2021_S02_PGE_M1_FIN_0603_E_L_BOD Financial Markets (Microstructure)

Semester 4 ***2020 – 2021***

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COURSE DELIVERABLE	DUE DATE	WEIGHT ON FINAL GRADE
Final Exam		60%
Seminar Paper		40%

Kedge Business School and its professors, encourage you to use your Pro-Acts, company projects and internships as privileged opportunities to apply the reflexions, theories, concepts and tools presented during this course

INTRODUCTION AND OBJECTIVES

Course Purpose & Objectives

> This module is about operations on financial market, particularly for trading and transaction: people who trade securities and contracts, the marketplaces where they trade, and the rules that govern trading. It is also called Market Microstructure, the branch of financial economics that investigates trading/transaction, institutional operations, and the organization of markets.

This course aims to provide input for:
- Understanding and appraising the potential for operating in a competitive environment
- Assessing strategic decision in contributing to a company's attraction towards international markets
- Identifying the specific decision methods, techniques and management tools which pave the way for international competitiveness

Courses contribution to program objectives (Select the most pertinent for your course)

- Understanding how markets work, and how governments and exchanges regulate them**.**
- Understanding how prices come to reflect information about fundamental values, who makes markets liquid, and why some traders consistently profit from trading while others lose.
- Predicting how various trading rules affect price efficiency, liquidity, and trading profits.
- Understanding the forces that government regulatory processes**.**
- Improving trading strategies, student can better manage the brokers who work for him.
- Understanding the way to design a market from policy maker's viewpoint
- Understanding the way to regulate a market from regulator's viewpoint

Following our "*complex package*" approach to international management (*see Bartlett & Ghoshal above*), this course contributes to four of the learning goals, albeit in varying degrees, of the ESC/MBA program.

- KM1. Understand and integrate core management disciplines:
Under international business academic simulation conditions, where return on effort as well as success can be measured by participants in the form of qualitative feedback from fellow students and from the professor (ultimately in terms of grades), having to learn, internalize, and apply international management foundations and international business techniques, implemented in individual, subgroup, and collective manners, in classes formed by individuals from up to 10 different nationalities, allows for reaching this learning goal without doubt.

- KM3. Demonstrate leadership, interpersonal and communication skills:
As mentioned above, each subgroup operates as an individual firm. The subgroup's ultimate success depends not only on mastering international business skills, but, moreover, on group members' ability to behave and work as a team as well as to assume individual and collective leadership for assigned subgroup responsibilities.

- KM6. Develop, and practice, a sense of innovation, entrepreneurship and creativity:
This is simply, and directly, achieved through the interaction of participants during the term. Students of up to ten different countries have attended this course during a given semester. The average international diversity is of six nationalities, during the last five editions of the course. Moreover, the setting, and the objective of the course target this learning objective in a most relevant manner.

Course Contribution to Application of Critical Thinking (Optional)

Participants acquire reflective management skills throughout the term, allowing them to act critically on individual and subgroup actions having direct or indirect consequences on their long-term performance.

Because of students' different backgrounds, knowledge input will be dependent on the participants' needs and questions. The subgroup work as well as the required preparation may raise particular questions on the implementation of course techniques. The Professor's role is to answer these questions with practical examples and link these to the subgroups' interests. In this manner, individually acquired theoretical knowledge becomes practical evidence and is interiorized as effective knowhow.

Courses description

1. Trading system, Information, Regulation
2. Liquidity, volatility, and transaction costs
3. Market design

COURSE MATERIAL

Textbooks

Harris, L. (2003). Trading and Exchanges. Oxford University Press.
Hasbrouck, J. (2007). Empirical Market Microstructure. Oxford University Press.
O'Hara, Maureen. (1995). Market Microstructure Theory. Blackwell.
Fudenberg and Tirole. (1991). Game Theory. MIT Press.

Websites

SUPPLEMENTARY READINGS

Lecture notes

DEROULEMENT DU COURS / COURSE PLAN			
SESSIONS	**TOPIC**	**PRELIMINARY READING(S AND ASSIGNMENTS**	**ADDITIONAL READING(S) AND ASSIGNMENTS**
1	The Financial Environment: Markets, Institutions, and Traders, The benefit of trading		Lecture note 1,2
2	Order and Order Properties, Order driven market		Lecture note 3,4
3	Dealer, Liquidity and Liquidity Supplier, Speculators		Lecture note 5,6
4	Volatility and transaction costs, Optimal trading strategy		Lecture note 7,8
5	Market design and market failure		Lecture note 9, 10
6	Case study I: Introduction to FinTech (Digital currency, mobile payment, virtual money, big data technology, block chains)	Reading materials	Lecture note 9
7	Technical study I: Game theory and its applications	Technical Notes	Exercise
8	Case study II: Trading games	Reading materials	Exercise
9	Team work / Seminar paper		Topic list
10	Exam		

