Institute
and Faculty
of Actuaries

Syllabus 2019

Syllabus 2019 Contents

Institute
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CS1 – Actuarial Statistics 1

Aim

The aim of the Actuarial Statistics 1 subject is to provide a grounding in mathematical and statistical techniques that are of particular relevance to actuarial work.

Competences

On successful completion of this subject, a student will be able to:

1   describe the essential features of statistical distributions.

2   summarise data using appropriate statistical analysis, descriptive statistics and graphical presentation.

3   describe and apply the principles of statistical inference.

4   describe, apply and interpret the results of the linear regression model and generalised linear models.

5   explain the fundamental concepts of Bayesian statistics and use them to compute Bayesian estimators.

Links to other subjects

CS2 – Actuarial Statistics 2 builds directly on the material in this subject.

CM1 – Actuarial Mathematics 1 and CM2 – Actuarial Mathematics 2 apply the material in this subject to actuarial and financial modelling.

This subject assumes that a student will be competent in the following elements of Foundational Mathematics and basic statistics:

1   Summarise the main features of a data set (exploratory data analysis)

1.1   Summarise a set of data using a table or frequency distribution, anddisplay it graphically using a line plot, a box plot, a bar chart, histogram, stem and leaf plot, or other appropriate elementary device.

CS1

    1.2   Describe the level/location of a set of data using the mean, median, mode, as appropriate.

    1.3   Describe the spread/variability of a set of data using the standard deviation, range, interquartile range, as appropriate.

    1.4   Explain what is meant by symmetry and skewness for the distribution of a set of data.

2   Probability

    2.1   Set functions and sample spaces for an experiment and an event.

    2.2   Probability as a set function on a collection of events and its basic properties.

    2.3   Calculate probabilities of events in simple situations.

    2.4   Derive and use the addition rule for the probability of the union of two events.

    2.5   Define and calculate the conditional probability of one event given the occurrence of another event.

    2.6   Derive and use Bayes' Theorem for events.

    2.7   Define independence for two events, and calculate probabilities in situations involving independence.

3   Random variables

    3.1   Explain what is meant by a discrete random variable, define the distribution function and the probability function of such a variable, and use these functions to calculate probabilities.

    3.2   Explain what is meant by a continuous random variable, define the distribution function and the probability density function of such a variable, and use these functions to calculate probabilities.

    3.3   Define the expected value of a function of a random variable, the mean, the variance, the standard deviation, the coefficient of skewness and the moments of a random variable, and calculate such quantities.

    3.4   Evaluate probabilities (by calculation or by referring to tables as appropriate) associated with distributions.

    3.5   Derive the distribution of a function of a random variable from the distribution of the random variable.

Syllabus topics

1   Random variables and distributions (20%)
2   Data analysis (15%)
3   Statistical inference (20%)
4   Regression theory and applications (30%)
5   Bayesian statistics (15%)

The weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions, and making recommendations).

In the CS subjects, the approximate split of assessment across the three skill types is 20% Knowledge, 65% Application and 15% Higher Order skills.

CS1

Detailed syllabus objectives

1 Random variables and distributions (20%)

1.1 Define basic univariate distributions and use them to calculate probabilities, quantiles and moments.

    1.1.1 Define and explain the key characteristics of the discrete distributions: geometric, binomial, negative binomial, hypergeometric, Poisson and uniform on a finite set.

    1.1.2 Define and explain the key characteristics of the continuous distributions: normal, lognormal, exponential, gamma, chi-square, t, F, beta and uniform on an interval.

    1.1.3 Evaluate probabilities and quantiles associated with distributions (by calculation or using statistical software as appropriate).

    1.1.4 Define and explain the key characteristics of the Poisson process and explain the connection between the Poisson process and the Poisson distribution.

    1.1.5 Generate basic discrete and continuous random variables using the inverse transform method.

    1.1.6 Generate discrete and continuous random variables using statistical software.

1.2 **Independence, joint and conditional distributions, linear combinations of random variables**

    1.2.1 Explain what is meant by jointly distributed random variables, marginal distributions and conditional distributions.

    1.2.2 Define the probability function/density function of a marginal distribution and of a conditional distribution.

    1.2.3 Specify the conditions under which random variables are independent.

    1.2.4 Define the expected value of a function of two jointly distributed random variables, the covariance and correlation coefficient between two variables, and calculate such quantities.

    1.2.5 Define the probability function/density function of the sum of two independent random variables as the convolution of two functions.

    1.2.6 Derive the mean and variance of linear combinations of random variables.

1.2.7   Use generating functions to establish the distribution of linear combinations of independent random variables.

1.3   Expectations, conditional expectations

1.3.1   Define the conditional expectation of one random variable given the value of another random variable, and calculate such a quantity.

1.3.2   Show how the mean and variance of a random variable can be obtained from expected values of conditional expected values, and apply this.

1.4   Generating functions

1.4.1   Define and determine the probability generating function of discrete, integer-valued random variables.

1.4.2   Define and determine the moment generating function of random variables.

1.4.3   Define and determine the cumulant generating function of random variables.

1.4.4   Use generating functions to determine the moments and cumulants of random variables, by expansion as a series or by differentiation, as appropriate.

1.4.5   Identify the applications for which a probability generating function, a moment generating function, a cumulant generating function and cumulants are used, and the reasons why they are used.

1.5   Central Limit Theorem – statement and application

1.5.1   State the central limit theorem for a sequence of independent, identically distributed random variables.

1.5.2   Generate simulated samples from a given distribution and compare the sampling distribution with the Normal.

2   Data analysis (15%)

2.1   Exploratory data analysis

2.1.1   Describe the purpose of exploratory data analysis.

2.1.2   Use appropriate tools to calculate suitable summary statistics and undertake exploratory data visualizations.

2.1.3   Define and calculate Pearson's, Spearman's and Kendall's measures of correlation for bivariate data, explain their interpretation and perform statistical inference as appropriate.

CS1

    2.1.4   Use Principal Components Analysis to reduce the dimensionality of a complex data set

2.2   **Random sampling and sampling distributions**

    2.2.1   Explain what is meant by a sample, a population and statistical inference.

    2.2.2   Define a random sample from a distribution of a random variable.

    2.2.3   Explain what is meant by a statistic and its sampling distribution.

    2.2.4   Determine the mean and variance of a sample mean and the mean of a sample variance in terms of the population mean, variance and sample size.

    2.2.5   State and use the basic sampling distributions for the sample mean and the sample variance for random samples from a normal distribution.

    2.2.6   State and use the distribution of the t-statistic for random samples from a normal distribution.

    2.2.7   State and use the F distribution for the ratio of two sample variances from independent samples taken from normal distributions.

3   Statistical inference (20%)

3.1   **Estimation and estimators**

    3.1.1   Describe and apply the method of moments for constructing estimators of population parameters.

    3.1.2   Describe and apply the method of maximum likelihood for constructing estimators of population parameters.

    3.1.3   Define the terms: efficiency, bias, consistency and mean squared error.

    3.1.4   Define and apply the property of unbiasedness of an estimator.

    3.1.5   Define the mean square error of an estimator, and use it to compare estimators.

    3.1.6   Describe and apply the asymptotic distribution of maximum likelihood estimators.

    3.1.7   Use the bootstrap method to estimate properties of an estimator.

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3.2 Confidence intervals

3.2.1 Define in general terms a confidence interval for an unknown parameter of a distribution based on a random sample.

3.2.2 Derive a confidence interval for an unknown parameter using a given sampling distribution.

3.2.3 Calculate confidence intervals for the mean and the variance of a normal distribution.

3.2.4 Calculate confidence intervals for a binomial probability and a Poisson mean, including the use of the normal approximation in both cases.

3.2.5 Calculate confidence intervals for two-sample situations involving the normal distribution, and the binomial and Poisson distributions using the normal approximation.

3.2.6 Calculate confidence intervals for a difference between two means from paired data.

3.3 Hypothesis testing and goodness of fit

3.3.1 Explain what is meant by the terms null and alternative hypotheses, simple and composite hypotheses, type I and type II errors, test statistic, likelihood ratio, critical region, level of significance, probability-value and power of a test.

3.3.2 Apply basic tests for the one-sample and two-sample situations involving the normal, binomial and Poisson distributions, and apply basic tests for paired data.

3.3.3 Apply the permutation approach to non-parametric hypothesis tests.

3.3.4 Use a χ^2 test to test the hypothesis that a random sample is from a particular distribution, including cases where parameters are unknown.

3.3.5 Explain what is meant by a contingency (or two-way) table, and use a χ^2 test to test the independence of two classification criteria.

4 Regression theory and applications (30%)

4.1 Linear regression

4.1.1 Explain what is meant by response and explanatory variables.

4.1.2 State the simple regression model (with a single explanatory variable).

CS1

4.1.3 Derive the least squares estimates of the slope and intercept parameters in a simple linear regression model.

4.1.4 Use appropriate software to fit a simple linear regression model to a data set and interpret the output.

- Perform statistical inference on the slope parameter.
- Describe the use of various measures of goodness of fit of a linear regression model ($R^{2 \cdots}$).
- Use a fitted linear relationship to predict a mean response or an individual response with confidence limits.
- Use residuals to check the suitability and validity of a linear regression model.

4.1.5 State the multiple linear regression model (with several explanatory variables).

4.1.6 Use appropriate software to fit a multiple linear regression model to a data set and interpret the output.

4.1.7 Use measures of model fit to select an appropriate set of explanatory variables.

4.2 Generalised linear models

4.2.1 Define an exponential family of distributions. Show that the following distributions may be written in this form: binomial, Poisson, exponential, gamma, normal.

4.2.2 State the mean and variance for an exponential family, and define the variance function and the scale parameter. Derive these quantities for the distributions above.

4.2.3 Explain what is meant by the link function and the canonical link function, referring to the distributions above.

4.3.4 Explain what is meant by a variable, a factor taking categorical values and an interaction term. Define the linear predictor, illustrating its form for simple models, including polynomial models and models involving factors.

4.2.5 Define the deviance and scaled deviance and state how the parameters of a GLM may be estimated. Describe how a suitable model may be chosen by using an analysis of deviance and by examining the significance of the parameters.

4.2.6 Define the Pearson and deviance residuals and describe how they may be used.

4.2.7   Apply statistical tests to determine the acceptability of a fitted model: Pearson's Chi-square test and the Likelihood ratio test

4.2.8   Fit a generalised linear model to a data set and interpret the output.

5   Bayesian statistics (15%)

5.1   Explain the fundamental concepts of Bayesian statistics and use these concepts to calculate Bayesian estimators.

5.1.1   Use Bayes' Theorem to calculate simple conditional probabilities.

5.1.2   Explain what is meant by a prior distribution, a posterior distribution and a conjugate prior distribution.

5.1.3   Derive the posterior distribution for a parameter in simple cases.

5.1.4   Explain what is meant by a loss function.

5.1.5   Use simple loss functions to derive Bayesian estimates of parameters.

5.1.6   Explain what is meant by the credibility premium formula and describe the role played by the credibility factor.

5.1.7   Explain the Bayesian approach to credibility theory and use it to derive credibility premiums in simple cases.

5.1.8   Explain the empirical Bayes approach to credibility theory and use it to derive credibility premiums in simple cases.

5.1.9   Explain the differences between the two approaches and state the assumptions underlying each of them.

Assessment

Combination of a computer based data analysis and statistical modelling assignment and a three hour written examination.

END

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CS2 – Actuarial Statistics 2

Aim

The aim of the Actuarial Statistics 2 subject is to provide a grounding in mathematical and statistical modelling techniques that are of particular relevance to actuarial work, including stochastic processes and survival models and their application.

Competences

On successful completion of this subject, a student will be able to:

1   describe and use statistical distributions for risk modelling.
2   describe and apply the main concepts underlying the analysis of time series models.
3   describe and apply Markov chains and processes.
4   describe and apply techniques of survival analysis.
5   describe and apply basic principles of machine learning.

Links to other subjects

This subject assumes that the student is competent with the material covered in CS1 – Actuarial Statistics 1 and the required knowledge for that subject.

CM1 – Actuarial Mathematics 1 and CM2 – Actuarial Mathematics 2 apply the material in this subject to actuarial and financial modelling.

Topics in this subject are further built upon in SP1 – Health and Care Principles, SP7 – General Insurance Reserving and Capital Modelling Principles, SP8 – General Insurance Pricing Principles and SP9 – Enterprise Risk Management Principles.

CS2

Syllabus topics

1   Random variables and distributions for risk modelling (20%)
2   Time series (20%)
3   Stochastic processes (25%)
4   Survival models (25%)
5   Machine learning (10%)

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- the need to provide thorough foundation understanding on which to build the other objectives.

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Skill levels

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Detailed syllabus objectives

1 Random variables and distributions for risk modelling (20%)

1.1 Loss distributions, with and without risk sharing

1.1.1 Describe the properties of the statistical distributions which are suitable for modelling individual and aggregate losses.

1.1.2 Explain the concepts of excesses (deductibles), and retention limits.

1.1.3 Describe the operation of simple forms of proportional and excess of loss reinsurance.

1.1.4 Derive the distribution and corresponding moments of the claim amounts paid by the insurer and the reinsurer in the presence of excesses (deductibles) and reinsurance.

1.1.5 Estimate the parameters of a failure time or loss distribution when the data is complete, or when it is incomplete, using maximum likelihood and the method of moments.

1.1.6 Fit a statistical distribution to a dataset and calculate appropriate goodness of fit measures.

1.2 Compound distributions and their applications in risk modelling

1.2.1 Construct models appropriate for short term insurance contracts in terms of the numbers of claims and the amounts of individual claims.

1.2.2 Describe the major simplifying assumptions underlying the models in 1.2.1.

1.2.3 Define a compound Poisson distribution and show that the sum of independent random variables each having a compound Poisson distribution also has a compound Poisson distribution.

1.2.4 Derive the mean, variance and coefficient of skewness for compound binomial, compound Poisson and compound negative binomial random variables.

1.2.5 Repeat 1.2.4 for both the insurer and the reinsurer after the operation of simple forms of proportional and excess of loss reinsurance.

CS2

1.3 Introduction to copulas

1.3.1 Describe how a copula can be characterised as a multivariate distribution function which is a function of the marginal distribution functions of its variates, and explain how this allows the marginal distributions to be investigated separately from the dependency between them.

1.3.2 Explain the meaning of the terms dependence or concordance, upper and lower tail dependence; and state in general terms how tail dependence can be used to help select a copula suitable for modelling particular types of risk.

1.3.3 Describe the form and characteristics of the Gaussian copula and the Archimedean family of copulas.

1.4 Introduction to extreme value theory

1.4.1 Recognise extreme value distributions, suitable for modelling the distribution of severity of loss and their relationships

1.4.2 Calculate various measures of tail weight and interpret the results to compare the tail weights.

2 Time series (20%)

2.1 Concepts underlying time series models

2.1.1 Explain the concept and general properties of stationary, $I(0)$, and integrated, $I(1)$, univariate time series.

2.1.2 Explain the concept of a stationary random series.

2.1.3 Explain the concept of a filter applied to a stationary random series.

2.1.4 Know the notation for backwards shift operator, backwards difference operator, and the concept of roots of the characteristic equation of time series.

2.1.5 Explain the concepts and basic properties of autoregressive (AR), moving average (MA), autoregressive moving average (ARMA) and autoregressive integrated moving average (ARIMA) time series.

2.1.6 Explain the concept and properties of discrete random walks and random walks with normally distributed increments, both with and without drift.

2.1.7 Explain the basic concept of a multivariate autoregressive model.

2.1.8 Explain the concept of cointegrated time series.

2.1.9 Show that certain univariate time series models have the Markov property and describe how to rearrange a univariate time series model as a multivariate Markov model.

2.2 Applications of time series models

2.2.1 Outline the processes of identification, estimation and diagnosis of a time series, the criteria for choosing between models and the diagnostic tests that might be applied to the residuals of a time series after estimation.

2.2.2 Describe briefly other non-stationary, non-linear time series models.

2.2.3 Describe simple applications of a time series model, including random walk, autoregressive and cointegrated models as applied to security prices and other economic variables.

2.2.4 Develop deterministic forecasts from time series data, using simple extrapolation and moving average models, applying smoothing techniques and seasonal adjustment when appropriate.

3 Stochastic processes (25%)

3.1 Describe and classify stochastic processes.

3.1.1 Define in general terms a stochastic process and in particular a counting process.

3.1.2 Classify a stochastic process according to whether it:

- operates in continuous or discrete time
- has a continuous or a discrete state space
- is a mixed type

and give examples of each type of process.

3.1.3 Describe possible applications of mixed processes.

3.1.4 Explain what is meant by the Markov property in the context of a stochastic process and in terms of filtrations.

3.2 Define and apply a Markov chain.

3.2.1 State the essential features of a Markov chain model.

3.2.2 State the Chapman-Kolmogorov equations that represent a Markov chain.

3.2.3 Calculate the stationary distribution for a Markov chain in simple cases.

CS2

        3.2.4   Describe a system of frequency based experience rating in terms of a Markov chain and describe other simple applications.

        3.2.5   Describe a time-inhomogeneous Markov chain model and describe simple applications.

        3.2.6   Demonstrate how Markov chains can be used as a tool for modelling and how they can be simulated.

    3.3   Define and apply a Markov process.

        3.3.1   State the essential features of a Markov process model.

        3.3.2   Define a Poisson process, derive the distribution of the number of events in a given time interval, derive the distribution of inter-event times, and apply these results.

        3.3.3   Derive the Kolmogorov equations for a Markov process with time independent and time/age dependent transition intensities.

        3.3.4   Solve the Kolmogorov equations in simple cases.

        3.3.5   Describe simple survival models, sickness models and marriage models in terms of Markov processes and describe other simple applications.

        3.3.6   State the Kolmogorov equations for a model where the transition intensities depend not only on age/time, but also on the duration of stay in one or more states.

        3.3.7   Describe sickness and marriage models in terms of duration dependent Markov processes and describe other simple applications.

        3.3.8   Demonstrate how Markov jump processes can be used as a tool for modelling and how they can be simulated.

4   Survival models (25%)

    4.1   Explain concept of survival models.

        4.1.1   Describe the model of lifetime or failure time from age x as a random variable.

        4.1.2   State the consistency condition between the random variable representing lifetimes from different ages.

        4.1.3   Define the distribution and density functions of the random future lifetime, the survival function, the force of mortality or hazard rate, and derive relationships between them.

4.1.4　　Define the actuarial symbols $_t p_x$ and $_t q_x$ and derive integral formulae for them.

4.1.5　　State the Gompertz and Makeham laws of mortality.

4.1.6　　Define the curtate future lifetime from age x and state its probability function.

4.1.7　　Define the symbols ex and $\overset{\circ}{e}_x$ and derive an approximate relation between them. Define the expected value and variance of the complete and curtate future lifetimes and derive expressions for them.

4.1.8　　Describe the two-state model of a single decrement and compare its assumptions with those of the random lifetime model.

4.2　　Describe estimation procedures for lifetime distributions.

4.2.1　　Describe the various ways in which lifetime data might be censored.

4.2.2　　Describe the estimation of the empirical survival function in theabsence of censoring, and what problems are introduced by censoring.

4.2.3　　Describe the Kaplan-Meier (or product limit) estimator of the survival function in the presence of censoring, compute it from typical data and estimate its variance.

4.2.4　　Describe the Nelson-Aalen estimator of the cumulative hazard rate in the presence of censoring, compute it from typical data and estimate its variance.

4.2.5　　Describe models for proportional hazards, and how these models can be used to estimate the impact of covariates on the hazard.

4.2.6　　Describe the Cox model for proportional hazards, derive the partial likelihood estimate in the absence of ties, and state the asymptotic distribution of the partial likelihood estimator.

4.3　　Derive maximum likelihood estimators for transition intensities.

4.3.1　　Describe an observational plan in respect of a finite number of individuals observed during a finite period of time, and define the resulting statistics, including the waiting times.

4.3.2　　Derive the likelihood function for constant transition intensities in a Markov model of transfers between states given the statistics in 4.3.1.

4.3.3　　Derive maximum likelihood estimators for the transition intensities in 4.3.2. and state their asymptotic joint distribution.

CS2

4.3.4 State the Poisson approximation to the estimator in 4.3.3 in the case of a single decrement.

4.4 Estimate transition intensities dependent on age (exact or census)

4.4.1 Explain the importance of dividing the data into homogeneous classes, including subdivision by age and sex.

4.4.2 Describe the principle of correspondence and explain its fundamental importance in the estimation procedure.

4.4.3 Specify the data needed for the exact calculation of a central exposed to risk (waiting time) depending on age and sex.

4.4.4 Calculate a central exposed to risk given the data in 4.4.3.

4.4.5 Explain how to obtain estimates of transition probabilities, including in the single decrement model the actuarial estimate based on the simple adjustment to the central exposed to risk.

4.4.6 Explain the assumptions underlying the census approximation of waiting times.

4.4.7 Explain the concept of the rate interval.

4.4.8 Develop census formulae given age at birthday where the age may be classified as next, last, or nearest relative to the birthday as appropriate, and the deaths and census data may use different definitions of age.

4.4.9 Specify the age to which estimates of transition intensities or probabilities in 4.4.8 apply.

4.5 Graduation and graduation tests

4.5.1 Describe and apply statistical tests of the comparison crude estimates with a standard mortality table testing for:

- the overall fit
- the presence of consistent bias
- the presence of individual ages where the fit is poor
- the consistency of the "shape" of the crude estimates and the standard table

For each test describe:

- the formulation of the hypothesis
- the test statistic
- the distribution of the test statistic using approximations where appropriate

- the application of the test statistic

4.5.2   Describe the reasons for graduating crude estimates of transition intensities or probabilities, and state the desirable properties of a set of graduated estimates.

4.5.3   Describe a test for smoothness of a set of graduated estimates.

4.5.4   Describe the process of graduation by the following methods, and state the advantages and disadvantages of each:

- parametric formula
- standard table
- spline functions

(The student will not be required to carry out a graduation.)

4.5.5   Describe how the tests in 4.5.1 should be amended to compare crude and graduated sets of estimates.

4.5.6   Describe how the tests in 4.5.1 should be amended to allow for the presence of duplicate policies.

4.5.7   Carry out a comparison of a set of crude estimates and a standard table, or of a set of crude estimates and a set of graduated estimates.

4.6   Mortality projection

4.6.1   Describe the approaches to the forecasting of future mortality rates based on extrapolation, explanation and expectation, and their advantages and disadvantages.

4.6.2   Describe the Lee-Carter, age-period-cohort, and p-spline regression models for forecasting mortality.

4.6.3   Use an appropriate computer package to apply the models in 4.6.2 to a suitable mortality dataset.

4.6.4   List the main sources of error in mortality forecasts.

5   Machine learning (10%)

5.1   Explain and apply elementary principles of machine learning

5.1.1   Explain the main branches of machine learning and describe examples of the types of problems typically addressed by machine learning.

5.1.2   Explain and apply high-level concepts relevant to learning from data.

CS2

5.1.3 Describe and give examples of key supervised and unsupervised machine learning techniques, explaining the difference between regression and classification and between generative and discriminative models.

5.1.4 Explain in detail and use appropriate software to apply machine learning techniques (e.g. penalised regression and decision trees) to simple problems.

5.1.5 Demonstrate an understanding of the perspectives of statisticians, data scientists, and other quantitative researchers from non-actuarial backgrounds.

Assessment

Combination of a computer based data analysis and statistical modelling assignment and a three hour written examination.

END

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CM1 – Actuarial Mathematics 1

Aim

The aim of the Actuarial Mathematics 1 subject is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value known cashflows as well as those which are dependent on death, survival, or other uncertain risks.

Competences

On the successful completion of this subject, the candidate will be able to:

1   describe the basic principles of actuarial modelling.

2   describe, interpret and discuss the theories on interest rates.

3   describe, interpret and discuss mathematical techniques used to model and value cashflows which are contingent on mortality and morbidity risks.

Links to other subjects

Concepts are introduced in:

CS1 – Actuarial Statistics 1

Topics in this subject are further built upon in:

CM2 – Actuarial Mathematics 2
CB1 – Business Finance
CP1 – Actuarial Practice
CP2 – Modelling Practice
SP1 – Health and Care Principles
SP2 – Life Insurance Principles
SP4 – Pensions and other Benefits Principles

CM1

Syllabus topics

1   Data and basics of modelling (10%)
2   Theory of interest rates (20%)
3   Equation of value and its applications (15%)
4   Single decrement models (10%)
5   Multiple decrement and multiple life models (10%)
6   Pricing and reserving (35%)

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In the CM subjects, the approximate split of assessment across the three skill types is 20% Knowledge, 65% Application and 15% Higher Order skills.

Detailed syllabus objectives

1 Data and basics of modelling (10%)

1.1 Data analysis

1.1.1 Describe the possible aims of a data analysis (e.g. descriptive, inferential, and predictive).

1.1.2 Describe the stages of conducting a data analysis to solve real-world problems in a scientific manner and describe tools suitable for each stage.

1.1.3 Describe sources of data and explain the characteristics of different data sources, including extremely large data sets.

1.1.4 Explain the meaning and value of reproducible research and describe the elements required to ensure a data analysis is reproducible.

1.2 Describe the principles of actuarial modelling.

1.2.1 Describe why and how models are used including, in general terms, the use of models for pricing, reserving, and capital modelling.

1.2.2 Explain the benefits and limitations of modelling.

1.2.3 Explain the difference between a stochastic and a deterministic model, and identify the advantages/disadvantages of each.

1.2.4 Describe the characteristics of, and explain the use, of scenario-based and proxy models.

1.2.5 Describe, in general terms, how to decide whether a model is suitable for any particular application.

1.2.6 Explain the difference between the short-run and long-run properties of a model, and how this may be relevant in deciding whether a model is suitable for any particular application.

1.2.7 Describe, in general terms, how to analyse the potential output from a model, and explain why this is relevant to the choice of model.

1.2.8 Describe the process of sensitivity testing of assumptions and explain why this forms an important part of the modelling process.

