Source Key

**NEW** Indicates new or updated material or modified citation.

**W** Represents material that is available at no charge under “Web Notes” in the “Study Tools” section of the CAS Web Site.

## Publishers and Distributors

Contact information is furnished for those who wish to purchase the text references cited for Exam 1/P. 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), 107 Groppo Drive, Suite A, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: retail@actexamdriver.com; Web site: www.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.

Anderson, J.F.; and Brown, R.L., "Risk and Insurance" (SN P-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: www.soa.org.

Bean, M.A., *Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering*, 2001, American Mathematical Society, 201 Charles Street, Providence, RI, 02904-2294; telephone: (800) 321-4267 or (401) 455-4000; Web Site: www.ams.org/bookstore.

Ghahramani, S., *Fundamentals of Probability with Stochastic Processes* (Third Edition), 2005, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: www.prenhall.com.

Hassett, M.; and Stewart, D., *Probability for Risk Management* (Second Edition), 2006, 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.

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; Web site: www.prenhall.com.

Ross, S.M., *A First Course in Probability* (Eighth Edition), 2009, Pearson/Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: www.prenhall.com.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: www.sliderulebooks.com.

Society of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: www.soa.org.

Wackerly, D.; Mendenhall III, W.; and Scheaffer, R., *Mathematical Statistics with Applications* (Seventh Edition), 2008, Duxbury Press; telephone: (800) 354-9706; Web site: www.duxbury.com.

## Exam 2

# Financial Mathematics

Exam 2 is a three-hour, multiple-choice examination that is administered by Preliminary Actuarial Examinations/SOA and is identical to SOA Exam FM. The examination is jointly sponsored and administered by the CAS, SOA, and the Canadian Institute of Actuaries (CIA). The examination is also jointly sponsored by the American Academy of Actuaries (AAA) and the Conference of Consulting Actuaries (CCA).

Exam 2 is administered as a computer-based test. For additional details, please refer to “Computer-Based Testing Rules and Procedures” (<http://www.beanactuary.org/exams/cbt.cfm>).

The goal of the syllabus for this examination 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, asset/liability management, investment income, capital budgeting, and valuing contingent cash flows. The candidate will also be given an introduction to financial instruments, including derivatives, and the concept of no-arbitrage as it relates to financial mathematics.

Exam 2 assumes a basic knowledge of calculus and an introductory knowledge of probability.

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 reflects that fact. In particular, such calculators eliminate the need for candidates to learn and be examined on certain mathematical methods of approximation.

Please check the “Syllabus Updates” section of the CAS Web Site for any changes to the exam or syllabus. Information about Study Notes is available in the “Study Resources” section.

### LEARNING OBJECTIVES

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 or discount, 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 or discount 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), where the cash flows may occur as frequently or more frequently than interest or discount is accrued, 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, and immunization.
- 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. measuring interest rate risk using duration and convexity.
    - ii. basic immunization calculations.
    - iii. cash flow matching calculations (the terms dedication and asset-liability matching are used in the readings as equivalent to cash flow matching).
4. Candidates will know definitions of key terms of financial economics at an introductory level: derivatives, forwards, futures, short and long positions, call and put options, spreads, collars, hedging, arbitrage, and swaps.

Specifically, candidates are expected to demonstrate the ability to:

- a. Explain the need for financial risk management. Explain how derivative securities can be used as tools to manage financial risk. Explain the reasons to hedge and not to hedge.
- b. Define, evaluate payoff, and evaluate profit of basic derivatives contracts [forward contracts, futures contracts, American and European put and call options, simple commodity swaps, and interest rate swaps].
- c. Define, evaluate payoff, and evaluate profit of basic trading strategies [floors, caps, covered puts and calls, synthetic forwards, spreads (including bull, bear, box, and ratio spreads), collars (including zero-cost collars), and straddles (including strangles, written straddles, and butterfly spreads)].
- d. Explain no-arbitrage pricing including put-call parity and pricing of prepaid forward contracts on stocks (with and without dividends). Explain arbitrage with respect to synthetic forward contracts and the effect of transaction costs.
- e. Determine forward price from prepaid forward price. Explain the relationship between forward price and futures price. Explain the relationship between forward price and future stock price.

## 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 of the source textbooks candidates choose to use, candidates are encouraged to work out the textbook exercises related to the listed readings.

### Suggested Textbooks for Topics in Learning Objectives 1–3

There is not a single textbook required for the topics covered by Learning Objectives 1–3. The texts listed below are representative of the textbooks available to cover the material on which the candidate may be tested. Not all topics may be covered at the same level in each text. The candidate may wish to use one or more texts in his/her preparation for the examination.

<p>Broverman, S.A., <i>Mathematics of Investment and Credit</i> (Fourth Edition), 2008, ACTEX Publications:</p> <ul style="list-style-type: none"> <li>Chapter 1 (1.1-1.7)</li> <li>Chapter 2 (2.1 -2.4 excluding 2.4.2 and 2.4.3)</li> <li>Chapter 3 (3.1-3.3, excluding 3.2.1 and 3.2.2)</li> <li>Chapter 4 (4.1-4.3.1)</li> <li>Chapter 5 (5.1-5.3 excluding 5.1.4 and 5.3.2)</li> <li>Chapter 6 (6.1-6.3 excluding 6.2)</li> <li>Chapter 7 (7.1-7.2)</li> <li>Chapter 8 (8.1, 8.3.1 and 8.4.1–8.4.2)</li> </ul> <p>Note: Candidates may also use the Third Edition of <i>Mathematics of Investment and Credit</i>. The following chapter references apply:</p> <ul style="list-style-type: none"> <li>Chapter 1 (1.1-1.6)</li> <li>Chapter 2 (2.1 -2.4 excluding 2.4.2 and 2.4.3)</li> <li>Chapter 3 (3.1-3.3 excluding pp. 188–189)</li> <li>Chapter 4 (4.1-4.3.1)</li> <li>Chapter 5 (5.1-5.3 excluding 5.1.4 and 5.3.2)</li> <li>Chapter 6 (6.1-6.3 excluding 6.2)</li> <li>Chapter 7 (7.1-7.2)</li> <li>Chapter 8 (8.2.1, 8.2.4, 8.3.1–8.3.2)</li> </ul>	<p><b>NEW</b></p>
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<p>Daniel, J.W.; and Vaaler, L.J.F., <i>Mathematical Interest Theory</i> (Second Edition), 2009, The Mathematical Association of America:  Chapter 1 (1.3-1.12, 1.14)  Chapter 2 (2.2-2.7)  Chapter 3 (3.2-3.9, 3.11, 3.13)  Chapter 4 (4.2-4.6)  Chapter 5 (5.2-5.4)  Chapter 6 (6.2-6.6, 6.9)  Chapter 7 (7.1)  Chapter 8 (8.3)  Chapter 9 (9.1-9.5)</p> <p>Note: Candidates may also use the First Edition of <i>Mathematical Interest Theory</i> (Publisher: Prentice Hall). The same chapter references apply.</p>	<b>NEW</b>
<p>Kellison, S.G., <i>The Theory of Interest</i> (Third Edition), 2008, Irwin/McGraw-Hill:  Chapter 1 (1.2-1.10)  Chapter 2 (2.3-2.6)  Chapter 3 (3.2-3.8)  Chapter 4 (4.2-4.9)  Chapter 5 (5.2-5.6)  Chapter 6 (6.2-6.7, 6.10)  Chapter 7 (7.2-7.7)  Chapter 9 (9.4)  Chapter 10 (10.2-10.5)  Chapter 11 (11.2-11.8)</p>	
<p>Ruckman, C.; and Francis, J., <i>Financial Mathematics: A Practical Guide for Actuaries and other Business Professionals</i> (Second Edition), 2005, BPP Professional Education:  Chapter 1  Chapter 2  Chapter 3 (3.1-3.9)  Chapter 4 (4.1-4.5)  Chapter 5  Chapter 6 (6.1-6.3 excluding 6.1.6-6.1.7)  Chapter 7 (7.1-7.9)  Chapter 8 (8.1-8.3)</p>	

**Textbook for Learning Objective 4**

<p>McDonald, R.L., <i>Derivatives Markets</i> (Second Edition), 2006, Addison Wesley:  Chapter 1 (1.1-1.4)  Chapter 2 (2.1-2.6 and Appendix 2.A)  Chapter 3 (3.1-3.5)  Chapter 4 (4.1-4.4)  Chapter 5 (5.1-5.4 and Appendix 5.B)  Chapter 8 (8.1-8.2).</p>	
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## Study Notes

<i>Derivatives Markets</i> , Errata, 2006 Second Edition, by R. McDonald: <a href="http://www.kellogg.northwestern.edu/faculty/mcdonald/hlm/typos2e.html">http://www.kellogg.northwestern.edu/faculty/mcdonald/hlm/typos2e.html</a>	<b>W</b>
<i>Mathematics of Investment and Credit</i> , Errata, 2004 Third Edition, by S. Broverman: <a href="http://www.actexamdriver.com/client/client_pages/actex_errata2.cfm">http://www.actexamdriver.com/client/client_pages/actex_errata2.cfm</a>	<b>W</b>
“Notation and terminology used for Exam FM/2”	<b>W</b>
Exam FM Sample Exam Questions and Solutions (SOA Study Note).	<b>W</b>
All versions of Exam 2/FM that have been released since 2000 are posted online at <a href="http://www.soa.org/education/resources/edu-multiple-choice-essay-examinations.aspx">http://www.soa.org/education/resources/edu-multiple-choice-essay-examinations.aspx</a> and in “Past Exams” under “Study Tools” in the “Admissions/Exams” section of the CAS Web Site ( <a href="http://www.casact.org">www.casact.org</a> ).	<b>W</b>
Exam FM Sample <a href="#">Questions</a> and <a href="#">Solutions</a> , SOA Study Note FM-09-05	<b>W</b>
“Sample Questions and Solutions for <i>Derivatives Markets</i> ,” Study Note FM-09-07.	<b>W</b>
Review of Calculator Functions for the Texas Instruments BA-35, SOA Study Note FM-22-05.	<b>W</b>
Review of Calculator Functions for the Texas Instruments BA II Plus, SOA Study Note FM-23-05.	<b>W</b>

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ACTEX Publications (Mad River Books), 107 Groppo Drive, Suite A, 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); Web site: [www.actexamdriver.com](http://www.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).

Broverman, S.A.; *Mathematics of Investment and Credit* (Fourth Edition) 2008, 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).

Daniel, J.W.; and Vaaler, L.J.F., *Mathematical Interest Theory* (Second Edition), 2009, The Mathematical Association of America, Mathematical Association of America, [P.O. Box 91112](#), Washington, DC 20090-1112; telephone: [\(800\) 331-1622](#) or [\(301\) 206-9789](#); Web site: [www.maa.org](http://www.maa.org).

Kellison, S.G., *The Theory of Interest* (Third Edition), 2008, Irwin/McGraw-Hill; P.O. Box 182604, Columbus, OH 43272; telephone: (877) 833-5524; Web site: [www.mcgraw-hill.com](http://www.mcgraw-hill.com).

McDonald, R.L., *Derivatives Markets* (Second Edition), 2006, Addison Wesley, imprint of Pearson Education, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; Web site: <http://www.aw-bc.com/catalog/>.

Ruckman, C.; and Francis, J., *Financial Mathematics: A Practical Guide for Actuaries and other Business Professionals* (Second Edition), 2005, BPP Professional Education, 245 Hopmeadow Street, Weatogue, CT 06089; telephone: (888) 277-6001; Web site: [www.bpptraining.com](http://www.bpptraining.com).

Society of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: [www.soa.org](http://www.soa.org).

SlideRule Books, P.O. Box 69, Greenland, NH 03840; 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—November 2009

### Actuarial Models

Updated: 8 October 2009

Exam 3 consists of five hours of multiple-choice questions offered in two independent segments. Exam 3F is a two-and-a-half-hour segment on financial economics that is administered by Preliminary Actuarial Examinations/SOA and is identical to SOA Exam MFE. Exam 3L is a two-and-a-half-hour segment on life contingencies and statistics that is administered by the CAS. Each segment will be graded separately. A candidate will not be required to take both segments during the same exam administration period.

This material develops the candidate's knowledge of the theoretical basis of certain 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/P is also assumed.

### Exam 3F—Financial Economics Segment

Exam 3F is administered by Preliminary Actuarial Examinations/SOA and is identical to SOA Exam MFE. The examination is jointly sponsored and administered by the SOA, CAS and the Canadian Institute of Actuaries (CIA). The examination is also jointly sponsored by the American Academy of Actuaries (AAA) and the Conference of Consulting Actuaries (CCA).

Before commencing study for this two-and-a-half-hour, multiple-choice examination, candidates should read the "Introduction" to "Materials for Study" for important information about learning objectives. Information about Study Notes is available in the "Study Resources" section.

Candidates are assumed to be familiar with the earlier chapters of *Derivatives Markets* by McDonald that are in the syllabus for Exam 2.

No guessing adjustment will be used in grading Exam 3F. A table of values from the standard normal distribution and the density and distribution functions for the standard normal and lognormal random variables are included in the "Tables for Exam MFE/3F" that are provided on the CAS and SOA Web Sites and will be provided at the examination. Since it will be included with the examination, candidates will not be allowed to bring copies of the tables into the examination room.

Please check the "Syllabus Updates" section of the CAS Web Site for any changes to the *Syllabus*.

#### LEARNING OBJECTIVES

##### A. Interest rate models

1. Evaluate features of the Vasicek and Cox-Ingersoll-Ross bond price models.
2. Explain why the time-zero yield curve in the Vasicek and Cox-Ingersoll-Ross bond price models cannot be exogenously prescribed.
3. Construct a Black-Derman-Toy binomial model matching a given time-zero yield curve and a set of volatilities.

##### B. Rational valuation of derivative securities

1. Use put-call parity to determine the relationship between prices of European put and call options and to identify arbitrage opportunities.
2. Calculate the value of European and American options using the binomial model.
3. Calculate the value of European and American options using the Black-Scholes option-pricing model.
4. Interpret the option Greeks.

5. Explain the cash flow characteristics of the following exotic options: Asian, barrier, compound, gap, and exchange.
6. Explain the properties of a lognormal distribution and explain the Black-Scholes formula as an **expectation with respect to** a lognormal distribution.
7. Explain what it means to say that stock prices follow a diffusion process.
8. Apply Itô's lemma in the one-dimensional case.
9. Apply option pricing concepts to actuarial problems such as equity-linked insurance.

### C. Simulation

1. Simulate lognormal stock prices.
2. Use variance reduction techniques to accelerate convergence.

### D. Risk management techniques

1. Explain and demonstrate how to control risk using the method of delta-hedging.

## Complete Text References for Exam 3F

Concepts, principles and techniques needed for Exam 3F/MFE are covered in the reference listed below. Candidates and professional educators may use other references, but candidates should be very familiar with the notation and terminology used in the listed references.

Citation	Source
<p>McDonald, R.L., <i>Derivatives Markets</i> (Second Edition), Addison Wesley, 2006:            Chapter 9,            Chapter 10, (excluding "Options on Commodities" on page 334),            Chapter 11, Sections 11.1–11.4, Appendices 11.A and 11.B,            Chapter 12, Sections 12.1–12.5, Appendix 12.A,            Chapter 13, including Appendix 13.B,            Chapter 14,            Chapter 18,            Chapter 19, Sections 19.1–19.5            Chapter 20, Sections 20.1–20.6 (up to but excluding "Multivariate Itô's Lemma" on pages 665-666) and 20.7 (up to but excluding "Valuing a Claim on <math>S^aQ^b</math>" on pages 670-672 and excluding "Finding the lease rate" on top one-half of page 669),            Chapter 21, Sections 21.1–21.2 (excluding "What If the Underlying Asset Is Not an Investment Asset?" on pages 688-690) and 21.3 (excluding "The Backward Equation" on pages 691-692, and excluding the paragraph on page 692 that begins "If a probability..." and through the end of the section),            Chapter 22, Section 22.1 (but with only those definitions in Tables 22.1 and 22.2 that are relevant to Section 22.1),            Chapter 23, Sections 23.1–23.2 ( up to but excluding "Exponentially Weighted Moving Average" on page 746 and through the end of the section),            Chapter 24, Sections 24.1–24.5 (up to but excluding "Forward rate agreements" on pages 806-808),            Appendix B.1,            Appendix C.            Including relevant Errata (see <a href="http://www.kellogg.northwestern.edu/faculty/mcdonald/htm/typos2e_01.html">http://www.kellogg.northwestern.edu/faculty/mcdonald/htm/typos2e_01.html</a>).            Unless otherwise stated, chapter appendices are not included in the required readings from this text.</p>	
<p>Shiu, E.S.W., "Some Remarks on <i>Derivative Markets</i>," Study Note, updated April 13, 2009.</p>	<b>W</b>

### Study Notes

<i>Derivatives Markets</i> , Errata 2006, Second Edition, by R. McDonald: <a href="http://www.kellogg.northwestern.edu/faculty/mcdonald/htm/typos2e.html">http://www.kellogg.northwestern.edu/faculty/mcdonald/htm/typos2e.html</a>	
Exam MFE/Exam 3F Tables (revised 15 September 2009, <a href="http://www.soa.org/files/pdf/edu-2009-fall-mfe-table.pdf">http://www.soa.org/files/pdf/edu-2009-fall-mfe-table.pdf</a> ).	<b>W</b>
Sample questions and solutions ( <a href="http://www.soa.org/files/pdf/edu-2009-fall-exam-mfe-qa.pdf">http://www.soa.org/files/pdf/edu-2009-fall-exam-mfe-qa.pdf</a> ).	<b>W</b>
All released exams since 2000 may be found at <a href="http://www.soa.org/education/resources/edu-multiple-choice-essay-examinations.aspx">http://www.soa.org/education/resources/edu-multiple-choice-essay-examinations.aspx</a> and in “Past Exams” under “Study Tools” in the “Admissions/Exams” section of the CAS Web Site ( <a href="http://www.casact.org">www.casact.org</a> ).	<b>W</b>

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## Exam 3L—Life Contingencies and Statistics Segment

Exam 3L is administered by the CAS. Before commencing study for this two-and-a-half-hour, multiple-choice examination, candidates should read the “Introduction” to “Materials for Study” for important information about learning objectives, knowledge statements, readings, and the range of weights. Items marked with a bold **W**—the 2009 CAS Exam 3L Web Notes—are available at no charge in the “Study Tools” section of the CAS Web Site or may be purchased in printed form from the CAS Office. Pricing and order information is available in both the “Study Resources” and “Exam Applications and Order Forms” sections.

Please check the “Syllabus Updates” section of the CAS Web Site for any changes to the *Syllabus*.

The CAS will grant credit for CAS Exam 3L to those who successfully complete SOA Exam MLC (life contingencies segment) in the current education structure.

A thorough knowledge of calculus, probability, and interest theory is assumed. Knowledge of risk management at the level of Exam 1/P is also assumed.

This examination develops the candidate’s knowledge of the theoretical basis of contingent payment models and the application of those models to insurance risks.

The candidate will be required to develop an understanding of contingent payment models. 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 on the CAS Web Site 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 topics that are presented in the learning objectives. Thus, the candidate should expect that each exam will cover a large proportion of the learning objectives and associated knowledge statements and syllabus readings, and that all of these will be tested at least once over the course of a few years—but each one may not be covered on each exam

A guessing adjustment will be used in grading Exam 3L. Details are provided under “Guessing Adjustment” in the “Rules-The Examination” section.

## A. Survival Models

Range of weight for Section A: 33-37 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 use Markov Chains in order to determine state probabilities and transition probabilities.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>1. 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>Range of weight: 5-10 percent</p>	<p>a. Failure time random variables  b. Life table functions  c. Cumulative distribution functions  d. Survival functions  e. Probability density functions  f. Hazard functions  g. Relationships between failure time random variables in the functions above</p>
<b>READINGS</b>	
<p>Option 1: Bowers et al., Chapter 3 (excluding 3.6 and 3.8)  Option 2: Cunningham et al, Chapters 3.1-3.4, 4.1-4.4  (Candidates may find the two-page study note, “Notational Differences,” helpful in identifying notational differences used in these two books, but it is not required.)</p>	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Assuming a uniform distribution of deaths, define the continuous survival time random variable that arises from the discrete survival time random variable. Range of weight: 3-7 percent	a. Life table function forms under uniform distribution of deaths assumption
<b>READINGS</b>	
Option 1: Bowers et al., Chapter 3.6 Option 2: Cunningham et al., Chapter 4.5	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Given the joint distribution of two failure times: <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 1 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 1 above (assuming independence of the two failure times).</li> </ul> Range of weight: 5-10 percent	a. Joint distribution of failure times b. Probabilities and moments
<b>READINGS</b>	
Option 1: Bowers et al., Chapter 9.1-9.5 Option 2: Cunningham et al., Chapters 9.1-9.2, 9.5	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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 and in terms of the functions $l_x^{(i)}$ , ${}_tq_x^{(i)}$ , ${}_tp_x^{(i)}$ , ${}_td_x^{(i)}$ , ${}_tm_x^{(i)}(t)$ : <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> Range of weight: 5-10 percent	a. Time until failure b. Competing risk (multiple decrement) models

<b>READINGS</b>
Option 1: Bowers et al., Chapter 10.1-10.3 Option 2: Cunningham et al., Chapters 10.1-10.3

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. For homogenous and non-homogenous discrete-time Markov chain models: <ul style="list-style-type: none"> <li>• Define each model.</li> <li>• Calculate probabilities of being in a particular state at a particular time.</li> <li>• Calculate probabilities of transitioning between states.</li> </ul> Range of weight: 5-10 percent	a. Markov chains b. Transition probability matrix c. Discrete-time Markov chains

<b>READINGS</b>
Daniel Markov, Chapters 1 and 3

## B. Stochastic Processes

Range of weight for Section B: 5-10 percent

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

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
1. Describe the properties of Poisson processes: <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> Range of weight: 0-5 percent	a. Poisson process b. Non-homogeneous Poisson process
2. For any Poisson process and the interarrival and waiting distributions associated with the Poisson process, calculate: <ul style="list-style-type: none"> <li>• Expected values</li> <li>• Variances</li> <li>• Probabilities</li> </ul> Range of weight: 0-5 percent	a. Probability calculations for Poisson process

<b>READINGS</b>
Daniel Poisson

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. For a compound Poisson process, calculate moments associated with the value of the process at a given time. Range of weight: 0-5 percent	a. Compound Poisson process



<b>READINGS</b>
Daniel Poisson

## C. Life Contingency Models

Range of weight for Section C: 23-27 percent

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
1. 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. Range of weight: 10-15 percent	a. Principles include: equivalence, exponential, standard deviation, variance, and percentile b. Models including those listed in Learning Objectives A2-A4 (survival models). c. Principle applications include: life insurance, annuities, health care, credit risk, environmental risk, consumer behavior (e.g., subscriptions), and warranties
<b>READINGS</b>	
Option 1: Bowers et al., Chapters 4.1-4.3, 5.1-5.3, 6.1-6.3, 9.7	
Option 2: Cunningham et al., Chapters 5.1-5.4, 6.1-6.3, 7.1-7.3, 9.4.1-9.4.4	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
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: 5-10 percent	a. Life insurance liability calculations b. Prospective and retrospective methods
<b>READINGS</b>	
Option 1: Bowers et al., Chapter 7.1-7.4	
Option 2: Cunningham et al., Chapter 8.1, 8.3	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Using present-value-of-benefit random variables and present-value-of-future-loss random variables extended to discrete time Markov chains, calculate: <ul style="list-style-type: none"> <li>• Actuarial present values of cash flows at transitions between states</li> <li>• Actuarial present values of cash flows while in a state</li> <li>• Considerations (premiums) using the Equivalence Principle</li> <li>• Liabilities (reserves) using the prospective method</li> </ul> Range of weight: 3-7 percent	a. Cash flows at transition b. Triple product summation c. Transition probabilities
<b>READINGS</b>	
Daniel Markov, Chapters 2 and 3	

## D. Statistics

Range of weight for Section D: 33-37 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>Range of weight: 10-15 percent</p>	<p>a. Equations for MLE of mean, variance from a sample</p> <p>b. Estimation of mean and variance based on sample</p> <p>c. General equations for MLE of parameters</p> <p>d. Equations for estimation of parameters using method of moments for means, variances, and higher moments</p> <p>e. Recognition of consistency property of estimators and alternative measures of consistency</p> <p>f. Application of criteria for measurement when estimating parameters through minimization of variance, mean square error</p> <p>g. Definition of statistical bias and recognition of estimators that are unbiased or biased</p>
<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 likelihood ratio equation.</p> <p>Range of weight: 10-15 percent</p>	<p>a. Presentation of fundamental inequalities based on general assumptions and normal assumptions</p> <p>b. Definition of Type I and Type II errors</p> <p>c. Significance levels</p> <p>d. One-sided versus two-sided tests</p> <p>e. Estimation of sample sizes under normality to control for Type I and Type II errors</p> <p>f. Determination of critical regions</p> <p>g. Definition and measurement of likelihood ratio tests</p> <p>h. Determining parameters and testing using tabular values</p> <p>i. Recognizing when to apply likelihood ratio tests versus chi-square or other goodness of fit tests</p>
<p>3. Calculate order statistics of a sample and use critical values from a sampling distribution to test means and variances.</p> <p>Range of weight: 3-7 percent</p>	<p>a. General form for distribution of <math>n^{\text{th}}</math> largest element of a set</p> <p>b. Application to a given distributional form</p> <p>c. Recognition of random variables from sample that behave as t-stat or F-stat</p> <p>d. Determination of parameters when applying these tests and obtaining tabular values</p> <p>e. Presentation of hypotheses testing from above for mean and variances</p>
<p>4. Perform a linear regression using the least squares method.</p> <p>Range of weight: 3-7 percent</p>	<p>a. Presentation and calculation of equations for regression statistics</p>

READINGS
There is no single required text for Section D. 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: Hogg and Tanis Hogg et al. Larsen and Marx

## Complete Text References for Exam 3L

*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, including erratum.	Bowers et al.	A1-A4, C1, C2	L
Cunningham, R.; Herzog, T.; and London, R., <i>Models for Quantifying Risk</i> (Third Edition), ACTEX Publications, 2008, with the following citation: Chapters 3.1-3.4, 4.1-4.4, 4.5, 5.1-5.4, 6.1-6.3, 7.1-7.3, 8.1, 8.3, 9.1-9.2, 9.4.1-9.4.4, 9.5, and 10.1-10.3. Candidates are not responsible for formulae 4.62 through 4.65 nor are they responsible for the “Hyperbolic (Balducci)” column of Table 4.3.	Cunningham et al.	A1-A4, C1, C2	L NEW
Daniel, J.W., “Multi-state Transition Models with Actuarial Applications,” Study Note, 2004 (second printing with minor corrections, October 2007).	Daniel Markov	A5, C3	W
Daniel, J.W., “Poisson processes (and mixture distributions),” Study Note, June 2008.	Daniel Poisson	B1-B3	W NEW
Hogg, R.V.; McKean, J.W.; and Craig, A.T., <i>Introduction to Mathematical Statistics</i> (Sixth Edition), 2004, Prentice Hall.	Hogg et al.	D1-D4	
Hogg, R.V.; and Tanis, E., <i>Probability and Statistical Inference</i> (Eighth Edition), 2010, Prentice Hall.	Hogg and Tanis	D1-D4	
Larsen, R.J.; and Marx, M.L., <i>An Introduction to Mathematical Statistics and Its Applications</i> (Fourth Edition), 2006, Prentice Hall.	Larsen and Marx	D1-D4	
“Notational Differences Between <i>Actuarial Mathematics</i> (AM) and <i>Models for Quantifying Risk</i> (MQR) for Candidates Taking Exam 3,” Study Note, 2006. This study note is not required but may be helpful.	Notational Differences	A1-A4, C1, C2	W

## Source Key

- L May be purchased from the publisher or bookstore or borrowed from the CAS Library.
- NEW Indicates new or updated material or modified citation.
- W Represents material in the 2009 Web Notes that is available at no charge from the “Study Tools” section of the CAS Web Site. A printed version may be purchased from the CAS Online Store.

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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; Web site: 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 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: www.soa.org.

Cunningham, R.; Herzog, T.; and London, R., *Models for Quantifying Risk* (Third Edition), 2008, 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; e-mail: retail@actexamdriver.com.

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: www.prenhall.com.

Hogg, R.V.; and Tanis, E., *Probability and Statistical Inference* (Eighth Edition), 2010, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: www.prenhall.com.

Larsen, R.J.; and Marx, M.L., *An Introduction to Mathematical Statistics and Its Applications* (Fourth Edition), 2006, Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: www.prenhall.com.

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.

McDonald, R.L., *Derivatives Markets* (Second Edition), 2006, Addison Wesley, imprint of Pearson Education, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; Web site: <http://www.aw-bc.com/catalog/>.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: www.sliderulebooks.com.

## Exam 4—May 2009

# Construction and Evaluation of Actuarial Models

Exam 4 is a four-hour, multiple-choice exam administered by Preliminary Actuarial Examinations/SOA and is identical to SOA Exam C. The examination is jointly sponsored and administered by the CAS, SOA, and the Canadian Institute of Actuaries (CIA). The examination is also jointly sponsored by the American Academy of Actuaries (AAA) and the Conference of Consulting Actuaries (CCA).

The syllabus for this examination provides an introduction to modeling and covers important actuarial methods that are useful in modeling. A thorough knowledge of calculus and probability is assumed.

The candidate will be introduced to useful frequency and severity models. 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.

A variety of tables is available for the candidate on the CAS and SOA Web Sites and will be provided to the candidate at the examination. These include values for the standard normal distribution, chi-square distribution, and abridged inventories of discrete and continuous probability distributions. Since they will be provided at the examination, candidates will not be allowed to bring copies of the tables into the examination room.

Please check the “*Syllabus Updates*” section of the CAS Web Site for any changes to the *Syllabus*. Information about Study Notes is available in the “Study Resources” section.

### LEARNING OBJECTIVES

The candidate is expected to be familiar with survival, severity, frequency and aggregate models, and use statistical methods to estimate parameters of such models given sample data. The candidate is further expected to identify steps in the modeling process, understand the underlying assumptions implicit in each family of models, recognize which assumptions are applicable in a given business application, and appropriately adjust the models for impact of insurance coverage modifications.

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

#### A. Severity Models

1. Calculate the basic distributional quantities:
  - a. Moments
  - b. Percentiles
  - c. Generating functions
2. Describe how changes in parameters affect the distribution.
3. Recognize classes of distributions and their relationships.
4. Apply the following techniques for creating new families of distributions:
  - a. Multiplication by a constant
  - b. Raising to a power
  - c. Exponentiation
  - d. Mixing
5. Identify the applications in which each distribution is used and reasons why.
6. Apply the distribution to an application, given the parameters.
7. Calculate various measures of tail weight and interpret the results to compare the tail weights.

8. Explain the properties of the lognormal distribution.
9. Explain the Black-Scholes formula as a limited expected value for a lognormal distribution.

## **B. Frequency Models**

For the Poisson, Mixed Poisson, Binomial, Negative Binomial, Geometric distribution and mixtures thereof (as well as compound distributions):

1. Describe how changes in parameters affect the distribution.
2. Calculate moments.
3. Identify the applications for which each distribution is used and give reasons why.
4. Apply the distribution to an application given the parameters.

## **C. Aggregate Models**

1. Compute relevant parameters and statistics for collective risk models.
2. Evaluate compound models for aggregate claims.
3. Compute aggregate claims distributions.

## **D. Severity, Frequency, and Aggregate Models**

1. Evaluate the impacts of coverage modifications:
  - a. Deductibles
  - b. Limits
  - c. Coinsurance
2. Calculate Loss Elimination Ratios.
3. Evaluate effects of inflation on losses.

## **E. Risk Measures**

1. Calculate VaR, CTE, and other risk measures and explain their use and limitations.

## **F. Ruin Theory**

1. Calculate survival and ruin probabilities using discrete models.
2. Describe the considerations included in a ruin model.

## **G. Construction of Empirical Models**

1. Estimate failure time and loss distributions using:
  - a. Kaplan-Meier estimator, including approximations for large data sets
  - b. Nelson-Åalen 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. Apply the following concepts in estimating failure time and loss distribution:
  - a. Unbiasedness
  - b. Consistency
  - c. Mean squared error

## **H. 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 and/or compare models using:
  - a. Graphical procedures
  - b. Kolmogorov-Smirnov test
  - c. Anderson-Darling test
  - d. Chi-square goodness-of-fit test
  - e. Likelihood ratio test

### **I. 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.

### **J. 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.
6. Simulate lognormal stock prices.
7. Incorporate jumps in stock prices by mixing Poisson and lognormal random variables.
8. Use variance reduction techniques to accelerate convergence.
9. Use the Cholesky decomposition method for simulating correlated random variables.

### **Text References for Exam 4**

Hardy, M.R., "An Introduction to Risk Measures for Actuarial Applications," 2006, Study Note, pp. 1-30.	<b>W</b>
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<p>Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., <i>Loss Models: From Data to Decisions</i> (Third Edition), 2008, John Wiley and Sons:</p> <p>Chapter 3, Sections 3.1– 3.4 (excluding example 3.6),  Chapter 4,  Chapter 5, Sections 5.1– 5.4,  Chapter 6, Sections 6.1– 6.5 and 6.7,  Chapter 8,  Chapter 9, Sections 9.1–9.7 (excluding 9.6.1 and examples 9.9 and 9.11), Sections 9.11.1– 9.11.2,  Chapter 10, Sections 10.1, 10.2.3 and 10.3,  Chapters 12–14,  Chapter 15, Sections 15.1–15.3, 15.5, 15.6.1–15.6.3,15.6.6,  Chapter 16,  Chapter 17, Section 17.3,  Chapter 21, Sections 21.1–21.2.3, and 21.2.6.</p> <p>Note: Candidates may also use the Second Edition of <i>Loss Models</i>, (2004). The following chapter references apply:</p> <p>Chapter 3,  Chapter 4, Sections 4.1-4.6.6,  Chapter 5,  Chapter 6, Sections 6.1–6.7 (excluding 6.6.1), 6.11.1,  Chapter 7, Sections 7.1, 7.2.3, 7.3.1, 7.3.2,  Chapters 9–11,  Chapter 12 (excluding 12.5.4, 12.5.5 and 12.6),  Chapter 13,  Chapter 17.</p>	
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McDonald, R.L., <i>Derivatives Markets</i> (Second Edition), 2006, Addison Wesley, Chapters 18-19, excluding appendices. [Including errata.]	
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For credibility, the candidate may use any of the options shown below:

<b>Option A</b>	
<p>Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., <i>Loss Models: From Data to Decisions</i> (Third Edition), 2008, John Wiley and Sons, New York, Chapter 20 (Sections 20.2; 20.3 excluding 20.3.8; and 20.4 excluding 20.4.3).</p> <p><b>Note:</b> For candidates using the second edition of <i>Loss Models</i>, the chapter references are: Chapter 16, Sections 16.1-16.2 (for background only), 16.3, 16.4 (excluding 16.4.7), 16.5 (excluding 16.5.3). [Including errata.]</p>	
<b>Option B</b>	
<p>Mahler, H.C.; and Dean, C.G., “Credibility,” <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 an SOA Study Note C-21-01.)</p>	<b>W</b>
<p>Dean, C.G., “Topics in Credibility Theory,” 2004 (SOA Study Note).</p>	<b>W</b>
<b>Option C</b>	
<p>Herzog, T.N., <i>Introduction to Credibility Theory</i> (Third Edition), 1999, Chapters 1-3 (background only); 4-8; and 9 (background only).</p>	



### Additional Study Notes

Tables for Exam C/4.	<b>W</b>
<i>Derivatives Markets</i> Errata, Second Edition: <a href="http://www.kellogg.northwestern.edu/faculty/mcdonald/htm/typos2e.html">http://www.kellogg.northwestern.edu/faculty/mcdonald/htm/typos2e.html</a>	
<i>Loss Models</i> Errata, Second Edition: <a href="http://www.soa.org/files/pdf/lm2e-errata%20070606.pdf">http://www.soa.org/files/pdf/lm2e-errata%20070606.pdf</a>	
All versions of Exam 4/C that have been released since 2000, are posted online at <a href="http://www.soa.org/education/resources/edu-multiple-choice-essay-examinations.aspx">http://www.soa.org/education/resources/edu-multiple-choice-essay-examinations.aspx</a> and in “Past Exams” under “Study Tools” in the “Admissions/Exams” section of the CAS Web Site ( <a href="http://www.casact.org">www.casact.org</a> ).	<b>W</b>
Exam C Sample <a href="#">Questions</a> and <a href="#">Solutions</a>	<b>W</b>

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**W** Represents material that is available at no charge under “Web Notes” in the “Study Tools” section of the CAS Web Site.

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Casualty Actuarial Society *Foundations of Casualty Actuarial Science* (Fourth Edition), 4350 N. Fairfax Drive, Suite 250, Arlington, VA 22203; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org); Web site: [www.casact.org](http://www.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@actexmadriver.com](mailto:retail@actexmadriver.com).

Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., *Loss Models: From Data to Decisions* (Third Edition), 2008, John Wiley and Sons, One Wiley Drive, Somerset, NJ 08875; telephone: (800) 225-5945 or (732) 469-4400.

McDonald, R.L., *Derivatives Markets* (Second Edition), 2006, Addison Wesley, imprint of Pearson Education, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; Web site: <http://www.aw-bc.com/catalog/>.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; 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 5

# Introduction to Property and Casualty Insurance and Ratemaking

Before commencing study for this four-hour examination, candidates should read the “Introduction” to “Materials for Study” for important information about learning objectives, knowledge statements, readings, and the range of weights. Items marked with a bold **SK** constitute the 2009 CAS Exam 5 Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **W**—the 2009 CAS Exam 5 Web Notes—are available at no charge in the “Study Tools” section of the CAS Web Site or may be purchased from the CAS Online Store.

Please check the “Syllabus Updates” section of the CAS Web Site for any changes to the *Syllabus*.

The CAS will test the candidate’s knowledge of topics that are presented in the learning objectives. Thus, the candidate should expect that each exam will cover a large proportion of the learning objectives and associated knowledge statements and syllabus readings, and that all of these will be tested at least once over the course of a few years—but each one may not be covered on a particular exam.

### A. Introduction to Property and Casualty Insurance

Range of weight for Section A: 15-20 percent

This section develops skills in reading and interpreting the policies that candidates 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, workers compensation, umbrella)

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Explain the insurance mechanism and its use as a risk management tool. Range of weight: 0-5 percent	a. Loss exposure b. Risk elements c. Perils and hazards d. Elements of pooling vs. insurance e. Risk characteristics of insurable risks
<b>READINGS</b>	
Nyce Foundations	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>2. Explain the basic purpose and structure of the insurance contract, including coverages, exclusions, exceptions, limits, and deductibles.</p> <p>Range of weight: 9-13 percent</p>	<p>a. 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>b. Lines of insurance that cover each of the exposures to loss</p> <p>c. Basic insurance terminology (e.g., premium, loss, loss adjustment expense)</p> <p>d. Basic policy structure</p> <p>e. Basic policy terminology (e.g., named insured, declarations)</p>
<b>READINGS</b>	
<p>Flitner and Trupin ISO PAP Nyce Foundations Nyce PI</p>	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>3. 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>Range of weight: 3-7 percent</p>	<p>a. Lines of insurance that cover each of the exposures to loss based on the contracts</p> <p>b. Coverage effective periods</p> <p>c. Loss versus loss expense</p> <p>d. Liability triggers</p>
<b>READINGS</b>	
<p>Flitner and Trupin ISO PAP Nyce PI</p>	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>4. Calculate a policy premium for a specified risk using the rate pages provided.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Exposure basis and how this is determined</p> <p>b. How to read and use rate pages</p> <p>c. Rating variables (e.g., territory, driver characteristics)</p> <p>d. How individual risk attributes contribute to loss exposure</p> <p>e. How rating variables relate to exposure to loss</p>
<b>READINGS</b>	
<p>Flitner and Trupin ISO PAM</p>	

## 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
1. Explain the functions of underwriting, marketing, and claims adjusting within an insurance company. Range of weight: 3-8 percent	a. Roles and responsibilities within an insurance company of: <ul style="list-style-type: none"> <li>• Underwriting</li> <li>• Marketing</li> <li>• Claims</li> </ul>
<b>READINGS</b>	
Myhr and Markham	

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

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Given specific external events or market conditions, explain the effect on insurance operations. Range of weight: 0-5 percent	a. Measurements of economics of insurance, including retention rate and new business b. Relationship of insurance and economic cycles c. Legal environment and how changes in it can affect exposure to loss d. Regulatory environment
<b>READINGS</b>	
Boor 2	
Boor 3	

## C. 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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. 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> Weight 0-5 percent	a. Loss exposures and policy coverages
<b>READINGS</b>	
Bourdon Flitner and Trupin Nyce PI	

## D. 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 different lines of business.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Explain the role of exposure bases in the ratemaking process. Range of weight: 0-5 percent	a. Definition of exposure base b. Characteristics of exposure base c. Impact of exposure change d. Coverage provisions
<b>READINGS</b>	
Bouska CAS Principles Feldblum 2 Finger Graves and Castillo Jones McClenahan	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Use appropriate premium data to estimate premium input into the overall rate level indication, adjusting for the following:</p> <ul style="list-style-type: none"> <li>• Coverage and benefit level changes</li> <li>• Rate level changes</li> <li>• Premium trend</li> </ul> <p>Range of weight: 8-12 percent</p>	<ul style="list-style-type: none"> <li>a. Compilations of experience (Calendar Year/ Policy Year/Accident Year)</li> <li>b. Written versus earned premium</li> <li>c. Rate changes</li> <li>d. Policy terms</li> <li>e. Distributional shifts/changes in volumes (trend over time)</li> <li>f. Parallelogram method</li> <li>g. Extension of exposures</li> <li>h. Definition of exposures</li> <li>i. Impact of law changes</li> </ul>
<b>READINGS</b>	
ASOP 13 CAS Principles Feldblum 1 Feldblum 2 Finger Jones McClenahan	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>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:</p> <ul style="list-style-type: none"> <li>• Coverage and benefit level changes</li> <li>• Loss trend</li> <li>• Loss development</li> <li>• Catastrophe provision</li> </ul> <p>Range of weight: 12-16 percent</p>	<ul style="list-style-type: none"> <li>a. Compilations of experience (Calendar Year/ Policy Year/Accident Year/Report Year)</li> <li>b. Incurred versus paid losses</li> <li>c. Loss development</li> <li>d. Impact of law changes</li> <li>e. Frequency and its trend over time</li> <li>f. Severity and its trend over time</li> <li>g. Pure premium and its trend over time</li> <li>h. Exponential versus linear trend</li> <li>i. Relationship between trend and loss development</li> <li>j. Changes in mix of business</li> <li>k. Allocated versus unallocated loss adjustment expenses</li> <li>l. Policy provisions</li> <li>m. Credibility criteria</li> <li>n. Credibility formulas</li> <li>o. Large loss adjustment</li> <li>p. Adjustments for catastrophe</li> </ul>
<b>READINGS</b>	
ASOP 13 Boor 1 Bourdon CAS Principles Feldblum 2 Finger Graves and Castillo Marker and Mohl McClenahan Walters	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>4. Calculate the underwriting expense provisions for estimating an overall rate level indication. Range of weight: 0-5 percent</p>	<p>a. 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>b. Profit and contingency provisions c. Sources of data and selection criteria d. Fixed and variable expense e. Expense fee calculation f. Differences in procedures for loss adjustment expenses versus underwriting expenses</p>
<b>READINGS</b>	
<p>Brown and Schmitz CAS Principles Feldblum 2 Graves and Castillo McClenahan Schofield Werner</p>	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>5. Calculate an overall rate level indication using the pure premium and loss ratio methods. Range of weight: 5-10 percent</p>	<p>a. Loss ratio formula b. Pure premium formula c. Estimates of formula components</p>
<b>READINGS</b>	
<p>Feldblum 2 Graves and Castillo McClenahan</p>	

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

## E. 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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Explain the purpose of and methods for segregating data into homogeneous groups. Range of weight: 0-5 percent	a. Effect on insurance operations (e.g., underwriting) b. Credibility c. Adverse selection d. Criteria for selection of classification grouping e. Efficiency of class plan
<b>READINGS</b>	
Boor 1 Bouska CAS Principles Feldblum 2 Finger Palmer Myhr and Markham Walters	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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> Range of weight: 8-12 percent	a. Credibility/complements of credibility b. Off balance c. Capping of changes d. Layers of loss e. Loss elimination f. Basic versus total limits g. Expense adjustments h. Formulas/processes for each rating factor
<b>READINGS</b>	
Boor 1 Bourdon Brown and Schmitz CAS Principles Feldblum 1 Feldblum 2 Finger Graves and Castillo Palmer Walters	



## F. Miscellaneous Ratemaking Topics

Range of weight for Section F: 15-20 percent

This section includes assorted topics related to ratemaking.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Explain the purpose of coinsurance. Range of weight: 0-5 percent	a. Definition of coinsurance b. Insurance to Value concepts c. Layers of loss d. Coverage issues e. Coinsurance provisions
2. Calculate premium for policies with coinsurance provisions. Range of weight: 0-5 percent	a. Common policy provisions b. Formula and its components c. Layers of loss
<b>READINGS</b>	
Anderson Kelley	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Explain the impact of catastrophes on insurance company operations and ratemaking. Range of weight: 0-5 percent	a. Definition of catastrophe b. Concentration of exposure c. Underwriting issues d. Reinsurance e. Loss adjustment issues f. Claim issues g. Risk and profit loads
<b>READINGS</b>	
Walters	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Calculate a catastrophe provision. Range of weight: 0-5 percent	a. Definition of catastrophe b. Formula/process for estimating modeled and non-modeled catastrophes c. Definition of damage curves d. Coverage terms
<b>READINGS</b>	
Walters	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
5. Explain the use of statistical plans. Range of weight: 0-5 percent	a. Purpose of a statistical plan b. Components of a statistical plan c. Limitations of company and industry data
<b>READINGS</b>	
Moncher Prevosto	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
6. Explain the purpose of individual risk rating. Range of weight: 0-5 percent	a. Experience modifications b. Schedule rating c. Credibility d. Manual rating e. Retrospective rating f. Experience period
<b>READINGS</b>	
CAS Principles Sherwood Tiller	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
7. Perform individual risk rating calculations. Range of weight: 0-5 percent	a. Formula for experience modification and components b. Layers of loss c. Credibility d. Manual rating
<b>READINGS</b>	
Sherwood Tiller	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
8. Calculate insurance prices using asset share and cash flow techniques for estimating costs. Range of weight: 3-7 percent	a. Model characteristics and formulas b. Premium c. Loss characteristics (frequency, severity) d. Expenses e. Persistency rates f. Policy durations g. Termination rates
<b>READINGS</b>	
Feldblum 1	

## Complete Text References for Exam 5

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objective	Source
Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 13, Trending Procedures in Property/Casualty Insurance Ratemaking."	ASOP 13	D2, D3	W
Anderson, G., "Insurance to Value," CAS Study Note, Fourth Edition, July 2006.	Anderson	F1, F2	W
Boor, J.A., "The Complement of Credibility," 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

Citation	Abbreviation	Learning Objective	Source
Boor, J.A., "The Impact of the Insurance Economic Cycle on Insurance Pricing" (Second Edition), CAS Study Note, August 2004.	Boor 2	B4	W
Boor, J.A., "A Macroeconomic View of the Insurance Marketplace," CAS Study Note, 1998.	Boor 3	B4	W
Bourdon, T.W.; Passwater, K.; and Priven, M., "An Introduction to Capitation and Health Care Provider Excess Insurance," <i>Health Care Issues for Property/Casualty Insurers</i> , Casualty Actuarial Society <i>Discussion Paper Program</i> , 1997, pp. 97-139, including errata.	Bourdon	C1, D3, E2	W
Bouska, A.S., "Exposure Bases Revisited," <i>PCAS LXXVI</i> , 1989, pp. 1-23.	Bouska	D1, E1,	W
Brown, B.Z.; and Schmitz, M.C., "Study Note on Deductibles," CAS Study Note, July 2006.	Brown and Schmitz	D4, E2	W
Casualty Actuarial Society Committee on Ratemaking Principles, <i>Statement of Principles Regarding Property and Casualty Insurance Ratemaking</i> , Casualty Actuarial Society.	CAS Principles	D1-4, D6, E1, E2, F6	W
Feldblum, S., "Personal Automobile Premiums: An Asset Share Pricing Approach for Property-Casualty Insurance," <i>PCAS LXXXIII</i> , 1996, pp. 190-256 (excluding Sections 7-9).	Feldblum 1	D2, E2, F8	W
Feldblum, S., "Workers' Compensation Ratemaking," 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., "Risk Classification," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 6, pp. 287-342, including errata.	Finger	D1-3, E1, E2	W
Flitner, A.L.; and Trupin, J., <i>Commercial Insurance</i> (Second Edition), American Institute for Chartered Property Casualty Underwriters, 2007, pp. 1.3-1.20; 2.3-2.16 (up to Limits of Insurance), excluding Exhibit 2-1; 3.3-3.18 (up to Other Commercial Property Coverage Forms); 8.3-8.33; 9.3-9.27, excluding Exhibit 9-2; 12.3-12.32, excluding Exhibits 12-1 and 12-2; and 13.3-13.25 (up to Aircraft Insurance), excluding Exhibit 13-4.	Flitner and Trupin	A2, A3, A4, C1	L NEW
Graves, N.; and Castillo, R., "Commercial General Liability Insurance Ratemaking for Premises and Operations," <i>Pricing Issues</i> , Casualty Actuarial Society <i>Discussion Paper Program</i> , 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 Automobile Manual (Effective 6-98), General Rules 1-6 only. The entire manual is included for completeness.	ISO PAM	A4	SK

Citation	Abbreviation	Learning Objective	Source
Insurance Services Office, Inc., Personal Automobile Policy (Edition 6-98).	ISO PAP	A2, A3	SK
Jones, B.D., "An Introduction to Premium Trend," CAS Study Note, 2002.	Jones	D1, D2	W
Kelley, R., "Homeowners Insurance to Value—An Update," Casualty Actuarial Society <i>Forum</i> including the Ratemaking Call Papers, 1994, pp. 529-562.	Kelley	F1, F2	W
Marker, J.O.; and Mohl, J.J., "Rating Claims-Made Insurance Policies," <i>Pricing Property and Casualty Insurance Products</i> , Casualty Actuarial Society <i>Discussion Paper Program</i> , 1980, pp. 265-304 and errata. Including discussion of paper: McManus, M.F., pp. 305-322.	Marker and Mohl	D3	W
McClenahan, C.L., "Ratemaking," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 3, pp. 75-148, including errata.	McClenahan	B2, D1-6	W
Moncher, R.B., "Study Note: NCCI Data Collection Calls and Statistical Plans," CAS Study Note. Examination questions will not be taken from the history section that was included to emphasize the changing nature of data collection activities over time.	Moncher	F5	W
Myhr, A.E.; and Markham, J.J., <i>Insurance Operations, Regulation, and Statutory Accounting</i> (Second Edition), American Institute for Chartered Property Casualty Underwriters, 2004, pp. 1.3-1.11 (up to Insurer Goals), 1.26-1.31 (up to the Summary); 3.3-3.17 (up to Convergence of Traditional Marketing Systems); 4.3-4.28 (up to Underwriting Results), excluding Exhibits 4-1 and 4-3; 5.3-5.37, excluding Exhibits 5-1, 5-2, 5-3, and 5-4; 6.3-6.41 (up to Underwriting Umbrella and Excess Liability Insurance), excluding Exhibits 6-1, 6-2, and 6-3; 8.40-8.41 (Summary section only); 9.3-9.30 (up to Adjusting Specific Types of Property Claims), excluding Exhibits 9-1, 9-2, and 9-3; and 10.3-10.30 (up to Adjusting Specific Types of Liability Claims).	Myhr and Markham	B1, B3, E1	L
Nyce, C.M., <i>Foundations of Risk Management and Insurance</i> (Second Edition), 2006, American Institute for Chartered Property Casualty Underwriters, Chapters 1 (1.3-1.17 up to "Classification of Risk," excluding Exhibits 1-1 and 1-2); 6 (6.21 from "Insurance Markets and Competition" through 6.27 up to "Summary," excluding Exhibits 6-7 and 6-8); 7 (7.9 from "Economic View of Insurance" through 7.26 up to "Financial View of Insurance," and 7.34-7.39 up to "Summary," excluding Exhibit 7-3); 8 (8.3-8.27 up to "Government Programs," excluding Exhibits 8-2 and 8-4); 9 (9.3-9.11 up to "Contract Law"); 10 (10.3-10.14 up to "Resolving Coverage Disputes"); and 11 (11.12 from "Common Policy Provisions" through 11.29, excluding Exhibits 11-5 through 11-12 and 11-14 through 11-17).	Nyce Foundations	A1, A2	L

Citation	Abbreviation	Learning Objective	Source
Nyce, C.M., <i>Personal Insurance</i> (Second Edition), American Institute for Chartered Property Casualty Underwriters, 2008, pp. 1.3–1.11 (up to Personal Financial Planning Loss Exposures), 1.17–1.25 (up to Insurance as a Risk Financing Technique), 3.3–3.56, 4.3–4.25 (up to Endorsements to the Personal Auto Policy), 5.3–5.51, 6.3–6.22 (up to HO-3 Section II—Conditions), 6.32 (from HO-3 Section II—Liability Coverage Case) – 6.38, 12.4 (from Providers of Private Health Insurance) – 12.28 (up to Government Health Insurance and Healthcare Programs).	Nyce PI	A2, A3, C1	L NEW
Palmer, J.M., “Increased Limits Ratemaking for Liability Insurance,” CAS Study Note, 2006.	Palmer	E1, E2	W
Prevosto, V.R., “Study Note: ISO Statistical Plans,” CAS Study Note. Candidates will not responsible for the details of the Exhibits.	Prevosto	F5	W
Schofield, D., “Going From a Pure Premium to a Rate,” CAS Study Note, 1998.	Schofield	D4	W
Sherwood, M.T., “Individual Risk Rating,” <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 4, pp. 149-195.	Sherwood	F6, F7	W
Tiller, M.W., “Individual Risk Rating,” CAS Study Note.	Tiller	F6, F7	W
Walters, M.A., “Catastrophe Ratemaking,” CAS Study Note, 2007, excluding the appendices.	Walters	D3, E1, E2, F3, F4	W
Werner, G.T., “Incorporation of Fixed Expenses,” <i>Casualty Actuarial Society Forum</i> , Winter 2004, pp. 211-249.	Werner	D4	W

## Source Key

- L** May be borrowed from the CAS Library.
- NEW** Indicates new or updated material or modified citation.
- SK** Represents material in the 2009 CAS Study Kit.
- W** Represents material in the 2009 Web Notes that is available at no charge from the “Study Tools” section of the CAS Web Site. A printed version may be purchased.

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

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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.

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, 4350 N. Fairfax Drive, Suite 250, Arlington, VA 22203; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org); Web site: [www.casact.org](http://www.casact.org).

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

SlideRule Books, P.O. Box 69, Greenland, NH 03840; 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, Reinsurance, and Enterprise Risk Management

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### A. Actuarial Reserves

Range of weight for Section A: 40–55 percent

This section introduces the various techniques that the actuary can use to develop estimated liabilities for unpaid claims or review reserves for such liabilities 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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Describe the information requirements for estimating unpaid claims. Range of weight: 0-5 percent	a. Types of data and their sources b. Role of homogeneity and credibility of data in the process of estimating unpaid claims c. Fundamentals of different types of insurance (e.g., long tail versus short tail lines of business; low frequency versus high frequency lines) d. Organization of data: calendar year, accident year, policy year, underwriting year, and report year e. Insurer’s environment f. Importance of accurate estimates of unpaid claims
<b>READINGS</b>	
Friedland, Chapters 1, 3, and 4; Appendices A and B	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Build and analyze claim development triangles. Range of weight: 0–5 percent	a. Purposes of the development triangle b. Development triangle as a diagnostic tool
<b>READINGS</b>	
Friedland, Chapters 5 and 6	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>3. Calculate unpaid claim estimates using each of the following estimation techniques:</p> <ul style="list-style-type: none"> <li>• Development technique, including case outstanding technique</li> <li>• Expected claim technique</li> <li>• Bornhuetter-Ferguson technique</li> <li>• Cape Cod technique</li> <li>• Frequency-severity techniques</li> <li>• Credibility models</li> </ul> <p>Range of weight: 12–16 percent</p>	<ul style="list-style-type: none"> <li>a. Standards of Practice, ASOP Nos. 9 and 43</li> <li>b. Statement of Principles, CAS</li> <li>c. The claims process</li> <li>d. Assumptions of each estimation technique</li> <li>e. Mechanics associated with each techniques (including organization of data)</li> <li>f. Reporting and payment patterns</li> <li>g. When each technique works and when it does not</li> <li>h. Application of credibility</li> <li>i. Terms: case outstanding, paid claims, reported claims, incurred but not reported, ultimate claims, claim related expenses, reported and closed claim counts, claim counts closed with no payment, insurance recoverables, exposures, experience period, maturity or age, and components of unpaid claim estimates</li> </ul>

**READINGS**

ASOP 9  
ASOP 43  
Brosius  
CAS  
Friedland, Chapters 1-12 and 15; and Appendices A-C  
Mack

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>4. Forecast unpaid claim estimates and their distributions using stochastic models.</p> <p>Range of weight: 2-6 percent</p>	<ul style="list-style-type: none"> <li>a. Formal mathematical model</li> <li>b. Data organization</li> <li>c. Calendar year, accident year, and development year trends and their interrelationships</li> <li>d. Appropriate parameters</li> <li>e. Variance and percentiles of reserve distribution</li> <li>f. Strengths and weaknesses of stochastic models for the estimation of unpaid claims</li> </ul>

**READINGS**

Barnett and Zehnwirth

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>5. Assess the influence of operating changes on the estimation of unpaid claims.</p> <p>Range of weight: 2-6 percent</p>	<ul style="list-style-type: none"> <li>a. How internal operating changes affect estimates of unpaid claims <ul style="list-style-type: none"> <li>• Claims processing</li> <li>• Underwriting and policy provisions</li> <li>• Marketing</li> <li>• Coding of claim counts and/or claim related expenses</li> <li>• Treatment of recoveries such as policyholder deductibles and salvage and subrogation</li> <li>• Reinsurance</li> </ul> </li> </ul>



<b>READINGS</b>
ASOP 9 Friedland, Part 3 (Chapters 6-15)

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Adjust data and/or estimation techniques for changes in: <ul style="list-style-type: none"> <li>• Internal environment (e.g., claims processes that result in a shift in adequacy of case outstanding or a shift in settlement rates, change in mix of business, change in rate level)</li> <li>• External environment (e.g., inflationary or legal environment)</li> </ul> Range of weight: 4-8 percent	a. Effect on reserving techniques due to change in: rate levels, claim ratio, mix of business b. Use of trend factors and tort reform factors in estimation techniques c. Adjustment for changes in case outstanding adequacy d. Adjustment for changes in rate of claims settlement

<b>READINGS</b>
Friedland, Chapters 7-14

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
7. Estimate recoveries. Range of weight: 0-5 percent	a. Salvage and subrogation b. Reinsurance

<b>READINGS</b>
Friedland, Chapter 14

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
8. Estimate unpaid claim adjustment expenses. Range of weight: 0-5 percent	a. Organization of data b. Estimation of unpaid ALAE c. Estimation of unpaid ULAE d. Strengths and weaknesses of the estimation techniques for claim related expenses

<b>READINGS</b>
Conger Friedland, Chapters 1, 3, and 16

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
9. Evaluate results of the estimation process for adequacy/reasonableness. Range of weight: 3-7 percent	a. Components of Evaluation <ul style="list-style-type: none"> <li>• Multiple methods</li> <li>• Explanation of differences</li> <li>• Test statistics (e.g., claim ratios, severities, pure premiums, frequencies, indicated unpaid)</li> </ul> b. Monitoring and interim valuations

<b>READINGS</b>
Friedland, Chapter 15

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
10. Forecast unpaid claim estimates for various layers of claims. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Methods for estimating unpaid claims in a deductible layer</li> <li>b. Methods for estimating unlimited unpaid claims excess of a threshold</li> <li>c. Methods for estimating unpaid claims excess of a retention but bounded by a limit</li> <li>d. Interrelationships between parameters for forecasting deductible, unlimited excess, layer excess and total claims</li> </ul>
<b>READINGS</b>	
Pinto and Gogol Siewert	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
11. Forecast premium reserves. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Reserves for retrospective premiums</li> <li>b. Reserves for unearned premiums for policies with non pro-rata earning patterns</li> </ul>
<b>READINGS</b>	
Blanchard Premium Teng and Perkins	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
12. Make specific provisions in the unpaid claim estimate for emerging mass tort liabilities. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Mass tort liabilities that are emerging, e.g., mold, asbestos, pollution, and lead paint</li> <li>b. Methods for estimating the unpaid claims</li> <li>c. Differences between normal or traditional claim development and development of mass torts</li> </ul>
<b>READINGS</b>	
Bouska	

## **B. Insurance Accounting Principles**

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 accounting principles (SAP) and Generally Accepted Accounting Principles (GAAP) accounting, and the impact of reinsurance and reserves on financial statements.

