2010 *Syllabus of Basic Education*
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Note: This *Syllabus* is subject to change in the future. The CAS is not responsible for any errors or omissions in the *Syllabus*.

FOREWORD

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

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

The purposes of the Society are to advance the body of knowledge of actuarial science applied to property, casualty, and similar risk exposures, to establish and maintain standards of qualification for membership, to promote and maintain high standards of conduct and competence for the members, and to increase the awareness of actuarial science. The Society's activities in support of this purpose include communicating with those affected by insurance, presenting and discussing papers, conducting seminars and workshops, collecting a library, conducting 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 are published in the *Proceedings of the Casualty Actuarial Society* and currently in *Variance*, the Society's peer-reviewed journal. The presidential addresses, also published in the *Proceedings*, have called attention to the most pressing actuarial problems, some of them still unsolved, that have faced the industry over the years.

The membership of the Society includes actuaries employed by insurance companies, industry advisory organizations, national brokers, accounting firms, educational institutions, state insurance departments, and the federal government. It also includes independent consultants. The Society has three classes of members: Fellows, Associates, and Affiliates. Both Fellowship and Associateship require successful completion of education requirements (examination, Validation by Educational Experience, and the Course on Professionalism) specified in the CAS S*yllabus of Basic Education*. The CAS also has mutual recognition agreements with other actuarial organizations as described under "Join/Renew" on the CAS Web Site (www.casact.org). 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

The publications of the Society and their respective prices are listed in the Society's *Yearbook/Proceedings*. The *Syllabus of Basic Education* outlines the course of study recommended for the examinations.

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.

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

The Challenge

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

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

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

Schedule of Study

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

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

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

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

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

Retention

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

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

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

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

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

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

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

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

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

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

Formulating Answers

Multiple-Choice Questions

Candidates can definitely improve their speed and mastery by seriously practicing sample examination-type questions before the examination. It helps to have a good understanding of the subject material. Candidates can also develop valuable shortcuts, such as eliminating impossible answers by checking out boundary conditions, by inspecting other aspects of certain suggested solutions, or by substituting numerical values and cutting out some answers. Since questions are varied, candidates will need a variety of techniques to cope with them.

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

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

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

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

Essay Questions

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

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

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

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

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

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

There is no advantage to answering the questions in any particular order. Candidates may answer the questions in the order given if they wish. Alternatively, candidates can quickly read over the whole

paper, warm up with whichever question comes easily to them, gradually work into the questions they find more challenging, and end on a question that they think can be answered readily even though, by that time, their energy and concentration may be falling off.

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

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

Final Mental Preparations

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

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

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

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

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

Candidates should never give up in the examination room. They should use every minute and every second of the available time. They should not "grade their own papers," and decide not to hand in an answer to a question or two because they feel it is all wrong. They should hand in all of their answers, and let the examiners do the grading. More than one candidate has not handed in some answer pages which he or she had condemned in his or her own mind, only to find out later that the work was correct, and to find out still later that he or she had narrowly failed to pass.

Books to Read

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

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

INTRODUCTION

Principles of the Casualty Actuarial Society for Basic Education

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

1. Basic education will remain a cornerstone of the CAS.

2. The CAS will assure that its members have the knowledge of those areas needed to practice effectively in the broad and expanding range of property, casualty, and similar business and financial risks (general insurance).

3. The CAS is committed to a depth of knowledge of techniques associated with the broad range of property, casualty, and similar business and financial risks.

4. The CAS will provide the basic education necessary to meet qualification standards to sign statements of actuarial opinion for general insurance and related specialties in at least the U.S. and Canada.

5. The education process will provide a balance among theoretical concepts, practical applications, and business acumen, to prepare our members to deliver high-quality service to meet current and projected future needs of employers and clients.

6. The CAS will approve the syllabus and examination standards used in determining eligibility for CAS membership.

7. Demonstration of mastery of the skill sets required of members is critical to basic education.

8. The CAS is committed to maintaining self-study as one route for attainment of designations.

9. The CAS will pursue strong working relationships with academia and professionals in related fields.

10. The CAS will attract a pool of strong candidates from a variety of backgrounds to the actuarial profession.

11. The CAS supports the goal of developing a global shared foundation of actuarial education, including joint sponsorship of examinations where consistent with other principles.

12. The CAS, as an educator of general insurance and related specialties, will remain a significant contributor to the worldwide actuarial profession.

Syllabus Goals and Objectives

One of the primary objectives of the Casualty Actuarial Society (CAS) is the development of qualified professionals in the field of casualty actuarial science. The CAS conducts an educational and examination program for prospective members in order to achieve this objective. The syllabus goals and objectives are as follows:

1. To develop a general understanding of the social, political, regulatory, legal, economic, and financial environment of the business of property and casualty insurance and similar risk assessment as well as the historical development of that environment.

2. To develop a thorough understanding of the fundamental mathematical concepts applicable to solving insurance and similar risk assessment problems, and to develop a high degree of skill in their applications.

3. To develop a comprehensive understanding of the business of property and casualty insurance, including underwriting, claims, marketing, and finance, as well as how these functions are performed and interrelated.

4. To develop a working knowledge of property and casualty insurance policies and contracts.

5. To develop an expert knowledge of a broad range of techniques to solve problems and to develop the ability to discern the appropriateness of techniques for particular applications based on a knowledge of the underlying assumptions, strengths, and weaknesses.

6. To develop an expert knowledge of a broad range of relevant and standard actuarial practices in order to present a framework for the use of problem-solving techniques.

7. To encourage a sense of inquisitiveness and creativity toward problem solving in order to foster an appreciation of the art in actuarial science.

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

Education and Examination System

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

CAS Education Policy Committee

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

CAS Syllabus Committee

The Syllabus Committee determines the scope and content of the CAS *Syllabus* and course of readings for CAS Examinations.

A chairperson supervises the committee that is composed of Fellows who represent a broad spectrum of CAS members including insurers, consultants, regulators, and academicians. At least one representative of the Canadian Institute of Actuaries (CIA) also serves on the committee; usually at least one of the representatives is a member of the CIA Education and Examination Committee. One or more members specialize in the material for each examination part. These specialists recommend changes to the *Syllabus*; however, recommendations must be approved by the entire committee.

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

CAS Examination Committee

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

The chairperson supervises the committee and is responsible for the overall administration of the CAS Examinations. The chairperson is assisted by several senior committee officers with the title of general

officer. The committee is subdivided into Examination Part Committees, each headed by an examination part chairperson.

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

- The responsibility for each CAS Examination is assigned to a part committee that writes, grades, and maintains the standards for that examination. Each part committee is assisted by two examination consultants who are CAS members and are experts on the material covered by that examination. The part committees are also assisted by a proofreader who concentrates on uniformity and grammar. In addition, some part committees are assisted by academic consultants who are independent experts from the academic community.

- Each examination is drafted by the responsible Examination Part Committee to test candidates' knowledge of the items listed in the "Materials for Study." The individual part committee, examination consultants, one of the Examination Committee general officers, the Examination Committee chairperson, and, in some cases, academic consultants review each examination to assure its quality.

- Every effort is made to ensure that the questions fall within the scope of the "Materials for Study." Complete coverage of all material is not practical for every examination every year. The goal is to produce examinations that contain representative, high-quality questions that test candidates' knowledge of the material. Trick questions are deliberately avoided, and the wording of each question is considered carefully to eliminate possible ambiguities. Preliminary versions of each examination are thoroughly reviewed in relation to all of these factors before the final examination is approved.

CAS Candidate Liaison Committee

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

MATERIALS FOR STUDY

Introduction

The syllabi for the CAS-specific Exams 3L and 5-9 are defined in the form of learning objectives, knowledge statements, and readings.

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

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

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

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

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

After each set of learning objectives, the readings are listed in abbreviated form. It is suggested that the candidate cover the learning objectives and their corresponding set of readings in the order listed. Complete text references are provided at the end of each exam section.

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 2010 CAS Study Kit.

SKU   Represents material included in the 2010 CAS Study Kit and the 2010 Update to the 2009 Study Kit.

W   Represents material in the 2010 Web Notes that is available at no charge from the "Study Tools" section of the CAS Web Site. A printed version may be purchased for Exams 3L and 5-9.

Information on sample and past examinations and for ordering Study Kits and Web Notes is available in the "Study Resources" section of this *Syllabus*. A detailed identification of the text references may be found at the end of each exam section of the *Syllabus*. The suggested reading material is designed to acquaint candidates with the respective subjects and should not be interpreted as representing views endorsed by the CAS. Although the CAS Library has a limited number of many of the *Syllabus* readings available for loan (citations indicated with a bold **L**), some must be obtained by contacting the organizations listed under "Publishers and Distributors" at the end of each exam section. (Some booksellers may not indicate the official copyright date of a specific edition. Please use the edition number as a guide.) Information about using the CAS Library is also included in the "Study Resources" section.

If a new edition of any text becomes available after publication of this *Syllabus*, candidates should check "*Syllabus* Update" in the "Admissions/Exams" section of the CAS Web Site or contact the CAS Office for instructions regarding its acceptability and the appropriate chapters or pages in the new edition that correspond to the published study requirements.

NOTICES TO CANDIDATES FOR 2010

1. New Education Structure to be Implemented in 2011

In March 2008, the CAS Board of Directors announced changes to the CAS basic education structure that will affect current Exams 5-9. These changes will be implemented in 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: Financial Risk and Rate of Return

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

2. 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 2010, Exams 1/P, 2/FM, and 4/C will be offered by CBT.

3. Exam Registration

Candidates may find online exam registration and related information in the "Exam Registration and Online Store" section of the CAS Web Site (also linked from the 2010 *Syllabus*). 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 "2010 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**. <u>**Exceptions will not be made.**</u>

4. 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 "2010 CAS Examination Schedule" section of this *Syllabus*.

5. Calculators

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

6. 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.

7. *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.

8. Changes to the 2010 *Syllabus*

Any changes to the 2010 *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*.

9. 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.

10. CAS Online Store

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

11. 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.

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

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, 2009 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 at the end of July for May Examinations and at the end of January 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.

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. 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:	*For candidates in East Asia:*
Casualty Actuarial Society	Actuaries Office in Hong Kong
Attention: Library Service	Attention: Patricia Kum
4350 N. Fairfax Drive, Suite 250	2202 Tower Two, Lippo Centre
Arlington, Virginia 22203	89 Queensway
Fax: (703) 276-3108	Hong Kong
E-mail: library@casact.org	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.

B. 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 are available under "Computer-Based Testing Rules and Procedures"). 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 at least 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 30, 2010, for May Examinations and January 31, 2011, 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.

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 on the "Computer-Based Testing Rules and Procedures" Web page. 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.

C. Grades and Accreditation

Defective Questions

Occasionally, through error or because of varying interpretations, a question on an examination is found to be ambiguous or defective. If a candidate believes a question is ambiguous or defective, he or she should bring this to the attention of the Examination Committee in writing within two weeks after the examination date. The candidate must mail or fax this letter to Preliminary Actuarial Examinations/SOA for Exams 1/P, 2/FM, 3F/MFE, and 4/C, or to the CAS Office for Exams 3L and 5-9. The letter should include detailed reasons why the question is believed to be ambiguous or defective. In addition, statistics are calculated on each test item to determine how well the candidates answered the question. The statistics can indicate that a question may be faulty and the question will be reviewed even without a candidate writing.

The CAS Examination Committee or Preliminary Actuarial Examinations/SOA will investigate all questions brought to their attention in this manner. Correspondence that does not reach these organizations within two weeks after the date of the examination will not be considered in the grading process.

Any multiple-choice question found to be defective is carefully examined to determine the most reasonable way to correct the situation. In some cases, the question is discarded, leaving scores and rankings as they would have been if the defective question had not been asked. In other cases, more than one answer for a multiple-choice question is given credit for being correct.

CAS Examination Processing

Computer-based tests are administered and scored according to computer-based testing methodologies. Although the multiple-choice exams that are administered exclusively by paper-and-pencil have a process that is similar to the description below, this section and the next, "Grading of Examinations: A Timeline," provide details about CAS-specific Exams 5-9.

Examination papers are sent to the CAS Office upon completion of the examination. The CAS Office prepares the examinations for the grading process. Approximately one week after all examinations have been completed, the examination and a preliminary list of multiple-choice answers will be posted in the "Admissions/Exams" section of the CAS Web Site. This is intended to assist candidates and the Examination Committee in determining whether they believe a question is ambiguous or defective.

Grading of Examinations: A Timeline

Week 1

After the examinations are administered, proctors return the packages to the CAS Office. Staff members log in each exam. Signatures are verified and the candidate numbers are checked against the proctor's report. As each envelope is opened the candidate's number must be checked against the number on the short answer card (both the written number and the coded number) and on all the essay sheets. The short answer cards are prepared for scanning and the essay sheets for all the candidates must be sorted so that individual questions can be copied for the graders.

Week 2

Essay question responses are sent to a vendor to be reproduced. Short answer cards are scanned twice and output is compared to ensure accuracy. Random checks are made of each series of cards to make sure the scanner is working properly. When the essays return from the vendor, copies of candidate responses are sent to the individual graders. Any comments on ambiguous or defective questions are forwarded to the graders, exam part chair, and the general officer of the exam series for review.

Weeks 3 and 4

Committee members review candidate comments about possibly defective questions and decide how they will be handled in the grading process. Discussions on the best course of action are often a very time-consuming part of the grading process.

Copies of responses to each essay question on the exam are sent to two graders. Some graders are given more than one question to grade. There can be 500 to more than 1,000 answer sheets for each grader to evaluate for a single question. A suggested answer key exists for each question, but alternative solutions may be correct, and the grader must be open to different approaches to a problem. About two dozen responses are graded and then the results are compared. The grading partners will establish a consistent grading scale and then evaluate the solution key. Consistency and accuracy are the most important factors in grading the responses. After looking at hundreds of papers, it is possible that a grader could slightly shift focus (either harder or easier). To minimize the chance of this happening the graders will begin grading at different points on the candidate list, then when the two grades are compared any significant differences will be checked. Each grader prepares a computer file with each candidate's number and the score for each question.

Week 5

The part chair holds the grading session with the graders. The first step is running the data through a standard grading program, verifying the data, and noting any significant discrepancies. For each candidate and each question the scores of each grading partner must be within a prescribed tolerance. If the scores do not fall within this tolerance the partners must discuss the candidate's answer sheet and come up with a decision on what the point value should be. When all the questions have been reconciled to the required tolerance, the scores are totaled and a tentative pass score is selected based on the pass mark panel's recommendation, various statistics, and guidelines.

This triggers the second round of reconciliation. Any candidates who have scores within a certain number of points from the tentative pass score will have all of their answers reconciled completely. This gives an exact score for any candidate near the passing score. The scores for any candidates who are close to passing will be checked manually as well. The committee members will then look at the statistics one more time and make a final recommendation for the passing score.