1.2.9 Explain the factors that must be considered when communicating the results following the application of a model.

CM1

1.3 Describe how to use a generalised cashflow model to describe financial transactions.

1.3.1 State the inflows and outflows in each future time period and discuss whether the amount or the timing (or both) is fixed or uncertain for a given cashflow process.

1.3.2 Describe in the form of a cashflow model the operation of financial instruments like a zero coupon bond, a fixed interest security, an index-linked security, cash on deposit, an equity, an interest only loan, a repayment loan, and an annuity certain; and an insurance contract like endowment, term assurance, contingent annuity, car insurance and health cash plans.

2 Theory of interest rates (20%)

2.1 Show how interest rates may be expressed in different time periods.

2.1.1 Describe the relationship between the rates of interest and discount over one effective period arithmetically and by general reasoning.

2.1.2 Derive the relationships between the rate of interest payable once per measurement period (effective rate of interest) and the rate of interest payable $p \ (> 1)$ times per measurement period (nominal rate of interest) and the force of interest.

2.1.3 Calculate the equivalent annual rate of interest implied by the accumulation of a sum of money over a specified period where the force of interest is a function of time.

2.2 Demonstrate a knowledge and understanding of real and nominal interest rates.

2.3 Describe how to take into account time value of money using the concepts of compound interest and discounting.

2.3.1 Accumulate a single investment at a constant rate of interest under the operation of simple and compound interest.

2.3.2 Define the present value of a future payment.

2.3.3 Discount a single investment under the operation of a simple (commercial) discount at a constant rate of discount.

2.4 Calculate present value and accumulated value for a given stream of cashflows under the following individual or combination of scenarios:

2.4.1 Cashflows are equal at each time period.

2.4.2 Cashflows vary with time which may or may not be a continuous function of time.

2.4.3 Some of the cashflows are deferred for a period of time.

2.4.4 Rate of interest or discount is constant.

2.4.5 Rate of interest or discount varies with time which may or may not be a continuous function of time.

2.5 Define and derive the following compound interest functions (where payments can be in advance or in arrears) in terms i, v, n, d, δ, $i(p)$ and $d(p)$:

2.5.1 $a_{\overline{n}|}$, $s_{\overline{n}|}$, $a_{\overline{n}|}^{(p)}$, $s_{\overline{n}|}^{(p)}$, $\ddot{a}_{\overline{n}|}$, $\ddot{s}_{\overline{n}|}$, $\ddot{a}_{\overline{n}|}^{(p)}$, $\ddot{s}_{\overline{n}|}^{(p)}$, $\overline{a}_{\overline{n}|}$ and $\overline{s}_{\overline{n}|}$.

2.5.2 ${}_{m|}a_{\overline{n}|}$, ${}_{m|}a_{\overline{n}|}^{(p)}$, ${}_{m|}\ddot{a}_{\overline{n}|}$, ${}_{m|}\ddot{a}_{\overline{n}|}^{(p)}$ and ${}_{m|}\overline{a}_{\overline{n}|}$.

2.5.3 $(Ia)_{\overline{n}|}$, $(I\ddot{a})_{\overline{n}|}$, $(\overline{I}a)_{\overline{n}|}$ and $(\overline{Ia})_{\overline{n}|}$ and the respective deferred annuities.

2.6 Show an understanding of the term structure of interest rates.

2.6.1 Describe the main factors influencing the term structure of interest rates.

2.6.2 Explain what is meant by, derive the relationships between and evaluate:

- discrete spot rates and forward rates.
- continuous spot rates and forward rates.

2.6.3 Explain what is meant by the par yield and yield to maturity.

2.7 Understanding duration, convexity and immunisation of cashflows

2.7.1 Define the duration and convexity of a cashflow sequence, and illustrate how these may be used to estimate the sensitivity of the value of the cashflow sequence to a shift in interest rates.

2.7.2 Evaluate the duration and convexity of a cashflow sequence.

2.7.3 Explain how duration and convexity are used in the (Redington) immunisation of a portfolio of liabilities.

3 Equation of value and its applications (15%)

3.1 Define an equation of value.

3.1.1 Define an equation of value, where payment or receipt is certain.

3.1.2 Describe how an equation of value can be adjusted to allow for uncertain receipts or payments.

3.1.3   Understand the two conditions required for there to be an exact solution to an equation of value.

3.2   Use the concept of equation of value to solve various practical problems.

3.2.1   Apply the equation of value to loans repaid by regular instalments of interest and capital. Obtain repayments, interest and capital components, the effective interest rate (APR) and construct a schedule of repayments.

3.2.2   Calculate the price of, or yield (nominal or real allowing for inflation) from, a bond (fixed-interest or index-linked) where the investor is subject to deduction of income tax on coupon payments and redemption payments are subject to deduction of capital gains tax.

3.2.3   Calculate the running yield and the redemption yield for the financial instrument as described in 3.2.2.

3.2.4   Calculate the upper and lower bounds for the present value of the financial instrument as described in 3.2.2 when the redemption date can be a single date within a given range at the option of the borrower.

3.2.5   Calculate the present value or yield (nominal or real allowing for inflation) from an ordinary share or property, given constant or variable rate of growth of dividends or rents.

3.3   Show how discounted cashflow and equation of value techniques can be used in project appraisals.

3.3.1   Calculate the net present value and accumulated profit of the receipts and payments from an investment project at given rates of interest.

3.3.2   Calculate the internal rate of return, payback period and discounted payback period and discuss their suitability for assessing the suitability of an investment project.

4   Single decrement models (10%)

4.1   Define various assurance and annuity contracts.

4.1.1   Define the following terms:

- whole life assurance
- term assurance
- pure endowment
- endowment assurance
- whole life level annuity
- temporary level annuity
- guaranteed level annuity

- premium
- benefit

including assurance and annuity contracts where the benefits are deferred.

4.1.2   Describe the operation of conventional with-profits contracts, in which profits are distributed by the use of regular reversionary bonuses, and by terminal bonuses. Describe the benefits payable under the above assurance-type contracts.

4.1.3   Describe the operation of conventional unit-linked contracts, in which death benefits are expressed as combination of absolute amount and relative to a unit fund and where maturity benefits can also be guaranteed to a minimum absolute amount or rate of investment return.

4.1.4   Describe the operation of accumulating with-profits contracts, in which benefits take the form of an accumulating fund of premiums, where either:

- the fund is defined in monetary terms, has no explicit charges, and is increased by the addition of regular guaranteed and bonus interest payments plus a terminal bonus; or

- the fund is defined in terms of the value of a unit fund, is subject to explicit charges, and is increased by regular bonus additions plus a terminal bonus (Unitised with-profits).

In the case of unitised with-profits, the regular additions can take the form of (a) unit price increases (guaranteed and/or discretionary), or (b) allocations of additional units.

In either case a guaranteed minimum monetary death benefit may be applied.

4.2   Develop formulae for the means and variances of the payments under various assurance and annuity contracts, assuming constant deterministic interest rate.

4.2.1   Describe the life table functions l_x and d_x and their select equivalents $l_{[x]+r}$ and $d_{[x]+r}$.

4.2.2   Define the following probabilities: $_n p_x$, $_n q_x$, $_{n|m} q_x$, $_{n|} q_x$ and their select equivalents $_n p_{[x]+r}$, $_n q_{[x]+r}$ $_{n|m} q_{[x]+r}$, $_{n|} q_{[x]+r}$.

4.2.3   Express the probabilities defined in 4.2.2 in terms of life table functions defined in 4.2.1.

4.2.4   Define the assurance and annuity factors and their select and continuous equivalents. Extend the annuity factors to allow for the possibility that payments are more frequent than annual but less frequent than continuous.

CM1

4.2.5 Understand and use the relations between annuities payable in advance and in arrear, and between temporary, deferred and whole life annuities.

4.2.6 Understand and use the relations between assurance and annuity factors using equation of value, and their select and continuous equivalents.

4.2.7 Obtain expressions in the form of sums/integrals for the mean and variance of the present value of benefit payments under each contract defined in 4.1, in terms of the (curtate) random future lifetime, assuming:

- contingent benefits (constant, increasing or decreasing) are payable at the middle or end of the year of contingent event or continuously.

- annuities are paid in advance, in arrear or continuously, and the amount is constant, increases or decreases by a constant monetary amount or by a fixed or time-dependent variable rate.

- premiums are payable in advance, in arrear or continuously; and for the full policy term or for limited period.

Where appropriate, simplify the above expressions into a form suitable for evaluation by table look-up or other means.

4.2.8 Define and evaluate the expected accumulations in terms of expected values and variances for the contracts described in 4.1 and contract structures described in 4.2.7.

5 Multiple decrement and multiple life models (10%)

5.1 Define and use assurance and annuity functions involving two lives.

5.1.1 Extend the techniques of objectives 4.2 to deal with cashflows dependent upon the death or survival of either or both of two lives.

5.1.2 Extend the technique of 5.1.1 to deal with functions dependent upon a fixed term as well as age.

5.2 Describe and illustrate methods of valuing cashflows that are contingent upon multiple transition events.

5.2.1 Define health insurance, and describe simple health insurance premium and benefit structures.

5.2.2 Explain how a cashflow, contingent upon multiple transition events, may be valued using a multiple-state Markov Model, in terms of the forces and probabilities of transition.

5.2.3 Construct formulae for the expected present values of cashflows that are contingent upon multiple transition events, including simple health

insurance premiums and benefits, and calculate these in simple cases. Regular premiums and sickness benefits are payable continuously and assurance benefits are payable immediately on transition.

5.3 Describe and use methods of projecting and valuing expected cashflows that are contingent upon multiple decrement events.

5.3.1 Define a multiple decrement model as a special case of multiple-state Markov model.

5.3.2 Derive dependent probabilities for a multiple decrement model in terms of given forces of transition, assuming forces of transition are constant over single years of age.

5.3.3 Derive forces of transition from given dependent probabilities, assuming forces of transition are constant over single years of age.

6 Pricing and reserving (35%)

6.1 Define the gross random future loss under an insurance contract, and state the principle of equivalence.

6.2 Describe and calculate gross premiums and reserves of assurance and annuity contracts.

6.2.1 Define and calculate gross premiums for the insurance contract benefits as defined in objective 4.1 under various scenarios using the equivalence principle or otherwise:

- contracts may accept only single premium.

- regular premiums and annuity benefits may be payable annually, more frequently than annually, or continuously.

- death benefits (which increase or decrease by a constant compound rate or by a constant monetary amount) may be payable at the end of the year of death, or immediately on death.

- survival benefits (other than annuities) may be payable at defined intervals other than at maturity.

6.2.2 State why an insurance company will set up reserves.

6.2.3 Define and calculate gross prospective and retrospective reserves.

6.2.4 State the conditions under which, in general, the prospective reserve is equal to the retrospective reserve allowing for expenses.

6.2.5   Prove that, under the appropriate conditions, the prospective reserve is equal to the retrospective reserve, with or without allowance for expenses, for all fixed benefit and increasing / decreasing benefit contracts.

6.2.6   Obtain recursive relationships between successive periodic gross premium reserves, and use this relationship to calculate the profit earned from a contract during the period.

6.2.7   Outline the concepts of net premiums and net premium valuation and how they relate to gross premiums and gross premium valuation respectively.

6.3   Define and calculate, for a single policy or a portfolio of policies (as appropriate):

- death strain at risk
- expected death strain
- actual death strain
- mortality profit

for policies with death benefits payable immediately on death or at the end of the year of death; for policies paying annuity benefits at the start of the year or on survival to the end of the year; and for policies where single or non-single premiums are payable.

6.4   Project expected future cashflows for whole life, endowment and term assurances, annuities, unit-linked contracts, and conventional/unitised with-profits contracts, incorporating multiple decrement models as appropriate.

6.4.1   Profit test life insurance contracts of the types listed above and determine the profit vector, the profit signature, the net present value, and the profit margin.

6.4.2   Show how a profit test may be used to price a product, and use a profit test to calculate a premium for life insurance contracts of the types listed above.

6.4.3   Show how gross premium reserves can be computed using above the cashflow projection model and included as part of profit testing.

6.5   Show how, for unit-linked contracts, non-unit reserves can be established to eliminate ("zeroise") future negative cashflows, using a profit test model.

Assessment

Combination of a computer based modelling assignment and a three hour written examination.

END

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CM2 – Actuarial Mathematics 2

Aim

The aim of the Actuarial Mathematics 2 subject is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on stochastic asset liability models and the valuation of financial derivatives. These skills are also required to communicate with other financial professionals and to critically evaluate modern financial theories.

Competences

On successful completion of this subject, a student will be able to:

1   describe, interpret and discuss the theories on the behaviour of financial markets.
2   discuss the advantages and disadvantages of different measures of investment risk.
3   describe, construct, interpret and discuss the models underlying asset valuations.
4   describe, construct, interpret and discuss the models underlying liability valuations.
5   describe, construct, interpret and discuss the models underlying option pricing.

Links to other subjects

Concepts introduced in CS1 – Actuarial Statistics 1, CS2 – Actuarial Statistics 2, CM1 – Actuarial Mathematics 1 and CB2 – Business Economics are used in this subject.

Topics in this subject are further built upon in CP1 – Actuarial Practice, CP2 – Modelling Practice, SP5 – Investment and Finance Principles, SP6 – Financial Derivatives Principles and SP9 – Enterprise Risk Management Principles.

CM2

Syllabus topics

1 Theories of financial market behaviour (15%)
2 Measures of investment risk (15%)
3 Stochastic investment returnmodels (10%)
4 Asset valuations (20%)
5 Liability valuations (20%)
6 Option theory (20%)

The weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions, and making recommendations).

In the CM subjects, the approximate split of assessment across the three skill types is 20% Knowledge, 65% Application and 15% Higher Order skills.

Detailed syllabus objectives

1 Theories of financial market behaviour (15%)

1.1 Rational expectations theory

1.1.1 Discuss the three forms of the Efficient Markets Hypothesis and their consequences for investment management.

1.1.2 Describe briefly the evidence for or against each form of the Efficient Markets Hypothesis.

1.2 Rational choice theory

1.2.1 Explain the meaning of the term "utility function".

1.2.2 Explain the axioms underlying utility theory and the expected utility theorem.

1.2.3 Explain how the following economic characteristics of investors can be expressed mathematically in a utility function:

- non-satiation
- risk aversion, risk neutrality and risk seeking
- declining or increasing absolute and relative risk aversion

1.2.4 Discuss the economic properties of commonly used utility functions.

1.2.5 Discuss how a utility function may depend on current wealth and discuss state dependent utility functions.

1.2.6 Perform calculations using commonly used utility functions to compare investment opportunities.

1.2.7 State conditions for absolute dominance and for first and second-order dominance.

1.2.8 Analyse simple insurance problems in terms of utility theory.

1.3 Behavioural economics

1.3.1 Describe the main features of Kahneman and Tversky's prospect theory critique of expected utility theory.

1.3.2 Explain what is meant by "framing", "heuristics" and "bias" in the context of financial markets and describe the following features of behaviour in such markets:

- the herd instinct

- anchoring and adjustment
- self-attribution bias
- loss aversion
- confirmation bias
- availability bias
- familiarity bias

1.3.3   Describe the Bernartzi and Thaler solution to the equity premium puzzle.

2   Measures of investment risk (15%)

2.1   Properties of risk measures

2.1.1   Define the following measures of investment risk:

- variance of return
- downside semi-variance of return
- shortfall probabilities
- Value at Risk (VaR) / Tail VaR

2.1.2   Describe how the risk measures listed in 2.1.1 above are related to the form of an investor's utility function.

2.1.3   Perform calculations using the risk measures listed in.2.1.1 above to compare investment opportunities.

2.1.4   Explain how the distribution of returns and the thickness of tails will influence the assessment of risk.

2.2   Risk and insurance companies

2.2.1   Describe how insurance companies help to reduce or remove risk.

2.2.2   Explain what is meant by the terms "moral hazard" and "adverse selection".

3   Stochastic interest rate models (10%)

3.1   Show an understanding of simple stochastic models for investment returns.

3.1.1   Describe the concept of a stochastic interest rate model and the fundamental distinction between this and a deterministic model.

3.1.2   Derive algebraically, for the model in which the annual rates of return are independently and identically distributed and for other simple models, expressions for the mean value and the variance of the accumulated amount of a single premium.

3.1.3   Derive algebraically, for the model in which the annual rates of return are independently and identically distributed, recursive relationships which

permit the evaluation of the mean value and the variance of the accumulated amount of an annual premium.

3.1.4 Derive analytically, for the model in which each year the random variable $(1 + i)$ has an independent log-normal distribution, the distribution functions for the accumulated amount of a single premium and for the present value of a sum due at a given specified future time.

3.1.5 Apply the above results to the calculation of the probability that a simple sequence of payments will accumulate to a given amount at a specific future time.

4 Asset valuations (20%)

4.1 Mean-variance portfolio theory

4.1.1 Describe and discuss the assumptions of mean-variance portfolio theory.

4.1.2 Discuss the conditions under which application of mean-variance portfolio theory leads to the selection of an optimum portfolio.

4.1.3 Calculate the expected return and risk of a portfolio of many risky assets, given the expected return, variance and covariance of returns of the individual assets, using mean-variance portfolio theory.

4.1.4 Explain the benefits of diversification using mean-variance portfolio theory.

4.2 Asset pricing models

4.2.1 Describe the assumptions, principal results and uses of the Sharpe-Lintner-Mossin Capital Asset Pricing Model (CAPM).

4.2.2 Discuss the limitations of the basic CAPM and some of the attempts that have been made to develop the theory to overcome these limitations.

4.2.3 Perform calculations using the CAPM.

4.2.4 Discuss the main issues involved in estimating parameters for asset pricing models.

4.3 Single and multifactor models for investment returns

4.3.1 Describe the three types of multifactor models of asset returns:

- macroeconomic models
- fundamental factor models
- statistical factor models

4.3.2 Discuss the single index model of asset returns.

CM2

> 4.3.3   Discuss the concepts of diversifiable and non-diversifiable risk.
>
> 4.3.4   Discuss the construction of the different types of multifactor models.
>
> 4.3.5   Perform calculations using both single and multi-factor models.

4.4   **Stochastic models for security prices**

> 4.4.1   Discuss the continuous time log-normal model of security prices and the empirical evidence for or against the model.
>
> 4.4.2   Explain the definition and basic properties of standard Brownian motion or Wiener process.
>
> 4.4.3   Demonstrate a basic understanding of stochastic differential equations, the Ito integral, diffusion and mean-reverting processes.
>
> 4.4.4   State Ito's Lemma and be able to apply it to simple problems.
>
> 4.4.5   Write down the stochastic differential equation for geometric Brownian motion and show how to find its solution.
>
> 4.4.6   Write down the stochastic differential equation for the Ornstein-Uhlenbeck process and show how to find its solution.

4.5   **Models of the term structures of interest rates**

> 4.5.1   Explain the principal concepts and terms underlying the theory of a term structure of interest rates.
>
> 4.5.2   Describe the desirable characteristics of models for the term-structure of interest rates.
>
> 4.5.3   Apply the term structure of interest rates to modelling various cash flows, including calculating the sensitivity of the value to changes in the term structure.
>
> 4.5.4   Describe, as a computational tool, the risk-neutral approach to the pricing of zero-coupon bonds and interest-rate derivatives for a general one-factor diffusion model for the risk-free rate of interest.
>
> 4.5.5   Describe, as a computational tool, the approach using state-price deflators to the pricing of zero-coupon bonds and interest-rate derivatives for a general one-factor diffusion model for the risk-free rate of interest.
>
> 4.5.6   Demonstrate an awareness of the Vasicek, Cox-Ingersoll-Ross and Hull-White models for the term-structure of interest rates.

4.5.7   Discuss the limitations of these one-factor models and show an awareness of how these issues can be addressed.

4.6   Simple models for credit risk

4.6.1   Define the terms credit event and recovery rate.

4.6.2   Describe the different approaches to modelling credit risk: structural models, reduced form models, intensity-based models.

4.6.3   Demonstrate a knowledge and understanding of the Merton model.

4.6.4   Demonstrate a knowledge and understanding of a two-state model for credit ratings with a constant transition intensity.

4.6.5   Describe how the two-state model can be generalised to the Jarrow-Lando-Turnbull model for credit ratings.

4.6.6   Describe how the two-state model can be generalised to incorporate a stochastic transition intensity.

5   Liability valuations (20%)

5.1   Ruin theory

5.1.1   Explain what is meant by the aggregate claim process and the cash-flow process for a risk.

5.1.2   Use the Poisson process and the distribution of inter-event times to calculate probabilities of the number of events in a given time interval and waiting times.

5.1.3   Define a compound Poisson process and calculate probabilities using simulation.

5.1.4   Define the probability of ruin in infinite/finite and continuous/discrete time and state and explain relationships between the different probabilities of ruin.

5.1.5   Describe the effect on the probability of ruin, in both finite and infinite time, of changing parameter values by reasoning or simulation.

5.1.6   Calculate probabilities of ruin by simulation.

5.2   Run-off triangles

5.2.1   Define a development factor and show how a set of assumed development factors can be used to project the future development of a delay triangle.

CM2

      5.2.2   Describe and apply a basic chain ladder method for completing the delay triangle using development factors.

      5.2.3   Show how the basic chain ladder method can be adjusted to make explicit allowance for inflation.

      5.2.4   Describe and apply the average cost per claim method for estimating outstanding claim amounts.

      5.2.5   Describe and apply the Bornhuetter-Ferguson method for estimating outstanding claim amounts.

      5.2.6   Describe how a statistical model can be used to underpin a run off triangles approach.

      5.2.7   Discuss the assumptions underlying the application of the methods in 5.2.1 to 5.2.6 above.

    5.3   Value basic benefit guarantees using simulation techniques.

6   Option theory (20%)

6.1   Option pricing and valuations

      6.1.1   State what is meant by arbitrage and a complete market.

      6.1.2   Outline the factors that affect option prices.

      6.1.3   Derive specific results for options which are not model dependent:

- show how to value a forward contract.
- develop upper and lower bounds for European and American call and put options.
- explain what is meant by put-call parity.

      6.1.4   Show how to use binomial trees and lattices in valuing options and solve simple examples.

      6.1.5   Derive the risk-neutral pricing measure for a binomial lattice and describe the risk-neutral pricing approach to the pricing of equity options.

      6.1.6   Explain the difference between the real-world measure and the risk-neutral measure. Explain why the risk-neutral pricing approach is seen as a computational tool (rather than a realistic representation of price dynamics in the real world).

      6.1.7   State the alternative names for the risk-neutral and state-price deflator approaches to pricing.

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6.1.8   Demonstrate an understanding of the Black-Scholes derivative-pricing model:

- explain what is meant by a complete market.
- explain what is meant by risk-neutral pricing and the equivalent martingale measure.
- derive the Black-Scholes partial differential equation both in its basic and Garman-Kohlhagen forms.
- demonstrate how to price and hedge a simple derivative contract using the martingale approach.

6.1.9   Show how to use the Black-Scholes model in valuing options and solve simple examples.

6.1.10   Discuss the validity of the assumptions underlying the Black-Scholes model.

6.1.11   Describe and apply in simple models, including the binomial model and the Black-Scholes model, the approach to pricing using deflators and demonstrate its equivalence to the risk-neutral pricing approach.

6.1.12   Demonstrate an awareness of the commonly used terminology for the first, and where appropriate second, partial derivatives (the Greeks) of an option price.

6.2   Value basic benefit guarantees using option pricing techniques.

Assessment

Combination of a computer based modelling assignment and a three hour written examination.

END

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CB1 – Business Finance

Aim

The aim of the Business Finance subject is to:

- provide a basic understanding of corporate finance including a knowledge of the instruments used by companies to raise finance and manage financial risk.

- provide the ability to interpret the accounts and financial statements of companies and financial institutions.

Competences

On successful completion of this subject, a student will be able to:

1   understand how companies are governed and structured.
2   suggest appropriate ways to finance a company.
3   analyse published accounts.
4   produce management information.

Links to other subjects

CB2 – Business Economics
CB3 – Business Management
CM1 – Actuarial Mathematics 1
CP1 – Actuarial Practice
SP5 – Investment and Finance Principles
P0 – Generic UK Practice Module

CB1

Syllabus topics

1   Corporate governance and organisation (10%)
2   How corporates are financed (20%)
3   Evaluating projects (20%)
4   Constructing and interpreting company accounts (40%)
5   Constructing management information and evaluating working capital (10%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

• the relative complexity of each topic, and hence the amount of explanation and support required for it.

• the need to provide thorough foundation understanding on which to build the other objectives.

• the extent of prior knowledge which is expected.

• the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the CB1 subject, the approximate split of assessment across these three skill types is 25% Knowledge, 55% Application and 20% Higher Order Skills.

Detailed syllabus objectives

1 Corporate governance and organisation (10%)

1.1   Explain the purpose and process of regulating the financial reporting information of incorporated entities.

1.2   Describe the key principles of corporate governance and the regulation of companies.

1.3   Demonstrate an awareness of the key principles of finance.

    1.3.1   Outline the relationship between finance and the real resources and objectives of an organisation.

    1.3.2   Outline the relationship between the stakeholders in an organisation (including lenders and investors).

    1.3.3   Outline the role and effects of the capital markets.

    1.3.4   Outline the maximisation of shareholder wealth as the main goal of financial management in a company.

    1.3.5   Outline problems relating to the maximisation of shareholder wealth in practice: social responsibility concerns, agency problems and divergent objectives.

    1.3.6   Outline the strategies employed by managers to maximise shareholder wealth.

    1.3.7   Outline the determinants of value and the actions managers can take to influence value.

2 How corporates are financed (20%)

2.1   Describe the structure of a company and the different methods by which it may be financed.

    2.1.1   Outline the distinctive characteristics of sole traders, partnerships and limited companies as business entities.

