
FINTECH RISK MANAGEMENT

INTA-GB 2312.30

PRELIMINARY SYLLABUS

SPRING 2020

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Meeting time & location: TBD, Location: KMC

DESCRIPTION OF THE CLASS

Fintech adoption is driven by new technologies reducing frictions across banking, securities and insurance services. Disruptive technologies utilized include ubiquitous mobile access, big data analytics, artificial intelligence, voice recognition, blockchain, open source platforms, cloud computing, etc. These are leveraged to lower costs, improve ease of access and simplify product use, as well as creating entirely new business models. Fintech's innovative services include wifi or cellular based e-commerce and personal payments, online banking, robo investing, crypto currency, crowd sourcing P2P lending and new insurance products. Existing firms research these same opportunities looking to protect their own revenue by creating competing products or acquiring interesting startups.

Risk management requires understanding, measuring, and managing market, credit, liquidity and operational risks. Fintech's broad acceptance ensures its usage by consumers who may not always be sophisticated in their operation requiring that their data and transactions are protected. This mandates protecting both the consumer of these services, as well as the businesses providing the services. In a broader context, an individual firm's network effects may extend risks and failures to related firms, industries, even national economies.

This class explores how FinTech addresses their risk management and regulatory challenges, particularly those unique to payment systems, cybersecurity, operational and lending credit risks and advanced techniques such as data mining and blockchain. Numerous examples and cases are used to enhance the understanding of these hazards. We will discuss specific opportunities and challenges created by the use of new technologies in finance. Here are some examples:

- FinTech customers expect real-time responses to their requests (for a loan, etc.) which means risk management must be able to assess risks automatically in real time
- Cyber security risks are more important in a connected world
- New algorithms can be used for underwriting, monitoring and fraud detection

The course is organized in two parts. Prof. Donefer will teach the first 6 sessions on Fintech Payments and Cybersecurity Risk and Prof. Pinedo the remaining 6 sessions on Data Mining and Machine Learning (Applications) in Fintech Risk Management with applications in operational risk and credit risk. Guest speakers will be announced in class.

PREREQUISITES

The material covered in **Foundations of Finance** is a prerequisite for this class. In addition, you should be familiar with the following topics:

- Statistics concepts such as expected value, standard deviation, and percentiles. You need to know how to compute them in a spreadsheet.

PRIMARY TEXT AND READINGS

There is no required text for this course. Both readings and cases, as well as class notes will be provided on NYU Classes for each topic in the syllabus prior to each class.

RECORDING CLASSES AND EMAIL

All classes are recorded and will be available to you on NYU Classes.

Be sure your email address in NYU Classes is correct. We will use it to communicate timely information about the course. To update your e-mail address in NYU Classes, log into NYU Home at <https://home.nyu.edu/>. Click Preferences at the top of the screen and then edit your Directory Address, which will be reflected in NYU Classes within 24 hours.

GRADING

At NYU Stern, we strive to create courses that challenge students intellectually and that meet the Stern standards of academic excellence. We will use the following grading guidelines for this course. Grades of “A” or “A-” will be awarded to approximately 35% of students. Your final grade will be based on:

- Homework assignments and class participation: 30%
- One quiz 35%
- One final exam (take-home) 35%

DEFAULT POLICIES FOR STERN COURSES

Laptops, Cell Phones, Smartphones, Recorders & Other Electronic Devices

May not be used in class. You must TURN OFF all devices BEFORE class. If your phone rings, you will be asked to leave. Further I reserve the right to reduce your final grade by reducing points normally awarded for class participation. If you are on-call for work or family, just *place your device on vibrate and leave the room before taking the call.*

ATTENDANCE

Required and part of grade.

I will excuse absences and entertain requests to change exam and assignment due dates only in cases of documented serious illness, family emergency, religious observance, or civic obligation. If you will miss class for religious observance or civic obligation, you must inform me no later than the first week of class. Recruiting activities, business trips, vacation travel, and club activities are not acceptable reasons for absences or requests to reschedule exams and assignments.

ARRIVING LATE, LEAVING EARLY, COMING & GOING

Arriving late interferes with other students' learning and is not acceptable. Subway delays and other problems are unavoidable on occasion, but it is each student's responsibility to plan carefully to arrive on time and well prepared. Repeated latecomers will be penalized. Students are expected to arrive to class on time and stay to the end of the class period.

Arriving late or leaving class early may impact the course grade. Students may enter class late only if given permission by the instructor and can do so without disrupting the class. (Note that instructors are not obliged to admit late students or readmit students who leave class.)