TEACHING APPROACH/ INSTRUCTIONAL METHODS

A Word of Advice

Knowledge of strategic decision-making techniques is necessary for managing international business correctly. These techniques vary from one market and trading instrument to another. This is why participants are advised to carefully prepare each session and to ensure that their doubts have been addressed in class. During the 1st part of each session the Professor will provide further in-depth and practical explanation of the concepts to be prepared for the session following, as well as, if necessary, explanations about the proposed solutions for in-class examples and/or cases. During the 2nd part, participants will work in subgroups on their own project benefiting of the Professor's tutoring at subgroup level (group work).

Organization of the sessions

50% lecturing and 50% case studies

Input :
- Professor: Explains how past material is linked to the day's agenda and subgroup work
Presents the session's material
Explains how the days content completes past material
Presents perspectives of how the present and past material link to future course content
- Students: Ask questions and request clarifications at the end of the professors' presentation

Feedback:
- Students: When needed, request additional explanations on past sessions;
Expose their questions for the session's agenda.
- Professor: When needed, extends additional insight on past material
Presents the session's agenda, and answer student's questions for the present session.

Individual Assignments

Reading and discuss with team members

Group work

Prepare the seminar paper (no less than 15 pages of A-4, single space) focusing on the interested topic discussed.

EVALUATION OF STUDENT PERFORMANCE

DELIVERABLE	%
Final exam (based on lectures)	60%
Team work/ Seminar paper (based on the topics of case study)	40%

Final exam: 50 multiple-choice questions (50 points) and one essay question (10 points).

Based on the following information, students can write a *seminar paper:*

Artificial Intelligence Use in Financial Services

Artificial Intelligence (AI), defined as the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages, has been around for over 60 years.[1] In his 1950 paper "Computing Machinery and Intelligence," Alan Turing opens with: "I propose to consider the question 'can machines think?'"[2] He proposed a test of a machine's ability to exhibit intelligent behavior, equivalent to, or indistinguishable from, that of a human being, which is now known as the Turing Test.[3] AI as an academic discipline began at the famous 1955 Dartmouth conference organized by John McCarthy from Stanford University and Marvin Minsky from MIT.[4] This CTO Corner explores both the potential for AI to transform the financial services industry and challenges it presents.

Surging Interest in AI Topic 30

Since its inception, AI has experienced at least two major *hype cycles*[5] with resulting *winters*[6] of disillusionment. Back in the early 1980's when I joined Citibank's Investment Bank to help build expert systems, a branch of AI that emulates the decision-making ability of a human expert, many other Wall Street firms set up similar projects during that era.[7] Although I and others deployed a number of successful applications, by the 1990's, AI went into its second winter of disillusionment as realization set in that these systems were harder and more costly to build and maintain than first anticipated.[8] AI appears to be entering a new phase where interest is surging again. An example of this is the sharp increase in the commercial use of AI, also known as machine intelligence, such as IBM's Watson.[9] As another indicator, the vast majority of respondents to the 2014 Future of the Internet study anticipate that robotics and machine intelligence will permeate wide segments of daily life by 2025 with huge implications for a range of industries.[10] Will the latest surge of AI applications in the financial services fall short again or will they this time truly transform the financial services industry?[11]

Several things have changed, including the cost of computing has declined dramatically and the power of computing has improved exponentially, making AI applications, which tend to be computational and "data hogs," more practical. Social networks, mobile phones and the emergence of wearable consumer devices have created an explosion of data needed to feed the data hungry AI engines, and, in turn, enable them to operate at peak performance. Furthermore, this explosion of data is so vast and overwhelming that it has become impossible to understand it without intelligent automated support. Advances in analytics, especially advances in machine learning with the needed computational power now available to support them, make AI systems more adaptable and easier to develop and implement. Finally, despite its "winters," the AI technology base has continued to grow exponentially, albeit quietly, with each advance building on another to the point where its impact is now becoming apparent. It may now be at a point where further significant and unexpected changes are likely to occur.[12]

Technology companies have already developed algorithms that track a user's online habits, creating deeply personal online experiences. For example, when searching for information, whether for research, pleasure, or necessity, Google displays results according to its relevancy algorithm. The search engine usually ends up providing the user only what he/she wants to read. Users are increasingly exposed to customized context-sensitive information and advice derived by systems that collect and analyze users' past actions, often with the users not aware of this happening.[13] The implications for the financial sector is that by tracking users' habits, activities, and behavioral characteristics, financial data and products can be personalized to meet and anticipate each user's unique and changing needs. This makes it practical for each user to have his/her own digital personal financial assistant.