    2.1.2.   Describe the different types of loan and share capital.

    2.1.3   Contrast authorised and issued share capital.

    2.1.4   Discuss the economic advantages and disadvantages of a limited company as a business entity.

    2.1.5   Outline the main differences between a private and public company.

CB1

    2.1.6   Outline the different types of medium term company finance:

- hire purchase
- credit sale
- leasing
- bank loans

    2.1.7   Describe the following different types of short term company finance:

- bank overdrafts
- trade credit
- factoring
- bills of exchange
- commercial paper

    2.1.8   Describe alternative methods of raising finance outside the regular banking system including 'shadow banking', direct project financing, crowd-funding and micro-finance.

2.2   Describe the basic principles of personal and corporate taxation.

    2.2.1   Describe the basic principles of personal taxation of income and capital gains.

    2.2.2   Describe the basic principles of company taxation.

    2.2.3   Explain the different systems of company taxation from the points of view of an individual shareholder and the company.

    2.2.4   Outline the basic principles of double taxation relief.

2.3   Demonstrate a knowledge and understanding of the characteristics of the principal forms of financial instrument issued or used by companies and the ways in which they may be issued.

    2.3.1   Outline the reasons a company might have for seeking a quotation on the stock exchange.

    2.3.2   Describe the characteristics:

- debenture stocks
- unsecured loan stocks
- Eurobonds
- preference shares
- ordinary shares
- convertible unsecured loan stocks
- convertible preference shares
- warrants
- floating rate notes

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- subordinated debt
- options issued by companies

2.3.3 Describe the characteristics and possible uses by a non-financial company of:

- financial futures.
- options.
- interest rate and currency swaps.

2.3.4 Outline the following methods of obtaining a quotation for securities:

- offer for sale
- offer for sale by tender
- offer for subscription
- placing
- introduction

2.3.5 Describe the following types of new issues to existing shareholders:

- scrip issue
- rights issue

2.3.6 Describe the role of underwriting in the issue of securities.

2.4 Discuss the factors to be considered by a company when deciding on its capital structure and dividend policy.

2.4.1 Describe the effect that the capital structure used by a company will have on the market valuation of the company.

2.4.2 Describe the effect of taxation on the capital structure used by a company.

2.4.3 Discuss the principal factors that a company should consider in setting dividend policy.

2.4.4 Discuss alternative ways of distributing profits, such as buybacks.

2.4.5 Discuss the effect that the dividend policy will have on the market valuation of a company.

2.5 Discuss how companies grow and the different ways of company restructuring.

2.5.1 Describe why businesses want to grow larger, how companies achieve internal growth and explain the relationship between growth and profitability.

2.5.2 Describe the constraints on a firm's growth.

CB1

    2.6   Outline the motives for mergers and acquisitions.

         2.6.1   Describe the characteristics of a merger.

         2.6.2   Discuss methods of evaluating a target company.

         2.6.3   Discuss the steps that a buyer will usually take in a leveraged buyout.

3   Evaluating projects (20%)

    3.1   Discuss how a company's cost of capital interacts with the nature of the investment projects it undertakes.

         3.1.1   Define what is meant by a company's cost of capital.

         3.1.2   Describe how to calculate a company's weighted average cost of capital.

         3.1.3   Discuss the principal methods that may be used to determine the viability of a capital project.

         3.1.4   Carry out cash flow projections and techniques to estimate cashflows.

         3.1.5   Describe methods commonly used to evaluate risky investments including simulation and certainty equivalents.

         3.1.6   Discuss the issues in establishing the required rate of return for a capital project.

         3.1.7   Discuss the factors underlying the choice of discount rate within project assessment, including:

- the assumptions and limitations in the use of the weighted average cost of capital.
- the allowance for leverage.
- the allowance for risk.

         3.1.8   Discuss the methods that may be used for identifying the risks that may be present for different types of project.

         3.1.9   Discuss suitable techniques for ascertaining the probability of occurrence of different risks over varying timescales and the financial impact of occurrence.

         3.1.10   Discuss suitable techniques for ascertaining the distribution of the possible financial outcomes of a capital project.

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4　Constructing and interpreting company accounts (40%)

4.1　Describe the basic construction of accounts of different types and the role and principal features of the accounts of a company.

4.1.1　Explain why companies are required to produce annual reports and accounts.

4.1.2　Explain the value of financial reporting on environmental, social and economic sustainability.

4.1.3　Describe alternatives to traditional financial reporting.

4.1.4　Explain the fundamental accounting concepts which should be adopted in the drawing up of company accounts.

4.1.5　Explain the purpose of a:

- statement of financial position.
- statement of comprehensive income.
- cash flow statement.
- and of the notes to the accounts.

4.1.6　Construct simple statements of financial position and statements of profit or loss.

4.1.7　Explain cash flow statements.

4.1.8　Describe the structure and content of insurance company accounts.

4.1.9　Explain what is meant by the terms subsidiary company and associated company.

4.1.10　Explain the purpose of consolidated accounts.

4.1.11　Explain how goodwill might arise on the consolidation of group accounts.

4.1.12　Explain how depreciation is treated in company accounts.

4.1.13　Explain the function of the following accounts – share capital, other reserves and retained earnings.

4.2　Assess the accounts of a company or a group of companies, including the limitations of such assessment.

4.2.1　Calculate and explain priority percentages and gearing.

4.2.2　Calculate and explain interest cover and asset cover for loan capital.

CB1

4.2.3   Describe the possible effects of interest rate movements on a highly geared company.

4.2.4   Calculate and explain price earnings ratio, dividend yield, dividend cover and EBITDA.

4.2.5   Explain net earnings per share.

4.2.6   Calculate and explain accounting ratios which indicate:

- profitability.
- liquidity.
- efficiency.

4.2.7   Discuss the shortcomings of historical cost accounting.

4.2.8   Discuss the limitations in the interpretation of company accounts.

4.2.9   Discuss the ways that reported figures can be manipulated to create a false impression of a company's financial position.

5   Constructing management information and evaluating working capital (10%)

5.1   Determine the working capital position of a company.

5.1.1   Analyse accounts receivables, accounts payables and inventory ratios

5.1.2   Evaluate policies for working capital management, including its individual elements.

5.1.3   Discuss methods for financing working capital.

5.1.4   Analyse the short term cash position of a company.

5.1.5   Discuss measures to manage the short term cash position of a company.

5.1.6   Discuss dividend sustainability.

5.2   Describe the function of forecasts and budgets as sources of management information.

5.2.1   Explain the purpose of forecasts and budgets.

5.2.2   Prepare basic examples of forecasts and budgets.

Assessment

Three hour assessment using objective test questions and "free form" short answer questions.

END

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CB2 – Business Economics

Aim

The aim of the Business Economics subject is to introduce students to the core economic principles and how these can be used in a business environment to help decision making and behaviour.

It provides the fundamental concepts of microeconomics that explain how economic agents make decisions and how these decisions interact.

It explores the principles underlying macroeconomics that explain how the economic system works, where it fails and how decisions taken by economic agents affect the economic system.

Competences

On successful completion of this subject, a student will be able to:

1   show a systematic knowledge and critical awareness of economic theory in the areas of syllabus covered by the subject.

2   apply a range of techniques to solve problems in the areas of syllabus covered by the subject.

3   appreciate recent developments and methodologies in economics.

4   understand the relevance of economic theory to the business environment and the links between economic theory and its application in business.

5   apply basic microeconomic and macroeconomic theory to business problems.

Links to other subjects

CB1 – Business Finance
CB3 – Business Management
CM2 – Actuarial Mathematics 2
CP1 – Actuarial Practice
SP5 – Investment and Finance Principles

Other Specialist Principles subjects and all the Specialist Advanced subjects require the use of economic judgement.

CB2

Syllabus topics

1   Economic models and recent historical applications (10%)

2   Microeconomics (45%)

- behaviour of consumers
- behaviour of firms
- behaviour of markets

3   Macroeconomics (45%)

- relationships between governments, markets and firms
- government policies
- international trade

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the CB2 subject, the approximate split of assessment across these three skill types is 40% Knowledge, 45% Application and 15% Higher Order Skills.

Detailed syllabus objectives

1   Economic models and recent historical applications (10%)

1.1   Discuss the relevance of economics to the world of business.

1.1.1   Describe what is meant by opportunity cost and scarcity and their relevance to economic choice.

1.1.2   Discuss the core economic concepts involved in choices made by businesses relevant to selection of outputs, inputs, technology, location and competition.

1.1.3   Contrast microeconomics and macroeconomics.

1.2   Assess the main strands of economic thinking.

- Classical
- Marxian socialism
- neo-classical, Keynesian, neo-Keynesian and post-Keynesian
- Monetarist
- Austrian

1.3   Analyse the recent macroeconomic history.

1.3.1   Describe the progress of the world economy since the Great Depression.

- a history of banking crises and irrational behaviour
- consequences of banking crises

1.3.2   Discuss the banking crisis of 2008, the Great Recession and recovery.

1.3.3   Describe the effectiveness of the monetary policy in the 2008 financial crisis and the governments' actions to combat recession.

1.3.4   Discuss the aftershocks in Europe following the 2008 financial crisis.

1.3.5   Assess the stimulus-austerity debate and regulatory action after the 2008 crisis.

2   Microeconomics – the behaviour of consumers, firms and markets (45%)

2.1   Discuss the workings of competitive markets.

2.1.1   Discuss how the markets operate.

- Explain the role of the price mechanism in a free market.
- Discuss the behaviour of firms and consumers in such markets.

CB2

2.1.2   Describe the factors which influence the market demand and supply.

2.1.3   Describe and discuss how market equilibrium quantity and price are achieved.

2.1.4   Discuss how markets react to changes in demand and supply.

2.1.5   Define and calculate price and income elasticities of demand and price elasticity of supply.

- Calculate elasticities of demand using both original and average quantities.

2.1.6   Discuss the factors that affect elasticity.

2.1.7   Explain the effect of elasticity on the workings of markets in the short and long run.

2.1.8   Discuss how firms deal with risk and uncertainty about future market movements.

2.1.9   Describe price expectations and speculation and how price bubbles develop.

2.2   Discuss consumer demand and behaviour.

2.2.1   Describe the concept of utility and representation of consumer preferences as indifference curves.

2.2.2   Discuss rational choice and how optimal consumption choice is determined by using indifference curves and budget lines.

2.2.3   Discuss the concepts of rational choice, perfect information and irrational behaviour in behavioural economics.

2.3   Discuss the importance of advertising for a firm.

2.3.1   Explain the effects of advertising on sales and demand.

2.4   Discuss the production function, costs of production, revenue and profit in order to understand a firm's price and output decisions.

2.4.1   Explain how the production function reflects the relationship between inputs and outputs in the short and long run.

2.4.2   Define average and marginal physical product.

2.4.3   Describe the meaning and measurement of costs and explain how these vary with output in the short and long run.

2.4.4   Define total, average and marginal costs.

2.4.5   Describe what is meant by "economies of scale" and explain the reasons for such economies and how a business can achieve efficiency in selecting the level of its inputs.

2.4.6   Describe revenue and profit and explain how both are influenced by market conditions.

2.4.7   Define and calculate average and marginal revenue.

2.4.8   Describe how profit is measured and explain how the firm arrives at its profit maximising output.

2.4.9   Explain what is meant by the "shut-down" point in the short and long run.

2.5   Discuss profit maximisation under perfect competition and monopoly.

2.5.1   Explain what determines the market power of a firm.

2.5.2   Describe the main features of a market characterised by perfect competition.

2.5.3   Explain how output and price are determined in such markets in the short and long run.

2.5.4   Describe how monopolies emerge, how a monopolist selects its profit maximising price and output and how much profit a monopolist makes.

2.5.5   Describe the barriers to entry in an industry and a contestable market and explain how these affect a monopolist's profit.

2.6   Discuss profit maximisation under imperfect competition.

2.6.1   Describe the behaviour of firms under monopolistic competition and explain why in this type of market only normal profits are made in the long run.

2.6.2   Describe the main features of an oligopoly and explain how firms behave in an oligopoly.

2.6.3   Discuss what determines competition and collusion of firms in an oligopoly and how the strategic decisions of such firms can be explained by game theory.

2.6.4   Discuss if firms in an oligopoly act in consumers' interest.

2.7   Assess various pricing strategies that firms can adopt.

CB2

    2.7.1   Describe how prices are determined in practice and factors that affect the ability of a firm to determine its prices.

    2.7.2   Describe average cost pricing and price discrimination.

    2.7.3   Discuss pricing strategy for multiple products and explain how pricing varies with the stage in the life of a product.

3   Macroeconomics – relationships between governments, markets and firms, government policies and international trade (45%)

3.1   Discuss the reasons for government intervention in the market.

    3.1.1   Explain and discuss the extent to which businesses meet the interests of consumers and society in general.

    3.1.2   Explain in what sense perfect markets are "socially efficient" and why most markets fail to achieve social efficiency.

    3.1.3   Explain why externalities can lead to inefficient markets.

    3.1.4   Describe the ways in which governments intervene in markets in order to influence business behaviour and explain the drawbacks of such intervention.

    3.1.5   Explain and discuss whether taxation or regulation could be more useful in correcting markets' shortcomings.

3.2   Discuss the relationship between the government and the individual firm.

    3.2.1   Describe the main targets of "competition policy" and explain the extent to which it is effective.

    3.2.2   Explain why a free market fails to achieve the optimal amount of research and development.

    3.2.3   Describe the various forms of intervention that the government can undertake in order to encourage technological advance and innovation.

3.3   Discuss globalisation and multinational business.

    3.3.1   Describe what is meant by globalisation and its impact on business.

    3.3.2   Explain what is driving the process of globalisation and whether the world benefits from globalisation of business.

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3.4   Discuss the importance of international trade.

    3.4.1   Describe the growth of international trade and its benefits to countries and firms.

    3.4.2   Explain the advantages of specialisation.

    3.4.3   Discuss the arguments for trade restriction and protection of domestic industries.

    3.4.4   Explain the role of the World Trade Organisation (WTO) in international trade.

3.5   Discuss the macroeconomic environment of the business.

    3.5.1   Describe the main macroeconomic variables that governments seek to control.

    3.5.2   Explain what determines the level of economic activity and hence the overall business climate.

    3.5.3   Describe the effect on business output if a stimulus is given to the economy.

    3.5.4   Contrast actual and potential growth.

    3.5.5   Describe the factors that determine economic growth and explain the reasons for differences in different nations' growth rates.

    3.5.6   Discuss the relationship between economic growth and environmental sustainability.

    3.5.7   Describe why economies experience periods of boom followed by periods of recession and explain factors which influence the length and magnitude of the phases of a business cycle.

    3.5.8   Describe the causes and costs of unemployment and how unemployment relates to the level of business activity.

    3.5.9   Discuss the determination of the price level in the economy by the interaction between aggregate supply and aggregate demand in a simple AS-AD model.

    3.5.10   Describe the causes and costs of inflation and how inflation relates to the level of business activity.

    3.5.11   Explain what is meant by GDP and describe how it is measured.

CB2

        3.5.12   Discuss the representation of the economy as a simple model of the circular flow of income.

3.6   Discuss what is meant by the balance of payments and how exchange rates are determined.

        3.6.1   Describe what is meant by "the balance of payments" and how trade and financial movements affect it.

        3.6.2   Explain how exchange rates are determined and how changes in exchange rates affect business.

        3.6.3   Explain the relationship between the balance of payments and the exchange rates.

        3.6.4   Discuss the advantages and disadvantages of fixed and floating exchange rates.

        3.6.5   Explain how governments and/or central banks seek to influence the exchange rates.

        3.6.6   Describe the implications of such actions for other macroeconomic policies and for business.

        3.6.7   Describe the purpose and examine the effectiveness of monetary union and single currencies, with reference to the European Economic and Monetary Union, the Exchange Rate Mechanism and the creation of a single currency.

3.7   Discuss the role of money and interest rates in the economy.

        3.7.1   Describe the function of money.

        3.7.2   Describe what determines the amount of money in the economy, what causes it to grow and what is the role of banks in this process.

        3.7.3   Discuss the concept of the money multiplier in the real world.

        3.7.4   Describe how interest rates are determined.

        3.7.5   Explain the relationship between money and interest rates.

        3.7.6   Explain why central banks play a crucial role in the functioning of economies.

        3.7.7   Describe how a change in the money supply and/or interest rates affects the level of business activity.

3.8   Discuss the role, structure and stability of the financial system.

    3.8.1   Describe the different financial systems.

    3.8.2   Evaluate how effectively different financial systems operate, with reference to the UK and China.

    3.8.3   Describe the role of the financial markets and how financial markets help to achieve a nation's objectives.

    3.8.4   Describe the different participants in the financial markets.

    3.8.5   Discuss the development of financial systems and the factors affecting the stability of financial systems.

3.9   Discuss what determines the level of business activity and how it affects unemployment and inflation.

    3.9.1   Discuss how the equilibrium level of income is determined within a simple aggregate demand-expenditure model.

    3.9.2   Describe the concept of the multiplier and calculate its value.

    3.9.3   Describe the effect of a rise in money supply on output and prices.

    3.9.4   Describe the relationship between unemployment and inflation and whether the relationship is stable.

    3.9.5   Discuss how business and consumer expectations affect the relationship between unemployment and inflation and explain how such expectations are formed.

    3.9.6   Describe how a policy of targeting inflation affects the relationship between unemployment and inflation.

    3.9.7   Describe what determines the course of a business cycle and its turning points.

    3.9.8   Discuss whether the business cycle is caused by changes in aggregate demand, or changes in aggregate supply (or both).

3.10   Assess how macroeconomic policies impact on businesses.

    3.10.1   Describe the types of macroeconomic policy that are likely to impact on business and explain the way in which this impact takes effect.

    3.10.2   Describe the impact of fiscal policy on the economy and business, and factors that determine its effectiveness in smoothing out economic fluctuations.

3.10.3 Describe the fiscal rules adopted by the government and discuss if following these rules is a good idea.

3.10.4 Explain how monetary policy works in the UK and the Eurozone and describe the roles of the Bank of England and the European Central Bank.

3.10.5 Explain how targeting inflation influences interest rates and hence the economic activity.

3.10.6 Discuss the merits of following a simple inflation target as a rule for determining interest rates, and suggest an alternative rule.

3.11 Assess how supply side policies impact on businesses.

3.11.1 Describe the effect of supply side policies on business and the economy.

3.11.2 Describe the types of supply side policies that can be pursued and discuss their effectiveness.

3.11.3 Explain the impact on business of a policy of tax cuts.

3.11.4 Describe the major types of policy open to governments to encourage increased competition.

Assessment

Three hour assessment using objective test questions and "free form" short answer questions.

END

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CB3 – Business Management

Aim

To provide students with an understanding of the wider business context in which Actuaries will work, integrating where appropriate the analysis of case studies to enhance the learning. The competencies gained should enable students to apply tools and techniques to assist strategic thinking and prepare for a role in wider management.

Competences

On successful completion of this subject, a student will be able to:

1   analyse the key drivers of external and internal business environments.
2   apply the strategic tools and frameworks needed to assess the competitiveness of a business.
3   develop a coherent business strategy.
4   define a business's culture.
5   explain how a business's culture will impact on the implementation of a chosen strategy.
6   understand the role of values and behaviours in the long term success of a business.
7   understand how to manage change within an organisation.
8   understand the importance of leadership in an organisation.
9   understand the nature and dynamics of working in teams.

Links to other subjects

The syllabuses for CB1, CB2 and CB3 were developed jointly with the aim of providing students with a coherent foundation in the key business topics of business accounting, finance, business economics and business management in order to develop an understanding of the business context beyond the work of the Actuary.

Syllabus topics

1   The external business environment (20%)
2   The internal business environment: organisational behaviour (20%)
3   Strategic management (30%)
4   Managing Change (10%)
5   Leadership (10%)
6   Working in Teams (10%)

CB3

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions, and making recommendations).

In the CB3 subject, the approximate split of assessment across the three skill types is 20% Knowledge, 65% Application and 15% Higher Order skills.

Detailed syllabus objectives

1 The external business environment

1.1 Describe the nature of competitive environments.

1.2 Describe different types of competitive environment.

1.3 Determine the impact and influence of the external environment on an organisation and its strategy.

1.4 Explain the key drivers of external demands for corporate social responsibility and the way in which organisations can respond.

1.5 Outline the meaning and nature of organisational development.

1.6 Define the nature, types and main features of organisational culture.

1.7 Outline influences on the development and importance of organisational culture.

2 Organisational behaviour: the internal business environment (impacting on business strategy, organisational change and how organisations are best led)

2.1 Explain the nature and main features of organisational behaviour in the context in which different businesses operate.

2.2 Describe the changing nature of work and work organisation.

2.3 Compare the main features of different approaches to organisation and management.

2.4 Outline the importance of management as an integrating activity.

2.5 Assess the impact of globalisation, the international context and cultural influences.

2.6 Explain the impact and influence of the internal environment on the implementation of an organisation's strategy.

3 Strategic management (to ensure sustainable business growth)

3.1 Describe concepts in strategic management.

3.2 Explain the nature of, and functions served by, corporate strategy.

3.3 Compare and contrast relationships between different levels of strategy in organisations.

3.4 Explain the importance of organisational goals, objectives and policy.

CB3

3.5 Explain the main features of the management of opportunities and risks.

3.6 Outline the importance of strategy and structure for the effective management of organisations.

3.7 Compare and contrast strategic analysis tools (audit and analysis of resources for use in strategic decision making).

3.8 Describe an organisation's value chain (value chain analysis).

3.9 Evaluate the impact and influence of the internal and external environment on an organisation and its strategy (PESTELE analysis; SWOT analysis; stakeholder mapping; quantitative and qualitative tools of competitor analysis; sources, quality and availability of data for environmental analysis; Porter's Five forces model; Porter's Diamond).

3.10 Explain the use of scorecards (balanced and strategic) in the strategic management of a company.

3.11 Recommend changes to the product portfolio to support the organisation's strategic goals (management of the product portfolio).

4 Managing change (to ensure change is aligned with the organisation's strategy, values and operational plans)

4.1 Explain the nature of organisational change and the reasons for resistance to change (external and internal change triggers).

4.2 Describe the management of change and the human and social factors of change.

4.3 Compare and contrast tools and methods for successfully implementing a change programme.

4.4 Describe the risks associated with managing change.

5 Leadership (to ensure that management get the best out of their people resource to achieve organisational goals)

5.1 Explain the importance of leadership in work organisations.

5.2 Contrast the main approaches to leadership, different styles and forms of leadership.

5.3 Describe the importance of values and behaviours in the context of leadership.

5.4 Explain the exercise of leadership power and influence.

5.5 Describe the variables which determine effective leadership.

6 Working in teams (to ensure strategic and operational goals are achieved efficiently and effectively)

6.1 Explain interactions among members of a group a membership of successful teams.

6.2 Describe the main types of member team roles.

6.3 Understand the professional and personal qualities.

6.4 Describe the nature and value of group dynamics.

6.5 Describe the tools and techniques of project management.

6.6 Identify the nature and causes of conflict.

6.7 Outline alternative approaches to the management of conflict.

6.8 Explain the importance of building effective teams and skills.

Assessment

The learning objectives of CB3 will be assessed by means of a three hour written examination, comprising 50% of objective test questions and 50% using three scenario based questions.

END

CP1 – Actuarial Practice

Aim

The aim of the Actuarial Practice subject is to use the technical and business skill learnt in the Actuarial Statistics, Actuarial Mathematics and Business subjects combining them with new material on how the skills are applied to solve real world problems.

The course provides the essential knowledge of risk management techniques and processes required by all actuaries and is an essential introduction to Enterprise Risk Management, subject SP9 and the Chartered Enterprise Risk Actuary qualification.

The course also underpins all the other SP and SA subjects, covering essential background material that is common to a number of specialisms.

Competencies

On successful completion of this subject, a student will be able to:

1   understand strategic concepts in the management of financial institutions and products.

2   understand the risks faced both by individuals and groups who might effect financial products and also by the providers of such products.

3   explain the principles and techniques used to manage these risks.

4   understand the key techniques used by the providers of financial products to ensure that promised liabilities can be met.

5   apply this knowledge, together with the skills learned from other subjects, to analyse the issues and formulate, justify and present plausible solutions to business problems.

Links to other subjects

The Actuarial Statistics, Actuarial Mathematics and Business subjects provide principles and tools that are built upon in Actuarial Practice.

The SP and SA subjects use the concepts developed in this subject to solve more complex problems, to produce coherent advice and to make recommendations in specific practice areas.

CP1

Syllabus topics

(Note: In this syllabus the phrase "financial products" is used to encompass all types of financial product, scheme, contracts or other arrangements.)

1 Actuarial advice (2.5%)
2 Meeting the needs of stakeholders (2.5%)
3 The actuarial control cycle (2.5%)
4 Risk Governance (5%)
5 Risk identification and classification (5%)
6 Risk measurement and monitoring (5%)
7 Responses to risk (7.5%)
8 Capital management and monitoring (5%)
9 The general business environment (20%)
10 Specifying the problem (5%)
11 Producing the solution (30%)
12 Living with the solution (7.5%)
13 Monitoring (2.5%)
14 Principal terms (0%)

The weightings above are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also correspond with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.
- the need to provide thorough foundation understanding on which to build the other objectives.
- the extent of prior knowledge which is expected.the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the CP1 subject, the approximate split of assessment across these three skill types is 20% Knowledge, 50% Application and 30% Higher Order Skills.

Detailed syllabus objectives

1 Actuarial advice (2.5%)

1.1 Identify the clients that actuaries advise in both the public and private sectors and the stakeholders affected by that advice.

1.2 Describe how stakeholders other than the client might be affected by any actuarial advice given.

1.3 Describe the functions of the clients that actuaries advise and the types of advice that actuaries might give to their clients.

1.4 Explain why and how certain factual information about the client should be sought in order to be able to give advice.

1.5 Explain why subjective attitudes of clients and other stakeholders – especially towards risk – are relevant to giving advice.

1.6 Distinguish between the responsibility for giving advice and the responsibility for taking decisions.

1.7 Discuss the professional and technical standards that might apply to actuarial advice.

2 Meeting the needs of stakeholders (2.5%)

2.1 Describe the main providers of benefits on contingent events.

2.2 Describe the main types of social security benefits and financial products and explain how they can provide benefits on contingent events which meet the needs of clients and stakeholders.

