Course Syllabus – Valuation and Corporate Finance FRE-6103

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Office hours: By email appointment
Grading assistant: Huiqi Tian (ht980@nyu.edu)

Course description:

FRE 6103 introduces financial engineers to robust risk-based valuation methods in discrete and continuous 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 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.

Instructor information:

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
Class organization:

*Required text*: Valuation for Financial Engineers, class notes to be provided by Prof Shimko. Other readings may be used as supplements and will be provided to students as needed.

*NYU Classes*: Please follow the course requirements online weekly, as they are likely to change as the term progresses.

*Recommended calculators*: I personally prefer the traditional HP 12C, and will use it in class. This does not mean you have to use it. It requires “reverse Polish sequences” for which I will provide an instruction note. You may also use the Texas Instrument BA II PLUS (Professional) calculator (or TI 83, TI 83 Plus). You may also use a smart phone app.

*Recommended analytic software*: I prefer Excel and VBA, 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 welcome to use Python or R for technical work, and for completing your projects.

*Course grading*: To be determined. This will be a combination of homework, exams and projects, with at least 25% of your grade being determined by class participation.

*Missed class policy*: If you do miss a class, it is your responsibility to cover the course with notes from your fellow students. I cannot make class notes or recordings available.

*Office hours*: After class as needed in the adjunct faculty office, or by appointment on the 26th Floor of 12 Metrotech.

*NYU Class Prerequisites*: None for FRE students

*Functional prerequisites*: Basic differential equations, Linear algebra, Constrained optimization

*Analytical skills taught*: Basic stochastic calculus, simulation, financial reasoning

**Class outline, subject to minor revisions:**

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Theories of valuation, cash flows and shortcuts in discrete &amp; continuous time</th>
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<td>2</td>
<td>Real world valuation: Taxes, currency, inflation, default, variable interest rates (also continuous time)</td>
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<td>3</td>
<td>EXAM/EXCEL PROJECT 1: e.g. Mortgages, financial planning, rent/buy/lease, student loans, government bonds &amp; risk</td>
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<td>4</td>
<td>Simulation and benchmark valuation of risky cash flows</td>
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<td>5</td>
<td>Portfolio Theory &amp; CAPM/APT benchmarks, with matrix notation and Black-Litterman expected return adjustment</td>
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<td>6</td>
<td>Forward contracts: standalone and use in benchmark valuation <strong>Second half</strong>: Intro to use of options in practice</td>
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<td><strong>Option valuation</strong>: Derive PDEs, risk-neutral adjustments, express as integrals and solve with simulation</td>
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<td>8</td>
<td><strong>Embedded derivatives</strong>: Contracts &amp; securities</td>
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<td>9</td>
<td><strong>PYTHON PROJECT 2</strong>: e.g. callable &amp; convertible bonds, structured credit</td>
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<td>10</td>
<td><strong>Corporate financial statement modeling</strong></td>
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<td>11</td>
<td><strong>Corporate capital budgeting decisions</strong> including real options</td>
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<td>12</td>
<td><strong>Corporate risk management decisions</strong></td>
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<td>13</td>
<td><strong>Corporate financing &amp; capital structure decisions</strong> including security selection</td>
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<td>14</td>
<td><strong>FINAL EXAM/PROJECT (Excel &amp; Python)</strong>: Corporate case study</td>
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