NYU TANDON SCHOOL OF ENGINEERING

Finance & Risk Engineering

FALL 2022

FRE-GY 6951 A ▶ Sustainable Investments

Saturday, 2PM – 4:41PM

Rogers 207, Brooklyn

Instructor Information

- **Lecturer:** Bruno G. Kamdem, Ph.D.
- **Contact:** bgk8384@nyu.edu; (410) 772-3948.
- **Office Hours:** Before and after class or by appointment.

Teaching Assistant

Course Information

- **Prerequisite:** Graduate standing.
- **Credits:** 1.5.
- **Term:** 9/1/2022 – 10/25/2022 (1st half).
- **Class Description:**
  The amount of assets being invested in SRI (Socially Responsible Investment) products is dramatically increasing. As the Millennial generation interest in ESG continues to grow along with the emergence of the Generation Z, more and more global assets under management will be invested with a consideration of ESG factors. A sustainable finance economy whose contours are gradually taking shape is emerging. In this new climate economy, substantial wealth will be created by firms that get in front of the opportunities but lost by firms that discount the potentials ahead. Consequently, there is an urgent need to develop a graduate skills base that can serve growing employer demand for expertise in the area of sustainable investing. This course provides a foundation in sustainable investing and a detailed understanding of sustainable financing products. In addition to elucidating on how carbon markets work, the course also provides the analytical tools for appraising the effectiveness and efficiency of carbon markets as policy instruments for mitigating climate change. We will also cover the role of impact investing, sustainability-linked strategies, and the identification of SRI investment funds.

- **Learning Goals:** This course aims at the following key goals:
  1. Recognize ESG scoring and explain ESG performance in the stock and corporate bond markets.
  2. Identify SRI investment funds, green and social bonds, and other sustainability-linked strategies.
  3. Implement climate risk modeling and explain the implications of the regulation of climate risk.
  4. Understand the economics of carbon trading, climate stress tests, and climate scenarios analysis.
  5. Explain how to quantitatively construct a portfolio with ESG data and criteria.

- **Structure:**
  Weekly in-person lectures, student presentations, expert panel discussions (through guest speakers) will constitute the core of this course. Weekly homework assignments, group projects, a midterm, and a final exam will frame the course. Refer to the Course Schedule (see page 8) for specific details on the course assignments and deadlines.

- **Materials:**
  - Required Textbooks/References (also available in "course reserve"):
    1. Perspectives in Sustainable Equity Investing (Guillaume Coqueret, 2021).
  - Recommended Textbooks/References (also available in "course reserve"):
    1. Emissions Trading : Institutional Design, Decision Making and Corporate Strategies (Ralf Antes, 2011).
    2. ESG Investing: A Balanced Analysis of the Theory and Practice of a Sustainable Portfolio (John Hill, 2020).
    3. Engineering Fundamentals: An Introduction to Engineering (Saeed Moaveni, 2020).
    4. Data Engineering with Python: Work with Massive Datasets to Design Data Models and Automate Data Pipelines Using Python (Paul Crickard, 2020).
  - Current industry and academic papers on ESG Investments

- **Readings:**
  Selected chapters of the above core texts and current industry and academic papers on ESG investing, green bonds, and carbon markets have already been determined (see page 7). Recommended readings will be downloaded to *NYU Brightspace* for your convenience. Required readings may be placed on "course reserves" at *NYU Libraries*. In addition, weekly lecture notes will be available prior to class to all students on *NYU Brightspace*.

- **Resources:**
  - Access to course materials: NYU Brightspace.
  - Databases, journal articles, miscellaneous: Bern Dibner Library.
  - Collection of business research resources: NYU Business Library.
  - 24/7 technology assistance:
    * Tandon IT Help Desk: soehelpdesk@nyu.edu, (646) 997-3123.
    * NYU IT Service Desk: AskIT@nyu.edu, (212) 998-3333.

- **Expectations:**
  Weekly readings should be reviewed by students prior to class. Students should attend classes and come prepared to engage, participate, and ask questions on concepts they do not fully grasp from the lecture notes. All assignments are due at 11:59pm on the last day of the class week (see the full Course Schedule on page 8). All assignments should be submitted on time to the Teaching Assistant. It is important that you spend the necessary time working in this course to achieve the expected outcomes by the end of the term. If you face challenges at any time during the semester, please let me know. Please contact me if you expect to miss class. I am available and ready to support your success.

