RUTGERS UNIVERSITY
School of Business - Camden

FINANCIAL DATA ANALYTICS (53:390:581:90)
Online FALL 2024

Professor: Dr. Andrei Nikiforov, PhD
Office: BSB435
Office Phone: (856) 225-6594
Office Hours: by Appt (phone or Webex)
E-mail: andnikif@camden.rutgers.edu

Key Fall 2024 Dates:

- **Fall 2024 classes begin Tuesday, September 3rd**
- **Last day to withdraw with a "W" Monday, November 11th**
- **Last day of classes Wednesday, December 11th**
- **Final Exam period Monday, December 16th - Saturday, December 21st**

COURSE DESCRIPTION:

The primary objective of this course is to provide a clear, concise, and structured introduction to the fundamentals of financial data analytics. The course aims to offer students opportunities to explore how these analytics tools can enrich both their personal and professional lives.

This course delivers a comprehensive and practical exploration of modern financial data analysis methods. We place a strong emphasis on the application of contemporary analytical techniques to draw insights from commonly used financial data sets. Adopting a hands-on approach, students will gain a deep, practical understanding of topics such as financial returns, portfolio construction and management, bond and stock valuation, and options trading.

Leveraging the R programming language, students will create financial models that integrate market and accounting data. They will also learn how to construct optimal portfolios and delve into essential risk management concepts, along with more advanced options pricing methodologies.

In addition to traditional learning methods, students are **encouraged to utilize AI chatbots, such as ChatGPT**, to enhance their programming skills and overall experience in the course. These chatbots can assist in debugging code, offering programming tips, and explaining complex concepts in a conversational manner. The use of such advanced tools aligns with the course's emphasis on leveraging modern technologies for financial data analysis and offers a dynamic, interactive way to deepen your understanding of the subject matter.

REQUIRED TEXTBOOK:

- ***Analyzing Financial Data and Implementing Financial Models Using R (SECOND EDITION)***. By Clifford S. Ang. Springer 2021(2nd edition). The book is available for free as a downloadable PDF from the Rutgers Libraries. The book's website offers the latest errata (list of typos) and some data.

OTHER REQUIRED MATERIALS:

- ***Create an account at DATACAMP*** – a premier source of learning for data science community. You will be required to complete two micro-courses on DataCamp in the first two weeks of the semester (you'll need to be logged in to access the links below)*:*
    - *Introduction to R, and*
    - *Introduction to R for Finance*

There is a lot of overlap between the two micro-courses but this will help reinforce the concepts successfully prepare you for the our main course material. DO NOT PAY for these courses. Instead, wait for my invitation sent to your official Rutgers e-mail address. (See more here: Teachers & Students Get Premium DataCamp Free for Entire Academic Careers | DataCamp)

GOALS AND OBJECTIVES:

Basic fluency of R: Students will be able to

1. Differentiate between different forms of data (vectors, data frames, lists, etc.)
2. Manipulate data in R
3. Sub setting and expanding data in R

Understanding Prices and Returns: Students will be able to

1. Differentiate between total and price returns
2. Understand the difference between logarithmic and arithmetic returns
3. Calculate cumulative returns for weeks, months, and years.

Understand Portfolio Return Concepts: Students will be able to

1. Construct portfolio returns from individual asset returns
2. Construct benchmark portfolio returns

Understanding Risk and Risk adjusted performance: Students will be able to

1. Describe risk-return tradeoff
2. Estimate portfolio Risk with Value at Risk, Expected Shortfall and other measures.

Understand Factor Models and Markowitz Optimization Procedure: Students will be able to

1. Use the CAPM to estimate required returns
2. Find optimal portfolio weights using quadratic optimization procedure
3. Calculate the expected return and standard deviation of a two-asset portfolio

Understand Issues in Analyzing Fixed Income Data: Students will be able to

1. Understand the role of Treasury securities in Economic Analysis
2. Estimate the value of a bond portfolio

Understand Issues in Analyzing Options Data: Students will be able to

1. Use Black-Scholes and the Binomial Options pricing model to find the value of calls and puts
2. Differentiate between different Greeks
3. Calculate implied volatility and use it gauge market risk

COMMUNICATION AND USE OF CANVAS:

1. **EMAIL**- USE YOUR RUTGERS EMAIL ADDRESS

   All communications to students will be done using the Rutgers email address provided to you. Please forward your Rutgers email to your personal email if necessary.

   Not checking your Rutgers email is not an excuse for missing any communications.

2. **CANVAS**

Canvas is the learning management system used for this course. Posted will be the syllabus, resources, Power Point slides, announcements, guides, etc. To access this system, go to http://canvas.rutgers.edu log in, and click on the course in the dashboard. For technical support 833-648-4357 or help@camden.rutgers.edu.

CLASSROOM POLICIES

Make-up Work Policy: If, for a university-approved reason, you cannot complete a quiz, assignment, or exam during the scheduled time, you must give me written notice via email (andnikif@camden.rutgers.edu) at least one week in advance so that other arrangements can be made. If the situation does not allow for advance notification (e.g., emergency hospitalization), contact me as soon as possible after the missed work and provide written documentation. The ability to make up work for non-university approved reasons is not guaranteed. The professor reserves the right to request written documentation to support your absence (such as a doctor's note, an obituary, or military orders).

