

B8121: Statistics for Investments

Course Description and Syllabus – Fall 2015 B-Term

PRELIMINARY and SUBJECT TO CHANGE

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Some General Information

- This course has a steady, above-average workload. You can assume that there is something due for every class.
- Often, the assignments lead the class in the sense that you work on something first and then we cover it in class. This is a good way to learn, but not everybody likes it.
- Assignments may be done in groups.
- There will be a final exam, and it will be open book, open notes. I am posting a past final so you can see what we'll be covering in this course.
- I consider *Capital Markets and Investments* a co-requisite for this course, but it helps to have taken it before. The key background we need from that course is the CAPM and its connections with regression. If you are taking *Capital Markets* at the same time as this course, you will probably be covering the CAPM right around the time this course starts.

Overview

This course discusses statistical concepts for investment analysis – measuring risk and return and the factors that drive them. The course is organized around three main topics:

- Equity factor models
- Volatility
- Fixed income and credit factors

The first topic will make up about half the course.

We will use specific tools (especially regression), but the emphasis will be on *statistical thinking about financial data* rather than on technique. In particular, the course will focus on broadly applicable features of market data and the statistical concepts that help us understand them. Each class will pair an idea from investment analysis with one or more statistical tools. All of the concepts and tools developed in the

course will be closely aligned with industry practice, and we will frequently draw on both industry and academic research. No familiarity with statistics beyond the MBA core course is required.

Prerequisites

The only formal prerequisite is the core class in *Managerial Statistics*. If you exempted out of the core statistics class, be sure you are comfortable interpreting regression output. I will assume familiarity with financial markets and terminology at the level of *Capital Markets and Investments*, so I strongly recommend taking that class in parallel with this one if you have not taken it before. This course will also have points of contact with the core courses in *Corporate Finance* and *Decision Models/Business Analytics*.

Course Work and Grading

There is no textbook for the course. The course will be taught from lecture notes and background readings. Readings will be posted on Canvas.

You should assume that there is an assignment due for every class. Homework assignments may be done individually or in groups of up to three people, and you may work with different teams on different assignments. If you would like help finding a team, email the TA. (We will discuss this on the first day of class.)

Assignments will be a mix of data analysis, thought questions, and reading. In calculating your course grade, I will drop your lowest homework score.

We will have a final exam, which will be based closely on the homework assignments and class material. My intention is that if you have kept up in class and understood the homework assignments, you will find the final exam straightforward; and if you have not kept up in class or not been conscientious about the homework, you will find the final exam difficult.

Class participation – meaning “present, prepared, participating” – is important for learning and will help keep the class interesting for all of us.

Grades will be based on the following weights:

- Assignments (with lowest homework score dropped) – 60%
- Final exam – 30%
- Class participation – 10%

Getting Help Outside of Class

I am available. I have set aside Wednesday 1:00-2:00pm as a regular time for office hours (barring unexpected constraints), but you should feel free to email me or talk to me after class to set up a different time. We will also have a TA for the course, and the TA’s office hours and contact information will be posted on Canvas.

Software

All data analysis assignments are designed to be done in Excel, so there is no requirement to use statistical software. However, if you happen to be familiar with a statistical package or want to experiment with other software, you are free to use any tools you wish. Many products offer free trial versions.

Course Outline

This is an overview of the topics in the course. Consult the course page on Canvas for detailed information on assignments.

1. Introduction

- Course overview
- Introduction to quantitative investment management
- Review of the CAPM and regression – what works and what doesn't work in the CAPM and why it's relevant to investment analysis
- Interpreting regression output

2. Equity factor models

- Why factor models?
- Fama-French factors – size and value
- Alternative beta versus alpha

3. Equity factor models and performance evaluation

- Momentum
- Performance measures – Sharpe ratio and information ratio
- Evaluating fund performance through regression
- Other equity factors

4. Risk models

- Factor models of risk
- Partial correlation
- Quantitative, fundamental, macroeconomic, and statistical factors
- Risk factors versus alpha factors

5. Factor reduction through principal components analysis

- Why a small number of factors often does the job
- Calculating and interpreting principal components

6. Guest Lecture

7. Long-term trends

- Long-horizon predictive regressions using P/E ratios or dividend yields
- Trend following and momentum
- Applications to sector allocation and global macro strategies

8. Properties of time series data

- Trend, seasonality, stationarity
- Autocorrelation and autoregressive models
- Cointegration versus correlation and application to pairs trading

9. Volatility I

- Measuring volatility: realized, implied, VIX
- Persistence; GARCH
- Leverage effect

10. Volatility II

- Volatility risk premium; covered calls
- Low-risk anomaly
- Risk parity

11. Dynamics of interest rates

- Properties of interest rate data
- Yield curve risk
- Nelson-Siegel model; level, slope, and curvature
- Forecasting the coefficients
- Incorporating macro factors

12. Credit risk and credit scoring

- Altman Z-score; discriminant analysis; logistic regression

The final exam will be held during exam period. Please plan your vacation accordingly.