

MFE 230O – Applied Finance Project (3 units)

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1. Course Personnel

- Instructor: Eric Reiner
 - Email: ereiner83@berkeley.edu, ereiner83@alum.mit.edu
 - Please copy both addresses since I may not check my Haas email continuously.
 - Please make sure to put your team number (e.g. “[AFP Team 19]”) somewhere in the subject line of your message.
 - Virtual Office Hours: Tu,Th 12 noon – 1 pm (or by appointment)
 - Dedicated video conference facility for this purpose: <https://berkeley.zoom.us/j/371026786>
 - I will normally make an announcement on the course site on bCourses if I need to move, curtail, or cancel my office hours for a particular day.
 - As always, feel free to reach out anytime by email with any questions or to schedule a conversation.
 - Note that I am on (or near) campus most of the time through Feb 10 (teaching the pre-program math fundamentals course), so in-person meetings can readily be scheduled during that period (except for a few days around the MLK holiday).
- Reader: **tba**

2. Review of Course Objectives, Deliverables, and Timelines

Overview

- This is an applied project exploring an unresolved finance problem that is met in practice and involves the development or application of quantitative financial techniques.
 - Participation requires prior approval of a supervising UC Berkeley faculty member (other than the course instructor).
 - You are required to work in project teams of 5 members.*
 - The course objectives involve demonstrating:
 - ① your mastery of the techniques and tools you have learned in the MFE curriculum;
 - ② your ability to apply that knowledge to solving real-world problems in a team-based, project setting; and
 - ③ your skill in communicating the results of your efforts in written and oral form to an audience that is broadly versed in the general aspects of quantitative finance and financial markets / institutions but, of course, lacking specific knowledge about the project you worked on.
- “Convince me that you’ve been here the past year!”
- MFE 230O is considered the culmination of the MFE program as a whole.
 - Under Graduate Division requirements for the master’s degree, the applied finance project serves as the comprehensive final examination or project, in lieu of a master’s thesis.
 - You must successfully complete 3 units of MFE 230O to receive the MFE degree.

2.1. Summary of Course Requirements and Key Dates

Planning / Execution / Communication

Scope	Original contribution by a 5-member team, guided by a faculty advisor
Paper length	35 to 50 pages, plus appendices
Attend course re-orientation session	Jan 14 (Tue)
Identify faculty advisor and topic	Jan 17 (Fri)
Submit project proposal to faculty advisor	Jan 21 (Tue)
Submit project proposal to instructor	Jan 24 (Fri) (along with advisor approval)
Attend 20-minute proposal feedback session (pre-scheduled with instructor)	Jan 27 (Mon) – Jan 29 (Wed)
Regular meetings with faculty advisor	Weekly
Reach out to course instructor(s)	As needed
Attend class session on writing standards	Jan 29 (Wed)
3 minute presentation to entire class	Jan 30 (Thu)
First portion of paper due	Feb 11 (Tue)
Final paper due	Mar 02 (Mon)
40-minute presentation	Mar 09 (Mon) – Mar 10 (Tue)
AFP Prize finals (by invitation)	Mar 12 (Thu)
GRADUATION! (announcement of winners)	Mar 13 (Fri)

2.1. Summary of Course Requirements and Key Dates (2)

Current Status

- 18 teams formed before the internship break in October.
- Most teams appear to be making good progress in identifying topics and advisors
- The following are team matches with advisors that I am aware of:
 - Hendershott (2), Wallace (2), Livdan (1), Kermani (1)
- One team has fully completed the proposal approval protocol (pending feedback session with me) and a few others are finalizing their proposals with their advisors.

2.2. Course Website

- Course website (bCourses): <https://bcourses.berkeley.edu/courses/1488397>
- All materials from last term (including previous years' titles and sample papers) have been ported over.
- Assignments, class handouts, etc. will be posted to the bCourses site.
- Digital submission of all assignments

3. Frequently Asked Questions

- Forming a Team & Choosing a Project
- Obtaining an Advisor
- Getting It Done
- Submissions & Presentations

3.1. Forming a Team & Choosing a Project

● “How do we pick a project?”

