FIN 4934 - FINANCIAL MODELING

Fall 2020

Fully Online, Asynchronous

Instructor	**Email**	**Office Hours**
Nick DeRobertis	derobertisna@ufl.edu	TBD

COURSE MATERIALS

Course Website

https://nickderobertis.github.io/fin-model-course

- The course website includes all of the materials for the course, including the course schedule, lecture videos, lab exercises, practice problems, and projects.

Textbook

Simon Benninga, "Financial Modeling," Fourth Edition, MIT Press.

- Textbook is only recommended. This book is very focused on Excel and we will be using both Excel and Python in the course. It is however useful as a reference for the Excel material and generally how to build the models.

Prepare for Class

Have a computer with Microsoft Excel 2007 or newer ready. We will be installing Python on this machine as well.

GENERAL INFORMATION

Description

This course covers the full financial modelling workflow using both Excel and Python. I will try to teach you how to build a model in general, all the way from concept and data collection to the result and visualization, and how to complete the various steps in either Excel or Python. My goal is to give you tangible skills which would be applicable in a finance job, and more so than any other course you've ever taken. This course will be very challenging for the less technically inclined, but I will try to help everyone succeed.

Prerequisites

Courses

FIN 3403 (Business Finance) is the minimum requirement. It is highly recommended that you have also taken FIN 4243 (Debt and Money Markets) and FIN 4504 (Equity and Capital Markets) as we will build models based on the concepts in these courses without a thorough treatment of them. We have a lot to cover already in the course and so the finance concepts are not the focus. I can recommend textbooks for any concepts which you haven't covered in prior courses, but then you will have a large learning curve.

Technical Skills

Understanding of algebra is necessary to work with equations in the models. Introductory Excel capabilities are required. Any experience with Python is a plus. It will be assumed that most students have introductory to intermediate skills in Excel and no experience with Python. Ensure that you have the Excel skills mentioned here. If you have no Excel experience or some gaps in your experience but still want to take the course, take a look at the free Excel resources at the end of the syllabus and contact me if you have questions as you go through the resources.

- Algebra
- Excel
  - Data entry, editing
  - Number and cell formatting
  - How to work with formulas, and knowledge of common math formulas
  - Cell references - fixed and relative, when to use each and why
  - Managing worksheets and workbooks
  - Graphs, charts

Class Structure

A Typical Day

The class is structured in three parts: lecture videos, lecture review sessions, and interactive lab sessions. The lecture review sessions will be a group video call which also be recorded and provide an opportunity for students to ask general questions about the lecture videos. You will have weekly assignments that reinforce the content from the lectures for that week, and they are the focus of the interactive lab sessions. The lab sessions will also be group video calls where students are encouraged to work on the problems and ask me questions. You may need to spend time outside of the lab sessions completing the exercises as well. You are encouraged to discuss the lab exercises with your classmates, but everyone should complete the exercises on their own computer.

Projects

There will be four or five projects in the course. The grading in this course is entirely project-based, between the projects and the lab exercises.

Projects are to be completed individually. Do not copy each other's code or workbooks. This includes copy/paste as well as manually following someone's specific steps. You can however discuss them with your classmates, so long as the final submission is entirely your own work.

Questions?

There are four ways you may ask questions: in lecture review sessions, in lab sessions, by email, and by appointment. Before you ask a question, be sure that you have watched the relevant lecture(s), and if the question is directly asking a question clearly covered in the lecture I may only point you to that.

If you are not able to figure out the lab exercise in the time provided, I am happy to help you by email or appointment for a video call.

Late Policy

I will accept late projects, **but I will subtract 10% from the grade for each day** late. Projects are **due by midnight on the due date** and must be submitted to Canvas by this time. If you turn it in five minutes after midnight, I will subtract 10%. Then each additional 10% subtraction happens at midnight on each following day. But **once we review the project as a class, you are no longer allowed to submit it.** This will usually be about a week after but not always.

For example, if a project was due Tuesday, and you submit it two minutes after midnight (Wednesday 12:02 AM), you will lose 10%. Then, starting 12:01 AM Thursday (Wednesday night), you are losing 20%. Then starting 12:01 Friday (Thursday night), you are losing 30%. But we review the project as a class that Thursday, you may only submit it up until that time on Thursday.

How to be Successful in This Class

I highly recommend using some outside resources to learn some basic Python as it will allow you to focus more on the course content. I will be teaching from the basics, but this is not a programming class so we don't have the time to give the language a proper treatment. In the past, students which started early with external Python and Excel resources performed well and got more applicable knowledge out of the class.