Performance Evaluation

(1) **Class Presentation:**
Students will be assigned to groups of three or four (depending on the size of the class). I suggest that you prepare for every class in study groups whether or not there is a group assignment. Each group will lead a brief 10 to 15 minutes verbal discussion at the beginning of each class. For grading purposes, it is imperative that you submit your slides (after your presentation) with the names of group participants (for the specific week) on *NYU Brightspace*. To earn full credit, you will have to follow the class presentation grading rubric that will be provided. The presentation will comprise a market update on one or more key financial market developments relevant to portfolio construction with ESG, green bonds, carbon markets, climate stress tests, climate scenarios analysis, or other ESG investments related topics over the prior week (or previous weeks). Sources for markets updates should be serious and credible references such as The *Wall Street Journal*, the *Financial Times*, *Bloomberg*, the *Economist*, $\cdots$. The University is already subscribed to most credible journals. You can find them directly linked on the *NYU Libraries* website under "Articles & Databases" $\rightarrow$ "Business" $\rightarrow$ "Articles, News, & Working Papers" or "Company & Financial Information".

② **Group Project:**
The group project will consist of a written and an in-class presentation on a subject relevant to portfolio construction with ESG, green bonds, carbon markets, climate stress tests, climate scenarios analysis, or other ESG investments related topics. In this project, you will have the opportunity to leverage programming and data analytics tools such as R, MATLAB, Python, Excel, Excel VBA, $\cdots$, to implement relevant models on real world data and infer realistic engineering applications. For the purpose of providing effective feedback, experts' evaluations will be resorted to. For the most part, data for the project will be available on *WRDS*, *Bloomberg*, or any other credible source. The databases for *WRDS* and *Bloomberg* can be found linked on the *NYU Libraries* website under "Articles & Databases" $\rightarrow$ "Business" $\rightarrow$ "Company & Financial Information". If needed, feel free to contact the School's Librarians or/and the contact Librarian at the above data sources for specific information regarding data for your topic. For grading purposes regarding the presentation part of the project, you will have to submit your slides (after your presentation) with the names of those who participate on *NYU Brightspace*. To deserve a 100%, you are required to abide by the provided group project presentation grading rubric. Further details on the project will be shared separately in class and on *NYU Brightspace*. Students will have to form their own groups and submit a written proposal with the subject and details of their group project (sections, subsections, names of members of the group, $\cdots$) no later than the end of week 2. Please, refer and abide by the deadlines below:

Initial proposal submission	5%	due by the end of week 2
Revised proposal submission	5%	due by the end of week 4
Final written presentation	10%	due by the end of week 6
In-class oral presentation	10%	to be held on week 7 & week 8

The above percentage is weighted on your group project's grade which is 30% of your final grade (see below). Each group member must contribute equally to the project. No work for this project may be partially or wholly part of an assignment prepared for another course. In case a student is unable to form a group and/or find a subject on his/her own, he/she will be assigned to a group and/or topic.

③ ***NYU Brightspace* Discussions:**
Each week, I will post an exploration item related to the topic covered on that week on *NYU Brightspace*. This interchange is designed to incite you to think critically about the concepts discussed in this class. It also gives you the opportunity to interact with each other's ideas. I may or may not partake in the discussions. Please, ensure to demonstrate good writing, critical thinking, objective discussion, and accurate interpretation of course materials as well as some insight into the concepts. For full credit, you must abide by the provided discussion grading rubric.

④ **Homework Assignments and Class Attendance:**
Weekly homework assignments will be posted on *NYU Brightspace*. All homework assignments should be submitted either physically or electronically (preferred) on *NYU Brightspace* by 11:59pm on the due date unless stated otherwise (see the full Course Schedule on page 8) for full credit to the Teaching Assistant. Attendance is expected at each class meeting. If you have to miss a class for family or health obligation, notify me in advance. A class roster will be taken before the start of each class. Consistent and constructive class participation may result in a student's grade being rounded up if very close to a higher letter grade once the curve is complete. Please, regularly check for new announcements on *NYU Brightspace*.

