

LBOMETR Course Book

Jem Marie M. Nario

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1 Introduction

Welcome to the **LBOMETR Course Book**! This book is designed to guide students through the course by providing all necessary resources, materials, and instructions.

This course book is intended to ensure that DLSU Carlos L. Tiu-School of Economics students will be able to learn more about Econometrics using R. You will find sections on the syllabus, course assessments, and group projects, as well as guidance for navigating the course effectively.

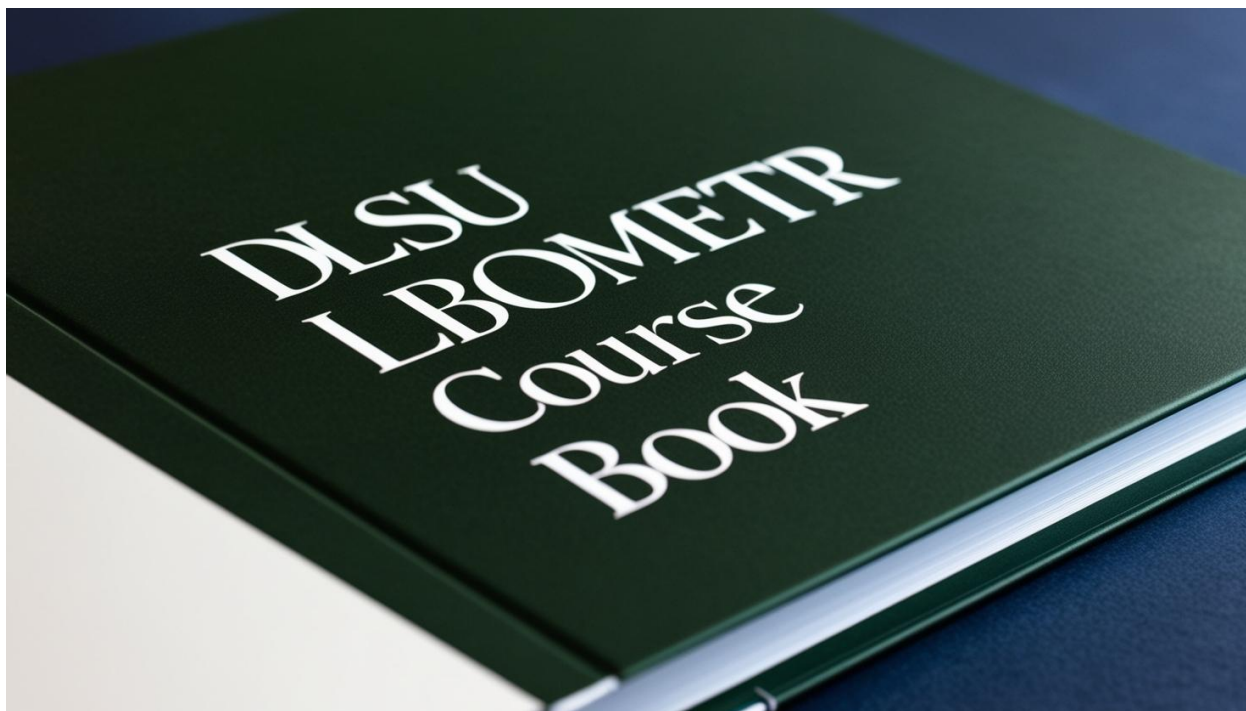


Figure 1: LBOMETR

1.1 About Me

My name is **Jem Marie M. Nario**, and I am your lecturer for this course. I am excited to guide you through this journey of learning and discovery since I am also on a journey of learning and discovery while teaching part-time.

This book is a trial version which will be updated along the course as it also serves as a practice for me.

- **Email:** jem.nario@dlsu.edu.ph
- **LinkedIn:** [linkedin.com/in/jmnario/](https://www.linkedin.com/in/jmnario/)

Feel free to reach out with any questions or concerns throughout the course.

2 Syllabus

You can download the course syllabus using the link below:

[Download Syllabus \(Word Document\)](#)

2.1 Course Description

This course introduces Economics majors to more advanced commands and techniques used in the econometric software package **R**, which is commonly used in empirical research.

2.2 Learning Outcomes

2.2.1 Knowledge

- To be able to distinguish a theoretical economic model from a statistical econometric model.
- To be able to use the R software package in estimating advanced econometric models.
- To learn advanced econometric models so that students can learn new methods of research.

