MSBA7017 Financial Engineering

0 Introduction

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Fall 2023

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Overview

- **Financial Engineering part (FE)**:

1. Bond analytics

--Classical bond mathematics: bond-yield relationship, spot rate curve (interest rate term structure), durations and immunization;

--Advanced topics will *not* be covered: short rate models, Heath-Jarrow-Morton framework, interest rate derivative pricing, credit risk, etc.

2. Modern portfolio theory

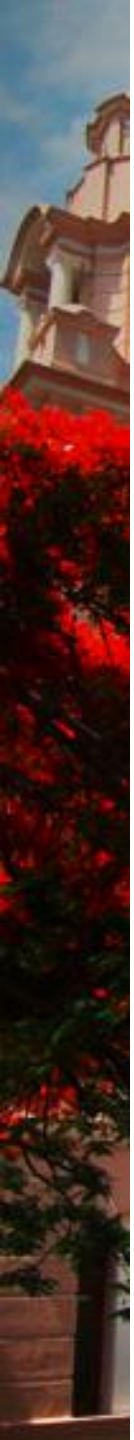
--Markowitz Model, CAPM, Black-Litterman Model

--Continuous time dynamic portfolio allocation will *not* be covered.

3. Options

-- Vanilla European stock options (simplest options)

-- will *not* cover proof of Black-Scholes formula or general derivative pricing



Overview (ct'd)

- **FinTech part:** introduction to active product areas in FinTech industry: financing (nonequity/equity crowdfunding and marketplace lending); automated investment advisor; Bitcoin and blockchain.

  Also, use cases of ML/AI in financial *service* industry.

- Relationship with FE: models built in field of Financial Engineering/Quantitative Finance/Mathematical Finance/Computational Finance/etc. are used in products of the FinTech industry.

  E.g. Bettermant uses Black-Litterman model.

Course Materials

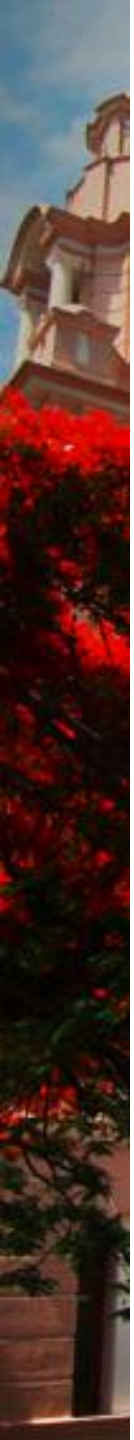
- FE: course notes (**[N]**) and slides. Any part with asterisk (*) is intended for interested audience only (i.e. not required).

  Spreadsheet modeling with VBA codes; Python codes.

- FinTech: slides.

1. Readings are assigned from *The FinTech Book* (Chishti et. al.), **[FB].** Electronic copy available at lib.hku.hk.

2. Academic journal papers; non-technical summaries are in slides; they are optional readings.



Course Materials (ct'd)

- For the Bitcoin and Blockchain in FinTech part, I follow the first four chapters of *Bitcoin and Cryptocurrency Technologies* (Narayanan et. al.), [NBFMG], in a light manner.

- You do not have to read the book; content is summarized in slides.

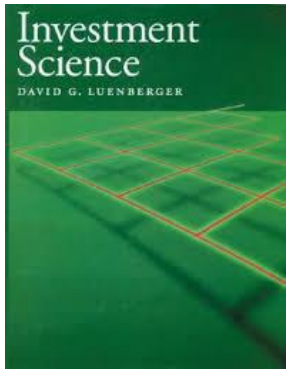
- A free pre-publication copy is on the author's website:

  http://bitcoinbook.cs.princeton.edu/

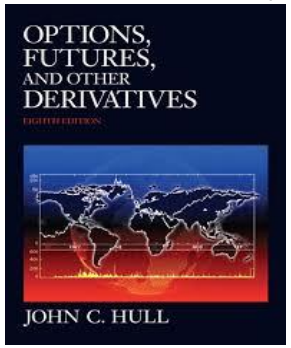
References

- I draw content from the following (optional) textbooks.

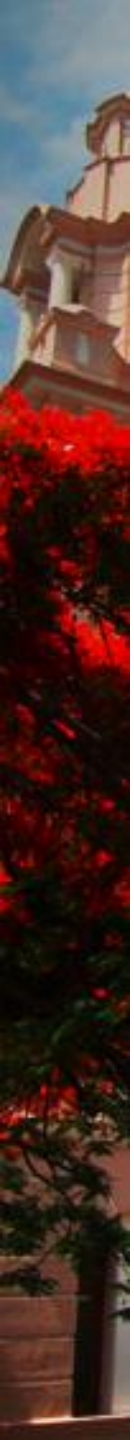
1. Luenberger, D.G., Investment Science, Oxford University Press, New York, 1998. **[L]**



2. Hull, J.C., Options, Futures, and Other Derivatives, latest ed., Prentice Hall, Upper Saddle River, NJ. **[H]**



I also draw content from a collection of other books, and they are listed in reference section of notes.



Course Logistics/Policy

- Two individual assignments, 40%
  -- Both accuracies and efforts will be weighed in grading.
  -- Coding in either VBA or Python is fine.
- Final exam (Mid January; Venue to be confirmed), 50%.
  -- 10 True or False questions (1 point each), 10 MCQ questions (1 point each)
  -- 3 Calculation Problems in total: one on bonds (20 points), one on portfolio theory (35 points), one on options (15 points).
  -- 1 on Fintech (short-answer， 10 points).
  -- Each problem will have several parts.
  -- Review problem set for final exam will be provided.
- In-class (lecture) participation, 10%.

- 10 lecture, 4 optional tutorials (help with homework and VBA/Python coding).

- Each lecture has three 50-min sessions and two 10-min breaks.
- Strictly no cheating.

Communication

- MOODLE
  - Notes, slides, and other materials
  - You can also ask questions on the discussion forum; excellent questions and discussions will be awarded for participation credit.
- Consultations by appointment is welcome
- Liao's Office: KKL806, Email: lwang98@hku.hk
- Allison's email: ah1122@hku.hk
- Feedback is highly welcome.