Empirical Finance (Fall 2021)

Instructor: Shuo Liu

Course Description: Empirical Finance is a course for senior undergraduate students who are interested in applying real data to test classical asset pricing theories and in the applications of econometric methods to financial problems. This course mainly contains two parts: "empirical asset pricing" and "applied econometrics". The first part discusses how to apply real data or simulation methods to test classical financial theories, including equity valuation, portfolio management analysis, CAPM model, Fama-Macbeth regression, Fama-French-Carhart factor model, Arbitrage Pricing Theory, and multi-factor pricing models for fixed income securities. The second part helps students review basic econometric theory, and further talks about more advanced time-series and panel data models, including ARIMA model, GARCH model, fixed/random effect models, and varying-coefficient models. Specifically, this course focuses on the application of econometric models to real financial or economic problems, for example, this course will cover the difference-in-difference analysis, solving endogeneity problem, model specification and selection issues. Also, after taking this course, students will have a general idea about how to write a research proposal and they should be able to construct appropriate reduced-form models for their topic of interest.

Class Time： Monday 13:30-16:55pm

Prerequisite: introduction to econometrics, investment theory

References：

1. Principles of Econometrics. Hill, R. C., Griffiths, W. E. and G. C. Lim, 4th Edition, 2011.

2. Analysis of Financial Time Series, Ruey S. Tsay, 3rd Edition, 2010.

Grading:

- biweekly assignments (20%) + midterm (40%) + final project (40%)
- Students can form groups of size up to 4 people. For each assignment, each group submits one copy of slides which presents the main results, and puts the calculation details as appendix. For the final project, each group just submits one copy of report.
- For assignments and final project, group members are equally graded.

Course Time Table:

Date	Assignment Due	Topics
Sep 13		Preview
		Time Value of Money
		– Discounted Cash Flow Analysis
		– Interest Rates
		– Equity Valuation
		– Mortgage Payments and Amortization Table
Sep 18		Asset Return and Volatility
		– Statistical Characteristics
		– Portfolio Management, Efficient Frontier and Capital Market Line
		– CAPM model and Security Market Line
Sep 27	Assignment-1	Fama-Macbeth Regression
		Multi-factor Asset Pricing Model
		– Fama-French-Carhart four factor model
		– Arbitrage Pricing Theory (APT)
		– model with security characteristics (e.g. fixed income securities)
Oct 11		Fixed Income Securities #1
		– main features of bonds
		– yield to maturity (YTM) and realized returns
		– yield curve
Oct 18		Fixed Income Securities #2
		– Interest Rate Risk: Duration and Immunization
		– Arbitrage Pricing
		– Liquidity Measures
		– Liquidity Risk and Liquidity Premium
Oct 25	Assignment-2	Options and Derivatives #1
		– Option Basics
		– Options: strategies and valuation prior to expiration

Date	Assignment Due	Topics
Nov 1	Assignment-3	Options and Derivatives #2 – Binomial Tree Option Pricing – Black-Scholes-Merton Formula
Nov 8		Review on Econometrics – Cross-Sectional Models: Simple Linear Model, Multivariate Linear Model – OLS Estimation, Heteroskedasticity, Generalized Least Square Estimation – Endogeneity Problem
Nov 15	Assignment-4	Time Series Analysis #1 – Stationarity – AR, MA, ARMA, ARIMA models
Nov 22		Time Series Analysis #2 – ARCH, GARCH – VAR, VEC, cointegration
Nov 29	Assignment-5	Panel Data Models #1 – Fixed Effect Model
Dec 6		Panel Data Models #2 – Time Effect Model, Random Effect Model – Dynamic Panel Data Model, Varying-Coefficient Models
Dec 13	Assignment-6	Additional Topics-1 – Causal Inference – Market Efficiency *a*. Efficient Market Hypothesis *b*. weak/semi-strong/stong form efficiency *c*. implications on securities analysis – Risk Management
Dec 20		Additional Topics-2 – Machine Learning Applications: Lasso, Ridge, ElasticNet – Review on Application of Dummy Variables: Diff-in-Diff, Regression Discontinuity
Dec 27	Assignment-7	Group Presentations

Software: EXCEL/R/Stata/Python