- Most of the MFE program is very fast-paced and quickly covers a broad variety of material.
- In contrast, the AFP is your chance to focus and do a deep-dive into a topic you and your teammates find interesting.
- An extension of something one or more of you encountered during an internship or an earlier work experience would be a natural choice.
- Remember that I am VERY open-minded about topics as long as they:
 - ① make reasonable use of your MFE toolkit,
 - ② rigorously and scientifically apply your ideas to real data, and
 - ③ are scoped to contain enough “meat” to merit 3 units of credit for each of 5 (or 6) people.
- If you don’t have anything in mind yet:
 - consult the posted list of topics and example (finalist) papers from the past few years
 - go back through your notes from two or three of your favorite classes and see if anything particularly piqued your interest;
 - read the two or three most recent issues of *Quantitative Finance*, *Applied Mathematical Finance*, *Journal of Financial Markets*, *Journal of Finance and Data Science*, *Journal of Financial Data Science*, *Journal of Risk*, *Journal of Credit Risk*, *Journal of Computational Finance*, *Journal of Derivatives*, *Journal of Fixed Income*, *Journal of Portfolio Management*, and/or *Journal of Finance*;
 - collect a series of rough thoughts and ideas and go speak with several Haas faculty, who may also have project ideas and/or data sets they’d like assistance with.
 - talk to the course instructor and/or MFE program office

3.1. Forming a Team & Choosing a Project (2)

- **“Have you heard of Infinite-Dimensional Super String Theory? Do you think it can be applied to finance? We really want to do something brilliant and innovative.”**
 - A word of advice: while it is nice to aim for a ground-breaking, earth-shattering, revolutionary paper that creates a completely new modeling framework or adapts some little-known branch of mathematics to a hard finance problem, in practice such ambitions don't usually pan out, particularly in a single term when you have to cover other classes plus recruiting as well (all the while, co-ordinating with the other members of your team).
 - The objective here is for you to gain experience with the application of the quantitative tools you have learned to a significant problem in finance: from concept to data to results and interpretation; keep that objective in mind.
 - Consider also that even well-posed pure theory topics are likely to have already been worked to death and/or may have challenges clearing the “applied” bar.
 - The AFP finals judges can be reluctant to find such topics relevant.

3.1. Forming a Team & Choosing a Project (3)

- **“We want to improve our job prospects by developing a new trading strategy that makes lots of money. That’ll get us a good grade too, right?”**
 - We talked about this a bit during the September preview session.
 - Truly new sources of alpha are like the proverbial “needle in a haystack”.
 - More often than not, papers that appear to have identified highly profitable strategies have succumbed to one of many subtle (and not so subtle) biases and errors.
 - There are ways to minimize the likelihood of such errors (see Grinold and Kahn, or talk to Prof. Kahn).
 - I would prefer a well-executed piece of empirical work to a not-so-well-executed test of a trade idea.
 - If you pursue this path, please make sure your underlying empirical analysis is solid and thorough first before proceeding on to the strategy work.

3.1. Forming a Team & Choosing a Project (4)

- **“I hear that you’re biased against Machine Learning and Optimization papers because you’re too old-fashioned to learn about these critically important new fields. How can you be so ignorant and unfair?”**
 - We also talked about this in September.
 - There is no question that both Machine Learning and Optimization techniques (whether “new” or not) are quickly becoming essential components of a financial engineer’s toolkit.
 - AFPs with elements of both fields have actually done extremely well in past years.
 - Nevertheless, it is important to avoid pitfalls that are typical of rapidly evolving areas. These are slightly different for Machine Learning vs. Optimization:
 - For Machine Learning, take care to avoid weak motivation for the choice of approach (i.e. rolling out the same old set of canned SVM and kernel transformation routines, whether they have any rational connection to the problem at hand or not) and poor understanding/ explanation of the results in terms of the characteristics of the methods. Hot, exciting “new” technology is not an excuse to abandon a scientific approach.
 - For Optimization, the most common trap appears to be excessive focus on abstraction & theory (which are indeed beautiful!) and too little connection to real data. See the previous slide on highly theoretical topics.

