Health Economic Modeling in R: A Hands-on Introduction

Pre-read materials

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Contents

1 Introduction

This document outlines course the structure and pre-read materials for the ISPOR EU 2025 in-person short course entitled "Health Economic Modeling in R: A Hands-on Introduction".

The planned itinerary for the course can be found at ISPOR short course.

- 8.00-8.05: Welcome & introductions ***Felicity Lamrock***
- 8.05-9.00: Introduction to R for Health Economics using (BCEA) ***Gianluca Baio***
- 9.00-10.00: Discrete time Markov models (deterministic) ***Felicity Lamrock***
- 10.00-10.15: **Coffee break**
- 10.15-11.15: Discrete time Markov models (probabilistic) ***Howard Thom***
- 11.15-12.00: Additional Useful Packages for R Modelling (shiny, hesim, rmarkdown) ***Rose Hart***

All parts of the course will have practical demonstrations and exercises for attendees to view in-session and will be available post-session via our combined GitHub repository.

It is recommended that you read through this document prior to attending the short course, and action the necessary points. There are further recommended materials provided; these will be discussed in the course but can be completed after the session by attendees.

These course materials, as well as extensive extended reading, can also be found in our book R for Health Technology Assessment, which can also be accessed online here.

2 Objectives of short course

1. Understand the advantages of R over Microsoft Excel for health economic modelling
2. Implement deterministic and probabilistic discrete-time cohort Markov models in R
3. Use the BCEA package to generate graphical and statistical summaries of health economic models
4. Understand and be able to use additional useful packages in R to increase user-friendliness and accessibility

3 Description summary

This highly practical course will outline the computational and transparency advantages of using R, for those used to health economic modelling using Microsoft Excel. This course explores the use of R for health economic modelling in the context of health economics and outcomes research (HEOR) and faculty will guide the participants through practical examples of HEOR. The faculty are expert speakers who have diverse experience in academia, national Health Technology Assessment agencies (NICE, NCPE), and industry. The faculty will lead participants through practical examples of health economic modelling including using R for Markov models from deterministic analysis through

to probabilistic sensitivity analysis and EVPI. Additional useful packages for modelling using R will also be discussed. All sessions will interchange between descriptive lectures and hands-on exercises. Participants will be provided with materials, including model examples in R and information on where to go for further learning. This course is designed for those with some familiarity with modelling techniques, such as the concepts of discrete time cohort Markov models and probabilistic sensitivity analysis, but familiarity with R coding is not required. Attendees will require a laptop with RStudio (v1.1.0 or higher) and R (v4.2.0 or higher) downloaded and installed.

4 Pre-course requirements

4.1 Download R and RStudio

This online book An introduction to R is a great place to learn to setup your R environment and start with learning R. It is not specific to health economics. Please view the setup page to go through installing R and R Studio on your machines. Please install R version 4.2.0 or higher and RStudio version 1.1.0 or higher. Also, please look at the 'Introducing RStudio' video to familiarize yourself with the RStudio layout.

You may find this book useful for continued post-course learning, as it has many great (and free) tutorials and exercises for beginners.

After setup, our book, R for Health Technology Assessment, offers HTA-specific teachings and exercises to build and extend on the skills learned in this course. This resource combines health economic principles with practical examples in R, and the online version is updated periodically.

4.2 Introduction to R coding

We recommend that attendees are familiar with the syntax and basic methods of R coding, such as how to assign variables and knowing the basic data types. Therefore, all attendees who are using R for the first time should undertake a practical introduction to R via DataCamp's 'Intro to basics' module for hands-on exercises prior to the short course.

4.3 Accessing the course materials

4.3.1 Downloading materials

The course materials can be found in our GitHub repository (at https://github.com/rhart1/Health-Economic-Modeling-in-R_A-Hands-on-Introduction-). It is recommended that materials are accessed after 25th March 2025 as they will be the most up to date before the session whilst giving you enough time to prepare and install packages ahead of the session.

If attendees have a GitHub account and are happy with cloning or forking a project to their own accounts, then feel free to do so. For those without a GitHub account, all project materials can be downloaded via a ZIP folder as indicated in the image below. GitHub is recommended but optional; it is useful for code version control and managing projects in any coding language. Further details can be found in 'Other pre-course materials'.

