Fundamentals of Actuarial Practice Module
Introduction and Objectives

FAP Introduction

FAP encompasses real-world applications and uses examples to demonstrate actuarial principles and practices. Practical techniques are presented to assist in your day-to-day work. You will also have opportunities to apply these principles and techniques in traditional and non-traditional actuarial practice areas. With the fundamentals in your toolkit, you will be better prepared to apply your learning to new areas of practice that may emerge during your actuarial career.

FAP Objectives

- Introducing you to financial security systems, common actuarial techniques, and practical experiences.
- Describing actuarial practices, principles, approaches, methods, commonalities, problems, and solutions.
- Explaining actuarial practices across the traditional areas of practice:
    - Life insurance
    - Property and casualty insurance
    - Health insurance
    - Retirement benefits
- Explaining actuarial practices as applied directly on behalf of financial security system providers or as a consultant to those providers.
- Preparing you to apply actuarial skills in nontraditional and emerging areas of practice.
- Providing context for the specific mathematical and technical skills tested in the Preliminary Education examinations, some of which you may have already taken, others of which you might be studying for now:
    - Probability
    - Financial Mathematics
    - Investment and Financial Markets
    - Statistics for Risk Management
    - Long-Term Mathematics
    - Short-Term Actuarial Mathematics
    - Statistics for Risk Modeling
    - Predictive Analytics
- Helping you prepare for your professional role as an Associate of the Society of Actuaries (ASA).

Each of these modules contains an End-of-Module Test and an Interactive Scenario. There are also four End-of-Module Assessments and one comprehensive Final Assessment.

FAP Risk in Actuarial Problems

Section 1: Module Overview

Description:

During your Risk in Actuarial Problems study, you will be exposed to typical actuarial problems and the processes used by actuaries to fully define problems. You will learn that problems revolve around risk and that identifying risks to be managed—i.e., looking below the surface—will help you to better define the real problem. You will learn how effective identification, analysis, and prioritization of various risks leads to a clearer definition of the problem and, ultimately, better solutions.

Objectives:
- Explain Define the Problem within the context of the Control Cycle.
- Explain the significance of identifying and defining the real problem and its associated risks.
- Describe risks that actuaries manage within a financial security system.
- Describe risk management for financial security systems from a global perspective.
- Identify commonalities among problems in existing areas of actuarial practice.

Section 2: Why Define the Problem

Description:

Section 2 focuses on Define the Problem as it fits in the Control Cycle and describes examples of scenarios where problems were not correctly defined.

Objectives:

After you complete this section, you will be able to:
- Explain how Define the Problem fits within the context of the Control Cycle.
- Given an example of a financial security system failure, describe how a better problem definition could have been employed to help avoid the crisis.
- Recognize the significance of successfully defining problems.
- Identify risks related to financial security systems.

Section 3: Introduction to Risk

Description:

In this section, you will review risk and risk analysis as they relate to actuarial problems. You will also have a chance to explore how risk influences the Define the Problem stage of the Control Cycle.

This section also introduces the foundations of risk analysis and management. For the purposes of this section, risk management is the art and science of balancing risk and reward across the functional areas within a financial security system.

Objectives:

After you complete this section, you will be able to:
- Define risk in an actuarial context.
- Describe risk management.
- Define risk types that need to be managed within a financial security system.
- Explain how risk is transferred from a consumer to a financial security system.
- Explain risk classification.

Section 4: Define the Problem and Identify Risks

Description:

In this section, you'll look more closely at the relationship between identifying risks and the Define the Problem stage of the Control Cycle. You will be introduced to some of the basic tools often used by actuaries to analyze financial risks.

Objectives:

After you complete this section, you will be able to:

- Determine factors or influences that are important to identify and analyze risks.
- Use techniques commonly used in asset-liability management (ALM) with financial security systems.
- Describe the various risk measures that are used in ALM.
- Describe the capital requirements for a financial security system.
- Describe the role of risk measurement tools when analyzing the risks in financial and non-financial organizations.

