Curriculum

This course applies a signal processing formalism to the study of financial time series. Through signal processing, a noisy time series can be smoothed in a variety of ways, and the smoothing function may be applied either on-line or off-line. We will cover the entire class of causal smoothing functions that have equivalent on- and off-line forms.

Signal processing relies heavily on Fourier, Laplace and z-transforms; and on pole-zero diagrams drawn in the complex plane. By the end of the course you will know three ways to express the same smoothing function: as a series in time, as a filter, and as a pole-zero diagram. Each representation adds richness to the understanding of how filters operate on financial data.

Topics by Week:

1. The kdb vector database and the q language – an introduction.
2. Course overview. Superposition and convolution.
3. Fourier transforms, spectral analysis and filters.
4. Sampling, replication and z-transforms.
5. Finite-difference equations with constant coefficients.
6. Finite-difference equations, convolution revisited.
7. Summary: the entire course in one lecture.

Reading Material

This year I am transitioning between lecture notes. You will have a pdf version of my earlier notes, "Signal Processing Applied To Finance, Lecture Notes for 2014". Most of the course material for 2015 will be in there.

I will also offer a printed draft of my manuscript, "Signal Processing for Quantitative Finance." Right now there are 6 chapters with references and index, these run 203 pages. The manuscript is *not* required for the course. Nonetheless, please let me know if you are interested in a copy, I will have them printed. The printing cost is about $35, I will know exactly once I know. Lastly, I'll bring a copy to the first lecture.

Administrative Details

- **Lecturer:** Jay Damask, jay.damask@baruch.cuny.edu
- **TA:** TBD
- **Class Room and Time:** 6:00pm - 8:30pm, Room 6-140
- **Class Dates:**

  Mondays Feb 2nd, Feb 9th; **Wednesday** Feb 18th; **Mondays** Feb 23rd, Mar 2nd, Mar 9th and Mar 16th
  Please note that

  * no class on Feb 16 because of President's Day
  * Feb 18 is on calendar Wed, but at Baruch it follows Mon schedule.

- **Final Exam Date:** Sat Mar 21th, time TBD
- **Final Exam Notes:** The final exam is closed book and will run three hours. A cheat sheet will be provided. The final will count as **28%** of your final grade.
- **Homeworks:** Homework is due at the beginning of class, and should be emailed to our TA.
  - Our policy is no late homeworks unless there is medical need.
  - Solutions will be posted after class.
  - There will be six homeworks, one due each week except for the first class. Each homework counts for **12%** of your final grade. The work is cumulative so it's important to keep pace.
  - The homeworks are to be done in **teams of two**. Please let our TA and me know how you make up your teams.
  - Scripts are to be written in Matlab. All scripts must run. Data will be provided for you.
  - Poor or incorrect form can penalize you. Make sure all of your axes are labeled, that your graphs are clearly marked, and your scripts commented. Simply put: follow good scientific practice and you will be fine.
  - Many of the homeworks are substantial so I recommend that you begin them early.
  - The homeworks are the practical component of the course. The lectures and lecture notes offer the theoretic part.
- **Reading Material:** The principal source material is my lecture notes, "Signal Processing Applied to Finance." These are a draft, which is pretty evident.