Weeks 6 and 7

After the grading session, the part chair will create and submit a report to the general officer of the exam series and the Examination Committee chairperson. In the report, the part chair recommends a passing score, gives a detailed analysis of the exam, and notes any unusual questions or situations that required special handling. The chairperson and general officer hold a teleconference with the vice president–admissions to discuss all of the exams from the series and to finalize the passing scores.

Week 8

After the passing score has been approved by the vice president–admissions, the data is verified and released to the CAS Office to update each candidate's record, post a list of passing candidate numbers on the CAS Web Site, and print and mail the grade reports.

Determination of the Pass Mark

The goal of the examination systems of the CAS is to pass all candidates who have demonstrated adequate knowledge of the syllabus and to fail those candidates who have not. The objective of the examinations is to evaluate candidate performance using criteria for demonstrating adequate knowledge that remain constant throughout the lifetime of the exam series. Pre-set pass marks (e.g., a candidate will pass if he or she answers *x* percent of the questions correctly) are counter to this philosophy. The examinations are meant to measure the candidate's level of achievement of the required learning objectives and their required level of capability of accomplishing specified learning outcomes.

Multiple-Choice Questions

As part of the input to the pass mark determination process for the multiple-choice exams that are not offered by computer-based testing, a modified Angoff passing score study is performed where a panel of experts in the subject material is convened to review the examination. This is a common testing and measurement technique. Each expert is asked to review each question in the examination, and assess the difficulty of that question. More specifically, they are asked to estimate the likelihood that a candidate with minimum adequate knowledge competency would answer the question correctly. The sum of these probabilities, averaged across the panel of experts, gives a preliminary estimate of the pass mark.

The estimated pass mark resulting from the modified Angoff passing score study is compared to and balanced with the actual performance statistics on the exam in finalizing the pass mark. The effects of any particularly difficult questions are also factored into the determination of the final pass mark.

Computer-based tests are administered and scored according to computer-based testing methodologies.

Written-Answer Questions

For CAS examinations consisting in whole or in part of written-answer questions, the assessment process is somewhat different. Before the exam is administered, a pass mark panel reviews the exam and assesses it based on how the panelists think a minimally qualified candidate will perform based on a predetermined definition of the minimally qualified candidate. This process follows the same basic technique used for multiple choice exams as described above. Based on this assessment, an expected pass mark is set.

Following the administration of each exam, responses to each written-answer question are graded simultaneously by two graders who must reconcile their techniques and grades. When all responses have been scored, the part committee chooses a preliminary pass mark based on the results of the pass mark panel augmented by actual performance of the current candidates versus historical performance of previous candidate cohorts. Candidate papers with scores close to the preliminary pass mark are re-graded to ensure correct and consistent scoring.

The part committee then determines the tentative pass mark by again balancing actual performance statistics against minimum adequate knowledge while taking into account other factors such as time pressure situations that may have occurred on some questions. Because the level of difficulty for each examination may vary from year to year, each part committee collects extensive data to ascertain the level of difficulty of its examination. The part committee compares the performance of the present year's candidates to the performance of candidates from prior years. Appropriate recognition is given to any peculiarities that may appear in connection with the answers to any question on an examination despite all the care taken in setting the examination questions.

With the use of content-based pass marks, fluctuation in the pass rate from session to session is expected. Although the percentage of candidates passing will vary from year to year, those candidates demonstrating the required level of competence with the material will pass.

A recommended pass mark is reached by consultation among the part chairperson, the general officer overseeing that examination, and the Examination Committee chairperson. Any significant deviations from the a priori pass mark set by the pass mark panel are explored at this time. The recommended pass mark and explanations for deviations from the a priori pass mark and any abnormal passing percentages are submitted to the vice president-admissions who approves the final pass mark. Upon approval by the vice president-admissions, the final exam statistics are forwarded to the Executive Council.

After the pass mark is finalized, each candidate is assigned a score. Scores of 0 to 5 are assigned to candidates who do not pass. On this scale, each interval is 10 percent of the pass mark. For example, a grade of 5 means failing with a mark of at least 90 percent, but less than 100 percent, of the pass mark. A grade of 0 means that the candidate's score is less than 50 percent of the pass mark. Candidates at or above the passing mark receive a grade of Pass.

The CAS releases the pass scores for Exams 3L and 5-9 after the appeals process for the exam session has been completed. It is posted in the "Admissions/Exams" section of the CAS Web Site. The purpose of releasing the pass scores is to help candidates prepare for future exam sittings. The 75th and 95th percentile scores are also released for each exam. These two key statistics indicate the performance level achieved by the better prepared candidates on the exam. Raw scores are not provided to candidates.

Examination Results

Examination results are available approximately eight weeks after the examination date. After exam results are received at the CAS Office, a list of passing candidate ID numbers will be posted in the "Admissions/Exams" section of the CAS Web Site between 3:00 and 3:30 p.m. Eastern time. Individual statements of examination results generally are mailed to candidates on the day that they are posted on the CAS Web Site.

For Exams 3L and 5-9, passing candidates are informed that they passed the exam, but they are not given a numeric score. Candidates with scores of 0 to 5 are informed of the score. Several weeks later, a list of the names of all passing candidates is posted on the CAS Web Site. Requests for reprints of individual grade reports will be accepted starting two weeks after the date that results were released.

To preserve candidate confidentiality, in the event of a lost or misplaced candidate ID number, the candidate ID number will be mailed to the candidate upon request. Under no circumstance will a candidate number be given over the telephone or by e-mail.

Computer-Based Testing

For some of the examinations administered by computer-based testing, an unofficial pass/fail result will be displayed on the computer screen at the conclusion of the examination and, in most CBT centers, a printed copy of the unofficial pass/fail result will be available from the proctor in the administrative area outside the testing room. For all CBT exams, the official decile scores will be available approximately eight weeks after the exam administration.

Analyses for Exams 3L and 5-9

Candidates for Exams 3L and 5-9 who did not pass will automatically be sent an analysis of their examination with the grade notification. The analysis of an examination is computer-generated. Actual points received for multiple-choice questions will be displayed. For essay questions, ranges will be given for the actual score. This information is intended to provide the educational guidance that most candidates desire. Copies of the exam analyses will not be provided after the appeals deadline.

Appeals for Exams 3L and 5-9

Multiple-Choice Questions

If a candidate believes that a multiple-choice question is ambiguous or defective, he or she should bring this to the attention of the Examination Committee in writing within two weeks after the examination date. In order to aid the candidate, preliminary answer keys for multiple-choice questions will be available the week following the examinations. The candidate may submit comments to the CAS Office by mail, fax, or e-mail. The correspondence should include detailed reasons why the question is believed to be ambiguous or defective. (In addition to candidate comments, statistics are calculated on each problem to see how well the candidates answered the question. The statistics can indicate that a question may be faulty and the question will be reviewed even without a candidate writing.) The CAS Examination Committee will investigate all questions brought to its attention in writing. To be considered in the grading process, correspondence must reach the CAS Office by the following deadlines: **May 21, 2010**, for May Exams; and **November 11, 2010**, for the October Exams. The decision of the Examination Committee chairperson is final.

No appeals based on ambiguous or defective questions will be considered after these deadlines. After grades are released, the only appeal permitted on multiple-choice questions will be to request an administrative check of the candidate's short answer card to verify that the card reader scanned the card correctly and that the output file reflected this data. This request must be made within three weeks after the release of grades.

Essay Questions

Once candidates have received the analyses of their exams, they may appeal their grade. Only candidates with valid appeals will be considered. Sample answers to essay questions will be available on July 30, 2010, for May Examinations, and January 31, 2011, for October Examinations. The sample essay answers are actual responses that have received credit and are illustrative of successful answers, although they may not be considered perfect answers.

If the candidate believes that the sample essay answer is incorrect or there is an alternative correct solution, the candidate must provide specific information on why his or her solution is correct. With specific information, the Examination Committee can research the answer properly and reply to the candidate. An example of an invalid appeal would be the following: "I am appealing my score of 5 on Exam 9, please recheck my examination." Another example of an invalid appeal would be: "On question number 2, I believe I should get full credit because I answered the following . . ."

Appeals must reach the CAS Office not later than **August 31, 2010**, for May 2010 Examinations and **March 1, 2011**, for October 2010 Examinations. Should an exam's sample answers be posted later than the date stated in the "Conduct of Exams" section above, the appeal deadline for that specific exam will be extended to 30 days after the posting date of that exam's sample answers. When a valid appeal is received, it is reviewed by the part chairperson and a recommendation is made to the Examination Committee chairperson. The Examination Committee chairperson will respond based on the recommendation of the part chairperson. The decision of the Examination Committee chairperson is final.

Confidentiality of Examination Records

The fact that a candidate has passed a particular examination is considered public knowledge. Any further information as to examinations taken by candidates and scores received by candidates is available only to the candidates themselves, to Examination Committee officials if required for committee purposes, and to the CAS Office, unless the candidate requests in writing that such information be provided to someone else. However, if any action is taken against a candidate as a result of his or her conduct (as described in the section on Examination Discipline), the Casualty Actuarial Society, at its sole discretion, may disclose such information to any other bona fide actuarial organization that has a legitimate interest in such results and/or actions. The candidate authorizes and consents to the Society using and disclosing (including, but not limited to, disclosing to the third-party contractors and service-providers of the Society) personally identifiable information about the candidate as necessary and appropriate for the purposes of registering the candidate for the exam, conducting the exam, determining the results of the exam, and communicating with the candidate regarding the results of the exam.

Transition Programs

The CAS generally reviews and makes revisions to the study material on an annual basis. Occasionally, a major topic will be added to or deleted from the syllabus. A major topic is defined as a series of learning objectives comprising a segment of an examination. When a major topic is added, the Syllabus Committee will determine if a transition program is appropriate. A transition program is generally appropriate when candidates are in a position to lose credit for a segment of an examination.

A transition program usually will provide candidates with at least two opportunities to complete the requirements for that examination. The completion of the requirements will result in the achievement of credit for that entire examination. The failure to fulfill the requirements for that complete examination could result in the expiration of credit for that deleted topic at the end of the transition period. The CAS

Board of Directors must approve any transition program.

2011 Education Structure

The CAS will implement a revised education structure in 2011. (Details are available in the "Admissions/Exam" section of the CAS Web Site.) In March 2008, the CAS Board of Directors released the following transition rules the for the education structure that will be implemented in 2011:

Current Exam	Credit in Education Structure to be Implemented in 2011
Exam 5	Half Exam on Basic Ratemaking[*] and Module 1
Exam 6	Half Exam on Basic Reserving[*] and Exam on Advanced Reserving, Reinsurance, and ERM
Exam 7	Exam on Regulation and Financial Reporting and Module 2
Exam 8	Exam on Investments and Rate of Return
Exam 9	Exam on Advanced Ratemaking

Note: To receive credit for the new exam on Basic Ratemaking and Reserving, the candidate must have credit for both old Exams 5 and 6. At the time of transition, if a candidate has credit for only one of the required exams (either Exam 5 or Exam 6), the candidate will be allowed to take just the part of the exam for which he or she is missing credit (i.e., either the basic ratemaking section or the basic reserving section of the new exam) in order to obtain credit for the new exam. It is anticipated that this option will be available for two sittings after the official conversion to the new education structure.

Current Education Structure

For the current education structure, the CAS Board of Directors approved the following transition rule for the revision to Exam 3 that was implemented in January 2008:

Credit in 2007	Credit In Education Structure Implemented In 2008
Exam 3	Exams 3F and 3L

The CAS Board of Directors approved the following transition rules for the revised preliminary education structure that was implemented in January 2005:

Credit in 2004	Credit In Education Structure Implemented In 2005
Exam 1	Exam 1
Exam 2	Exam 2, VEE-Economics, VEE-Corporate Finance
Exam 3	Exam 3 [now Exams 3F and 3L]
Exam 4	Exam 4, VEE-Applied Statistical Methods

The following rules apply for candidates with **unused** credit from exams administered prior to 2000:

Pre-2000 Credit	Credit In New System Implemented In 2005
Exam 3A	VEE-Applied Statistical Methods
Exam 4A	Exam 2
Exam 4B	Exam 4
Exam 5A	VEE-Economics
Exam 5B	VEE-Corporate Finance

CAS Course on Professionalism

The CAS Course on Professionalism is designed to present candidates with real situations that contain ethical and professional issues for the actuary. Volunteer members of the CAS facilitate small group discussions of actual case studies. Although grades are not given for the course, candidates must actively participate in order to receive credit. Successful completion of this course is required before a candidate can become a member of the Casualty Actuarial Society.

Candidates are urged to register for this course as soon as they are eligible. To be eligible for the CAS Course on Professionalism, a candidate must (a) have credit for any five actuarial exams and all three VEE

requirements in the current education structure or (b) have credit for any six actuarial exams in the current education structure—regardless of VEE status. (The two segments of Exam 3—3F and 3L—together count as one exam only. Transitional VEE Exams do not count as actuarial exams.)

Dates for the course will be posted in the "Admissions/Exams" section of the CAS Web Site. Registered candidates will receive a study book of required readings before the start of the course. Each course is limited to 60 participants; early registration is recommended. Facility information and course times will be provided upon registration.

CAS Membership Requirements

Associateship

Candidates for Associateship in the Casualty Actuarial Society must fulfill the examination requirements by successful completion of, or credit for, Exams 1-7; have credit by Validation by Educational Experience (VEE) for the required topics of economics, corporate finance, and applied statistical methods; and successful completion of, or credit for, the CAS Course on Professionalism. Exam 7 is nation specific, and passage of any one of the CAS-approved nation-specific exams fulfills the completion requirements.

After completing the prescribed requirements, all prospective Associate members must make formal application to the Casualty Actuarial Society. The CAS Office will e-mail application materials to these candidates, including instructions for obtaining letters of reference from two CAS members. Obtaining the two letters of reference is the prospective Associate's responsibility. If no member of the CAS is familiar with the prospective Associate and his or her work history, references from members of the American Academy of Actuaries, the Canadian Institute of Actuaries, the Society of Actuaries, or senior executives where the candidate is employed may be substituted. For further information on alternative acceptable references, please contact the CAS Office. An application for membership will not be processed without these references.

Candidates must have completed *all* educational requirements prior to submitting an application for CAS membership.

After all requirements are met and application is made, each candidate is voted on by the CAS Executive Council. Upon approval of the CAS Executive Council, the candidate will be admitted as an Associate of the Casualty Actuarial Society (ACAS). Candidates approved by the Executive Council will be notified by letter from the CAS president. Members may indicate their designation as an Associate of the Casualty Actuarial Society by using the initials "A.C.A.S." after their names only after they have received official notification of acceptance as an Associate from the CAS.

Fellowship

In addition to fulfilling all the requirements of Associateship, successful completion of, or credit for, all nine examinations is required to fulfill the examination requirements for Fellowship and to be designated as a Fellow of the Casualty Actuarial Society (FCAS). Candidates who are admitted to the CAS as Fellows rather than Associates may indicate their designation as a Fellow of the Casualty Actuarial Society by using the initials "F.C.A.S." after their names only after they have received official notification of acceptance as a Fellow from the CAS. Associates who complete their Fellowship requirements may use the "F.C.A.S." designation immediately following official notification of successful completion of all the Fellowship requirements as prescribed by the Board of Directors.

