Statistical Arbitrage
MFE 237M2, Fall 2016

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Course Description
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.

Course Materials
Quantitative Trading (2009), Ernest P. Chan John Wiley and Sons, New Jersey.

Grading
Three problem sets will be distributed through the class intranet. There will be an in-class three-hour final exam. Course grades will be determined as follows:
Class Participation: 10%
Problem Sets: 50% in total (16.6667% each)
Final exam: 40%
Note: Every lecture is 1h30 long.

Course Outline

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: Guest lecture by Joseph Signorelli & David Don from Wedbush Securities/Lime Brokerage

- 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?

About the Instructor

Dr. Olivier Ledoit is Permanent Research Fellow in the University of Zurich Economics Department. Previously, he was Managing Director and Head of Global Statistical Arbitrage in Credit Suisse's Equity Proprietary Trading Group based in London, and prior to that Finance Professor at UCLA. He received the Roger F. Murray Prize from the Q Group. His research has been published in top peer-reviewed scientific journals in Probability Theory, Statistics, Economics and Finance. He holds a Bachelor's Degree in Engineering from Ecole Polytechnique in Paris, a Master's Degree in Economics and Statistics from ENSAE (Ecole Nationale de la Statistique et de l'Administration Economique), and a PhD in Finance from MIT.