Course Description

Financial econometrics is the intersection of statistical techniques and finance. Financial econometrics provides a set of tools that are useful for modeling financial data and testing beliefs about how markets work and prices are formed. Conversely, new techniques in analyzing financial data can lead to empirical facts inconsistent with existing theories, begging for new models or investment strategies.

We begin with models of time varying expected returns which are useful in formulating expected returns. A casual follower of financial asset prices quickly notices prolonged periods of high volatility followed by more tranquil periods. We next develop several modeling tools that allow us to forecast or predict risk, or volatility, when risk is changing through time. The financial crisis highlighted contagion or the fact that returns on assets tend to be more highly correlated in market downturns. We introduce factor models as well as some more recent modeling innovations that allow for the covariance between assets to change through time – possibly increasing in market downturns. Some market prices must satisfy long run relationships. For example, the price of homes and household income must satisfy a long-run relationship in that average home prices cannot be too high relative to incomes. We introduce a simple statistical model that can account for this type of relationship. Finally, we will discuss models for within day price dynamics, or high-frequency financial data.

Who should take this class?
This course will be useful to students who plan to take empirically oriented finance courses as well as students who want to get a solid understanding of the tools required to analyze and model financial asset prices. The link between new statistical models and implementation is emphasized throughout.

Prerequisites
A solid understanding of statistics at the level of 41000 or 41100 is required.

Book
There is no text for the class.

Grading
There will be weekly homework assignments, a midterm and a final exam. Students may work in groups of size three or less on homeworks. One assignment per group should be submitted.

**Software**
I have arranged discounted prices for students of my class to purchase the software package EViews. This is one of the most powerful and simple to use software packages available for the types of models that we will use throughout the class. Directions to order at the discounted rates are available on the course web page. I would like for you to have EViews installed and ready to go by the first day of class so that you can begin the homework and get started with the new statistical package.

**Topics covered**
1. Predicting financial returns
   a. Market efficiency
   b. Autoregressive models
   c. Moving average models
   d. ARMA
   e. Model evaluation

2. Predicting volatility and risk
   a. ARCH
   b. GARCH (Nobel Prize in Economics)
   c. EGARCH and other variations
   d. Recent advances in volatility estimation using high frequency data - realized volatility

3. Predicting multiple, related series.
   a. Models for the means
   b. Time varying variance covariance matrices.
   c. The Dynamic Conditional Correlations (DCC) model

4. Random walks and cointegration
   a. Pitfalls - spurious regression
   b. Cointegration and error correction models (Nobel prize in Economics)
   c. Forecasting cointegrated systems
   d. When and how to use cointegration
5. Models for high-frequency price dynamics
   a. High frequency data characteristics
   b. Models for intraday returns – a point process approach

6. Evaluating trade execution costs
   a. Optimal trade execution and automated trading strategies
   b. Evaluating the performance of execution strategies