

# Finance Theory

The course consists of two parts.

Part I: Asset Pricing: Empirical Regularities and Important Models, lecturer is Dmitry Makarov.

Part II: Microstructure of Financial Markets, lecturer is Alexei Boulatov.

Overall Grade for the Course: the descriptions of Parts I and II below explain how the grade for each part is determined. The overall grade for the Course is the average of these two grades.

## Part 1: Asset Pricing: Empirical Regularities and Important Models

Lecturer: Dmitry Makarov

### Prerequisites

Intermediate microeconomics, some calculus and probability theory.

### Course Description

Asset pricing is a branch of Financial Economics devoted to uncovering patterns in asset returns (empirical asset pricing) and explaining these patterns (theoretical asset pricing). In this course, we will focus on theoretical asset pricing models and, in less details, will talk about main patterns in asset returns, those that received most attention in the literature.

There are several important by-products in the process of studying theoretical papers.

First, as many explanations of asset pricing puzzles rely on investor irrationality, students will become familiar with examples of behavioral finance research. This is an increasingly promising research area lying at the intersection of psychology and finance.

Second, students will learn (or refresh) some fundamental concepts in financial economics: market efficiency, risk aversion, risk and return, diversification, time discounting and interest rates, cash flows, financial instruments (stocks, bonds, options, etc), utility-based pricing versus pricing by replication, complete and incomplete markets, static versus dynamic models, market efficiency.

Third, students will learn the “language” of financial economics, defined broadly to include not only special terms and notions but also fundamental ideas and analytical frameworks. Without good knowledge of the language, one may find it difficult to understand academic finance papers, and may feel lost at finance research seminars or conference presentations. For 4<sup>th</sup> year bachelor students, this is especially important given the need to produce a research paper (bachelor thesis) at the end of the year. Reading many different papers, understanding what the contribution is, learning how these papers are structured – all these ingredients will prove useful when students will be writing their own papers.

## **Methods of Instruction**

The course relies on the following teaching methods:

- Lectures (active participation is encouraged)
- Home assignments
- Self-study: reading additional materials assigned during lectures

## **Grading, Exams, and Homework**

- Home assignments account for 20%
- Midterm exam accounts for 30%
- Final exam accounts for 50%

## **Course Materials**

Given the above description, it is clear that the main material for the course are research articles. Many of them are fairly recent, and so are not discussed in any textbook. These articles rely to a large extent on what is considered to be standard material in asset pricing. This material is covered in many books, but if I were to recommend some, it would be:

- 1) Cvitanic J., and F. Zapatero, *Introduction to the Economics and Mathematics of Financial Markets*, MIT Press 2004.
- 2) Pennacchi, G., *The Theory of Asset Pricing*, Pearson Addison Wesley, 2008.

## Course Outline

The course in the current form is offered for the first time (it will differ a lot from a similarly-titled course given last year). Given this, it is difficult to commit to a specific timetable: what topics will each sessions be devoted to.

Instead, below is a tentative list of topics that I plan to cover during the course, and (also tentative) list of research papers that will be discussed.

### Topics:

- 1) **Overview:** historical background, key concepts: risk and return, diversification, time discounting and interest rates, cash flows, financial instruments, market efficiency, asset pricing puzzles
- 2) **Empirical regularities:** equity premium puzzle, excess volatility, value effect, size effect, momentum, bubbles, comovement, underdiversification.
- 3) **Consumption CAPM:** equilibrium stock returns, risk free rate, plausible risk aversion, puzzles
- 4) **Explaining puzzles:** habit formation, rare events
- 5) **Behavioral Finance:** noise trader risk, arbitrage risk, prospect theory
- 6) **Ambiguity Aversion:** multiple priors, portfolio choice, ambiguity premium

### Papers:

Abel, A., (1990), Asset prices under habit formation and catching up with the joneses, *American Economic Review* 80, 38-42.

Barberis, N., A. Shleifer and R. Vishny (1998), “A model of investor sentiment”, *Journal of Financial Economics* 49:307–345.