2.2.2 Skills

- Apply numerical and statistical techniques in economic analysis.
- Use statistical concepts as a language in economic discourse.
- Confidently write script files for economic analysis.

2.2.3 Behavior/Attitude

- To imbibe in the student the need for transparency and academic integrity when handling data analysis.
- To allow the student to learn to construct more complex programs from basic commands learned in class.

2.3 Grading

2.3.1 Grade Components

| Component | Weight (%) |
|-------------------------|-------------|
| Attendance | 5% |
| Group Participation | 10% |
| Data Story Presentation | 35% |
| Data Story Archive | 50% |
| Total | 100% |

2.3.2 Grade Scale

| Percentage Range | Grade |
|------------------|-------|
| 96 - 100 | 4.0 |
| 90 - 95.99 | 3.5 |
| 84 - 89.99 | 3.0 |
| 78 - 83.99 | 2.5 |
| 72 - 77.99 | 2.0 |
| 66 - 71.99 | 1.5 |
| 60 - 65.99 | 1.0 |

3 Course Assessments

3.1 Data Story Archive

The **Data Story Archive** is the culmination of your group's work throughout the course. It includes your group's data story report, R script, practical assignments, and a group reflection, all compiled into a single

professionally formatted PDF file.

3.1.1 Requirements

Your submission should follow this structure:

1. **Cover Page:**

- Include the title of the Data Story, group members, and submission date.

2. **Table of Contents:**

- Provide a clear list of sections with page numbers.

3. **Data Story Report:**

- The complete report should include:
 - **Introduction:** Problem statement and research question.
 - **Methods:** Data sources, methodology, and analysis techniques.
 - **Results:** Key findings supported by R-generated visuals.
 - **Discussion:** Implications of the findings and any limitations.
 - **Conclusion:** Summary and recommendations.
 - **Appendix:** Supporting tables, additional plots, or materials.

4. **R Script:**

- Render your R script as a **PDF** using Quarto Markdown.
- Ensure the script is well-structured, commented, and includes outputs like plots and tables.

5. **Computer Practicals:**

- Include PDFs of all Quarto Markdown files from your computer practicals.

6. **Group Reflection:**

- Write a 1-2 page reflection on:
 - Your teamwork experience (challenges and successes).
 - What you learned from working on the data story.
 - How the course contributed to your growth in data analysis and collaboration.

3.1.2 Submission

- Combine all the components into a **single PDF** file.
- Name your file as: `LBOMETR[Section_GroupNo.]_DataStoryArchive.pdf`
- **Deadline:** [11 April 2025, 21:00].
- In the event that the file is too big for Animospace, kindly submit as pdf to my email.

3.1.3 Grading Rubric for Data Story Archive

The grading rubric for the Data Story Archive is divided into three categories: **Content**, **Analysis and Technical Work**, and **Overall Presentation Quality**.

| Category | Criteria | Points | Description |
|---------------------------------|-----------------------------|--------|---------------------------------------------------------------------------------------------------|
| 1. Content | Clarity of Objective | 10 | Clearly defined problem/question and its relevance to the course. |
| | Data Story Report | 20 | Completeness and quality of the report, including introduction, methods, results, and discussion. |
| | Appendix | 10 | Completeness of additional materials (e.g., tables, plots) in the appendix. |
| 2. Analysis and Technical Work | R Script Quality | 15 | Well-structured, commented, and reproducible R script with outputs rendered as a PDF. |
| | Practical Assignments | 15 | Quality and completeness of PDFs rendered from Quarto Markdown files. |
| | Visualizations | 15 | Clear, meaningful, and well-designed plots and tables generated in R. |
| 3. Overall Presentation Quality | Group Reflection | 15 | Thoughtful insights on teamwork, learning, and course experience. |
| | Formatting and Organization | 10 | Overall organization, formatting, and adherence to submission guidelines. |
| | Total | 100 | |

3.2 Data Story Presentation

The **Data Story Presentation** is your group's opportunity to communicate your findings and insights through a live presentation. This format allows you to showcase animated visualizations and engage directly with the audience in real time. A room will be requested for you to be able to present in front of your classmates and I will be present online *hopefully this will be applicable*;

3.2.1 Requirements

1. **Objective:**

- Your live presentation should effectively communicate your data story with clarity, engagement, and professionalism, making full use of visuals and animations to enhance understanding.