Potential Use Cases for AI

The following are examples of how AI might be deployed in financial services:

Personalized Financial Services

Because of the increased customized automation, the financial institution can offer more personalized services in near real-time at lower costs. We already are starting to see a number of successful new applications that provide hints as to where the industry may be heading. Consider the following examples of applications that are being developed and deployed:

• Automated financial advisors and planners that assist users in making financial decisions. These include monitoring events and stock and bond price trends against the user's financial goals and personal portfolio and making recommendations regarding stocks and bonds to buy or sell. These systems are often called "robo advisors" and are increasingly being offered both by start-ups and established financial service providers.[14] Topic 1

• Digital and wealth management advisory services offered to lower net worth market segments, resulting in lower fee-based commissions.[15] Topic 2

• Smart wallets that monitor and learn users' habits and needs and alert and coach users, when appropriate, to show restraint and to alter their personal finance spending and saving behaviors (e.g., Wallet.AI).[16] Topic 3

• Insurance underwriting AI systems that automate the underwriting process and utilize more granular information to make better decisions.[17] Topic 4

• Data-driven AI applications to make better informed lending decisions.[1819] Topic 5

• Applications, embedded in end-user devices, personal robots, and financial institution servers that are capable of analyzing massive volumes of information, providing customized financial advice, calculations and forecasts. These applications also can develop financial plans and strategies, and track their progress. This includes research regarding various customized investment opportunities, loans, rates and fees. Topic 6

• Automated agents that assist the user, over the Internet, in determining insurance needs.[20] Topic 7

• Trusted financial social networks that allow the user to find other users who are willing to pool their money to make loans to each other, and to share in investments. Topic 8

New Management Decision-making

Data-driven management decisions at lower cost could lead to a new style of management, where future banking and insurance leaders will ask the right questions to machines, rather than to human experts, which will analyze the data to come up with the recommended decisions that leaders and their subordinates will use and motivate their workforce to execute.[21] Topic 9

Reducing Fraud and Fighting Crime

AI tools which learn and monitor users' behavioral patterns to identify anomalies and warning signs of fraud attempts and occurrences, along with collection of evidence necessary for conviction are also becoming more commonplace in fighting crime. Topic 10

Business issues

As businesses begin to rely more on data-driven AI applications, these new applications lead to new business issues, security, and privacy concerns, including:

• How will they differentiate themselves? Topic 11

• How does a user distinguish one automated on-line banking application from another? Topic 12

• How can one benchmark and rank the quality of the recommendations? Topic 13

• Which financial institution and application will the user trust to provide access to his/her financial details across financial institutions? Topic 14

• Will more comprehensive access to data across institutions result in better advice? Topic 15

• How can this be demonstrated? Topic 16

• Is the speed of execution, the ability to act and provide information in real or near-real time, more important, or equal in importance to the recommendations? Topic 17

• Given that AI systems can also explain their recommendations. How important is the ability to explain the recommendations in a convincing and understandable manner? Topic 18

• How easy will the system be to use? Topic 19

Most likely all of the above will be qualities that will determine which financial institutions' products and services will prevail in the marketplace.

Security and Privacy Concerns

• When things fail, or AI applications are attacked and access denied, or resulting recommendations tampered with, the consequences could be devastating. Topic 20

• If applications get compromised or tampered with, the user will get poor or false advice. Topic 21

• If the user can't identify an application as genuine and valid with a high level of assurance, the user could be handing personal information and goals over to the wrong applications or act on malicious or bad advice. Topic 22

• Is there an equivalent for a "Series 7" certification for a robot advisor, and who is liable when providing inappropriate advice? Topic 23

• Likewise, if the applications can't identify their users with high enough assurance, criminals could successfully impersonate the real user and convince the program to turn over sensitive data, or to take instructions from the wrong person. Topic 24

• It could result, among other things, in lost funds, reduced eligibility for loans and insurance and destroyed reputations. Topic 25

• How do we assess and audit the financial institutions and third parties that develop and run these applications? Topic 26

