

Business Analytics & Information Technology
COURSE NUMBER: 33:136:450
COURSE TITLE: Investment Modeling in R**COURSE DESCRIPTION**

The purpose of this class are 2 fold:

- 1) To understand the basics of how investors and traders use R programming to visualize and quantify investments
- 2) To understand how probabilities and distributions are used in the world of capital finance and investments

COURSE MATERIALS

Textbook: *R Graphics Cookbook*, Winston Chang

Quantitative Value, + Web Site: A Practitioner's Guide to Automating Intelligent Investment and Eliminating Behavioral Errors Hardcover – December 26, 2012
by [Wesley Gray](#)

GRADING

Grading for this class will be based on a point system. Everyone in the class starts with 0 points, as the semester goes on and you complete different work and take different exams, you will earn points. Your total points will be summed up after the final to give you your final grade for the class. The class will consist of 8 labs, 2 HW (your midterm review), 2 Midterms, and a Final. In addition, you can earn additional points through bonus questions and problems I give.

Lab 1 – 10 pts

Lab 2 – 10 pts

Lab 3 – 10 pts

Lab 4 – 10 pts

Lab 5 – 10 pts

Lab 6 – 10 pts

Lab 7 – 10 pts

Lab 8 – 10 pts

**Labs are meant for you to practice the lessons from the class, and allow me to give individual attention to students with their programming*

HW1 – 35 pts
HW2 – 35 pts
Midterm 1 – 100 pts
Midterm 2 – 100 pts
Final – 200 pts

The Stock Game:
1st place 50 pts
2nd place 10 pts
Those that beat me 5 pts
Last place -1 pt

**Additional points through bonuses*

A \geq 400
400 > B+ \geq 350
350 > B \geq 325
325 > C+ \geq 300
300 > C \geq 275
275 > D \geq 250
F < 250

LECTURES:

Date	Lesson
Lecture 1	Introduction Discuss the concept of stocks being valued according to future cash flows and the uncertainty around it We discuss the Syllabus and how your semester grade depends on the point system Install R and Rstudio and Quantmod (financial package that allows you access to historical stock and option prices) package on your laptop. All the software is free
Lecture 2	Data and Containers In this lecture we go over the basic concepts of data objects in R called containers. We also explore how we use these containers to load up data and do analysis on the data, i.e. daily returns, std, etc. We also discuss R's control statements (for loops, If/else statements)
Lecture 3	Script files and Graphing In this lecture we go over the importance of visualization when analyzing data and how the investment world relies on it to summarize incredible amounts of data fast
Lecture 4	Discrete historical Model In this lecture we build our first our first stock probability model (a very simple model). It'll be based on historical daily returns and will be discrete. I will also post your HW#1
Lecture 5	Investing in the future by looking at the past In this lecture we'll attempt to find cheap investments using the probability model from our previous lecture in addition to discussing the dangers of this kind of "naïve" stock picking. We will also review your HW#1 for Midterm 1.
Lecture 6	midterm 1
Lecture 7	Stock options and Black Scholes In this lecture you will be introduced to stock options and the famous equation, Black Scholes, which theoretically prices stock options. We will talk about the relationships between stock prices and their options and display it using programming
Lecture 8	Implied volatility and the normal distribution In this lecture we build a normal distribution using the implied volatility derived from using options data, the black scholes model, and the bisection method. We discuss how this is a future looking model (based on the

market) and the down side to using a normal distribution. I also post your HW#2

Lecture 9

Lecture 7

In this lecture we review all the material from the beginning of class, and link it together for the Midterm # 2.

Lecture 10

midterm 2

Lecture 11

Quarterly filings and stock prices

In this lecture we'll discuss the difference between long term, and short term investing in the stock market and the importance of the quarterly filings on short term gambles in the market. We attempt to forecast what the market is implying and see if any of our two models can help identify good stocks to buy in the short term

Lecture 12

Portfolio Theory and correlation

Given the uncertainty in the markets and in the distributions of our stock models, we attempt mitigate our risk by investing in uncorrelated stocks.

Lecture 13

Sweave and Presenting your portfolio

Lecture 14

Final Review

TBD

Final