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

<b>READINGS</b>
Blanchard Accounting Blanchard Premium Blanchard Selected FAS 5 FAS 60 FIN 14 IFRS 4 Basis IFRS 4 Standard Myhr and Markham

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Create a balance sheet and income statement given major account balances at various points in time. Range of weight: 0-5 percent	a. Formulas associated with each component of the balance sheet and income statement b. Classification of items as assets, liabilities, receipts, and expenses according to GAAP and SAP

<b>READINGS</b>
Blanchard Premium Blanchard Selected IFRS 4 Basis IFRS 4 Standard Myhr and Markham

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Evaluate risk transfer content of reinsurance contracts. Range of weight: 3-7 percent	a. Identification and evaluation of insurance and financing components of the contract b. Determination whether the contract qualifies for insurance accounting treatment or deposit accounting treatment

<b>READINGS</b>
CAS VFIC FAS 113 IFRS 4 Basis IFRS 4 Standard

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Create accounting entries relating to reinsurance transactions and measure their effects on key financial statement values. Range of weight: 3-7 percent	a. Insurance accounting versus deposit accounting b. How surplus relief works c. Effect on loss reserves d. Effect on unearned premium reserves e. Types of reinsurance that apply f. Leverage ratios (gross versus net) g. FAS 113

<b>READINGS</b>
Blanchard Selected CAS VFIC FAS 113 IFRS 4 Standard IFRS 4 Basis

## C. 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, their purposes, and how reinsurance is marketed and underwritten. It also addresses how actuarial concepts such as pricing and reserving are adapted to apply to reinsurers.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
1. Explain the meaning of various reinsurance terms. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. XOL</li> <li>b. Quota share</li> <li>c. Surplus share</li> <li>d. Treaty</li> <li>e. Facultative</li> <li>f. Rate-on-line</li> <li>g. Subject earned premium</li> <li>h. Commutation</li> <li>i. Finite reinsurance</li> <li>j. Insurance capacity</li> <li>k. Clash</li> <li>l. Ceded, direct, gross, assumed, net</li> <li>m. Catastrophe treaty</li> <li>n. Aggregate excess of loss</li> <li>o. Burning costs</li> </ul>
2. Explain the purposes of various reinsurance arrangements. Range of weight: 3-7 percent	<ul style="list-style-type: none"> <li>a. Capacity</li> <li>b. Surplus relief</li> <li>c. Smoothing of results</li> </ul>
<b>READINGS</b>	
Harrison	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Determine the price of reinsurance programs using the appropriate methods. Range of weight: 3-7 percent	<ul style="list-style-type: none"> <li>a. Loss distributions</li> <li>b. Increased limit factors</li> <li>c. Trend</li> <li>d. Expenses</li> <li>e. Reinsurance pricing methods <ul style="list-style-type: none"> <li>• Burn cost</li> <li>• Exposure method</li> <li>• Experience rating</li> </ul> </li> </ul>
<b>READINGS</b>	
Clark Ludwig	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Measure the effects on reinsurance pricing of: <ul style="list-style-type: none"> <li>• Sliding scale commissions</li> <li>• Reinstatement clauses</li> <li>• Loss corridors</li> <li>• Retrospective rating</li> <li>• Commutations</li> <li>• Clash</li> <li>• Catastrophe</li> </ul> Range of weight: 3-7 percent	a. Expenses b. Contract provisions, e.g., risk attaching versus losses occurring c. Loss distributions d. Present value e. Fundamentals of retrospective rating
<b>READINGS</b>	
Clark Ludwig Steeneck	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. Calculate ceded losses when provided with gross losses using the provisions of the given reinsurance program. Range of weight: 3-7 percent	a. How reinsurance contracts apply <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>
<b>READINGS</b>	
Harrison	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Compare and contrast reinsurance and primary reserving procedures. Range of weight: 0-5 percent	a. Reinsurance and primary reserving methods b. Impact on assumptions because of differences in information available to reinsurers c. Stanard-Buhlmann method
7. Adjust primary methods and data to be used for reinsurance reserving. Range of weight: 0-5 percent	a. Reinsurance and primary reserving methods b. Impact on assumptions because of differences in information available to reinsurers c. Underlying business characteristics e.g., concentration of exposures d. Data structures: <ul style="list-style-type: none"> <li>• Ground up versus excess loss</li> <li>• Accident year versus treaty year</li> </ul>
8. Calculate ceded loss reserves using appropriate methods. Range of weight: 3-7 percent	a. Reinsurance reserving methods b. Adjustments in data (see above) c. Statement of Principles, CAS d. Standards of Practice, ASOP No. 9
<b>READINGS</b>	
Patrik	

## D. Enterprise Risk Management

Range of weight for Section D: 0–10 percent

This section introduces the candidate to the concepts and basic techniques of Enterprise Risk Management (ERM). ERM seeks to address the entire landscape of risk that confronts a business. Within the broad arena of ERM, the techniques of Dynamic Financial Analysis (DFA) provide a quantitative modeling framework for analyzing the potential financial results of a firm on a stochastic basis.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Explain concepts of ERM. Range of weight: 0-5 percent	a. ERM's various categories of risk (description and examples)
<b>READINGS</b>	
CAS ERM	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Map all sources of risk into an integrated framework. Range of weight: 0-10 percent	a. Create comprehensive landscape of risks threatening a firm b. Identify positive and negative correlations among sources of risk c. Create probabilistic, quantitative model for Strategic Risk d. Create probabilistic, quantitative model for Operational Risk
<b>READINGS</b>	
CAS ERM Slywotzky and Drzik	

## Complete Text References for Exam 6

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objective	Source
Actuarial Standards Board of American Academy of Actuaries, "Actuarial Standard of Practice No. 9, Documentation and Disclosure in Property and Casualty Insurance Ratemaking, Loss Reserving, and Valuations (Doc. No. 027)," 1991. Excluding Appendices 1 and 3.	ASOP 9	A3, A5	<b>W</b>
Actuarial Standards Board of American Academy of Actuaries, "Actuarial Standard of Practice No. 43, Property/Casualty Unpaid Claim Estimates" (Doc. No. 106; June 2007).	ASOP 43	A3	<b>W NEW</b>
Barnett, G.; and Zehnwirth, B, "Best Estimates for Reserves," <i>PCAS LXXXVII</i> , 2000, pp. 245-303.	Barnett and Zehnwirth	A4	<b>W</b>
Blanchard, R.S., "Accounting Concepts for the Actuary," CAS Study Note, June 2003.	Blanchard Accounting	B1	<b>W</b>
Blanchard, R.S., "Basic Insurance Accounting—Selected Topics," CAS Study Note, June 2007, pages 1–20 only.	Blanchard Selected	B1, B2, B4	<b>W</b>
Blanchard, R.S., "Premium Accounting," CAS Study Note, May 2005.	Blanchard Premium	A11, B1, B2	<b>W</b>

Citation	Abbreviation	Learning Objective	Source
Bouska, A.S., "From Disability Income to Mega-Risks: Policy-Event Based Loss Estimation," <i>Casualty Actuarial Society Forum</i> , Summer 1996, pp. 291-320.	Bouska	A12	W
Brosius, E., "Loss Development Using Credibility," CAS Study Note, March 1993.	Brosius	A3	W
Casualty Actuarial Society Enterprise Risk Management Committee, "Overview of Enterprise Risk Management," <i>Casualty Actuarial Society Forum</i> , Summer 2003, Section 3 and Appendix B.	CAS ERM	D1, D2	W
Casualty Actuarial Society, <i>Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Reserves</i> , May 1988.	CAS	A3	W
Casualty Actuarial Society Valuation, Finance, and Investments Committee, "Accounting Rule Guidance Statement of Financial Accounting Standards No. 113—Considerations in Risk Transfer Testing" <i>Casualty Actuarial Society Forum</i> , Fall 2002, pp. 305-338, excluding Sections 7 and 8.	CAS VFIC	B3, B4	W
Clark, D.R., "Basics of Reinsurance Pricing," CAS Study Note, 1996.	Clark	C3, C4	W
Conger, R.F.; and Nolibos, A., "Estimating ULAE Liabilities: Rediscovering and Expanding Kittel's Approach," <i>CAS Forum</i> , Fall 2003, pp. 94-139, excluding appendices. Including errata.	Conger and Nolibos	A8	W
Financial Accounting Standards Board, "Interpretation No. 14," Paragraphs 1-6.	FIN 14	B1	SK
Financial Accounting Standards Board, "Statement of Financial Accounting Standards No. 5, Accounting for Contingencies," Paragraphs 1-4, and 8-10.	FAS 5	B1	SK
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, 27-30, 32-34, and 60 a, d, e, f, h.	FAS 60	B1	SK
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 6-11, 14-18a, 21-22, 25, 28, 34-67, 70-74, 79-80, 82-85, and 94-109. Candidate will not be responsible for material relating to long-duration contracts and/or life insurance.	FAS 113	B3, B4	SK
Friedland, J.F., "Estimating Unpaid Claims Using Basic Techniques," <i>Casualty Actuarial Society</i> , July 22, 2009. (Changes from the original March 2009 edition are listed on the last page of the document.)	Friedland	A1-A3, A5-A8	OP NEW

<b>Citation</b>	<b>Abbreviation</b>	<b>Learning Objective</b>	<b>Source</b>
Harrison, C.M., <i>Reinsurance Principles and Practices</i> (First Edition), American Institute for Chartered Property Casualty Underwriters/Insurance Institute of America, 2004, Chapters 1, 2 (from beginning through page 2.21), 4, 8, 9, and 10.	Harrison	C1, C2, C5	L
International Accounting Standards Board, Basis for Conclusions on IFRS 4 Insurance Contracts, paragraphs BC11-BC39.	IFRS 4 Basis	B1, B2, B3, B4	SK
International Accounting Standards Board, International Financial Reporting Standard 4 Insurance Contracts. Candidate is responsible only for Appendix A (only the defined terms for fair value, financial risk, insurance contract, and insurance risk) and Appendix B (entire Appendix).	IFRS 4 Standard	B1, B2, B3, B4	SK
Ludwig, S.J., "An Exposure Rating Approach to Pricing Property Excess-of-Loss Reinsurance," <i>PCAS LXXVIII</i> , 1991, pp. 110-145. Includes discussion: Feldblum, S., <i>PCAS LXXX</i> , 1993, pp. 380-395.	Ludwig	C3, C4	W
Mack, T. "Credible Claims Reserve: The Benktander Method," <i>ASTIN Bulletin</i> , 2000, pp. 333-337.	Mack	A3	W
Myhr, A.E.; and Markham, J.J., <i>Insurance Operations, Regulation, and Statutory Accounting</i> (Second Edition), American Institute for Chartered Property Casualty Underwriters, 2004, pp. 12.30-12.33.	Myhr and Markham	B1, B2	SK
Patrik, G.S., "Reinsurance," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 7, pp. 434-464 (section on Reinsurance Loss Reserving).	Patrik	C6, C7, C8	W
Pinto, E.; and Gogol, D.F., "An Analysis of Excess Loss Development," <i>PCAS LXXIV</i> , 1987, pp. 227-255. Including discussions of paper: Levine, G.M., <i>PCAS LXXIV</i> , 1987, pp. 256-271; and Bear, R.A., <i>PCAS LXXIX</i> , 1992, pp. 134-148.	Pinto and Gogol	A10	W
Siewert, J.J., "A Model for Reserving Workers Compensation High Deductibles," <i>Casualty Actuarial Society Forum</i> , Summer 1996, pp. 217-244.	Siewert	A10	W
Slywotzky, A.J.; and Drzik, J., "Countering the Biggest Risk of All," <i>Harvard Business Review</i> , April 2005, Harvard Business School Publishing.	Slywotzky and Drzik	D2	SK
Steeneck, L., "Commutation of Claims," CAS Study Note, 1998.	Steeneck	C4	W



Teng, M.T.S.; and Perkins, M.E., “Estimating the Premium Asset on Retrospectively Rated Policies,” <i>PCAS LXXXIII</i> , 1996, pp. 611-647, excluding Section 5. Including discussion of paper: Feldblum, S., <i>PCAS LXXXV</i> , 1998, pp. 274-315, Sections 1 and 2 only. Candidates will not be held responsible for specific Annual Statement notation but will be responsible for concepts presented.	Teng and Perkins	A11	W
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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; Web site: 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*, Casualty Actuarial Society, 4350 N. Fairfax Drive, Suite 250, Arlington, VA 22203; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: office@casact.org; Web site: www.casact.org.

Financial Accounting Standards Board, 401 Merret 7, P.O. Box 5116, Norwalk, CT 06856-5116; telephone: (203) 847-0700; FASB pronouncements are available online (www.fasb.org/st/).

Harvard Business School Publishing, 60 Harvard Way, Boston, MA 02163; telephone (617) 783-7500; fax: (617) 783-7555.

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

International Accounting Standards Board, 30 Cannon Street, London EC4M 6XH, United Kingdom; telephone: +44 (0)20 7246 6410; fax: telephone: +44 (0)20 7246 6411; Web site: [www.iasb.org](http://www.iasb.org).

SlideRule Books, P.O. Box 69, Greenland, NH 03840; 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: Law, Regulation, Government and Industry Insurance Programs, and Financial Reporting

Before commencing study for this four-hour examination, candidates should read the “Introduction” to “Materials for Study” for important information about learning objectives, knowledge statements, readings, and the range of weights. Items marked with a bold **SK** or **SKU** constitute the 2009 CAS Exam 7-Canada Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **W**—the 2009 CAS Exam 7-Canada Web Notes—are available at no charge in the “Study Tools” section of the CAS Web Site or may be purchased from the CAS Online Store. The 2009 Update to the 2008 Study Kit includes only the new items marked with a bold **SKU** and may be purchased from the CAS Online Store.

Please check the “Syllabus Updates” section of the CAS Web Site for any changes to the *Syllabus*.

The CAS will test the candidate’s knowledge of topics that are presented in the learning objectives. Thus, the candidate should expect that each exam will cover a large proportion of the learning objectives and associated knowledge statements and syllabus readings, and that all of these will be tested at least once over the course of a few years—but each one may not be covered on a particular exam.

Section A of this examination includes a comprehensive presentation of Canadian tort law from 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 it 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
1. Identify and describe the key components of tort law. Range of weight: 3-8 percent	a. Functions of tort law b. Negligence theory including standard of care, duty, causation, harm, and defenses c. Occupiers’ liability d. Products liability e. Professional liability f. Crown liability g. Strict liability h. Vicarious liability

<b>READINGS</b>
Baer and Rendall Kerr et al.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Identify and describe the underlying principles of insurance law. Range of weight: 0-5 percent	a. Utmost good faith b. Fortuity c. Indemnity d. Consumer protection e. Compensation

<b>READINGS</b>
Brown

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Discuss major elements of insurance contract law. Range of weight: 0-5 percent	a. Disclosure during negotiation b. Insurable interest c. Policy interpretation d. Relief from forfeiture, waiver, and estoppel e. Dispute resolution f. Liability insurance claims g. Salvage and subrogation

<b>READINGS</b>
Baer and Rendall Brown

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Distinguish between the different types of damages with respect to remedies in tort. Range of weight: 0-5 percent	a. Compensatory damages b. Exemplary or punitive damages c. Aggravated damages d. Damages in intentional tort e. Damages in negligence
5. Discuss the measurement of damages and the elements of personal injury damages. Range of weight: 0-5 percent	a. General and special damages b. Restitution in integrum c. Mitigation d. Non-pecuniary loss e. Pecuniary loss f. Structured settlements and judgments g. Survival of actions

<b>READINGS</b>
Kerr et al.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Discuss the trends in tort litigation including options for tort reform. Range of weight: 0-5 percent	a. Options for tort reform

<b>READINGS</b>
AAA BC Civil Liability Harris Mello Towers Perrin

## **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 fundamentals of insurance regulation as well as the historical development of insurance regulation in Canada. 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.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
1. Describe the reasons and the objectives of insurance regulation. Range of weight: 3-8 percent	a. Solvency b. Economics c. Contract regulation d. Market conduct e. Rate regulation
<b>READINGS</b>	
AMF 1 AMF 2 Baer and Rendall McDonald Noonan	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Describe both the historical development and the current state of insurance regulation, including the division of responsibility between federal and state/provincial regulators. Range of weight: 3-8 percent	a. British North America Act b. Privy Council c. Insurance Companies Act d. Role of CCIR e. Federal and provincial regulation, legislation, and case law f. Federal, foreign, and provincial companies g. U.S. regulation

<b>READINGS</b>
AMF 1 AMF 2 Baer and Rendall Brown McDonald Noonan

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Compare and contrast different types of rate regulation; discuss state/provincial rate filing guidelines. Range of weight: 0-5 percent	a. Forms of rate regulation (e.g., prior approval, flex rating, competitive rating, state-price governed) b. Effects of rate regulation c. Filing guideline requirements

<b>READINGS</b>
FSCO IBC Rate Regulation

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Discuss the issues, outcome, rationale and implications of landmark decisions for the insurance industry. Range of weight: 0-5 percent	a. Specific court cases cited in the Readings section directly below

<b>READINGS</b>
Baer and Rendall Brown Harris Kerr et al. Landmark Legal McDonald

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. Describe the structure of the insurance industry in Canada. Range of weight: 0-5 percent	a. Types of insurance carriers b. Nature of competition c. Insurance industry organizations d. Types of insurance (social and private, marine and non-marine, indemnity and non-indemnity, group and individual)

<b>READINGS</b>
Baer and Rendall Brown

### **C. Government and Industry Insurance Programs**

Range of weight for Section C: 20-25 percent

Government programs are an intrinsic part of the overall insurance system. The actuary should have a general understanding of Canadian federal and provincial programs. 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>1. 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>• Employment</li> <li>• Medicare/Health Care</li> <li>• Residual markets (e.g., auto, property)</li> <li>• Workers Compensation</li> <li>• Automobile</li> <li>• Pension Plans</li> <li>• Guaranty Funds</li> <li>• Asbestos</li> <li>• TRIA</li> </ul> <p>Range of weight: 5-10 percent</p>	<p>a. Reason for inception</p> <p>b. Major historical developments</p> <p>c. 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>Range of weight: 5-10 percent</p>	<p>a. Funding mechanisms/sources</p> <p>b. Allocation/assignment of exposures and associated costs</p> <p>c. Eligibility provisions</p> <p>d. Loss payment provisions</p> <p>e. Claim settlement provisions</p> <p>f. Welfare (subsidization) versus insurance principles</p> <p>g. Insurance coverage provisions</p> <p>h. Private response to gap in government program</p> <p>i. Government response to gap in private program</p>
<p>3. Evaluate the effectiveness of a government/industry program (actual, as listed in Section C.1, or hypothetical).</p> <p>Range of weight: 5-10 percent</p>	<p>a. 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> <p>b. How well program meets its purpose</p> <p>c. Impact of external factors (e.g., economic conditions, weather, regulation, etc.)</p>

**READINGS**

AAA  
Agricultural Programs  
Alberta  
CAS  
CIA Health Care  
CPCU  
Dutil  
FSCO  
Groupement des assureurs automobiles By-Law 7  
Groupement des assureurs automobiles Plan  
Harris  
IBC Availability  
ICBC  
KPMG et al. 1  
KPMG et al. 2  
Morneau Sobeco  
New Brunswick Auto  
OSFI Earthquake  
PACICC 1

**D. Financial Reporting**

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 has led to the use of U.S. material. In the long run, the core of the syllabus will focus on Canadian issues 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 Accounting Principles (SAP) 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.



<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>1. Evaluate the financial health of an insurance entity. Range of weight: 19-21 percent</p>	<p>a. 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>b. Risk-Based Capital, Minimum Capital Test</p> <p>c. Dynamic Capital Adequacy Testing</p> <p>d. Rating Agencies</p> <p>e. MSA Ratios</p>
<b>READINGS</b>	
<p>A.M. Best Cantin and Trahan CCIR Instructions CIA Accounting Standards CIA CSOP (2500) CIA DCAT CIA Discounting CIA Materiality CIA Min Capital CIA Valuation Dibra and Leadbetter E&amp;Y Feldblum Gorvett Harris IASA KPMG MSA NAIC Accounting NAIC Annual Statement OSFI MCT Uniform Annual Return</p>	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<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> <li>• Net Claims and Adjustment Expenses Runoff</li> </ul> <p>Range of weight: 5-7 percent</p>	<p>a. Valuation of assets and liabilities</p> <p>b. Schedule P</p> <p>c. Calculation of change in surplus</p> <p>d. Calculation of net income</p> <p>e. Calculation of Insurance Expense Exhibit</p> <p>f. Calculation of reinsurance penalties</p> <p>g. Calculation of excess (deficiency) ratio from page 60.40 of the Annual Return</p> <p>h. Direct Expense Report</p>

<b>READINGS</b>
CCIR Instructions CIA Accounting Standards CIA Runoff IASA IBC Expense NAIC Annual Statement Uniform Annual Return

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Calculate the Minimum Capital Test and interpret its results. Range of weight: 4-6 percent	a. MCT Formula b. Definition of components of MCT

<b>READINGS</b>
CIA Min Capital OSFI MCT

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Differentiate between different accounting reporting principles (e.g., GAAP, SAP, IAS) Range of weight: 3-5 percent	a. U.S. Statutory Accounting Principles b. Generally Accepted Accounting Principles c. Adjustments to go from SAP to GAAP d. Canadian Statutory Accounting Principles e. Actuarial Liabilities f. Fair value of claims liabilities g. International Accounting Standards h. Solvency II

<b>READINGS</b>
CEA and Towers Perrin Cheng CIA Accounting Standards CIA Discounting Feldblum IASA NAIC Accounting

<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. Range of weight: 9-11 percent	a. Statutory Actuarial Opinion b. Contents of Statutory Report of the Actuary c. Standards of Practice d. Educational Notes e. Insurance Companies Act f. Actuary and auditor relationship g. Regulatory requirements

READINGS
CIA Accounting Standards CIA CSOP CIA DCAT CIA Discounting CIA Materiality CIA Min Capital CIA Peer Review CIA Runoff CIA Taxes CIA Valuation ICA OSFI Annual Disclosures OSFI External Review OSFI Memorandum

