FINTECH RISK MANAGEMENT

**Professors:**  
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**Meeting time & location:** Wednesday 6-9pm, location: TBD

**DESCRIPTION OF THE CLASS**

This class explores how FinTech changes the practice of risk management in financial firms. Risk management requires understanding, measuring, and managing market risk, credit risk, liquidity risk, and operational risk. The class presents the technology behind enterprise risk systems and shows how to manage risk using quantitative models. We consider how recent FinTech innovations such as Blockchains, mobile technologies, etc., can change the way these risk systems operate, and create a new demand for talents in risk departments. We also study the specific risk management and regulatory challenges faced by FinTech firms.

The class has two main objectives. The first objective is to introduce the principles of risk management that anyone working for a financial firm needs to understand. The second objective is to 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
- Cyber security risks will become more important
- New algorithms can be used for underwriting, monitoring and fraud detection

Financial technology has gone through three major stages. In 1960s and ‘70s, back office paper based processes migrated to mainframe computers, using standard CUSIP’s and equity clearing houses and depositories. The second stage used PCs, communications networks to address the front office, FIX standards brought online banking, trading and electronic markets. The third, and the subject of our class, is “fin-tech”, where innovative use of technology disrupts existing financial processes and businesses.

Entrepreneurs create new business models with relatively modest capital investment using new technologies: broadband internet, Wi-Fi, mobile computing, cloud storage and “free” platforms
such as Python and Linux. Major banks, securities and insurance firms research these same opportunities looking to protect their own revenue by creating competing products or acquiring interesting startups.

**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.

**GRADING**

At NYU Stern, we strive to create courses that challenge students intellectually and that meet the Stern standards of academic excellence. To ensure fairness and clarity of grading, the Stern faculty have agreed that for elective courses the individual instructor or department is responsible for determining reasonable grading guidelines. The Finance Department has elected to use the following grading guidelines for this course and all other elective courses. Instructors should award grades of “A” or “A-” to approximately 35% of students in elective courses with enrollments of more than 25 students. Your final grade will be based on:

- Homework assignments and participation: 30%
- One midterm exam (1.5h) 30%
- One final exam (3h) 40%
The course is organized in two parts. The first half will teach the building blocks of risk management: financial risk management (market, credit, liquidity), operational risk and data, payment systems, clearing and settlements. The second half will present various topics related to FinTech and risk management.

## I. Building Blocks

1. Introduction
   a. What is FinTech? Overview: robo advisors and systematic trading; fintech analytics; digital currency and blockchains; lending and funding platforms.
   b. Why is FinTech happening now? The excessive cost structure of traditional financial services
   c. What is financial risk management? Overview: market, credit, liquidity, and operational risks
   d. Financial risk management
      i. Value at risk
2. Basics of Regulation
   a. Banking regulation: capital ratios, liquidity ratios
   b. Insurance regulation: solvency ratios
   c. Reg SCI
   d. Systemic risk and stress tests
   e. Resolution and living wills
3. Definition of Operational Risk
   a. Basel II and Basel III
   b. Various Measurement approaches:
      i. Loss-Distribution Approach,
   c. Frequency distributions, Severity Distributions (e.g., Heavy–Tailed distributions).
   d. Use of Internal Data and Use of External Data
   e. Distribution fitting (K-S and other tests).
   f. ORX and other large consortia databases and their use.
4. Big Data and Data Mining
   a. Applications of CLT and EVT
   b. Machine Learning (Neural nets, and so on)
5. Payment Systems
   a. Checking, debit (ATM), credit card processes
   b. Automated clearing house (ACH)
   c. Wholesale payment systems: Fedwire, CHIPS, SWIFT, CLS
6. Transaction Security
   a. Phishing, pharming and online risks
   b. Encryption
      i. RSA, SSL, Hashing, Digital signatures
ii. Biometrics vs password
c. New card transaction methodologies and their risk mitigation potential
   i. EMV
   ii. Near Field Communication (NFC)
   iii. Apple, Google, Samsung Pay, Square, et al

7. Blockchain
   a. History and context
      i. Digital Assets – risk of unlimited duplication
      ii. Data structure, hash pointers
   b. Distributed ledgers, peer to peer file sharing, mining, proof of work
   c. Clearance and Settlement
      i. Post trade processes using central counterparties and depositories
      ii. How these can be replaced with blockchain and risk implications.

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<th>Topics in Fintech Risk Management</th>
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8. Case Study: Smith Thompson Case
   a. Use of Multi-Factor analysis: how to detect human errors (or other anomalies) in a database of open FX-trades.
   b. Use of Nonlinear regression.

9. Case Study: Fraud Detection in credit card charges
   b. Formulation of optimization model to determine trigger mechanisms for rejecting charges.

10. Cybersecurity
    a. Cyber Threats
    b. Security risk analysis
    c. Cyber Defenses
    d. Fundamental Security Design Principles
    e. Policy, Legal, Ethics, and Compliance Patent risk

11. Data aggregators robo investing
    a. Design and implementation of investment strategies to work without human interventions
    b. Case studies & guest speakers: Wealthfront, Betterment, Personal Capital, Vanguard, Schwab

12. Banking the unbanked
    a. Mobile payments in Emerging markets
       i. Mobile money revolution in Kenya, Tigo in Tanzania.
       ii. Guest speakers
    b. Reaching new savers and borrowers in Advanced economies
       i. Is ‘Fintech’ Good for Small Business Borrowers? Why do firms borrow from the crowd?
       ii. Liquidity and information in marketplace lending
       iii. Benefits, risks, and regulatory concerns of Online lending