Watching every lecture is important as the knowledge from prior lectures becomes essential to understand the later lectures. Beyond the lectures, we will have interactive lab sessions where you can ask me questions and actively get help with the course material as you work on it. For the projects, you will need to build upon (directly or indirectly) what you have put together in the lab sessions. Practice problems will also be provided, and it is encouraged that you complete them before the projects. Start the projects early as there is considerable work involved. Many students have said they have been the most challenging and rewarding projects they completed at UF.

If you feel lost at any time, please contact me and I can provide additional help, as the material will continue to build on itself. You cannot afford to feel lost and do nothing and hope it will get better, it will only get worse as the course progresses.

Make-Up Policy

Projects may be turned in late for reduced credit but not after we have reviewed it. See Projects section above.

GRADES

Breakdown

Item	Grade Percentage
Lab Exercises	20%
Projects	80%

Grading Scale

Grade	Grade Percentage
A	93 - 100%
A-	90 - 92%
B+	87 - 89%
B	83 - 86%
B-	80 - 82%
C+	77 - 79%
C	73 - 76%
C-	70 - 72%
D+	67 - 69%
D	63 - 66%
D-	60 - 62%
F	0 - 59%

Rounding

I will strictly follow standard rounding rules to two decimal places, so 92.450% is the minimum grade for an A. 92.449% is considered an A-.

Curve

I will strive for a B average in the class. If this requires boosting grades with a curve, this will be done after all the projects are submitted. I will not reduce grades with a curve even if grades are higher than a B average.

MAIN TOPICS COVERED

Subject to change but in approximate order.

Introduction to Financial Modeling

- Overview
- Basic technical skills and setup – Excel and Python
- Time value of money models
- Basic statistical tools
- Monte Carlo methods

Corporate Valuation

- Capital budgeting

- Estimating beta

- Estimating market value of debt

- Weighted average cost of capital (WACC)

- Free cash flow (FCF)

- Pro forma financial statements

- Discounted cash flow (DCF) valuation

RESOURCES

Python

Interactive + Video Tutorials

- [Python from Scratch](#) (University of Waterloo)

Interactive Tutorials

- [Computer Science Circles](#) (University of Waterloo)

- [Learn Python 2](#) (codecademy) | This one teaches Python 2, which is outdated, but the main difference in the covered material is just that the print function doesn't use parentheses in Python 2. So if you do this one then just adjust how you call print for the class. There is also a Python 3 course but it requires the Pro plan.

- [learnpython.org](#) | This is more fast paced

Video Tutorials

- [YouTube Video Series](#) (Jayanam)

Text (Non-Interactive) Tutorials

- [Non-Programmer's Tutorial for Python 3](#) (Wikibooks) | Fairly detailed and approachable

- [Hands-on Python 3 Tutorial](#) () | Very detailed and a bit faster paced

- [The Python Guru](#) | Fast paced, this one would be good for those who already know programming but not Python

Excel

Video Tutorials

- [Trump Excel](#)

- [Excel 2016 Tutorial](#) (GCF Global)

- [Excel Exposure](#) (Ben Currier)

Financial Modeling Schedule

Week	Dates	Topic	Lectures	Projects Assigned	Projects Due
Week 1	08/31-09/07	Introduction to the Class, Modeling, Python, and Excel	1: Financial Modeling with Python and Excel 2: Getting Started with Python and Excel		
Week 2	09/07-09/14	Building a Full Excel Model and Python Basics	3: The Depth of a Financial Model 4: Going Beyond an Initial Python Script	1: Excel and Python TVM	
Week 3	09/14-09/21	Python Basics, Continued	4: Going Beyond an Initial Python Script		
Week 4	09/21-09/28	Building a Full Python Model	5: The Depth of a Financial Model, Continued		
Week 5	09/28-10/05	Visualization	6: Understanding Complex Results		
Week 6	10/05-10/12	Sensitivity Analysis	7: Exploring the Parameter Space		1: Excel and Python TVM
Week 7	10/12-10/19	Sensitivity Analysis and Probability Modeling	7: Exploring the Parameter Space 8: Probabilistic Modeling	2: Probabilistic Loan Pricing	
Week 8	10/19-10/26	Probability Modeling	8: Probabilistic Modeling		
Week 9	10/26-11/02	Probability Modeling and Combining Excel and Python	8: Probabilistic Modeling 9: Combining Excel and Python		
Week 10	11/02-11/09	Monte Carlo Simulation	10: Monte Carlo Simulation	3: Monte Carlo Cost of Capital	2: Probabilistic Loan Pricing
Week 11	11/09-11/16	Introduction to DCF Valuation and Cost of Capital Estimation	11: Introduction to DCF Valuation and Cost of Capital Estimation		
Week 12	11/16-11/23	Free Cash Flow Estimation and Intro to Forecasting	12: Free Cash Flow Estimation and Forecasting	4: Full DCF Valuation	
Week 13	11/23-11/30	Forecasting Free Cash Flows	12: Free Cash Flow Estimation and Forecasting		3: Monte Carlo Cost of Capital
Week 14	11/30-12/07	Advanced Financial Modeling Roadmap	13: Advanced Financial Modeling		
Week 15	12/07-12/17	Final Project Time			4: Full DCF Valuation

