ACTUARIAL STATISTICS-AN INTRODUCTION USING R BY SHAILAJA R DESHMUKH

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This book is a refreshing guide to various actuarial concepts and statistical techniques deployed in the calculation of premiums and reserves for life insurance products and annuities. It builds on from the very basic concepts, defining and explaining terms along the way, to move on to their application to real life situations and products. Although the focus of the book is primarily on calculations related to life-insurance products, the statistical concepts discussed will prove to be useful to all students in the actuarial domain, especially those studying the CT series of subjects.

The highlight of the book is its introduction to the R software and its usage for statistical computations and analysis. R is a software cum programming language with simple syntax that uses the usual arithmetic operators to write commands to perform required computations. It can be downloaded and installed free of charge. This book not only introduces readers to the software but also enlists several examples to explain the commands typed in and the output thus generated. The statistical calculations discussed in most chapters are followed by detailed examples illustrating how R can be used to perform the same calculations.

This book is broadly divided into nine sections. Each section begins with a summary of key terms and an introduction to the topics covered. The first part is a familiarisation to the insurance business and the concept of risk. It also discusses the role of statistics in insurance and provides a synopsis on the growth of insurance in the Indian market and the emergence of the actuarial profession.

The next section begins with introducing readers to the theory of probability and the notions of mean, standard deviation, moments and probability density functions. It moves on to discuss some standard and frequently encountered discrete and continuous distributions such as Bernoulli, Binomial, Poisson, Negative Binomial, Uniform, Exponential, Gamma, Chi-Square, Normal etc. These are tabulated with summary statistics for ease of reference of formulae. This is followed by discussing multivariate distributions and associated concepts of covariance, conditional probability, joint and marginal distribution functions. The section concludes with a brief introduction to the law of large numbers and the central limit theorem.

The third section builds upon the previous section and introduces the concept of a utility function. This section is more practical in nature and has several examples to illustrate the measurement of risk using individual risk models where the aggregate claim amount from a portfolio is assessed using a fixed number of policies from the portfolio. It extends this concept to recognising the uncertainty in both the number of claims and amounts of individual claims, using collective risk models to model both frequency and severity. There are plenty of examples and exercise questions for students to practice the concepts studied.

The fourth section discusses the distribution theory related to the future life time random variable. This section introduces readers to the basics of life insurance related statistics and acquaints them with the concept of a survival function, force of mortality and curtate future life time variable. It also discusses the frequently used Gompertz's law and Makeham's law of mortality and assumptions used for fractional ages. It goes on to constructing life tables, differentiating between select and ultimate life tables. All life functions are well explained using graphs to illustrate their nature with increasing age. Actuarial notations used are clearly spelt out for the benefit of the readers. This section first introduces R to the readers. Clear commands and crisp instructions make them easy to follow for a reader with little or no previous experience of programming. Examples are provided on performing computations using R to first construct a life table and then use it to find the curtate future life time distribution of a life aged 25 years.

The following four sections deal with the topics of actuarial present values of benefit payable for various life insurance products, annuities, premium and reserve computations. The fifth section is about present value computations of benefits payable at the moment of death or at the end of year of death for whole life insurance, term life insurance, endowment insurance and deferred insurance products. It begins with the basic concepts of force of interest and discount factors. Computations of present values in R using loops in programming are illustrated at the end of the section. As mentioned previously, this section too has internationally accepted actuarial notations and formulae tabulated for ready reference and numerous examples and exercise questions for practice. The sixth section deals with various kinds of annuities and related computations. It discusses annuities certain, annuities due, annuities immediate, discrete and continuous annuities, whole-life, deferred and temporary life annuities.

The next section extends the concept of present value calculations of benefits for life insurance products and annuities to determining premiums for these products keeping in mind the frequency of premium payments. It also introduces the concepts of benefit premiums and expense loaded premiums. The eighth section deals with valuation or reserve calculations for each policy using the prospective and the retrospective approach. It separately discusses reserve estimation for fully discrete policies and fully continuous policies. The book concludes with a brief discussion on the concepts of joint life status and last survivor status in the last section.

This book will prove beneficial to all those interested in practical applications of actuarial statistics to various life insurance products. It is easy to follow and moves on step-by-step from basics to detailed calculations. It is also useful as a ready reference guide for various formulae and notations related to life insurance products. The introduction to R is an added benefit to the readers some of whom may even find it useful to implement in their area of work practice.

Introduction. R is a popular language and environment that allows powerful and fast manipulation of data, offering many statistical and graphical options. Graphical representation of data is pivotal when one wants to present scientific results, in particular in publications. R allows you to build top quality graphs (much better than Excel for example). In this manual, however, we are going to focus on the statistical possibilities of R. Whatever package you use, you need some basic statistical knowledge if only to design your experiments correctly, so there is no way out of it! And don't forge... The strength of our Actuarial Statistics subjects is the emphasis on understanding statistical concepts and methods, and their practical application to actuarial problems. In both CS1 and CS2, emphasis is placed on being able to apply statistical methods to actuarial problems using real data sets and the open-source software environment R. In designing these new subjects will enhance Actuarial Science for our student members through the development of transferable skills and enhanced employability. Find out more on how to install R and how it is used in the CS1B and CS2B examinations: Getting started with R. CS1 and CS2 examination guide. Please note: the CS1 and CS2 exams are now a combination of both a written (A) and an online (B) assessment. using R: an introduction. Adrian Waddell. University of Waterloo Departement of Statistics and Actuarial Science. September 8, 2010. About these Slides. These slides were written on behalf of the Departement of Statistics and Actuarial Science at the University of Waterloo, Canada. At the time of writing, the current software versions are GNU Emacs 23.1.1 Eclipse SDK Version: 3.5.2 R version 2.11.1 ESS 5.11. There are more slides like these on our homepage. Statistics plays a key role in laying the foundation of actuarial calculations in the presence of uncertainty in the mortality pattern of society and under varying economica Actuarial Statistics: An Introduction Using R Book Description About the Book: Actuarial science is an interdisciplinary science comprising four subjects'mathematics, statistics, economics and finance. Statistics plays a key role in laying the foundation of actuarial calculations in the presence of uncertainty in the mortality pattern of society and under varying economical conditions. Actuarial calculations mainly involve determination of premium rates and computation of reserves.