Section 5: Recognize Problem Commonalities

Description:

Understanding the commonalities and similarities that many actuarial problems share provides a foundation or starting point as you define problems. This section examines some of those commonalities.

Objectives:

After you complete this section, you will be able to:

- Describe aspects of actuarial work that are both fundamental and common to all practice areas.
- Categorize commonalities in actuarial problems.

Section 6: Communications

Description:

In today's business environment, professionals of all disciplines are turning to actuaries to identify, quantify, and manage risk-related issues. You can no longer assume your role as an actuary is to tabulate numbers. The reasoning behind actuarial calculations and the business decisions resulting from actuarial analysis are valuable to today's organizations.

This section will provide you with tips and guidelines on how to communicate effectively with professionals across all disciplines. It will also provide video examples demonstrating effective communication, as well as videos of expert actuaries who share their tips for effective communication.

Objectives:

After you complete this section, you will be able to:

- Prepare to communicate by answering six key communication questions.
- Eliminate and limit use of acronyms.
- Describe elements of effective presentations.
- Describe elements of effective memos and reports.
- Avoid common mistakes when communicating as an actuary.
- Apply the principles of Actuarial Standards of Practice 41 (US), Standards of Practice 1700 (Canada), Section 8 Principle 6 (UK).

Designing and Pricing an Actuarial Solution

Section 1: Module Overview

Description:

In this module, Designing and Pricing an Actuarial Solution, you will further explore models by tying together what you have already learned into a framework for models that emphasizes pricing, reserving, and funding.

Pricing is the function related to the determination of the cost for an individual to participate in a financial security system. Reserving is the function related to the determination of the amount of assets currently needed to be available to meet the financial security system's obligations. Funding is the function related to the determination of the financial security system's future capital needs and the allocation of current and future assets to meet those needs.

The purposes and details of each of these types of models will be analyzed.

Objectives:

After you complete this module, you will be able to:
- Explain how the fundamental actuarial formula provides the basis for all modeling.
- Demonstrate how models are applied to develop pricing, reserving, and funding solutions.
- Explain how models are applied on an individual and group basis in the different practice areas.
- Apply primary and secondary models to practice area pricing, reserving, and funding problems.

Section 2: Overview of Actuarial Models

Description:

This section introduces you to the concept of a fundamental actuarial formula that represents this idea as it pertains to risk management problems. This section also introduces you to a framework that categorizes actuarial models according to this formula. The framework provides a useful way of thinking about models and provides the structure for the remaining sections in this module.

Objectives:

After you complete this section, you will be able to:
- Describe how the fundamental actuarial formula provides the basis for all modeling.
- Describe how models are applied to develop pricing, reserving, and funding solutions.
- Describe how models are applied on an individual and group basis in the different practice areas.

Section 3: Pricing Models

Description:

In this section, you will learn about pricing and pricing models, which are based on the following fundamental formula:

$$0 = V_0 = \sum_{t=0}^{\infty} B_t d_t v^t - \pi_t \Delta_t v^t$$

In this section, you will also see how each practice area employs pricing models.

Objectives:

After you complete this section, you will be able to:
- Explain how pricing models are used to solve pricing problems.
- Explain how to use "secondary" models/methods to define parameters for pricing models.
- Apply primary and secondary models to practice area pricing problems.

Section 4: Models for Reserving and the Allocation of Capital

Description:

In the previous section, you learned about pricing problems and pricing models. In this section, you will learn about reserving problems and reserving models. Models for reserving purposes are created using the following simplified formula:

$$V_x = \sum_{t=x}^{\infty} B_t d_{x,t} v^{t-x} - \pi_t \Delta_{x,t} v^{t-x}$$

Reserving is a process an actuary uses to determine the current liability associated with future claims. It is a point estimate for future periods.

Objectives:

In this section, you'll learn more about reserving models. After completing this section, you will be able to:
- Explain how reserving models are used to solve for reserving problems.
- Explain how to use "secondary" models/methods to define parameters for reserving models.
- Apply primary and secondary models to practice area reserving problems.
- For reserving purposes, the application of models to solve the fundamental simplified equation as noted above can be completed on a "prescribed basis" or using a "principles-based" approach.

