Syllabus "BIG DATA & BEHAVIORAL FINANCE LAB"

Giuseppe Attanasi

giuseppe.attanasi@unice.fr

www.giuseppeattanasi.com

The laboratory deals with a statistical/econometric project of **big data** analysis applied to behavioral finance.

The aim of the project is to highlight similarities and differences between subjects' behavior in experimental financial markets (laboratory data) and that of financial operators in international markets (big data). The analysis of the behavior of former subjects is the basis of recent studies of **behavioral finance**.

Every day we take thousands of decisions: do I have to cross the road right away or wait for the incoming car to pass first? Should I cook pasta or prepare a salad for dinner? How much do I have to tip the cab driver? Usually, we take these decisions without thinking enough, using what psychologists call "heuristics" – rules of thumb that allow us to "play it by ear", intuitively and without apparent difficulty, in the complex system where we live nowadays. Without these mental shortcuts, we would be paralyzed by the multitude of daily choices.

However, in some circumstances, these shortcuts lead to "predictable" errors, in the sense that we could anticipate them if we knew in advance what to pay attention to. For example, we are naturally inclined to sell financial assets with good performance, while keeping in the portfolio those with poor performance. Or we often get to buy insurance coverage that we do not really need. Behavioral finance deals with the study of these and other dozens of financial decision-making mistakes that we could avoid, if only we were familiar with the distortions that caused them.

Specifically, in the project being the subject of the "Big Data & Behavioral Finance" Lab, students will learn how behavioral finance provides explanations for market outcomes that are not in line with rational explanations and market efficiency (e.g., incorrect price evaluation, irrational decision making, and anomalies on financial yields). **Richard Thaler**, who has recently received the **Nobel Prize for Economics** (October 2017), has written a long series of scientific articles describing specific market anomalies from a behavioral perspective.

The main question the "Big Data & Behavioral Finance" Lab aims at answering is: Can the results of behavioral finance studies, usually based on very small samples and on (controlled) laboratory data, be easily extended to current financial markets, whose description is increasingly characterized by big data?

Big Data – a collection of heterogeneous, structured or non-structured data, defined in terms of volume, speed, variety, and accuracy – characterize many of the interactions between humans in our modern, increasingly computerized, society. These are satellite, telephone, financial, or social network datasets whose size/volume/complexity is so "big" that it exceeds the ability of relational database systems to capture, store, manage, and analyze them. This data is currently exploited by several economic actors for various reasons: from companies – for management and marketing purposes – to local governments for the development of smart cities; from intelligence agencies for security reasons to families for purchase decisions. Big data is typically the subject of data science analysis, but are becoming more and more

relevant to economic research. From a methodological point of view, it allows researchers to overcome the difficulties of working with representative samples, since big data refers to the entire target population.

Big data is (and will become more and more) essential in the financial world. Markets, intermediaries and financial instruments are subject to epochal changes: a recent research by Hays (a company specialized in the field of personnel recruitment) has shown that 54% of the sample of interviewed Italian professionals in Finance believe that in 2030 banking branches will disappear from the streets of our cities, while 71% among them believe that artificial intelligence and big data will be the basis of all financial advices and forecasts, thereby crucially affecting the work of financial operators.

Also for this reason, the skill to evaluate the actual ability of behavioral finance to provide insights that will guide a decision maker into a financial world that will produce more and more "big data" in the future becomes fundamental.

The "Big Data & Behavioral Finance" Lab, to be carried out in groups, will allow students to compare predictions on small and controlled samples (laboratory data) to those on populations described by big data.

From a methodological point of view, the projects carried out by students will serve as a stimulus to learn the techniques of:
- analysis of experimental data ("experimetrics");
- management of large amounts of data (relational databases);
- predictive and causal analysis in a context of big data.