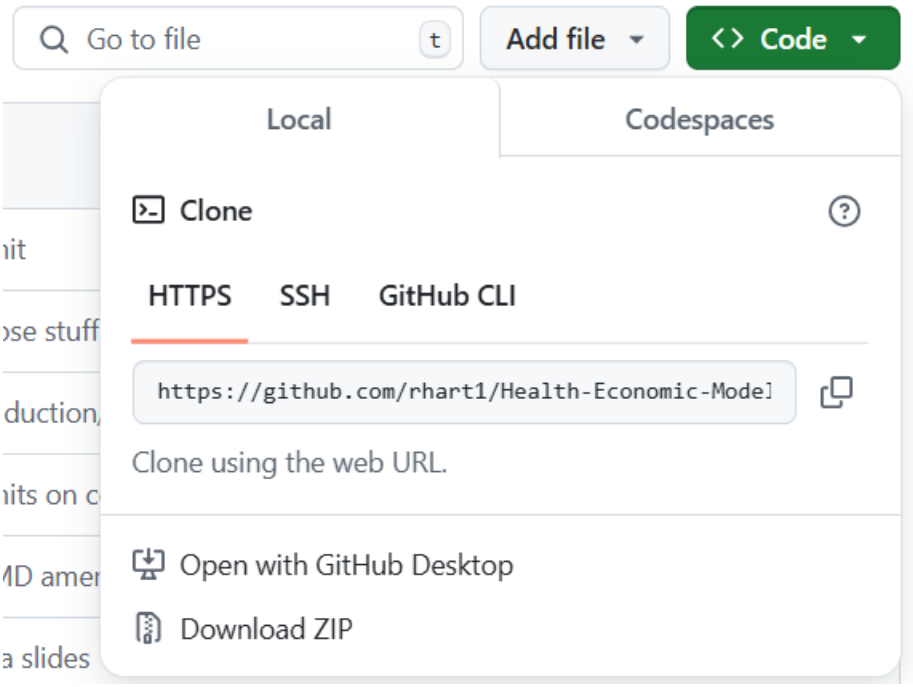

Figure 1: These are the options for accessing the materials, which can be found on the GitHub repository page

4.3.2 Opening materials

Once attendees have the materials folder via ZIP or GitHub, the project needs to be opened in RStudio as a **project**. For those who are unfamiliar with project files, they are self-contained work areas that can be managed by version control software (Git). When a user opens a project, the working directory (file location) is set automatically to the location of the project, meaning that scripts that reference other scripts (this is common in shiny apps or markdown documents, and will be covered in the 'Additional useful packages' part of the course).

To open the materials as a project, within RStudio, please go to 'File' -> 'Open project in New Session', then find the location where you have the materials file saved. You need to click on the '.Rproj' file.

Figure 2: The '.Rproj' file is likely to have this logo

4.3.3 Downloading required packages

Once opent, if this is the first time opening then you will need to run the init.R script.

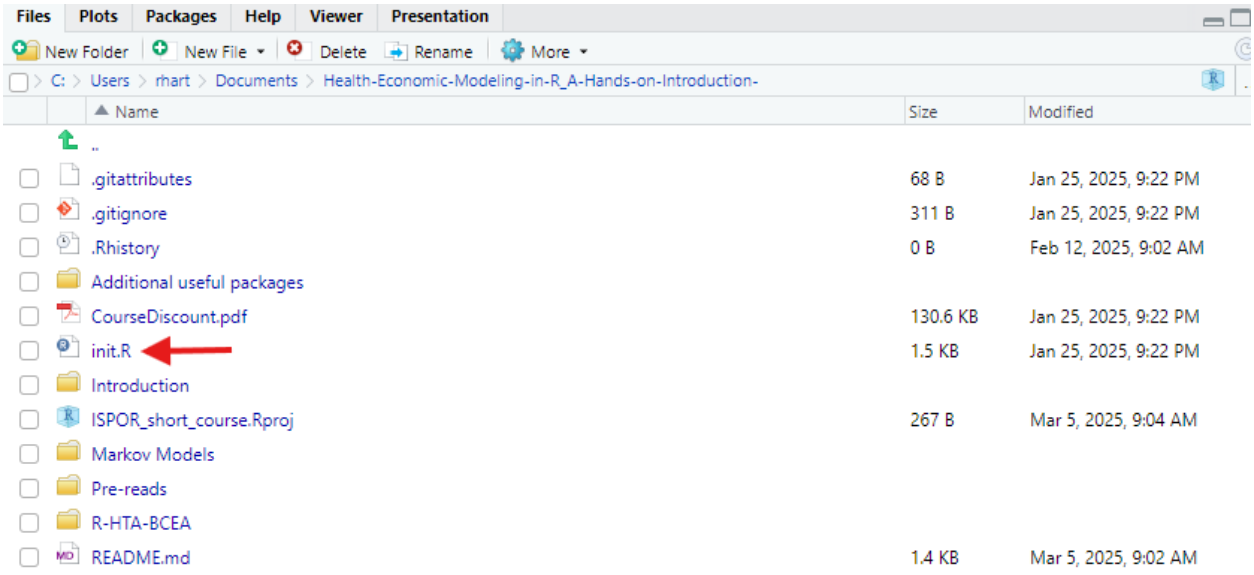

Figure 3: The init.R script is in the project folder at the top level

The init.R script has a code that checks the packages that are already installed. It will then download and install all the packages that are required for the short course that are missing and will then load all packages. If you have not previously used R, then this may take a few minutes. If you have used R before and have many of the packages installed, then please update your existing packages by going to 'Tools' -> 'Check for package updates' in RStudio to update to the most recent version.

Once those are downloaded then you are ready for the short course.

4.3.4 On the day

Some of the short course sessions will be running through code live, so on the day it would be best if all attendees have the R project with the short course materials downloaded and open, even if not all the packages have been successfully installed.

5 Other pre-course materials (optional)

In this section is additional reading to complement some of the above instructions. It is recommended as prior reading but is optional. Alternatively, it can be completed after the course to flesh out some of the practical details for using R for health economics projects.

5.1 What is a package and how to install one

This DataCamp guide gives a useful overview of what packages are, how they can be used, how to install them and an explanation into some of the language used when talking about R.

5.2 Background and instructions for GitHub

As mentioned previously, Git is software that manages version control for code, and GitHub is the interface to view and manage the changes over time. This online GitHub guide is useful for detailing how to use Git and takes the reader through creating a repository, branching and making changes.

Additionally, the setup guide referenced in the 'Download R' section above also mentions GitHub and R Markdown in the 'Optional Software' section for some background and useful reading.