Education of Financial Engineering at Hitotsubashi and Japan

Personal View from 1990
By
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Kunitachi Japan
Preliminary

- Education System in Japan (Mathematics)
  
  **Science**: Natural Sciences
  
  Math, Physics, Chemistry, …
  
  Engineering, Medicine, etc.

  **Non-Science** (Literature • Arts, Social Sciences):
  
  Law, Economics, Literature, …. etc
High School

- Students have to choose which “Course” he/she want to enter at college.

ENTRANCE EXAM
Science: Required high level Math
Non-Science, Arts: Some university don’t require math
High School Math and College Math

- **High School:**
  - Math 1 (Most of them who want to enter college complete)
    - Equation, Quadratic function,
    - Inequality,

  - Math 2 Algebraic geometry, Higher order equation,
    - Proof, Trigonometric, Exponential,
    - Logarithm, Idea of differentiation and integration
High School  Cont

- Math 3  Limit,
  Differentiation: chain rule
  Integration: integration, by parts, area, volume
Continue;

- Math A  Geometry, Set and & Logic, Combinatorics

Math B  Sequence, Vector, Stat & Computer, Numerical Analysis

Math C  Matrix, Curve and its equations, Probability Distribution, Stat’l Anal
Entrance Exam

Science course: Math 1,2,3
Math A,B,C

Non Science course: Math 1, A (?)
Math 1,2:
Math A,B

Major Univ.
At College:

Science major: Calculus, Linear Algebra
Lot of exercises

Non-Science major:
Usually, Math is not required!

Economics: Calculus, Linear Algebra
No home works!
Statistics and Probability

- There are no department of statistics in Japan!
- Probability: Mainly taught at Math Dept.
- Stat: Econ, Engineering,.....
Movement at early 90’s

- Deregulation:
  Security company, Bank, Insurance company started dealing with derivatives.

LOST a lot of MONEY!

some said insurance companies lost $200 billion (US$)
What they thought?

- They thought they need a good “QUANTS”
Quants (?)

- Mathematics Analysis
- Basic Knowledge Of Prob and Stat
- Computational Skill

New Graduate Who can Work immediately
They started hiring newly graduated students from the department of Mathematics!
Results

- Most of the cases they failed!!

Financial engineering is “not” a pure mathematics!

What we need:
- Probability, Statistics, Economics,
- Econometrics, Computer
Statistics and Probability in Japan

- Stat is not considered as mathematics. (=> some dept of Math don’t have stat program.)
- Probability isn’t a main stream in math dept.

1. There are no dept. of stat in Japan
2. Stat are mainly educated in Econ, Engineering, , , , ,
At the same time outside the Univ.

- Request from the industries
  Educate their employee.
  Their background:
  - Science; Not enough knowledge of econ., stat, ....
  - N-Science; Stat, Prob, (Econ Too ??)
Is OJT Possible?

They thought they could train their young worker easily and made understood these new theory without too much effort!
Need to Educate Students at Graduate Level

- At Hitotsubashi:
  We were planning to start a “Business School” at the center of Tokyo.
  There were many young people in financial industries who wanted to brush up their skills.
  
  => We decided to start evening school.
  Students should have at least 2 years of working experience.
International Corporate Strategies

- ICS was Founded April 1998,
- First Student Enrolled April 2000

ICS Financial Strategy
International Business Strategy
Business Law
(Asian Public Policy)
- **Admission Requirements**

  The program is targeted for students who already have work experience in the areas of finance, manufacturing, trading or services. To be eligible for admission, candidates are expected to have appropriate background knowledge in English, mathematics and statistics equivalent to bachelor’s degree holders. Consideration will also be given to the quality of the required thesis proposal and relevant research potential based on work experience.
At our Main Campus

- University of Social Sciences:
  A. Students at Econ;
     Most of them have a strong Math background.
  B. Level of Math, Stat are fairly high!
  C. Some of our students can be (potentially) very good QUANTS!
    (and Actuary)
5 year BA・MA program

- Need more knowledge on Stat., Econometrics, Prob., Finance

4 years are too short to learn everything
6 years are too much!
5-year BA • MA Program

- 4 Years College + 1 year MA = 5 year
- Senior year: Combination of BA & MA
  - (Residence unit for College is very stringent in Japan)

- 3 major field
  - (1) Public Policy
  - (2) Stat Finance
  - (3) Regional Studies, (4) Other

- Selection: Junior year (December)
- Grade Point Average, Recommendation
Stat Finance Course at College and Grad School

BA-MA Program

Selected 2nd Semester Junior Year

Senior • MA 1st Year

Stat Finance Course

MA 1st, 2nd Year

BA

2 Year Regular Grad Student

Selected When they Started
What is Stat Finance Course?

- One of the Education Program at Hitotsubashi Dept of Econ (Grad+Under)
- Goal: Teach Financial Engineering as well as Statistics+Probability+Econometrics in a limited time.

We have an organized curriculum to materialize the idea.
Before Who Became Quants?

- Graduate from Science Dept:
  - Math, Engineering,
  - Over sea’s Business School

- Very rare from the non-Science dept.
  (Even from Hitotsubashi)

This might have caused a problem!
Why Financial Engineering at Econ?