## Complete Text References for Exam 7-Canada

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objective	Source
Agriculture and Agri-Food Canada, <i>Canada's Agricultural Business Risk Management Programs</i> , pages 1-8.	Agricultural Programs	C1, C2, C3	SK
"Alberta Insurance Act, Premium Regulation" Appendix, Schedules 1-3, pp. 15-22.	Alberta	C1, C2, C3	SK
A.M. Best Company, <i>Best's Key Rating Guide, Property/Casualty, United States &amp; Canada</i> , 2008, Preface (only Sections I-IV, X, and XI). Candidates are not expected to memorize the details of published insurance statistics.	A.M. Best	D1	SKU NEW
American Academy of Actuaries Mass Torts Subcommittee, "Current Issues in Asbestos Litigation," Issue Brief, February 2006. Candidates will not be responsible for material in the attachments.	AAA	A6, C1, C2, C3	SK
Autorité des Marchés Financiers, "Commercial Practices in the Quebec Damage Insurance Brokerage Sector," April 14, 2005. Candidates will not be responsible for the appendices.	AMF 1	B1, B2	SK
Autorité des Marchés Financiers, "Distribution of Financial Products and Services Section," <i>Bulletin de l'Autorité des Marchés Financiers</i> , Volume 3, Number 9, March 9, 2006. Candidates are not responsible for the regulations.	AMF 2	B1, B2	SK
Baer, M.G.; and Rendall, J.A., <i>Cases on the Canadian Law of Insurance</i> (Sixth Edition), Carswell, 2000, pp. 27-32, 37-38, 67-91, 93-100 302-304, 518-529, 821-827 and 829-831. Candidates are responsible for the following cases: <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>Fletcher v. MPIC</i> (Chapter 8); <i>Broadhurst and Ball v. American Home</i> ; and <i>Dillon v. Guardian Insurance</i> (Chapter 11).	Baer and Rendall	A1, A3, B1, B2, B5	SKU NEW

Citation	Abbreviation	Learning Objective	Source
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	SK
Brown, C., <i>Introduction to Canadian Insurance Law</i> (Second Edition), LexisNexis Canada, 2006, Chapters 1-3, 5, 6, 9, 11, 12 (Sections “Resolving Disputes” and “Liability Insurance Claims” only), and 13.	Brown	A2, A3, B2, B4, B5	L
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 40.07-40.60. [The citation above has been updated for the 2008 <i>Instructions</i> (available at <a href="http://www.osfi-bsif.gc.ca">www.osfi-bsif.gc.ca</a> ). Please use the version that was updated on 24 November 2008.]	CCIR Instructions	D1, D2	L NEW
Canadian Institute of Actuaries, Consolidated Standards of Practice, 1620, 1630, 2200, 2400, and 2500.	CIA CSOP	D1, D5	SK
Canadian Institute of Actuaries, “Educational Note: Consideration of Future Income Taxes in the Valuation of Policy Liabilities,” July 2005.	CIA Taxes	D5	SK
Canadian Institute of Actuaries, “Educational Note: DCAT—Minimum Regulatory Capital Requirement,” July 2003.	CIA Min Capital	D1, D3, D5	SK
Canadian Institute of Actuaries, “Educational Note: Discounting,” July 2005.	CIA Discounting	D1, D4, D5	SK
Canadian Institute of Actuaries, “Educational Note: Dynamic Capital Adequacy Testing—Life, Property and Casualty,” November 2007. Candidates are not responsible for details related to life insurance companies.	CIA DCAT	D1, D5	SKU NEW
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	SK
Canadian Institute of Actuaries, “Educational Note: Implications of CICA Accounting Standards 3855 and 1530,” January 2007.	CIA Accounting Standards	D1, D2, D4, D5	SK
Canadian Institute of Actuaries, “Educational Note: Review of Work of an Actuary,” September 2003.	CIA Peer Review	D5	SK
Canadian Institute of Actuaries, “Educational Note: Valuation of Policy Liabilities P&C Insurance Considerations Regarding Claim Liabilities and Premium Liabilities,” June 2003.	CIA Valuation	D1, D5	SK
Canadian Institute of Actuaries, “Report—Materiality,” October 2007. Candidates are not responsible for material in the Appendix.	CIA Materiality	D1, D5	SKU NEW

<b>Citation</b>	<b>Abbreviation</b>	<b>Learning Objective</b>	<b>Source</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>
Cantin, C.; and Trahan, P.; "Study Note on the Actuarial Evaluation of Premium Liabilities," CAS Study Note, 1999. Candidates will be responsible for Exhibits but not for Appendices.	Cantin and Trahan	D1	<b>W</b>
CEA and Towers Perrin, "Solvency II Introductory Guide," June 2006.	CEA and Towers Perrin	D4	<b>SK</b>
Cheng, J.S., <i>Fair Value of Claims Liabilities</i> , March 2007, J.S. Cheng & Partners Inc.	Cheng	D4	<b>SK</b>
CPCU Society's Connecticut Chapter, "Flood Insurance and Hurricane Katrina, Evaluation of the National Flood Insurance Program and Overview of the Proposed Solutions," <i>CPCU eJournal</i> , September 2006.	CPCU	C1, C2, C3	<b>SK</b>
Dibra, S.; and Leadbetter, D., "Why insurers fail: The dynamics of property and casualty insurance insolvency in Canada," Property and Casualty Insurance Compensation Corporation, 2007.	Dibra and Leadbetter	D1	<b>SK</b>
Dutil, R., "Facility Association," CAS Study Note, May 2008.	Dutil	C1, C2, C3	<b>W NEW</b>
Ernst & Young, "At the Crossroads—The future direction of insurance accounting," EYGM Limited, 2007. Candidates may find the following material valuable as background for the E&Y and KPMG papers on IFRS: International Accounting Standards Board (IASB) May 2007 "Discussion Paper Preliminary Views on Insurance Contracts," Part 1, Chapters 1-3. Candidates, however, are not responsible for the IASB Discussion Paper.	E&Y	D1	<b>SKU NEW</b>
Feldblum, S., "Statutory Surplus: Computation, Pricing and Valuation," CAS Study Note, June 2003.	Feldblum	D1, D4	<b>W</b>
Financial Services Commission of Ontario, <i>Private Passenger Automobile Filing Guidelines—Major for Proposed Revisions to Automobile Insurance Rates and Risk Classification Systems</i> , December 2006, Part A, Part B, Part C (Sections 3–7 and 10), and Appendices B1 and B2.	FSCO	B3, C1, C2, C3	<b>SKU NEW</b>
Gorvett, R.W.; Tedeschi, J.L.; and Ward, K.A., "Special Issues: Data Sources," <i>Foundations of Casualty Actuarial Science</i> (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 10, pp. 787-796.	Gorvett	D1	<b>W</b>
"Government Insurers Study Note," CAS Study Note, May 2008, pp. 1-4 and 17-20.	CAS	C1, C2, C3	<b>W NEW</b>

Citation	Abbreviation	Learning Objective	Source
Groupement 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.	Groupement des assureurs automobiles: By-Law 7	C1, C2, C3	SK
Groupement des assureurs automobiles, <i>Risk Sharing Plan—Procedures Manual; General Description of the Plan</i> , October 2003, Sections 15A to 15E and 15G.	Groupement des assureurs automobiles: Plan	C1, C2, C3	SK
Harris, C. “Dangerous Dose, Alberta Auto Cap Decision Hard to Swallow,” <i>Claims Canada</i> , April/May 2008.	Harris	A6, B4, C1, C2, C3, D1	SKU NEW
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.” The eighth edition update is required.	IASA	D1, D2, D4	L NEW
Insurance Bureau of Canada, Direct Expense Report, Instructions, Forms and Results, Parts I; and II, Sections A, D, E, and K.	IBC Expense	D2	L
Insurance Bureau of Canada, “The Effects of Rate Regulation on the Volatility of Auto Insurance Prices: Evidence from Canada,” June 2005. Candidates are responsible for the appendices but are not responsible for material in the tables.	IBC Rate Regulation	B3	SK
Insurance Bureau of Canada, “Residential Insurance Availability,” October 2001.	IBC Availability	C1, C2, C3	SK
“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 (updated to August 31, 2004).	ICA	D5	SK
Insurance Corporation of British Columbia, January 27, 2006 Filing with B.C. Utilities Commission, Chapter 14, “Supporting Evidence on ICBC’s Proposed Increase of Basic Insurance Rates,” pp. 14-20 to 14-31. Candidates are not responsible for material in figures 14.12 through 14.20.	ICBC	C1, C2, C3	SK
Kerr, M.; Kurtz, J; and Olivo, L.M., <i>Canadian Tort Law in a Nutshell</i> (Second Edition), Thomson Carswell, 2005. Regarding the cases included in this reading, candidates are only responsible for the following cases: <i>Rylands v. Fletcher</i> ; <i>McAlister (Donoghue) v. Stevenson</i> ; and <i>Hedley Byrne and Company v. Heller and Partners Ltd.</i>	Kerr et al.	A1, A4, A5, B4	L

Citation	Abbreviation	Learning Objective	Source
KPMG, LLP, "Impact of IFRS on Canadian Property and Casualty Insurers," 2008. Candidates may find the following material valuable as background for the E&Y and KPMG papers on IFRS: International Accounting Standards Board (IASB) May 2007 "Discussion Paper Preliminary Views on Insurance Contracts," Part 1, Chapters 1-3. Candidates, however, are not responsible for the IASB Discussion Paper.	KPMG	D1	SKU NEW
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; and Section VII, Conclusion. Candidates will not be responsible for information in exhibits.	KPMG et al. 1	C1, C2, C3	SK
KPMG, Eckler Partners Ltd. & Exactor Insurance Services, Inc., "Motor Vehicle Insurance in British Columbia—At the Crossroads, Volume II: Options and Choices," Section II excluding Section F. Candidates will not be responsible for information in exhibits.	KPMG et al. 2	C1, C2, C3	SK
"Landmark Legal Insurance Cases in Canada" which covers the following cases: Whiten v. Pilot Insurance Co.; Somersall v. Friedman; Somersall v. Scottish and York; Sansalone v. Wawanesa Mutual Insurance Co.; Nichols v. American Home Assurance Co.; Amos v. Insurance Corporation of British Columbia; KP Pacific Holdings Ltd. v. Guardian Insurance Co. of Canada; Alie v. Bertrand & Frere Construction Company Limited; McNaughton Automotive Ltd. v. Co-operators General Insurance Co.; British Columbia v. Imperial Tobacco Canada Ltd.; Herbison v. Lumbermens Mutual Casualty Co.; and Vytlingam v. The Citadel General Assurance Company.	Landmark Legal	B4	SKU NEW
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	SK
Mello, M.M., "Medical malpractice: Impact of the crisis and effect of state tort reforms," The Synthesis Project, Robert Wood Johnson Foundation, Research Synthesis Report No. 10, May 2006. Candidates will not be tested on material in Figures 1-4 or the appendices.	Mello	A6	SK
<i>Morneau Sobeco Handbook of Canadian Pension and Benefit Plans</i> (Thirteenth Edition), 2005, CCH Canadian Limited, Chapters 3, 12, 13-15. <b>The Fourteenth Edition (2008) may also be used with the same chapter citations.</b>	Morneau Sobeco	C1, C2, C3	L
MSA Research, Inc., "MSA Report on Property & Casualty, Canada, 2008," Section 3, pp. 1-9, <b>including errata.</b>	MSA	D1	SKU NEW
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2008, Preamble, pp. P-1 to P-12.	NAIC Accounting	D1, D4	SKU NEW

Citation	Abbreviation	Learning Objective	Source
National Association of Insurance Commissioners, <i>Official NAIC Annual Statement Blanks, Property and Casualty</i> , 2008 (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 2007 statement. The <i>Syllabus</i> Update will contain updated page references for the 2008 statement.]	NAIC Annual Statement	D1, D2	L NEW
New Brunswick, “Auto Insurance for New Brunswick–Final Report of the Select Committee on Private Passenger Automobile Insurance,” November 2002, pp. 7-21; and “New Brunswick Canada – Government Response to the Report of the Select Committee on Private Passenger Automobile Insurance,” March 28, 2003.	New Brunswick Auto	C1, C2, C3	SK
Noonan, B., “Protecting the Pledge,” <i>Foundations of Regulation, Best’s Review</i> , October 2005.	Noonan	B1, B2	SK
Office of the Superintendent of Financial Institutions Canada, “2008 Memorandum for the Actuary’s Report on Property and Casualty Insurance Business,” Fall 2008.	OSFI Memorandum	D5	WN NEW
Office of the Superintendent of Financial Institutions Canada, “Annual Disclosures (Property and Casualty Insurance Enterprises),” Accounting D-1B, Revised October 2006.	OSFI Annual Disclosures	D-5	SK
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	SK
Office of the Superintendent of Financial Institutions Canada, Guideline E-15, “Appointed Actuary: Legal Requirements, Qualifications and External Review,” Revised November 2006.	OSFI External Review	D5	SK
Office of the Superintendent of Financial Institutions Canada Guideline, “Minimum Capital Test (MCT) for Federally Regulated Property and Casualty Insurance Companies,” March 2008, pp. 1-10 and 17-22; and “Notes on the Development of the Minimum Capital Test (MCT),” pp. 1-7, July 2003.	OSFI MCT	D1, D3	SKU NEW
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	SK
Towers Perrin Tillinghast, “2007 Update on U.S. Tort Cost Trends.” Candidates will not be responsible for statistics contained within the paper or material from the tables or appendices.	Towers Perrin	A6	SKU NEW



Uniform Annual Return (2008 approved by the 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 2007 statement. The <i>Syllabus</i> Update will contain updated page references for the 2008 statement.]	Uniform Annual Return	D1, D2	<b>L NEW</b>
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## Source Key

- L** May be borrowed from the CAS Library.
- NEW** Indicates new or updated material or modified citation.
- SK** Represents material included in the 2009 CAS Study Kit.
- SKU** Represents material included in the 2009 CAS Study Kit and the 2009 Update to the 2008 Study Kit.
- W** Represents material in the 2009 Web Notes that is available at no charge from the “Study Tools” section of the CAS Web Site. A printed version may be purchased from the CAS Online Store.

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

American Academy of Actuaries, 1100 Seventeenth Street NW, Seventh Floor, Washington, DC 20036; telephone: (202) 223-8196; Web site: [www.actuary.org](http://www.actuary.org).

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 Services, 1717 Arch Street, 31st Floor, Philadelphia, PA 19103; telephone: (215) 988-5690 or (800) 234-6859 (for the *NAIC Annual Statement Blanks, Property and Casualty*).

Brown, C., *Introduction to Canadian Insurance Law*, (Second Edition), 2006, LexisNexis Canada, telephone: (800) 668-6481; Web site: [www.lexisnexis.ca/bookstore](http://www.lexisnexis.ca/bookstore).

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*, Casualty Actuarial Society, 4350 N. Fairfax Drive, Suite 250, Arlington, VA 22203; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: office@casact.org; Web site: www.casact.org.

Facility Association, 151 Yonge Street, 18<sup>th</sup> 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.

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.

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

Kerr, M.; Kurtz, J; and Olivo, L.M., *Canadian Tort Law in a Nutshell* (Second Edition), 2005, Thomson Carswell, One Corporate Plaza, 2075 Kennedy Road, Toronto, Ontario M1T 3V4; telephone: (416) 609-3800; Web site: www.carswell.com.

*Morneau Sobeco Handbook of Canadian Pension and Benefit Plans* (Thirteenth Edition), 2005, CCH Canadian Limited, 90 Shepherd East, Suite 300, North York, Ontario M2N 6X1, Canada; telephone: (416) 224-2248; fax: (800) 461-4131.

*NAIC Annual Statement Blanks, Property and Casualty* may be obtained from Bowne Insurance Services, 1717 Arch Street, 31st Floor, Philadelphia, PA 19103; telephone: (215) 988-5690 or (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.

# Exam 7-United States Nation-Specific Examination: Law, Regulation, Government and Industry Insurance Programs, and Financial Reporting and Taxation

Before commencing study for this four-hour examination, candidates should read the “Introduction” to “Materials for Study” for important information about learning objectives, knowledge statements, readings, and the range of weights. Items marked with a bold **SK** or **SKU** constitute the 2009 CAS Exam 7-United States Study Kit that may be purchased from the CAS Office. Items marked with a bold **W**—the 2009 CAS Exam 7-United States Web Notes—are available at no charge in the “Study Tools” section of the CAS Web Site or may be purchased in printed form from the CAS Office. The 2009 Update to the 2008 Study Kit includes only the new items marked with a bold **SKU**. Pricing and order information is available in both the “Study Resources” and “Exam Applications and Order Forms” sections.

Please check the “*Syllabus Updates*” section of the CAS Web Site for any changes to the *Syllabus*.

The CAS will test the candidate’s knowledge of topics that are presented in the learning objectives. Thus, the candidate should expect that each exam will cover a large proportion of the learning objectives and associated knowledge statements and syllabus readings, and that all of these will be tested at least once over the course of a few years—but each one may not be covered 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. 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. For the Miceli reading and Mallor reading, examination questions will not be based upon recognition of the names of court cases cited, but the candidate should understand the concepts of each case. The candidate will not be responsible for numerical examples in the Miceli text. The candidate may wish to review a microeconomic text or the appendix to Chapter 1 of the Miceli text.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Describe the different theories of tort law as applied to insurance. Range of weight: 3-7 percent	a. Types of negligence b. Causation c. Immunities d. Common law principles (e.g., assumption of risk) e. Theories of liability f. Criteria for torts
<b>READINGS</b>	
Mallor et al. Miceli	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Describe the difference between tort systems and no-fault systems. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Tort</li> <li>b. No fault (workers compensation, auto)</li> <li>c. History of no fault</li> <li>d. Type of thresholds</li> <li>e. Advantages and disadvantages of tort and no-fault systems</li> <li>f. Experience of individual systems</li> </ul>
<b>READINGS</b>	
Hamilton and Ferguson pp. 8.20–8.26	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Discuss the impact to insurance of trends in tort litigation. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Trends in litigation</li> <li>b. Litigation costs</li> <li>c. Asbestos litigation</li> <li>d. Regulatory &amp; insurer responses</li> <li>e. Economic policy</li> </ul>
<b>READINGS</b>	
A.M. Best 2 Asbestos Miceli	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Model an objective framework for the incentives that a tort law system gives to parties engaged in risk activities to minimize the costs of these activities, and apply the framework to specific area of product liability. Range of weight: 0-5 percent	<p>Elements necessary to pursue a tort claim:</p> <ul style="list-style-type: none"> <li>a. Strict liability vs. negligence vs. immunity from liability</li> <li>b. The Hand Rule and the reasonable person standard</li> <li>c. Contributory Negligence</li> <li>d. Products Liability Law</li> <li>e. How much of a dangerous product to produce</li> <li>f. Choices of care levels in product liability</li> <li>g. Perceptions of risk in products liability.</li> </ul>
<b>READINGS</b>	
Mallor Miceli	

## 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 regulation and governmental actions designed 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>
1. Describe the reasons and the objectives of insurance regulation. Range of weight: 8 percent to 12 percent	a. Solvency b. Market conduct c. Rate regulation d. Domestic, foreign, and alien insurers
<b>READINGS</b>	
A.M. Best 1 Bartlett et al. Brady et al. Ettlenger et al. Ghezzi Harrington NAIC Model Law Wagner	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Describe both the historical development and the current state of insurance regulation. Range of weight: 5-10 percent	a. SEC reporting and regulation b. Basis of insurance regulation c. Solvency, including RBC, insurance department examination, and NAIC regulatory tests d. Functions of NAIC e. Antitrust provisions f. Catastrophe, terrorism, and modeling
<b>READINGS</b>	
Brady et al. Ettlenger et al. Feldblum (RBC) Harrington Musulin NAIC IRIS Wagner	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Compare and contrast different types of rate filing approaches; discuss state rate filing guidelines. Range of weight: 5-10 percent	a. Prior approval b. File and use c. Use and file d. Open competition e. State mandated

<b>READINGS</b>
A.M. Best 1 Brady et al. Ettlinger et al. Harrington Harrington and Doerpinghaus Wagner

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Discuss the issues, outcome, rationale and implications of landmark decisions for the insurance industry including the division of responsibility between federal and state regulators.  Range of weight: 0-5 percent	a. Sherman Antitrust b. McCarran-Ferguson c. Southeastern Underwriters

<b>READINGS</b>
Brady et. al Harrington Wagner

### C. 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>
1. Describe the origin and purpose of certain government and industry insurance programs.  Range of weight: 3-7 percent	a. Reason for inception b. Major historical development c. Philosophy of program d. Insurance Programs <ul style="list-style-type: none"> <li>• Social Security</li> <li>• Flood insurance</li> <li>• Unemployment</li> <li>• Medicare</li> <li>• Residual markets (e.g., auto, workers compensation, property)</li> <li>• Workers compensation</li> <li>• Automobile Plans</li> <li>• Pension plans</li> <li>• Guaranty funds</li> <li>• TRIA</li> </ul>

<b>READINGS</b>
AAA Monograph CPCU Ettlinger et al. Government Insurers Study Note Hamilton and Ferguson, pp. 6.31-6.34, 9.36-9.40 Jenkins Nyce Wiening et al. Wilcox

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Describe the operations and risk transfer process for government/industry programs, and the interactions of government/industry insurance programs with the voluntary private insurance sector. Range of weight: 5-10 percent	a. Funding mechanisms/sources b. Allocation/assignment of exposures and associated costs c. Eligibility provisions d. Loss payment provisions e. Claim settlement provisions f. Welfare (subsidization) versus insurance principles g. Insurance coverage provisions h. Private response to gap in government program (e.g., Medigap, supplementary health)

<b>READINGS</b>
AAA Monograph Bartlett et al. CPCU Ettlinger et al. Government Insurers Study Note Hamilton and Ferguson, pp. 6.31–6.34, 9.36–9.40 Nyce Wiening et al.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Evaluate the effectiveness of a government/industry program (actual or hypothetical). Range of weight: 0-5 percent	a. How to measure performance of programs b. Solvency c. Efficiencies d. Stability e. Viability/longer term prospects f. How well program meets its purpose g. Impact of external factors (e.g., economic conditions, weather, regulation, etc.)