2.3 Explain the main principles of insurance and pensions that impact on these benefits and products.

2.4 Describe the ways of analysing the needs of clients and stakeholders to determine the appropriate benefits on contingent events to be provided by financial products.

3 The Actuarial Control Cycle (2.5%)

3.1 Describe the Actuarial Control Cycle and explain the purpose of each of its components.

3.2 Demonstrate how the Actuarial Control Cycle can be applied in a variety of practical commercial situations, including its use as a Risk Management Control Cycle.

CP1

4 Risk Governance (5%)

4.1 Describe the risk management process for a business that can aid in the design of financial products to provide benefits on contingent events.

4.2 Discuss the differences between risk and uncertainty and between systematic and diversifiable risk.

4.3 Describe how enterprise risk management can add value to the management of a business.

4.4 Discuss the roles and responsibilities of various stakeholders in the management of risk.

4.5 Discuss risk appetite and the attainment of risk efficiency.

5 Risk identification and classification (5%)

5.1 Describe the techniques that can be used to identify the risks associated with financial products or with the providers of benefits on contingent events.

5.2 Discuss how the risks of a project are taken into account in project management.

5.3 Describe the risks and uncertainties affecting:

- the level and incidence of benefits payable on contingent events.
- the overall security of benefits payable on contingent events.

5.4 Describe how risk classification can aid in the design of financial products that provide benefits on contingent events.

5.5 Show an awareness and understanding of the risk categories that apply to businesses in general, and particularly financial services businesses.

6 Risk measurement and monitoring (5%)

6.1 Describe the various methods used to quantify risk.

6.2 Discuss the uses of scenario analysis, stress testing and stochastic modelling in the evaluation of risk.

6.3 Describe different methods of risk aggregation and explain their relative advantages and disadvantages.

6.4 Explain the importance of risk reporting to managers and other stakeholders.

6.5 Discuss the methods of measuring and reporting risk that can be used by the main providers of benefits on contingent events.

7   Responses to risk (7.5%)

7.1   Describe attitudes to and methods of risk acceptance, rejection, transfer and management for stakeholders.

7.2   Discuss the portfolio approach to the overall management of risk, including the use of diversification and avoidance of risk concentrations.

7.3   Distinguish between the risks taken as an opportunity for profit and the risks to be mitigated.

7.4   Describe the principle of pooling risks.

7.5   Describe the methods of transferring risks.

7.6   Discuss the issues surrounding the management of risk.

7.7   Analyze the risk management aspects of a particular business issue and recommend an appropriate risk management strategy.

7.8   Describe the tools that can be used to aid the management and control of risk.

7.9   Describe how risks with low likelihood but high impact might be managed.

8   Capital management and monitoring (5%)

8.1   Discuss the interrelationship between risk and capital management.

8.2   Explain the implication of risk for capital requirement, including economic and regulatory capital requirements.

8.3   Describe how the main providers of benefits on contingent events can meet, manage and match their capital requirements.

8.4   Discuss the implications of the regulatory environment in which the business is written for provisioning and capital requirements.

8.5   Discuss risk-based capital and compare with other measures of capital needs.

8.6   Discuss the merits of looking at an economic balance sheet in order to determine the risk based capital requirements of a provider of benefits on contingent events.

8.7   Discuss the use of internal models for assessment of economic and regulatory capital requirements.

CP1

9 The general business environment (20%)

9.1 Regulatory environment

9.1.1 Describe the principles and aims of prudential and market conduct regulatory regimes.

9.1.2 Discuss the role that major financial institutions can play in supporting the regulatory and business environment.

9.1.3 Explain the concept of information asymmetry.

9.1.4 Explain how certain features of financial contracts might be identified as unfair.

9.1.5 Discuss the implications of a requirement to treat the customer fairly.

9.2 External environment

9.2.1 Describe the implications for the main providers of benefits on contingent events of:

- legislation – regulations.
- State benefits.
- tax.
- accounting standards.
- capital adequacy and solvency.
- corporate governance.
- risk management requirements.
- competitive advantage.
- commercial requirements.
- changing cultural and social trends.
- climate change.
- demographic changes.
- environmental issues.
- lifestyle considerations.
- international practice.
- technological changes.

9.3 Investment environment

9.3.1 Discuss the cashflows of simple financial arrangements and the need to invest appropriately to provide for financial benefits on contingent events.

9.3.2 Demonstrate a knowledge and understanding of the characteristics of the principal investment assets and of the markets in such assets.

9.3.3 Describe how the risk profile of the principal investment assets affects the market in such assets.

9.3.4   Explain the principal economic influences on investment markets.

9.3.5   Describe other factors affecting supply and demand in investment markets.

10   Specifying the problem (5%)

10.1   Contract design

10.1.1   Discuss the factors to be considered in determining a suitable design for financial products that will provide benefits on contingent events in relation to:

- the characteristics of the parties involved.
- the risk appetite or risk aversion of the parties involved.
- the regulatory environment.
- the market for the product.
- competitive pressures.
- the level and form of benefits to be provided.
- any options or guarantees that may be included.
- the benefits payable on discontinuance or transfer of rights.
- the method of financing the benefits to be provided.
- the choice of assets when benefits are funded.
- administrative issues.
- the charges that will be levied.
- the capital requirements.

10.2   Data

10.2.1   Explain the ethical and regulatory issues involved in working with personal data and extremely large data sets.

10.2.2   Explain the main issues to be addressed by a data governance policy and its importance for an organization.

10.2.3   Explain the risks associated with use of data (including algorithmic decision making).

10.2.4   Discuss the data requirements for determining values for assets, future benefits and future funding requirements.

10.2.5   Describe the checks that can and should be made on data.

10.2.6   Describe the circumstances under which the ideal data required might not be available and discuss ways in which this problem may be overcome.

10.2.7   Describe how to determine the appropriate grouping of data to achieve the optimal level of homogeneity.

CP1

11   Producing the solution (30%)

11.1   Modelling

11.1.1   Describe the approaches available to produce the solution to an actuarial or financial problem.

11.1.2   Describe the use of actuarial models to produce solutions in terms of:

- the objectives of the model.
- the operational issues that should be considered in designing and running models.
- the use of models for:
- pricing or setting future financing strategies.
- risk management: assessing the capital requirements and the return on capital or the funding levels required.
- assessing the provisions needed for existing commitments to provide benefits on contingent events.
- pricing and valuing options and guarantees.
- how sensitivity analysis of the results of the models can be used to help decision making.

11.2   Assumption setting

11.2.1   Describe the principles behind the determination of assumptions as input to a model relevant to producing a specific solution having regard to:

- the types of information that may be available to help in determining the assumptions to be used; and
- the extent to which each type of information may be useful, and the other considerations that may be taken into account, in deciding the assumptions.
- the level of prudence in the assumptions required to meet the objectives of the client.

11.3   Mortality and morbidity

11.3.1   Describe the principal forms of heterogeneity within a population, the ways in which selection can occur, and how the use of risk classification can address the consequences of selection.

11.3.2   Explain why it is necessary to have different mortality tables for different classes of lives. State the principal factors which contribute to the variation in mortality and morbidity by region and according to the social and economic environment, specifically:

- occupation.
- nutrition.
- housing.
- climate/geography.

- education.
- genetics.

11.3.3 Explain how various types of selection (e.g. temporary initial selection, class selection) can be expected to occur among individuals or groups effecting financial products.

11.3.4 Explain the concept of mortality convergence.

11.3.5 Describe how decrements can have a selective effect on the remaining business.

11.4 Expenses

11.4.1 Describe the types of expenses that the providers of benefits on contingent events must meet.

11.4.2 Describe how expenses might be allocated when pricing financial products.

11.5 Developing the cost and the price

11.5.1 Discuss how to determine the cost of providing benefits on contingent events.

11.5.2 Discuss the factors to take into account when determining the appropriate level and incidence of contributions to provide benefits on contingent events.

11.5.3 Discuss the factors to take into account when determining the price or the contributions to charge for benefits on contingent events.

11.5.4 Discuss the influence of provisioning, or regulatory capital requirements on pricing or setting financing strategies.

11.6 Investment management

11.6.1 Discuss the principles and objectives of investment management and analyse the investment needs of an investor, taking into account liabilities, liquidity requirements and the risk appetite of the investor.

11.6.2 Discuss the different methods for the valuation of individual investments and demonstrate an understanding of their appropriateness in different situations.

11.6.3 Discuss the theoretical relationships between the total returns and the components of total returns, on equities, bonds and cash, and price and earnings inflation.

CP1

11.6.4   Discuss the different methods for the valuation of portfolios of investments and demonstrate an understanding of their appropriateness in different situations.

11.6.5   Discuss methods of quantifying the risk of investing in different classes and sub-classes of investment.

11.7   Provisioning

11.7.1   Discuss the different reasons for the valuation of the benefits from financial products and the impact on the choice of methodology and assumptions.

11.7.2   Discuss how to determine values for provisions in terms of:

- the need for placing values on provisions and the extent to which values should reflect risk management strategy.
- the principles of "fair valuation" of assets and liabilities and other "market consistent" methods of valuing the liabilities.
- the reasons why the assumptions used may differ in different circumstances.
- the reasons why the assumptions and methods used to place a value on guarantees and options may differ from those used for calculating the accounting provisions needed.
- how sensitivity analysis can be used to check the appropriateness of the values.
- and be able to perform calculations to demonstrate an understanding of the valuation methods.

11.7.3   Describe different methods of allowing for risk in cash-flows.

11.7.4   Discuss different methods of allowing for uncertainty in present values of liabilities.

11.7.5   Discuss the purpose of and uses for equalisation reserves.

11.7.6   Describe the influence of comparisons with market values.

11.8   Relationship between assets and liabilities

11.8.1   Describe the principles of investment and the asset/liability matching requirements of the main providers of benefits on contingent events.

11.8.2   Show how actuarial techniques such as asset/liability modelling may be used to develop an appropriate investment strategy.

11.8.3   Describe the use of a risk budget for controlling risks in a portfolio.

11.8.4   Describe the techniques used to construct and monitor a specific asset portfolio.

11.8.5 Discuss the need to monitor investment performance and to review investment strategy.

12 Living with the solution (7.5%)

12.1 Maintaining profitability

12.1.1 Describe how the main providers of benefits on contingent events can control and manage the cost of:

- payments arising on contingent events.
- expenses associated with the payment of benefits on contingent events.

12.1.2 Discuss how regulatory capital requirements impact on a provider's profitability.

12.1.3 Describe the tools available for capital management.

12.2 Determining the actual results

12.2.1 Describe how a provider can analyse actual performance against expected performance.

12.2.2 Describe how a provider can analyse performance of an investment portfolio against a benckmark.

12.2.3 Discuss the possible sources of surplus/profit and the levers that can control the amount of surplus/profit.

12.2.4 Describe why a provider will carry out an analysis of the changes in its surplus/profit.

12.2.5 Describe how any surplus/profit arising may be distributed.

12.2.6 Discuss the issues surrounding the amount of surplus/profit that may be distributed at any time and the rationale for retention of surplus/profit.

12.3 Reporting actual results

12.3.1 Describe the reports and systems which may be set up to control the progress of the financial condition of the main providers of benefits on contingent events.

12.3.2 Describe the reports and systems which may be set up to monitor and manage risk at the enterprise level.

12.3.3 Discuss the issues facing the main providers of benefits on contingent events relating to reporting of risk.

12.4 Insolvency and closure

12.4.1 Discuss the issues that need to be taken into account on the insolvency or closure of a provider of benefits on contingent events.

12.5 Options and guarantees

12.5.1 Discuss the issues surrounding the management of options and guarantees.

13 Monitoring (2.5%)

13.1 Describe how the actual experience can be monitored and assessed, in terms of:

- the reasons for monitoring experience.
- the data required.
- the process of analysis of the various factors affecting the experience.
- the use of the results to revise models and assumptions.

13.2 Describe how the results of the monitoring process in the Actuarial Control Cycle or the Risk Management Control Cycle are used to update the financial planning in a subsequent period.

14 Have an understanding of the principal terms used in financial services, investments, asset management and risk management (0%)

Assessment

The assessment will consist of two unseen written papers held in a invigilated environment Paper one will have 15 minutes planning time and three hours writing time. The questions will range from 5–12 marks and will broadly cover the assessment of knowledge and straightforward applications.

Paper two will have 45 minutes planning time and two and a half hours writing time. A series of questions on a single theme will be asked, which will test more difficult applications and higher order skills.

Each paper will be marked out of 100 and the scores for the two papers will be aggregated. There will be no requirement to pass or to reach a minimum standard either paper on a stand-alone basis.

In the examination questions may be set on any area of work in which actuaries participate, including wider fields such as banking, environmental issues, management of natural resources, and other topics. Questions will not require technical knowledge of the subject context beyond the material covered in this and the Actuarial Statistics, Actuarial Mathematics and Business subjects, but a general understanding of the business, commercial, social and natural environment will be assumed.

END

CP2 – Modelling Practice

Aim

The aim of the Modelling Practice subject is to ensure that the successful candidate can model data, document the work (including maintaining an audit trail for a fellow student and senior actuary), analyse the methods used and outputs generated and communicate to a senior actuary the approach, results and conclusions.

Competences

On the successful completion of this subject, the candidate will be able to:

1   prepare and summarise data, and undertake exploratory data analysis and visualisation.
2   construct an actuarial model to solve a realistic problem.
3   document the model by constructing an audit trail.
4   analyse the methods used and outputs generated.
5   communicate the results.

Links to other subjects

This subject builds upon concepts introduced in CM1 – Actuarial Mathematics 1 and CM2 – Actuarial Mathematics 2. It can also use material from CS1 – Actuarial Statistics 1 and CS2 – Actuarial Statistics 2.

This subject also uses the principles in CP1 – Actuarial Practice and some features of the communications development in CP3 – Communication Practices.

Syllabus topics

1   Preparation and exploratory analysis of data (10%) **(0%–15%)**
2   Development of a model with clear documentation (30%) **(25%–45%)**
3   Analysis of methods and model outputs (15%) **(10%–20%)**
4   Application and interpretation of results (20%) **(15%–25%)**
5   Communication of results and conclusions (25%) **(20%–35%)**

The mean weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions, and taking into account of how the subject is to be examined in future.

In addition to the mean weightings a range for the weightings has been provided to indicate how the typical weightings of main syllabus topics may vary in a given examination session. This reflects the variation resulting in the underlying models used and the questions asked in a given examination session.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions, and making recommendations).

In the CP2 subject, the approximate split of assessment across the three skill types is 20% Knowledge, 50% Application and 30% Higher Order skills.

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Detailed syllabus objectives

1 Preparation and analysis of data (10%)

1.1 Use appropriate tools for cleaning, restructuring and transforming data to make it suitable for analysis.

1.2 Summarise data using appropriate analysis, descriptive statistics and graphical representation .

1.3 Select and carry out appropriate statistical tests of reasonableness.

1.4 Make appropriate assumptions about the data provided.

1.5 Repair corrupt or missing data.

2 Development of a model with clear documentation (30%)

2.1 Plan and produce a spreadsheet model to solve a specified problem.

2.2 Document the results of the model including justification of key assumptions, detailing the methodology adopted, an appropriate level of reasonableness checks, sensitivities and limitations.

2.3 Produce and audit trail enabling detailed checking and high-level scrutiny of the model by a fellow student and a senior actuary.

3 Analysis of methods used and model outputs (15%)

3.1 Explain why sensitivity and stress testing of assumptions forms an important part of the modelling process.

3.2 Perform checks on the results of a model, including applying sensitivity and/or scenario tests.

3.3 Comment on the reasonableness of the results under different scenarios

4 Application and interpretation of results (20%)

4.1 Apply the results to the problem set, suggesting solutions.

4.2. Summarise the results using appropriate charts and tables.

4.3. Consider possible next steps.

CP2

5   Communication of results and conclusions (25%)

5.1   Explain the factors that must be considered when communicating the results following the application of a model.

5.2   Plan and draft a summary document to cover the data, approach, assumptions, results, conclusions and suggested next steps for presentation to a senior actuary.

5.3   Create appropriate data visualisations to communicate the key conclusions of an analysis.

Assessment

Two computer based modelling assignments.

END

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CP3 – Communications Practice
Syllabus

Module summary

This module introduces candidates to the skill of providing effective written communication of a technical nature to a non-technical audience. It builds on the idea that actuaries, while working in technical and specialist environments, will often have to provide written communications to non-specialists. These communications need to convey appropriate information, but without unnecessary complexity. The audiences for such communications could include:

- pension scheme trustees and insurance company non-executive directors.
- CEOs, CFOs and other senior managers.
- business managers across business functions such as customer services and marketing.
- insurance brokers and financial advisors.

Aims

- to identify appropriate forms of written communication
- to select appropriate language for a non-specialised audience
- to identify the key issues that need to be addressed and convey these in an effective way

Competences

On completion of the module, a successful candidate will be able to:

1   draft an appropriate piece of communication as directed, to a standard expected of a newly qualified actuary without the need for significant re-drafting.

2   use an effective structure.

3   identify and use appropriate language that the intended recipient(s) will understand easily.

4   provide adequate and appropriate explanation of technical concepts.

5   incorporate appropriate communications tools to help convey meaning (e.g. graphs, tables and charts).

6   reflect appropriately on their approach to a particular piece of communication.

CP3 Syllabus

Links to other subjects

The assessment will draw upon, although not exclusively, material from the core modules and will be set in an actuarial context. Individuals may wish to complete their core modules before sitting CP3, but they are not required to do so.

Syllabus topics

To ensure that the recipient receives an effective piece of written communication by:

- using an effective structure.
- adopting suitable language.
- including adequate explanations.
- incorporating appropriate communication tools effectively.
- justifying the approach used when communicating.

The balance and weighting given to these categories will depend on the nature of the scenario and the question asked.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the CP3 subject, the approximate split of assessment across these skill types is 85% Application and 15% Higher Order.

Details of the syllabus objectives are in Annex A.

Annex A: Detailed syllabus objectives

1 Identify relevant information and appropriate content

1.1 Identify key information that must be conveyed in order for a communication to meet the objectives. This may include:

- setting out any implications that may affect the intended recipients' decisions.

- disclosing the extent of any uncertainty involved, and any limitations in the information being communicated, if that uncertainty or those limitations may affect the intended recipients' decisions.

1.2 Assess what information is not necessary and might, if included, detract from communicating effectively.

1.3 Use numbers in a way that is appropriate for the intended recipient(s), given the objectives of the communication:

- Prepare numerical examples, where appropriate, by drawing on some or all of the available data, or, creating representative numeric examples (if suitable data is not provided).

- Prepare numerical information so that it is presented in an appropriate format (e.g. appropriate use of percentages, ratios, fractions) and level of detail (e.g. well-judged number of significant figures or decimal places).

1.4 Be able to justify the choice of information and content

2 Use an effective structure

2.1 Prepare an appropriate structure for a specific communication objective.

2.2 Be able to justify the choice of structure.

3 Adopt appropriate language

3.1 Assess what terminology will be easily understood by the intended recipient(s).

3.2 Explain or define necessary technical terms at an appropriate level of detail for the intended recipient(s).

3.3 Be able to justify the choice of language and terminology.

CP3 Syllabus

4 Include appropriate explanation

4.1 Set-out a draft communication for the intended recipient(s), including:

- sufficient explanatory steps.
- effective explanation.
- appropriate level of detail.
- technically correct information that is not misleading.

5 Incorporate effective communication tools

5.1 Set-out information using simple and effective communication tools:

- visual presentation of numerical information
- diagrams or pictures
- bullet points

5.2 Be able to justify the choice of communication tool(s) for presenting numerical information (e.g. data tables, bar charts, line charts, pie charts, scatter charts etc.).

END

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SP1 – Health and Care Principles

Aim

The aim of the Health and Care Principles subject is to instil in successful candidates the ability to apply, in simple situations, the main principles of actuarial planning and control that are relevant to the provision of health and care benefits.

Competences

On successful completion of this subject, a student will be able to:

1   understand the main principles and techniques of actuarial management and control that are relevant to health and care insurance.

2   apply these principles to simple situations within the context of health and care insurance.

3   analyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations relating to the management of health and care insurance business.

Links to other subjects

CS2 – Actuarial Statistics 2
CM1 – Actuarial Mathematics 1
CP1 – Actuarial Practice
SA1 – Health and Care Advanced

Syllabus topics

1   Health and Care products and general business environment (15%)
2   Product design and specific features (25%)
3   Risks and risk management (30%)
4   Models and valuation (15%)
5   Monitoring experience and setting assumptions (15%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

SP1

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order Skills.

Detailed syllabus objectives

0 Introduction

0.1 Define the principal terms used in health and care.

1 Health and Care products and general business environment (15%)

1.1 Describe the main types of Health and Care contact and their purpose for the customer products:

- critical illness insurance
- income protection insurance
- long term care insurance
- health cash plans
- major medical expenses
- private medical insurance
- group and individual covers

1.2 Understand the operating environments in which health and care insurance products and services are traded.

- distribution channels
- regulatory and taxation regimes
- professional guidance
- economic and political influences

1.3 Explain the role of the State in the provision of alternative or complementary health and care protection.

- objectives of State healthcare provision
- methods of State healthcare provision
- funding approaches

2 Product design and specific features (25%)

2.1 Demonstrate an understanding of health and care product design, including:

2.1.1 Describe the principles by which health and care insurance contracts are designed and the interest of the various stakeholders in the process.

2.1.2 Determine a suitable design for a product in a given situation.

2.1.3 Discuss the relative merits of different product designs.

SP1

3 Risks and risk management (30%)

3.1 Assess how the following can be a source of risk to a health and care insurance company:

- data
- claim rates
- claim amounts
- investment performance
- expenses and inflation
- persistency
- mix of new business
- volume of new business
- guarantees and options
- competition
- actions of management
- actions of distributors
- counterparties
- legal, regulatory and tax developments
- reputation
- internal audit failures/fraud
- physical risks
- aggregation and concentration of risk
- catastrophes
- non-disclosure and anti-selection

3.2 Demonstrate the application of reinsurance as a risk management technique.

    3.2.1 Describe the purposes of reinsurance.

    3.2.2 Describe the different types and structures of reinsurance.

    3.2.3 Discuss the factors that should be considered in determining the level of retention.

3.3 Demonstrate the application of underwriting as a risk management technique.

    3.3.1 Outline the purposes of underwriting.

    3.3.2 Describe the different approaches by which underwriting is applied.

    3.3.3 Discuss the factors that should be considered when determining the level of underwriting to use.

3.4 Propose further ways of managing the risks in 3.1, including:

- claims management.
- data checks.
- product design.

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- managing the distribution process and customer relationship.
- managing other counterparties.
- other internal processes.

3.5 Demonstrate the application of asset-liability matching as a risk management technique.

    3.5.1 State the principles of investment and how they apply to health and care insurance.

    3.5.2 Analyse health and care insurance liabilities into different types for asset-liability matching purposes.

    3.5.3 Propose an appropriate asset-liability matching strategy for different types of liability.

4 Models and valuation (15%)

4.1 Describe the main features of a health and care insurance model.

    4.1.1 Outline the objectives and basic features of a health insurance model.

    4.1.2 Compare the stochastic and deterministic approaches.
    4.1.3 Compare a formula and cash flow approach.

    4.1.4 Outline the basic features of multi-state models.

    4.1.5 Explain the use of sensitivity analysis.

4.2 Understand and apply the techniques used in pricing health and care insurance products in terms of:

- data availability.
- assumptions used.
- equation of value / formula approach.
- cashflow techniques.
- group risk assessments.
- options and guarantees.
- external influences.

4.3 Demonstrate the different uses of actuarial models for decision-making purposes in health and care insurance, including:

- pricing products.
- developing investment strategy.
- projecting solvency.
- calculating embedded value.

SP1

4.4 Discuss the determination of supervisory reserves and solvency capital requirements for health and care insurance company.

    4.4.1 Describe the purposes of reserves, solvency capital requirements and embedded values, and the methodologies by which they are calculated for a health and care insurer, including:

- role of statistical and individual case estimates.
- setting assumptions, including a comparison with those used in pricing.
- market consistent valuation.
- Value at Risk (VaR) capital assessment.

    4.4.2 Discuss the interplay between the strength of the supervisory reserves and the level of solvency capital required.

    4.4.3 Compare passive and active valuation approaches.

5 Monitoring experience and setting assumptions (15%)

5.1 Describe the principles of setting assumptions for health and care insurance business.

    5.1.1 Describe the principles of setting assumptions for pricing health and care insurance contracts.

    5.1.2 Describe the principles of setting assumptions for determining liabilities.

    5.1.3 Explain why the assumptions used for supervisory reserves may be different from those used in pricing.

    5.1.4 Outline the principles of setting assumptions for determining embedded value.

5.2 Demonstrate the relevance of experience monitoring to a health insurance company.

    5.2.1 Explain why it is important for a health insurance company to monitor its experience.

    5.2.2 Describe how the actual mortality, morbidity, claims amounts, persistency, expense, new business and investment experience of a health insurance company should be monitored, including the data required.

5.3 Demonstrate the relevance of analysis of surplus or profit.

    5.3.1 Give reasons for undertaking an analysis of surplus and an analysis of embedded value profit.

    5.3.2 Suggest ways in which the results of such analyses can be used.

6   Solving problems

6.1   Analyse hypothetical examples and scenarios in relation to the financial management of health and care insurance companies.

6.1.1   Propose solutions and actions that are appropriate to the given context, with justification where required.

6.1.2   Suggest possible reasons why certain actions have been chosen.

6.1.3   Assess the implications of actions within a given scenario.

6.1.4   Discuss the advantages and disadvantages of suggested actions, taking into account different perspectives.

Assessment

Three hour written examination.

END

SP2 – Life Insurance Principles

Aim

The aim of the Life Insurance Principles subject is to instil in successful candidates the main principles of actuarial planning and control, and mathematical and economic techniques, relevant to life insurance companies. The student should gain the ability to apply the knowledge and understanding, in simple situations, to the operation, on sound financial lines, of life insurance companies. The life insurance products covered by this subject exclude health and care insurance products covered by the Health and Care Principles subject.

