Data-driven Decision Theory

Course manual

Course manual EBC1046
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BSc Business Analytics Maastricht University

Contents

1 Introduction

1.1 Purpose of the course and place in the curriculum

Data-driven decision making is an introduction to Microeconomics, specifically designed for the BSc program in Business Analytics. The purpose of the course is to help students take the first steps towards thinking like an economist. In particular, we will study the following:

- Basic questions that economists try to answer.
- Standard tools that they use in order to answer these questions.

In this sense, the course focuses both on the content and the methodology of economics. So, after the course, the students should be able to understand and explain core concepts in economics (e.g., preferences, utilities, demand, supply, etc) and their role in solving a business analytics problem. Moreover, they should be able to comprehend the usefulness of data-driven insights in economic reasoning and solving problems in business functions and their interrelations. Let us elaborate a bit more.

The general question that economists have been trying to answer is how economic agents make choices that have to do with allocating resources under certain restrictions. This question becomes more specific depending on the framework (i.e., the branch of Economics) where we ask it. For instance, in consumer theory, we ask how individual consumers choose to spend their limited budget across different goods. In the theory of the firm, we ask how firms choose the prices they charge given the technology that is available to them and their capacity. But importantly, Economics is not just about decisions related to money. In public economics, we ask how individuals choose how much to pollute using their car, given the time constraints imposed to them by using alternative means of transportation. The common theme in all these cases is that choices made by the different economic agents affect the allocation of scarce resources that everybody wants. It is exactly the fact that economics tries to answer questions from such a wide spectrum of frameworks that makes it so fundamental for several other disciplines, like business, marketing, computer science, just to mention a few. And this is why we study it so early in the curriculum, before we go into more specialized courses.

But of course, asking general questions with far-reaching implications comes at a cost. Namely, it becomes difficult to answer them. So, we need powerful tools and methods. Economics uses a mix of mathematics and data analysis in order to answer these questions. The first step that uses math is to take a problem from the real world (i.e., our question), then translate it into the language of math (i.e., build a model), then keep only the essential parts of it (i.e., make some simplifying assumptions), then do mathematical manipulations (i.e., solve the model), and finally translate everything back to the real world (i.e., make predictions). The second step is to use data in order to test these predictions. This means that we take actual behavior (either directly from the real world or from an experiment that we have designed) and we check whether it is consistent with what the mathematical model predicted. If yes, then we can conclude that we are sufficiently certain that our answer to the research question is good. If not, we have to go back to our model, refine it, and repeat the same process. Of course, you should be aware that *matching elegant mathematical models with messy data is more difficult than it sounds*. But nevertheless, this is the methodological approach that all of science follows, so economics could not have been different. And after all, this is what makes it interesting.

1.2 Structure of the course

Throughout the course, we will follow the first part of the textbook of Acemoglu, Laibson & List, which provides a modern introduction to microeconomics along the lines described above. It is interesting to know that all three authors are leading economists, having contributed in many areas of economics research. The course consists of seven topics, each corresponding to some chapter(s) from the main textbook (see course outline below). Additional material will be provided for certain topics. The topics that we will cover are:

1. Introduction to Economics: You will be introduced to the main aims and methods used in economics. The focus will be on the three main principles, which are optimization, equilibrium and empiricism.

2. Demand and Supply: This is perhaps the most famous model in economics, analysing and predicting how prices are set and quantities are determined as a result of the demand and supply.

3. Consumer Theory: We will take a step back, asking a basic question. Namely, how is demand formed in the first place?

4. Theory of the Firm: We continue asking a second basic question. Namely, how is supply formed in the first place?

5. Perfect Competition: This is one of the benchmark markets that we model in economics. We will discuss the underlying assumptions and study the predictions that this model gives us.

6. Externalities and Public Goods: We will study different reasons why perfectly competitive markets often fail to lead to socially efficient outcomes.