**READINGS**

AAA Monograph  
 Bartlett et al.  
 PCU  
 Ettlenger et al.  
 Government Insurers Study Note  
 Hamilton and Ferguson, pp. 6.31–6.34, 9.36–9.40  
 Jenkins  
 Marshall and Neale  
 Nyce  
 Wiening et al.

**D. 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 and international 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: relevant sections of the IASA text and the Exam 6 readings “Accounting Concepts for the Actuary,” “Basic Insurance Accounting—Select Topics,” and “Premium Accounting” by R.S. Blanchard.

As background reading on the responsibilities of actuaries, it is highly recommended that the candidate study ASOP 36. However, the candidate will only be tested on those portions of the ASOP mentioned in the COPLFR Practice Note.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
1. Understand the elements of the Annual Statement. Complete specific schedules and exhibits and use them to evaluate the financial health of an insurance entity.  Range of weight: 30 - 35 percent	a. Balance sheet b. Income statement c. Change in surplus d. Schedule P e. Insurance Expense Exhibit f. Notes to financial statements g. Reinsurance accounting including Schedule F



<b>READINGS</b>
2008 IEE Feldblum (Notes, Surplus, Schedule F, Schedule P, and IEE) Gorvett IASA 1 IASA 2 NAIC Annual Statement NAIC IRIS NAIC SSAP 53, 62, and 65 OSFI MCT

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Evaluate an insurer's financial health using RBC, IRIS ratios and rating agency information. Range of weight: 8-12 percent	a. RBC formula b. Definition of components of RBC c. Calculation of IRIS ratios d. Rating agencies
<b>READINGS</b>	
A.M. Best 1 Feldblum (RBC) IASA 3 NAIC IRIS	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Differentiate between various accounting reporting principles, e.g., GAAP, SAP, IAS. Range of weight: 3-7 percent	a. U.S. Statutory Accounting Principles b. Generally Accepted Accounting Principles c. Adjustments to go from SAP to GAAP d. Canadian Statutory Accounting Principles e. Fair value of claims liabilities f. International Accounting Standards
<b>READINGS</b>	
Blanchard Conger et al. IASA 1, Chapter 14 NAIC APPM, Preamble OSFI MCT	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Explain the responsibilities of an actuary as defined by standards of practice, regulators and insurance laws for financial reporting. Range of weight: 5-10 percent	a. Statutory Actuarial Opinion b. Standards of Practice c. Actuary and auditor relationship d. Materiality e. Actuarial Opinion Summary
<b>READINGS</b>	
AAA Materiality COPLFR P&C Practice Note Feldblum (Schedule P), pp. 69-72	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
5. Calculate specific elements of income tax and evaluate their implications for a property/casualty insurer. Range of weight: 0-5 percent	a. Discounting b. Elements of income tax calculation c. Book income versus taxable income d. Alternative minimum tax e. DTA and DTL
<b>READINGS</b>	
Blanchard Feldblum (Loss Reserve Discounting, Taxable Income, and Taxes and Investment Strategy) NAIC SSAP 65	

## Complete Text References for Exam 7-United States

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objective	Source
2008 Insurance Expense Exhibit.	2008 IEE	D1, D2	L, NEW
American Academy of Actuaries, Task Force on Materiality, "Materiality, Concepts on Professionalism," Discussion Paper, Professionalism Series, 2006, No. 8.	AAA Materiality	D4	W NEW
American Academy of Actuaries, "Social Security Reform Options," Public Policy Monograph, January 2007.	AAA Monograph	C1, C2, C3	W NEW
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 1	B1, B3, D2	SK
A.M. Best, <i>Business as Never Before</i> , Best's Review, January 2005.	A.M. Best 2	A3	SK
Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice, No. 36, Statements of Actuarial Opinion Regarding Property/Casualty Loss and Loss Adjustment Expense Reserves."	ASOP 36	D4	W
American Academy of Actuaries Mass Tort Subcommittee, "Current Issues in Asbestos Litigation" Issue Brief, February 2006.	Asbestos	A3	W
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	SK
Blanchard, R.S., "Basic Insurance Accounting—Select Topics," CAS Study Note, July 2008, pp. 21-24.	Blanchard	D3, D5	W NEW

<b>Citation</b>	<b>Abbreviation</b>	<b>Learning Objective</b>	<b>Source</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, B4	L
Committee on Property and Liability Financial Reporting, American Academy of Actuaries, “Property and Casualty Practice Note, Statements of Actuarial Opinion on P&C Loss Reserves as of December 31, 2007.”	COPLFR P&C Practice Note	D4	W NEW
Conger, R.F.; Hurley, J.D.; and Lowe, S.P., “How Might the Presentation of Liabilities at Fair Value Have Affected the Reported Results of U.S. Property Casualty Insurers,” <i>Fair Value of P&amp;C Liabilities: Practical Implications</i> , 2004, Casualty Actuarial Society, pp. 13-24.	Conger et al.	D3	W
CPCU Society’s Connecticut Chapter, “Flood Insurance and Hurricane Katrina, Evaluation of the National Flood Insurance Program and Overview of the Proposed Solutions,” <i>CPCU eJournal</i> , September 2006.	CPCU	C1, C2, C3	SKU NEW
Ettlenger, 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) including Exhibit 6-1, 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> .	Ettlenger et al.	B1, B2, C1, C2, C3	L NEW
Feldblum, S., “Completing and Using Schedule P” (Eighth Edition), CAS Study Note, June 2003, excluding pp. 38–41 on IRIS ratios. Candidates are not responsible for the end notes.	Feldblum (Schedule P)	D1, D4	W
Feldblum, S., “Computing Taxable Income for Property-Casualty Insurance Companies,” CAS Study Note, 2007, pp. 1-13, excluding appendices and end notes.	Feldblum (Taxable Income)	D5	W
Feldblum, S., “Federal Income Taxes and Investment Strategy,” CAS Study Note, 2007, pp. 1–12, excluding Appendix and end notes.	Feldblum (Taxes and Investment Strategy)	D5	W
Feldblum, S., “The Insurance Expense Exhibit and the Allocation of Investment Income” (Fifth Edition), CAS Study Note, May 1997.	Feldblum (IEE)	D1	W
Feldblum, S., “IRS Loss Reserve Discounting,” CAS Study Note, 2007. pp. 1–13, including errata, excluding Appendix and end notes.	Feldblum (Loss Reserve Discounting)	D5	W

<b>Citation</b>	<b>Abbreviation</b>	<b>Learning Objective</b>	<b>Source</b>
Feldblum, S., "NAIC Property/Casualty Insurance Company Risk-Based Capital Requirements," <i>PCAS LXXXIII</i> , 1996, pp. 297-358 (end at "The Square Root Rule") and 379-389 (excluding Section 11 and related exhibits).	Feldblum (RBC)	B2, D2	<b>W NEW</b>
Feldblum, S., "Notes to the Financial Statement," CAS Study Note, May 2004.	Feldblum (Notes)	D1	<b>W</b>
Feldblum, S., "Reinsurance Accounting: Schedule F" (Eighth Edition), CAS Study Note, April 2003. Candidates are not responsible for the end notes.	Feldblum (Schedule F)	D1	<b>W</b>
Feldblum, S., "Statutory Surplus: Computation, Pricing and Valuation," CAS Study Note, June 2003. Candidates are not responsible for the end notes.	Feldblum (Surplus)	D1	<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., "Special Issues—Data Sources," <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>
"Government Insurers Study Note," CAS Study Note, May 2008. Candidates are not responsible for numbers or statistics in charts.	Government Insurers Study Note	C1, C2, C3	<b>W 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, 2002, pp. 6.32-6.34, 8.20-8.26, and 9.36-9.40.	Hamilton and Ferguson	A2, C1, C2, C3	<b>SK NEW</b>
Harrington, S.E., "Insurance Rate Regulation in the 20 <sup>th</sup> 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>
Insurance Accounting and Systems Association, <i>Property-Casualty Insurance Accounting</i> (Eighth Edition), 2003, Chapters 2, 5, 8, 9, 10, 14, 15, and 18. Candidates are not responsible for items in the update to the 2003 Edition.	IASA 1	D1, D3	<b>L</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). Candidates are not responsible for items in the update to the 2003 Edition.	IASA 2	D1	<b>L</b>

<b>Citation</b>	<b>Abbreviation</b>	<b>Learning Objective</b>	<b>Source</b>
Insurance Accounting and Systems Association, <i>Property-Casualty Insurance Accounting (Eight Edition)</i> , 2003, Chapter 16 pp. 27-33. Candidates are not responsible for items in the update to the 2003 Edition.	IASA 3	D2	L
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	SK
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, A4	SK
Marshall, T.S.; and Neale, F.R., “Troubled Waters in Mississippi, The Homeowners Market and the Attorney General Lawsuit,” <i>CPCU eJournal</i> , November 2006. Candidates are not responsible for data in tables or the quantitative data in the Introduction, Mississippi Damage, or the Analysis of Mississippi Homeowner Insurance Market sections.	Marshall and Neale	C3	SK
Miceli, T.J., <i>The Economic Approach to Law</i> , 2004, Stanford University Press, Chapter 2, Sections 1 and 2 (pp. 38-54), Section 3.4 (pp. 66-68), Section 3.7, and 3.8 (pp. 71-73); and Chapter 3, Section 1 (pp. 80-93). The candidate may wish to review some of the material for VEE-Economics, especially on microeconomics and decision making.	Miceli	A1, A3, A4	SK
Musulini, 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.	Musulini	B2	SK
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2008, Preamble.	NAIC APPM, Preamble	D3	SKU NEW
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2008, Statement of Statutory Accounting Principles 53, “Property Casualty Contracts—Premiums,” paragraphs 1-17.	NAIC SSAP 53	D1	SKU NEW
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2008, Statement of Statutory Accounting Principles 62, “Property and Casualty Reinsurance,” paragraphs 1-82.	NAIC SSAP 62	D1	SKU NEW
National Association of Insurance Commissioners, <i>Accounting Practices and Procedures Manual</i> , 2008, Statement of Statutory Accounting Principles 65, “Property and Casualty Contracts,” paragraphs 1-45.	NAIC SSAP 65	D1	SKU NEW

Citation	Abbreviation	Learning Objective	Source
National Association of Insurance Commissioners, <i>Official 2008 NAIC Annual Statement Blanks, Property and Casualty</i> , (both individual and consolidated basis), pp. 2-13, Notes to the Financial Statement pp. 14, (Notes 23-27, 32, and 33); 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 other sections of the annual statement that are discussed in other <i>Syllabus</i> readings. Candidates are not responsible for page numbers. [The “Notes to the Financial Statement” 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. If the 2008 Annual Statement and the study materials differ, candidates may base their answers on either.]	NAIC Annual Statement	D1	L NEW
National Association of Insurance Commissioners, “Property and Casualty Model Rating Law (File and Use Version),” Model Regulation Service 1998.	NAIC Model Law	B1	SK
National Association of Insurance Commissioners, “NAIC Insurance Regulatory Information System,” 2007, Section II, Property/Casualty Ratios, pp. 5-30.	NAIC IRIS	B2, D1, D2	SKU NEW
Nyce, C.M., “ <i>Foundations of Risk Management and Insurance</i> ” (Second Edition), 2006, American Institute for Chartered Property Casualty Underwriters, pp. 8.27–8.32	Nyce	C1, C2, C3	SK
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.	OSFI MCT	D1, D3	SK
Wagner, T., “Insurance Rating Bureaus,” <i>Journal of Insurance Regulation</i> , Winter 2000, pp. 189-202.	Wagner	B1, B2, B3, B4	SK
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. 10.25-10.32 and 12.26-12.33.	Wiening et al.	C1, C2, C3	SK
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	SK

## Source Key

- L** May be purchased from the publisher or bookstore or borrowed from the CAS Library.
- NEW** Indicates new or updated material.
- SK** Represents material included in the 2009 CAS Study Kit.
- SKU** Represents material included in the 2009 CAS Study Kit and the 2009 Update to the 2008 Study Kit.
- W** Represents material in the 2009 Web Notes that is available at no charge from the “Study Tools” section of the CAS Web Site. A printed version may be purchased.

## 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), 107 Groppo Drive, Suite A, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: retail@actexmadriver.com; Web site: www.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.

*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 Services, 1717 Arch Street, 31st Floor, Philadelphia, PA 19103; telephone: (215) 988-5690 or (800) 234-6859.

Bowne Insurance Services, 1717 Arch Street, 31st Floor, Philadelphia, PA 19103; telephone: (215) 988-5690 or (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; Web site: www.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.

Insurance Expense Exhibit, Bowne Insurance Services, 1717 Arch Street, 31st Floor, Philadelphia, PA 19103; telephone: (215) 988-5690 or (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. 12<sup>th</sup> 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; Web site: www.aria@cpcuia.org.

*NAIC Annual Statement Blanks, Property and Casualty* may be obtained from Bowne Insurance Services, 1717 Arch Street, 31st Floor, Philadelphia, PA 19103; telephone: (215) 988-5690 or (800) 223-3103.

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

Stanford University Press, 1450 Page Mill Road, Palo Alto, CA, 94304; telephone (800) 621-2736; Web site: [www.sup.org](http://www.sup.org).



# Fellowship Exams

## Exam 8

### Investments and Financial Analysis

Before commencing study for this four-hour examination, candidates should read the “Introduction” to “Materials for Study” for important information about learning objectives, knowledge statements, readings, and the range of weights. Items marked with a bold **SK** or **SKU** constitute the 2009 CAS Exam 8 Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **W**—the 2009 CAS Exam 8 Web Notes—are available at no charge in the “Study Tools” section of the CAS Web Site or may be purchased from the CAS Online Store. The 2009 Update to the 2008 Study Kit includes only the new item marked with a bold **SKU** and may be purchased from the CAS Online Store.

Please check the “Syllabus Updates” section of the CAS Web Site for any changes to the *Syllabus*.

The CAS will test the candidate’s knowledge of topics that are presented in the learning objectives. Thus, the candidate should expect that each exam will cover many of the learning objectives and associated knowledge statements and syllabus readings, and that all of these will be tested at least once over the course of a few years—but each one may not be covered 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-E covering mostly financial theory and tools and Sections F-H 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.

#### READINGS

There are two main texts: *Investments* (2009) by Bodie, Kane, and Marcus and *Options, Futures and Other Derivatives* (2009) by Hull. In addition, one chapter from *The Handbook of Fixed Income Securities* (2005) edited by Fabozzi is 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 is not part of the learning objectives.

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 Excel applications or 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 references to later chapters in texts may occur before 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 part of the material covered by the exam 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.

#### BACKGROUND – FINANCIAL MARKETS AND INSTRUMENTS

Candidates may find it helpful to review Chapters 1-5 of *Investments* by Bodie, Kane, and Marcus for background in financial markets and instruments.

## A. Portfolio Theory and Equilibrium in Capital Markets

Range of weight for Section A: 13-17 percent

The portfolio theory portion of 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. In the portion of this section on equilibrium in capital markets, various equilibrium models are presented, including the Capital Asset Pricing Model, Arbitrage Pricing Theory, and other multi-factor 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>1. Calculate the expected return and standard deviation of return for a portfolio consisting of a risky asset and risk-free asset and identify optimal combinations of the risky asset and the risk-free asset for investors with different levels of risk aversion.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Utility functions, utility scores and utility maximization</p> <p>b. Risk aversion</p> <p>c. Mean-variance criterion</p> <p>d. Capital allocation line</p> <p>e. Complete portfolio</p> <p>f. Reward to variability ratio (Sharpe ratio)</p>
<b>READINGS</b>	
BKM, Chapter 6	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>2. Determine the weights for two risky assets in the optimal risky portfolio and the weights on the components of the optimal complete portfolio.</p> <p>Range of weight: 3-7 percent</p>	<p>a. Expected return for portfolios of risky and risk-free assets</p> <p>b. Standard deviation of return for portfolios of two or more risky assets</p> <p>c. Standard deviation of return for portfolios of risky and risk-free assets</p> <p>d. Reward to variability ratio (Sharpe ratio)</p> <p>e. Optimal risky portfolio</p> <p>f. Optimal complete portfolio</p>
<p>3. Describe two arguments why a passive strategy for selecting a portfolio of risky assets may be a reasonable choice for many investors and the key steps in the Markowitz Portfolio Selection Model.</p> <p>Range of weight: 3-7 percent</p>	<p>a. Passive vs. active strategies: Costs of active strategy and free-rider benefit</p> <p>b. Minimum variance frontier</p> <p>c. Efficient frontier of risky assets</p> <p>d. Optimal capital allocation line</p> <p>e. Separation property</p> <p>f. Asset allocation vs. security selection</p>
<p>4. Calculate the variance of returns for an equally weighted portfolio of risky assets and describe the limits to the benefits of diversification.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Systematic risk</p> <p>b. Risk pooling</p> <p>c. Risk sharing</p> <p>d. Insurance principle</p>
<b>READINGS</b>	
BKM, Chapter 7	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>5. Use a single index model to calculate a security's expected return, variance, covariance (and correlation) with other securities and its beta.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Single factor model</p> <p>b. Single index model</p> <p>c. Systematic risk</p> <p>d. Alpha</p> <p>e. Covariance and correlation estimates for single index model</p> <p>f. Estimating beta using single index model</p> <p>g. Adjusting beta estimates to reflect tendency of betas to move towards 1.0 and account for estimation error.</p> <p>h. Forecasting beta</p>
<p>6. Contrast the process of portfolio construction using the single index model and the full covariance (Markowitz) model.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Markowitz model</p> <p>b. Single index model</p> <p>c. Alpha</p> <p>d. Risk premiums due to market and non-market factors</p> <p>e. Role of parameter estimation risk</p> <p>f. Decentralizing macroeconomic analysis and security analysis</p>
<b>READINGS</b>	
BKM, Chapter 8	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>7. Explain the Capital Asset Pricing Model, including the major assumptions and examples of its applications. Use CAPM to measure expected returns for risky securities with different risk characteristics. Explain the assumptions that are modified under various extensions of CAPM.</p> <p>Range of weight: 3-7 percent</p>	<p>a. CAPM assumptions and why these cause all investors to hold the market portfolio</p> <p>b. Market price of risk</p> <p>c. Capital market line</p> <p>d. Security market line</p> <p>e. Beta</p> <p>f. Extensions of CAPM – Zero Beta CAPM, CAPM with Non-Traded Assets and Labor Income, ICAPM, CAPM with Liquidity Adjustments</p>
<p>8. Describe the differences between CAPM and the Single Index Model, including their respective implications for security alphas.</p> <p>Range of weight: 0-5 percent</p>	<p>a. CAPM</p> <p>b. Single Index Model</p> <p>c. Expected vs. actual returns</p> <p>d. Market portfolio vs. market index</p>
<b>READINGS</b>	
BKM, Chapter 9	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>9. Use Arbitrage Pricing Theory to determine the expected return for a security given its factor sensitivities, using either known expected returns on the factor portfolios or by calculating the expected returns on the factor portfolios using the expected returns and factor sensitivities of other diversified portfolios.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Arbitrage and the Law of One Price</p> <p>b. Arbitrage Pricing Theory (APT) and its comparison to CAPM</p> <p>c. Factor betas</p> <p>d. Factor portfolios and factor risk premiums</p> <p>e. Alternative Factors in Multifactor Models: Macroeconomic Factors (Chen, Roll and Ross) and Fama-French Factors</p>
<b>READINGS</b>	
BKM, Chapter 10	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>10. Describe the concept of market efficiency, including the three major forms, and its implications for portfolio management.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Efficient Market Hypothesis: Weak Form, Semi-Strong Form, Strong Form</p> <p>b. Random walk</p> <p>c. Technical analysis</p> <p>d. Fundamental analysis</p> <p>e. Passive investment strategy and index funds</p> <p>f. Role of portfolio management in achieving appropriate diversification, reflecting tax differences and reflecting different risk tolerances.</p>
<p>11. Describe various tests of market efficiency and the resulting observations from various studies.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Weak form tests: Patterns in stock prices including momentum, returns over long horizons and predictors of broad market returns</p> <p>b. Semi-strong tests: Market anomalies, including P/E effect, small-firm effect, neglected-firm effect, book-to-market effect and post-earnings announcement price drift</p> <p>c. Strong form tests: Inside information</p> <p>d. Risk premiums vs. inefficiencies</p> <p>e. Anomalies vs. data mining</p> <p>f. The “noisy market hypothesis” and fundamental indexing</p> <p>g. Event studies and abnormal returns</p> <p>h. Performance of market professionals—analysts, mutual funds managers (including effect of survivor bias)</p>
<b>READINGS</b>	
BKM, Chapter 11	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>12. Describe how information processing errors, behavioral irrationalities and limits to arbitrage can affect market efficiency and evaluate the importance of the behavioral critique of market efficiency.</p> <p>Range of weight: 0-5 percent</p>	<ul style="list-style-type: none"> <li>a. Information processing errors including forecasting errors, overconfidence, conservatism, sample size neglect and representativeness</li> <li>b. Behavioral biases including framing, mental accounting, regret avoidance and prospect theory</li> <li>c. Limits to arbitrage including fundamental risk, implementation costs and model risks</li> <li>d. Examples of violations of Law of One Price, including “Siamese Twin” Companies (Royal Dutch/Shell), Equity carve outs (3Com/Palm) and Close End Fund discounts and premiums</li> <li>e. Behavioral critique, including inconsistencies and statistical significance</li> <li>f. Technical analysis—use of price data, volume data and sentiment indicators, and their links to the behavioral critique</li> </ul>
<b>READINGS</b>	
BKM, Chapter 12	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>13. Evaluate the practicality of CAPM.</p> <p>Range of weight: 0-5 percent</p>	<ul style="list-style-type: none"> <li>a. Testability of CAPM</li> <li>b. Failure of empirical tests of alpha values</li> <li>c. Role of decomposition of systematic and firm-specific risk and the efficiency of the market portfolio in CAPM’s acceptance in practice</li> <li>d. Use of CAPM by security analysts</li> <li>e. Statistical estimation problems associated with CAPM in practice</li> </ul>
<p>14. 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.</p> <p>Range of weight: 0-5 percent</p>	<ul style="list-style-type: none"> <li>a. Two-stage test of the expected return - beta relationship</li> <li>b. Statistical limitations, including actual versus expected returns, market index as proxy for market portfolio, measurement error, stochastic volatility</li> <li>c. Roll’s critique</li> <li>d. Important tests of CAPM, such as Miller and Scholes; Black, Jensen and Scholes; Fama and Macbeth, and their results/conclusions</li> <li>e. Accounting for Human Capital, Cyclical Variations, and Nontraded Business</li> <li>f. Chen, Roll and Ross tests of APT</li> <li>g. Fama and French’s 3-Factor Model, including alternative explanations of the empirical results as either priced risk factors or mispricings due to behavioral biases</li> </ul>
<b>READINGS</b>	
BKM, Chapters 9 and 13	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
15. Describe the Equity Premium Puzzle and various explanations for the puzzle. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Equity Premium Puzzle</li> <li>b. Fama and French's analysis based on the dividend discount model</li> <li>c. Expected vs. realized returns</li> <li>d. Survivorship bias</li> <li>e. Extensions of CAPM</li> <li>f. Behavioral explanations</li> </ul>
<b>READINGS</b>	
BKM, Chapter 13	