⑤ **Mid-term and Final Exams:**
You will have an in-class Mid-term Exam on week 5. The Mid-term Exam will be closed-book to be completed individually and submitted in class. The Mid-term Exam will cover materials we discussed in week 1 through week 4. A one double-sided cheat sheet (A4 paper) will be allowed along with a calculator or excel worksheet session on your lap-top or mac-book.
You will have a ninety minutes-window to complete the Final Exam throughout the 72 hours available dates on *NYU Brightspace*. Once started, you should finish the Final Exam. The Final Exam is open book but should represent your own personal work to be submitted electronically by 11:59pm on the

last day of the term.

⑥ **Grading:**

Homework	30%	weekly
NYU Brightspace Discussions	5%	weekly
Class Presentations	5%	weekly
Midterm Exam	15%	Saturday, October 1
Group Project	30%	week 7 & week 8
Final Exam	15%	Tuesday, October 25
TOTAL	**100%**	

$$\begin{aligned}
&\texttt{if grade} \geq 93\% \Leftrightarrow \texttt{4.00:A} \\
&\texttt{else if } 90\% \leq \texttt{grade} \leq 92\% \Leftrightarrow \texttt{3.67:A-} \\
&\texttt{else if } 87\% \leq \texttt{grade} \leq 89\% \Leftrightarrow \texttt{3.33:B+} \\
&\texttt{else if } 84\% \leq \texttt{grade} \leq 86\% \Leftrightarrow \texttt{3.00:B} \\
&\texttt{else if } 80\% \leq \texttt{grade} \leq 83\% \Leftrightarrow \texttt{2.67:B-} \\
&\texttt{else if } 77\% \leq \texttt{grade} \leq 79\% \Leftrightarrow \texttt{2.33:C+} \\
&\texttt{else if } 70\% \leq \texttt{grade} \leq 76\% \Leftrightarrow \texttt{2.00:C} \\
&\texttt{else F}
\end{aligned}$$

Academic Misconduct

(A) **Introduction (School of Engineering Student Code of Conduct):** 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 available here.

(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 your own.
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 has 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.

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. If this standard is not being upheld, please feel free to speak with me.

Unexpected Events

You may encounter unforeseen family, health, or other issues during the semester which create circumstances that prevent you from meeting course requirements. In this case, please raise the issue(s) directly with **Deanna Rayment** in the Office of Student Affairs at (646) 997-3046 or deanna.rayment@nyu.edu before requesting any accommodation from me.

Disability Disclosure Statement

Academic accommodations are available for students with disabilities. Please contact the **Moses Center for Students with Disabilities (CSD)** at (212) 998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at `www.nyu.edu/csd`. The Moses Center is located at 726 Broadway on the 2nd floor.

Readings

	MANDATORY READINGS	RECOMMENDED READINGS
WEEK1	Perspectives in Sustainable Equity Investing: 2.1. Overview of ESG Issues; 2.2. Rating Disagreement; 2.4. Greenwashing	ESG Investing-A Balanced Analysis of the Theory and Practice of a Sustainable Portfolio: Chapter 2. ESG, SRI, and impact investing
WEEK 2	ESG Investing-A Balanced Analysis of the Theory and Practice of a Sustainable Portfolio: Chapter 7. Financial markets: bonds	Engineering Fundamentals: An Introduction to Engineering: 14.4. Matrix Computation with Excel, Matrix Algebra
WEEK 3	Perspectives in Sustainable Equity Investing: 3.1. Investor Preferences and Beliefs	Engineering Fundamentals: An Introduction to Engineering: 15.4. Matrix Computations with MATLAB, Curve Fitting with MATLAB
WEEK 4	Perspectives in Sustainable Equity Investing: 4.1. Theory, Assets, Agents, Equilibrium; 4.2. SRI Improves Investment; 4.6. CSR and Risk	Data Engineering with Python: Chapter 4. Working with Databases
Week 5	Perspectives in Sustainable Equity Investing: 5.1. Simple Porfolio Choice Solution; 5.2. Improved Mean-Variance Allocation; 5.3. Other Quantitative Techniques	Engineering Fundamentals: An Introduction to Engineering: 20.7. Present Cost Analysis; 20.8. Bonds, Depreciation, Life-Cycle Cost
WEEK 6	Emissions Trading : Institutional Design, Decision Making and Corporate Strategies: Part A. Emissions Trading Markets	Data Engineering with Python: Chapter 5. Cleaning, Transforming, and Enriching Data
WEEK 7	Perspectives in Sustainable Equity Investing: 6.2. Measurement Issues and Stress Tests; 6.3. Macroeconomics Impact	"The Use of Scenario Analysis in Disclosure of Climate-related Risks and Opportunities" TCFD (2022)
WEEK 8	Perspectives in Sustainable Equity Investing: 7.1. Asset Pricing; 7.2. The DICE Model	ESG Investing-A Balanced Analysis of the Theory and Practice of a Sustainable Portfolio: Chapter 10. ESG in managing institutional investor funds