Section 5: Models for Funding and the Planning for Capital Needs

Description:

In the previous two sections, you learned about pricing and reserving and their associated models. In this section, you will cover funding models, which are created to solve the following simplified formula:

$$V_x = \sum_{t=0}^{x-1} \pi_t \Delta_{t,x} v^{t-x} - B_t d_{x,t} v^{t-x}$$

As mentioned in Section 2, funding involves the question "Will future funds be sufficient to meet the financial security system's future needs?" Funding models are used by financial security systems to determine an appropriate build-up of funds to be used for future purposes. Traditionally, funding has been used to secure the long-term benefits promised to the beneficiaries of a financial security system. Funding methods were initially developed for defined benefit pension plans, and you will begin your study of funding models with the models typically used for such plans.

Funding problems, however, also apply in the other practice areas. For example, an actuary working in the finance practice area must consider the problems associated with ensuring that the insurance company's resources will be sufficient to meet its future obligations. This is a funding problem.

Objectives:
After you complete this section, you will be able to:
- Explain how funding models are used to solve funding problems.
- Explain how to use "secondary" models/methods to define parameters for funding models. Apply models to practice area funding problems.

Section 6: Tying It All Together
This section quickly summarizes the fundamental concepts covered within the module. You were guided in integrating existing knowledge into a comprehensive framework that focused on pricing, reserving, and funding models within financial security systems. It delved into the functions of pricing, which determined individual participation costs, reserving, which assessed current asset needs for meeting obligations, and funding, which addressed future capital requirements and asset allocation.

Objectives:
After you complete this section, you will be able to:
- Summarize the fundamental concepts learned in the module in regard to pricing, reserving, and funding models within financial security systems.

Model Selection and Solution Design

Section 1: Module Overview

Description:

Designing and Pricing an Actuarial Solution focused on common actuarial models being used in the practice areas. A framework for thinking about models was introduced and you learned how the fundamental actuarial formula provides a basis for all modeling. You learned how models are applied to develop pricing, reserving, and funding solutions, as well as how they are applied on an individual and group basis in various practice areas. Finally, the application of primary and secondary models to practice area pricing, reserving, and funding problems was presented.

Building on Designing and Pricing an Actuarial Solution, Model Selection and Solution Design provides an overview of the model selection and solution design process. This module begins with an explanation of how the model selection and model-building process fits within the context of the Control Cycle. A three-stage process for building and selecting models (i.e., define the problem, match the model to the problem, and design the solution) provides the basis for the remainder of the content within this module. Specific modeling steps that occur within each stage of the Control Cycle are also covered.

Objectives:

After you complete this module, you will be able to:
- Review modeling techniques and models used in actuarial practice.
- Define the business problem that needs to be modeled.
- Match the model to the problem in context.
- Design a solution.

Section 2: The Module Control Cycle

Description:

This section begins with a review of the relationship between the model definition and building processes and the Control Cycle introduced earlier. You will also review the types of models used in actuarial work.

Objectives:

After you complete this section, you will be able to:
- Explain how the model definition and model-building process fits within the context of the Control Cycle.
- Work through the process of defining and building a model.
- Apply Control Cycle principles to the process of model design and building.
- Describe the rationale for selecting a particular model.

Section 3: Pricing Models

Description:

In this section, you will begin with an extension of the Term Life Insurance case study from Designing and Pricing an Actuarial Solution. This portion of the case study will involve pricing and pricing models that are based on the following fundamental formula:

$$0 = V_0 = \sum_{t=0}^{\infty} B_t d_t v^t - \pi_t \Delta_t v^t$$

Objectives:

After you complete this section, you will be able to:

- Use the Model Control Cycle to solve a pricing problem.
- Describe how different models can be applied to solve the same problem.
- Determine which model is most appropriate for the presented pricing problem.
- Practice applying a model to solve a pricing problem.