2. **Presentation Structure:** The presentation must include the following sections:

- **Introduction:** Briefly introduce your topic, research question, and the significance of your data story (1 slide).
- **Methods:** Provide a concise explanation of your data and analysis methodology (1-2 slides).
- **Results:** Highlight the most important findings using R-generated visualizations, including animations if applicable (3-4 slides).
- **Discussion and Conclusion:** Discuss the implications of your findings and conclude with actionable insights or recommendations (1 slide).

3. **Delivery:**

- Each group member must actively participate in the presentation.
- Presentation duration: **10 minutes**, followed by a **5-minute Q&A session**.

4. **Visualizations:**

- Use animated or interactive visualizations (e.g., created with `gganimate` or other R packages) to effectively demonstrate key trends and insights.
- Ensure visuals are clear, professional, and aligned with your narrative.

5. **Tools:**

- Create your presentation using tools like Google Slides, Microsoft PowerPoint, or Canva.
- Incorporate animated visualizations as needed.

6. **Submission:**

- Submit your presentation slides as a **PDF file** named:
`LBOMETR[Section_GroupNo.].DataStoryPresentation.pdf`
- Submit the file before your scheduled presentation time.

3.2.2 Grading Rubric

The grading rubric for the Data Story Presentation is divided into three categories: **Content**, **Visualizations**, and **Delivery and Engagement**.

| Category | Criteria | Points | Description |
|------------|----------------------------------|--------|--------------------------------------------------------------|
| 1. Content | Introduction and Methods | 10 | Clear and concise introduction and explanation of methods. |
| | Results | 20 | Logical flow and depth of results, focusing on key findings. |
| | Discussion and Conclusion | 10 | Insightful discussion and actionable conclusion. |

| Category | Criteria | Points | Description |
|-----------------------------------|-----------------------------|------------|-----------------------------------------------------------------------------------------|
| 2. Visualizations | Quality of Visuals | 20 | Professional and well-designed visualizations, including appropriate use of animations. |
| | Relevance of Visuals | 10 | Visuals strongly support the analysis and enhance understanding. |
| 3. Delivery and Engagement | Delivery | 20 | Confident, clear, and professional delivery by all group members. |
| | Audience Engagement | 10 | Creativity and ability to maintain audience attention. |
| | Q&A Session | 10 | Ability to effectively respond to audience questions. |
| | Time Management | 10 | Adherence to the 10-minute time limit and logical pacing. |
| | Total | 100 | |

4 Grouping Process

Students will be randomly assigned to groups of **4-5 members** based on their responses to a pre-course survey. The survey collects information that will be used to ensure fair and balanced groupings. The group assignments will be announced on the first day of the course.

4.1 Survey

Please complete the survey **before 14:30 PM on January 6, 2025** using the link:

- Google Form Survey Link

4.2 How Groups Are Formed

The groupings are created using RStudio. The coding ensures randomness while incorporating some aspects of the survey responses to balance groups. If you wish to see the code used for grouping, you may contact me directly. However, please note: - The **CSV file with survey responses will not be shared** to protect your anonymity and privacy.

4.3 Announcement of Groups

The group assignments will be distributed on the **first day of the course**. Please check your assigned group and connect with your group members as soon as possible.

5 Basic Introduction to R

This portion of the book offers an introduction to the basics of R. R offers a wide variety of functionality. Note that this book only offers basic Econometric analysis. It will be useful to have some basic familiarity with R and its syntax but this is not strictly necessary.

Each chapter includes both R code and results to make it easier for students to follow along, even without detailed knowledge of R.

5.1 Session Information

This version of the book was built using R version 4.4.2. See below for the session information:

```
## R version 4.4.2 (2024-10-31 ucrt)
## Platform: x86_64-w64-mingw32/x64
## Running under: Windows 11 x64 (build 22631)
##
## Matrix products: default
##
##
## locale:
## [1] LC_COLLATE=English_Philippines.utf8  LC_CTYPE=English_Philippines.utf8    LC_MONETARY=English_Philippines.utf8
## [4] LC_NUMERIC=C                        LC_TIME=English_Philippines.utf8
##
## time zone: Europe/Berlin
## tzcode source: internal
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods    base
##
## other attached packages:
## [1] bookdown_0.41
##
## loaded via a namespace (and not attached):
## [1] digest_0.6.37      R6_2.5.1           fastmap_1.2.0       xfun_0.49           cachem_1.1.0        knitr
## [7] htmltools_0.5.8.1  rmarkdown_2.29     tinytex_0.54        lifecycle_1.0.4     cli_3.6.3           sass_
## [13] jquerylib_0.1.4    compiler_4.4.2     rstudioapi_0.17.1   tools_4.4.2         evaluate_1.0.1      bslib
## [19] yaml_2.3.10        jsonlite_1.8.9     rlang_1.1.4
```

5.2 Preliminaries

The first step is to gain access to R, which is free and available on the R website: <http://cran.r-project.org/>. Simply go to the R website, select the appropriate location and operating system, and follow the instructions to download the base distribution of R. RStudio offers a user friendly environment to run R and is recommended.