Privacy could become an even bigger deal in the future. The data used to make advice and recommendations more relevant can also be used for purposes that could be considered an invasion of a person's privacy. On one hand, users appreciate the advantages of having one-on-one experiences with companies. That's how, through alerts and other techniques, they quickly find what they need online and manage their money better on each individual transaction. On the other hand, analytics empowers businesses to collect and use consumer data in ways that were unimaginable just a few years ago. Such dynamics are creating a "perfect storm" when it comes to consumer privacy, with a broad range of developing conflicts, trends and ethical challenges that demonstrates the vast complexities of this issue. To provide some insight, Constellation Research has published "Privacy Enters Adolescence"[22], which concludes that consumers have not given up on privacy, they have been tricked out of it, and that the land grab for public and personal data is accelerating. The financial services industry needs to better understand these privacy issues and how they may intersect with, among other things, various U.S. federal and State consumer protection and privacy laws[23] and Europe's EU Directive 95/36/EC (the so-called "EU Cookie Directive"). Would it help if, as Alex Pentland, Director, Media Lab Entrepreneurship Program, suggests, financial institutions were to provide users with a dashboard that showed what they know about you and what they share, and you could turn it off or on?[24] Topic 27

AI Gone Rogue?

Programs endowed with this much intelligence can evolve in ways that can be detrimental and not in the users self-interest. We've all seen science fiction movies like 2001: A Space Odyssey and The Matrix, where the villain is an AI program that has gone rogue. These scenarios have entertained us at the cinema for decades, but some scientists are now warning that businesses must heed these potential scenarios seriously. Nick Bostrom who directs Oxford's Future of Humanity Institute, explains in his book, Superintelligence, how a super smart robot could arise and destroy us.[25] Other luminaries such as Stephen Hawking, Bill Gates and Elon Musk also warn of the potential dangers that AI can bring.[26] Topic 28

Regulatory Oversight

Another concern for financial institutions is how regulators will respond and supplement guidance on use of AI. Federal financial regulators have issued extensive supervisory

guidance on use of information technology generally and security, privacy, vendor management and resiliency specifically which require financial institutions to assess the risk and develop adequate controls. As the number of AI applications increases, regulators are likely to focus more on the use of AI and to identify deficiencies in controls. Topic 29

Conclusion

Because of the significant potential benefits there is probably no turning back, there will be increasing automation of financial services, often employing AI technology. However, these new AI applications introduce a number of business, security and privacy issues which will have to be addressed if they are to succeed in the marketplace. It will be important to ensure that these intelligent applications are developed in in a way that they will provide the desired benefit and that the user can trust the advice and services provided. It will be important to be able to detect and isolate infected or malicious AI programs immediately, and develop the effective policy and laws for governing their development and use, so that personal information is safeguarded and not misused. This includes technology and policy with respect to what constitutes liability, how to best audit these systems, and how to design and control AI systems for human safety.27

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2. http://www.loebner.net/Prizef/TuringArticle.html

3. http://en.wikipedia.org/wiki/Turing_test, http://www.computerweekly.com/photostory/2240233857/The-Imitation-Game/1/The-Imitation-Game-the-life-of-Alan-Turing?src=5368266&asrc=EM_ERU_40604257&uid=16804943&utm_medium=EM&utm_source=ERU&utm_campaign=20150312_ERU+Transmission+for+03%2F12%2F2015+%28UserUniverse%3A+1442300%29_myka-reports%40techtarget.com, The Turing tests asks whether a human judge engaged in natural language conversations with a human and a machine can distinguish between human and machine

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7. http://www.webopedia.com/TERM/E/expert_system.html

8. http://nerdsonwallstreet.com/artificial-intelligence-and-wall-street-trading-309/

9. http://www.ibm.com/smarterplanet/us/en/ibmwatson/what-is-watson.html

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15. http://www.pymnts.com/in-depth/2015/can-banks-embrace-their-inner-uber/#.VQG0U2jF-So, http://www.businessinsider.com/investment-tips-for-the-99-2012-3?utm_source=N9515.186294OUTBRAININC0&utm_medium=Content&utm_campaign=BusinessInsider

16. http://www.wired.com/2014/02/artificial-intelligence-way-forward-personal-finance/

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Tags: AI, Artificial Intelligence, BITS, Citibank, CTO Corner, Dan Schutzer, EU Cookie Directive, Financial Services, information technology, robo advisors