7. Monopoly and Oligopoly: Two more market structures will be studied. Monopoly is the second benchmark case at the opposite end of the spectrum compared to perfect information. Oligopoly can be placed between the two extremes.

Our approach will be a mixture of theory and application. In particular, for each topic there will be one theory tutorial (on Monday) during which you will discuss designated questions and problems from the textbook. The aim of these tasks will be to make sure that you have understood the theory well. Then, there will be one project tutorial (on Wednesday) during which you will work on a project. The aim of the project is to understand how we use data to test hypotheses that come from our theories, and eventually provide answers to applied problems. All this is explained in more detail below.

1.3 Expectations

The course is clearly demanding (like most first year courses), as you will be exposed to many new ideas. It is very important to always keep in mind that the whole point is to understand the material, and not to simply memorize it. In order to achieve this goal, it is extremely important that you follow all the designated meetings and that you self-study according to the weekly schedule. Studying hard only before the exam is not enough. The minimum workload of self-study in order to pass the course is estimated at approximately 16 hours per week.

In terms of specific pre-knowledge, you are expected to have a decent understanding of the topics that you covered in your previous courses, and in particular there will be reference to things that you have already learned in Mathematical Analysis (EBC1042) and Statistics (EBC1044).

2 Course content

2.1 Outline of the course

The course consists of one lecture and twelve tutorial meetings. In particular, each week there are two tutorials, except the first and the fourth week in which there is only one tutorial.

Week	Topic	Tutorial	Task	Literature
1	Introduction to Economics	Intro Lecture		1 – 3
		Theory/Project	Questions/Problems Returns to education	
2	Demand and Supply	Theory	Questions/Problems	4
		Project	UBER during Covid	
3	Consumer Theory	Theory	Questions/Problems	5
		Project	Demand for UBER	
4	Theory of the Firm	Theory	Questions/Problems	6
		Career days		
5	Perfect Competition	Theory	Questions/Problems	7
		Project	UBER market prices	
6	Externalities and Public Goods	Theory	Questions/Problems	9
		Project	Public good game	
7	Monopoly and Oligopoly	Theory	Questions/Problems	12.1 – 12.5 14.1 – 14.2
		Project	Catching a cartel	

2.2 The meetings

Here is some more information on how the tutorials will work:

2.2.1 Theory tutorials

There are six and a half theory tutorials, normally scheduled on Monday, except for the first week when it is scheduled for the first half of the Wednesday tutorial. The purpose of these meetings is to make sure that you have a good understanding of the designated literature.

The form of instruction will be a modified version of problem-based learning (PBL). Before each theory tutorial, you are expected to have carefully read the mandatory literature (chapters from main textbook). During the tutorial meeting your tutor will provide you with a list of tasks. You will be split in small groups (of 2-3 students) and you will be asked to discuss and answer these tasks using arguments from the textbook. Many of these tasks will require pen and paper to be solved, so make sure that you have a notepad and a pen with you in class. The tutor will be walking around the class to provide help when needed.

It will be nearly impossible to answer the tasks without having read the literature at home. Remember that PBL is at its best when students come well-prepared, engage actively during the discussions and are open to other opinions that are based on logical arguments. Physical presence alone is not sufficient. You need to actively contribute to the joint learning effort. And active contribution means that you need to discuss the questions in depth and even go beyond the questions sometimes: simple two-word answers (just to quickly go through the tasks) is not good practice.

2.2.2 Project tutorials

There are five and a half project tutorials, each corresponding to one project. These tutorials will always take place on Wednesday and they will follow the theory tutorials. The idea is to apply the theory that you have already studied in scenarios that resemble reality.

Each project consists of a series of questions that the tutor will provide. During the tutorial you will be split in small groups (of 2-3 students) and you will be asked to discuss these questions one by one. Some of the questions are conceptual, while some others are of quantitative nature. For those questions, pen and paper will be again needed. So, once again make sure that you have a notepad and a pen with you in class. For some questions, you will need to use a dataset that you will be provided with. So bring your laptop with you, and make sure that there is a statistical package installed.[1] Regardless of the type of question, the most important thing is to use arguments that are based on the theory that has preceded the project. And once again, remember that you need to actively contribute to the joint learning effort.