Waiver of Examinations

Waiver of individual examination requirements will be granted by the CAS Board of Directors in instances where an applicant has passed or received credit for examinations sponsored by another recognized actuarial organization that cover equivalent material in both subject and depth. The granting of waivers by the Board will be based on the recommendation of the vice president-admissions. The vice

president-admissions' recommendation will be guided by the policy established by the CAS Education Policy Committee.

The CAS generally will not grant waiver of all or any portion of its examination requirements for work experience, contribution to actuarial literature, academic courses of study, or examinations of non-actuarial organizations. Individuals who claim competence in the areas covered by the examinations should not have difficulty demonstrating their competence by participating in the examination process.

SOA Exam MLC
The CAS will grant a waiver of CAS Exam 3L to those who have passed SOA Exam MLC on life contingencies.

Faculty of Actuaries, Institute of Actuaries (U.K.), Institute of Actuaries of Australia, and Institute of Actuaries of India
The CAS recognizes some of the examinations sponsored by the Faculty of Actuaries (Scotland) and the Institute of Actuaries (United Kingdom), Institute of Actuaries of Australia, and the Institute of Actuaries of India. Credit will be granted for examinations passed or waived in accordance with examination equivalencies between the CAS syllabus and the syllabi of each of the three aforementioned actuarial organizations. The CAS will not grant credit for examinations waived on account of academic records achieved in North American universities, nor for credit granted to candidates not qualifying directly in obtaining membership through the normal qualification/examination process. Credit will not be given to Fellows of the Faculty or Institutes who have attained their designation through mutual recognition rather than through the standard Faculty or Institutes credentialing process. Fellows by mutual recognition should pursue examination waivers based on their original credentials.

The following waiver policy has been approved by the CAS:

Subject of the Faculty of Actuaries, Institute of Actuaries (U.K.), Institute of Actuaries of Australia, and Institute of Actuaries of India*	Waiver Granted for CAS Exam/Educational Experience
CT1	Exam 2/FM
CT2	VEE-Corporate Finance
CT3	Exam 1/P
CT4 and CT5	Exam 3L
CT8	Exam 3F/MFE
CT6	Exam 4/C and VEE-Applied Statistical Methods
CT7	VEE-Economics

* Waivers will not be granted for Faculty/Institute exam credit earned through coursework except for those universities on the Faculty/Institute list as of May 7, 2000 and universities that have been subsequently approved by the CAS.

Candidates requesting a waiver of an examination requirement should present their request to the vice president-admissions with appropriate evidence that demonstrates the passing of (or score on) the actuarial examination equivalent for which a waiver is requested. The vice president-admissions will review all such requests and recommend action to the CAS Board of Directors.

Please address all waiver requests to: Vice President-Admissions, Casualty Actuarial Society, 4350 N. Fairfax Drive, Suite 250, Arlington, Virginia 22203, USA.

Waivers are considered on a case-by-case basis for examination equivalents of actuarial organizations not named above. Candidates must present their requests to the vice president-admissions and include with their applications documented evidence that demonstrates the asserted equivalence, as well as the appropriate educational policy material of their local actuarial organizations. If such material is not included, the vice president-admissions will request it from the candidates. The vice president-admissions will forward the request to the Education Policy Committee for a determination of whether sufficient equivalence exists to permit granting any examination waiver.

EXAMINATION RULES

A. Registration

Administration of Examinations

The CAS basic education structure has three Validation by Educational Experience (VEE) requirements, nine examinations, and the Course on Professionalism. Exams 1/P, 2/FM, 3F/MFE, and 4/C are jointly administered by the CAS and the Society of Actuaries (SOA) through Preliminary Actuarial Examinations. Exams 3L and 5-9 and the Course on Professionalism are exclusively administered by the CAS. The Canadian Institute of Actuaries (CIA) cosponsors all the examinations except Exam 7-United States.

Filing of Applications and Deadlines

All candidates filing for an examination(s) must submit a signed application for each examination period. Both online registration and application forms are linked from the "Exam Registration and Online Store" section of this *Syllabus*. Payment must accompany each application to be valid. *Applications must be received by the registration deadlines* stated in the "Examination Schedule" of this *Syllabus* (see pages 5-7). 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.** Send applications as follows:

Jointly Administered Exams 1, 2, 3F, and 4

Exams 1/P, 2/FM, 3F/MFE, and 4/C are administered by Preliminary Actuarial Examinations for the CAS, CIA, and SOA. Candidates must submit a signed application for each examination session or register online. Fees should be remitted in U.S. funds (or equivalent) by check, money order, or credit card (American Express, MasterCard, or Visa). Please note that payment in Canadian currency may slightly delay the processing of the application.

For the joint exams, the candidate's letter of admission is also a tax receipt and should be retained after the examination if needed for tax purposes. Applications and online registration are linked from the "Exam Registration and Online Store" section. Applications must be received by the published deadlines.

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 by 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 agrees 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 Registration and Online Store" 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 2010 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.

2010 Examination Fees

	Candidates	Full-Time Students
Exam 1/P (CBT)	$200	$200
Exam 2/FM (CBT)	$200	$200
Exam 3F/MFE	$200	$160
Exam 3L	$325	$260
Exam 4/C	$375	$300
Exams 5, 6, 7, 8, and 9	$575	$460

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, 2, and 4)

Exams 1/P, 2/FM, and 3F/MFE are offered by computer-based testing (CBT). CBT provides 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" Web page. The rules and procedures provided on the CBT Web page are part of the CAS examination rules.

Exam 1 Fee Reimbursement Program in the U.S.

The Joint CAS/SOA Committee on a Diversity 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 "Diversity Programs" section of the actuarial career Web site at 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 full-time 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 Registration and Online Store" 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 Exam 3F and the Paper-and-Pencil Versions of Exams 1, 2, and 4)

For Exam 3F/MFE, as well as the paper-and-pencil administrations of Exams 1/P, 2/FM, and 4/C, 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/exam-req/exam-day-info/edu-letter-admin.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, 2, 3F, and 4

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 the "Computer-Based Testing Rules and Procedures" section.

- Submit a refund request by the refund deadline to Preliminary Actuarial Examinations at the SOA Office by e-mail (cbtrefund@soa.org). The request must be received by the refund deadline stated in the "Examination Schedule" of this *Syllabus* (see pages 5-7).

Examination fee refunds will be issued following the testing administration.

Paper-and-Pencil Versions of Exams 1, 2, 3F, and 4

Any candidate who submits an application for the paper-and-pencil administration of Exams 1/P, 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 be received by Preliminary Actuarial Examinations/SOA by the refund deadline stated in the "Examination Schedule" of this *Syllabus* (see pages 5-7). 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 1/P, 2/FM, 3F/MFE, and 4/C are only refundable from Preliminary Actuarial Examinations/SOA. Change-of-center fees, special center fees, and CBT rescheduling 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 by the refund deadline stated in the "Examination Schedule" of this *Syllabus* (see pages 5-7). 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.

2010 EXAMINATION SCHEDULE

Exam 1/P by Computer-Based Testing

	EXAM DATES	DURATION	START TIME	REGISTRATION DEADLINE	REFUND DEADLINE
January Test Window	January 5-16, 2010	3 Hours	Various	**December 3, 2009**	January 4, 2010
- Limited paper/pencil sites	January 5, 2010	3 Hours	8:30 a.m.	**December 3, 2009**	January 4, 2010
March/April Test Window	Mar. 23 - Apr. 4, 2010	3 Hours	Various	**February 9, 2010**	March 22, 2010
May/June Test Window	May 26 – June 6, 2010	3 Hours	Various	**April 14, 2010**	May 25, 2010
- Limited paper/pencil sites	May 26, 2010	3 Hours	8:30 a.m.	**April 14, 2010**	May 25, 2010
July/August Test Window	July 27 – Aug. 7, 2010	3 Hours	Various	**June 15, 2010**	July 26, 2010
September/October Test Window	Sept. 21 – Oct. 2, 2010	3 Hours	Various	**August 10, 2010**	September 20, 2010
- Limited paper/pencil sites	September 21, 2010	3 Hours	8:30 a.m.	**August 10, 2010**	September 20, 2010
November Test Window	November 16-30, 2010	3 Hours	Various	**October 5, 2010**	November 15, 2010

Note: Exam 1/P is administered by paper-and-pencil exam in limited sites outside the U.S. where CBT is not available on the dates indicated above.

Exam 2/FM by Computer-Based Testing

	EXAM DATES	DURATION	START TIME	REGISTRATION DEADLINE	REFUND DEADLINE
February Test Window	February 9-15, 2010	3 Hours	Various	**December 29, 2009**	February 8, 2010
May Test Window	May 19-25, 2010	3 Hours	Various	**April 7, 2010**	May 18, 2010
- Limited paper/pencil sites	May 19, 2010	3 Hours	8:30 a.m.	**April 7, 2010**	May 18, 2010
August Test Window	August 19-25, 2010	3 Hours	Various	**July 8, 2010**	August 18, 2010
- Limited paper/pencil sites	August 19, 2010	3 Hours	8:30 a.m.	**July 8, 2010**	August 18, 2010
December Test Window	December 1-8, 2010	3 Hours	Various	**October 20, 2010**	November 30, 2010
- Limited paper/pencil sites	December 1, 2010	3 Hours	8:30 a.m.	**October 20, 2010**	November 30, 2010

Note: Exam 2/FM is administered by paper-and-pencil exam in limited sites outside the U.S. where CBT is not available on the dates indicated above.

Exam 4/C by Computer-Based Testing

	EXAM DATES	DURATION	START TIME	REGISTRATION DEADLINE	REFUND DEADLINE
April/May Test Window	April 29 – May 5, 2010	3.5 Hours	Various	**March 18, 2010**	April 28, 2010
- Limited paper/pencil sites	April 29, 2010	3.5 Hours	8:30 a.m.	**March 18, 2010**	April 28, 2010
August Test Window	August 10-16, 2010	3.5 Hours	Various	**June 29, 2010**	August 9, 2010
- Limited paper/pencil sites	August 10, 2010	3.5 Hours	8:30 a.m.	**June 29, 2010**	August 9, 2010
November Test Window	November 3-9, 2010	3.5 Hours	Various	**September 22, 2010**	November 2, 2010
- Limited paper/pencil sites	November 3, 2010	3.5 Hours	8:30 a.m.	**September 22, 2010**	November 2, 2010

Note: Exam 4/C is administered by paper-and-pencil exam in limited sites outside the U.S. where CBT is not available on the dates indicated above.

Computer-Based Testing in Québec City, Québec

A mobile computer-based testing center will be available in Québec City, Québec on the dates listed below for Exams 1/P, 2/FM, and 4/C.					
	EXAM DATES	DURATION	START TIME	REGISTRATION DEADLINE	REFUND DEADLINE
May Test Window					
- Exam 1/P	May 25-26, 2010	3 Hours	Various	**April 14, 2010**	May 18, 2010
- Exam 2/FM	May 25-26, 2010	3 Hours	Various	**April 7, 2010**	May 18, 2010
- Exam 4/C	May 25-26, 2010	3.5 Hours	Various	**March 18, 2010**	May 18, 2010
November/December Test Window					
- Exam 1/P	Nov. 30 – Dec. 1, 2010	3 Hours	Various	**October 5, 2010**	November 2, 2010
- Exam 2/FM	Nov. 30 – Dec. 1, 2010	3 Hours	Various	**October 20, 2010**	November 2, 2010
- Exam 4/C	Nov. 30 – Dec. 1, 2010	3.5 Hours	Various	**September 22, 2010**	November 2, 2010

May 2010 Exam Administration

EXAM	EXAM DATE	DURATION	START TIME	REGISTRATION DEADLINE	REFUND DEADLINE
Exam 3, Segment 3F/MFE	May 12, 2010	2.5 Hours	8:30 a.m.	**March 25, 2010**	April 29, 2010
Exam 3, Segment 3L	May 7, 2010	2.5 Hours	8:30 a.m.	**March 25, 2010**	May 3, 2010
Exam 5	May 6, 2010	4 Hours	8:30 a.m.	**March 25, 2010**	May 3, 2010
Exam 7	May 4, 2010	4 Hours	8:30 a.m.	**March 25, 2010**	May 3, 2010
Exam 8	May 5, 2010	4 Hours	8:30 a.m.	**March 25, 2010**	May 3, 2010

October/November 2010 Exam Administration

EXAM	EXAM DATE	DURATION	START TIME	REGISTRATION DEADLINE	REFUND DEADLINE
Exam 3, Segment 3F/MFE	November 5, 2010	2.5 Hours	8:30 a.m.	**September 24, 2010**	November 1, 2010
Exam 3, Segment 3L	October 26, 2010	2.5 Hours	8:30 a.m.	**September 16, 2010**	October 25, 2010
Exam 6	October 27, 2010	4 Hours	8:30 a.m.	**September 16, 2010**	October 25, 2010
Exam 9	October 28, 2010	4 Hours	8:30 a.m.	**September 16, 2010**	October 25, 2010

Important Schedule Notes

- Starting times listed for examinations refer to the local time.

- Candidates should arrive at the examination center at least 30 minutes prior to the scheduled exam time for the check-in process.

- Examinations administered exclusively by the CAS will have a reading time prior to the commencement of the timed exams. For Exam 3L, there will be a 10-minute reading period; for Exams 5-9, there will be a 15-minute reading period.

- Updated information for Exams 1/P, 2/FM, 3F/MFE, and 4/C that are jointly administered by the Casualty Actuarial Society and the Society of Actuaries will be incorporated as necessary and will be noted in the "*Syllabus* Updates" section of the CAS Web Site.

2010 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

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Notice on 2011 Basic Education Requirements for CAS Membership

In March 2008, the CAS Board of Directors approved changes to the CAS basic education structure and finalized transition rules that will affect current Exams 5-9. The new education structure will be implemented in 2011. Details are available in the Admissions/Exams section of the CAS Web Site (www.casact.org).

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[*] Preliminary Actuarial Examinations administers the jointly sponsored Exams 1/P, 2/FM, 3F/MFE, and 4/C of the Canadian Institute of Actuaries, Casualty Actuarial Society, and Society of Actuaries.

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

D. 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.)

A copy of the Casualty Actuarial Society Rules of Procedure for Disciplinary Actions Involving Candidates is available in the "Admissions/Exams" section of the CAS Web Site under "Codes of Professional Conduct and Ethics."

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."

