

1.5: Outline of the Book

The goal of this text is to develop an understanding of how to build theories by testing hypotheses using empirical data and statistical models. There are three necessary ingredients of strong empirical research. The first is a carefully constructed theory that generates empirically testable hypotheses. Once tested, these hypotheses should have implications for the development of theory. The second ingredient is quality data. The data should be valid, reliable, and relevant. The final ingredient is using the appropriate model design and execution. Specifically, the appropriate statistical models must be used to test the hypotheses. Appropriate models are those that are properly specified, estimated, and use data that conforms to the statistical assumptions. This course focuses on model design and execution.

As noted, this text uses political ideology and views on the environment as a case study to examine theory building in the social sciences.³ The text is organized by the idealized steps of the research process. As a first step, this first chapter discussed theories and hypothesis testing, which should always be (but often are not!) the first consideration. The second chapter focuses on research design and issues of internal and external validity. Chapter 3 examines data and covers specific ways to understand how the variables in the data are distributed. This is vital to know before doing any type of statistical modeling. The fourth chapter is an introduction to probability. The fifth chapter covers inference and how to reach conclusions regarding a population when you are studying a sample. The sixth chapter explores how to understand basic relationships that can hold between two variables including cross-tabulations, covariance, correlation, and difference of means tests. These relationships are the foundation of more sophisticated statistical approaches and therefore understanding these relationships is often a precursor to the later steps of statistical analysis. The seventh through tenth chapters focus on bi-variate ordinary least squares (OLS) regression or OLS regression with a dependent variable and one independent variable. This allows us to understand the mechanics of regression before moving on the third section (chapters eleven to fifteen) that cover multiple OLS regression. The final section of the book (chapter sixteen) covers the logistic (logit) regression. Logit regression is an example of a class of models called generalized linear models (GLM). GLMs allow for linear analysis to be performed on different types of dependent variables that may not be appropriate for OLS regression.

As a final note, this text makes extensive use of `R`. The code to reproduce all of the examples is excluded in the text in such a way that it can be easily copied and pasted into your `R` console. The data used for the examples is available as well. You can find it [here](#).

1. This matter will be discussed in more detail in the multiple regression section.↩
2. The more coffee, the greater the productivity – up to a point! Beyond some level of consumption, coffee may induce jitters and ADD-type behavior, thereby undercutting productivity. Therefore the posited function that links coffee consumption to productivity is non-linear, initially positive but then flat or negative as consumption increases.↩
3. As you may have already realized, social scientists often take these steps out of order ... we may back into" an insight, or skip a step and return to it later. There is no reliable cookbook for what we do. Rather, think of the idealized steps of the scientific process as an important heuristic that helps us think through our line of reasoning and analysis – often after the fact – to help us be sure that we learned what we *think* we learned from our analysis.↩

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