Once R is opened, we can begin to run commands. R commands can be run directly from the console, from the R script editor or from a text editor separate from R.

R offers detailed help files for each function. To access help, run:

```
?sum
```

All lines preceded by a `#` are comments and will not run. For example:

```
# This is a comment. R will not recognize this as a command.
```

5.3 Quarto Markdown

In LBOMETR, Quarto Markdown will be used by the students when submitting the Scripts for the Data Story Archive. Quarto Markdown is a tool for creating documents, reports and presentations using Markdown and executable code. Below is a concise guide to help you get started, along with key shortcuts for both Mac and Windows.

5.3.1 1. Starting a Quarto File

To begin creating a Quarto document, follow these steps:

1. Open RStudio.
2. Go to **File > New File > Quarto Document**.
3. Choose the document type (e.g., HTML, PDF, Word, etc.) and specify whether the document will include code. For ease, we will use the html document type. I have also added a sample Quarto Markdown file you can copy.

Quarto Markdown Template

5.3.2 2. Quarto Key Features

Code Chunks

Code chunks allow you to include and run code inside your document.

Inline Code

Embed R code in text using backticks and `r`.

5.3.3 Quarto Markdown Shortcuts

| Action | Windows Shortcut | Mac Shortcut |
|----------------------------|------------------|-----------------|
| Insert a new code chunk | Ctrl+Alt+I | Cmd+Alt+I |
| Run current code chunk | Ctrl+Shift+Enter | Cmd+Shift+Enter |
| Run all code chunks | Ctrl+Alt+R | Cmd+Alt+R |
| Run current line/selection | Ctrl+Enter | Cmd+Enter |

| Action | Windows Shortcut | Mac Shortcut |
|-------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Knit/Render document | Ctrl+Shift+K | Cmd+Shift+K |
| Comment/uncomment lines | Ctrl+Shift+C | Cmd+Shift+C |
| Insert pipe (%>%) | Ctrl+Shift+M | Cmd+Shift+M |
| Headings | /Number of Heading (if in Visual mode) Prefix line with #, ##, etc. manually (in Source mode) | /Number of Heading (if in Visual mode) Prefix line with #, ##, etc. manually (in Source mode) |
| Bold | Ctrl+B | Cmd+B |
| Italic | Ctrl+I | Cmd+I |
| Inline code | Surround with backticks (`) manually | Surround with backticks (`) manually |

*Note: you can choose between Source or Visual (upper left); personally, it is easier for me to use the Visual Mode compared to the Source Mode.

5.4 Packages

Each package of interest must be installed and loaded before it can be used. The packages will not be immediately available when R is opened. A package only has to be installed once on a computer, but the package will have to be loaded every time R is restarted.

We can install a package individually as we need them. For example, to install **tidyverse** and **psych**, we would do:

```
install.packages("tidyverse")
install.packages("psych")
```

In the tidyverse package, the **ggplot2** is usually included; if you do not see the package in the Packages list at the lower right, you can do this:

```
if(!("ggplot2" %in% installed.packages()[,"Package"])) install.packages("ggplot2")
```

Now that we have our packages successfully installed, we can go ahead and load them into R. Here we will load the tidyverse package as an example. We can use all the functions available in that package once it is loaded into R. We load packages by using a **library()** function. The input is the name of the package, not in quotes.

```
library(network)
```

We can look up all of the functions within a package by using a **help()** function. For example, let's look at the functions available in the **tidyverse** package.

```
help(package = tidyverse)
```

Note that the package argument is necessary to look up all of the functions. We can also detach a package if we no longer want it loaded. This is sometimes useful if two packages do not play well together. Here we will use a **detach()** function.

```
detach(package:tidyverse)
```

For simplicity, we will assume that the reader has restarted R at the beginning of each tutorial.