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 below for download and will be included with the examination. 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, gamma, 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

REFERENCES

There is no single required text for this exam. Periodically the list of representative texts is updated. There is no advantage to selecting a text just added or to avoiding a text that has been deleted. 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).	**W**
Exam P Sample Questions and Solutions.	**W**
Tables for Exam P	**W**

Suggested Texts

Bean, M.A., *Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering*, 2001, American Mathematical Society, Chapters 1-9.
Hassett, M.; and Stewart, D., *Probability for Risk Management* (Second Edition), 2006, ACTEX Publications, Chapters 1-11.
Hogg, R.V.; and Tanis, E.A., *Probability and Statistical Inference* (Eighth Edition), 2009, Pearson/ Prentice Hall, Chapters 1-5.
Ross, S.M., *A First Course in Probability* (Eighth Edition), 2009, Pearson/Prentice Hall, Chapters 1-8.
Wackerly, D.; Mendenhall III, W.; and Scheaffer, R., *Mathematical Statistics with Applications* (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@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.

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.

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

Hogg, R.V.; and Tanis, E.A., *Probability and Statistical Inference* (Eighth Edition), 2009, Pearson/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 (603) 373-6140; fax: (877) 417-5433 or (603) 430-1258; 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

I. Interest Theory

   A. Time Value of Money

      1. The candidate will be able to define and recognize the definitions of the following terms:
        a. Interest rate (rate of interest)
        b. Simple interest
        c. Compound interest
        d. Accumulation function
        e. Future value
        f. Present value/net present value
        g. Discount factor
        h. Discount rate (rate of discount)
        i. Convertible m-thly
        j. Nominal rate
        k. Effective rate
        l. Force of interest
        m. Equation of value

      2. The candidate will be able to:
        a. Given any two of interest rate, present value, or future value, calculate the third based on simple or compound interest.
        b. Given any one of the effective interest rate, the nominal interest rate convertible m-thly, the effective discount rate, the nominal discount rate convertible m-thly, or the force of interest, calculate all of the other items.

      c. Write the equation of value given a set of cash flows and an interest rate.

B. Annuities with payments that are not contingent

  1. The candidate will be able to define and recognize the definitions of the following terms:
    a. Annuity-immediate
    b. Annuity-due
    c. Perpetuity
    d. Payable m-thly
    e. Level payment annuity
    f. Arithmetic increasing/decreasing payment annuity
    g. Geometric increasing/decreasing payment annuity
    h. Term of annuity

  2. The candidate will be able to:
    a. Given an annuity with level payments, immediate (or due), payable m-thly, and any three of present value, future value, interest rate, payment, and term calculate the remaining two items.
    b. Given an annuity with non-level payments, immediate (or due), payable m-thly, the pattern of payment amounts, and any three of present value, future value, interest rate, payment amounts, and term of annuity calculate the remaining two items.

C. Loans

  1. The candidate will be able to define and recognize the definitions of the following terms:
    a. Principal
    b. Interest
    c. Term of loan
    d. Outstanding balance
    e. Final payment (drop payment, balloon payment)
    f. Amortization
    g. Sinking fund

  2. The candidate will be able to:
    a. Given any four of term of loan, interest rate, payment amount, payment period, principal, calculate the remaining items.
    b. Calculate the outstanding balance at any point in time.
    c. Calculate the amount of interest and principal repayment in a given payment.
    d. Given the quantities, except one, in a sinking fund arrangement calculate the missing quantity.

D. Bonds

  1. The candidate will be able to define and recognize the definitions of the following terms:
    a. Price
    b. Redemption value
    c. Par Value/Face value
    d. Coupon, Coupon rate
    e. Term of bond
    f. Yield rate
    g. Callable/non-callable
    h. Book value
    i. Accumulation of discount

  2. The candidate will be able to:
    a. Given any four of price, redemption value, yield rate, coupon rate, and term of bond, calculate the remaining item.

E.   General Cash Flows and Portfolios

1.   The candidate will be able to define and recognize the definitions of the following terms:
     a.   Yield rate/rate of return
     b.   Dollar-weighted rate of return/Time-weighted rate of return
     c.   Current value
     d.   Duration (Macaulay and modified)
     e.   Convexity
     f.   Portfolio
     g.   Spot rate
     h.   Forward rate
     i.   Yield curve
     j.   Stock price, stock dividend

2.   The candidate will be able to:
     a.   Calculate the current value of a set of cash flows.
     b.   Calculate the portfolio yield rate.
     c.   Calculate the dollar-weighted and time-weighted rate of return.
     d.   Calculate the duration and convexity of a set of cash flows.
     e.   Calculate either Macaulay or modified duration given the other.
     f.   Use duration and convexity to approximate the change in present value due to a change in interest rate.
     g.   Calculate the price of a stock using the dividend discount model.

F.   Immunization

1.   The candidate will be able to define and recognize the definitions of the following terms:
     a.   Cash-flow matching;
     b.   Immunization (including full immunization);
     c.   Redington immunization.

2.   The candidate will be able to:
     a.   Construct an investment portfolio to fully immunize a set of liability cash flows.
     b.   Construct an investment portfolio to match present value and duration of a set of liability cash flows.
     c.   Construct an investment portfolio to exactly match a set of liability cash flows.

II. Financial Economics

A.   General Derivatives

1.   The candidate will be able to define and recognize the definitions of the following terms:
     a.   Derivative, Underlying asset, Over-the-counter market
     b.   Ask price, Bid price, Bid-ask spread
     c.   Short selling, Short position, Long position
     d.   Stock index
     e.   Spot price
     f.   Net profit/payoff
     g.   Credit risk
     h.   Marking-to-market
     i.   Margin, Maintenance margin, Margin call

2.   The candidate will be able to evaluate an investor's margin position based on changes in asset values.

B.   Options

1.   The candidate will be able to define and recognize the definitions of the following terms:

a. Call option, Put option
b. Expiration, Expiration date
c. Strike price/Exercise price
d. European option, American option, Bermudan option
e. In-the-money, At-the-money, Out-of-the-money
f. Covered call, Naked writing
g. Dividends
h. Put-call parity

2. The candidate will be able to evaluate the payoff and profit of basic derivative contracts.

C. Hedging and Investment Strategies

1. The candidate will be able to define and recognize the definitions of the following terms:
   a. Hedging, Arbitrage
   b. Diversifiable risk, Nondiversifiable risk
   c. Synthetic forwards
   c. Spreads (including bull, bear, box, and ratio spreads)
   d. Collars (including zero-cost collars), Paylater strategy
   e. Straddles (including strangles, written straddles and butterfly spreads)
   f. Convertible bond, Mandatorily convertible bond

2. The candidate will be able to:
   a. Explain how derivative securities can be used as tools to manage financial risk.
   b. Explain the reasons to hedge and not to hedge.
   c. Evaluate the payoff and profit of hedging strategies.

D. Forwards and Futures

1. The candidate will be able to define and recognize the definitions of the following terms:
   a. Forward contract, Prepaid forward contract
   b. Outright purchase, Fully leveraged purchase
   c. Implied repo rate
   d. Cost of carry
   e. Lease rate
   f. Futures contract

2. The candidate will be able to:
   a. Determine forward price from prepaid forward price.
   b. Explain the relationship between forward price and futures price.
   c. Explain the relationship between forward price and future stock price.
   d. Use the concept of no-arbitrage to determine the theoretical value of futures and forwards.
   e. Given any four of call premium, put premium, forward price, strike price and interest rate, calculate the remaining item using the put-call parity formula.

E. Swaps

1. The candidate will be able to define and recognize the definitions of the following terms:
   a. Swap, Prepaid swap
   b. Swap term, Swap spread, Notional Amount
   c. Simple commodity swap, Interest rate swap
   d. Deferred swap

2. The candidate will be able to use the concept of no-arbitrage to determine the theoretical values of swaps.

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 Learning Objectives in Section I, Interest Theory

There is not a single textbook required for the learning objectives in Section I. 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.

Broverman, S.A., *Mathematics of Investment and Credit* (Fourth Edition), 2008, ACTEX Publications:
    Chapter 1 (1.1-1.7)
    Chapter 2 (2.1 -2.4 excluding 2.4.2 and 2.4.3)
    Chapter 3 (3.1-3.3, excluding 3.2.1 and 3.2.2)
    Chapter 4 (4.1-4.3.1)
    Chapter 5 (5.1-5.3 excluding 5.1.4 and 5.3.2)
    Chapter 6 (6.1-6.3 excluding 6.2)
    Chapter 7 (7.1-7.2)
    Chapter 8 (8.1, 8.3.1 and 8.4.1–8.4.2)

Daniel, J.W.; and Vaaler, L.J.F., *Mathematical Interest Theory* (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)
Note: Candidates may also use the First Edition of *Mathematical Interest Theory* (Publisher: Prentice Hall). The same chapter references apply.

Kellison, S.G., *The Theory of Interest* (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)

Ruckman, C.; and Francis, J., *Financial Mathematics: A Practical Guide for Actuaries and other Business Professionals* (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)

Textbook for Learning Objectives in Section II, Financial Economics

McDonald, R.L., *Derivatives Markets* (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).

Study Notes

Derivatives Markets, Errata, 2006 Second Edition, by R. McDonald: http://www.kellogg.northwestern.edu/faculty/mcdonald/htm/typos2e.html	**W**
"Notation and terminology used for Exam FM/2"	**W**
All versions of Exam 2/FM that have been released since 2000 are posted online at http://www.soa.org/education/exam-req/syllabus-study-materials/edu-multiple-choice-exam.aspx and in "Past Exams" under "Study Tools" in the "Admissions/Exams" section of the CAS Web Site (www.casact.org).	**W**
"Sample Questions and Solutions for *Derivatives Markets*."	**W**
Review of Calculator Functions for the Texas Instruments BA-35, SOA Study Note FM-22-05.	**W**
Review of Calculator Functions for the Texas Instruments BA II Plus, SOA Study Note FM-23-05.	**W**

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 2/FM. 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.

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@actexmadriver.com.

Daniel, J.W; and Vaaler, L.J.F., *Mathematical Interest Theory* (Second Edition), 2009, The 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.

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.

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.

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.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; telephone: (877) 407-5433 or (603) 373-6140; fax: (877) 417-5433 or (603) 430-1258; Web site: www.sliderulebooks.com.

Exam 3L
Actuarial Models—Life Contingencies and Statistics Segment

Exam 3L is a two-and-a-half-hour, multiple-choice exam on life contingencies and statistics that is administered by the CAS. 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 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.

Before commencing study for this exam, 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 2010 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
1. For discrete and continuous univariate probability distributions for failure time random variables, develop expressions in terms of the life table functions, l_x, q_x, p_x, $_nq_x$, $_np_x$, and $_{m|n}q_x$, for the cumulative distribution function, the survival function, the probability density function and the hazard function (force of mortality), and be able to: • Establish relations between the different functions • 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 • Express the effect of explanatory variables on a failure time distribution in terms of proportional hazards and accelerated failure time models The distributions may be left-truncated, right-censored, both, or neither. Range of weight: 5-10 percent	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
READINGS	
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.)	

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
READINGS	
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: • Calculate probabilities and moments associated with functions of these random variables' variances. • 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. • 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). Range of weight: 5-10 percent	a. Joint distribution of failure times b. Probabilities and moments
READINGS	
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 $l_x^{(t)}$, $_tq_x^{(t)}$, $_tp_x^{(t)}$, $_td_x^{(t)}$, $_tm_x^{(t)}$ (t): • Establish relations between the functions. • 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. Range of weight: 5-10 percent	a. Time until failure b. Competing risk (multiple decrement) models
READINGS	
Option 1: Bowers et al., Chapter 10.1-10.3 Option 2: Cunningham et al., Chapters 10.1-10.3	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
5. For homogenous and non-homogenous discrete-time Markov chain models: • Define each model. • Calculate probabilities of being in a particular state at a particular time. • Calculate probabilities of transitioning between states. Range of weight: 5-10 percent	a. Markov chains b. Transition probability matrix c. Discrete-time Markov chains
READINGS	
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Describe the properties of Poisson processes: • For increments in the homogeneous case • For interval times in the homogeneous case • For increments in the non-homogeneous case • Resulting from special types of events in the Poisson process • Resulting from sums of independent Poisson processes 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: • Expected values • Variances • Probabilities Range of weight: 0-5 percent	a. Probability calculations for Poisson process
READINGS	
Daniel Poisson	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Daniel Poisson	

C. Life Contingency Models

Range of weight for Section C: 23-27 percent

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
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	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Option 1: Bowers et al., Chapter 7.1-7.4 Option 2: Cunningham et al., Chapter 8.1, 8.3	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Using present-value-of-benefit random variables and present-value-of-future-loss random variables extended to discrete time Markov chains, calculate: • Actuarial present values of cash flows at transitions between states • Actuarial present values of cash flows while in a state • Considerations (premiums) using the Equivalence Principle • Liabilities (reserves) using the prospective method Range of weight: 3-7 percent	a. Cash flows at transition b. Triple product summation c. Transition probabilities
READINGS	
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
1. Perform point estimation of statistical parameters using the following statistical methods: • Maximum likelihood estimation ("MLE") • Method of moments Apply criteria to the estimates such as: • Consistency • Unbiasedness • Minimum variance • Mean square error Range of weight: 10-15 percent	a. Equations for MLE of mean, variance from a sample b. Estimation of mean and variance based on sample c. General equations for MLE of parameters d. Equations for estimation of parameters using method of moments for means, variances, and higher moments e. Recognition of consistency property of estimators and alternative measures of consistency f. Application of criteria for measurement when estimating parameters through minimization of variance, mean square error g. Definition of statistical bias and recognition of estimators that are unbiased or biased
2. Test statistical hypotheses including Type I and Type II errors using: • Neyman-Pearson lemma • Likelihood ratio tests Apply Neyman-Person lemma to construct likelihood ratio equation. Range of weight: 10-15 percent	a. Presentation of fundamental inequalities based on general assumptions and normal assumptions b. Definition of Type I and Type II errors c. Significance levels d. One-sided versus two-sided tests e. Estimation of sample sizes under normality to control for Type I and Type II errors f. Determination of critical regions g. Definition and measurement of likelihood ratio tests h. Determining parameters and testing using tabular values i. Recognizing when to apply likelihood ratio tests versus chi-square or other goodness of fit tests
3. Calculate order statistics of a sample and use critical values from a sampling distribution to test means and variances. Range of weight: 3-7 percent	a. General form for distribution of nth largest element of a set b. Application to a given distributional form c. Recognition of random variables from sample that behave as t-stat or F-stat d. Determination of parameters when applying these tests and obtaining tabular values e. Presentation of hypotheses testing from above for mean and variances
4. Perform a linear regression using the least squares method. Range of weight: 3-7 percent	a. Presentation and calculation of equations for regression statistics

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., *Actuarial Mathematics* (Second Edition), 1997, Society of Actuaries, including erratum.	Bowers et al.	A1-A4, C1, C2	**L**
Cunningham, R.; Herzog, T.; and London, R., *Models for Quantifying Risk* (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**
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**
Hogg, R.V.; McKean, J.W.; and Craig, A.T., *Introduction to Mathematical Statistics* (Sixth Edition), 2004, Prentice Hall.	Hogg et al.	D1-D4	
Hogg, R.V.; and Tanis, E., *Probability and Statistical Inference* (Eighth Edition), 2010, Prentice Hall.	Hogg and Tanis	D1-D4	
Larsen, R.J.; and Marx, M.L., *An Introduction to Mathematical Statistics and Its Applications* (Fourth Edition), 2006, Prentice Hall.	Larsen and Marx	D1-D4	
"Notational Differences Between *Actuarial Mathematics* (AM) and *Models for Quantifying Risk* (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.