Barberis, N., M. Huang and T. Santos (2001), “Prospect theory and asset prices”, *Quarterly Journal of Economics* 116:1–53.

Campbell, J. and J. Cochrane 1999, By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior *Journal of Political Economy*, 107, 205-251.

Cao, H., T. Wang, and H. Zhang, 2005, Model uncertainty, limited participation, and asset prices, *Review of Financial Studies* 18, 1219–1251.

De Long, J.B., A. Shleifer, L. Summers and R. Waldmann (1990a), “Noise trader risk in financial markets”, *Journal of Political Economy* 98:703–738.

De Long, J.B., A. Shleifer, L. Summers and R. Waldmann (1990b), “Positive feedback investment strategies and destabilizing rational speculation”, *Journal of Finance* 45:375–395.

Mehra, R. and E. Prescott, (1985), The equity puzzle, *Journal of Monetary Economics* 15, 145-161.

Shiller, R., (1981), Do stock prices move too much to be justified by subsequent changes in dividends?, *The American Economic Review* 71, 421-436.

Weil, P., (1989), The equity premium puzzle and the risk free rate puzzle, *Journal of Monetary Economics* 24, 401-421.

Wurgler, J., and K. Zhuravskaya (2002), “Does arbitrage flatten demand curves for stocks?”, *Journal of Business* 75:583–608

## Part 2: Microstructure of Financial Markets

Lecturer: Alexei Boulatov

### **Description**

This part of the course is an introduction into some basic concepts and models of the microstructure theory of financial markets. Theoretical Market Microstructure is intended to develop economic models of financial markets within a “microscopic” approach when one explicitly takes into account a particular market design and types of agents involved in a trading process. One application of the Market Microstructure models is analysis of the impact of market organizational structure on various important market characteristics, such as price efficiency, transaction costs, liquidity, etc., and to construct quantitative indicators of market quality.

The main part of the class is based on original academic research papers on Market Microstructure theory. The emphasis is on the finance models that are sufficiently simple and analytically tractable. The goal is to provide students with the tools and basic knowledge required to understand and analyze original academic papers on market microstructure.

### **Prerequisites**

The prerequisite for this class are: the first part of Theory of Finance course, or any other basic

course on Financial Economics.

## Teaching methods

The following methods and forms of study are used in the course:

- Lectures.
- Paper presentations: students are expected to present and discuss in class some required original papers specified by the instructor. Active participation is required.
- Self-study: preparing for classes, it is important to read the corresponding required original research papers and chapters in the textbooks as indicated in the course outline below.

## Course Materials

The lecture notes and required original papers contain all required material. The readings of journal papers will be announced in class. The recommended textbook is:

(DJR) De Jong, F., and B. Rindi, 2010, *The Microstructure of Financial Markets*, Cambridge Univ. Press, Cambridge.

Supplemental reference:

(RL) Lyons, R. 2001, *The Microstructure Approach to Exchange Rates*, Cambridge, Mass: MIT Press.

## Grading, Exams, and Homework

- Class participation including the presentation of papers accounts for 20%.
- The midterm exam accounts for 30%.
- The rest of the grade (50%) comes from the final exam.
- The exact material covered in each of the two exams will be announced in class.

## Analytic and technical skills

This part of the course may be rather demanding in terms of the analytic skills for some of the students. Although the course materials are self-contained, the students are encouraged to “brush up” their knowledge and skills in mathematical analysis, random processes, and linear algebra.

## **Course Outline**

### **Sessions 1-2. Review.**

1. Basic facts and terminology on financial market structure.

Auction, dealers' and hybrid markets, order-driven and quote-driven, call and continuous markets. High-frequency (HFT) and algorithmic trading. Liquidity; bid-ask spread and its components; price impact and its components; cost of trading and transaction cost (t-cost). Notion of informational efficiency.