## B. Fixed Income Securities

Range of weight for Section B: 15-20 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.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
1. Describe key features of various fixed income securities and identify differences in how their cash flows are determined. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Key Features: Issuer, Contractual Cash Flows, Credit Risk, Tax Treatment for Investors</li> <li>b. Types of Fixed Income Securities: Treasury Notes and Bonds, Corporate Bonds, Preferred Stock, Asset-Backed Securities, Catastrophe Bonds, International Bonds, Indexed Bonds (e.g., TIPS)</li> </ul>
<b>READINGS</b>	
BKM, Chapter 14 Cummins CAT Bond Gorvett	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Determine the quoted price, cash price, and yield to maturity of U.S. Treasury Bonds and Corporate Bonds. Range of weight: 3-7 percent	<ul style="list-style-type: none"> <li>a. Accrued interest</li> <li>b. Quoted or Clean price</li> <li>c. Sale, Invoice, Cash or Dirty price</li> <li>d. Alternative yield measures—current yield, yield to maturity, yield to call, par yield</li> <li>e. Prices and yields for Zero Coupon Bonds</li> <li>f. Annual, quarterly and continuous compounding</li> <li>g. Day count conventions</li> </ul>
<b>READINGS</b>	
BKM, Chapter 14 Hull, Chapter 4 and Section 6.1	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
3. Calculate the pre-tax and after-tax holding period returns, taking into account taxes associated with the amortization of original issue discount. Range of weight: 0-5 percent	a. Holding Period Returns b. Original Issue Discount
<b>READINGS</b>	
BKM, Chapter 14	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
4. Explain the three different Term Structure Theories. Range of weight: 0-5 percent	a. Three theories, including Expectations Hypothesis, Liquidity Preference Theory, and Segmentation Theory b. Forward rate versus expected spot rate
5. Determine U.S. Treasury zero rates at different maturities (i.e., the term structure) based on U.S. Treasury bond yields and calculate forward rates from U.S. Treasury and LIBOR zero rates. Range of weight: 3-7 percent	a. Spot rates b. Short rates c. Bootstrap method for determining zero rates from coupon bonds using both continuous and semi-annual compounding d. LIBOR zero rates e. Determining forward rates from spot rates (zero rates) f. Forward Rate Agreements
<b>READINGS</b>	
BKM, Chapter 15 Hull, Chapter 4	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
6. Describe the process used to rate the default risk on corporate bonds and the various mechanisms used to limit this risk to investors. Range of weight: 0-5 percent	a. Methods to estimate bond default probabilities, including Financial Ratios and Altman's Z-Score b. Bond indentures including, sinking funds, subordination, dividend restrictions, and collateral
<b>READINGS</b>	
BKM, Chapter 14	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
7. Determine the promised (stated) yield and expected yield for corporate bonds, taking into account default probabilities and expected recovery rates. Range of weight: 3-7 percent	a. Promised (stated) yield b. Expected yield c. Unconditional default probability d. Conditional default probability, default intensity or hazard rate e. Default premium or yield spread
<b>READINGS</b>	
BKM, Chapter 14 Hull, Chapter 22	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
8. Determine the approximate default intensity for a corporate bond or the annual unconditional probability of default for a corporate bond given its yield, the risk free yield, and its expected recovery rate. Range of weight: 0-5 percent	a. Default intensity or hazard rate b. Unconditional default probability c. Expected loss from default d. Yield spread e. Recovery rate
<b>READINGS</b>	
Hull, Chapter 22	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
9. Calculate the historical default probabilities for corporate bonds using Altman's bond mortality method. Range of weight: 0-5 percent	a. Bond Mortality b. Marginal and Cumulative Mortality Rates
<b>READINGS</b>	
Altman	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
10. Discuss the reasons Altman gives for excess historical default premiums and the reasons Hull gives for differences between historical default probabilities and default probabilities implied by bond prices. Range of weight: 0-5 percent	a. Historical statistics of bond defaults and yields for various rating cohorts b. 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 c. Risk Neutral versus Real World estimates of default probabilities
<b>READINGS</b>	
Altman Hull, Chapter 22	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
11. Describe the use of Merton's model to estimate probabilities of default using equity prices and equity volatility. Range of weight: 0-5 percent	a. Equity as a call option on the assets of the firm b. Relationship between asset volatility and equity volatility
<b>READINGS</b>	
Hull, Chapter 22	

## C. Futures, Forwards and Swaps

Range of weight for Section C: 8-12 percent

This section covers in detail various derivative instruments, including futures, forwards, and swaps. The emphasis in each case is on understanding 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>
<p>1. Describe the standardized features of futures contracts that are specified by the Exchange and how futures contracts differ from forward contracts.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Standardized features, including asset description, contract size, delivery arrangements, delivery months, method of quoting prices, price, and position limits</p> <p>b. Margins</p> <p>c. Marking to market</p> <p>d. Closing out positions</p>
<b>READINGS</b>	
Hull, 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>
<p>2. Use forward and/or futures contracts to either hedge the future purchase or sale of an asset or to hedge a portfolio of stocks.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Long hedge versus short hedge</p> <p>b. Arguments for and against hedging</p> <p>c. Basis risk</p> <p>d. Minimum variance hedge ratio</p> <p>e. Optimal number of futures contracts for hedging asset positions</p> <p>f. Optimal number of index futures contracts to hedge portfolios</p>
<b>READINGS</b>	
Hull, Chapter 3 (excluding Appendix)	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>3. Use arbitrage arguments to determine equilibrium forward prices for non-dividend paying stocks, dividend paying stocks, stock indices, currencies and commodities.</p> <p>Range of weight: 3-7 percent</p>	<p>a. Arbitrage</p> <p>b. Short selling</p> <p>c. Forward prices versus futures prices</p> <p>d. Convenience yields</p> <p>e. Relationship between forward prices and expected future spot prices</p> <p>f. Cost of carry</p> <p>g. Stock indices</p>
<p>4. Determine the value of an existing forward contract.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Present value difference of forward price and the delivery price of an existing forward contract</p>
<b>READINGS</b>	
Hull, Chapters 3 and 5 (excluding Appendix)	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
5. Describe how Interest Rate Swaps or Currency Swaps can be used to alter the interest rate sensitivity or exchange rate sensitivity of an asset or a liability. Range of weight: 0-5 percent	a. Swap cash flow mechanics b. Role of financial intermediary c. Comparative advantage argument for swaps and the role of the counterparties' credit ratings
6. Determine the value of an existing interest rate swap or currency swap and the equilibrium swap rate. Range of weight: 0-5 percent	a. Swap rate b. LIBOR/swap zero rate c. Value of a swap as an exchange of bonds d. Value of a swap as series of forward agreements
<b>READINGS</b>	
Hull, Chapter 7	

## D. Options

Range of weight for Section D: 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 they can be used to manage financial risk. Various valuation models are presented and used to determine the values of a variety of options.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
1. 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. Range of weight: 0-5 percent	a. 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 b. Effect of cash dividends, stock dividends, and stock splits on stock option contracts c. Early exercise of American puts and calls, with and without dividends
<b>READINGS</b>	
Hull, Chapters 8 and 9	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
2. Use Put-Call Parity to determine the relationship between prices of European Put and Call options and to identify arbitrage opportunities. Range of weight: 0-5 percent	a. Arbitrage b. Put-Call Parity for European options c. Use of short selling to lock in arbitrage profits d. Effect of dividends on put-call parity
<b>READINGS</b>	
Hull, Chapter 9	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Draw payoff and profit diagrams for different trading strategies involving options. Range of weight: 0-5 percent	a. Combinations of options with underlying stock b. Spreads—Bull, Bear, Box, Butterfly, Calendar, Diagonal c. Combinations—Straddle, Strips, Straps, Strangles
<b>READINGS</b>	
Hull, Chapter 10	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Value European and American Put and Call options using the Binomial Model and Risk Neutral Valuation Model. Range of weight: 3-7 percent	a. Single period and multi-period binomial stock price trees b. Selecting parameters ( $u$ and $d$ ) for the binomial option pricing model based on the stock volatility c. Risk neutral valuation method d. Risk neutral probabilities e. Early exercise of American options f. Binomial model for options on dividend-paying stocks, indices, currencies and futures
<b>READINGS</b>	
Hull, Chapter 11	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
5. Value European Puts and Calls using the Black-Scholes Option Pricing Formula for dividend and non-dividend paying stocks, indices, currencies, and futures contracts. Range of weight: 3-7 percent	a. Geometric Brownian Motion as a model for stock prices b. Estimation of volatility for option pricing purposes and implied volatility c. Put-call parity d. Methods for valuing European and American call options on dividend paying stocks, including Black's Approximation for American options e. Black Model for valuing futures options
<b>READINGS</b>	
Hull, Chapters 12 (excluding Appendix), 13 (excluding Appendix), 15, and 16	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
6. Explain the impact that various real-world deviations from the standard Black-Scholes assumptions would have on the accuracy of the Black-Scholes option pricing formula. Range of weight: 0-5 percent	Impact of: a. Changes in volatility b. Jumps in asset prices c. Changes in interest rates d. Borrowing penalties e. Short-selling restrictions f. Trading costs g. Taxes h. Dividends i. Takeovers
<b>READINGS</b>	
Hull, Chapter 13 (excluding Appendix) Black	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
7. Determine whether a particular function is a valid formula for the price of a derivative security using the Black-Scholes-Merton Differential Equation. Range of weight: 0-5 percent	a. Ito's Lemma b. Black-Scholes-Merton Differential Equation c. Riskless portfolio
<b>READINGS</b>	
Hull, Section 12.5 and Chapter 13 (excluding Appendix)	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
8. Explain the difference between standard options and warrants or executive stock options and use the Black-Scholes model with appropriate adjustments to determine the value of warrants. Range of weight: 0-5 percent	a. Black-Scholes Model b. Adjustments for new shares issued and exercise price paid
<b>READINGS</b>	
Hull, Chapter 13 (excluding Appendix)	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
9. Determine the value of bonds with embedded put or call features using a Binomial Interest Rate Tree. Range of weight: 3-7 percent	a. Binomial interest rate tree for short rate b. Calibrating a binomial interest rate tree using U.S. Government bonds c. Option-adjusted spread
<b>READINGS</b>	
Fabozzi, Chapter 37	

## E. International Securities

Range of weight for Section E: 0-5 percent

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Describe sources of risk in investing internationally, including exchange rate risk and country-specific risk. Range of weight: 0-5 percent	a. Exchange Rate Risk b. Country-specific risk and political risk
2. Describe the potential diversification benefits from investing in international securities for passive and active investors. Range of weight: 0-5 percent	a. Approaches: American Depositary Receipts, country specific mutual funds and ETFs (e.g. WEBS), derivatives on foreign markets b. Betas, Average Returns and Correlations c. Expected vs. realized returns and risk measures d. Home bias e. Empirical estimates of benefits for passive investors, including benefits over different historical time periods
<b>READINGS</b>	
BKM, Chapter 25	

## F. Asset-Liability Management

Range of weight for Section F: 5-10 percent

This section further exposes 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. The same concepts are also applied to the interest rate risk associated with a firm's liabilities and the interest rate risk associated with a firm's total market value, inclusive of their franchise value.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Describe how to use various strategies 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. Range of weight: 3-7 percent	a. Duration (Macaulay, Modified and Effective) b. Convexity c. Estimating the effect of interest changes on bond prices using duration and convexity risk measures d. Immunization – protecting current net worth or protecting future value of portfolio e. Cash flow matching and dedication f. Contingent immunization g. Rebalancing h. Use of interest rate swaps, mortgage-backed securities, and other derivative securities to alter the interest rate risk for a bond portfolio
<b>READINGS</b>	
BKM, Chapter 16 Hull, Sections 4.8 and 4.9, Chapter 7 Gorvett	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Calculate the Macaulay duration of loss reserves and the Macaulay duration of the surplus of a property-casualty insurance company using either annually or continuously compounded interest rates. Range of weight: 0-5 percent	a. Macaulay duration b. Relationship between surplus, asset and liability durations for a property-casualty insurance company
<b>READINGS</b>	
Feldblum Noris (excluding Sections I, II, V, and VI)	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Explain why Panning argues that traditional ALM, which emphasizes the interest rate risk management of the assets and liabilities on the balance sheet, is incomplete. Range of weight: 0-5 percent	a. Total Economic Value b. Franchise Value – Magnitude and exposure to interest rate risk (duration)
4. Explain the reason why, with constant expected losses, fixed expenses and premiums that reflect a constant target return on surplus, an insurer's franchise value would have a high duration and how this duration can be altered through changes in the pricing strategy. Range of weight: 0-5 percent	a. Duration of franchise value b. Pricing strategy as defined by <i>a</i> and <i>b</i> parameters c. Advantages of managing the interest rate sensitivity of the firm's total economic value through the pricing strategy as opposed to changing the asset mix or using derivatives
<b>READINGS</b>	
Panning	

## G. Financial Risk Management

Range of weight for Section G: 20-25 percent

This section goes beyond the treatment of Asset-Liability Management in Section F to include other sources of financial risk beyond interest rate 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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. 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). Range of weight: 0-5 percent	a. Delta b. Gamma c. Vega d. Theta e. Rho

<p>2. Demonstrate how to delta, gamma and vega hedge a portfolio of stocks and options. Range of weight: 3-7 percent</p>	<p>a. Strategies for managing risk of written option contracts: do nothing, cover, stop loss, delta hedging b. Delta hedging c. Gamma hedging d. Vega hedging e. Delta, gamma, and vega of stocks, futures, and forwards f. Using futures or forwards to delta hedge efficiently g. Portfolio insurance (synthetic)</p>
<p><b>READINGS</b></p>	
<p>Hull, Section 15.1 and Chapter 17 (excluding Appendix)</p>	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>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</p>	<p>a. VaR definition b. VaR for individual stocks using model building (variance-covariance) approach c. VaR for portfolio of stocks using linear model d. VaR for bonds using linear model and duration e. Cash flow mapping procedure for bonds f. VaR for options using linear model and quadratic model</p>
<p><b>READINGS</b></p>	
<p>Hull, Chapter 20</p>	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>4. Describe alternative ways to estimate the VaR besides analytical calculations. Range of weight: 0-5 percent</p>	<p>a. Historical simulation b. Monte Carlo simulation, including partial simulation approach c. Stress testing and back testing</p>
<p><b>READINGS</b></p>	
<p>Hull, Chapter 20 Culp, Miller and Neves (excluding Appendix)</p>	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>5. Describe various mechanisms firms can use to reduce their credit risk on derivatives. Range of weight: 0-5 percent</p>	<p>a. Netting b. Collateralization c. Downgrade triggers</p>
<p>6. Describe the <i>CreditMetrics</i> approach to estimating Credit Value at Risk for a single bond or a portfolio of bonds. Range of weight: 0-5 percent</p>	<p>a. Credit ratings transition matrix b. Use of Gaussian copula to simulate correlated ratings transitions for two bonds</p>
<p><b>READINGS</b></p>	
<p>Hull, Chapter 22</p>	

<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>Range of weight: 0-5 percent</p>	<p>a. 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>b. Limitations of VaR, including limited data to parameterize models over long horizons and deviations of real world distributions from normality assumption</p> <p>c. Cash Flow at Risk</p> <p>d. Risk-Based Capital</p> <p>e. Shortfall Risk</p>

**READINGS**

Stulz  
Culp, Miller and Neves (excluding Appendix)  
Butsic  
Cummins Capital

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>8. Explain why financial risk management can enhance the value of a firm.</p> <p>Range of weight: 0-5 percent</p>	<p>Effect of risk management on:</p> <p>a. Bankruptcy costs</p> <p>b. Taxes</p> <p>c. Payments to stakeholders</p> <p>d. Access to capital for new investments</p> <p>e. Capital structure</p> <p>f. Management incentives</p>

**READINGS**

Stulz  
Butsic

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
<p>9. Describe how a firm's capital structure or credit rating could affect their preferred degree of financial risk management.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Highly-rated firms</p> <p>b. Low-rated firms</p> <p>c. Firms in distress</p>

**READINGS**

Stulz



LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>10. Describe how firms can use Risk Adjusted Return on Capital (RAROC) and Economic Value Added (EVA) measures to maximize value creation.</p> <p>Range of weight: 0-5 percent</p>	<p>a. RAROC, including alternative measures of income and alternative measures of risk-adjusted capital</p> <p>b. EVA</p> <p>c. Management of risk taking by measuring gains on a risk-adjusted basis and design of compensation systems to reward excess returns only</p>
<b>READINGS</b>	
<p>Goldfarb Risk-Adjusted Performance Measurement Cummins Capital Stulz</p>	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>11. Determine how to allocate risk capital to various risk sources or lines of business, and discuss the strengths and weaknesses of the various methods.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Distinction between risk measures and risk capital</p> <p>b. Proportional allocation using risk measures such as Percentile (VaR), CTE or EPD Ratio</p> <p>c. Merton-Perold method using Insolvency Put/EPD Ratio risk measure</p> <p>d. Myers-Read method</p> <p>e. Co-Measures, such as Co-CTE</p>
<b>READINGS</b>	
<p>Goldfarb Risk-Adjusted Performance Measurement Cummins Capital</p>	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
<p>12. Describe the key risk sources included in Goldfarb's risk-adjusted return on capital (RAROC) framework.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Market Risk</p> <p>b. Credit Risk</p> <p>c. Insurance Risk, including loss reserve risk, underwriting risk, property catastrophe risk</p> <p>d. Other risks, including operational and strategic risk</p>
<p>13. Use the methodology discussed in Goldfarb's Risk-Adjusted Performance Measurement to evaluate actual, <i>ex post</i>, performance of different business units using RAROC.</p> <p>Range of weight: 0-5 percent</p>	<p>a. Measures of income</p> <p>b. Alternative methods used to allocate risk capital</p> <p>c. Return on Risk-Adjusted Capital (RAROC)</p>
<p>14. Use RAROC as a basis for insurance policy pricing by calculating the additional risk margin needed to achieve a target RAROC.</p> <p>Range of weight 0-5 percent</p>	<p>a. Economic profit as income measure</p> <p>b. Allocation of risk capital</p> <p>c. Cost of capital</p> <p>d. Additional risk margin</p> <p>e. Multi-period capital commitment</p>
<b>READINGS</b>	
<p>Goldfarb Risk-Adjusted Performance Measurement Cummins Capital</p>	

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
15. Describe the three types of friction costs associated with an insurer's capital. Range of weight: 0-5 percent	a. Friction costs, including agency costs, double taxation and regulation

<b>READINGS</b>
Cummins Capital

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
16. Calculate the Expected Policyholder Deficit (EPD) for an insurance policy or line of business. Range of weight: 0-5 percent	a. Expected Policyholder Deficit (EPD)
17. 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. Range of weight: 0-5 percent	a. EPD ratio b. Alternative assumptions about invested assets (cash versus risky securities)

<b>READINGS</b>
Butsic Cummins Capital

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
18. Discuss how banks have used mortgage backed securities and other forms of securitization to alter their exposure to interest rate risk, prepayment risk and credit risk. Range of weight: 0-5 percent	a. Impact of securitization on sources of funds for mortgage holders and on interest rate risk retained by the mortgage originators b. Mortgage pass throughs and the effect of mortgage prepayment on cash flows to investors c. Collateralized Mortgage Obligations (CMOs) and the impact of prepayments on cash flows to investors in particular tranches
19. Describe the benefits that various forms of securitization have created for the financial markets. Range of weight: 0-5 percent	a. Increased liquidity b. Observable market prices c. Lower costs of financing d. Improved credit ratings for institutions that are able to transfer their risk to a broader pool of investors
20. Describe the market for securitizing catastrophic risk and explain the reasons for its growth. Range of weight: 0-5 percent	a. Products on the market, including Risk-Linked Securities, CAT Bonds, Sidecars, Cat-E-Puts, Catastrophe Risk Swaps, and Industry Loss Warranties b. Factors influencing interest in insurance securitization in relation to traditional reinsurance c. Factors impeding the growth of the market, including regulatory, accounting, tax, and rating issues

<b>READINGS</b>
BKM, Chapter 1 (p. 16), Chapter 2 (pp. 34-35), and Chapter 16 (Section 16.2) Cummins CAT Bond Gorvett

## H. Valuation

Range of weight for Section H: 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.