Publishers and Distributors for Exam 3L

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

ACTEX Publications, 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.

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.actexmadriver.com; e-mail: retail@actexmadriver.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.

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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 (603) 373-6140; fax: (877) 417-5433 or (603) 430-1258; Web site: www.sliderulebooks.com.

Exam 3F
Actuarial Models—Financial Economics Segment

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.

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.

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 options using the Black-Scholes option-pricing model.
4. Identify the situations where the values of European and American options are the same.
5. Interpret the option Greeks.
6. Explain the cash flow characteristics of the following exotic options: Asian, barrier, compound, gap, and exchange.
7. Explain the properties of a lognormal distribution and explain the Black-Scholes formula as an expectation with respect to a lognormal distribution.
8. Explain what it means to say that stock prices follow a diffusion process.
9. Apply Itô's lemma in the one-dimensional case.

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

McDonald, R.L., *Derivatives Markets* (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 S^aQ^b" 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 (pages 744 through the middle of page 746 only),
    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 http://www.kellogg.northwestern.edu/faculty/mcdonald/htm/typos2e_01.html).
 	
    Unless otherwise stated, chapter appendices are not included in the required readings from this text.	

Shiu, E.S.W., "Some Remarks on *Derivative Markets*," Study Note, updated April 13, 2009.	W

Study Notes

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

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 for Exam 3F

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

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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.

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Exam 4
Construction and Evaluation of Actuarial Models

Exam 4 is a three-and-a-half-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).

Exam 4 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 syllabus for this examination provides an introduction to modeling and covers important actuarial methods that are useful in modeling. A thorough knowledge of calculus, probability, and mathematical statistics is assumed.

The candidate will be introduced to useful frequency and severity models beyond those covered in Exam 3. 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 relative tail weight, and interpret the results to compare the tail weights.

B. Frequency Models

For the Poisson, Mixed Poisson, Binomial, Negative Binomial, Geometric distribution and mixtures thereof:
1. Describe how changes in parameters affect the distribution,
2. Calculate moments,
3. Identify the applications for which each distribution is used and reasons why,
4. Apply the distribution to an application given the parameters,
5. Apply the zero-truncated or zero-modified distribution to an application given the parameters.

C. Aggregate Models

1. Compute relevant probabilities and moments for aggregate risk models.
2. Evaluate aggregate claim models.
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 and TVaR and explain their use and limitations.

F. 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. Apply the following concepts in estimating failure time and loss distribution:
   a. Unbiasedness
   b. Consistency
   c. Mean squared error

G. 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 unbiased
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
   f. Schwarz Bayesian Criterion

H. 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.

I. Simulation

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

Text References for Exam 4/C

For Learning Objectives A through G and I, the readings are:

Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., *Loss Models: From Data to Decisions* (Third Edition), 2008, John Wiley and Sons:
   Chapter 3,
   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 12,
   Chapter 13,
   Chapter 14,
   Chapter 15, Sections 15.1–15.6.4, and 15.6.6,
   Chapter 16,
   Chapter 21, Sections 21.1–21.2 (excluding 21.2.4).

For Learning Objective H (Credibility), the candidate may use any of the options shown below:

Option A	
Klugman, S.A.; Panjer, H.H.; and Willmot, G.E., *Loss Models: From Data to Decisions* (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).	
Option B	
Mahler, H.C.; and Dean, C.G., "Credibility," *Foundations of Casualty Actuarial Science* (Fourth Edition), 2001, Casualty Actuarial Society, Chapter 8, Section 1 (background only) and Sections 2-5. (Also available as an SOA Study Note.)	**W**
Dean, C.G., "Topics in Credibility Theory," 2004 (SOA Study Note).	**W**
Option C	
Herzog, T.N., *Introduction to Credibility Theory* (Third Edition), 1999, Chapters 1-3 (background only); 4-8; and 9 (background only).	

Additional Study Notes

Corrections and comments for *Loss Models: From Data to Decisions*, Third Edition (see http://www.soa.org/files/pdf/edu-loss-models-errata-corrections.pdf).	**W**
Tables for Exam C/4—also see the HTML format of the tables that will be used for the exam by computer-based testing.	**W**
Sample questions and solutions.	**W**
All released exams since 2000 may be found on the SOA Web Site and in "Past Exams" under "Study Tools" in the "Admissions/Exams" section of the CAS Web Site.	**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.

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; Web site: 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.

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.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; telephone: (877) 407-5433 or (603) 373-6140; fax: (877) 417-5433 or (603) 430-1258; Web site: 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 2010 CAS Exam 5 Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **OP** (Online Publication) or **W**—the 2010 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
READINGS	
Nyce Foundations	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS

2. Explain the basic purpose and structure of the insurance contract, including coverages, exclusions, exceptions, limits, and deductibles.
 	
Range of weight: 9-13 percent
	a. Possible exposure to loss:
	  • Individual
	  • Company
	  • First party
	  • Third party (legal liability and triggers; state mandated)
	  • Perils covered
	b. Lines of insurance that cover each of the exposures to loss
	c. Basic insurance terminology (e.g., premium, loss, loss adjustment expense)
	d. Basic policy structure
	e. Basic policy terminology (e.g., named insured, declarations)

READINGS	
Flitner and Trupin ISO PAP Nyce Foundations Nyce PI	

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Calculate a policy premium for a specified risk using the rate pages provided. Range of weight: 0-5 percent	a. Exposure basis and how this is determined b. How to read and use rate pages c. Rating variables (e.g., territory, driver characteristics) d. How individual risk attributes contribute to loss exposure e. How rating variables relate to exposure to loss
READINGS	
Flitner and Trupin ISO PAM Werner & Modlin, Chapter 2	

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: • Underwriting • Marketing • Claims
READINGS	
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
READINGS	
Myhr & Markham Werner & Modlin, Chapters 8, 13, and 14	

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
READINGS	
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
READINGS	
Boor Cycle Boor Macro	

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: • Medical malpractice • Professional liability Weight 0-5 percent	a. Loss exposures and policy coverages
READINGS	
Flitner and Trupin	

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
READINGS	
Werner & Modlin, Chapters 1, 2, and 4	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Use appropriate premium data to estimate premium input into the overall rate level indication, adjusting for the following: • Coverage and benefit level changes • Rate level changes • Premium trend Range of weight: 8-12 percent	a. Compilations of experience (Calendar Year/ Policy Year/Accident Year) b. Written versus earned premium c. Rate changes d. Policy terms e. Distributional shifts/changes in volumes (trend over time) f. Parallelogram method g. Extension of exposures h. Definition of exposures i. Impact of law changes
READINGS	
ASOP 13 Werner & Modlin, Chapters 1-3, 5, and Appendices A-D	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Use appropriate loss and loss adjustment expense data to estimate loss and loss adjustment expense input into the overall rate level indication, adjusting for the following: • Coverage and benefit level changes • Loss trend • Loss development • Catastrophe provision Range of weight: 12-16 percent	a. Compilations of experience (Calendar Year/ Policy Year/Accident Year/Report Year) b. Reported versus paid losses c. Loss development d. Impact of law changes e. Frequency and its trend over time f. Severity and its trend over time g. Pure premium and its trend over time h. Exponential versus linear trend i. Relationship between trend and loss development j. Changes in mix of business k. Allocated versus unallocated loss adjustment expenses l. Policy provisions m. Credibility criteria n. Credibility formulas o. Large loss adjustment p. Adjustments for catastrophe q. Claims made coverage

READINGS

ASOP 13

Werner & Modlin, Chapters 1, 3, 6, 12, 16, and Appendices A-D

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Calculate the underwriting expense provisions for estimating an overall rate level indication. Range of weight: 0-5 percent	a. Expense categories: • Commission • General • Other acquisition • Tax, license, and fees b. Profit and contingency provisions c. Cost of capital d. Sources of data and selection criteria e. Fixed and variable expense f. Expense fee calculation g. Differences in procedures for loss adjustment expenses versus underwriting expenses

READINGS

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
5. Calculate the overall rate level indication using the pure premium and loss ratio methods. Range of weight: 5-10 percent	a. Formulae b. Data Requirements c. Advantages and disadvantages of each method d. Compare and contrast methods e. Four principles of ratemaking from CAS Statement of Principles

READINGS

CAS Principles

Werner & Modlin, Chapters 1, 8, and Appendices A-D

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
6. Explain the considerations beyond the calculated cost based estimate of the rate when selecting a final rate change to implement. Range of weight: 0-5 percent	a. Calculated cost based rate b. Regulatory constraints c. Operational constraints d. Marketing considerations: • Competitive comparisons • Close ratios • Retention ratios • Growth • Distributional analysis • Policyholder dislocation analysis e. Lifetime value analysis f. Optimized pricing
READINGS	
Werner & Modlin, Chapter 13	

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 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
READINGS	
CAS Principles Werner & Modlin, Chapter 9	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Calculate rating variable differentials for: • Classification • Territory • Deductibles • Increased limits 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 i. Fundamentals of univariate and multivariate relativity analysis
READINGS	
Feldblum Werner & Modlin, Chapters 9-12, 15, and Appendices E-F	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Describe the process for implementing rates to achieve an organization's goals. Range of weight: 0-3 percent	a. Rating algorithms b. Rating variables and differentials c. Fixed expenses, if applicable d. Calculation of final base rates e. Minimum premiums f. Non-pricing solutions
READINGS	
Werner & Modlin, Chapter 14	

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 f. Guaranteed replacement cost
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
READINGS	
Werner & Modlin, Chapter 11	

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
READINGS	
Werner & Modlin, Chapters 6, 7, and Appendix B	

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
READINGS	
Werner & Modlin, Chapters 6, 7, and Appendix B	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
5. Explain the considerations for selecting and using data in the ratemaking process. Range of weight: 0-5 percent	a. Key principles of data quality b. Purpose and components of a statistical plan c. Common data issues d. Data management principles
READINGS	
Werner & Modlin, Chapter 3	

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
READINGS	
Werner & Modlin, Chapter 15	

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
READINGS	
Werner & Modlin, Chapter 15	

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
READINGS	
Feldblum	

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," June 2009, excluding Appendices.	ASOP 13	D2, D3	**W** **NEW**

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 Cycle	B4	**W**
Boor, J.A., "A Macroeconomic View of the Insurance Marketplace," CAS Study Note, 1998.	Boor Macro	B4	**W**
Casualty Actuarial Society Committee on Ratemaking Principles, *Statement of Principles Regarding Property and Casualty Insurance Ratemaking*, Casualty Actuarial Society.	CAS Principles	D5, E1,	**W**
Feldblum, S., "Personal Automobile Premiums: An Asset Share Pricing Approach for Property-Casualty Insurance," *PCAS* LXXXIII, 1996, pp. 190-256 (excluding Sections 7-9).	Feldblum	F8	**W**
Flitner, A.L.; and Trupin, J., *Commercial Insurance* (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	A2-4, C1	**L**
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**
Insurance Services Office, Inc., Personal Automobile Policy (Edition 6-98).	ISO PAP	A2-3	**SK**
Myhr, A.E.; and Markham, J.J., *Insurance Operations, Regulation, and Statutory Accounting* (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	B1-3	**L**

Citation	Abbreviation	Learning Objective	Source
Nyce, C.M., *Foundations of Risk Management and Insurance* (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	A1-2	**L**
Nyce, C.M., *Personal Insurance* (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.	Nyce PI	A2-3	**L NEW**
Werner, G. and Modlin, C, "Basic Ratemaking," Casualty Actuarial Society, Version 3, January 2010, including errata. (both errata that were incorporated into the third version that are listed on the last two pages of the publication as well as the errata issued on 9 April 2010.)	Werner & Modlin	A4, B2, D1-6, E1-3, F1-7	**OP NEW**

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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; Web site: 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 (603) 373-6140; fax: (877) 417-5433 or (603) 430-1258; Web site: www.sliderulebooks.com.

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

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 2010 CAS Exam 6 Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **OP** (Online Publication) or **W (**2010 CAS Exam 6 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.

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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
READINGS	
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
READINGS	
Friedland, Chapters 5 and 6	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Calculate unpaid claim estimates using each of the following estimation techniques: • Development technique, including case outstanding technique • Expected claim technique • Bornhuetter-Ferguson technique • Cape Cod technique • Frequency-severity techniques • Credibility models Range of weight: 12–16 percent	a. Standards of Practice, ASOP Nos. 9 and 43 b. Statement of Principles, CAS c. The claims process d. Assumptions of each estimation technique e. Mechanics associated with each techniques (including organization of data) f. Reporting and payment patterns g. When each technique works and when it does not h. Application of credibility 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

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Forecast unpaid claim estimates and their distributions using stochastic models. Range of weight: 2-6 percent	a. Formal mathematical model b. Data organization c. Calendar year, accident year, and development year trends and their interrelationships d. Appropriate parameters e. Variance and percentiles of reserve distribution f. Strengths and weaknesses of stochastic models for the estimation of unpaid claims

READINGS
Barnett and Zehnwirth

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
5. Assess the influence of operating changes on the estimation of unpaid claims. Range of weight: 2-6 percent	a. How internal operating changes affect estimates of unpaid claims • Claims processing • Underwriting and policy provisions • Marketing • Coding of claim counts and/or claim related expenses • Treatment of recoveries such as policyholder deductibles and salvage and subrogation • Reinsurance

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS

6. Adjust data and/or estimation techniques for changes in:
  • 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)
  • External environment (e.g., inflationary or legal environment)
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

READINGS

Friedland, Chapters 7-14

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

READINGS

Friedland, Chapter 14

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS

Conger
Friedland, Chapters 1, 3, and 16

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS

9. Evaluate results of the estimation process for adequacy/reasonableness.
Range of weight: 3-7 percent
	a. Components of Evaluation
	  • Multiple methods
	  • Explanation of differences
	  • Test statistics (e.g., claim ratios, severities, pure premiums, frequencies, indicated unpaid)
	b. Monitoring and interim valuations