Section 4: Reserving and the Allocation of Capital

Description:

The Health Reserves case study presented in this section focuses on various reserve models applied to develop reserves for incurred but not reported (IBNR) claims of a small but growing Health Management Organization (HMO) called YourHealth. YourHealth has become a concern for the insurance commissioner. In particular, the commissioner is worried about the adequacy of YourHealth's IBNR reserves.

Objectives:

After completing the case study in this section, you will be able to:

- Evaluate YourHealth's reserve methodology.
- Determine if YourHealth's reserves are adequate.
- Determine the size of the reserve deficiency or surplus.

Section 5: Funding and the Planning for Capital Needs

Description:

In this section, you will be provided with additional opportunities to work with other models and concepts that you have learned in previous modules.

Objectives:

After completing the case studies in this section, you will be able to:

- Identify existing models that may be used or adapted for the business problem.
- Identify available data and determine its adequacy, appropriateness, and sensitivity.
- Identify required model inputs, assumptions, and constraints.
- Define the model to be used for the business problem.
- Understand the applications of Solvency II.
- Build and test the selected model.
- Confirm that the model output addresses the original business problem and that the results are reasonable and explainable.
- Go back and forth between the Define the Model and Build the Model stages.

Selection of Initial Assumptions

Section 1: Module Overview

Description:

From your studies, you have learned quite a bit about assumptions. The definition of an assumption is "any non-factual, non-verifiable item that the actuary relies on in a model." Assumptions may involve filling in a missing piece of data, projecting a future expectation, or hypothesizing about the relationship between two variables. The major types of assumptions are economic, demographic, and experience-based. Assumptions are important to actuaries and their stakeholders.

How does an actuary select assumptions? What is the set of assumptions that are material to the business problem, solution, and model? What constraints or other determinants should be considered when selecting them? What methods and tools are available to actuaries when they need to quantify assumptions? These are the questions that will be answered in this module.

Objectives:

After you complete this module, you will be able to:

- Recall and describe the major categories of assumptions.
- Describe assumption constraints and determinants.
- Describe methods and tools for quantifying assumptions.
- Describe international considerations and constraints.
- Describe the interdependency of assumptions.

Section 2: Overview of Selecting Assumptions

Description:

In this section, you will learn about the important role of assumptions in the success of ongoing risk management of the financial security system. Additionally, you will come to understand the different types of assumptions and the initial assumption selection process.

Objectives:

After you complete this section, you will be able to:

- Recognize the significance of assumptions to the success of ongoing risk management of the financial security system.
- Identify types of actuarial assumptions.
- Describe the processes used to select initial assumptions.

Section 3: Assumption Constraints

Description:

You learned in the previous section that there are different types of assumptions and that they are very important in the Control Cycle. Other important factors to consider when selecting assumptions are the

constraints and other determinants. This section of Selection of Initial Assumptions covers constraints and other determinants as well as the external forces that actuaries face when defining the set of assumptions.

Objectives:

As a result of completing this section, you will be able to:

- Identify assumption constraints and other determinants.
- Describe assumption constraints.

- Describe other determinants for assumptions.

Section 4: International Considerations and Constraints

Description:

In this section, you will be introduced to international considerations and constraints. In particular, you will be introduced to the differences between principle-based and rule-based approaches, supplementary regulation and supervision, and guidelines regarding corporate governance.

Objectives:

After you complete this section, you will be able to describe:
- Identify the differences between principle-based and rule-based approaches, which will differ in applicable solvency regimes.
- Describe supplementary regulation and supervision, including corporate governance, risk and solvency assessment, supervisory review process, group supervision, and reporting requirements.
- Describe definitions and guidelines regarding corporate governance.

Section 5: Methods and Tools for Quantifying Assumptions

Description:

In previous sections, you learned about some of the criteria, constraints, and other determinants used to select assumptions for actuarial models. This section provides a high-level description of the methods used to quantify and select assumptions. A number of different methods are presented through readings from the various practice areas.

Objectives:

After you complete this section, you will be able to describe:
- Types of methods and tools used to quantify assumptions.
- Methods used to select initial assumption.
- Tools used to select assumptions.