Competences

On successful completion of this subject, a student will be able to:

1   understand the main principles and techniques of actuarial management and control that are relevant to life insurance.

2   apply these principles to simple situations within the context of life insurance.

3   analyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations relating to the management of life insurance business.

Links to other subjects

CM1 – Actuarial Mathematics 1
CP1 – Actuarial Practice
SA2 – Life Insurance Advanced

SP2

Syllabus topics

1   Life insurance products and general business environment (15%)
2   Product design and specific features (25%)
3   Risks and risk management (30%)
4   Models and valuation (15%)
5   Monitoring experience and setting assumptions (15%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order Skills.

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Detailed syllabus objectives

0 Introduction

0.1 Define the principal terms used in life insurance.

1 Life insurance products and general business environment (15%)

1.1 Describe the main types of life insurance products.

1.1.1 Describe the main types of life insurance products that provide benefits on death, survival to a specified point in time or continued survival.

1.1.2 Describe the following life insurance product bases:

- conventional without profits
- with profits
- unit-linked
- index-linked

1.1.3 Outline typical guarantees and options that may be offered on life insurance products.

1.2 Assess the main types of life insurance products in terms of:

- the needs of consumers and key risks for the insured.
- the purpose and key risks for the insurer.

1.3 Assess the effect of the general business environment on the management of life insurance business, in terms of:

- propensity of consumers to purchase products.
- local culture.
- methods of sale.
- remuneration of sales channels.
- types of expenses and commissions, including influence of inflation.
- economic environment.
- legal environment.
- regulatory environment.
- taxation regime.
- professional guidance.

2 Product design and specific features (25%)

2.1 Demonstrate an understanding of life insurance product design, including:

2.1.1 Describe the factors to consider in determining a suitable design, in terms of premiums, benefits and charges, for a life insurance product.

SP2

      2.1.2   Determine a suitable design for a product in a given situation.

      2.1.3   Discuss the relative merits of different product designs.

  2.2   Demonstrate an understanding of with profits business management.

      2.2.1   Describe methods of distributing profits to with profits policyholders.

      2.2.2   Explain the main uses of asset shares and how they may be built up using a recursive formula.

  2.3   Describe the principles of unit pricing for internal unit-linked funds.

  2.4   Determine discontinuance and alteration terms for without profits contracts.

      2.4.1   State the principles of setting discontinuance and alteration terms.

      2.4.2   Describe different methods of determination of discontinuance and alteration terms.

      2.4.3   Assess the extent to which these methods meet the principles in 2.4.1.

      2.4.4   Calculate surrender values and alteration terms for conventional without profits contracts using reserves or by equating policy values.

3   Risks and risk management (30%)

  3.1   Assess how the following can be a source of risk to a life insurance company:

- policy and other data
- mortality rates
- investment performance
- expenses, including the effect of inflation
- persistency
- mix of new business
- volume of new business
- guarantees and options
- competition
- actions of the board of directors
- actions of distributors
- failure of appropriate management systems and controls
- counterparties
- legal, regulatory and tax developments
- fraud
- aggregation and concentration of risk

  3.2   Demonstrate the application of reinsurance as a risk management technique.

      3.2.1   Describe the purposes of reinsurance.

3.2.2   Describe the different types and structures of reinsurance.

3.2.3   Discuss the factors that should be considered before taking out reinsurance.

3.3   Demonstrate the application of underwriting as a risk management technique.

3.3.1   Outline the purposes of underwriting.

3.3.2   Describe the different approaches by which underwriting is applied.

3.3.3   Discuss the factors that should be considered when determining the level of underwriting to use.

3.4   Demonstrate the application of asset-liability matching as a risk management technique.

3.4.1   State the principles of investment for a life insurance company.

3.4.2   Analyse life insurance liabilities into different types for asset-liability matching purposes.

3.4.3   Propose an appropriate asset-liability matching strategy for different types of liability.

3.5   Propose further ways of managing the risks in 3.1, including:

- policy data checks.
- choice of with profits bonus method.
- capital management.
- expense control.
- policy retention activity.
- management of new business mix and volumes.
- management of options.
- systematic risk assessment and management strategies.

4   Models and valuation (15%)

4.1   Describe the main features of a life insurance model.

4.1.1   Outline the objectives and basic features of a life insurance model.

4.1.2   Compare stochastic and deterministic approaches.

4.1.3   Explain the use of sensitivity analysis.

4.2   Demonstrate the different uses of actuarial models for decision-making purposes in life insurance, including:

- pricing products.

SP2

- developing investment strategy.
- projecting solvency.
- calculating embedded value.

4.3   Demonstrate methods of determining the cost of options and guarantees.

4.3.1   Describe the use of stochastic simulation and the use of option prices to determine the cost of an investment guarantee.

4.3.2   Describe the assessment of the cost of simple mortality options.

4.4   Discuss the determination of supervisory reserves and solvency capital requirements for a life insurance company.

4.4.1   Describe how supervisory reserves and solvency capital requirements may be determined, including:

- market consistent valuation.
- non-unit reserves.
- Value at Risk (VaR) capital assessment.

4.4.2   Discuss the interplay between the strength of the supervisory reserves and the level of solvency capital required.

4.4.3   Compare passive and active valuation approaches, including the valuation of assets.

5   Monitoring experience and setting assumptions (15%)

5.1   Describe the principles of setting assumptions for life insurance business.

5.1.1   Describe the principles of setting assumptions for pricing life insurance contracts, including profit requirements.

5.1.2   Describe the principles of setting assumptions for determining liabilities.

5.1.3   Explain why the assumptions used for supervisory reserves may be different from those used in pricing.

5.1.4   Outline the principles of setting assumptions for determining embedded value.

5.2   Demonstrate the relevance of experience monitoring to a life insurance company.

5.2.1   Explain why it is important for a life insurance company to monitor its experience.

5.2.2 Describe how the actual mortality, persistency, expense and investment experience of a life insurance company should be monitored, including the data required.

5.3 Demonstrate the relevance of analysis of surplus or profit.

5.3.1 Give reasons for undertaking an analysis of surplus and an analysis of embedded value profit.

5.3.2 Suggest ways in which the results of such analyses can be used.

6 Solving problems

6.1 Analyse hypothetical examples and scenarios in relation to the financial management of life insurance companies.

6.1.1 Propose solutions and actions that are appropriate to the given context, with justification where required.

6.1.2 Suggest possible reasons why certain actions have been chosen.

6.1.3 Assess the implications of actions within a given scenario.

6.1.4 Discuss the advantages and disadvantages of suggested actions, taking into account different perspectives.

Assessment

Three hour written examination.

END

SP4 – Pensions and other benefits Principles

Aim

The aim of the Pension and other benefits Principles subject is to instil in candidates the ability to apply:

- the mathematical and economic techniques, and
- the principles of actuarial planning and control

needed for the financial management of pensions and other benefits.

Competences

On successful completion of this subject, a student will be able to:

1   understand the main principles and techniques of actuarial management and control that are relevant to benefit provision.

2   apply these principles to simple situations within the context of pensions and other benefits.

3   analyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations relating to the management of benefit arrangements.

Links to other subjects

CM1 – Actuarial Mathematics 1
CP1 – Actuarial Practice
SA4 – Pensions and other benefits Advanced

SP4

Syllabus topics

1   Pension provision and general business environment (20%)
2   Scheme design and financing (20%)
3   Managing schemes and risks (20%)
4   Models, valuations and setting assumptions (30%)
5   Monitoring experience and the Control Cycle (10%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order Skills.

Detailed syllabus objectives

0   Introduction

0.1   Define the main terms used in the provision of benefits.

1   Pension provision and the general business environment (20%)

1.1   Describe the roles that interested parties may play, and responsibilities they may have, in the provision of benefits, including:

- the State and statutory bodies.
- employers or groups of employers.
- trustees or scheme managers.
- Financial advisers.
- individuals or groups of individuals.

1.2   Compare the provision of benefits from the State, employers in the public and private sector and individuals.

1.3   Discuss the implications, for the parties in 1.1, of the environment in which benefits are provided, including:

- different presentation and reporting of benefits and contributions.
- regulation and taxation.
- any professional guidance for actuaries or other professionals.

1.4   Discuss the issues surrounding sponsor covenant in terms of:

- measurement.
- integration with funding and investment.

2   Scheme design and financing (20%)

2.1   Describe the different ways in which providers may be able to finance the benefits to be provided, including:

- the timing of contributions (relative to when the benefits are due to be paid).

- the forms and characteristics of investment that may be available (if benefits are funded).

- financial instruments, including contingent assets, which may be used to back benefit promises.

SP4

2.2 Discuss the factors to consider in determining a suitable design for a pension scheme, or other benefits such as social security benefits, including:

- type of pension scheme e.g. defined benefit, defined contribution, risk-sharing.
- the governance requirements.
- the level and form of benefits and/or contributions.
- the method of financing the benefits.
- how risk is shared between parties.
- the choice of assets (when benefits are to be funded).

3 Managing schemes and risks (20%)

3.1 Describe the risks affecting:

- the level and incidence of benefits.
- the level and incidence of contributions.
- the level and incidence of return on assets.
- the extent to which assets are exhausted during a member's lifetime
- the overall security of benefits.

3.2 Discuss the issues taken into account in producing information to meet accounting standards, including:

- the objectives.
- the disclosure requirements.
- the calculations of cost of benefit provision.

3.3 Discuss the main factors that should be taken into account in setting appropriate terms and consent requirements for member options, taking into account the risk and reward for all relevant parties

3.4 Discuss the factors taken into account in setting the investment strategy of a provider of benefits. Describe how projection models may be used to develop appropriate strategies.

3.5 Discuss the principles underlying the use of insurance as a means of risk mitigation.

4 Models, valuations and setting assumptions (30%)

4.1 Discuss the use of actuarial models for decision making purposes, including:

- the objectives of and requirements for building a model for the financial management of the provision of benefits.

- the basic features of a model for projecting income and outgo.

- the use of these models for setting contributions, targeting benefit levels and assessing the return on assets.

- how sensitivity analysis of the results of the models can be used.

4.2   Discuss the principles underlying the determination of the funding method, valuation method and assumptions for valuing benefits and contributions, including:

- the types of information that may be available to help determine the assumptions and methods.

- the requirements for prudence.

- the objectives of the various parties involved.

4.3   Discuss how to determine values for assets, past and future benefits and future contribution requirements, including:

- the data requirements.

- the reasons why the assumptions and methods used may differ in different circumstances.

- the extent to which values should reflect investment / risk management strategy.

- how to place values on guarantees and options.

- sensitivity analysis and reasonableness checking.

- and be able to perform calculations to demonstrate an understanding of the main methods used.

4.4   Discuss the principles underlying the determination of discontinuance terms for benefits, taking into account:

- the rights and expectations of beneficiaries.
- the availability and selection of a method of provision of discontinuance benefits.
- the level of available assets.

5   Monitoring experience and the control cycle (10%)

5.1   Identify the sources of surplus/deficit for a benefit provider and discuss the factors that affect the application of this surplus/deficit.

6   Solving problems

6.1   Analyse hypothetical examples and scenarios in relation to the financial management of pension arrangements.

6.1.1   Propose solutions and actions that are appropriate to the given context, with justification where required.

6.1.2   Suggest possible reasons why certain actions have been chosen.

SP4

6.1.3   Assess the implications of actions within a given scenario.

6.1.4   Discuss the advantages and disadvantages of suggested actions, taking into account different perspectives.

Assessment

Three hour written examination.

END

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SP5 – Investment and Finance Principles

Aim

The aim of the Investment and Finance Principles subject is to instil in successful candidates the key principles of evaluating investments, including the appropriate selection and effective risk management of a portfolio of investments which meet the needs of a particular investor.

Competences

On successful completion of this subject, a student will be able to:

1   understand the main principles and techniques of actuarial management and control that are relevant to the management of investments.

2   apply these principles to given situations within the context of investment management.

3   analyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations relating to the management of investments.

Links to other subjects

CB1 – Business Finance
CB2 – Business Economics
CM2 – Actuarial Mathematics 2
CP1 – Actuarial Practice
SA7 – Investment and Finance Advanced

SP5

Syllabus topics

1   The economic, regulatory and legislative framework for investment management (10%)
2   Specialist investment products (15%)
3   Valuing investments (10%)
4   Monitoring and managing investment risks (10%)
5   Investor characteristics, including behavioural finance and taxation (10%)
6   Appropriate investment strategies (15%)
7   Portfolio management and risk control (15%)
8   Analysing portfolio performance (15%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order Skills.

Detailed syllabus objectives

1 The economic, regulatory and legislative framework for investment management (10%)

1.1 Explain the influences over the commercial and economic environment from:

- central banks.
- main investor classes.
- government policy

1.2 Discuss the principles underlying the legislative and regulatory framework for investment management and the securities industry and how these principles can be applied in the areas of:

- trust law.
- corporate governance.
- role of the listings authority.
- environmental and ethical issues.
- competition and fair trading controls.
- monopolies regulators.
- investment restrictions in investment agreements.
- provision of financial services.
- institutional investment practices.
- EU legislation.
- role and responsibilities of directors.
- development of international accounting standards.

2 Specialist investment products (15%)

2.1 Discuss the characteristics of specialist financial instruments:

- financial instruments available for short-term lending and borrowing
- corporate debt and credit derivatives
- swaps and swaptions
- private debt
- asset-backed securities, securitisation
- venture capital
- hedge funds
- currency
- infrastructure
- commodities
- insurance-linked securities
- structured products
- new ways of investing in old asset classes

2.2 Describe the main types of derivative contract, including:

- how they are traded.

- their payoffs.
- how they can be used by an investment manager

3 Valuing investments (10%)

3.1 Describe the principles of fundamental analysis of equities and bonds, including:

- factors affecting equity prices.
- credit analysis of bonds.
- role of credit rating agencies.

3.2 Determine the value of individual investments.

3.3 Discuss the appropriateness to valuing investments in different situations of:

- fixed income analytics and valuation (including interest rate swaps and futures).
- arbitrage pricing and the concept of hedging.
- empirical characteristics of asset prices.
- fixed income option pricing.
- evaluating a securitisation.
- evaluating a credit derivative.

4 Monitoring and managing investment risks (10%)

4.1 Describe methods by which an institution can monitor and control its exposure to the following types of risk:

- asset / liability mismatching risk
- market risk
- credit risk (including counterparty risk)
- operational risk
- liquidity risk
- relative performance risk

4.2 Explain in the context of mean-variance portfolio theory what is meant by:

- opportunity set.
- efficient frontier.
- indifference curves.
- the optimum portfolio.

5 Investor characteristics, including behavioural finance and taxation (10%)

5.1 Discuss the application of the key findings in behavioural finance.

5.2 Outline the main steps involved in financial planning.

5.3   Describe the typical ways in which investment returns are taxed and the effect of the taxation basis on investor behaviour.

6   Appropriate investment strategies (15%)

6.1   Propose how actuarial techniques may be used to develop an appropriate investment strategy, including:

- asset pricing models.
- asset / liability modelling.
- asset / liability mismatch reserving.
- liability hedging.
- dynamic liability benchmarks.

7   Portfolio management and risk control (15%)

7.1   Discuss the principal:

- active management "styles" (value, growth, momentum, rotational).
- equity portfolio management techniques.
- bond portfolio management techniques.

7.2   Discuss the uses which an institutional investor might make of:

- financial futures and options, including over the counter contracts.
- interest rate and currency and inflation swaps.
- forward foreign exchange contracts for currency hedging.

7.3   Discuss the usefulness of multifactor models in practical investment management and risk control.

7.4   Discuss the problems of making significant changes to the investment allocation of a substantial portfolio.

7.5   Discuss transition management and asset allocation techniques (including overlay strategies).

7.6   Describe the role of the custodian.

7.7   Assess portfolio construction with attention to:

- value at risk.
- tracking error.
- risk budgets.

7.8   Discuss measurement, comparison and attribution of risk.

SP5

8 Analysing portfolio performance (15%)

8.1 Assess the performance of an investment and discuss the limitations of such measurement techniques, including:

- portfolio risk and return analysis.
- equity price.
- net present value.
- net asset value.
- return on capital.

8.2 Discuss the construction and uses of investment indices.

8.2.1 Describe the principal indices in the international stock markets.

8.2.2 Explain the problems encountered in constructing property indices.

8.2.3 Discuss the uses of investment indices.

8.3 Assess the performance of an investment portfolio and discuss the limitations of such portfolio measurement.

8.3.1 Assess the performance of a portfolio relative to a:

- published market index.
- predetermined benchmark portfolio.

8.3.2 Assess the performance of a portfolio into components relating to investment sector selection and individual stock selection.

8.3.3 Discuss the relative merits of assessing portfolio performance relative to published indices, other portfolios or a predetermined benchmark portfolio.

8.3.4 Discuss the uses of risk adjusted performance measures.

8.3.5 Discuss the value of portfolio performance measurement and its limitations.

9 Solving problems

9.1 Analyse hypothetical examples and scenarios in relation to the management of investments.

9.1.1 Propose solutions and actions that are appropriate to the given context, with justification where required.

9.1.2 Suggest possible reasons why certain actions have been chosen.

9.1.3 Assess the implications of actions within a given scenario.

9.1.4   Discuss the advantages and disadvantages of suggested actions, taking into account different perspectives.

Assessment

Three hour written examination.

END

SP6 – Financial Derivatives Principles

Aim

The aim of the Financial Derivatives Principles subject is to instil in successful candidates the ability (at a higher level of detail and ability than in CM2) to understand different types of financial derivatives and their uses, the markets in which they are traded, methods of valuation of financial derivatives, and the assessment and management of risks associated with a portfolio of derivatives.

Competences

On successful completion of this subject, a student will be able to:

1   understand the main principles and techniques that are relevant to the use and management of financial derivatives.

2   apply these principles to given situations within the context of financial derivative management.

3   analyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations relating to the management of financial derivatives.

Links to other subjects

CM2 – Actuarial Mathematics 2
CP1 – Actuarial Practice

SP6

Syllabus topics

1   Derivative markets (5%)
2   Derivative types and uses (20%)
3   Derivative pricing and valuation methods, including interest rate models (50%)
4   Management of derivatives (25%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

*   the relative complexity of each topic, and hence the amount of explanation and support required for it.

*   the need to provide thorough foundation understanding on which to build the other objectives.

*   the extent of prior knowledge which is expected.

*   the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order Skills.

Detailed syllabus objectives

1 Derivative markets (5%)

1.1 Demonstrate an awareness of the basic characteristics of the derivatives markets.

1.2 Describe the characteristics of exchange traded contracts and over-the-counter contracts.

1.3 Describe the uses of forwards, future and options by different types of traders: hedgers, speculators and arbitrageurs.

1.4 Demonstrate an understanding of how futures and options markets work.

1.5 Describe the operation of central counterparty clearing houses (CCPs) and the related regulatory environment.

2 Derivative types and uses (20%)

2.1 Describe the payoffs of forwards and futures, calls and puts (American and European).

2.2 Demonstrate an understanding of forward and futures prices.

2.3 Explain how to use the futures contracts in 2.2 for hedging.

2.4 Describe the following traded derivative contracts:

- stock options
- currency options
- index options
- options on futures
- warrants
- convertibles

2.5 Describe different types of property derivatives, including their uses, and property indices.

2.6 Describe the following interest rates and interest rate derivatives:

- Treasury rates
- LIBOR rates
- repo rates
- zero rates
- forward rates
- forward rate agreements
- interest rate futures
- Treasury bond futures
- interest rate swaps

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- European swap options (swaptions)
- caps and caplets
- floors and floorlets
- Bermudan swaptions

2.7 Describe the following exotic equity and foreign exchange derivatives:

- quanto options
- chooser options
- barrier options
- binary options
- lookback options
- Asian options
- exchange options
- basket options

2.8 Describe the following structured securities and over-the-counter (OTC) contracts, including how each can be used to hedge certain types of liability:

- STRIPS
- Interest rate swaps
- Interest rate swaptions
- Index-linked bonds
- Inflation swaps
- Limited Price Indexation (LPI) swaps
- LPI bonds

2.9 Describe how non-economic risks such as longevity risk can be hedged using suitable structured securities and OTC contracts.

2.10 Demonstrate a knowledge and understanding of credit derivatives and their application.

  2.10.1 Describe the following types of credit derivative:

  - credit default swaps (CDSs)
  - collateralised debt obligations (CDOs)
  - nth to default baskets
  - total return swaps

  2.10.2 Explain the relationship between CDSs and corporate bonds, in particular as shown by their relative credit spreads.

  2.10.3 Describe the uses of credit derivatives.

3   Derivative pricing and valuation methods, including interest rate models (50%)

3.1   Describe how the following factors affect option prices:

- stock price
- strike price
- term to expiry
- volatility
- risk-free rate
- dividends

3.2   Demonstrate the theory underpinning the determination of derivative prices and hedging strategies using the binomial model, including:

- sample paths.
- filtrations.
- the Binomial Representation Theorem.
- conditional expectations.
- previsible process.
- self-financing portfolio strategies.
- replicating strategies.
- pricing under the martingale measure.

3.3   Demonstrate the theory underpinning the determination of derivative prices and hedging strategies using the Black-Scholes model, including:

- Brownian motion.
- Itô calculus.
- Itô's Lemma.
- statement of the Cameron-Martin-Girsanov Theorem.
- the concept of the Radon-Nikodym derivative.
- change of measure.
- statements of the Martingale Representation Theorem.
- continuous-time portfolio strategies.
- self-financing portfolios in continuous time.
- the Black-Scholes model.
- construction of replicating strategies using the martingale approach.
- the Black-Scholes formula for non-dividend-paying stocks.

3.4   Demonstrate more advanced application of the Black-Scholes model in the determination of derivative prices.

3.4.1   Demonstrate how to adapt the martingale approach to the pricing of foreign-exchange options and options on stock indices paying dividends continuously.

3.4.2   Derive the Black-Scholes-Merton partial differential equation.

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3.4.3   Explain the role of the market price of risk in the transfer between the real-world and the risk-neutral probability measures.

3.4.4   Demonstrate the role of the volatility parameter in the valuation of options, including:

- calculation of implied volatility from option prices.
- estimation of volatility from historical time series or other market indices (e.g. the VIX index).
- the "smile" effect and volatility surfaces.

3.4.5   Describe approaches to valuing options on discrete dividend-paying securities.

.3.5   Demonstrate alternative numerical methods for the determination of derivative prices and hedging strategies.

3.5.1   Describe the following numerical methods for determining equity and foreign exchange derivative prices and hedging strategies:

- binomial and trinomial trees
- Monte Carlo techniques
- finite difference methods

3.5.2   Discuss possible methods for determining prices of American options, including Monte Carlo simulation using the least-squares (Longstaff-Schwartz) approach.

3.6   Demonstrate the pricing of interest rate derivatives, including the Black model.

3.6.1   Determine the following:

- the yield curve, zero rates, forward rates and bond prices
- the relationship between forward rates and futures rates
- the value of interest rate swaps

3.6.2   Explain the relationship between swap quotes and LIBOR zero rates.

3.6.3   Demonstrate the use of the Black model for pricing and valuing the following contracts:

- bond options
- caps and floors
- European swap options (swaptions)

3.6.4   Comment on the assumptions underlying Black's model.

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3.7   Demonstrate the use of models of the term structure of interest rates.

    3.7.1   Explain the difference between equilibrium and no-arbitrage models.

    3.7.2   Describe the Hull & White model for the term structure of interest rates.

    3.7.3   Contrast the Hull & White model with the Vasicek and Cox-Ingersoll-Ross models.

    3.7.4   Describe the numerical techniques that can be used to value an interest rate derivative using the risk-neutral approach to pricing.

    3.7.5   Outline a valuation method for an interest rate derivative using an appropriate forward measure and zero-coupon bond.

    3.7.6   Explain the role of the market price of risk and changes of numeraire in the dynamics of term structure models.

    3.7.7   Describe how interest rate models can be developed in a multifactor setting.

    3.7.8   Outline the characteristics of the Heath , Jarrow and Morton (HJM) and LIBOR market models.

    3.7.9   Demonstrate how the LIBOR market model can be used to price caps and swaptions.

    3.7.10   Discuss the use of Black's model in the calibration of the LIBOR market model, including the problems with this approach.

3.8   Outline approaches that can be taken to price property swaps.

3.9   Demonstrate an understanding of the pricing of credit derivatives.

    3.9.1   Determine the price of a credit default swap.

    3.9.2   Explain the role of correlation in pricing credit derivatives.

4   Management of derivatives (25%)

4.1   Demonstrate an understanding of how derivatives are used by investors:

    4.1.1   Explain how derivatives help investors meet their objectives.

    4.1.2   Assess the change in risk profile of a portfolio following the use of derivatives.

    4.1.3   Discuss practical issues and limitations arising from derivative use.

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        4.1.4   Compare alternative strategies.

  4.2   Demonstrate a knowledge and understanding of how to hedge derivatives.

        4.2.1   Calculate the partial derivatives (the Greeks).

        4.2.2   Describe the use of the Greeks in hedging individual derivatives and portfolios of derivatives.

        4.2.3   Explain how option prices and Greeks change in relation to underlying variables.

        4.2.4   Describe how to manage portfolios of derivatives using scenario analysis.

        4.2.5   Assess the risk management characteristics of a given derivative, including exotic contracts .

        4.2.6   Describe the hedging of interest rate derivatives with respect to the underlying parameters (the Greeks).

        4.2.7   Describe delta hedging techniques in relation to credit default swaps.

  4.3   Describe what is meant by basis risk and its impact on hedging strategies.

  4.4   Discuss the risks that arise in the use of derivatives, and how to manage them.

        4.4.1   Define market risk, credit (or counterparty) risk and liquidity risk.

        4.4.2   Identify the market, credit (or counterparty), liquidity and other risks that arise in the use of derivatives.

        4.4.3   Outline the way in which these risks affect the use of derivatives and how these risks may be handled.

        4.4.4   Describe possible methods for establishing Value at Risk (on a portfolio).

        4.4.5   Comment on the weaknesses of the Value at Risk measure.

        4.4.6   Discuss the use and limitations of credit ratings.

        4.4.7   Describe simple techniques for measuring and managing credit (or counterparty) risk on derivatives, including:

                • International Swaps and Derivatives Association (ISDA) agreements.
                • collateral management.