READINGS

Friedland, Chapter 15

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
10. Forecast unpaid claim estimates for various layers of claims. Range of weight: 0-5 percent	a. Methods for estimating unpaid claims in a deductible layer b. Methods for estimating unlimited unpaid claims excess of a threshold c. Methods for estimating unpaid claims excess of a retention but bounded by a limit d. Interrelationships between parameters for forecasting deductible, unlimited excess, layer excess and total claims
READINGS	
Pinto and Gogol Siewert	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
11. Forecast premium reserves. Range of weight: 0-5 percent	a. Reserves for retrospective premiums b. Reserves for unearned premiums for policies with non pro-rata earning patterns
READINGS	
Blanchard Premium Teng and Perkins	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
12. Make specific provisions in the unpaid claim estimate for emerging mass tort liabilities. Range of weight: 0-5 percent	a. Mass tort liabilities that are emerging, e.g., mold, asbestos, pollution, and lead paint b. Methods for estimating the unpaid claims c. Differences between normal or traditional claim development and development of mass torts
READINGS	
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Explain the purposes and origins of accounting standards and regulations. Range of weight: 0-5 percent	a. Purpose of accounting b. Types of accounting c. Principal financial statements d. Sources of accounting rules e. Selected accounting concepts f. Common accounts for insurance companies g. The ways GAAP and SAP accounting can differ for a particular country (e.g., the United States)

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
Blanchard Premium
Blanchard Selected
IFRS 4 Basis
IFRS 4 Standard
Myhr and Markham

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
CAS VFIC
FAS 113
IFRS 4 Basis
IFRS 4 Standard

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Explain the meaning of various reinsurance terms. Range of weight: 0-5 percent	a. XOL b. Quota share c. Surplus share d. Treaty e. Facultative f. Rate-on-line g. Subject earned premium h. Commutation i. Finite reinsurance j. Insurance capacity k. Clash l. Ceded, direct, gross, assumed, net m. Catastrophe treaty n. Aggregate excess of loss o. Burning costs
2. Explain the purposes of various reinsurance arrangements. Range of weight: 3-7 percent	a. Capacity b. Surplus relief c. Smoothing of results
READINGS	
Harrison	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
3. Determine the price of reinsurance programs using the appropriate methods. Range of weight: 3-7 percent	a. Loss distributions b. Increased limit factors c. Trend d. Expenses e. Reinsurance pricing methods • Burn cost • Exposure method • Experience rating
READINGS	
Clark Ludwig	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Measure the effects on reinsurance pricing of: • Sliding scale commissions • Reinstatement clauses • Loss corridors • Retrospective rating • Commutations • Clash • Catastrophe 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
READINGS	
Clark Ludwig Steeneck	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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 • ALAE included or excluded • Per occurrence limits • Aggregate limits • Order in which limits apply
READINGS	
Harrison	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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: • Ground up versus excess loss • Accident year versus treaty year
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
READINGS	
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)
READINGS	
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
READINGS	
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	**W**
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	**W**
Barnett, G.; and Zehnwirth, B, "Best Estimates for Reserves," *PCAS* LXXXVII, 2000, pp. 245-303.	Barnett and Zehnwirth	A4	**W**
Blanchard, R.S., "Accounting Concepts for the Actuary," CAS Study Note, June 2003.	Blanchard Accounting	B1	**W**
Blanchard, R.S., "Basic Insurance Accounting—Selected Topics," CAS Study Note, June 2007, pages 1–20 only.	Blanchard Selected	B1, B2, B4	**W**
Blanchard, R.S., "Premium Accounting," CAS Study Note, May 2005.	Blanchard Premium	A11, B1, B2	**W**

Citation	Abbreviation	Learning Objective	Source
Bouska, A.S., "From Disability Income to Mega-Risks: Policy-Event Based Loss Estimation," Casualty Actuarial Society *Forum*, 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," Casualty Actuarial Society *Forum*, Summer 2003, Section 3 and Appendix B.	CAS ERM	D1, D2	**W**
Casualty Actuarial Society, *Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Reserves*, 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" Casualty Actuarial Society *Forum*, 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," CAS *Forum*, 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," Casualty Actuarial Society, July 2009.	Friedland	A1-A3, A5-A8	**OP**
Harrison, C.M., *Reinsurance Principles and Practices* (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**

Citation	Abbreviation	Learning Objective	Source
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," *PCAS* LXXVIII, 1991, pp. 110-145. Includes discussion: Feldblum, S., *PCAS* LXXX, 1993, pp. 380-395.	Ludwig	C3, C4	**W**
Mack, T. "Credible Claims Reserve: The Benktander Method," *ASTIN Bulletin*, 2000, pp. 333-337.	Mack	A3	**W**
Myhr, A.E.; and Markham, J.J., *Insurance Operations, Regulation, and Statutory Accounting* (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," *Foundations of Casualty Actuarial Science* (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," *PCAS* LXXIV, 1987, pp. 227-255. Including discussions of paper: Levine, G.M., *PCAS* LXXIV, 1987, pp. 256-271; and Bear, R.A., *PCAS* LXXIX, 1992, pp. 134-148.	Pinto and Gogol	A10	**W**
Siewert, J.J., "A Model for Reserving Workers Compensation High Deductibles," Casualty Actuarial Society *Forum*, Summer 1996, pp. 217-244.	Siewert	A10	**W**
Slywotzky, A.J.; and Drzik, J., "Countering the Biggest Risk of All," *Harvard Business Review*, 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," *PCAS* LXXXIII, 1996, pp. 611-647, excluding Section 5. Including discussion of paper: Feldblum, S., *PCAS* LXXXV, 1998, pp. 274-315, Sections 1 and 2 only. Candidates will not be held responsible for specific Annual Statement notation but will be responsible for concepts presented.	Teng and Perkins	A11	**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.

OP   Represents an Online Publication 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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W   Represents material in the 2010 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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Contact information is furnished for those who wish to purchase the text references cited for Exam 6. Publishers and distributors are independent and listed for the convenience of candidates; inclusion does not constitute endorsement by the CAS.

ACTEX Publications, 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 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.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; telephone: (877) 407-5433 or (603) 373-6140; fax: (877) 417-5433 or (603) 430-1258; Web site: 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 2010 CAS Exam 7-Canada Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **W**— the 2010 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 2010 Update to the 2009 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

READINGS
Baer and Rendall
Kerr et al.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Brown	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Baer and Rendall Brown	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Kerr et al.	

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

READINGS
AAA
BC Civil Liability
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS	
AMF 1	
AMF 2	
Baer and Rendall	
McDonald	
Noonan	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
AMF 1
AMF 2
Baer and Rendall
Brown
McDonald
Noonan

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
FSCO 5 Year Review
FSCO Private Auto
FSCO Prohibited
IBC Rate Regulation

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
Baer and Rendall
Brown
Kerr et al.
Landmark Legal
McDonald
Morrow v. Zhang

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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)

READINGS
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
1. Describe the origin and purpose of the following government and industry insurance programs: • Flood insurance • Crop insurance • Employment • Medicare/Health Care • Residual markets (e.g., auto, property) • Workers Compensation • Automobile • Pension Plans • Guaranty Funds • Asbestos • TRIA Range of weight: 5-10 percent	a. Reason for inception b. Major historical developments c. Philosophy of program
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. 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 i. Government response to gap in private program
3. Evaluate the effectiveness of a government/industry program (actual, as listed in Section C.1, or hypothetical). Range of weight: 5-10 percent	a. How to measure performance of programs: • Solvency • Efficiencies • Stability • Viability/longer term prospects b. How well program meets its purpose c. Impact of external factors (e.g., economic conditions, weather, regulation, etc.)

READINGS
AAA
Agricultural Programs
Alberta
CAS
CIA Health Care
CPCU
Dutil
FSCO Private Auto
Groupement des assureurs automobiles By-Law 7
Groupement des assureurs automobiles Plan
KPMG et al.
Morneau Sobeco
N&L PUB Hearing
N&L PUB IBC
OSFI Earthquake
PACICC Options

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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Evaluate the financial health of an insurance entity. Range of weight: 19-21 percent	a. Annual Statement and Annual Return • Balance sheet • Income statement • Change in surplus • Notes to financial statements • Cash flow exhibit • Actuarial liabilities • Reinsurance accounting b. Risk-Based Capital, Minimum Capital Test c. Dynamic Capital Adequacy Testing d. Rating Agencies e. MSA Ratios

READINGS
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
Feldblum
IASA
KPMG
MSA
NAIC Accounting
NAIC Annual Statement
OSFI MCT
Uniform Annual Return

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Complete specific schedules and exhibits of Annual Statements/Annual Returns: • Balance sheet • Income statement • Schedule P • Insurance Expense Exhibit • Net Claims and Adjustment Expenses Runoff Range of weight: 5-7 percent	a. Valuation of assets and liabilities b. Schedule P c. Calculation of change in surplus d. Calculation of net income e. Calculation of Insurance Expense Exhibit f. Calculation of reinsurance penalties g. Calculation of excess (deficiency) ratio from page 60.40 of the Annual Return h. Direct Expense Report

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
CIA Min Capital
OSFI MCT

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
CEA and Towers Perrin Cheng CIA Accounting Standards CIA Discounting Feldblum IASA NAIC Accounting

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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 Subsequent Events 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, *Canada's Agricultural Business Risk Management Programs*, pages 1-8.	Agricultural Programs	C1, C2, C3	**SK**

Citation	Abbreviation	Learning Objective	Source
"Alberta Insurance Act, Premium Regulation" Appendix, Schedules 1-3, pp. 15-22.	Alberta	C1, C2, C3	**SK**
A.M. Best Company, *Best's Key Rating Guide, Property/Casualty, United States & Canada*, 2009, 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," *Bulletin de l'Autorité des Marchés Financiers*, 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., *Cases on the Canadian Law of Insurance* (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: *Glenn v. Scottish Union and National Insurance Company Ltd.* (Chapter 1); *Regal Films Corporation Ltd. v. Glens Falls Insurance Company* (Chapter 2); *Fletcher v. MPIC* (Chapter 8); *Broadhurst and Ball v. American Home*; and *Dillon v. Guardian Insurance* (Chapter 11).	Baer and Rendall	A1, A3, B1, B2, B5	**SK**
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., *Introduction to Canadian Insurance Law* (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, *Annual Statement Instructions P&C-1*, 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 is for the 2008 *Instructions* (available at www.osfi-bsif.gc.ca). Please use the 2009 version. A revised citation will be posted online.]	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, "Draft Educational Note: Subsequent Events," October 2008.	CIA Subsequent Events	D1	**SKU NEW**

Citation	Abbreviation	Learning Objective	Source
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	**SK**
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: Guidance for the 2008 Valuation of Policy Liabilities and DCAT for Property and Casualty Insurers," December 2008. Candidates will not be tested directly on material in this Educational Note. Candidates, however, may find this Educational Note valuable in understanding the obligations of the Appointed Actuary with respect to the valuation of policy liabilities and DCAT.	CIA Guidance		**SKU NEW**
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	**SK**
Canadian Institute of Actuaries, "Submission to the Commission on the Future of Health Care in Canada," January 2002.	CIA Health Care	C1, C2, C3	**SK**
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	**W**
CEA and Towers Perrin, "Solvency II Introductory Guide," June 2006.	CEA and Towers Perrin	D4	**SK**

Citation	Abbreviation	Learning Objective	Source
Cheng, J.S., *Fair Value of Claims Liabilities*, March 2007, J.S. Cheng & Partners Inc.	Cheng	D4	**SK**
Court of Appeal of Alberta, *Morrow v. Zhang*, 2009 ABCA 215, Date: 12.06.2009, Docket: 0801-0041-AC/0801-0044-AC/0801-0067-AC, Sections I, II, III, IV, VI (E), VII, VIII, and IX.	Morrow v. Zhang	B4	**SKU NEW**
CPCU Society's Connecticut Chapter, "Flood Insurance and Hurricane Katrina, Evaluation of the National Flood Insurance Program and Overview of the Proposed Solutions," *CPCU eJournal*, September 2006.	CPCU	C1, C2, C3	**SK**
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	**SK**
Dutil, R., "Facility Association," CAS Study Note, May 2008.	Dutil	C1, C2, C3	**W**
Feldblum, S., "Statutory Surplus: Computation, Pricing and Valuation," CAS Study Note, June 2003.	Feldblum	D1, D4	**W**
Financial Services Commission of Ontario, *Private Passenger Automobile Filing Guidelines–Major for Proposed Revisions to Automobile Insurance Rates and Risk Classification Systems*, March 2009, Part A, Part B, Part C (Sections 3–7 and 10), and Appendices B1 and B2.	FSCO Private Auto	B3, C1, C2, C3	**SKU NEW**
Financial Services Commission of Ontario, "Prohibited Practices," FSCO Auto Bulletin A-02-05, R.R.O. 1990, Regulation 664.	FSCO Prohibited	B3	**SKU NEW**
Financial Services Commission of Ontario, "Report on the Five Year Review of Automobile Insurance," March 2009.	FSCO 5 Year Review	B3	**SKU NEW**
"Government Insurers Study Note," CAS Study Note, May 2008, pp. 1-4 and 17-20.	CAS	C1, C2, C3	**W**
Groupement des assureurs automobiles, Risk Sharing Plan—Procedures Manual; By-Law No.7—Risk Sharing Plan, 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, Risk Sharing Plan–Procedures Manual, December 2006 Update, By-Law No. 7, Sections 1.1, 2.1 to 2.4, 2.7 to 2.9, 3.1 to 3.2, 3.5 to 3.9, 4.1 to 4.2, 4.11 to 4.14, 5.1 to 5.5, 7.1 to 7.6, 8.1 to 8.3, and 9.1 to 9.7; General Description of the Plan, Sections 15A to 15E and 15G.	Groupement des assureurs automobiles: Plan	C1, C2, C3	**SKU NEW**
Insurance Accounting and Systems Association, Property-Casualty Insurance Accounting (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**

Citation	Abbreviation	Learning Objective	Source
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 Companies Act," *Financial Institutions Act*, 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**
Kerr, M.; Kurtz, J; and Olivo, L.M., *Canadian Tort Law in a Nutshell* (Second Edition), Thomson Carswell, 2005. Regarding the cases included in this reading, candidates are only responsible for the following cases: *Rylands v. Fletcher*; *McAlister (Donoghue) v. Stevenson*; and *Hedley Byrne and Company v. Heller and Partners Ltd.*	Kerr et al.	A1, A4, A5, B4	**L**
KPMG, LLP, "Impact of IFRS on Canadian Property and Casualty Insurers," 2008. Candidates may find the following material valuable as background for the KPMG paper 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	**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.	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	**SK**
McDonald, B.R., Life Insurance Laws of Canada (Common Law Provinces), 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**

Citation	Abbreviation	Learning Objective	Source
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**
Morneau Sobeco Handbook of Canadian Pension and Benefit Plans (Fourteenth Edition), 2008, CCH Canadian Limited, Chapters 3, and 14-17.	Morneau Sobeco	C1, C2, C3	**L**
MSA Research, Inc., "MSA Report on Property & Casualty, Canada, 2009," Section 3, Detailed Exhibit Explanations, pp. 1-9.	MSA	D1	**SKU NEW**
National Association of Insurance Commissioners, *Accounting Practices and Procedures Manual*, 2009, Preamble, pp. P-1 to P-12.	NAIC Accounting	D1, D4	**SKU NEW**
National Association of Insurance Commissioners, Official NAIC Annual Statement Blanks, Property and Casualty, 2009 (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 Syllabus readings. [Note: Page numbers refer to the 2008 statement. The Syllabus Update will contain updated page references for the 2009 statement.]	NAIC Annual Statement	D1, D2	**L NEW**
Newfoundland and Labrador Public Utilities Board, 2005 Automobile Insurance Benchmark Hearing, "A submission by Insurance Bureau of Canada," November 2004.	N&L PUB Hearing	C1,C2,C3	**SKU NEW**
Newfoundland and Labrador, Public Utilities Board, Homeowners' Insurance Review, "A Submission by Insurance Bureau of Canada," December 2005.	N&L PUB IBC	C1,C2,C3	**SKU NEW**
Noonan, B., "Protecting the Pledge," Foundations of Regulation, Best's Review, October 2005.	Noonan	B1, B2	**SK**
Office of the Superintendent of Financial Institutions Canada, "2009 Memorandum for the Actuary's Report on Property and Casualty Insurance Business."	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**

Citation	Abbreviation	Learning Objective	Source
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	**SK**
"Options for Preparedness at PACICC," February 2005.	PACICC Options	C1,C2, C3	**SKU** **NEW**
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	**SK**
Uniform Annual Return (2009 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, 40.07, 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 have been updated for the 2009 statement.]	Uniform Annual Return	D1, D2	**L**

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 2010 CAS Study Kit.