3.1. Forming a Team & Choosing a Project (5)

- **“Is it all right if we use an independent study one or more of us have already done as the basis for our AFP?”**
- While we generally discourage doing so, it is possible to take an independent study you’ve already completed and substantially extend it in scope and depth.
 - When you submit the proposal, you will also need to submit the paper from your independent study, and explicitly address how your proposed work goes beyond what you have already done.
 - The instructor, as well as Linda Kreitzman and your faculty advisor, will need to approve.
- In the end, an AFP needs to consist of 3 units worth of additional work per team member (and this is what we will be looking out for).
 - It’s not nearly sufficient to just implement the same research methodology on a different dataset, or make some marginal improvements to the model.
 - Feel free to check with Eric on specifics in advance of the proposal deadline if you are worried whether or not your plans reflect an adequate extension of your previous work.

3.1. Forming a Team & Choosing a Project (6)

- **“We’re doing our project based on my internship (or an industry-sponsored assignment or work experience). Now, the firm is telling me it’s uncomfortable with this. What can we do?”**
 - Make sure you are thinking about this issue in advance.
 - Identify the person, people or office in your firm which has decision-making power in this regard, and make clear your willingness to take any reasonable steps to address the firm’s confidentiality policy or concerns.
 - In our experience, AFP papers themselves almost never contain ideas or concepts so revolutionary as to compromise the intellectual property of a financial institution, and the analysis and presentation of data and results can almost always be altered in such a way as to avoid giving away any critical information; Eric can also help with ideas on how to do this.
 - *In any case, it is absolutely necessary for your AFP that you present data analysis and detailed results; you cannot cite confidentiality concerns and just outline concepts with vague or no concrete results and analysis.*
 - You are responsible for ensuring that you are able to deliver a paper that presents a story sufficiently complete to allow us to evaluate your work while satisfying any confidentiality constraints.

3.1. Forming a Team & Choosing a Project (7)

- **“Our internship project(s) really didn’t involve applying many of the skills from the MFE program. May we just write about how we implemented the projects?”**
 - Frankly, if you’re asking this question then you’ve probably got the wrong handle on the objectives and scope of the AFP. The objectives are:
 - ① to demonstrate the ability to apply the tools you have learned in the MFE curriculum to real-world problems in a novel way, and
 - ② to communicate the results of your efforts in written and/or oral form.
 - If you’re thinking of leveraging a previous project that involved very limited use of quantitative finance techniques, you should strongly consider an alternative AFP topic that WILL meet these objectives.
 - If you are unsure if the project you are considering is, for lack of a better phrase, “sufficiently MFE,” please email Eric with your concerns as soon as possible.
 - Please remember, that for all projects, it’s important that you really need to do/implement something, and in addition that ‘something’ needs to go beyond the existing literature.
 - This almost always needs to involve real data and/or inputs, derivation followed by implementation of models via code or whatnot, and explicit quantitative results.
 - Pure literature reviews or project descriptions/documentation without any meat won’t suffice.