Week 1 (08/31 - 09/07)

Lectures Covered

- Financial Modeling with Python and Excel

  - About Me
  - Syllabus
  - What is a Financial Model?
  - Tools and Skills
  - Installing Python

- Getting Started with Python and Excel

  - Introduction and an Example Model
  - Building a Simple Excel Model
  - Building a Simple Python Model
  - Basic Iteration
  - Extending a Simple Excel Model
  - Extending a Simple Python Model
  - Getting Started with Python and Excel Labs

Week 2 (09/07 - 09/14)

Lectures Covered

- The Depth of a Financial Model

  - Simple Retirement Model Assumptions
  - Relaxing the Salary Assumption
  - Skills for the Advanced Excel Model
  - Implementing the Dynamic Salary Model
  - Lab Exercise

- Going Beyond an Initial Python Script

  - Structuring a Complex Python Model
  - Branching Logic with Python Conditionals

Projects Assigned

- 1: Excel and Python TVM

Lab Exercises Due by 09/14

- Extending a Simple Retirement Model

- Determining Desired Cash in the Dynamic Salary Retirement Excel Model

- Python Basics - Conditionals

Week 3 (09/14 - 09/21)

Lectures Covered

- Going Beyond an Initial Python Script

    - Grouping Objects with Python Lists
    - Grouping Logic with Python Functions
    - Python Basic Data Types
    - Creating Python Data Types with Classes
    - Handling Errors in Python

Lab Exercises Due by 09/21

- Python Basics - Lists

- Python Basics - Functions

- Python Basics - Data Types

- Python Basics - Classes

Week 4 (09/21 - 09/28)

Lectures Covered

- The Depth of a Financial Model, Continued

    - Using Jupyter to Structure a Python Model
    - Salaries in the Python Dynamic Salary Retirement Model
    - Wealth in the Python Dynamic Salary Retirement Model
    - Retirement in the Python Dynamic Salary Retirement Model

Lab Exercises Due by 09/28

- Determining Desired Cash in the Dynamic Salary Retirement Python Model

Week 5 (09/28 - 10/05)

Lectures Covered

- Understanding Complex Results

    - Introduction to Visualization
    - Visualization in Excel Example
    - Introduction to Pandas
    - Styling Pandas DataFrames
    - Introduction to Graphs in Python with Pandas
    - Visualization in Python Example

Lab Exercises Due by 10/05

- Getting Started with Pandas

- Styling Pandas DataFrames

- Introduction to Graphing with Pandas

Week 6 (10/05 - 10/12)

Lectures Covered

- Exploring the Parameter Space
    - Introduction to Parameter Exploration
    - Introduction to Sensitivity Analysis
    - Sensitivity Analysis in Excel
    - Using Python Dictionaries
    - Python List Comprehensions - Convenient List Building
    - Python Imports and Installing Packages

Projects Due by 10/05

- 1: Excel and Python TVM

Lab Exercises Due by 10/12

- Adding Sensitivity Analysis to Project 1 - Excel
- Learning How to Use Dictionaries
- Learning How to Use List Comprehensions

Week 7 (10/12 - 10/19)

Lectures Covered

- Exploring the Parameter Space
    - Introduction to Sensitivity Analysis in Python
    - Sensitivity Analysis in Python Example
- Probabilistic Modeling
    - Introduction to Probabilistic Modeling
    - Math Review for Probabilistic Modeling
    - Introduction to Scenario Analysis
    - Scenario Analysis in Excel

Projects Assigned

- 2: Probabilistic Loan Pricing

Lab Exercises Due by 10/19

- Adding Sensitivity Analysis to Project 1 - Python
- Adding Scenario Analysis to Project 1 - Excel