SKU   Represents material included in the 2010 CAS Study Kit and the 2010 Update to the 2009 Study Kit.

W   Represents material in the 2010 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.

American Academy of Actuaries, 1100 Seventeenth Street NW, Seventh Floor, Washington, DC 20036; telephone: (202) 223-8196; Web site: 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.

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.

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.

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

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

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

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 (Fourteenth Edition), 2008, 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. 12th 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-Taipei
Nation-Specific Examination: Law, Regulation, Government and Industry Insurance Programs, and Financial Reporting

The Actuarial Institute of Chinese Taipei (AICT) uses the Casualty Actuarial Society examinations for its property-casualty actuaries. A candidate who completes CAS Exams 1-6, 8, and 9 as well as the nation-specific Taiwan exam (i.e., both AICT Exam 7GA2 on Actuarial Standard of Practice and Accounting and Exam 7GB2 on Insurance Regulations and Discipline) may become a member of the AICT.

Prior to 2010, AICT members who wished to become members of the CAS would have to pass an additional nation-specific exam (i.e., CAS Exam 7-Canada or Exam 7-United States). In September 2009, the CAS Board reviewed a proposal from the CAS Education Policy Committee. The proposal provided details of the AICT nation-specific examination and showed that it meets the requirements of the CAS nation-specific exam. The Board approved the AICT nation-specific exam (i.e., current AICT Exams 7GA2 and 7GB2) as fulfilling the nation-specific requirement for CAS membership effective January 1, 2010.

For details on the administration of AICT nation-specific examinations, please contact:

Actuarial Institute of Chinese Taipei
10F.-1, No.216, Sec. 2
Nanchang Road, Zhongzheng District
Taipei 100
Taiwan (R.O.C.)
Telephone: 886-2-2364-9168
Fax: 886-2-3365-2283
E-mail: airc.org@gmail.com
Web Site in Chinese: http://airc.org.tw/2007/html/4-2-1.php?bookittm_id=2
Web Site in English: http://airc.org.tw/newsfiles/AICT_exam.pdf

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** constitute the 2010 CAS Exam 7-United States Study Kit that may be purchased from the CAS Office. Items marked with a bold **W**—the 2010 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 2010 Update to the 2009 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
READINGS	
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	a. Tort b. No fault (workers compensation, auto) c. History of no fault d. Type of thresholds e. Advantages and disadvantages of tort and no-fault systems f. Experience of individual systems
READINGS	
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	a. Trends in litigation b. Litigation costs c. Asbestos litigation d. Regulatory & insurer responses e. Economic policy
READINGS	
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	Elements necessary to pursue a tort claim: a. Strict liability vs. negligence vs. immunity from liability b. The Hand Rule and the reasonable person standard c. Contributory Negligence d. Products Liability Law e. How much of a dangerous product to produce f. Choices of care levels in product liability g. Perceptions of risk in products liability.
READINGS	
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. 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 Annual Statement and how they are used to monitor solvency.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
A.M. Best 1 Bartlett et al. Ghezzi Harrington NAIC Model Law Porter Wagner	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Feldblum (RBC) Harrington Musulin NAIC IRIS Porter Wagner	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
A.M. Best 1 Harrington Harrington and Doerpinghaus Porter Wagner	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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 d. Gramm-Leach-Bliley
READINGS	
AM Best 1 Harrington Porter 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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS

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
	   • Social Security
	   • Flood insurance
	   • Unemployment
	   • Medicare
	   • Residual markets (e.g., auto, workers compensation, property)
	   • Workers compensation
	   • Automobile Plans
	   • Pension plans
	   • Guaranty funds
	   • TRIA

READINGS	
AAA Monograph CPCU Government Insurers Study Note Hamilton and Ferguson, pp. 6.31-6.34, 9.36-9.40 Nyce Porter Wiening et al. Wilcox Williams	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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)

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. CPCU Government Insurers Study Note Hamilton and Ferguson, pp. 6.31–6.34, 9.36–9.40 Marshall and Neale Nyce Porter Wiening et al. Williams

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 Annual Statement and the Insurance Expense Exhibits. A detailed knowledge of reserves and values required in the Annual Statement 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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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: 25 - 30 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

READINGS
2009 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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS
A.M. Best 1 Feldblum (RBC) IASA 3 NAIC IRIS

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. Fair value of claims liabilities e. International Accounting Standards

READINGS
Blanchard
Conger et al.
IASA 1, Chapter 14
NAIC APPM, Preamble

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
4. Explain the responsibilities of an actuary as defined by standards of practice, regulators and insurance laws for financial reporting. Range of weight: 10-15 percent	a. Statutory Actuarial Opinion b. Standards of Practice c. Actuary and auditor relationship d. Materiality e. Actuarial Opinion Summary f. Actuarial Report
READINGS	
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
READINGS	
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
2009 Insurance Expense Exhibit.	2009 IEE	D1	**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**
American Academy of Actuaries, "Social Security Reform Options," Public Policy Monograph, January 2007.	AAA Monograph	C1, C2, C3	**W**
A.M. Best, *Annual Review of the Excess and Surplus Lines Industry*, September 2001, Section V, pp. 25-32.	A.M. Best 1	B1, B3, B4, D2	**SK NEW**
A.M. Best, *Business as Never Before,* Best's Review, January 2005.	A.M. Best 2	A3	**SK**

Citation	Abbreviation	Learning Objective	Source
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," *Journal of Insurance Regulation*, Summer 1999, pp. 478-487 up to "Assessment Life Insurance."	Bartlett et al.	B1, C2, C3	**SK NEW**
Blanchard, R.S., "Basic Insurance Accounting—Select Topics," CAS Study Note, July 2008, pp. 21-24.	Blanchard	D3, D5	**W**
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, 2008."	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," *Fair Value of P&C Liabilities: Practical Implications*, 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," *CPCU eJournal*, September 2006.	CPCU	C1, C2, C3	**SK**
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**

Citation	Abbreviation	Learning Objective	Source
Feldblum, S., "NAIC Property/Casualty Insurance Company Risk-Based Capital Requirements," *PCAS* LXXXIII, 1996, pp. 297-358 (end at "The Square Root Rule") and 379-389 (excluding Section 11 and related exhibits).	Feldblum (RBC)	B2, D2	**W**
Feldblum, S., "Notes to the Financial Statement," CAS Study Note, May 2004.	Feldblum (Notes)	D1	**W**
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	**W**
Feldblum, S., "Statutory Surplus: Computation, Pricing and Valuation," CAS Study Note, June 2003. Candidates are not responsible for the end notes.	Feldblum (Surplus)	D1	**W**
Ghezzi, T.L., "Actuarial Perspective on Property/Casualty Redlining Issues," *Actuarial Digest*, Volume 15, No. 1, February/March 1996.	Ghezzi	B1	**SK**
Gorvett, R.W.; Tedeschi, J.L.; and Ward, K.A., "Special Issues—Data Sources," *Foundations of Casualty Actuarial Science* (Fourth Edition), Casualty Actuarial Society, 2001, Chapter 10, pp. 787-796.	Gorvett et al.	D1	**W**
"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	**W**
Hamilton, K.L.; and Ferguson, C.L., *Personal Risk Management and Property-Liability Insurance* (First Edition), American Institute for Chartered Property Casualty Underwriters, 2002, pp. 6.31 [beginning with Fair Access to Insurance Requirements (FAIR) Plans] - 6.34, 8.20-8.26, and 9.36-9.40.	Hamilton and Ferguson	A2, C1, C2, C3	**SK**
Harrington, S.E., "Insurance Rate Regulation in the 20th Century," *Journal of Insurance Regulation*, Winter 2000, pp. 204-217.	Harrington	B1, B2, B3, B4	**SK**
Harrington, S.E.; and Doerpinghaus, H.I., "The Economics and Politics of Automobile Insurance Rate Classification," *Journal of Risk and Insurance*, 1993, pp. 59-84.	Harrington and Doerpinghaus	B3	**SK**
Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (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	**L**
Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (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	**L**

Citation	Abbreviation	Learning Objective	Source
Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting (Eight Edition),* 2003, Chapter 16 pp. 27-33. Candidates are not responsible for items in the update to the 2003 Edition.	IASA 3	D2	**L**
Mallor, J.P.; Barnes, A.J.; Bowers, T.; Phillips, M.J.; and Langvardt, A.W., *The Legal Environment of Risk Management and Insurance* (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," *CPCU eJournal*, 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., *The Economic Approach to Law,* 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**
Musulin, R.T., "Issues in the Regulatory Acceptance of Computer Modeling for Property Insurance Ratemaking," *Journal of Insurance Regulation*, Spring 1997, pp. 342-359.	Musulin	B2	**SK**
National Association of Insurance Commissioners, *Accounting Practices and Procedures Manual*, 2009, Preamble.	NAIC APPM, Preamble	D3	**SKU NEW**
National Association of Insurance Commissioners, *Accounting Practices and Procedures Manual*, 2009, Statement of Statutory Accounting Principles 53, "Property Casualty Contracts—Premiums," paragraphs 1-17.	NAIC SSAP 53	D1	**SKU NEW**
National Association of Insurance Commissioners, *Accounting Practices and Procedures Manual*, 2009, Statement of Statutory Accounting Principles 62, "Property and Casualty Reinsurance," paragraphs 1-82.	NAIC SSAP 62	D1	**SKU NEW**
National Association of Insurance Commissioners, *Accounting Practices and Procedures Manual*, 2009, Statement of Statutory Accounting Principles 65, "Property and Casualty Contracts," paragraphs 1-46.	NAIC SSAP 65	D1	**SKU NEW**

Citation	Abbreviation	Learning Objective	Source
National Association of Insurance Commissioners, *Official 2009 NAIC Annual Statement Blanks, Property and Casualty*, pp. 2-13, Notes to the Financial Statement pp. 14, (Notes 23-27, 32, and 33); Schedules D (pp. S105-S110 and E10 through E16), F (pp. 20-27), H (pp. 28-30), P (pp. 31-91). Candidates are expected to have knowledge of other sections of the annual statement that are discussed in other *Syllabus* 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 2009 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 (IRIS) Ratios Manual," 2009, Section II, Property/Casualty Ratios, pp. 5-29.	NAIC IRIS	B2, D1, D2	**SKU NEW**
Porter, K., *Insurance Regulation* (First Edition), American Institute of Chartered Property Casualty Underwriters/Insurance Institute of America, 2008, Chapters 2 (excluding 2.19-2.28), 3 (excluding 3.21 from Other Interest Groups-3.26), 4, 5, 6 (pp. 6.11–6.17 stopping at Licensing Priority and Process), 8 (pp. 8.15 beginning at Regulatory Practices–8.21 ending at Underwriting Cycle), 11 and 12.	Porter	B1, B2, B3, B4, C1, C2, C3	**L NEW**
Nyce, C.M., "*Foundations of Risk Management and Insurance*" (Second Edition), 2006, American Institute for Chartered Property Casualty Underwriters, pp. 8.27–8.32	Nyce	C1, C2, C3	**SK**
Wagner, T., "Insurance Rating Bureaus," *Journal of Insurance Regulation*, Winter 2000, pp. 189-202.	Wagner	B1, B2, B3, B4	**SK**
Wiening, E.A.; Rejda, G.E.; Luthardt, C.M.; and Ferguson, C.L.; *Personal Insurance* (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," *Journal of Insurance Regulation*, 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**
Williams, O., "Federal Emergency Management Agency, Ongoing Challenges Facing the National Flood Insurance Program," Testimony Before the Committee on Banking, Housing and Urban Affairs, U.S. Senate, October 2, 2007.	Williams	C1, C3	**W NEW**

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 2010 CAS Study Kit.

SKU　Represents material included in the 2010 CAS Study Kit and the 2010 Update to the 2009 Study Kit.

W　　Represents material in the 2010 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 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. 12th Street, #1100, Kansas City, MO 64105; telephone: (816) 842-3600.

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

SlideRule Books, P.O. Box 69, Greenland, NH 03840; telephone: (877) 407-5433 or (603) 373-6140; fax: (877) 417-5433 or (603) 430-1258; Web site: www.sliderulebooks.com.

Stanford University Press, 1450 Page Mill Road, Palo Alto, CA, 94304; telephone (800) 621-2736; Web site: 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** constitute the 2010 CAS Exam 8 Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **W**—the 2010 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.