3.2. Obtaining an Advisor

- **“How do we go about obtaining a faculty advisor for our project?”**
 - The Haas faculty are accessible and are generally excited to supervise MFE students.
 - The most important thing here is *start early*. Faculty do not appreciate it when students come to see them for the first time and ask for sponsorship on the last day before the proposal is due.
 - Also, while it is a great idea to ask your potential advisor to help you refine and/or redirect your proposal idea, don't just walk into his/her office and ask for a topic; be proactive and present a set of specific areas or ideas you find interesting.
 - Note that adjunct members of the Haas faculty and professors outside of the business school are limited to advising only a few teams. Similarly, the instructors of some of the MFE courses tend to be very popular as advisors and can't accept all the teams that would like to work with them.
 - Hence, if you have not already done so, you should begin discussions with faculty members immediately to ensure that you're able to obtain your choice of advisors.
 - This is subject to the constraint that advising can (almost always) only be compensated in the form of instructional points (IP) and not monetary remuneration (and this should be made explicit if you approach a non-Haas/ladder faculty member). Please speak to Linda if you have a VERY strong reason otherwise.
 - In case of doubt as to whether the professor you have in mind is acceptable, please ask the course instructor or MFE Office.
 - Remember that your advisor is responsible for ca. 50% of your grade, so it's a good idea to build a healthy, respectful relationship with him/her.

3.2. Obtaining an Advisor (2)

- **“Why do we need an advisor from Haas? My internship/industry project supervisor is a respected researcher who knows my project topic and is keen to supervise it; why isn’t that enough?”**
 - MFE 230O is an academic class like all the others you have been taking, even if it is project-based.
 - It is important that a Haas (or exceptionally, other Berkeley) faculty member, who shares accountability to the MFE program and has comparative experience with MFE students, be responsible for guiding and evaluating your AFP project.
 - Nevertheless, if your firm supervisor is interested in the project, he/she is welcome to be engaged as long as:
 - ① your teammates all agree and
 - ② your faculty advisor also approves.
 - We will consider loosening this restriction on a highly exceptional basis, but this will likely be done by treating Eric and Linda as your *de facto* advisors. Be aware that this may have side effects to avoid conflicts of interest.

Please also see the answers to the questions related to firm-proprietary information.

3.3. Getting It Done

● “Could you remind us of the proposal requirements, please?”

- The proposal doesn't have to be more than a page (or, more likely two) in length.
- It isn't marked separately, but contributes to the overall grade for project execution.
- Its primary purpose is to serve as a formal agreement between your team and your faculty advisor regarding what you're going to study under his/her guidance.
- Consequently, there is an approval protocol in which you email the proposal to your advisor, myself, and the MFE Office. Your advisor should then reply-all indicating his/her approval.
- At minimum, the proposal should:
 - ❶ lay out the general problem setting;
 - ❷ state the specific question(s) or objective(s) to be addressed/explored;
 - ❸ indicate what methods/techniques are going to be applied;
 - ❹ outline data requirements and sources.
- A very thorough proposal would address each of these points in detail, in a manner approaching a project/work plan (i.e. considering time requirements/allocations as well as inter-task dependencies), and would also consider risk management strategy (e.g. what could be dropped if necessary, what would happen if data were unavailable, etc.)
- Teams that have identified a faculty advisor and topic and have obtained their advisor's approval of their project proposal before the MLK holiday on Monday Jan 20 can have their proposal feedback session with me that week (Jan 23-24) or even sooner.

3.3. Getting It Done (2)

- **“Between our other courses and looking for jobs, we’re running out of time to work on our project. What can we do?”**
 - Compared to other courses, MFE 2300 is relatively unstructured – there aren’t regular problem sets or exams to remind you to stay on course – and the term is very short, so it is very easy for deadlines to sneak up and for more specific short-term objectives for other courses or the job search to “crowd out” the persistent effort needed to complete AFP projects.
 - The best way to avoid this is to plan out your schedule and work-plan: set aside a specific block of several hours a week, assign objectives for each work session, and hold yourselves accountable for staying on schedule.

3.3. Getting It Done (3)

● “What other advice would you give us?”

