Special Topics in Financial Engineering: Statistical Arbitrage

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Course Description

<u>Attendance is restricted to students enrolled in the UCLA Anderson Master of Financial Engineering.</u>

This course deals with quantitative equity market-neutral strategies. At one end of the spectrum, there are high-capacity strategies with multi-year time horizons. At the other end of the spectrum, there are low-capacity strategies with milli-second time horizons. We will place ourselves squarely in the middle of this trade-off. This will enable us to study *both* slow and fast signals. This is the sweet spot where you can have sufficiently high Sharpe ratio to be rewarded on your own merit rather than on your verbal ability to explain away bad performance, *and* you can escape from the technologically intensive rat race to have the fastest computer co-located closest to the Stock Exchange. Rather than giving students "a fish", i.e., a list of alphas that are supposed to work, we will "teach them how to fish", i.e., give them the toolkit necessary to develop their own sources of alpha. Statistical arbitrage is less of a formula than an ongoing process: you fix the airplane as you are flying it.

Recommended reading
This book is a great read on the topic and has lots of complementary example to what we cover in class:
Quantitative Trading: How to Build Your Own Algorithmic Trading Business (2021), Ernest P. Chan, Wiley

Grading
Three problem sets will be distributed on Briun Learn. There will be a final team project to be presented during the last class. Course grades will be determined as follows:
- Class Participation: 10%
- Problem Sets: 60% in total (20% each). These will be conducted in groups of size 4, as assigned by the MFE office.
- Final project: 30%.

Gen AI policy
You may use Generative AI tools, such as ChatGPT, to assist with your assignments and the project. If you choose to use these tools, you must document their usage and include this documentation as part of your submission

Times and Dates
Every lecture is 2h50 long. Our regular meeting time will be on Mondays from 4:10pm to 7:00pm in G305. One exception is Thanksgiving week, when the class will meet on Zoom on Tuesday (Nov. 25) from 1:00pm to 3:50pm.

Office Hours
I will always be available to talk right after class or by appointment, just email me!

Teaching Assistant
Junyu Zhang, 3rd year Finance PhD student and MFE alum.
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Review sessions and office hours
Fridays, 10-11 am in D301 (with the exception of 11/28)
Office hours: 10/17, 10/24, 11/7, 11/14, and 12/5
Review Sessions (strongly recommended): 10/3, 10/10, 10/31, and 11/21

Tentative Course Outline (Lectures correspond to material, not specific classes)

Lecture 01
- Introduction and logistics
- What is statistical arbitrage?
- Frequency: high/medium/low
- What does it take to succeed?
- Are markets efficient?
- General building blocks of a statistical arbitrage strategy

Lecture 02
- What is an alpha?
- Constructing the universe of stocks
- Transaction costs
- Start Problem Set 1

Lecture 03
- Signal vs. noise
- Introduction to shrinkage
- How to estimate the optimal shrinkage slope

Lecture 04
- Turn in Problem Set 1
- How to estimate the covariance matrix of asset returns

Lecture 05
- Alphas
- Correction of Problem Set 1
- Start Problem Set 2

Lecture 06
- More alphas

Lecture 07
- Turn in Problem Set 2
- The optimizer

Lecture 08
- Short-term alphas
- What is it like to work in a Statistical Arbitrage hedge fund?
- Start Problem Set 3

Lecture 09:
- Auditing and controls

Lecture 10
- Turn in Problem Set 3
- Managing interpersonal dynamics in Stat Arb teams
- The August 2007 Quant meltdown
- Does Stat Arb still work?