

**Special Topics in Finance, BAFI580C**  
***Quantitative Investments***  
**Masters in Business Analytics Program**  
**April, 2020**

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Meeting Times Tuesday and Thursday, 10-12  
Virtual office hours after class and by appointment  
Website: Canvas

Teaching Assistants:

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### **I. Course Description, General**

The area of finance relates to how and why individuals and institutions buy and sell claims to real assets. As a special topics course, priority will be given to advancing quickly to the frontiers of knowledge in one or more specialized areas of finance. We emphasize recently emerging topics, research findings, and areas gaining prominence in industry that are not yet covered elsewhere in the students' curriculum. Primary resources and methods will be the study of working papers, journal articles, and industry publications that develop new ideas, consideration of real-world examples and current events, and student-led, data-driven implementation of financial strategies. The topics covered in this course will vary according to the background and interests of students and instructor and changes in the field of finance.

### **II. Details for this Section: Methods, Topics, and Learning Objectives**

This course is being offered for the first-time in the Masters in Business Analytics program. The unique characteristics of this student group are likely to be i) widely varying backgrounds with respect to finance theory, data, and practice, and ii) a high level of technical proficiency and teamwork. We will take advantage of these unique student characteristics. Our discussions will range from exposition of basic concepts that assume no specialized finance knowledge to empirical implementations at the level of doctorate level and/or specialized industry research. To best suit this approach, the subject-area focus of this section will be *quantitative investing*.

Investments is the area of finance that looks at how individuals and institutions form portfolios across asset classes and individual securities and trade securities in order to meet their investment objectives. By emphasizing quantitative approaches to investments, we will focus on methods that are data-driven and computationally scalable. We will use the programming language Python, which is an increasingly

important tool in the finance industry, as well as free and open-source. We will develop skills in identifying appropriate data and carrying out empirical analyses using Python.

A rough outline of topics follows:

- Week 1: Background
  - Financial market basics: market participants, securities, returns, etc.
  - Key concepts: efficient markets, arbitrage, CAPM, multi-factor pricing models
  - Finance data: Yahoo Finance, CRSP, Compustat, WRDS
  - Properties of stock returns and portfolio returns
- Week 2: Asset allocation
  - Stocks, bonds, bills, and other asset classes
  - Tools: mean-variance analysis, simulation/bootstrapping
- Weeks 3-4: Cross-section of stock returns
  - Multi-factor pricing models and cross-sectional trading strategies: Fama-French model, momentum, other empirical factors; macro factors
- Week 5: Additional topics as time permits
  - Macro factors
  - Time-series predictability: market risk premium, volatility and VIX

Corresponding learning outcomes are:

- Explain the roles, objectives, and strategies of different types of investors and traders.
- Evaluate the potential benefits and risks of different investment and trading strategies.
- Implement known investment and trading strategies and develop new investment and trading strategies.
- Explain one's analysis and conclusions to other investment professionals and potential clients.

### **III. Student Work and Evaluation**

Students will participate in lectures, discussions, and in-class and out-of-class exercises that develop course concepts. There will be 2-3 graded homework assignments that focus on developing understanding of finance data, empirical methods, and implementation in Python. Students will work in teams of 4-5 to develop a course project focusing on one of the primary empirical tools of the course. This project will involve a proposal (delivered in writing and a brief presentation in approximately week 4) and a final project (again involving written and presentation components, in lieu of a final exam). Students may also write an optional individual essay on a quantitative investments topic of their choosing. A summary of approximate weights and further description of each component follows.

	<u>Approximate weight</u>
Group project proposal	20
Group project final memorandum and presentation	50
Homework (expect 2-3 graded)	20
Participation	10
Optional individual essay	*see below

Further details on assessment:

Group project: Your group (4-5 students per group) will develop a quantitative investment strategy, implement the investment strategy, and evaluate the historical performance of the investment strategy.

The project will be based on one of the primary quantitative topics of the course of your choosing (asset allocation, cross-sectional trading strategies, or another topic you discuss with me):

- Motivation: What makes you believe this is an interesting investment strategy to explore? What is the relevant literature in the area? Are there any relevant theories and what are your initial hypotheses about what you will find in the data?
- Data and Methods: Explain precisely what data you use for the study and how the strategy is implemented.
- Performance evaluation: This will consist of an evaluation of, at least, mean returns, variance, and Sharpe ratio of the strategy; as appropriate also CAPM alpha; Fama-French 3-factor alpha, and any other analysis you consider to be informative
- Discussion of findings and interpretation
- Analysis tool/data visualization: to take advantage of the specialized skills some of you may have, a component of this project could be to create a front end tool that facilitates the data analysis or data visualization. I will discuss this with the class to see if it could be appropriate for some of you to include.

You will consider your role to be that of a research team working in a quantitative asset management environment. Your colleagues (myself and the rest of the class) will be well-versed in quantitative methods, but do not know the details of the particular project you have been working on; you need to communicate what you know efficiently both in writing and in a brief presentation. Specifically, the final written product will be a 3-5 page written memorandum (not including attachments); there will also be brief presentations of these projects in lieu of an exam.

A preliminary component of the project is to develop a proposal for the project. This will have a written component (1-2 pages) and a brief class presentation (5-10 minutes) in approximately week 4. From this proposal you will receive feedback from the class, the TAs, and myself that will allow you to incorporate recommended revisions before you go on to fully carry out the project.

