R for Actuarial Statistics

Krishna Kumar Shrestha

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Preface

Welcome to *Foundations of Statistical Modeling and Analysis: A Computational Approach.* I'm excited to be your guide through the intricate world of statistical science and programming. My name is Krishna Kumar Shrestha, and as an educator deeply passionate about mathematics and its applications, I've witnessed firsthand the transformative power of statistical analysis in various domains, from finance to healthcare and beyond.

This course draws heavily from BMS102 Actuarial Statistics I and BMS152 Actuarial Statistics II and emphasizes the practical implementation of statistical concepts using the R programming language. This book focuses primarily on practical aspects rather than theoretical discussions. Through the R programming environment, you'll not only master the fundamental syntax and object types of R programming but also delve into probability distributions, data analysis, statistical inference, and regression theory.

Approach each chapter with curiosity and diligence, embracing the challenges and celebrating the breakthroughs. Remember, mastery is a journey, not a destination. With dedication and perseverance, you'll emerge equipped to tackle the complexities of statistical modeling with confidence and precision.

I extend my heartfelt gratitude to all the students, educators, and professionals who have contributed to this book's development, directly or indirectly. Your insights, feedback, and passion for learning have been invaluable.

In closing, I wish you a fulfilling and enriching learning experience. May this book serve as a guiding light on your path to mastering the computational aspects of statistical modeling and analysis.

Happy coding!

Krishna Kumar Shrestha

1 Introduction

1.1 Welcome to R programming

Hello, My name is Krishna Kumar Shrestha. I'm glad you're here! This book is a guide to learning R, a powerful computer language used for statistics and data analysis. It's written for students who are preparing for Actuarial Professional Exams that requires R programming but it's also great for anyone who wants to learn R from scratch and move to an intermediate level.

1.2 What's Inside This Book?

In this book, we will start with the basics of R and work our way up to more complex topics. I will explain things step-by-step, so you don't need to worry if you are new to programming or statistics. By the end of this book, you will know enough about R to do real-world data analysis, especially in the field of actuarial statistics. Along the way, I will give you exercises and examples to help you practice.

1.3 Why learn R?

R is a free and open-source language, which means anyone can use it and contribute to it. It is used by data scientists, statisticians and researchers all over the world. With R, you can do simple tasks like adding up numbers, as well as complex things like making charts and Running statistical tests. Its very useful tool, and once you learn it, you will have a skill that can help you in your research or in professional work

1.4 Let's Get started!

Now that you know a bit about R and what's in this book , let's get started! Follow the instructions in the next chapters to set up R and Rstudio, and then we will dive into the basics. I am excited to guide you through this journey. By the end , you will be able to use R for all sorts of data analysis, especially in the field of actuarial statistics. Let's go!

2 Setting Up Your R Environment

Before we can start coding in R, lets make sure everything is set up properly. In this chapter, we will install R and Rstudio, the tools you will use throughout this book. We will also explore the RStudio interface to understand where everything is and what each part does.

2.1 Installing R

To install R, go to the Comprehensive R Archive Network (CRAN) website and choose the version that matches your operating system(Windows, macOS or Linux). Follow the on-screen instructions to complete the installation. If you run into any issues, check the FAQs on the CRAN website or reach out to online R forums for help.

2.2 Installing Rstudio.

Once R is installed, lets install Rstudio. It's an integrated development environment(IDE) that makes working in with R easier. Visit the RStudio Website and download the desktop version for your operating system. After downloading, follow the installation steps to set up RStudio.

2.3 Exploring the RStudio Interface

When You first open Rstudio, it might look a bit overwhelming with multiple panes and buttons. Don't worry; we will break it down to understand what each part does and how to use it. Here's guide to the main components of the RStudio interface:

1. Console: This is where you can type and run R code directly. It's usually in the bottom-left corner of the screen. You can type commands here and press `Enter` to execute them.

2. Script Editor: This is where you write and save your R scripts (A script in a file containing a series of R commands). If you don't see the Script Editor when you open RStudio, you can create a new script by clicking "File" > "New File" > "R Script." It will usually appear in the top-left corner. You can write your code here and run it in the Console by pressing `Ctrl + Enter` (Windows) or `Cmd+Enter` (macOS).

3. Environment Pane: This pane shows you all the variables, data frames, and other objects you are working with. By default, it's located in the top-right corner. This pane is useful for keeping track of the data in your current R session.

4. Files Pane: this pane displays the files in your working directory(the folder where Rstudio looks for files). It's usually in the bottom-right corner. You can use it to navigate through your files and open scripts or data files.

5. Plots Pane: This is where you will see any plots or graphs you create. By default, it's also in the bottom-right corner, typically sharing space with the files Pane. If you create a plot in R, it will appear here.

6. Packages Pane: This pane shows you the R packages installed on your system and allows you to install or update packages. It is Generally located in the bottom-right corner, sharing space with the Files and Plots Panes.

7. Help Pane: This pane provides documentation and help for R commands and packages. You can usually find it in the bottom-right corner as well. When you use the `?` command or press `F1` on a function, the documentation will appear in this pane.

2.4 Customizing Your Work Space

RStudio allows you to customize your work space by resizing and moving panes. If you find that the default layout doesn't suit you, you can adjust it. To move a pane, click and drag the tab to a new location. To resize a pane, hover over the edge of a pane until you see a double-headed arrow, then click and drag to adjust the size.

8. If you want to reset the layout to the default settings, go to "Tools" > "Global Options" > "Pane Layout" and click "Reset to Default". This will return the interface to its original setup.

> Exercise 2.1 What is the difference between R and RStudio? Describe the roles each plays in the process of writing and executing R code.
>
> Exercise 2.2 Explain the differences between the console and script file in Rstudio. When would you use one over the other?

3 Summary

In summary, this book has no content whatsoever.

```r
1 + 1
```

```
[1] 2
```

References