Late Work Policy: All work must be completed and uploaded to Canvas by the specified due date (with the exception of a university-approved, documented, and professor or Dean of Students verified reason; see Make-up Work Policy above). Any work submitted after the due date and time will receive a reduction of one full letter grade for each day that it is late.

Incompletes: "Incompletes" will only be given through prior consultation, under extreme circumstances, and when completion of the course requirements in question would substantially improve your grade. In the rare event when an "incomplete" is given, you must submit all of the agreed-upon work to me by the Rutgers registrar deadline to avoid the "incomplete" converting to an "F": https://registrar.camden.rutgers.edu/gradeinstruction#incomplete.

ASSESSMENTS:

1. **FINAL EXAM (25%):**

   There will be one exam. The Final will consist of questions designed to test understanding of the facts and concepts of the course and how they can be applied to practical investment problems. All problems will be based on the assigned required weekly readings, mainly from your textbook.

2. **WEEKLY DISCUSSIONS (25%):**

   Active participation in discussions is essential in this course. You will regularly contribute to online forums, sharing insights and progress on projects focused on financial data analytics using R. These projects will cover topics like financial returns, portfolio management, and options trading.

   Given the complexity of the work, you are encouraged to use AI chatbots like ChatGPT to assist with R programming and to better understand financial concepts. In your weekly posts, share your intermediate steps, findings, and how you utilized chatbots, including any helpful prompts or strategies.

   Engage with at least two classmates' posts per discussion by offering advice, solutions, or resources. Your contributions will be evaluated based on relevance, depth, and the effective use of AI tools. Strive to create a collaborative and supportive learning environment for all.

3. **WEEKLY QUIZZES (50%):**

   Quizzes are difficult and are based exclusively on the content of the required assigned readings. You should carefully read the assigned materials before attempting to take the quiz.

COURSE GRADING:

For the assignment of final grades, the course requirements will be weighted approximately as follows:

Final exam 25%
Weekly Quizzes..... 50%
Weekly Discussions (Projects)……25%

EXAM GRADE RANGES:

90-100% ..... A
85-89% ..... B+
80-84% ..... B
75-79% ..... C+
70-74% C
Less than 70% ..... F

DISABILITY SERVICES/ACCOMMODATIONS:

The University is committed to supporting the learning of all students and faculty will provide accommodations as indicated in a Letter of Accommodation issued by the Office of Disability Services (ODS). If you have already registered with ODS and have your letter of accommodations, please share this with me early in the course. If you have or think you have a disability (learning, sensory, physical,

chronic health, mental health or attentional), please contact https://success.camden.rutgers.edu/disability-services.
Accommodations will be provided only for students with a letter of accommodation from ODS. Their services are free and confidential. Letters only provide information about the accommodation, not about the disability or diagnosis.

ACADEMIC INTEGRITY
The Academic Integrity policy can be found at https://studentconduct.rutgers.edu/processes/university-code-student-conduct
Students are responsible for understanding the principles of academic integrity and abiding by them in all aspects of their work at the University. Students are also encouraged to help educate fellow students about academic integrity and to bring all alleged violations of academic integrity they encounter to the attention of the appropriate authorities.
Academic Integrity means that you (the student) must:

- properly acknowledge and cite all use of the ideas, results, or words of others,
- properly acknowledge all contributors to a given piece of work,
- make sure that all work submitted as your own in a course activity is your own and not from someone else
- obtain all data or results by ethical means and report them accurately
- treat all other students fairly with no encouragement of academic dishonesty

Adherence to these principles is necessary in order to ensure that:

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments
- all student work is fairly evaluated, and no student has an inappropriate advantage over others
- the academic and ethical development of all students is fostered
- the reputation of the University for integrity is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students.

ARTIFICIAL INTELLIGENCE USE
The use of AI, particularly Large Language Model (LLM) chatbots, is an integral part of this course. Here's our policy on AI use:
Suggested Use:

- For Weekly Discussions (Projects): The use of LLM chatbots is strongly recommended. These tools are essential for tackling the complex, real-world scenarios presented in these assignments.

Permitted Use:

- Brainstorming and refining ideas
- Fine-tuning research questions
- Finding and summarizing information on course-related topics
- Drafting outlines to organize thoughts
- Checking grammar and style
- Explaining complex concepts
- Providing coding assistance for course-related programming tasks

Prohibited Use:

- Completing quizzes or exams
- Submitting AI-generated content as your own without substantial modification and critical evaluation

Best Practices:

1. Always critically evaluate the information provided by AI tools.
2. Cite your use of AI tools in your work, including any particularly useful prompts or strategies.
3. Use AI as a collaborative tool to enhance your learning, not as a replacement for your own critical thinking and analysis.

You are responsible for all information you submit, including ensuring it does not violate intellectual property laws or contain misinformation. Any use of AI tools must be properly documented to comply with academic honesty policies.
If you're unsure about appropriate AI use in any situation, please ask for clarification.

CODE OF STUDENT CONDUCT

Rutgers University-Camden seeks a community that is free from violence, threats, and intimidation; is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and does not threaten the physical or mental health or safety of members of the University community, including in classroom space.
As a student at the University, you are expected adhere to the Code of Student Conduct.
To review the code, go to the Office of Community Standards:
https://deanofstudents.camden.rutgers.edu/student-conduct
Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."