2.2.3 Rules of conduct

The following rules should be followed during the tutorials:

- Be on time: if your are more than 20 minutes late, you can still stay in the meeting, but it will count as if you have missed the tutorial.
- Be prepared and avoid free-riding on others' efforts.
- Bring a notepad and a pen with you.
- Participate actively in the discussion.
- Refrain from hostile behavior, such as derogatory comments towards fellow students or the tutor.
- Cell phones are strictly forbidden during the tutorial. They should stay in your bag/pocket during the entire meeting.
- Do not disturb in any other way.

[1] Most economists use Stata, but you are free to use any other software (most students in the past used R).

2.3 Course material

The compulsory textbook for this course is:

- Acemoglu, D., Laibson, D. & List, J. (2018). Microeconomics. 2nd Global Edition, Pearson (ISBN 9781292214504)

Note that the book is sold with and without access to the online platform MyEconLab. In this course, we will only use the textbook, so you do not need to purchase access to MyEconLab.

Short online video lectures will be provided to you each via canvas on a weekly basis. The purpose of these videos is *not to replace your home study, but to supplement it.*

3 Performance assessment

3.1 Calculation of the course grade

In order to pass the course, you **must pass both the following tasks:**

1. **Participation:** For each tutorial meeting, each student will receive a grade on a scale 0 – 3. You will get 0 points if you do not show up; 1 point if you show up and do not participate; 2 points if you show up and you participate actively; 3 points if you show up and you participate actively and your input is of high-quality. This means that in total you can get between 0 and 36 points throughout the course. In order to pass participation, you need to fulfil both the following two requirements:

   (a) Be present in at least 9 of the 12 tutorials

   (b) Get at least 18 points in total

   If you fail participation, you can do a course assignment. However, this is not advised unless absolutely necessary. In particular, if you elect to replace the participation requirements with the assignment, you cannot get more than 18 points for participation. The length of the course assignment depends on how many tutorials you missed. For instance, people who missed 10 tutorial meetings will have to do much more work than those who missed 5 tutorial meetings. But in either case, be advised that if you have to do the course assignment, the work load in the last weeks of the course will be very intense.

2. **Final exam:** The final exam will be a regular 2-hour computerized exam in MECC and it will contain a mix of conceptual questions and quantitative problems, very similar to the ones in your textbook. You will receive more information on the exact structure of the exam once the course has started. The exam will be graded on a scale 0 – 64 points. In order to pass the exam you need at least 32 points.

So overall, if you pass both parts, your final grade will be the total number of points from parts 1 and 3, divided by 10 and rounded to the nearest half. For example, if you score 30 points for participation and 37 points in the exam, your total number of points will be 67, and your grade will be 6.5. If your total score is above 55, but you have failed one of the two independent requirements (i.e., participation or exam), your final grade will be 5.0.

For the students who fail the exam, there will be a resit exam. The students who take the resit carry with them the participation grade. Students who fail participation and do not take the course assignment, will need to attend the course again the following year.

3.2 Fraud and plagiarism

In order to protect the reputation of our degrees and the integrity of our school, instances of fraud or plagiarism are treated very seriously. Fraud is understood as a student's act or failure to act that makes it partially or fully impossible to correctly assess his/her knowledge, insight or skills. An example of fraud is cheating during an exam. Plagiarism is understood as the presentation of someone else's ideas or words as your own without proper reference to the source. An example of plagiarism is copying from someone else's paper, or copying from a textbook or an online source without explicitly mentioning where this was taken from. This includes AI's, like for instance ChatGPT.[2]

If the board of examiners concludes that any offense related to plagiarism or fraud has been committed, they will initiate the procedures for imposing sanctions in accordance to the school's policies.

4 Contact information

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[2]You are advised to read carefully the school's policy regarding the use of AI.