Week 8 (10/19 - 10/26)

Lectures Covered

- Probabilistic Modeling

  – Scenario Analysis in Python
  – Introduction to Internal Randomness
  – Intro to Randomness in Excel
  – Intro to Randomness in Python
  – Discrete Randomness

Lab Exercises Due by 10/26

- Adding Scenario Analysis to Project 1 - Python
- Generating and Visualizing Random Numbers - Excel
- Generating and Visualizing Random Numbers - Python
- Building a Simple Model of Stock Returns

Week 9 (10/26 - 11/02)

Lectures Covered

- Probabilistic Modeling

  – Adding Internal Randomness to an Excel Model
  – Adding Internal Randomness to a Python Model
  – Internal Randomness Lab Exercises Overview

- Combining Excel and Python

  – Introduction to Combining Excel and Python
  – Combining Excel and Python using Pandas
  – Combining Excel and Python using xlwings

Lab Exercises Due by 11/02

- Extending the Dynamic Salary Retirement Model with Internal Randomness
- Reading and Writing to Excel with Pandas
- Reading and Writing to Excel with xlwings

Week 10 (11/02 - 11/09)

Lectures Covered

- Monte Carlo Simulation

  – Introduction to Monte Carlo Simulations
  – Monte Carlo Investment Returns
  – Formal Introduction to Monte Carlo Simulations
  – Analyzing Relationships with Monte Carlo Simulations
  – Applying Monte Carlo Simulation to a Python Model
  – Applying Monte Carlo Simulation to an Excel Model

Projects Assigned

- 3: Monte Carlo Cost of Capital

Projects Due by 11/02

- 2: Probabilistic Loan Pricing

Lab Exercises Due by 11/09

- Monte Carlo Simulation of DDM

- Monte Carlo Simulation of Python Models

- Monte Carlo Simulation of Excel Models

Week 11 (11/09 - 11/16)

Lectures Covered

- Introduction to DCF Valuation and Cost of Capital Estimation

  - Introduction to Discounted Cash Flow (DCF) Valuation
  - Enterprise Value and Equity Value
  - Introduction to Cost of Equity
  - Cost of Equity in Python
  - Cost of Equity in Excel
  - Market Value of Equity
  - Introduction to Cost of Debt
  - Introduction to Market Value of Debt
  - Calculating the Market Value of Debt in Python
  - Calculating the Weighted Average Cost of Capital (WACC)

Lab Exercises Due by 11/16

- Finding Enterprise and Equity Value Given FCF and WACC

- Finding Cost of Equity Given Historical Prices

- Finding Cost of Debt Given Financial and Market Info

Week 12 (11/16 - 11/23)

Lectures Covered

- Free Cash Flow Estimation and Forecasting

  - Introduction to Free Cash Flows
  - Introduction to Calculating Historical Free Cash Flows
  - Historical Free Cash Flows in Python
  - Introduction to Forecasting
  - Simple Time-Series Forecasting Models
  - Simple Time-Series Forecasting in Excel
  - Simple Time-Series Forecasting in Python
  - Simple Time-Series Forecasting Lab Overview

Projects Assigned

- 4: Full DCF Valuation

Lab Exercises Due by 11/23

- Free Cash Flow Calculation
- Forecasting Simple Time-Series

Week 13 (11/23 - 11/30)

Lectures Covered

- Free Cash Flow Estimation and Forecasting
    - Complex Time-Series Forecasting
    - Complex Time-Series Forecasting in Python - Manual Method
    - Complex Time-Series Forecasting in Python - finstmt Method
    - Complex Time-Series Forecasting Lab Overview
    - Applying Forecasting to Free Cash Flows
    - Calculating a Terminal Value

Projects Due by 11/23

- 3: Monte Carlo Cost of Capital

Lab Exercises Due by 11/30

- Forecasting Complex Time-Series
- DCF Stock Price using Terminal Values

Week 14 (11/30 - 12/07)

Lectures Covered

- Advanced Financial Modeling
    - Introduction to Advanced Financial Modeling
    - Additional Types of Financial Models
    - Data Pipelines for Financial Modeling
    - Advanced Mathematical Tools for Financial Modeling
    - Better Presentation of Python Financial Models
    - Programming Skills for Advanced Financial Models
    - Extra Resources for Python Financial Modeling

Week 15 (12/07 - 12/17)

Projects Due by 12/17

- 4: Full DCF Valuation

FIN 4243 – Debt and Money Markets

Spring 2018, Tuesday/Thursday 11:45 AM – 1:40 PM

Instructor	Email	Office Location & Hours
Nick DeRobertis	derobertisna@ufl.edu	Tuesday/Thursday 1:45 PM -2:45 PM (after class, and by appointment)

Course Materials

Textbook

Frank Fabozzi, *"Bond Market: Analysis and Strategies," Sixth Edition*, Prentice Hall.