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
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. Range of weight: 0-5 percent	a. Utility functions, utility scores and utility maximization b. Risk aversion c. Mean-variance criterion d. Capital allocation line e. Complete portfolio f. Reward to variability ratio (Sharpe ratio)
READINGS	
BKM, Chapter 6	

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

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. Range of weight: 3-7 percent	a. CAPM assumptions and why these cause all investors to hold the market portfolio b. Market price of risk c. Capital market line d. Security market line e. Beta f. Extensions of CAPM – Zero Beta CAPM, CAPM with Non-Traded Assets and Labor Income, ICAPM, CAPM with Liquidity Adjustments
8. Describe the differences between CAPM and the Single Index Model, including their respective implications for security alphas. Range of weight: 0-5 percent	a. CAPM b. Single Index Model c. Expected vs. actual returns d. Market portfolio vs. market index
READINGS	
BKM, Chapter 9	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. Range of weight: 0-5 percent	a. Arbitrage and the Law of One Price b. Arbitrage Pricing Theory (APT) and its comparison to CAPM c. Factor betas d. Factor portfolios and factor risk premiums e. Alternative Factors in Multifactor Models: Macroeconomic Factors (Chen, Roll and Ross) and Fama-French Factors

READINGS
BKM, Chapter 10

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

READINGS
BKM, Chapter 11

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. Range of weight: 0-5 percent	a. Information processing errors including forecasting errors, overconfidence, conservatism, sample size neglect and representativeness b. Behavioral biases including framing, mental accounting, regret avoidance and prospect theory c. Limits to arbitrage including fundamental risk, implementation costs and model risks 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 e. Behavioral critique, including inconsistencies and statistical significance f. Technical analysis—use of price data, volume data and sentiment indicators, and their links to the behavioral critique
READINGS	
BKM, Chapter 12	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
13. Evaluate the practicality of CAPM. Range of weight: 0-5 percent	a. Testability of CAPM b. Failure of empirical tests of alpha values c. Role of decomposition of systematic and firm-specific risk and the efficiency of the market portfolio in CAPM's acceptance in practice d. Use of CAPM by security analysts e. Statistical estimation problems associated with CAPM in practice
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. Range of weight: 0-5 percent	a. Two-stage test of the expected return - beta relationship b. Statistical limitations, including actual versus expected returns, market index as proxy for market portfolio, measurement error, stochastic volatility c. Roll's critique d. Important tests of CAPM, such as Miller and Scholes; Black, Jensen and Scholes; Fama and Macbeth, and their results/conclusions e. Accounting for Human Capital, Cyclical Variations, and Nontraded Business f. Chen, Roll and Ross tests of APT 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
READINGS	
BKM, Chapters 9 and 13	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
15. Describe the Equity Premium Puzzle and various explanations for the puzzle. Range of weight: 0-5 percent	a. Equity Premium Puzzle b. Fama and French's analysis based on the dividend discount model c. Expected vs. realized returns d. Survivorship bias e. Extensions of CAPM f. Behavioral explanations
READINGS	
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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	a. Key Features: Issuer, Contractual Cash Flows, Credit Risk, Tax Treatment for Investors 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)
READINGS	
BKM, Chapter 14 Cummins CAT Bond Gorvett	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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	a. Accrued interest b. Quoted or Clean price c. Sale, Invoice, Cash or Dirty price d. Alternative yield measures—current yield, yield to maturity, yield to call, par yield e. Prices and yields for Zero Coupon Bonds f. Annual, quarterly and continuous compounding g. Day count conventions
READINGS	
BKM, Chapter 14 Hull, Chapter 4 and Section 6.1	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
BKM, Chapter 14	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
BKM, Chapter 15 Hull, Chapter 4	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
BKM, Chapter 14	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
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
READINGS	
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
READINGS	
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
READINGS	
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
READINGS	
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
1. Describe the standardized features of futures contracts that are specified by the Exchange and how futures contracts differ from forward contracts. Range of weight: 0-5 percent	a. Standardized features, including asset description, contract size, delivery arrangements, delivery months, method of quoting prices, price, and position limits b. Margins c. Marking to market d. Closing out positions

READINGS

Hull, Chapter 2 (For background, the candidate may wish to refer to Chapter 1, but no questions will be taken from Chapter 1.)

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. Range of weight: 0-5 percent	a. Long hedge versus short hedge b. Arguments for and against hedging c. Basis risk d. Minimum variance hedge ratio e. Optimal number of futures contracts for hedging asset positions f. Optimal number of index futures contracts to hedge portfolios

READINGS

Hull, Chapter 3 (excluding Appendix)

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

READINGS

Hull, Chapters 3 and 5 (excluding Appendix)

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Hull, Chapters 8 and 9	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
2. Use Put-Call Parity to determine the relationship between prices of European Put and Call options and to 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
READINGS	
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
READINGS	
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
READINGS	
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
READINGS	
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
READINGS	
Hull, Chapter 13 (excluding Appendix) Black	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Hull, Section 12.5 and Chapter 13 (excluding Appendix)	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
Hull, Chapter 13 (excluding Appendix)	

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
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 Depository 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

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
READINGS	
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
READINGS	
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)

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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 *a* and *b* 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

READINGS

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
2. Demonstrate how to delta, gamma and vega hedge a portfolio of stocks and options. Range of weight: 3-7 percent	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)

READINGS

Hull, Section 15.1 and Chapter 17 (excluding Appendix)

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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	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
READINGS	
Hull, Chapter 20	

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

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

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. Range of weight: 0-5 percent	a. Examples of firms experiencing large losses due to poor financial risk management, including Proctor and Gamble, Barings, Orange County, Metallgesellschaft and Daimler Benz b. Limitations of VaR, including limited data to parameterize models over long horizons and deviations of real world distributions from normality assumption c. Cash Flow at Risk d. Risk-Based Capital e. Shortfall Risk
READINGS	
Stulz Culp, Miller and Neves (excluding Appendix) Butsic Cummins Capital	

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

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

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

READINGS
Goldfarb Risk-Adjusted Performance Measurement Cummins Capital Stulz

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. Range of weight: 0-5 percent	a. Distinction between risk measures and risk capital b. Proportional allocation using risk measures such as Percentile (VaR), CTE or EPD Ratio c. Merton-Perold method using Insolvency Put/EPD Ratio risk measure d. Myers-Read method e. Co-Measures, such as Co-CTE

READINGS
Goldfarb Risk-Adjusted Performance Measurement Cummins Capital

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

READINGS
Goldfarb Risk-Adjusted Performance Measurement Cummins Capital

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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

READINGS

Cummins Capital

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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)

READINGS

Butsic
Cummins Capital

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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. Collaterized 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

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.

Learning Objectives	Knowledge Statements
1. Value the equity of a firm based on its expected future dividends. Range of weight: 0-5 percent	a. Dividend Discount Model (DDM), using no growth, constant growth, or two-stage growth assumptions b. Estimating dividend growth rates based on dividend payout ratios and return on equity c. Terminal values
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	a. Free cash flow to equity for a P&C insurer
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	a. Dividend Discount Model (DDM) b. Free cash flow to equity for a P&C insurer 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&C insurers d. Abnormal earnings e. Abnormal Earnings Valuation (AE), including impact of alternative methods of estimating terminal values
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	a. Comparative valuation ratios including price-earnings, price-sales, price-book, price-cash flow b. Relationship between the dividend discount model and the price-earnings (P-E) ratio c. Relationship between the abnormal earnings valuation model and the price-book value (P-BV) ratio
READINGS	
BKM, Chapter 18 Goldfarb Valuation	

Complete Text References for Exam 8

Text references are alphabetized by the citation column.

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Black, F., "How to Use the Holes in Black-Scholes," *The New Corporate Finance: Where Theory Meets Practice* (Third Edition), Chew, D.H., editor; McGraw-Hill/Irwin, 2001, Chapter 32, pp. 455-461.	Black	D6	**SK**
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Cummins, J. D., "Allocation of Capital in the Insurance Industry", *Risk Management and Insurance Review*, 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," *Risk Management and Insurance Review*, American Risk and Insurance Association, Inc., 2008, Vol. 11, No. 1, pp. 23-47.	Cummins CAT Bond	B1, G18-20	**SK**
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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," *Securitization of Risk*, Casualty Actuarial Society *Discussion Paper Program*, May 1999, pp. 133-140.	Gorvett	B1, F1, G18-20	**W**

Citation	Abbreviation	Learning Objective	Source
Hull, J.C., *Options, Futures, and Other Derivatives* (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**
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," *The New Corporate Finance: Where Theory Meets Practice* (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 2010 CAS Study Kit.

W   Represents material in the 2010 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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American Risk and Insurance Association, 716 Providence Road, Malvern, PA 19355; telephone: (610) 640-1997; Web site: aria@cpcuiia.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.

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.

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

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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 2010 CAS Exam 9 Study Kit that may be purchased from the CAS Online Store. Items marked with a bold **W**—the 2010 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 2010 Update to the 2009 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
READINGS	
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	a. GLM assumptions compared to one-way analysis, minimum bias procedures, and classical linear analysis b. Components of a GLM formula c. Aliasing and near-aliasing
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	a. Multidimensional relativities b. Credibility techniques
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	a. Different descriptions and uses of severity distributions, including ILFs and Loss Elimination Ratios (LERs) b. Properties of ILFs c. Interaction among inflation, changes in layer, and losses d. Methods of estimating frequency and severity distributions from losses
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	a. Techniques to estimate aggregate loss distributions directly from aggregate data (e.g., Table M, Table L) b. Construction of an aggregate loss distribution from frequency and severity distributions

READINGS
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS
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
READINGS	
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.

LEARNING OBJECTIVES	KNOWLEDGE STATEMENTS

1. Analyze rate of return.
Range of weight: 10-15 percent
	a. Composition of surplus
	b. Measures of return (including ROE, underwriting profit, IRR)
	   • Advantages
	   • Disadvantages
	   • Perspectives of users
	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)
	   • Advantages
	   • Disadvantages
	   • Perspectives of users
	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
READINGS	
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)
READINGS	
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
READINGS	
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

READINGS
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

READINGS
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	**W**
Anderson, D.; Feldblum, S; Modlin, C; Schirmacher, D.; Schirmacher, E.; and Thandi, N., "A Practitioner's Guide to Generalized Linear Models" (Third Edition), CAS Study Note, February 2007, pp. 4-39 only. [Note: the study note edition is a revised version of a paper from the *CAS Discussion Paper Program*. Candidates must use the study note edition.]	Anderson et al.	A3	**W**
Bailey, R.A.; and Simon, L.J., "An Actuarial Note on the Credibility of Experience of a Single Private Passenger Car," *PCAS* XLVI, 1959, pp. 159-164. Including discussion of paper: Hazam, W.J., *PCAS* XLVII, 1960, pp. 150-152.	Bailey and Simon	A1, A2, A3, A4	**W**

Citation	Abbreviation	Learning Objective	Source
Bault, T., Discussion of Feldblum: "Risk Load for Insurers," *PCAS* LXXII, 1995, pp. 78-96. Candidates may wish to review the following articles as background to the above, although no questions will be directly drawn from them: Feldblum, S., "Risk Loads for Insurers," *PCAS* LXXVII, 1990, pp. 160-195, including discussions of paper: Philbrick, S.W., *PCAS* LXXVIII, 1991, pp. 56-63.	Bault	D3	**W**
Brosius, J.E., "Table M Construction," CAS Study Note, 2002.	Brosius	B2, E3	**W**
Cummins, J.D.; Smith, B.D.; Vance, R.N.; and VanDerhei, J.L., *Risk Classification in Life Insurance*, 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	**SK**
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	**W**
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	**W**
Ferrari, J.R., "The Relationship of Underwriting, Investment, Leverage, and Exposure to Total Return on Owners' Equity," *PCAS* LV, 1968, pp. 295-302. Includes discussion: Balcarek, R.J., *PCAS* LVI, 1969, pp. 58-60.	Ferrari	D1, D2, D3	**W**
Fisher, G.K., "Pricing Aggregates on Deductible Policies," CAS Study Note, 2002.	Fisher	E4, E5	**W**
Gillam, W.R., "Workers' Compensation Experience Rating: What Every Actuary Should Know," *PCAS* LXXIX, 1992, Sections 1-5, pp. 215-239.	Gillam	E1, E2	**W**
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	**W**
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	**W**
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	**W**

Citation	Abbreviation	Learning Objective	Source
Insurance Services Office, Inc., *Commercial General Liability Experience and Schedule Rating Plan,* 2006. Excerpts from the ISO *Commercial General Liability Experience and Schedule Rating Plan* 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," *Actuarial Considerations Regarding Risk and Return In Property-Casualty Insurance Pricing*, 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, *PCAS* LXXV, 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, *PCAS* LXXV, 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," *PCAS* LXXVII, 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," *PCAS* LXXXV, 1998, pp. 316-344. Appendices B-D are for reference only; candidates do not need to memorize formulas in Appendices B-D. Including Errata.	Mahler 2	B1	**W**
Mahler, H.C., "Workers Compensation Excess Ratios: An Alternative Method of Estimation," *PCAS* LXXXV, 1998, pp. 132-156.	Mahler 3	B2	**W**
Mango, D.F, "An Application of Game Theory: Property Catastrophe Risk Load," *PCAS* LXXXV, 1998, pp. 157-186. Exam questions will not be drawn from Section 9.	Mango	D3	**W**
McClenahan, C.L., "Insurance Profitability," *Actuarial Considerations Regarding Risk and Return in Property-Casualty Insurance Pricing*, Casualty Actuarial Society, 1999, Chapter 8.	McClenahan	D1, D2	**W**
Miccolis, R.S., "On the Theory of Increased Limits and Excess of Loss Pricing," *PCAS* LXIV, 1977, pp. 27-59 excluding "Risk Reduction by Layering" (pp. 45-49). Including discussion of paper: Rosenberg, S., *PCAS* LXIV, 1977, pp. 60-73.	Miccolis	B1	**W**
National Council on Compensation Insurance, *The 1998 Adjustment to the Experience Rating Plan: Your Guide to Understanding the Changes*.	NCCI 1	E1	**SK**

Citation	Abbreviation	Learning Objective	Source
National Council on Compensation Insurance, *Experience Rating Plan Manual for Workers Compensation and Employers Liability Insurance* (as of June 30, 2009). Candidates are responsible for only the excerpted material. Excerpts from the NCCI *Experience Rating Plan Manual for Workers Compensation and Employers Liability Insurance* 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, *Retrospective Rating Plan Manual for Workers Compensation and Employers Liability Insurance* (as of June 30, 2009). Candidates are responsible for only the excerpted material. Exclude Part 2, Section III, on cancellation provisions. Excerpts from the NCCI *Retrospective Rating Plan Manual for Workers Compensation and Employers Liability Insurance* 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," *Insurer Financial Solvency*, Casualty Actuarial Society *Discussion Paper Program*, 1992, Volume I, pp. 439-464.	Roth	D1, D2, D3	**W**
Skurnick, D., "The California Table L," *PCAS* LXI, 1974, pp. 117-140. Including discussion of this paper: Gillam, W.R., *PCAS* LXXX, 1993, pp. 353-365.	Skurnick	B2, E3, E4	**W**
Teng, M.T.S., "Pricing Workers' Compensation Large Deductible and Excess Insurance," Casualty Actuarial Society *Forum*, Winter 1994, pp. 413-437.	Teng	E5	**W**
Venter, G.G., "Experience Rating—Equity and Predictive Accuracy," *NCCI Digest*, 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)," *PCAS* LXXXIV, 1997, pp. 1-43.	Walters and Morin	C1	**W**

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

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

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

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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.

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 this requirement 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 mathematical sophistication of these courses will vary widely and all levels are intended to be acceptable. Some analysis of real data should be included. 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 program covers the topics below in two semesters with an introductory course followed by a more advanced semester. If the second course covers most of the topics, then only the second course will be required. Where the topics are split across two semesters or courses, both will be required. The exceptional case where the corporate finance topics are covered in only one course, with no finance prerequisite, will also be considered, however, this will typically be at a more advanced level than a course designed for general business students.

Most of the topics listed below should be covered:

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
7. Definitions of key finance terms: financial instruments – bond, stock, basic options (calls, puts); dividends; price to earnings ratio
8. Structure of a stock company and the different methods by which it may be financed
9. Calculate value of stocks
10. 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
11. 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