Course Syllabus – Valuation for Financial Engineering FRE-6103

David C. Shimko, Industry Full Professor of Financial Engineering, Fall 2023

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Office:	1 Metrotech, 10th Floor
Office hours:	In-person Thu 2:00 – 4:00 p.m., By Zoom appointment, or in-person appt,
Grading assistants:	Rahul Bhagtani (rb5162@nyu.edu) Aditya Daftari (ad6173@nyu.edu)
Sections/Location/Time:	RH 216 2:00-4:30 Weds RH 216 6:00-8:30 Weds RH 216 11:00-1:30 p.m. Thurs RH 216 11:00-1:30 p.m. Fri

FRE 6103 introduces financial engineers to robust risk-based valuation methods in discrete time. This includes four major applications: cash flows, traded derivative contracts, nontraded and embedded derivatives, and corporate assets & liabilities.

- "Cash flows" refers to risk-free and risky payments or expenditures.
- "Traded derivatives" include a high-level integrative treatment of forward contracts and the most commonly traded option contracts.
- "Nontraded and embedded derivatives" refer to contingent cash flows created in the normal processes of contracting and asset management
- "Corporate assets" refer to claims to cash flows owned and managed by corporations
- "Corporate liabilities" refers to corporate-issued securities or other payment obligations incurred by corporations

This is not a generalist MBA finance course. Being designed for engineers, it focuses on deep analytical methods, is computational in nature, and is driven by practical problems encountered by finance professionals. Being an introductory core course, it does not go into depth into all subject areas, but provides a suitable and

broad foundation for advanced elective courses in advanced valuation, corporate finance, investment, derivatives, and trading.

IMPORTANT! FOR WEEKS 2-13

Except for Week 1, you must prepare for every class by watching the video covering the basic theory of each class. Advanced theory and problem-solving will be done during the class, which requires your participation. You will be called on or asked to go to the board to solve problems.

Instructor information:

Prof David C. Shimko

Resume in brief:

- Assistant Professor, Marshall School, USC
- Adjunct Professor, Harvard Business School
- Adjunct Professor, NYU Courant
- Head of Commodity Derivatives Research, JPMorgan
- Head of Credit Research, JPMorgan
- Head of Risk Management Advisory, Bankers Trust
- CEO and co-founder of Risk Capital, an independent risk advisory firm
- CEO and co-founder of CreditCircle, a marketplace lending platform
- Director of public, private and non-profit entities including GARP
- Widely published in derivatives valuation, risk management, commodities and credit
- Father of five, grandfather of five

Class organization:

Required texts: Valuation for Financial Engineers, class notes to be provided by Prof Shimko. This will be provided free of charge on Brightspace. Corporate Finance, 4th Edition (MFE Version) by Ivo Welch is recommended for those who need more background or debt in traditional corporate finance. The Welch text is available free online or a print copy may be purchased. Other readings may be used as supplements and will be provided to students as needed.

Brightspace: Please follow the course requirements and announcements online weekly, as they are likely to change as the term progresses.

Recommended calculators: You may use any calculator. I personally prefer the traditional HP 12C, and will use it in class. This does not mean you have to use it. You may also use a smart phone app or simply use Excel in class.

Recommended analytic software: I prefer Excel, not for its elegance or ease of use, but for the ease of collaboration and visualization with colleagues, supervisors and clients. **You must have access to Excel to complete your assignments.** You are also expected to use Python for completing more complex projects.

Course grading: This will be a combination of homework and several 2-person mini projects (50%), a midterm exam (25%), a personal final project (10%) and class participation (15%), which is based on your answers to questions in class. You will be cold-called and expected to answer. Each project team will consist of at most two people, and the group *must be different for each project*. There is no final exam, but there will be a final project.

The expected grade distribution is 50% in the A range and 50% in the B range. The actual distribution may vary from expectations depending on the class performance as a group.

Missed class policy: I do not take responsibility for your missed classes. You are not penalized for missing classes, however, your participation grade may suffer. If you must miss a class, be sure to study the preparatory video, the powerpoint presentation and any sample spreadsheets from that week.

Office hours: GA hours TBA on Brightspace. Prof Shimko by in-person appointment, Zoom appointment, or from 2:00-4:00 p.m. Thursdays.

NYU Class Prerequisites: None for FRE students
Functional prerequisites: Calculus, Linear algebra
Analytical skills taught: Basic stochastic calculus, simulation, financial economics, financial valuation models & model-building

Class outline, subject to revisions (most lectures are less than a full period, and will be combined):

Lecture	Title	2023 Target Dates
1	Valuation Puzzles in Finance	
2	Using the GVE to value cash flows	Sept 6-8
3	Amortization, fixed rate bonds and financial decisions in Excel	
4	Bootstrapping, ZCBs and the Term Structure	Sept 13-15
5	Floating rate bonds, variable interest rates and interest rate risk	
6	Inflation, TIPS, and currencies (incl gold and BTC)	Sept 20-22
7	Corporate bonds and default models	Sep 27-29
8	Basics of simulation	
9	Multivariate simulations and copulae	Oct 4-6
10	Stochastic processes used in finance	
11	Advanced topics in stochastic processes	Oct 11-13
12	Lintner's CAPM and option pricing	Oct 18-20
13	Multiperiod CAPM and applications	Oct 25-27
14	**MIDTERM EXAM**	**Nov 1-3**
15	Futures valuation	
16	Futures in practice	Nov 8-10
17	Option valuation in the CAPM	
18	Real options; Simulated cash flows	Nov 15-17
	THANKSGIVING BREAK	**Nov 22-24**
19	Introduction to corporate reporting	
20	Introduction to corporate financial decisions	
21	Corporate capital budgeting	Nov 29–Dec 1
22	Corporate capital structure	
23	Corporate risk management	Dec 6–8
	FINAL PERSONAL CORPORATE FINANCE PROJECT DUE	**Dec 13-15**
	MINIPROJECT 1: FIXED INCOME BOOTSTRAPPING	*TBD*
	MINIPROJECT 2: CDOs	
	MINIPROJECT 3: Alternative equity valuation models	
	MINIPROJECT 4: Farmer Brown and contract design	
	MINIPROJECT 5: Exotic option pricing and hedging	

Policies

Academic Misconduct

A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
3. Plagiarism: Intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
4. Unauthorized collaboration: working together on work that was meant to be done individually.
5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission have been received from the course instructor(s) or research adviser involved.
6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

Disability Disclosure Statement

Academic accommodations are available for students with disabilities. Please contact the **Moses Center for Students with Disabilities** (212-998-4980 or mosescsd@nyu.edu) for further information. Students who are requesting academic accommodations are advised to reach out to the Moses Center as early as possible in the semester for assistance.

Inclusion Statement

The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit.