DSC5121 HANDS ON WITH BUSINESS ANALYTICS: ANALYTICS EDGE IN FINANCE

AY2014-2015 Semester 2

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Course Description

The goal of this course is to expose students to the art of practical problem solving involving analytics, with emphasis on applications in the finance industry. We will cover a range of topics and applications from data science to stochastic finance, giving students a sample of real challenging yet exciting problems where analytics concepts and techniques are applied.

Learning Outcomes

- Exercise the problem-solving thought process involving analytics.
- Learn how to apply previously learned concepts in analytics to real world problems in the context of the finance industry.
- Understand opportunities and challenges involving analytics present in the finance industry.

Topics & Tentative Schedule

Week 1	Introduction to the Analytics Edge in Finance
Part 1: Data Science in Finance	
Week 2	Overview of Data Science Techniques and Tools
Week 3	Introduction of Group Assignment 1: Understanding Why Value Investing Works
Week 4	Case Studies and Q&A on Group Assignment 1
Week 5	Industry Guest Speaker
Week 6	Presentations Group Assignment 1: Understanding Why Value Investing Works
Part 2: Stochastic Science in Finance	
Week 7	Probabilistic and Stochastic Finance
Week 8	Monte Carlo and Historical Simulation
Week 9	Optimization and Calibration
Week 10	Introduction of Group Assignment 2: Stress Testing Market Risk
Week 11	Case Studies and Q&A of Group Assignment 2
Week 12	Industry Guest Speaker
Week 13	Presentations Group Assignment 2: Stress Testing Market Risk

Readings

In addition to the various references to be introduced during the classes, the main reference textbooks adopted for the course are:

(1) “Data Science for Business” by Foster Provost and Tom Fawcett

(2) “Options, Futures and Other Derivatives” by John Hull.

R is the adopted software for the course. Students are required to use R as this is the form in which the assignments will be submitted for grading.

Prerequisites

Although we will review the techniques and tools applied, covering the theoretical background in detail is not in the scope of this course. In order to be successful and make the most out of this course, students are expected to have at least basic understating and previous hands-on experience with:

- data science basics (descriptive analytics, predictive analytics, etc);
- stochastic finance basics (random variables, probability theory, Black-Scholes paradigm, etc);
- usage and experience with R.

Those who are not sufficiently experienced in these areas but still wish to attend the course will need to catch up beforehand. As well as studying the recommended references and browsing the literature, students are encouraged to explore past classes of the following online courses offered by edX and Coursera:

- R Programming (Johns Hopkins University)
  https://www.coursera.org/course/rprog

- Practical Machine Learning (Johns Hopkins University)
  https://www.coursera.org/course/predmachlearn

- The Analytics Edge (MITx: 15.071x)
  https://courses.edx.org/courses/MITx/15.071x/1T2014/info

- Financial Engineering and Risk Management Part I (Columbia University)
  https://class.coursera.org/fe1-001

Preclusions

Nil

Assessment

There will be two group assignments (groups of 3-5 students) and one individual assignment. The final grade will distributed as follows:

Component	**Weight**
Group assignments	60% (2x 30%)
In-class presentations of group assignments	10% (2x 5%)
Individual assignment	30%
Total	**100%**

Given the diverse backgrounds and past experiences students come from, it is appropriate that the topic of their respective individual assignments is of their own choice. The instructor also believes that this aspect creates a stronger sense of ownership for the exercise, which should be engaging and stimulating for the student. Basic rules and expectations for the individual assignment will be disclosed at the beginning of the course. Students are encouraged to consult the instructor for guidance on his or her choice.

Exceptional as well as relevant participation in class gives an individual bonus of up to 10 out of 100 in total grading points.