Basic Knowledge of Economic Theory

Timely Topic
Retirement Of 1st BabyBoomers

Globalization of Economics
Sub Prime Loan

Financial Engineering Quants?
We have enough faculty members

Math
Prob. and Stat.
Econometrics Statistical Finance
Mathematical Finance

Well Organized Education

http://www.econ.hit-u.ac.jp/~finmodel/jpn/staff.html
Basic Concept of our Curriculum

- Under Graduate:
  - Introduction
  - Intermediate
  - “Advanced” (in college level)

Econ, Stat, (Math) : All of these have such a sequence !
Graduate School

- Basically 2 step+1:
  - Introductory
  - Advanced
  - Seminar Classes
  - Research Level (MA thesis)
Curriculum
(Core)

- 1st Intro stat (no calculus) : Prob and Stat (some calculus)
- 2nd Basic Econometrics (without Matrix)
- 3rd Statistics (Hogg+Craig level) Computer Sciences Intermediate Econometrics (some matrix alg.)
Introduction to Financial Engineering
(easier than Hull)

Quantitative Economics: (Sometimes used as preparation for advanced econometrics)

Financial Economics (Macro econ)
- Basic Mathematical Analysis
- Real Analysis
- Introductory computer analysis
- Statistical analysis of economics
Graduate School

- 1st Advanced Econometrics
  Intermediate Micro, Macro

Financial Economics A,B
  (Stochastic Calculus)
Quantitative Economics A,B
Monetary Economics (Macro Econ)
Special Topics Quantitative Econ
Advanced Prob, Advanced Stat…
Others

- 1st Intro Economics
- 2nd Intermediate Micro
  Intermediate Macro
  Math for Economics

Also, most students complete more advanced Micro and Macro Economics in their Junior and Senior year.
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<th>Year</th>
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<td>Totally 12 more</td>
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# 統計・ファイナンス学生人数の推移
3/15/2008現在

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<th>5年</th>
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統計・ファ学生総数推移（第1四半期毎）
Number of Students as of July 08 (7/30/2008)

- BA・MA M1:3
- M2:7、M1:4
- BA・MA Senior:3、Total 17
- Number of Grad. 9 (07), 9 (08)
- Faculty:12(+1)、Staff 2
Big Government Support
$400,000/year for 3 years (??)

- Data Base: NEEDS FQ, Bloomberg
- Soft Ware: (Matlab, GAUSS)
- High Speed PC (Vista 64bit) 3
- Printer etc.
- Desks for each Student
- For the detail, CFEE HP:
Organized CFEE

- Center for Financial Engineering Education CFEE at 2007
Stat & Finance and CFEE

Tsunemasa Shiba
March 3, 2008
Statistics & Finance Program

5-yr CBMA

Accepted junior year

BA in Econ.

Stat & Finance

MA in Econ.

Accepted when entering graduate program
Group of classes in Stat&Finance

(1) **Statistics and Probability**

(2) **Econometrics and Financial Econometrics**, and

(3) **Financial Engineering**: includes mathematical finance, finance theory, computational finance and so on.
Two pictures of the CFEE opening day, 12/21/2007 follow.
Stat & Finance Program

- Financial Engineering Education with solid base in statistics and econometrics.
- In the past 2 years, FIVE each have finished. This a.y., NINE are expected to finish!
- They all got jobs at the frontiers of financial engineering industry.
Placement Record

including 2008 a.y.

- Nomura Asset Management (4)
- Nippon Life Insurance Co. (3)
- Sompo Japan Insurance (2)
- Nissay Asset Management (1)
- Meiji Yasuda Insurance Co. (1)
- Bear Sterns Japan (1)
- Chuo Mitsui Trust Holdings (1)
- Daido Life Insurance Co. (1)
- Nomura Securities (4)
- Accenture Technology Solutions Japan (1)
Funding

- Support Program for Improving Graduate School Education (JSPS) announced spring of 2007
- Stat&Finance proposal submitted
- Title “Improving Financial Engineering Education in Economics MA Program”
- Accepted fall, 2007.
- CFEE room opened: 12/2007
Seven pictures of outside and inside of CFEE room follow.
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経済学研究科
金融工学教育センター
Phone: 042-580-9129
3402
経済学研究科
金融工学教育センター
Phone: 042-580-9129
関係者以外の方はノックをして下さい
Where do we go from here?

- New courses coming/planned:
  - actuarial science, ERM (enterprise risk management), mathematical programming
- By supporting Stat & Finance students better,
- We expect to recruit more good students.
- Collaboration with financial engineering academic institutions both domestically and internationally.
What our students did 2007?

- Some passed CFA and/or Actuarial exam.
- Some of the students published their research paper at the refereed journal.
- Present their paper at the professional meetings.
The Future of Education at Hitotsubashi

- Economics
- Comm & Management
- ICS

Financial Engineering Educ ･ Research
Other University

- The Univ. of Tokyo: Math and Econ
- Meiji Univ. Business School
- The Univ. of Tsukuba Tokyo Campus
- Waseda Univ. Business School
- Osaka Univ. Center for the Study of Finance and Insurances
- Ritsumeikan
Professional Organization

- Nippon Finance Association

Later

- JARIP Japanese Association of Risk, Insurance and Pensions
- JAREFE Japan Japanese Association of Real Estate Financial Engineering
Pre-existing Associations

- Japan Statistical Society
- Japan Society for Industrial and Applied Mathematics
- Mathematical Society of Japan
Thanks for Listening