Homework: I will give two or three graded homework assignments. These will be geared towards learning Python, the data, and the quantitative methods for the course. You may work with, and are encouraged to work with, one other person for the assignments, but I do not want groups larger than that, to ensure that each of you uses programming skills and data interpretation for the homework.

Participation: Evaluating participation may be something of a challenge in this new environment, but I do hope our class remains interactive despite the new environment, and preparation for class will still be important. We will figure out together how to interact online as opposed to in the classroom. Thoughtful questions are extremely important so please do not be shy to ask any reasonable questions – these are often the most interesting places to start a conversation. I also very much value feedback given to your classmates, and there will be opportunity for this.

Individual research essay (Optional, approximately 25% weight, replaces the lowest 25% weight of any other assignment): Write an individual essay on a topic of your choosing related to the course. The objective will be to learn on your own more about a topic of interest. The essay will be 3-4 pages in length, and will be based on a minimum of 6 readings (more is ok). At least three readings must be “academic”, and at least three must be from the popular press or industry. You must add your own perspective, not simply summarize the opinions of the background articles. Explain why the topic is important; relate the articles you have read to one another and to current events; conjecture about future research or investigations that could help to shed more light on the topic. This is an opportunity for you to broaden your understanding of investment topics, so feel free to range outside of things you have already worked on. You may discuss essay topics with me at any point during the course.

#### **IV. Course Materials**

i. required materials: All course materials (lecture notes, sample data, sample code) will be available on Canvas, either directly or through links provided in lecture notes. All outside readings referenced in the lecture notes are available through the university library or posted as links.

ii. computing and software: You will need a reliable computing platform with Python installed. The TAs and I will be using the Python 3.7 version provided by Anaconda at <https://www.anaconda.com/distribution/>. The sample code used in the course has been developed on this distribution, and it is recommended you use the same.

iii. journal articles: Accessing journal articles will be very useful in this course. When searching for journal articles on a particular topic Google Scholar is a great resource, and provides links to articles. The UBC library has subscriptions to all major journals. Please be aware that you will need to have a UBC VPN set up since we are all now accessing library resources from off campus. The library home page has additional information on setting up a VPN if you have not already done this.

iv. supplemental reading: Because of the varied finance backgrounds of the students in this course, different background readings may be helpful. I will provide the basics of all concepts in lecture notes, and we will go into details of theories and empirical implementations in our discussions and exercises. Additional background readings as described below can always be useful.

Any introductory finance textbook, in either corporate finance or investments, can help with basic concepts, whether your background in finance is novice or advanced. The content of these textbooks does not change very much from edition to edition, and older editions are often available at highly

discounted prices. All of these textbooks will cover in fairly similar ways basic concepts such as CAPM, efficient markets, etc. If you have or would like to have a reference like this it may be useful to acquire one. Some of the standard textbooks for basic finance concepts include the following (please note that author configuration can change across editions, and across US vs Canadian editions, but this should not affect treatment of basic finance concepts):

- Ross, Westerfield, and Jaffee, Corporate Finance
- Brealey, Myers, and Allen, Principles of Corporate Finance
- Berk and DeMarzo, Corporate Finance
- Bodie, Kane, and Marcus, Investments
- Pierre Vernimmen, Corporate Finance: Theory and Practice, (I have not used this book previously, but it was the only relevant book I could find available electronically through the UBC library)

There are many other finance books that give an interesting perspective on the profession and quantitative finance. A few of my favorites are:

- Robert Shiller, Finance and the Good Society (great book about why finance matters)
- Jeremy Siegel, Stocks for the Long Run (very good introduction to thinking about the relevance of long histories of data)
- Roger Lowenstein, When Genius Failed (as the title suggests, what can go wrong with quant finance)

Some of you may be interested in more Ph.D. level treatments of some of the topics we discuss. In that case, consider the following references:

- John Cochrane, Asset Pricing
- John Campbell, Financial Decisions and Markets
- Campbell, Lo, and MacKinlay, The Econometrics of Financial Markets

You can also browse the finance journals for articles related to any of the topics we discuss in class. Google Scholar may again be useful. The top three finance journals are the Journal of Finance, the Journal of Financial Economics, and the Review of Financial Studies. Good finance articles can also be found in the Journal of Financial and Quantitative Analysis, the Review of Finance, and in top economics journals.

## **V. Policies**

- i. Late assignments not accepted following RHL policy.
- ii. Academic concessions follow RHL policy. <https://webforms.sauder.ubc.ca/academic-concession-rhlee>.

iii. Academic misconduct of any kind is not worth it. Academic misconduct has serious consequences, and students are responsible for understanding academic misconduct policies. See the [UBC Policy on Academic Misconduct](#).

In particular, use appropriate citation, whether for writing or for code. If you are having trouble distinguishing where others' ideas end and yours begin, or how to cite research or code, please ask me. We all use others ideas and work, but we give proper attribution.

For homework and projects, I give allowances to work with others when it is appropriate for learning. Please do not go beyond that. If you need more help or you think it would aid learning to work in larger groups, ask me.

iv. RHL policy on citations is for APA standard but unlike APA I do not need page numbers unless the reference is a book or a direct quotation from any source. You can also use standards from any major finance or economics journal and I will be fine with that.

v. RHL policies are summarized [here](#).

vi. Copyright: All course materials including recordings of class are covered by copyright, and must not be reproduced without authorization of the instructor.

vii. UBC policies, developed by UBC Senate: *UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website at <https://senate.ubc.ca/policies-resources-support-student-success>.*