        4.4.8   Describe the risks that arise in the use of specific types of derivative.

4.5 Describe how special purpose vehicles can be used as part of a mechanism for risk transfer, including the role of a credit enhancement agency.

5 Solving problems

5.1 Analyse hypothetical examples and scenarios in relation to the use and management of financial derivatives.

5.1.1 Propose solutions and actions that are appropriate to the given context, with justification where required.

5.1.2 Suggest possible reasons why certain actions have been chosen.

5.1.3 Assess the implications of actions within a given scenario.

5.1.4 Discuss the advantages and disadvantages of suggested actions, taking into account different perspectives.

5.2 Draw charts to illustrate how attributes of portfolios vary with respect to relevant factors, in the context of derivative use.

Assessment

Three hour written examination.

END

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SP7 – General Insurance Reserving and Capital Modelling Principles

Aim

The aim of this General Insurance Reserving and Capital Modelling Principles subject is to instil in successful candidates the ability to apply, in simple reserving and capital modelling situations, the mathematical and economic techniques and the principles of actuarial planning and control needed for the operation on sound financial lines of general insurers.

Competences

On successful completion of this subject, a student will be able to:

1   understand the main principles and techniques of reserving and technical modelling that are relevant to general insurance.

2   apply these principles to simple situations within the context of general insurance.

3   analyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations relating to reserving and capital modelling in general insurance business.

Links to other subjects

CS2 – Actuarial Statistics 2
CP1 – Actuarial Practice
SP8 – General Insurance Pricing Principles
SA3 – General Insurance Advanced

SP7

Syllabus topics

1   General insurance products and general business environment (20%)
2   Risk, uncertainty and regulation (15%)
3   Reserving (30%)
4   Capital modelling (17.5%)
5   Data, investigations, reinsurance and accounting (17.5%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

* the relative complexity of each topic, and hence the amount of explanation and support required for it.

* the need to provide thorough foundation understanding on which to build the other objectives.

* the extent of prior knowledge which is expected.

* the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order Skills.

Detailed syllabus objectives

Introduction

Define the principal terms in use in general insurance.

1 General insurance products and general business environment (20%)

1.1 Describe the main types of general insurance product in terms of:

- the needs of customers.
- the financial and other risks they pose for the general insurer including their capital requirements and possible effect on solvency.

1.2 Describe the main types of general reinsurance products and the purposes for which they may be used.

1.3 Describe the implications of the general business environment in terms of:

- the main features of the general insurance market.
- the effect of different marketing strategies.
- the effect of fiscal regimes.
- the effect of inflation and economic factors.
- the effect of legal, political and social factors.
- the effect of the climate and environmental factors.
- the general effect of professional guidance.
- the impact of technological change.

1.4 Outline the key features of the Lloyd's market.

2 Risk, uncertainty and regulation (15%)

2.1 Describe the major areas of risk and uncertainty in general insurance business with respect to reserving and capital modelling, in particular those that might threaten profitability or solvency.

2.2 Discuss the purposes of regulating general insurance business.

2.3 Outline possible methods by which general insurers can be regulated, including advantages and drawbacks of each.

3 Reserving (30%)

3.1 With regard to reserving work using triangulations:

- Analyse the range of general issues that can affect reserving work using triangulations.
- Identify how to deal with these general issues in reserving work.

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- Evaluate the main triangulation methods in use – namely the chain ladder method, the Bornhuetter-Ferguson method and the Average Cost per Claim method.

3.2   Suggest appropriate reserving bases for general insurance business, having regard to:

- the different reasons for calculating reserves.
- the assumptions that might be appropriate in each case
- why the assumptions may differ from a rating exercise.
- the allowance for future inflation.
- whether or not to discount for investment income.
- the approach for additional unexpired risk reserve.
- communication of the reserving basis.

3.3   Evaluate stochastic reserving processes.

3.3.1   Describe the uses of stochastic reserving methods.

3.3.2   Describe the likely sources of reserving uncertainty.

3.3.3   Describe the following types of stochastic reserving methods:

- analytic methods
- simulation-based methods

3.3.4   Describe the Mack and Bootstrapping approaches to reserving.

3.3.5   Describe the issues, advantages and disadvantages of each of the methods.

3.3.6   Describe the approach to aggregating the results of stochastic reserving across multiple lines of business, and discuss methods of correlation.

3.4   Evaluate reserving result analyses,

3.4.1   Describe the factors an actuary should consider in assessing the reasonableness of the results of a reserving exercise.

3.4.2   Describe typical diagnostics that are commonly used to assess the reasonableness of the results of a reserving exercise.

3.4.3   Describe the factors an actuary should consider in assessing the reasonableness of changes in results of a reserving exercise over time.

3.4.4   Describe how an analysis of experience might be carried out in the context of a reserving exercise.

3.4.5   Describe how alternative results of reserving exercises can arise and highlight some of the professional issues in resolving them.

3.5   Assess uncertainty and its communication in reserving.

3.5.1   Discuss what is meant by a "best estimate" reserve.

3.5.2   Describe the following approaches to estimating ranges of reserves:

- stochastic models
- scenario tests
- use of alternative sets of assumptions

3.5.3   Discuss the uses, advantages and disadvantages of each of these methods.

3.5.4   Discuss the issues to be considered when communicating reserve ranges and uncertainties.

4   Capital modelling (17.5%)

4.1   Evaluate the key considerations in deriving and applying capital modelling techniques.

4.2   Evaluate the following approaches to capital modelling:

- deterministic models
- stochastic models

4.3   Discuss the following issues with regard to parameterisation of capital models:

- developing assumptions
- validation

4.4   Describe approaches to the assessment of capital requirements for the following risk types:

- insurance risk
- market risk
- credit risk
- operational risk
- liquidity risk
- group risk

4.5   Explain some of the areas to consider when approaching a capital modelling exercise.

4.6   Describe the practical considerations which should be borne in mind when undertaking capital modelling.

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5   Data, investigations, reinsurance and accounting (17.5%)

5.1   With regard to the use of data in reserving and capital modelling:

- Describe the types of data that are used.
- Describe the main uses of data.
- Describe the requirements for a good information system.
- Outline the possible causes of data errors.
- Analyse the effects of inadequate data.

5.2   Outline the major actuarial investigations and analyses of experience undertaken with regard to reserving and capital modelling for general insurers.

5.3   Describe the factors influencing the choice of an appropriate reinsurance programme for a general insurer.

5.4   Describe how to test the appropriateness of alternative reinsurance structures for a general insurer.

5.5   Describe how reinsurance purchasing decisions might be impacted by capital management considerations.

5.6   Describe the following approaches to reserving for outwards reinsurance:

- gross less net
- application of standard techniques to reinsurance data
- use of appropriate factors
- application of detailed contract terms

5.7   Compare the advantages and disadvantages of each of the above methods and the appropriate circumstances in which to use them.

5.8   Discuss suitable approaches to reserving for inwards reinsurance.

5.9   Describe, within the context of investment and ALM:

- the principles of investment.
- the asset-liability matching requirements of a general insurer.
- how projection models might be used to develop an appropriate investment strategy.

5.10   Describe the methods and principles of accounting for general insurance business and interpret the accounts of a general insurer.

5.11   Describe the changes to accounting methods expected under IFRS.

6   Solving problems

6.1   Analyse hypothetical examples and scenarios in relation to the financial management of general insurance companies.

6.1.1   Propose solutions and actions that are appropriate to the given context, with justification where required.

6.1.2   Suggest possible reasons why certain actions have been chosen.

6.1.3   Assess the implications of actions within a given scenario.

6.1.4   Discuss the advantages and disadvantages of suggested actions, taking into account different perspectives.

Assessment

Three hour written examination.

END

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SP8 – General Insurance Pricing Principles

Aim

The aim of this General Insurance: Pricing Principles subject is to instil in successful candidates the ability to apply, in simple pricing situations, the mathematical and economic techniques and the principles of actuarial planning and control needed for the operation on sound financial lines of general insurers.

Competences

On successful completion of this subject, a student will be able to:

1   understand the main principles and techniques of pricing that are relevant to general insurance.

2   apply these principles to simple situations within the context of general insurance.

3   a nalyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations relating to pricing in general insurance business.

Links to other subjects

CS2 – Actuarial Statistics 2
CP1 – Actuarial Practice
SP7 – General Insurance Reserving and Capital Modelling Principles
SA3 – General Insurance Advanced

SP8

Syllabus topics

1   General insurance products and general business environment (20%)
2   Data, risks and risk management (30%)
3   Rating bases and methodology (35%)
4   Credibility, reinsurance and catastrophe modelling (15%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

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In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order Skills.

Detailed syllabus objectives

0 Introduction

0.1 Define the principal terms in use in general insurance.

1 General insurance products and general business environment (20%)

1.1 Describe the main types of general insurance product in terms of:

- the needs of customers.
- the financial and other risks they pose for the general insurer including their capital requirements and possible effect on solvency.

1.2 Describe the main types of general reinsurance products and the purposes for which they may be used.

1.3 Describe the implications of the general business environment in terms of:

- the main features of the general insurance market.
- the effect of different marketing strategies.
- the effect of fiscal regimes.
- the effect of inflation and economic factors.
- the effect of legal, political and social factors.
- the effect of the climate and environmental factors.
- the general effect of professional guidance.
- the impact of technological change.

2 Data, risks and risk management (30%)

2.1 Describe the major areas of risk and uncertainty in general insurance business with respect to pricing, in particular those that might threaten profitability or solvency.

2.2 Describe, with regard to the use of data in pricing:

- the types of data that are used.
- the main uses of data.
- the requirements for a good information system.
- the possible causes of data errors.
- the effects of inadequate data.

2.3 Outline the major actuarial investigations and analyses of experience undertaken with regard to pricing for general insurers.

2.4 Describe the Individual Risk Model and its applications in a general insurance environment.

2.5 Describe the Collective Risk Model and its applications in a general insurance environment.

2.6   Analyse the derivation of the Aggregate Claim Distribution for the Collective Risk Model, and its approximations using stochastic simulation.

3   Rating bases and methodologies (35%)

3.1   Analyse the various components of a general insurance premium.

3.2   Describe the basic methodology used in rating general insurance business.

3.3   Suggest the various factors to consider when setting rates.

3.4   Evaluate appropriate rating bases for general insurance contracts, having regard to:

- return on capital.
- underwriting considerations.
- reinsurance considerations.
- investment.
- policy conditions such as self retention limits.
- the renewal process.
- expenses.

3.5   Discuss the burning cost approach to pricing.

     3.5.1   Describe the burning cost approach to rating.

     3.5.2   Determine the assumptions required when using this approach.

     3.5.3   Outline the practical considerations when using this approach.

3.6   Discuss the frequency/severity approach to pricing.

     3.6.1   Describe the frequency / severity approach to rating.

     3.6.2   Determine the assumptions required when using this approach.

     3.6.3   Outline the practical considerations when using this approach.

     3.7.1   Describe how Original Loss Curves can be used in rating.

     3.7.2   Determine the assumptions required when using this approach.

     3.7.3   Outline the practical considerations when using this approach.

3.8   Understand generalised linear models and multivariate modelling.

     3.8.1   Assess the applications of generalised linear models to the rating of personal lines business and small commercial risks.

3.8.2 Evaluate the uses of multivariate models in pricing.

3.8.3 Outline the different types of multivariate models.

4 Credibility, reinsurance and catastrophe modelling (15%)

4.1 Outline the fundamental concepts of credibility theory.

4.2 Describe and compare the Classical and Bayes credibility models.

4.3 Describe the practical uses of credibility models in a general insurance environment.

4.4 Outline the similarities and differences between pricing direct and reinsurance business.

4.5 Describe how to determine appropriate premiums for each of the following types of reinsurance:

- proportional reinsurance
- non-proportional reinsurance
- property catastrophe reinsurance
- stop losses

4.6 Describe the data required to determine appropriate premiums for each of the above types of reinsurance.

4.7 Outline the basic structure of a catastrophe model.

4.8 Describe the key perils that can be modelled in a catastrophe model.

5 Solving problems

5.1 Analyse hypothetical examples and scenarios in relation to the financial management of general insurance companies.

5.1.1 Propose solutions and actions that are appropriate to the given context, with justification where required.

5.1.2 Suggest possible reasons why certain actions have been chosen.

5.1.3 Assess the implications of actions within a given scenario.

5.1.4 Discuss the advantages and disadvantages of suggested actions, taking into account different perspectives.

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Assessment

Three hour written examination.

END

Assessment

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SP9 – Enterprise Risk Management Principles

Aim

The aim of the Enterprise Risk Management (ERM) Specialist Principles subject is to instil in successful candidates the key principles underlying the implementation and application of ERM within an organisation, including governance and process as well as quantitative methods of risk measurement and modelling. The student should gain the ability to apply the knowledge and understanding of ERM practices to any type of organisation.

Competences

On successful completion of this subject, a student will be able to:

1   understand the main principles and techniques that are relevant to ERM.

2   apply these principles to given situations, for both financial and non-financial organisations.

3   analyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations in relation to ERM.

Links to other subjects

CS2 – Actuarial Statistics 2
CM2 – Actuarial Mathematics 2
CP1 – Actuarial Practice

SP9

Syllabus topics

1   ERM concept and framework (15%)
2   ERM process (10%)
3   Risk categories and identification (10%)
4   Risk modelling and aggregation of risks (15%)
5   Risk measurement and assessment (15%)
6   Risk management tools and techniques (20%)
7   Capital management (15%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

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- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order Skills.

Detailed syllabus objectives

1 ERM concept and framework (15%)

1.1 Explain the principal terms in Enterprise Risk Management (ERM).

1.2 Describe the concept of ERM.

    1.2.1 Define what is meant by ERM.

    1.2.2 Describe the role of the following concepts in ERM:

- the holistic approach
- downside and upside risks
- measurement of risk
- unquantifiable risks
- responses to risk, and risk management

    1.2.3 Describe the benefits of ERM.

1.3 Discuss the framework for risk management and control within a company.

    1.3.1 Recommend an appropriate framework for an organisation's ERM.

    1.3.2 Propose best practice ERM approaches in compliance and corporate governance.

    1.3.3 Discuss governance issues including market conduct, audit, and legal risk.

    1.3.4 Evaluate an organisation's risk management culture, including risk awareness, accountabilities, collaboration, incentive compensation, communication and the problem of bias.

1.4 Demonstrate an understanding of risk frameworks in regulatory environments.

    1.4.1 Explain the role of regulators in ERM and effective management of the supervisor relationship.

    1.4.2 Describe the Basel Accord and Solvency II frameworks, including their underlying principles and approaches to risk measurement.

    1.4.3 Outline the requirements of Sarbanes-Oxley and other regulatory risk frameworks and their underlying principles.

    1.4.4 Demonstrate an awareness of how different parts of an organisation and different parts of a portfolio may be subject to different capital adequacy standards.

1.5 Demonstrate an understanding of the perspectives of credit rating agencies.

    1.5.1 Describe the role of credit rating agencies in the evaluation of risk management functions, including the risk management grading criteria used.

    1.5.2 Assess the relevance of these criteria.

2 ERM process (10%)

2.1 Demonstrate an understanding of the relevance of ERM to all stakeholders.

    2.1.1 Compare the relevance of risk measurement and management to various stakeholders.

    2.1.2 Explain contagion and how it affects different stakeholders.

    2.1.3 Explain the risks arising from any misalignment of interests between different groups of stakeholders.

2.2 Demonstrate how to determine and articulate risk appetite, risk capacity, risk tolerances, desired risk profile and risk objectives.

2.3 Evaluate the elements and structure of a successful risk management function.

    2.3.1 Describe the ERM roles and responsibilities of the people within an organisation and how the different groups should interact.

    2.3.2 Recommend a structure for an organisation's risk management function.

2.4 Assess the implications of financial and other risks and opportunities for strategic planning and the selection of strategy.

2.5 Demonstrate the application of the risk management control cycle, including the relevance of external influences and emerging risks.

2.6 Describe methods for the identification of risks and their causes and implications.

2.7 Discuss important past examples of both good risk management practices and of risk failures, for financial and non-financial entities, including how better risk management might have prevented these failures.

2.8 Propose an ERM process that creates value for an organisation.

3 Risk categories and identification (10%)

3.1 Explain what is meant by risk and uncertainty, including different definitions and concepts of risk.

3.2 Demonstrate an understanding of risk categories.

    3.2.1 Identify the risks faced by an entity, including market risk, economic risk, interest rate risk, foreign exchange risk, basis risk, credit risk, counterparty risk, liquidity risk, insurance risk, operational risk, environmental risk, legal risk, regulatory risk, political risk, agency risk, reputational risk, project risk, strategic risk, demographic risk, moral hazard.

    3.2.2 Analyse the financial and non-financial risks faced by an organisation within a given context.

    3.2.3 Discuss risk taxonomy, including an awareness of how individual risks might be categorised in different ways.

3.3 Describe the relationship between systematic risk, non-systematic or specific risk, and concentration of risk.

4 Risk modelling and aggregation of risks (15%)

4.1 Assess the extent to which each of the risks in 3.2.1 can be amenable to quantitative analysis.

4.2 Demonstrate an understanding of the use of correlation measures.

    4.2.1 Demonstrate enterprise-wide risk aggregation techniques incorporating the use of correlation.

    4.2.2 Comment on the relative merits and implications of different correlation measures.

4.3 Discuss the use of scenario analysis and stress testing in the risk measurement process, including the advantages and disadvantages of each.

4.4 Demonstrate understanding of the use of copulas as part of the process of modelling multivariate risks.

    4.4.1 Evaluate different types of copula for a given purpose.

    4.4.2 Recommend an appropriate copula for a given situation.

4.5 Explain the importance of the tails of distributions, tail correlations and low frequency / high severity events.

4.6 Demonstrate how extreme value theory can be used to help model risks that have a low probability.

4.7 Demonstrate an understanding of model and parameter risk.

SP9

4.8 Discuss the use of models in the overall ERM decision-making process.

4.8.1 Describe the development and use of models for decision-making purposes in ERM.

4.8.2 Explain how the decision-making process takes account of the organisation's risk appetite and corporate governance, and builds on the results of stochastic modelling, scenario analysis, stress testing and analysis of model and parameter risk.

4.8.3 Evaluate different types of model for a given purpose.

5 Risk measurement and assessment (15%)

5.1 Demonstrate an understanding of common risk measures.

5.1.1 Describe the properties and limitations of the following:

- Value at Risk (VaR)
- Tail Value at Risk (TVaR)
- Probability of ruin
- Expected shortfall

5.1.2 Determine risk exposures and tolerances using these measures.

5.2 Describe how to choose a suitable time horizon and risk discount rate.

5.3 Analyse univariate and multivariate financial and insurance data (including asset prices, credit spreads and defaults, interest rates and insurance losses) using appropriate statistical methods.

5.4 Recommend a specific choice of model based on the results of both quantitative and qualitative analysis of financial or insurance data.

5.5 Assess different types of market risk.

5.6 Assess credit risk.

5.6.1 Describe what is meant by a credit spread and its components.

5.6.2 Discuss different approaches to modelling credit risk.

5.7 Assess operational, liquidity and insurance risks.

6 Risk management tools and techniques (20%)

6.1 Demonstrate risk optimisation and responses to risk.

6.1.1 Explain how to optimise an objective, possibly subject to constraints.

6.1.2 Demonstrate risk optimisation and responses to risk using illustrative examples.

6.1.3 Analyse the risk and return trade-offs that result from changes in the organisation's risk profile.

6.2 Recommend approaches, which balance benefits against inherent costs, that can be used to manage an organisation's overall risk profile.

6.2.1 Describe how to reduce risk by transferring it.

6.2.2 Describe how to reduce risk without transferring it.

6.2.3 Analyse the residual risks and new risks arising following risk mitigation actions.

6.2.4 Explain how an organisation's ability to manage risk is affected by regulatory, capacity and cost constraints.

6.3 Demonstrate strategies for the management of market risk.

6.3.1 Recommend strategies for the reduction of market risk using financial derivatives.

6.3.2 Demonstrate an awareness of the practical issues related to market risk hedging, including dynamic hedging.

6.4 Demonstrate the use of tools and techniques for identifying and managing credit and counterparty risk.

6.5 Demonstrate possible strategies for the management of operational, liquidity, insurance and other key risks.

7 Capital management (15%)

7.1 Demonstrate an understanding of capital calculations.

7.1.1 Describe the concept of economic measures of value and capital, and their uses in corporate decision-making processes.

7.1.2 Evaluate different risk measures and capital assessment approaches.

7.1.3 Demonstrate the ability to develop a capital model for a representative financial firm.

7.2 Propose techniques for allocating capital across an organisation.

SP9

8 Solving problems

8.1 Analyse hypothetical examples and scenarios in relation to the application of ERM, in both financial and non-financial contexts.

8.1.1 Propose solutions and actions that are appropriate to the given context, with justification where required.

8.1.2 Suggest possible reasons why certain actions have been chosen.

8.1.3 Assess the implications of actions within a given scenario.

8.1.4 Discuss the advantages and disadvantages of suggested actions, taking into account different perspectives.

Assessment

Three hour written examination plus attendance at the CERA Seminar for those who wish to gain the CERA qualification.

END

SA1 – Health and Care Advanced

Aim

The aim of the Health and Care Advanced subject is to instil in successful candidates the ability to apply knowledge of the health and care environment (in the United Kingdom and other jurisdictions) and the principles of actuarial practice to the provision of health and care benefits in complex situations.

Competences

On successful completion of this subject, a student will be able to:

1   understand the more complex aspects of actuarial practice within health and care insurance companies.

2   apply the principles of actuarial practice to the management of health and care insurance under complex scenarios.

3   compare the approaches by which the principles are applied in practice across different jurisdictions.

4   recommend coherent solutions and courses of action in relation to the overall ement of health insurance companies.

Links to other subjects

SP1 – Health and Care Principles
P1 – Health and Care UK Practice Module
SP2 – Life Insurance Principles
SA2 – Life Insurance Advanced

SA1

Syllabus topics

1   Health insurance products and general business environment (30%)
2   Regulatory, legislative and taxation environment (10%)
3   Rating, Pricing and Underwriting (20%)
4   Valuation, ALM and Reinsurance (20%)
5   Monitoring and Strategy (20%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SA subjects, the approximate split of assessment across these three skill types is 20% Knowledge, 50% Application and 30% Higher Order Skills.

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Detailed syllabus objectives

0   Introduction

0.1   Define the principal terms used in health and care in various jurisdictions.

1   Health insurance products and general business environment (30%)

1.1   Describe the major health and care insurance products that are offered, beyond the general descriptions provided in Subject SP1:

1.1.1   Describe the benefits and other main features of the following products:

- critical illness insurance
- income protection insurance
- long term care insurance
- health cash plans
- major medical expenses
- private medical insurance
- group and individual covers

1.1.2   Analyse the health and care insurance products outlined in 1.1.1, in terms of:

- customer needs.
- interaction with State provision.
- bundling and unbundling.
- impact of unit-linked wrappers.

1.2   Assess the effect of the general business environment on the management of health and care insurers, in terms of:

- products and distribution, including the roles of the State and employers.
- underwriting approaches, including genetic testing.
- use of counterparties.
- external influences – demographic, medical, economic, political and social.
- key medical conditions, treatments and other current health issues.

1.3   Suggest actions that a health and care insurance company could take in order to ensure that it is treating its customers fairly.

1.4   Understand areas of best practice in International health and care provision.

1.5   Understand the considerations underlying the provision of national healthcare systems:

- the importance of healthcare provision
- different healthcare systems worldwide
- different approaches to financing healthcare

SA1

- QALYs (quality adjusted life years)

2 Regulatory, legislative and taxation environment (10%)

2.1 Explain the relevance of legislation to health and careinsurance business, in relation to:

- consumer protection.
- equality legislation.

2.2 Explain the implications of the taxation of health and care insurance business for:

- policyholders.
- health and care insurance companies.

2.3 Describe regulatory frameworks for health and care insurance companies, including:

- objectives of regulators.
- financial reporting requirements.
- conduct of business rules.
- supervisory tools, including rulebooks and reporting requirements.
- statutory actuarial roles.

2.4 Demonstrate understanding of the over-arching Solvency II regulatory framework.

2.4.1 Describe the Solvency II framework in terms of:

- background and scope.
- structure.
- Pillar 2 governance requirements.
- Pillar 3 disclosure and reporting requirements.
- group reporting requirements.

2.4.2 Assess the implications of a regulatory framework such as Solvency II for business culture and strategy.

2.5 Compare regulatory, legislative and taxation environments between different jurisdictions.

2.6 Demonstrate how the regulatory, legislative and taxation environments affect the way in which health and care insurance companies carry out their business in practice.

2.7 Outline the requirements of actuarial standards in relation to actuaries practicing in or advising health and care operations.

3　Rating, pricing and underwriting (20%)

3.1　Demonstrate product design and pricing techniques.

3.1.1　Describe the requirements for the design of health and care insurance products to be marketed in a particular jurisdiction, including:

- policy conditions.
- capital requirements and return on capital.
- marketability, competition and distribution.
- management of the risks.
- underwriting.
- reinsurance.
- investment policy.
- the renewal process and options.
- regulatory requirements.

.3.1.2　Determine appropriate methods for pricing such products.