2. General approaches to modelling trading strategies and prices.

Price taking and Rational expectations. Information and pricing; Rational Expectations Equilibrium (REE). Models of strategic trading.

3. Dynamic strategies.

Dynamic trading strategies, modelling in discrete and continuous time. Liquidity and algorithmic trading. Optimal execution. "Predatory trading" and "front running".

4. Applied topics: Liquidity provision, HFT and algorithmic trading.

a. High-frequency and algorithmic trading and liquidity issues.

b. Quality of markets and informed liquidity provision.

Problems of assessing the quality of markets and liquidity provision. Optimization of limited information resources (limited attention).

### **Sessions 3-4. Price taking, Rational Expectations, and Strategic trading models.**

**Note:** Students have to read and be ready to discuss all the papers required for current session. Please pay special attention to the following issues:

Compare different trading strategies, pricing rules and types of equilibrium described by all three classes of models.

#### **Required reading:**

1. Hellwig, M., 1980, "On the Aggregation of Information in Competitive Markets," *Journal of Economic Theory*, 22, 477-498.
2. Grossman, S. and J. Stieglitz, 1980, "On the Impossibility of Informationally Efficient Markets," *American Economic Review* 70, 393-408.
3. Kyle, A.S, 1985, "Continuous Auctions and Informed Trader Trading", *Econometrica* 53, 1315-1335.
4. Admati, A., 1985, "A Noisy Rational Expectations Equilibrium for Multi-Asset Securities Markets," *Econometrica*, 53, 629-658.
5. Admati and Pfleiderer, 1988, *Review of Financial Studies*, 78, 96-103.

### **Sessions 5-6. Dynamic trading strategies.**

**Note:** Students have to read and be ready to discuss all the papers required for current session. Please pay special attention to the following issues:

Compare the cases of strategic trading based on single and multiple signals (static and dynamic private information structure), and trading not based on information (optimal execution). What makes "predatory trading" possible? What are the shortcomings of Brunnermeier and Pedersen (2005) model?

#### **Required reading:**

- 1 Kyle, A.S, 1985, "Continuous Auctions and Informed Trader Trading", *Econometrica* 53, 1315-1335.
- 2 Back, K., H. Cao, and G. Willard, 2000, "Imperfect Competition among Informed Traders" *Journal of Finance*, 55, 2117-2155.
- 3 Boulatov A., and D. Livdan, 2011, "Strategic Trading with Dynamic Information Dissemination," *Working paper*, UC Berkeley.
- 4 Almgren, R., and N.Chriss, 1999, "Optimal Execution of Portfolio Transactions," *Journal of Risk*, 3(2), 5-39.
- 5 Bertsimas, D., and A.W. Lo, 1998, "Optimal control of execution costs," *Journal of Financial Markets*, 1, 1-50.
- 6 Brunnermeier, M., and L. H. Pedersen, 2005, "Predatory Trading" *Journal of Finance* 4, 1825-1863.

### **Sessions 7-8. Applied topics.**

**Note:** Students have to read and be ready to discuss all the papers required for current session. Please pay special attention to the following issues:

What are the different aspects of liquidity discussed in the first two empirical papers? Describe and explain the economic content of the “invariants” considered in the third paper. What do the existing theoretical models say about order cancellation and its impact on the market quality?

### **Required reading:**

1. Hendershott, T., C. M. Jones, and A. J. Menkveld, 2009, “Does Algorithmic Trading Improve Liquidity?,” *Journal of Finance* 66, 1-33.
2. Kirilenko, A., A. Kyle, M. Samadi, T. Tuzun, 2010, “The Flash Crash: The Impact of High Frequency Trading on an Electronic Market,” *Working paper*, University of Maryland.
3. Kyle, A.S., and A. Obizhaeva, 2012, “Market Microstructure Invariants: Theory and Implications of Calibration,” *Working paper*, University of Maryland.
4. Kyle, A.S., and A. Obizhaeva, 2012, “Large Bets and Stock Market Crashes,” *Working paper*, University of Maryland.