GENERAL BEHAVIOR

You may eat in class as long as it is not odiferous or noisy. There will be a break at about 7:30 when you can get "dinner". Please clean up and throw away all trash.

As a mark of respect, I ask all men to remove their caps or hats while in class, unless worn for a religious reason.

Students will conduct themselves with respect and professionalism toward faculty, students, and others present in class and will follow the rules laid down by the instructor for classroom behavior. Students who fail to do so may be asked to leave the classroom. (NYU Stern Code of Conduct).

DISABILITY

If you have a qualified disability and will require academic accommodation during this course, please contact the Moses Center for Students with Disabilities (CSD, 998-4980) and provide me with a letter from them verifying your registration and outlining the accommodations they recommend. If you will need to take an exam at the CSD, you must submit a completed Exam Accommodations Form to them at least one week prior to the scheduled exam time to be guaranteed accommodation.

COURSE CONTENT

The course is organized in two parts. Prof. Donefer will teach the first 6 sessions on *Fintech Payments and Cybersecurity Risk* and Prof. Pinedo the remaining 6 sessions on *Data Mining and Machine Learning (Applications) in Fintech Risk Management* with applications in operational risk and credit risk. Guest speakers will be announced in class.

Fintech Payments and Cybersecurity Risk

Session 1: What is Fintech?

- Introduction to the course, syllabus, grading, etc.
- What is FinTech?
 - Banks, securities, insurance industry functions
 - Disruptive technologies and their new business models, cost structures
 - Mobile, big data and analytics, blockchain, crypto currencies, AI, ...
 - Robo investing, crowd funding, mobile payments (P2P)...
 - Identify individual fintech firm to examine
 - Determine critical risks to fintech
- Risk event analyzed: e-Trade pump and dump

Session 2: Cybersecurity

- Malware, viruses, key loggers, DDOS, Botnets
- Phishing, whaling
- Identification and authorization of users
- Firewalls and intrusion detection systems
- Risk event analyzed: Stuxnet, JPMC

Session 3: Cybersecurity

- Security risk analysis – Cyber kill chain
- Risk event analyzed: Harvard Cyber Attack simulation and discussion
- Guest speaker – financial services CISO

Session 4: Encryption and e-Commerce Security

- Encryption
 - Symmetric and public key encryption
 - Hashing
- SSL and TLS online e-commerce security
- Digital signatures
- Quantum computing invalidating encryption?
- Risk event analyzed: NSA hacking

Session 5: Payment Systems

- Retail payments, checks, debit / credit cards
 - EMV and chip cards
 - P2P systems, Apple Pay, Zelle, PayPal
 - PCI DSS standards
- Risk event analyzed: Target and Home Depot attacks
- Institutional payment systems
 - Fedwire, CHIPS, SWIFT, ACH, CLS
- Risk event analyzed: Bangladesh Central Bank Hack

Spring Break

Session 6: Blockchain and Cryptocurrency

- Distributed ledgers
 - Double spend attack
- P2P file sharing
- How does blockchain work – transactions, mining
- Blockchain risks
- Crypto currencies (Bitcoin, etc.)
 - Initial Coin Offerings (ICOs)
- Smart contracts
- Risk event analyzed: Hacks of Bitcoin Exchanges
- Risk event analyzed: Ethereum DAO smart contract and fork

Data Mining and Machine Learning in Fintech Risk Management

Session 7: Data Acquisition and Data Mining.

- Multi-factor analysis, Linear and Nonlinear Regression.
- Central Limit Theorem, Extreme Value Theorem.
- Use of Internal Data versus External Data.

Session 8: Machine Learning in Fintech

- Neural nets, Bayesian Belief Networks, Support Vector Machines.
- Applications of Machine Learning to marketing of financial products.
- Applications to fraud detection and default prediction.

Session 9: Operational Risk – General Aspects.

- History of Operational risk, Different Aspects of Operational risk.
- Basel II, III.
- LDA (frequency and severity distributions), AMA, SMA.
- Key Risk Indicators,
- The ACBC Case

Session 10: Operational Risk in Fintech:

- Oprisk and Market Risk in algorithmic trading (flash crashes) and robo-investing,
- Oprisk and Credit Risk in peer to peer lending, crowdfunding,
- Platform (e.g., Crypto-Currency exchange) hacks.

Session 11: Intro to Credit Risk and Peer to Peer Lending:

- Main drivers of peer to peer lending.
- Crowdfunding.
- Machine Learning applications in default prediction
- Ezubao Case

Session 12: Data-Driven Investment Strategies for Peer-to-Peer Lending.

- The Lending Club Case (Cohen, Guetta, Jiao, Provost Case)
- Data exploration and predictive models for default
- Investment strategies and Optimization