4　Valuation, ALM and reinsurance (20%)

4.1　Demonstrate solvency assessment techniques.

4.1.1　Outline the valuation of assets, liabilities and solvency capital requirements under Solvency II.

4.1.2　Compare solvency assessment approaches between different jurisdictions.

4.2　Demonstrate capital management techniques.

4.2.1　Explain the different types of capital assessment.

4.2.2　Describe the different sources of capital.

4.2.3　Discuss the assessment of ongoing solvency, including practical modelling considerations.

4.2.4　Explain the relationship between capital, risk and value.

4.2.5　Propose methods of improving available capital.

4.2.6　Describe the principles of asset-liability management and the use of derivatives.

4.3　Evaluate the uses and benefits of reinsurance support in health and care insurance:

- control of risks
- financing
- technical assistance

SA1

- reinsurance impact
- badging

4.4   Analyse the asset-liability matching requirements of a health and care insurer and develop appropriate strategies.

5   Monitoring and Strategy (20%)

5.1   Analyse the experience and surplus/profit of a health and care insurer arising over a period.

5.2   Propose possible actions that should be taken following an analysis of experience or surplus/profit, including capital management and modelling considerations.

5.3   Understand the principles and practices that are relevant to the assessment of specific business strategies:

- assessment of the market for a new company launch
- assessment of overseas markets
- assessment of a company or portfolio for takeover

5.4   Recommend coherent solutions and courses of action in relation to the overall financial management of health and care insurance companies.

5.4.1   Analyse complex problems in terms of actuarial, economic and financial factors to a level where appropriate analytical techniques may be used.

5.4.2   Assess the implications and relevance of such factors, integrating the results into a coherent whole.

5.4.3   Evaluate the results critically in a wider context, drawing appropriate conclusions.

5.4.4   Propose solutions and actions, or a range of possible solutions and actions, based on this evaluation.

6   Solving problems

6.1   Recommend coherent solutions and courses of action in relation to the overall financial management of health and care insurance companies.

6.1.1   Analyse complex problems in terms of actuarial, economic and financial factors to a level where appropriate analytical techniques may be used.

6.1.2   Assess the implications and relevance of such factors, integrating the results into a coherent whole.

6.1.3   Evaluate the results critically in a wider context, drawing appropriate conclusions.

6.1.4   Propose solutions and actions, or a range of possible solutions and actions, based on this evaluation.

Assessment

Three hour written examination.

END

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SA2 – Life Insurance Advanced

Aim

The aim of the Life Insurance Advanced subject is to instil in successful candidates the ability to apply knowledge of the life insurance environment (in the United Kingdom and other jurisdictions) and the principles of actuarial practice to the management of life insurance business in complex situations.

Competences

On successful completion of this subject, a student will be able to:

1   understand the more complex aspects of actuarial practice within life insurance companies.

2   apply the principles of actuarial practice to the management of life insurance under complex scenarios.

3   compare the approaches by which the principles are applied in practice across different jurisdictions.

4   recommend coherent solutions and courses of action in relation to the overall financial management of life insurance companies.

Links to other subjects

SP2 – Life Insurance Principles
P2 – Life Insurance UK Practice Module
SP1 – Health and Care Principles
SA1 – Health and Care Advanced

SA2

Syllabus topics

1   Life insurance products and general business environment (30%)
2   Regulatory, legislative and taxation environment (15%)
3   Reporting and management of capital and profit (25%)
4   General business management (30%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SA subjects, the approximate split of assessment across these three skill types is 20% Knowledge, 50% Application and 30% Higher Order Skills.

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Detailed syllabus objectives

0   Introduction

  0.1   Define the principal terms used in life insurance in various jurisdictions.

1   Life insurance products and general business environment (30%)

  1.1   Describe the major life insurance products that are offered, beyond the general descriptions provided in Subject SP2.

    1.1.1   Describe the benefits and other main features of the following products:

- term assurance, including group life assurance
- income protection insurance
- critical illness insurance
- endowment assurance
- universal life
- investment bond
- individual and group pension products
- annuities and income drawdown
- wraps
- variable annuities
- equity release products
- Takaful insurance
- microinsurance

    1.1.2   Describe the main features of the following life insurance product bases:

- conventional with profits
- accumulating with profits
- unit-linked
- index-linked

    1.1.3   Assess the purpose and key risks of the above products and bases to the policyholder and the insurer.

  1.2   Assess the effect of the general business environment on the management of life insurance business, in terms of:

- competition and other new business considerations.
- distribution of products.
- outsourcing.
- corporate finance, including mergers and closed funds.

SA2

2 Regulatory, legislative and taxation environment (15%)

2.1 Explain the relevance of legislation to life insurance business, in relation to:

- consumer protection.
- equality legislation.

2.2 Explain the implications of the taxation of life insurance business for:

- policyholders
- life insurance companies
- unit pricing

2.3 Describe regulatory frameworks for life insurance companies, including:

- objectives of regulators
- supervisory tools, including rulebooks and reporting requirements
- statutory actuarial roles
- transfer of liabilities between companies

2.4 Demonstrate understanding of the over-arching Solvency II regulatory framework.

2.4.1 Describe the Solvency II framework in terms of:

- background and scope.
- structure.
- Pillar 2 governance requirements.
- Pillar 3 disclosure and reporting requirements.
- group reporting requirements.

2.4.2 Assess the implications of a regulatory framework such as Solvency II for business culture and strategy.

2.5 Compare regulatory, legislative and taxation environments between different jurisdictions.

2.6 Demonstrate how the regulatory, legislative and taxation environments affect the way in which life insurance companies carry out their business in practice.

2.7 Outline the requirements of actuarial standards in relation to actuaries practising in or advising life insurance companies.

3 Reporting and management of capital and profit (25%)

3.1 Demonstrate solvency assessment techniques.

3.1.1 Outline the valuation of assets, liabilities and solvency capital requirements under Solvency II.

3.1.2 Compare solvency assessment approaches between different jurisdictions.

3.2 Demonstrate capital management techniques.

3.2.1 Explain the different types of capital assessment.

3.2.2 Describe the different sources of capital.

3.2.3 Discuss the assessment of ongoing solvency, including practical modelling considerations.

3.2.4 Explain the relationship between capital, risk and value.

3.2.5 Propose methods of improving available capital.

3.2.6 Describe the principles of asset-liability management and the use of derivatives.

3.3 Demonstrate profit reporting approaches.

3.3.1 Outline the main requirements of different accounting standards, including International Financial Reporting Standards (IFRS) and US GAAP, in relation to life insurance business.

3.3.2 Compare profit reporting approaches between different jurisdictions.

3.3.3 Describe embedded value reporting approaches, including under Solvency II.

3.4 Analyse surplus and profit arising over a period.

3.4.1 Analyse supervisory surplus arising, including under Solvency II.

3.4.2 Analyse the change in embedded value.

3.4.3 Propose possible actions that should be taken following an analysis of surplus or profit.

SA2

4 Business management (30%)

4.1 Suggest actions that a life insurance company could take in order to ensure that it is treating its customers fairly.

4.2 Demonstrate appropriate risk management strategies and controls that should be exercised by a life insurance company.

4.2.1 Outline an appropriate risk management framework.

4.2.2 Describe the following key risk types in relation to life insurance business:

- credit risk
- market risk
- liquidity risk
- operational risk, including conduct risk, model risk and unit pricing as a source of risk
- insurance risk, including longevity risk
- group risk

4.2.3 Propose appropriate risk management strategies and controls for these risk types.

4.3 Demonstrate the management of with profits business.

4.3.1 Describe the components of an asset share calculation and how they could be determined.

4.3.2 Compare different methods of distributing bonuses under the "additions to benefits" method.

4.3.3 Discuss the concept of smoothing.

4.3.4 Describe investigations that can be performed in order to inform with profits business management.

4.3.5 Evaluate different bonus distribution approaches.

4.3.6 Describe general with profits management considerations, including:

- regulatory requirements and policyholder protection.
- management actions.
- managing closed with profits funds.

4.4 Demonstrate product design and pricing techniques.

4.4.1 Describe the requirements for the design of life insurance products to be marketed in a particular jurisdiction.

4.4.2   Determine appropriate methods and bases for pricing such products.

5   Solving problems

5.1   Recommend coherent solutions and courses of action in relation to the overall financial management of life insurance companies.

5.1.1   Analyse complex problems in terms of actuarial, economic and financial factors to a level where appropriate analytical techniques may be used.

5.1.2   Assess the implications and relevance of such factors, integrating the results into a coherent whole.

5.1.3   Evaluate the results critically in a wider context, drawing appropriate conclusions.

5.1.4   Propose solutions and actions, or a range of possible solutions and actions, based on this evaluation.

Assessment

Three hour written examination.

END

SA3 – General Insurance Advanced

Aim

The aim of the General Insurance Advanced subject is to instil in successful candidates the ability to apply knowledge of the general insurance environment (in the United Kingdom and other jurisdictions)and the principles of actuarial practice to providers of general insurance in complex situations.

Competences

On successful completion of this subject, a student will be able to:

1   understand the more complex aspects of actuarial practice within general insurance companies.

2   apply the principles of actuarial practice to the management of general insurance under complex scenarios.

3   compare the approaches by which the principles are applied in practice across different jurisdictions.

4   recommend coherent solutions and courses of action in relation to the overall financial management of general insurance companies.

Links to other subjects

SP7 – General Insurance Reserving and Capital Modelling Principles
SP8 – General Insurance Pricing Principles
P3 – General Insurance UK Practice Module

SA3

Syllabus topics

1   General insurance products and general business environment (35%)
2   Regulatory, legislative and taxation environment (10%)
3   Reserving, ALM and reinsurance (30%)
4   Financial, monitoring and strategies (25%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SA subjects, the approximate split of assessment across these three skill types is 20% Knowledge, 50% Application and 30% Higher Order Skills.

Detailed syllabus objectives

0   Introduction

0.1   Define the principal terms in use in general insurance.

1   General insurance products and business environment (35%)

1.1   Describe the main features of general insurance markets.

1.2   Outline the key features of the Lloyd's market.

1.3   Special aspects of pricing including catastrophe modelling

1.3.1   Suggest the particular considerations to be borne in mind when pricing large commercial risks.

1.3.2   Describe the alternative approaches to rating large commercial risks.

1.3.3   Outline how to incorporate the return on capital in the calculation of premium rates.

1.3.4   Evaluate the difference between catastrophe modelling and traditional actuarial rating methods.

1.3.5   Outline the generic structure of a catastrophe model.

1.3.6   Suggest the key perils modelled.

1.3.7   Describe the key uses to which a non-life actuary might put the output of catastrophe models.

1.3.8   Suggest some key considerations in using the output of catastrophe models.

1.3.9   Non-modelled catastrophes

1.4   Outline the particular actuarial features of annuities in non-life insurance (also known as periodic payment orders or PPOs)

1.5   Suggest possible emerging risks and disrupters and their impacts on the general insurance market

SA3

2 Regulatory, legislative and taxation environment (10%)

2.1   Demonstrate an understanding of the over-arching Solvency II regulatory framework.

    2.1.1   Describe the Solvency II framework in terms of:

- background and scope.
- structure.
- Pillar 2 governance requirements.
- Pillar 3 disclosure and reporting requirements.
- group reporting requirements.

2.2   Describe the regulatory regime in place in Lloyd's

2.3   Explain the relevance of legislation to general insurance business, in relation to:

- consumer protection.
- equality legislation.

2.4   Explain the implications of the taxation of general insurance business for:

- policyholders.
- general insurance companies, mutual and proprietary.
- Lloyd's syndicates and their members.

2.5   Describe regulatory frameworks for general insurance companies, including:

- objectives of regulators.
- supervisory tools, including rulebooks and reporting requirements.
- statutory actuarial roles.
- transfer of liabilities between companies.

2.6   Demonstrate how the regulatory, legislative and taxation environments affect the way in which general insurance companies carry out their business in practice.

2.7   Outline the requirements of actuarial standards in relation to actuaries practising in or advising general insurance companies.

3 Reserving, ALM and reinsurance (30%)

3.1   Determine appropriate bases for valuing the insurance liabilities of a general insurer in order to produce:

- annual accounting and statutory returns.
- management accounts.

3.2   Demonstrate an understanding of the reasons why different reserving techniques are required for latent claims and disease claims.

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4 Financial management, monitoring and strategies (25%)

4.1 Demonstrate an understanding of financial planning in general insurance management.

4.1.1 Analyse the financial planning requirements of a general insurer and develop appropriate strategies.

4.1.2 Evaluate appropriate models for the purpose of financial planning to enable a general insurer to develop and monitor its objectives at either the corporate or product level.

4.2 Exits and transfers

4.2.1 Demonstrate an understanding of general insurance portfolio transfer alternatives.

4.2.2 Outline the reasons why a general insurer may wish to transfer a portfolio of business to another insurer.

4.2.3 Describe the alternative approaches to such a transfer, including the situations in which each may be appropriate.

5 Solving problems

5.1 Recommend coherent solutions and courses of action in relation to the overall financial management of general insurance companies.

5.1.1 Analyse complex problems in terms of actuarial, economic and financial factors to a level where appropriate analytical techniques may be used.

5.1.2 Assess the implications and relevance of such factors, integrating the results into a coherent whole.

5.1.3 Evaluate the results critically in a wider context, drawing appropriate conclusions.

5.1.4 Propose solutions and actions, or a range of possible solutions and actions, based on this evaluation.

Assessment

Three hour written examination.

END

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SA4 – Pensions and other benefits Advanced

Aim

The aim of the Pensions and other benefits Advanced subject is to instil in candidates the ability to apply:

- knowledge of the benefits environment (in the United Kingdom and other jurisdictions), and

- the principles of actuarial practice

in respect of pensions and other benefits in complex situations.

Competences

On successful completion of this subject, a student will be able to:

1   understand the more complex aspects of actuarial practice within benefit provision.

2   apply the principles of actuarial practice to the management of pensions and other benefits under complex scenarios.

3   compare the approaches by which the principles are applied in practice across different jurisdictions.

4   recommend coherent solutions and courses of action in relation to the overall financial management of benefit arrangements.

Links to other subjects

SP4 – Pensions and other benefits Principles
P4 – Pensions and other benefits UK Practice Module

SA4

Syllabus topics

1   Pension and benefit provision and general business environment (30%)
2   Regulatory, legislative and taxation environment (15%)
3   Design and financing of benefit arrangements (20%)
4   Reporting/valuation and management of benefit arrangements (15%)
5   General business and risk management (20%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SA subjects, the approximate split of assessment across these three skill types is 20% Knowledge, 50% Application and 30% Higher Order Skills.

Detailed syllabus objectives

0 Introduction

0.1 Define the main terms used in the provision of benefits in various jurisdictions.

1 Pension and benefit provision and general business environment (30%)

1.1 Describe the roles that interested parties may play, and responsibilities they may have, in the provision of benefits, including the following:

- the State.
- any other central body within the jurisdiction.
- employers.
- individuals.
- trustees.
- actuaries.
- investment advisers.
- other advisers.

1.2 Discuss the factors which influence the provision of benefits by the State, employers in the public and private sectors and individuals.

1.3 Discuss the main saving alternatives to pension savings available to individuals.

1.4 Discuss the issues surrounding sponsor covenant, including:

- what is meant by sponsor covenant.
- when / how it may be measured.
- integration with funding and investment.

2 Regulatory, legislative and taxation environment (15%)

2.1 Describe how the legal framework attempts to:

- encourage appropriate non-State provision.
- ensure security for non-State provision.

2.2 Discuss the implications, for the parties in 1.1, of the environment in which benefits are provided, in particular:

- benefits policy.
- regulation.
- the tax and national insurance regime.
- accounting standards.
- the Actuarial Standards in relation to actuaries practicing in, or giving advice in relation to pension arrangements.

SA4

2.3 Compare regulatory, legislative and taxation environments between different jurisdictions.

3 Design and financing of benefit arrangements (20%)

3.1 Describe the different ways in which providers are able to finance the benefits to be provided, including:

- the timing of contributions (relative to when the benefits are due to be paid).
- the forms and characteristics of investment that are available.
- financial instruments and contingent funding arrangements which may be used to back benefit promises.

3.2 Discuss the factors to consider in determining a suitable design for a pension scheme, or other benefits such as social security benefits, including:

- type of pension scheme e.g. defined benefit, defined contribution, risk-sharing.
- the governance requirements.
- the level and form of benefits and/or contributions.
- the method of financing the benefits.
- how risk is shared between parties.
- the choice of assets (when benefits are to be funded)

and describe how membership and other data analysis can be used to provide insight into individuals' current and future behaviour and therefore inform benefit design.

4 Reporting/valuation and management of benefit arrangements (15%)

4.1 Describe the issues that arise from the transfer / amendment of benefit rights, for example following significant corporate activity (such as an acquisition or scheme merger), including:

- the interests and responsibilities of the parties involved.
- the terms set out in the legal documentation.
- financial aspects; such as the calculation of the bulk transfer value (if relevant) and benefits provided.

4.2 Determine an appropriate method and appropriate financial and demographic assumptions for a valuation of a pension scheme and placing values on benefits and contributions.

4.3 Discuss how to determine values for assets, past and future benefits and future contributions, including:

- the data requirements.
- the reasons why the assumptions and methods used may differ in different circumstances.
- the extent to which values should reflect investment / risk management strategy.
- valuing guarantees and options.

- sensitivity analysis and reasonableness checking

and be able to perform calculations to demonstrate an understanding of the main methods used.

4.4   Discuss the issues taken into account in producing information to meet accounting standards, including:

- the objectives.
- the disclosure requirements, including those for directors' remuneration.
- the calculations of cost of benefit provision.

4.5   Discuss the issues concerning surplus/deficit including:

- identifying the sources.
- the factors that affect the treatment of a surplus/deficit

and describe how the financial significance of deviations from expectations should be monitored and assessed, including:

- the data required
- the methods used
- the use of the results to help identify issues and develop solutions

5   General business and risk management (20%)

5.1   Describe the main risks affecting and risk mitigation strategies concerning:

- the level and incidence of benefits
- the level and incidence of contributions
- the level and incidence of return on assets
- the extent to which assets are exhausted during a member's lifetime
- the overall security of benefits

5.2   Analyse the investment strategy of a provider of benefits, taking into account:

- any asset-liability matching requirements
- the trade-off between risk and reward
- an awareness of adding value to the shareholders of the business

and describe how projection models may be used to develop strategies.

5.3   Discuss the principles underlying the use of insurance as a means of risk mitigation.

5.4   Discuss the benefit options typically available to individuals:

- before retirement.
- at retirement.
- after retirement

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and discuss how to set appropriate terms and consent requirements for these options (where appropriate), taking into account the risk and reward for all relevant parties.

5.5   Discuss the issues arising from the discontinuance of benefit provision, including:

- the rights and expectations of beneficiaries.
- the availability and selection of a method of provision of discontinuance benefits.
- the level of available assets.

6   Solving problems

6.1   Recommend coherent solutions and courses of action in relation to the overall financial management of benefit arrangements.

- Analyse complex problems in terms of actuarial, economic and financial factors to a level where appropriate analytical techniques may be used.

- Assess the implications and relevance of such factors, integrating the results into a coherent whole.

- Evaluate the results critically in a wider context, drawing appropriate conclusions.

- Propose solutions and actions, or a range of possible solutions and actions, based on this evaluation.

Assessment

Three hour written examination.

END

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SA7 – Investment and Finance Advanced

Aim

The aim of the Investment and Finance Advanced subject is to instil in successful candidates the ability to apply:

- knowledge of the financial environment in the United Kingdom and other jurisdictions and

- the principles of actuarial practice

to the selection and management of investments in complex situations appropriate to the needs of a range of investors, together with relevant aspects of corporate finance.

Competences

On successful completion of this subject, a student will be able to:

1   understand the more complex aspects of actuarial practice within investment management, in particular being able to show a reasoned and appropriate balance of risk and reward.

2   apply the principles of actuarial practice to the selection and management of investments under complex scenarios.

3   compare the approaches by which the principles are applied in practice areas across different jurisdictions.

4   recommend coherent solutions and courses of action in relation to the overall management of investments.

Links to other subjects

SP5 – Investment and Finance Principles
P7 – Investment and Finance UK Practice Module

SA7

Syllabus topics

1   The framework for investment management, including relevant aspects of corporate finance (30%)

2   Meeting investor requirements, including investment strategies to meet liabilities (35%)

3   Management and risk control for an investment manager, including portfolio management (35%)

These weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

- the extent of prior knowledge which is expected.

- the degree to which each topic area is more knowledge or application based.

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SA subjects, the approximate split of assessment across these three skill types is 20% Knowledge, 50% Application and 30% Higher Order Skills.

Detailed syllabus objectives

1   **The framework for investment management, including relevant aspects of corporate finance (30%)**

1.1   Describe the financial markets in the developed and emerging economies, including:

- public and private market assets.
- over the counter and exchange traded derivatives.
- the historic behaviour of major asset classes and market indices.

1.2   Describe the key domestic and global influences over the economic and capital markets environment in the United Kingdom and other jurisdictions from:

- global economic trends.
- Central Banks.
- government policy.
- market regulation (including MIFID, EMIR).
- regulatory capital requirements (including Basel, Solvency 2).

1.3   Describe how the principles of a legislative, taxation and regulatory conduct framework can be applied to investment management in the United Kingdom and other jurisdictions.

1.4   Discuss the key principles of corporate finance including capital structure and financing, and how these relate to different asset classes.

2   **Meeting investor requirements, including investment strategies to meet liabilities (35%)**

2.1   Discuss the principles and objectives of investment management, along with the main factors influencing investment strategy, and analyse the investment needs of an investor.

2.1.1   Analyse the particular liability characteristics, investment requirements and the influence of the regulatory environment (including capital requirements) on the investment policies of the following institutions:

- a life insurance company transacting with-profits, non-profit or unit-linked business
- a non-life insurance company
- a defined benefit pension fund
- a defined contribution pension fund
- an endowment, charity or other fund
- an unconstrained investor, including a sovereign wealth fund

2.1.2   Discuss the investment strategies that would be suitable to meet an individual investor's requirements, allowing for their risk appetite, time horizon and other constraints.

SA7

3 Management and risk control for an investment manager, including portfolio management (35%)

3.1 Assess the principal techniques in portfolio management.

    3.1.1 Discuss active management approaches, both within and across asset classes, and over different time horizons.

    3.1.2 Discuss passive management and quasi-passive management including factor-based approaches.

    3.1.3 Discuss portfolio risk control techniques and risk-based portfolio construction approaches.

    3.1.4 Describe how derivative based strategies can be used for risk taking or for risk mitigation.

    3.1.5 Describe how a liability benchmark or replicating portfolio can be used as part of an investor's investment strategy.

3.2 Discuss the techniques used for investment management assessment and selection.

    3.2.1 Discuss methods of organising the investment management of a large portfolio.

    3.2.2 Describe the structure of a typical institutional investment department.

    3.2.3 Describe fund of funds and fiduciary management approaches to investment management.

    3.2.4 Describe the function of a performance measurement service.

3.3 Describe the impact of technology on investment management, including:

- trading in derivative, equity and bond markets.
- product development.

4 Solving problems

4.1 Recommend coherent solutions and courses of action in relation to the overall financial management of investment portfolios, having regard to the liabilities.

    4.1.1 Analyse complex problems in terms of actuarial, economic and financial factors to a level where appropriate analytical techniques may be used.

    4.1.2 Assess the implications and relevance of such factors, integrating the results into a coherent whole.

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4.1.3   Evaluate the results critically in a wider context, drawing appropriate conclusions.

4.1.4   Propose solutions and actions, or a range of possible solutions and actions, based on this evaluation.

Assessment

Three hour written examination.

END

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Online Professional Awareness Test (OPAT)

Aim

The aim of the Online Professional Awareness Test (OPAT) is to ensure that all new members of the IFoA have a good understanding of the importance of professionalism, the Actuaries' Code and the approaches taken by the IFoA in terms of regulation and compliance.

Competences

On successful completion of this subject, a delegate will be able to:

1   understand the concepts of professionalism and ethics.

2   understand the role and structure of the IFoA, particularly with regard to regulation and compliance.

3   understand the importance of the Actuaries' Code and its key components.

4   understand how to apply professionalism in practice.

Links to other subjects

Professional Skills Course (PSC)
Professional Skills for Experienced Members
Work-Based Skills

Syllabus topics

1   Introduction to professionalism (25%)
2   The IFoA: structure, regulation and compliance (25%)
3   The Actuaries' Code (25%)
4   Professionalism in practice (25%)

Skill levels

Questions will be mainly Knowledge based (i.e. demonstration of knowledge and understanding of the topic). Some questions may require Application to a simple situation (i.e. demonstration of an ability to apply the principles underlying the topic within a given context).

OPAT

Detailed syllabus objectives

1   Introduction to professionalism (25%)

      1.1   Describe the concept of professionalism.

      1.2   Explain the distinguishing features of a profession.

      1.3   Explain the relevance of professionalism to actuaries.

      1.4   Describe the concept of ethics.

      1.5   Explain the relevance of ethics to actuarial work.

2   The IFoA: structure, regulation and compliance (25%)

      2.1   Explain the role of the IFoA.

      2.2   Describe the structure of the IFoA.

      2..3   Describe the regulation and compliance framework that applies to the IFoA.

      2.4   Describe the Disciplinary Scheme:

            2.4.1   Explain the need for the Disciplinary Scheme
            2.4.2   Explain how a charge can arise, including the definition of misconduct
            2.4.3   Describe the process that would apply to such a case

      2.5   Outline the requirements of the Continuous Professional Development (CPD) Scheme.

3   The Actuaries' Code (25%)

      3.1   Explain the importance of the Actuaries' Code.

      3.2   Explain the scope of the Actuaries' Code.

      3.3   Outline the key components of the Actuaries' Code.

4   Professionalism in practice (25%)

      4.1   Explain the importance of documenting work and the elements of acceptable documentation to achieve a satisfactory audit trail.

      4.2   Explain the importance of checking work and the need to consider work review.

      4.3   Describe how to monitor changes to standards of practice.

      4.4   Explain how to determine which standards apply to a particular work assignment.

4.5 Explain the approach that should be taken if unsure about the best course of action to take.

Assessment

Multiple choice examination (20–40 questions; TBC).

END

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Professional Skills Course (PSC)

Aim

The aim of the Professional Skills Course is to enable members with four to six years' experience to appreciate the practical implications of professionalism and to develop skills that will help them to deal with situations that involve ethical dilemmas. It comprises Level 2 of Professional Skills Training.