Course Structure

- SUBJECT: "Big Data & Behavioral Finance" Lab
- ELIGIBILITY: 4 CFU
- LENGTH: 30 hours
- TIMETABLE: Thursday afternoon, 5 pm – 8 pm (February – May 2018)
- LANGUAGE: English

Content Synopsis

The laboratory deals with a statistical/econometric project of analysis of experimental data and big data. The project will be carried out in groups, through Stata, R, or similar statistical softwares.

Eligibility Requirements

The requirements for getting the 4 credits (only for students in Economics and Finance) are:
- attendance of at least 80% of the course meetings (24 over 30 hours);
- positive evaluation of the final project,

Calendar (the final timetable will be decided in agreement with students enrolled in the course)

Week 1 (4 hours)
Presentation of the course structure and object:
- Definition and nature of the big data
- Link between big data and laboratory/experimental data in behavioral finance

Week 2 (5 hours)
Experimental data generation:
5 classroom experiments (1 hour each) on different bargaining mechanisms used in financial markets, realized with students attending the course, in the Cesare Laboratory of LUISS

Week 3 (4 hours)
Introduction and discussion of reference theoretical models:
For each of the laboratory experiments carried out in week 2,
- presentation of a theoretical model that predicts the performance of the financial markets implemented in the laboratory;
- comparison of theoretical predictions and experimental data (obtained in the laboratory).

Week 4 (2 hours)
Definition of working groups, assignment of projects and research questions: from laboratory data (experimental data) to real data (big data)

Week 5 (4 hours)
Introduction and discussion of big data analysis techniques. In particular:
- data collection (web scraping & open data)
- exploratory analysis & data visualization
- statistical modeling & data mining

Weeks 6-8 (6 hours: 2 hours per week)
Control and support for project advancement:
Interaction between teacher and working groups for fine-tuning of research questions and choice of statistical/econometric tools suitable for the big data under analysis.

Week 9 (5 hours)
Final presentation of group projects

Didactic methods

- Coaching
- Team Working
- Classroom Experiments

Course enrollment

The Laboratory can be chosen through the Web Self-Service: Student enrollment takes place directly through the web platform.

Prerequisites for participation in the laboratory are:
• Knowledge of statistical programming software “Stata”;
• Basic knowledge of Statistics.

The absence of these prerequisites must be communicated via email to the teacher: within the Laboratory, the teacher may eventually provide some classes (6 hours max) to allow students who do not have adequate knowledge of Stata to familiarize with the software.

Suggested References

Behavioral Finance:

- Attanasi, G., Centorrino, S., & Moscati, I. (2016). Over-the-counter markets vs. double auctions: A comparative experimental study. *Journal of Behavioral and Experimental Economics*, 63, 22-35.
- Gode, D. K., & Sunder, S. (1993). Allocative efficiency of markets with zero-intelligence traders: Market as a partial substitute for individual rationality. *Journal of Political Economy*, 101, 119-137.
- Gode, D. K., & Sunder, S. (1997). What makes markets allocationally efficient?. *Quarterly Journal of Economics*, 112, 603-630.
- Moffatt, P. G. (2015). *Experimetrics: Econometrics for experimental economics*. Palgrave Macmillan.
- Thaler, R. H. (2015). *Misbehaving. The Making of Behavioural Economics*, New York, W. W. Norton & Company, London.

Big Data:

- Einav, L., & Levin, J. (2014). The data revolution and economic analysis. *Innovation Policy and the Economy*, 14, 1-24.
- Friedman, J., Hastie, T. and R. Tibshirani (2001). *The elements of statistical learning*, Springer, New York.
- James, G., Witten, D., Hastie, T. and R. Tibshirani (2013). *An introduction to statistical learning with applications in R*, Springer, New York.
- Stock J.H. and Watson M.W. (2011). *Introduction to econometrics*, Pearson Education, 3rd Edition.
- Varian, H. R. (2014). Big data: New tricks for econometrics. *Journal of Economic Perspectives*, 28, 3-27.