- Get a good start on your project during the first couple of weeks of the term, before the workload in your other classes becomes too intense and your job search escalates.
- If you can settle on a topic, outline the scope of and your approach to the project, and lay out your work plan including having a risk management strategy in which you identify – in advance –
 - ① portions of the project that you can drop without threatening the integrity of your ‘story’ if time becomes an issue, as it usually does
 - ② your dependence on specific data sources, their availability, and what you would do if they turned out to be unavailable

at the beginning of the term, you’ll be in much better shape to execute on it and manage the inevitable time conflicts – making it much more likely that you’ll be able to complete your work successfully and won’t feel the need to scramble at the end of the term.

3.4. Submissions & Presentations

● “How does the first (draft) submission work?”

- The first submission provides the opportunity to organize your team’s paper around the existing state of the art and what your contribution to that will be.
- No new research work is needed in order to prepare the first submission. It should, however, allow you to shape what you will be doing for the next several weeks in preparation for the final submission.
- In addition, it will allow you to gain experience with the turnitin process which is necessary for the final submission of your project.

3.4. Submissions & Presentations (2)

- **“How should we submit our project proposal/draft/final paper?”**
 - You’ll need to show evidence of faculty member agreement to act as your project advisor and approval of your proposal.
 - To do this, you should send an email to your proposed faculty advisor (copying Eric and the MFE Office) including a copy of your proposal and asking her/him to reply to all with their agreement.
 - I’ve also created an assignment allowing you to upload your proposals to bCourses.
 - Submission of drafts should also be via bCourses.
 - If you would like to test drive your paper through turnitin (and I recommend that you do), I’ll create a practice assignment space to facilitate doing so.
 - You are also encouraged to share your draft(s) with your advisor.
 - Final paper submissions should be to bCourses (and thereby to turnitin, which has been integrated into bCourses) and to the faculty advisor as well.
 - I will be asking each of you, as individuals and not just as a team, to upload an acknowledgment of your turnitin report to bCourses as well.

3.4. Submissions & Presentations (3)

- **‘Something’s come up and we need some extra time. May we have an extension, please?’**
 - Extensions of a day or two will be granted if a good reason is provided at least 48 hours in advance.
 - Please email Eric and your faculty advisor – whose approval *in advance* is required for the extension to be granted – if one is absolutely needed.
 - Last minute or post-deadline requests may be refused or subject to a grade penalty.
 - Please note that longer extensions cannot be granted except in extraordinary circumstances because of the need for the faculty advisor and course instructor to review the project before final presentations are made.
 - Any such exceptional requests must be negotiated, *in advance*, directly between you and your faculty advisor and can in no case extend past **Wednesday, March 04**.

3.4. Submissions & Presentations (4)

- **“Our paper contains a revolutionary, top-secret trading idea, based on a highly proprietary data set, that neither we nor our sponsoring firm want to disclose or discuss publicly. May we give our presentation and submit our paper confidentially?”**
 - Several years ago, a fraction of the students requested confidential presentations of their projects.
 - Because of the number of people necessarily involved with each paper (faculty advisor, instructors, etc.) and the logistical difficulties of scheduling transitions between open and confidential presentations, we concluded that this was no longer practicable.
 - *All students enrolled in the AFP must be prepared to present their projects **in person** to an audience consisting of their fellow MFE students, Haas faculty, and members of the MFE Steering Committee.*
 - In addition, please understand that since your AFP papers are effectively Masters’ theses, the University considers them to lie in the public domain.
 - Please also see the answers to the questions on firm confidentiality.

4. Topics for Jan 29 Class Meeting

- What distinguishes an A paper from a B paper from an unsatisfactory paper
 - ...and A+ from A from A- from B+ from B...
- Writing and citation standards
 - How to organise your paper and start writing...
 - ...and how to avoid the dreaded P-word
- Hints on how to maximize your grade
 - 30% comes from basic writing mechanics: 'form'
 - a good portion of the rest comes from simply presenting the results/story coherently
- What we look for in the AFP prize finalists
 - how this might differ slightly from the final grade results/order