<b>Learning Objectives</b>	<b>Knowledge Statements</b>
1. Value the equity of a firm based on its expected future dividends. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Dividend Discount Model (DDM), using no growth, constant growth, or two-stage growth assumptions</li> <li>b. Estimating dividend growth rates based on dividend payout ratios and return on equity</li> <li>c. Terminal values</li> </ul>
2. Calculate the impact of loss and expense reserve requirements and regulatory or rating agency capital requirements on the free cash flow to equity for a P&C insurer. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Free cash flow to equity for a P&amp;C insurer</li> </ul>
3. Value the equity of a P&C insurer based on its expected future dividends, its free cash flow to equity, or its expected abnormal earnings. Range of weight: 3-7 percent	<ul style="list-style-type: none"> <li>a. Dividend Discount Model (DDM)</li> <li>b. Free cash flow to equity for a P&amp;C insurer</li> <li>c. Discounted Cash Flow (DCF) Valuation using free cash flow to equity (FCFE), including impact of alternative methods of estimating terminal values and reasons why this method is preferred over the free cash flow to the firm (FCFF) method for P&amp;C insurers</li> <li>d. Abnormal earnings</li> <li>e. Abnormal Earnings Valuation (AE), including impact of alternative methods of estimating terminal values</li> </ul>
4. Value the equity of a firm using comparative or relative valuation methods based on multiples of selected financial variables obtained from either peer companies or from underlying fundamentals. Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. Comparative valuation ratios including price-earnings, price-sales, price-book, price-cash flow</li> <li>b. Relationship between the dividend discount model and the price-earnings (P-E) ratio</li> <li>c. Relationship between the abnormal earnings valuation model and the price-book value (P-BV) ratio</li> </ul>

<b>READINGS</b>
BKM, Chapter 18 Goldfarb Valuation

## Complete Text References for Exam 8

Text references are alphabetized by the citation column.

Citation	Abbreviation	Learning Objective	Source
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	B9-10	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	D6	SK
Bodie, Z.; Kane, A.; and Marcus, A.J., <i>Investments</i> (Eighth Edition), McGraw-Hill/Irwin, 2009. Chapter or section citations are listed under the appropriate learning objective, and include Chapters 1, 2, 6-16, 18, and 25.	BKM	A1-15, B1-7, E1-2, F1, G18-20, H1-4	L NEW
Butsic, R.P., "Solvency Measurement for Property-Liability Risk-Based Capital Applications," <i>The Journal of Risk and Insurance</i> , Volume 61, No. 4 (December 1994), pp. 656-690.	Butsic	G7-8, G16-17	SK
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	G4, G7	SK
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 Capital	G7, G10-17	SK
Cummins, J. D., "CAT Bond and Other Risk-Linked Securities: State of the Market and Recent Developments," <i>Risk Management and Insurance Review</i> , American Risk and Insurance Association, Inc., 2008, Vol. 11, No. 1, pp. 23-47.	Cummins CAT Bond	B1, G18-20	SKU NEW
Fabozzi, F.J., <i>The Handbook of Fixed Income Securities</i> (Seventh Edition), McGraw-Hill, 2005, Chapter 37.	Fabozzi	D9	SK
Feldblum, S., "Asset Liability Matching For Property/Casualty Insurers," <i>Valuation Issues, CAS Special Interest Seminar</i> , 1989, pp. 117-154.	Feldblum	F2	W
Goldfarb, R. "CAS Exam 8 Study Note: P&C Insurance Company Valuation," August 2005.	Goldfarb Valuation	H1-4	W
Goldfarb, R. "CAS Exam 8 Study Note: Risk-Adjusted Performance Measurement for P&C Insurers," December 2006.	Goldfarb Risk-Adjusted Performance Measurement	G10-14	W
Gorvett, R.W., "Insurance Securitization: The Development of a New Asset Class," <i>Securitization of Risk, Casualty Actuarial Society Discussion Paper Program</i> , May 1999, pp. 133-140.	Gorvett	B1, F1, G18-20	W NEW

Citation	Abbreviation	Learning Objective	Source
Hull, J.C., <i>Options, Futures, and Other Derivatives</i> (Seventh Edition), Prentice Hall, 2009. Chapter or section citations are listed under the appropriate learning objective, and include Chapters 2-5, 6.1, 7-13, 15-17, 20, and 22.	Hull	B2, B4-5, B7-8, B10-11, C1-6, D1-8, F1, G1-6	L NEW
Noris, P.D., "Asset/Liability Management Strategies for Property and Casualty Companies," Morgan Stanley, May 1985.	Noris	F2	SK
Panning, W.H., "Managing Interest Rate Risk: ALM, Franchise Value, and Strategy," Willis Re Working Paper, July 2006.	Panning	F3-4	W
Stulz, R.M., "Rethinking Risk Management," <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.	Stulz	G7-10	SK

## Source Key

- L** May be purchased from the publisher or bookstore or borrowed from the CAS Library.
- NEW** Indicates new or updated material or modified citation.
- SK** Represents material included in the 2009 CAS Study Kit.
- SKU** Represents material included in the 2009 CAS Study Kit and the 2009 Update to the 2008 Study Kit.
- W** Represents material in the 2009 Web Notes that is available at no charge from the "Study Tools" section of the CAS Web Site. A printed version may be purchased from the CAS Online Store.

## 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.

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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; Web site: www.actuarialbookstore.com.

American Risk and Insurance Association, 716 Providence Road, Malvern, PA 19355; telephone: (610) 640-1997; Web site: aria@cpcuia.org.

Bodie, Z.; Kane, A.; and Marcus, A.J., *Investments* (Eighth Edition), 2009, McGraw-Hill/Irwin, 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262-4729.

Casualty Actuarial Society *Forum*, *PCAS*, and *Discussion Paper Program*, Casualty Actuarial Society, 4350 N. Fairfax Drive, Suite 250, Arlington, VA 22203; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: office@casact.org; Web site: www.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* (Seventh Edition), 2005, McGraw-Hill, 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262-4729.

Hull, J.C., *Options, Futures, and Other Derivatives* (Seventh Edition), 2009, Prentice Hall; telephone: (800) 374-1200; Web site: [www.prenhall.com](http://www.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; Web site: [www.aria.org](http://www.aria.org).

McGraw-Hill/Irwin, 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262-4729.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; 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 9

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

Before commencing study for this four-hour examination, candidates should read the “Introduction” to “Materials for Study” for important information about learning objectives, knowledge statements, readings, and the range of weights. Items marked with a bold **SK** or **SKU** constitute the 2009 CAS Exam 9 Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **W**—the 2009 CAS Exam 9 Web Notes—are available at no charge in the “Study Tools” section of the CAS Web Site or may be purchased from the CAS Online Store. The 2009 Update to the 2008 Study Kit includes only the new items marked with a bold **SKU** and may be purchased from the CAS Online Store.

Please check the “Syllabus Updates” section of the CAS Web Site for any changes to the *Syllabus*.

The CAS will test the candidate’s knowledge of topics that are presented in the learning objectives. Thus, the candidate should expect that each exam will cover a large proportion of the learning objectives and associated knowledge statements and syllabus readings, and that all of these will be tested at least once over the course of a few years—but each one may not be covered on a particular exam.

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. Range of weight: 0-5 percent	a. Characteristics of appropriate classes (Statement of Principles) b. Sampling techniques c. Credibility considerations
2. Measure the statistical significance of possible classes. Range of weight: 0-5 percent	a. Characteristics of appropriate classes (Statement of Principles) b. Sampling techniques c. Credibility considerations
<b>READINGS</b>	
AAA Bailey and Simon Cummins et al. Feldblum and Brosius Mahler 1	

3. Formularize and solve Generalized Linear Models (GLMs). Range of weight: 0-5 percent	<ul style="list-style-type: none"> <li>a. GLM assumptions compared to one-way analysis, minimum bias procedures, and classical linear analysis</li> <li>b. Components of a GLM formula</li> <li>c. Aliasing and near-aliasing</li> </ul>
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**READINGS**

Anderson et al.  
Bailey and Simon  
Feldblum and Brosius

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Translate the class differences into price differences. Range of weight: 5-10 percent	<ul style="list-style-type: none"> <li>a. Multidimensional relativities</li> <li>b. Credibility techniques</li> </ul>

**READINGS**

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
1. Apply frequency and severity distributions to determine expected losses by layer of insurance. Range of weight: 5-10 percent	<ul style="list-style-type: none"> <li>a. Different descriptions and uses of severity distributions, including ILFs and Loss Elimination Ratios (LERs)</li> <li>b. Properties of ILFs</li> <li>c. Interaction among inflation, changes in layer, and losses</li> <li>d. Methods of estimating frequency and severity distributions from losses</li> </ul>

**READINGS**

Gillam and Snader 1  
Lee 1  
Mahler 2  
Miccolis

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Estimate aggregate loss distributions. Range of weight: 5-10 percent	<ul style="list-style-type: none"> <li>a. Techniques to estimate aggregate loss distributions directly from aggregate data (e.g., Table M, Table L)</li> <li>b. Construction of an aggregate loss distribution from frequency and severity distributions</li> </ul>



<b>READINGS</b>
Brosius Gillam and Snader 2 Lee 2 Mahler 3 Skurnick

## C. 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 a catastrophe risk load.

<b>LEARNING OBJECTIVES</b>	<b>KNOWLEDGE STATEMENTS</b>
1. Estimate the probability and potential cost of Catastrophic Events. Range of weight: 0-5 percent	a. Models used to estimate the probability and potential cost of catastrophic events
<b>READINGS</b>	
Walters and Morin	

## D. 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 expected profit loaded in rates may not be realized. The models discussed in Learning Objectives 1 and 2 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>
1. Analyze rate of return. Range of weight: 10-15 percent	a. Composition of surplus b. 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> c. 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. Range of weight: 10-15 percent	a. Composition of surplus b. 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> c. Sources and types of data used for analysis including calendar year versus accident year

READINGS
Feldblum Ferrari McClenahan Robbin Roth

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Determine risk load and contingency provision to be included in insurance rates. Range of weight: 10-15 percent	a. Theory underlying the risk load (including why a risk load is necessary and relationship between risk load and variability)

READINGS
Bault Feldblum Ferrari Kreps Mango Roth

## E. 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 addressed 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:

1. Prospective rating, in which prior individual risk experience is used to adjust rates prospectively (also known as experience rating);
2. 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 are 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 *Commercial General Liability Experience and Schedule Rating Plan* 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 (or Experience) 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
1. Adjust class rates based on individual risk experience and exposure. Range of weight: 5-10 percent	a. Actuarial principles and concepts underlying development of experience rating plans b. Credibility concepts (e.g., maximum single loss) c. Current NCCI and ISO experience rating plans d. Schedule rating
<b>READINGS</b>	
Gillam Gillam and Snader 1 ISO NCCI 1 NCCI 2 Venter	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Assess effectiveness of experience rating plans. Range of weight: 5-10 percent	a. Off-balance factors b. Evaluation techniques (e.g., quintile test)
<b>READINGS</b>	
Gillam Venter	

***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 rating and deductible rating are other methods that allow 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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Construct a retrospectively rated plan. Range of weight: 8-13 percent	a. Actuarial principles and concepts underlying the construction of a retrospective rating plan (e.g., balance principle, construction of table of insurance charges) b. NCCI retrospective rating plans
<b>READINGS</b>	
Brosius Gillam and Snader 2 Lee 2 NCCI 3 Skurnick	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Analyze the elements of a loss sensitive rating plan. Range of weight: 3-8 percent	a. How the parameters and other elements of the plan affect the final price and potential profitability of product b. How the parameters and other elements of the plan affect cost and cash flow to insured
<b>READINGS</b>	
Fisher Gillam and Snader 2 Lee 2 Skurnick	

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

## Complete Text References for Exam 9

*Text references are alphabetized by the citation column.*

Citation	Abbreviation	Learning Objective	Source
American Academy of Actuaries Committee on Risk Classification, "Risk Classification Statement of Principles," June 1980. (Available at no charge from the American Academy of Actuaries at (202) 223-8196 or on the Academy's Web Site at www.actuary.org.)	AAA	A1, A2	<b>W</b>
Anderson, D.; Feldblum, S; Modlin, C; Schirmacher, D.; Schirmacher, E.; and Thandi, N., "A Practitioner's Guide to Generalized Linear Models" ( <b>Third Edition</b> ), CAS Study Note, <b>February 2007</b> , pp. 4-39 only. [Note: the study note edition is a revised version of a paper from the <i>CAS Discussion Paper Program</i> . Candidates must use the study note edition.]	Anderson et al.	A3	<b>W</b> <b>NEW</b>
Bailey, R.A.; and Simon, L.J., "An Actuarial Note on the Credibility of Experience of a Single Private Passenger Car," <i>PCAS XLVI</i> , 1959, pp. 159-164. Including discussion of paper: Hazam, W.J., <i>PCAS XLVII</i> , 1960, pp. 150-152.	Bailey and Simon	A1, A2, A3, A4	<b>W</b>

Citation	Abbreviation	Learning Objective	Source
Bault, T., Discussion of Feldblum: "Risk Load for Insurers," <i>PCAS LXXII</i> , 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., "Risk Loads for Insurers," <i>PCAS LXXVII</i> , 1990, pp. 160-195, including discussions of paper: Philbrick, S.W., <i>PCAS LXXVIII</i> , 1991, pp. 56-63.	Bault	D3	<b>W</b>
Brosius, J.E., "Table M Construction," CAS Study Note, 2002.	Brosius	B2, E3	<b>W</b>
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, excluding the following two sections: "Additional Welfare Considerations" and "Effects of the Assumptions" (pp. 48-59). Candidates are not responsible for mathematical proofs.	Cummins et al.	A1, A2	<b>SK NEW</b>
Feldblum, S., "Pricing Insurance Policies: The Internal Rate of Return Model," 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	<b>W</b>
Feldblum, S.; and Brosius, J.E., "The Minimum Bias Procedure, A Practitioner's Guide," CAS Study Note, April 2003, including errata. Formulae in the summary section (pp. 53-54) are for reference only and need not be memorized.	Feldblum and Brosius	A1, A2, A3, A4	<b>W</b>
Ferrari, J.R., "The Relationship of Underwriting, Investment, Leverage, and Exposure to Total Return on Owners' Equity," <i>PCAS LV</i> , 1968, pp. 295-302. Includes discussion: Balcarek, R.J., <i>PCAS LVI</i> , 1969, pp. 58-60.	Ferrari	D1, D2, D3	<b>W</b>
Fisher, G.K., "Pricing Aggregates on Deductible Policies," CAS Study Note, 2002.	Fisher	E4, E5	<b>W</b>
Gillam, W.R., "Workers' Compensation Experience Rating: What Every Actuary Should Know," <i>PCAS LXXIX</i> , 1992, Sections 1-5, pp. 215-239.	Gillam	E1, E2	<b>W</b>
Gillam, W.R.; and Snader, R.H., "Fundamentals of Individual Risk Rating," National Council on Compensation Insurance (Study Note), 1992, Part I.	Gillam and Snader 1	B1, E1	<b>W</b>
Gillam, W.R.; and Snader, R.H., "Fundamentals of Individual Risk Rating," National Council on Compensation Insurance (Study Note), 1992, Part II.	Gillam and Snader 2	B2, E3, E4	<b>W</b>
Gillam, W.R.; and Snader, R.H., "Fundamentals of Individual Risk Rating," National Council on Compensation Insurance (Study Note), 1992, Part III.	Gillam and Snader 3	E5	<b>W</b>

Citation	Abbreviation	Learning Objective	Source
Insurance Services Office, Inc., <i>Commercial General Liability Experience and Schedule Rating Plan</i> , 2006. Excerpts from the ISO <i>Commercial General Liability Experience and Schedule Rating Plan</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
Kreps, R.E., "Investment-Equivalent Reinsurance Pricing," <i>Actuarial Considerations Regarding Risk and Return In Property-Casualty Insurance Pricing</i> , Casualty Actuarial Society, 1999, Chapter 6, excluding Section IV; including errata.	Kreps	D3	W
Lee, Y.S., "The Mathematics of Excess of Loss Coverages and Retrospective Rating—A Graphical Approach," Sections 1-3, <i>PCAS LXXV</i> , 1988, pp. 49-64.	Lee 1	B1	W
Lee, Y.S., "The Mathematics of Excess of Loss Coverage and Retrospective Rating—A Graphical Approach," 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., "An Example of Credibility and Shifting Risk Parameters," <i>PCAS LXXVII</i> , 1990, pp. 225-282. Candidates will not be tested on the Appendices.	Mahler 1	A1, A2	W
Mahler, H.C., Discussion of "Retrospective Rating: 1997 Excess Loss Factors," <i>PCAS LXXXV</i> , 1998, pp. 316-344. Appendices B-D are for reference only; candidates do not need to memorize formulas in Appendices B-D. Including errata (updated 6 July 2009).	Mahler 2	B1	W
Mahler, H.C., "Workers Compensation Excess Ratios: An Alternative Method of Estimation," <i>PCAS LXXXV</i> , 1998, pp. 132-156.	Mahler 3	B2	W
Mango, D.F., "An Application of Game Theory: Property Catastrophe Risk Load," <i>PCAS LXXXV</i> , 1998, pp. 157-186. Exam questions will not be drawn from Section 9.	Mango	D3	W
McClenahan, C.L., "Insurance Profitability," <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., "On the Theory of Increased Limits and Excess of Loss Pricing," <i>PCAS LXIV</i> , 1977, pp. 27-59 excluding "Risk Reduction by Layering" (pp. 45-49). Including discussion of paper: Rosenberg, S., <i>PCAS LXIV</i> , 1977, pp. 60-73.	Miccolis	B1	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

Citation	Abbreviation	Learning Objective	Source
National Council on Compensation Insurance, <i>Experience Rating Plan Manual for Workers Compensation and Employers Liability Insurance</i> (as of June 30, 2008). 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 June 30, 2008). 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, "The Underwriting Profit Provision," CAS Study Note, as updated in 1992.	Robbin	D1, D2	W
Roth, R., "Analysis of Surplus and Rate of Return Without Using Leverage Ratios," <i>Insurer Financial Solvency</i> , Casualty Actuarial Society <i>Discussion Paper Program</i> , 1992, Volume I, pp. 439-464.	Roth	D1, D2, D3	W
Skurnick, D., "The California Table L," <i>PCAS LXI</i> , 1974, pp. 117-140. Including discussion of this paper: Gillam, W.R., <i>PCAS LXXX</i> , 1993, pp. 353-365.	Skurnick	B2, E3, E4	W
Teng, M.T.S., "Pricing Workers' Compensation Large Deductible and Excess Insurance," <i>Casualty Actuarial Society Forum</i> , Winter 1994, pp. 413-437.	Teng	E5	W
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	SK
Walters, M.A.; and Morin, F., "Homeowners Ratemaking Revisited (Use of Computer Models to Estimate Catastrophe Loss Costs)," <i>PCAS LXXXIV</i> , 1997, pp. 1-43.	Walters and Morin	C1	W

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- L** May be purchased from the publisher or bookstore or borrowed from the CAS Library.
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- SKU** Represents material included in the 2009 CAS Study Kit and the 2009 Update to the 2008 Study Kit.
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American Academy of Actuaries, 1100 Seventeenth Street NW, Seventh Floor, Washington, DC 20036; telephone: (202) 223-8196; Web site: www.actuary.org.

Casualty Actuarial Society *Forum*, *PCAS*, and *Discussion Paper Program*, Casualty Actuarial Society, 4350 N. Fairfax Drive, Suite 250, Arlington, VA 22203; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: office@casact.org; Web site: www.casact.org.

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.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: www.sliderulebooks.com.