Course Schedule

SESSIONS & TOPICS	LECTURES	ASSIGNMENTS
Week 1 (Thu, Sep 1 – Wed, Sep 7) **ESG Investing** Guest Speaker 1 (in class)	*(i).Introduction to Sustainable Finance* *(ii).ESG Scoring* *(iii).Performance in the Stock Market* *(iv).Performance in the Corporate Bond Market* *(v).Greenwashing* Sat, Sep 3 (2PM – 4:41PM)	1.Readings for week 1 2.Review class syllabus 3.Confirm reception of welcome email 4.Check announcements posted on NYU Brightspace 5.Homework 1 due
Week 2 (Thu, Sep 8 – Wed, Sep 14) **Sustainable Financing Products** Guest Speaker 2 (in class)	*(i).SRI Investment Funds* *(ii).Green Bonds* *(iii).Social Bonds* *(iv).Other Sustainability-Linked Strategies* Sat, Sep 10 (2PM – 4:41PM)	1.Readings for week 2 2.Group in-class Presentation 3.Homework 2 due 4.Group Project Proposal due
Week 3 (Thu, Sep 15 – Wed, Sep 21) **Investors & SRI** Guest Speaker 3 (in class)	*(i).Investor Preferences and Beliefs* *(ii).Impact Investing* *(iii).Investor Practices* Sat, Sep 17 (2PM – 4:41PM)	1.Readings for week 3 2.Group in-class Presentation 3.Homework 3 due
Week 4 (Thu, Sep 22 – Wed, Sep 28) **ESG Investing and Financial Performance** Guest Speaker 4 (in class)	*(i).Theory: Assets, Agents, Equilibrium* *(ii).Numerical Example* *(iii).SRI & Performance* *(iv).CSR and Risk* *(v).ESG and other Financial Metrics* *(vi).Empirical Illustration* Sat, Sep 24 (2PM – 4:41PM)	1.Readings for week 4 2.Group in-class Presentation 3.Homework 4 due 4.Group Project Proposal (revised) due
Week 5 (Thu, Sep 29 – Wed, Oct 5) **Quantitative Portfolio Construction with ESG Data and Criteria**	*(i).Simple Portfolio Choice Solutions* *(ii).Improved Mean-Variance Allocation* *(iii).Other Quantitative Techniques* *(iv).Miscellaneous Tips and Methods* Sat, Oct 1 (2PM – 4:41PM)	1.Readings for week 5 2.Group in-class Presentation 3.Homework 5 due 4.Midterm Exam (Sat, Oct 1)
Week 6 (Thu, Oct 6 – Wed, Oct 12)	Fall Break NO CLASS	Group Project Final Write-up due (on NYU Brightspace)
Week 7 (Thu, Oct 13 – Wed, Oct 19) **Climate Change Risk** Guest Speaker 5 (in class)	*(i).Uncertain Discounting* *(ii).Climate Stress Tests & Measurement Issues* *(iii).Climate Scenario Analysis* *(iv).Macroeconomic Impacts* *(v).Investor Attention* *(vi).Carbon Markets* Sat, Oct 15 (2PM – 4:41PM)	1.Readings for week 7 2.Group project in-class oral presentation 3.Homework 6 due
Week 8 (Thu, Oct 20 – Tue, Oct 25) **SRI in Economic Equilibria** Guest Speaker 6 (in class)	*(i).Asset Pricing* *(ii).The DICE Model* *(iii).Other Models for Social Impact* *(iv).Uncertainty* *(v).Policy* Sat, Oct 22 (2PM – 4:41PM)	1.Readings for week 8 2.Group project in-class oral presentation 3.Homework 7 due 4.Final Exam (Tue, Oct 25)