Evaluation of seminar paper

Subgroup work assessment rubrics: **CRITERIA**	Below Requirements *(05/20 ≤ mark ≤ 09/20)*	Meets Requirements *(10/20 ≤ mark ≤ 14/20)*	Exceeds Requirements *(15/20 ≤ mark ≤ 19/20)*
Identify issues	No issues identified, or only peripheral issues.	Identifies main issues.	All potential issues with interactions.
Identify Stakeholders	Doesn't identify all primary stakeholders	Identify all primary stakeholders	Identify all primary and secondary stakeholders
General Solutions	Solutions infeasible or only a single solution	Generates some feasible solutions	Multiple feasible creative solutions
Evaluate solutions	Ignores stakeholders; limited criteria considered.	Evaluate feasible solutions through impact on stakeholders.	Evaluate using multiple criteria for all relevant stakeholders
Recommend solutions	Infeasible or inadequate justification	Feasible alternative with justification for primary stakeholders	Creative solution with justifications for all relevant stakeholders

BIOGRAPHY

Prof. Dr. Edward Sun is currently the Senior Professor of Data Science & Fintech at KEDGE Business School, France. He was an adjunct professor at KIT, Germany as well as the HSBC Endowed Visiting Chair Professor in Taiwan and South Africa. Prior to joining KEDGE, Prof. Dr. Sun was a senior professor of finance at BEM Management School, France and visiting professor at Vlerick Management School, Belgium, and EDHEC Nice, France. Prof. Dr. Sun received his BSc, MSc, and Ph.d in Germany. His dissertation is on statistics and mathematical Finance with summa cum laude completed at University of Karlsruhe (TH), one of the first three elite universities in Germany. His principal doctoral supervisor is Prof. S. T. Rachev (Professor Emeritus at University of California Santa Barbara and professor of finance at the College of Business at Stony Brook University New York, USA) who completed doctoral work under supervision of L. Kantorovich, a Nobel Prize winner in economic sciences in 1975, and A. Kolmogorov, a 20th-century Russian mathematician who made significant contributions to the mathematics. Prof. Sun's research interests are Applied Mathematics and Operations Research, Artificial Intelligence, Business Analytics, Data Mining, Financial Institutions and Markets, and Risk Management. He has published his research in different journals such as European Journal of Operational Research, International Journal of Production Economics, Annals of Operations Research, European Financial Management, Journal of International Money and Finance, Computational Economics, and Study in Nonlinear Dynamics and Econometrics, among others.

ACADEMIC FRAUD

Definition

Academic fraud is a breach of ethics.

"Is achieved using unfair means or deception, to obtain material or undue moral advantage, or with the intent to avoid the enforcement of laws". (Translated from the original source: Dictionnaire Juridique des Lois, 2010, available at: www.dictionnaire-juridique.com/definition/fraude/php)

Plagiarism consists of attributing authorship by (partial or total) copying, imitation or misappropriation.

The act of fraud is committed by one or more students/participants when they:

- appropriate written or oral work to themselves when they are not the author (in whole or in part) of the work, by omitting any references or quotations to the author or to the owner of the work;
- present any data that has been falsified or invented in any way;
- use the identity of the author, attributing the contents of and/or a resource to him/her, but without explicitly mentioning that they are not the author;
- appropriate the creative work of someone else and present it as their own;
- acquire exerts of texts, images, results etc. from external sources by including them in their own work without mentioning the origins of the exerts;
- summarise the original idea of an author by expressing it in their own words but omit quoting the source;
- cheat in an academic evaluation.

Plagiarism can occur in:

- an academic article or book;
- an exercise or a case study;
- a study or a report;
- a dissertation or a thesis;
- any document of which the student/participant is not, but purports to be the author.

Sanctions

Any student/participant having committed academic fraud, or having participated in it, will be sanctioned by the professor in charge of the course. The professor can apply 1st and 2nd level sanctions (detailed below). The professor will send a copy of the sanction to the student's/participant's programme. The student/participant will be informed/and or convoked by the programme director (or his/her representative) to a hearing prior to the possible convening of the Kedge Business School Disciplinary Council. In the case of a hearing of the Disciplinary Council, they can decide to apply 3rd and 4th level of sanctions.

Any student/participant guilty of academic fraud will receive one of the following sanctions:

- Applied by the professor in charge of the course, Kedge Business School faculty member (1st and 2nd level):
  - A grade of zero for the work concerned and a formal warning;
  - A grade of zero for the course or module concerned and a formal warning.
- Applied by Kedge Business School's Disciplinary Council (3rd and 4th level):
  - Suspension from the programme for one or two semesters;
  - Exclusion from the programme.

N.B.: Plagiarism within a partner institution can result in these sanctions being applied by Kedge Business School, notwithstanding partner's decision.