Section 6: Applying Assumption Concepts

Description:

Thus far in this module, you have studied quite a bit about actuarial assumptions. In addition to learning more about types of assumptions (i.e., economic, demographic, and experience-based), you have learned how assumptions relate to the Control Cycle and the process used to select initial assumptions. Further, you looked at how actuaries treat assumption constraints (e.g., those placed by regulatory bodies, the profession or the client/employer) and other determinants (e.g., materiality, the effect of internal or external forces). Finally, you looked at methods and tools actuaries use to quantify assumptions that are used in actuarial models.

In this section, you will have an opportunity to apply your knowledge about assumptions setting to Retirement Benefits, Structured Settlement, Term Life Insurance, Retiree Medical Funding, and Health Assumptions case studies.

Objective:

After you complete this section, you will be able to:
- Apply assumptions concepts to realistic actuarial scenarios.

Section 7: Interdependency of Assumptions

Description:

Throughout this module, you have read about the constraints and other determinants that an actuary needs to consider when selecting economic, demographic, and experience-based assumptions. This section covers the interdependency of the different assumption types and the dependency of assumptions on the design of the solution.

Objectives:

After you complete this section, you will be able to:

- Describe interdependency.
- Explain how assumptions are dependent on other assumptions.
- Explain how assumptions are dependent on the product's design.

Monitoring Results

Section 1: Module Overview

Description:

In previous modules of this course, you learned that the Control Cycle can be stated quite simply as three stages: Define the Problem, Design the Solution, and Monitor the Results. In past modules, you learned to Define the Problem and Design the Solution. In this module, you will explore the Monitor the Results stage of the Control Cycle.

Objectives:

After you complete this module, you will be able to:

- Describe each element of the Monitoring Results Control Cycle.
- Identify the results to be monitored.
- Explain how to validate data gathered for monitoring results.
- Describe possible methods of analyzing experience data.
- Identify the source of experience deviations.
- Identify possible solutions to problems resulting from experience deviations.
- Explain the importance of appropriate communication and documentation while monitoring results.

Section 2: Introduction to Gathering Data

Description:

A major component of the Actuarial Control Cycle is the regular comparison of expected outcomes with experience (i.e., actual outcomes). Analysis of actual experience is an essential element of this comparison. This section will focus on the process used to monitor results. You will learn about a framework for this process. This framework will provide you with a useful way of thinking about monitoring results.

Objectives:

After you complete this section, you will be able to:

- Explain how the Monitor the Results stage fits within the context of the larger Control Cycle.
- Describe each element of the Monitoring Results control cycle.
- Describe the process of identifying and gathering data necessary to monitor the results.
- Describe the process of validating data.
- Apply concepts related to gathering data in an actuarial scenario.

Section 3: Analyzing Results

Description:

The Monitoring Results Control Cycle and the Gather Data element were introduced to you in Section 1. This section will discuss the second element of the Monitoring Results Control Cycle, Analyze Results.

Objectives:

After you complete this section, you will be able to:

- Identify various methods for analyzing data when monitoring results.
- Explain six data analysis methods including when to apply each.
- Apply concepts related to analyzing results in an actuarial scenario.

Section 4: Providing Feedback

Description:

In the previous section, you learned about analyzing results to identify differences between expected and actual experience. In this section, you will learn about providing feedback about the discrepancies identified.

Objectives:

After you complete this section, you will be able to:

- Identify possible sources of error.
- Identify possible solutions to problems caused by adverse experiences.
- Explain the critical importance of appropriate communication and documentation.
- Apply concepts related to providing feedback in actuarial scenarios.

Section 5: Recap of the Control Cycle

Description:

This section summarizes the Fundamentals of Actuarial Practice course by using the Control Cycle to highlight key actuarial concepts. The Control Cycle, along with its associated "micro" control cycles and illustrations, provided the structure for this course and provides a framework for recapping key concepts.

Objectives:

After you complete this section, you will be able to:

- Recall key actuarial concepts and principles related to Control Cycle elements.