Competences

On successful completion of this subject, a delegate will be able to:

1   analyse situations which may require decisions relating to professionalism and ethics.
2   apply professional and ethical standards to such situations.
3   recommend courses of action in such situations.

Links to other subjects

Online Professional Awareness Test (OPAT)
Professional Skills for Experienced Members
Work-Based Skills

Syllabus topics

Professionalism in Practice (100%)

Skill levels

Delegates are required to demonstrate higher order skills, through analysing case study material and proposing solutions.

PSC

Detailed syllabus objectives

1 Professionalism in practice (100%)

    1.1   Assess the ethical content of practical dilemmas for actuaries, including in relation to:

- conflicts of interest.
- impartiality/independence.
- fairness and justice.
- serving the public interest.
- integrity.
- competence and care.
- honesty and openness.
- confidentiality.

    1.2   Propose actions that can be taken in situations:

- which involve professional or ethical dilemmas.
- which could lead to an accusation of professional misconduct.
- where an actuary's integrity could come under pressure.

    1.3   Justify such actions to a third party.

    1.4   Apply professional and ethical standards appropriately to a situation outlined in a case study.

Assessment

Monitored participation, meeting minimum stated contribution levels and standards.

END

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P0 – Generic UK Practice Module

Aim

The aim of this module is to provide a knowledge of United Kingdom (UK) business practice, regulation, legislation and professional guidance notes relevant to the work of an actuary practising in financial services in the UK.

P0 consists of generic material for all actuaries practising in the UK. The content reflects the current (2016) P0 syllabus but the final content will reflect the requirements of the Financial Conduct Authority.

P1–P7 are subject specific and are offered for a choice of specialisms.

Generally, P0 will be taken at the same time as one of P1–P7.

Competences

On successful completion of this subject, a student will know and understand UK business practice, regulation, legislation and professional guidance notes that are relevant to financial services.

Links to other subjects

CB1 – Business Finance

The material introduced in P0 underpins the material in the UK Practice Module specialist subjects P1–P7

P0

Syllabus topics

1   Background to financial institutions and insurance contracts (10%)
2   Institutional investment (15%)
3   Personal investment (10%)
4   Legislation and regulation (60%)
5   Professional guidance (5%)

These weightings are indicative of the balance of the assessment of this subject between the main syllabus topics.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

Skill levels

Questions will be mainly Knowledge based (i.e. demonstration of a detailed knowledge and understanding of the topic). Some questions may require Application to a simple situation (i.e. demonstration of an ability to apply the principles underlying the topic within a given context).

Detailed syllabus objectives

Demonstrate a knowledge and understanding of the following areas in relation to United Kingdom practice:

1   Background to financial institutions and insurance contracts (10%)

   1.1   Purpose and structure of the UK financial services industry.

   1.2   Key organisations, institutions and people in the industry and the roles they play in the provision of financial services products.

   1.3   Concepts and principles underpinning insurance contracts.

2   Institutional investment (15%)

   2.1   The importance of financial planning and the factors that affect financial needs for institutions, including:

   - institutional investors' objectives.
   - factors influencing strategy.

   2.2   Principles and concepts of risk associated with financial planning for institutional investors.

   2.3   Principles of asset ownership to financial services for key UK institutions, including:

   - liability characteristics.
   - investment requirements.
   - influence of the regulatory environment.

3   Personal investment (10%)

   3.1   The importance of financial planning and the factors that affect financial needs throughout life, including:

   - an individual's objectives.
   - factors influencing strategy.

   3.2   Principles and concepts of risk associated with financial planning for individual investors.

   3.3   Principles of asset ownership to retail financial services for individual investors, including:

   - decisions for individuals.
   - collective investments.
   - tax efficient investments.

P0

4 Legislation and regulation (60%)

4.1 Basic principles of business ethics and integrity, including:

- principles underlying the legislative and regulatory framework for investment management and the securities industry.
- objectives of European Union legislation and International Financial Reporting Standards.

4.2 Purpose and structure of UK financial services regulations:

4.2.1 Framework of self-regulation, including:

- roles of Financial Policy Committee, Prudential Regulation Authority and Financial Conduct Authority.
- principles for the conduct of investment business.

4.2.2 Meaning of investment advice, including:

- monitoring and review arrangements.
- rules applying to different types of advice.

4.2.3 How members of the Institute and Faculty of Actuaries are regulated in the conduct of regulated business under the Financial Services and Markets Act 2000.

4.3 Powers of the regulators of financial services, including how the regulatory rules impact on:

- firms and individuals.
- control structures of firms.
- relationships of firms with the regulators.
- approach to ethical conduct by firms and individuals.

4.4 Requirements of the major codes of practice relevant to retail financial services, including:

- Panel on Takeovers and Mergers.
- Competition and Markets Authority.

4.5 Role of the main consumer protection bodies in UK financial services, including:

- role of the financial regulators.
- regulatory requirements for the handling of complaints.
- requirements of the Institute and Faculty of Actuaries.

4.6 Financial services regulators' requirements relating to:

- financial promotions.

- market abuse.
- handling client money.
- nature of business fees and commission.

4.7   Main requirements of other legislation and regulation, including:

- Data Protection Act 1998.
- Proceeds of Crime Act 2002.
- Bribery Act 2010.
- anti money laundering regulations.
- the laws of agency and contract in dealing with customers.

5   Professional guidance (5%)

5.1   Principles underlying the requirements of the professional standards and guidance that are relevant to actuaries practising in financial services, including:

- Actuaries' Code.
- Technical Actuarial Standards.
- practice specific standards and guidance notes.
- International Actuarial Standards.

Assessment

Multiple choice examination (20 questions).

END

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and Faculty
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P1 – Health and Care UK Practice Module

Aim

The aim of this module is to provide a knowledge of United Kingdom (UK) business practice, regulation, legislation and professional standards relevant to the work of an actuary practising in health and care insurance in the UK.

Competences

On successful completion of this subject, a student will know and understand UK business practice, regulation, legislation and professional standards that are relevant to health and care insurance.

Links to other subjects

SP1 – Health and Care Principles
SA1 – Health and Care Advanced
P0 – Generic UK Practice Module
(P0 is taken at the same time as P1.)

Syllabus topics

1   Products (27.5%)
2   Legislation and Regulation (15%)
3   Taxation and State benefits (15%)
4   Valuation (17.5%)
5   General business management (25%)

These weightings are indicative of the balance of the assessment of this subject between the main syllabus topics.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

P1

Skill levels

Questions will be mainly Knowledge based (i.e. demonstration of a detailed knowledge and understanding of the topic). Some questions may require Application to a simple situation i.e. demonstration of an ability to apply the principles underlying the topic within a given context).

Detailed syllabus objectives

Demonstrate a knowledge and understanding of the following areas in relation to UK practice:

1 Products (27.5%)

1.1 The principal terms used in health and care in the UK.

1.2 The major products of interest to UK health and care insurance companies, in terms of:

- customer needs.
- interaction with State provision.
- higher order insurer risk considerations.
- bundling and unbundling.
- impact of unit-linked wrappers.

1.3 Requirements for the design of health and care insurance contracts to be marketed in the UK, including:

- methods and bases for pricing.
- policy conditions.
- capital requirements and return on capital.
- marketability, competition and distribution.
- management of risks.
- underwriting.
- reinsurance.
- investment policy.
- the renewal process and options.
- regulatory requirements.

1.4 Best practice in UK health and care insurance provision, including ABI guidelines.

2 Legislation and regulation (15%)

2.1 The legislative environment for UK health and care insurance companies, including:

- principles of contract and trust law.
- consumer protection legislation, including Unfair Contract Terms and the Financial Ombudsman Service.
- equality legislation, including the EU gender directive.

2.2 The regulatory environment for UK health and care insurance companies, including:

- objectives of the PRA and FCA.
- supervisory tools, including rulebooks, the Conduct of Business Sourcebook, and Treating Customers Fairly.
- supervisory reporting.
- UK statutory actuarial roles.
- Solvency II regulatory framework and structure.

2.3 The principles underlying the requirements of the professional standards and guidance that are relevant to actuaries practicing in or advising UK health and care insurance companies.

3   Taxation and State benefits (15%)

3.1 Taxation of UK health and care insurance products: premiums, benefits, profits.

3.2 Taxation of the UK business of health and care insurers (mutual, proprietaries and providents).

3.3 Understand the considerations underlying the provision of national healthcare systems:

- the importance of healthcare provision
- different healthcare systems worldwide
- different approaches to financing healthcare
- QALYs (quality adjusted life years)

4   Valuation (17.5%)

4.1 Valuation of assets, liabilities and solvency capital requirements under Solvency II.

4.2 Profit reporting under UK GAAP and EU approved IFRS.

4.3 Embedded value reporting, including market consistent embedded values and implications of Solvency II.

4.4 Analysis of Solvency II supervisory valuation surplus.

4.5 Analysis of embedded value for a proprietary company, within the Solvency II environment.

P1

5 General business management (25%)

5.1 Describe the impact of the general business environment on the management of UK health and care insurance business, in terms of:

- products and distribution, including the roles of the State and employers.
- underwriting approaches, including genetic testing.
- use of counterparties.
- external influences – demographic, medical, economic, political and social.

5.2 Understand the principles and practices that are relevant to the assessment of specific business strategies:

- assessment of the market for a new company launch
- assessment of overseas markets
- assessment of a company or portfolio for takeover

5.3 Evaluate the uses and benefits of reinsurance support in health and care insurance:

- control of risks
- financing
- technical assistance
- reinsurance impact
- badging

5.4 Analyse the experience and surplus/profit of a health and care insurer.

5.5 Develop appropriate strategic recommendations for a health and care insurer following an analysis of experience or surplus/profit, including capital management and modelling considerations.

5.6 Analyse the asset-liability matching requirements of a UK health and care insurer and develop appropriate strategies.

Assessment

Multiple choice examination (40 questions, excluding P0).

END

Institute and Faculty of Actuaries

P2 – Life Insurance UK Practice Module

Aim

The aim of this module is to provide a knowledge of United Kingdom (UK) business practice, regulation, legislation and professional standards relevant to the work of an actuary practising in life insurance in the UK.

Competences

On successful completion of this subject, a student will know and understand UK business practice, regulation, legislation and professional standards that are relevant to life insurance.

Links to other subjects

SP2 – Life Insurance Principles
SA2 – Life Insurance Advanced
P0 – Generic UK Practice Module
(P0 is taken at the same time as P2.)

Syllabus topics

1   Products (20%)
2   Legislation and regulation (25%)
3   Taxation (10%)
4   Valuation (25%)
5   General business management (20%)

These weightings are indicative of the balance of the assessment of this subject between the main syllabus topics.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

*   the relative complexity of each topic, and hence the amount of explanation and support required for it.

*   the need to provide thorough foundation understanding on which to build the other objectives.

P2

Skill levels

Questions will be mainly Knowledge based (i.e. demonstration of a detailed knowledge and understanding of the topic). Some questions may require Application to a simple situation (i.e. demonstration of an ability to apply the principles underlying the topic within a given context).

Detailed syllabus objectives

Demonstrate a knowledge and understanding of the following areas in relation to UK practice:

1   Products (20%)

1.1   The major products of interest to UK life insurance companies, including their main features.

1.2   Requirements for the design of life insurance contracts to be marketed in the UK, including appropriate methods and bases for pricing them.

2   Legislation and regulation (25%)

2.1   The legislative environment for UK life insurance companies, including:

- principles of contract and trust law.
- consumer protection legislation, including Unfair Contract Terms and the Financial Ombudsman Service.
- equality legislation, including the EU Gender Directive.
- pensions legislation.

2.2   The regulatory environment for UK life insurance companies, including:

- objectives of the PRA and FCA.
- supervisory tools, including rulebooks, the Conduct of Business Sourcebook, Treating Customers Fairly and the Principles and Practices of Financial Management.
- supervisory reporting.
- UK statutory actuarial roles.
- Part VII transfers of liabilities.
- Solvency II regulatory framework and structure.

2.3   The principles underlying the requirements of the professional standards and guidance that are relevant to actuaries practising in or advising UK life insurance companies.

3   Taxation (10%)

3.1   Taxation of policyholders, in relation to premiums and benefits paid under UK life insurance contracts.

3.2   Corporate taxation of the UK business of life insurance companies.

3.3   Allowance for tax in unit pricing within BLAGAB funds.

4   Valuation (25%)

4.1   Valuation of assets, liabilities and solvency capital requirements under Solvency II.

4.2   Profit reporting under UK GAAP and EU approved IFRS.

4.3   Embedded value reporting, including market consistent embedded values and implications of Solvency II.

4.4   Analysis of Solvency II supervisory valuation surplus.

4.5   Analysis of embedded value for a proprietary company, within the Solvency II environment.

5   General business management (20%)

5.1   Impact of the general business environment on the management of UK life insurance business, in terms of:

- competition and other new business considerations.
- distribution of products and financial advice, including the Retail Distribution Review.
- corporate finance, including mergers and closed funds.

5.2   Capital management techniques that are relevant to UK life insurance companies, including:

- different types of capital assessment.
- typical sources of capital.
- solvency projections, including the use of proxy models.
- methods of improving available capital.
- asset-liability management techniques, including the use of derivatives.

5.3   Sources of risk and risk management techniques that are relevant to UK life insurance companies, including the use of CMI longevity projections.

5.4   Management of UK with profits business, including:

- the calculation and uses of asset shares.
- methods of determining surplus distribution policy.
- regulatory requirements for UK surplus distribution systems.

P2

Assessment

Multiple choice examination (40 questions, excluding P0).

END

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P3 – General Insurance UK Practice Module

Aim

The aim of this module is to provide a knowledge of United Kingdom (UK) business practice, regulation, legislation and professional standards relevant to the work of an actuary practising in general insurance in the UK.

Competences

On successful completion of this subject, a student will know and understand UK business practice, regulation, legislation and professional standards that are relevant to general insurance.

Links to other subjects

SP7 – General Insurance Reserving and Capital Modelling Principles
SP8 – General Insurance Pricing Principles
SA3 – General Insurance Advanced
P0 – Generic UK Practice Module
(P0 is taken at the same time as P3.)

Syllabus topics

1   Products and markets (20%)
2   Legislation, taxation and regulation (20%)
3   Pricing and selling (20%)
4   Reserving (20%)
5   Aspects of financial management (incl. capital modelling) (20%)

These weightings are indicative of the balance of the assessment of this subject between the main syllabus topics.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

P3

Skill levels

Questions will be mainly Knowledge based (i.e. demonstration of a detailed knowledge and understanding of the topic). Some questions may require Application to a simple situation (i.e. demonstration of an ability to apply the principles underlying the topic within a given context).

Detailed syllabus objectives

Demonstrate a knowledge and understanding of the following areas in relation to UK practice:

1   Products and markets (20%)

    1.1   The main features of the United Kingdom general insurance market.

    1.2   The key features of the Lloyd's market.

    1.3   The main types of general insurance product.

2   Legislation, taxation and regulation (20%)

    2.1   The principal regulatory and supervisory requirements that affect general insurers (including Lloyd's) established in the UK.

    2.2   The principal taxation requirements that affect general insurers (including Lloyd's) established in the UK.

    2.3   The principles on which the taxation of a proprietary insurer is based.

    2.4   The technical reserves that can be taken into account in calculating the taxable profits of a proprietary insurer.

    2.5   The principal differences in taxation treatment between a mutual and a proprietary insurer.

    2.6   The principles of taxation within the Lloyd's market.

    2.7   The requirements of the professional standards relevant to actuaries practising or advising United Kingdom general insurance companies and Lloyd's syndicates.

3   Pricing and selling (20%)

    3.1   The various components of a general insurance premium.

    3.2   The basic methodology used in rating general insurance business.

    3.3   The various factors to consider when setting rates.

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3.4 Commercial risks

3.4.1 The particular considerations to be borne in mind when pricing large commercial risks.

3.4.2 The alternative approaches to rating large commercial risks.

3.5 Return on capital

3.5.1 The return on capital in the calculation of premium rates.

.3.6 Catastrophe modelling

3.6.1 The use of catastrophe modelling in non-life actuarial work.

3.6.2 The difference between catastrophe modelling and traditional actuarial rating methods.

3.6.3 The generic structure of a catastrophe model.

3.6.4 The key perils modelled.

3.6.5 The key uses to which a non-life actuary might put the output of catastrophe models.

3.6.6 The key considerations in using the output of catastrophe models.

4 Reserving (20%)

4.1 Reserving work using deterministic and stochastic methodologies.

4.2 The appropriate bases for valuing the insurance liabilities of a United Kingdom general insurer in order to produce:

- Companies Act accounts and statutory returns.
- taxation accounts.
- management accounts.

4.3 Evaluating and communicating the results including uncertainty.

4.4 The reasons why different reserving techniques are required for latent claims and disease claims.

5 Aspects of financial management (20%)

5.1 The major areas of risk and uncertainty in general insurance business.

5.2 The use of data.

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5.3 The major actuarial investigations and analyses of experience.

5.4 The financial planning requirements of a general insurer and develop appropriate strategies.

5.5 The appropriate models for the purpose of financial planning to enable a general insurer to develop and monitor its objectives at either the corporate or product level.

5.6 The key considerations in deriving and applying capital modelling techniques.

- deterministic models
- stochastic models
- developing assumptions
- validation
- insurance risk
- market risk
- credit risk
- operational risk
- liquidity risk
- group risk

5.6.1 The areas to consider when approaching a capital modelling exercise.

5.6.2 The practical considerations which should be borne in mind when undertaking capital modelling.

5.7 The reasons why a general insurer may wish to transfer a portfolio of business to another insurer.

5.7.1 The alternative approaches to such a transfer, including the situations in which each may be appropriate.

5.8 The recommendations for the overall financial management of a general insurer.

Assessment

Multiple choice examination (40 questions, excluding P0).

END

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P4 – Pensions and other benefits UK Practice Module

Aim

The aim of this module is to provide a knowledge of United Kingdom (UK) business practice, regulation, legislation and professional standards relevant to the work of an actuary practising in life insurance in the UK.

Competences

On successful completion of this subject, a student will know and understand UK business practice, regulation, legislation and professional standards that are relevant to pensions and other benefit arrangements.

Links to other subjects

SP4 – Pensions and other benefits Principles
SA4 – Pensions and other benefits Advanced
P0 – Generic UK Practice Module
(P0 is taken at the same time as P4.)

P4

Syllabus topics

1   Terms and abbreviations used in pensions and other benefits (20%)
2   Actuarial Standards, TAS, APS (20%)
3   UK legislation, taxation and regulation (excluding standards in 2) (20%)
4   Accounts, funding methods, valuation methods & basis (20%)
5   General, duties, roles & responsibilities, scheme design (20%)

These weightings are indicative of the balance of the assessment of this subject between the main syllabus topics.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it.

- the need to provide thorough foundation understanding on which to build the other objectives.

Skill levels

Questions will be mainly Knowledge based (i.e. demonstration of a detailed knowledge and understanding of the topic). Some questions may require Application to a simple situation (i.e. demonstration of an ability to apply the principles underlying the topic within a given context).

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Detailed syllabus objectives

Demonstrate a knowledge and understanding of the following areas in relation to UK practice:

1   Terms and abbreviations used in pensions and other benefits (20%)

    1.1   The main terms used in the provision of benefits in the UK.

2   Actuarial Standards, TAS, APS (20%)

    1.2   The professional standards which apply to actuaries practising in the UK, including:

- the general Technical Actuarial Standards on Data, Modelling and Reporting, and the specific Technical Actuarial Standards on Pensions and Transformations.
- the Actuaries' Code.
- Actuarial Profession Standards P1, X1, X2 and X3.

3   UK legislation, taxation and regulation (excluding standards in 2) (20%)

    1.3   The legislative environment for the following UK stakeholders in the provision of pension benefits:

- the State.
- HM Revenue & Customs.
- the Pensions Regulator.
- the Board of the Pension Protection Fund.
- employers.
- individuals.
- trustees.
- actuaries.
- investment advisers.
- other advisers.

4   Accounts, funding methods, valuation methods & basis (20%)

    4.1   The professional standards which apply to actuaries practising in the UK, including:

- accounting standards IAS19, FRS102 and ASC715.

5   General duties, roles & responsibilities, scheme design (20%)

    5.1   Pension provision in the UK, including:

- occupational benefit schemes.
- public and private sector arrangements.
- the main saving alternatives to pension savings available to individuals.

P4

In respect of the following:

- scheme design
- financing and funding
- member options and guarantees
- corporate activity such as mergers and acquisitions
- risk management, including investment strategy and insurance

5.2   Valuation of assets, past and future benefits and future contributions.

5.3   Analysis of surplus/deficit and experience between valuations.

5.4   Discontinuance of benefit provision.

Assessment

Multiple choice examination (40 questions, excluding P0).

END

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P7 – Investment and Finance UK Practice Module

Aim

The aim of this module is to provide a knowledge of United Kingdom (UK) business practice, regulation, legislation and professional guidance notes relevant to the work of an actuary practising in investment in the UK.

Competences

On successful completion of this subject, a student will know and understand UK business practice, regulation, legislation and professional guidance notes that are relevant to investment:

Links to other subjects

SP5 – Investment and Finance Principles
SA7 – Investment and Finance Advanced
P0 – Generic UK Practice Module
(P0 is taken at the same time as P7.)

Syllabus topics

1   Asset characteristics, historic returns and indices (55%)
2   Legislation, regulation and professional guidance (10%)
3   Taxation (10%)
4   Investors' needs and asset/liability matching (15%)
5   Portfolio management techniques and performance assessment (10%)

These weightings are indicative of the balance of the assessment of this subject between the main syllabus topics.

The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

*   the relative complexity of each topic, and hence the amount of explanation and support required for it.

*   the need to provide thorough foundation understanding on which to build the other objectives.

P7

Skill levels

Questions will be mainly Knowledge based (i.e. demonstration of a detailed knowledge and understanding of the topic). Some questions may require Application to a simple situation (i.e. demonstration of an ability to apply the principles underlying the topic within a given context).

Detailed syllabus objectives

Demonstrate a knowledge and understanding of the following areas in relation to UK practice:

1   Asset characteristics, historic returns and indices (55%)

    1.1   Characteristics of the principal investment assets and the markets in such assets covering the main markets in:

- equities.
- bonds.
- commodities.
- derivatives.

    1.2   How an institutional investor might provide funds for the finance of a property investment or development.

    1.3   Main features of the historic behaviour of markets and indices and their relationships to each other and to price and earnings inflation.

2   Investment framework, including legislation, regulation and professional guidance (10%)

    2.1   Key influences over the economic and capital markets environment in the UK.

    2.2   Key principles of corporate finance including capital structure and financing in the UK.

    2.3   Legislative and regulatory framework for investment management and the securities industry, including:

- the framework of regulation in the investment industry.
- how members of the Institute and Faculty of Actuaries are regulated in the conduct of investment business under the Financial Services and Markets Act 2000.
- the circumstances under which actuaries require authorisation under the Financial Services and Markets Act 2000.

    2.4   Principles underlying the requirements of the professional standards and guidance that are relevant to actuaries practising in the investment field.

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2.5   Any proposed changes in legislation or professional guidance that will affect the work undertaken or advice given by actuaries practising in the investment field, and their expected effective date of implementation.

3   Taxation (10%)

3.1   Taxation of investments for typical investors in the UK, including:

- individual investor.
- life insurance company.
- non-life insurance company.
- pension scheme.

4   Investors' needs and asset/liability matching (15%)

4.1   Investment needs of particular investors, in particular:

- the investment requirements and regulatory constraints for key institutional investors.
- the appropriate investments for an individual investor.
- the appropriate investments for an unconstrained investor.
- the risks faced by investors and how an investor's risk profile is determined.

4.2   Asset liability matching requirements and appropriate strategies in relation to the following institutions in the UK:

- life insurance company
- non-life insurance company
- defined benefit pension scheme
- defined contribution pension scheme
- endowment or charity fund

5   Portfolio management techniques and performance assessment (10%)

5.1   Principal techniques in portfolio management, including:

- risk control techniques.
- performance assessment.
- overall management of assets to meet investors' liabilities.

Assessment

Multiple choice examination (40 questions, excluding P0).

END

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Assumed knowledge

Please find below a list of objectives which will be moved into pre-requisite material.

CT3	(i)	1	Summarise a set of data using a table or frequency distribution, and display it graphically using a line plot, a box plot, a bar chart, histogram, stem and leaf plot, or other appropriate elementary device.
CT3	(i)	2	Describe the level/location of a set of data using the mean, median, mode, as appropriate.
CT3	(i)	3	Describe the spread/variability of a set of data using the standard deviation, range, interquartile range, as appropriate.
CT3	(i)	4	Explain what is meant by symmetry and skewness for the distribution of a set of data.
CT3	(ii)	1	Explain what is meant by a set function, a sample space for an experiment, and an event.
CT3	(ii)	2	Define probability as a set function on a collection of events, stating basic axioms.
CT3	(ii)	3	Derive basic properties satisfied by the probability of occurrence of an event, and calculate probabilities of events in simple situations.
CT3	(ii)	4	Derive the addition rule for the probability of the union of two events, and use the rule to calculate probabilities.
CT3	(ii)	5	Define the conditional probability of one event given the occurrence of another event, and calculate such probabilities.
CT3	(ii)	6	Derive Bayes' Theorem for events, and use the result to calculate probabilities.
CT3	(ii)	7	Define independence for two events, and calculate probabilities in situations involving independence.
CT3	(iii)	1	Explain what is meant by a discrete random variable, define the distribution function and the probability function of such a variable, and use these functions to calculate probabilities.
CT3	(iii)	2	Explain what is meant by a continuous random variable, define the distribution function and the probability density function of such a variable, and use these functions to calculate probabilities.
CT3	(iii)	3	Define the expected value of a function of a random variable, the mean, the variance, the standard deviation, the coefficient of skewness and the moments of a random variable, and calculate such quantities.
CT3	(iii)	4	Evaluate probabilities (by calculation or by referring to tables as appropriate) associated with distributions.
CT3	(iii)	5	Derive the distribution of a function of a random variable from the distribution of the random variable.