- Textbook is required but I specifically picked an old edition so that it would be cheap. Any edition is fine. If on the off chance you miss a test question because your edition didn't cover a topic, bring it to my office hours and you'll get the credit back, unless I also covered the material in class.

Bring to Class Every Day

A calculator, paper, and pen.

For Homework

A computer with Microsoft Excel 2007 or newer.

General Information

Description

This course covers debt analysis and debt portfolio management. My goal is to teach you skills and knowledge which would be applicable in a finance job related to debt. I hope to challenge you but not overwhelm you with technical details. This course requires knowledge of basic financial concepts and algebra. Experience with Microsoft Excel is helpful for homework.

Class Structure

A Typical Day
Class will involve a PowerPoint lecture, with questions throughout. I will pause the lecture for you to complete the questions, and may walk around the room giving guidance depending on the type of question. Answers should be put on a piece of paper to be handed in at the end of class. I will grade for completion on these exercises. This also serves as an attendance measure.

Homework
There will be homework assignments probably once every two or three weeks. I will typically assign homework on Thursday which will be due by class on Tuesday. Most weeks I should be able to grade the homework by Thursday for discussion. Homework will be in the form of Excel assignments, which must be completed individually.

I will accept late homework, but I will **subtract 10% from the grade for each day** late. Homework is **due by class time** on Tuesday. If you turn it in five minutes after class starts, I will subtract 10%. Then you have a bit of a grace period where I won't subtract 20% until 12:01 AM Thursday (Wednesday night). But **once I review the homework in class, you are no longer allowed to submit it**. This will usually be Thursday of the same week but not always.

Assessments
There will be four quizzes and two tests: a midterm and a final. Test and quiz questions can come from either my lecture, or the textbook chapters listed in the course schedule.

The final exam will be focused on topics from the second half of the course, but may be considered cumulative. Some topics from the midterm may show up on the final, especially core concepts and analysis.

The in-class questions and quizzes are designed to prepare you for the tests. I will hand back all of them so you can study them before the tests. As such, I cannot give you any further practice questions.

How to be Successful in This Class
You should read the relevant textbook chapters before the class, to better understand the lecture. Then look over them again before test time. Beyond the textbook, the in-class questions and homework give you an idea about the test questions relating to my lecture. Studying these as well as the textbook are a great way to prepare for tests and quizzes.

Make-Up Policy
If you let me know at least two weeks prior to class or if there is an emergency, you may make up quizzes and tests. Please try to be there for the midterm and final, as if you have to make up these tests you will have to complete a make-up exam which may be more difficult. I require documentation for emergencies.

If you miss class, **you cannot make up the in-class questions**. Missing a couple classes will have a negligible effect on your grade.

Homework may be turned in late for reduced credit but not after I have reviewed it in class. See homework section above.

Grades

Breakdown

Item	Grade Percentage
Tests (Midterm, Final)	40%
Quizzes (4)	35%
Homework	20%
In-Class Questions	5%

Grading Scale

Grade	Grade Percentage
A	>= 93%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D+	67-69%
D	63-66%
D-	60-62%
F	<= 59%

Rounding

I will strictly follow standard rounding rules to two decimal places, so 92.450% is the minimum grade for an A. 92.449% is considered an A-.

Curve

I will strive for a B average in the class. If this requires boosting grades with a curve, this will be done after the final exam. I **will not** reduce grades with a curve even if grades are higher than a B average.

Exam Schedule

Date	Subject
TBD	Quiz 1
TBD	Quiz 2
February 27th	Midterm Exam
TBD	Quiz 3
TBD	Quiz 4
May 2nd, 5:30-7:30 PM	Final Exam

Main Topics Covered

Subject to change but in approximate order.

Basic Debt Analysis

- Time Value of Money – Review
- Bond pricing
- Yield to Maturity (YTM)
- Interest rates
- Types of debt
- Risk factors for debt
- Term structure of interest rates

Debt Portfolio Management

- Duration & Immunization
- Convexity
- Credit risk analysis
- Bond options
- Interest rate swaps
- Credit default swaps