

Empirical Finance (40510673, Fall 2023)

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 also 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 and 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. After taking this course, students are expected to obtain a general idea about how to write a research proposal and how to construct appropriate reduced-form empirics models for their research topics.

Class Time: Thursday 9:50am-12:15pm

Instructor contact: liushuo3@sem.tsinghua.edu.cn

Office hour: Thursday 17:30-19:30pm or by appointment

Teaching Assistant: Cindy Xueyang Zhu, xy-zhu21@mails.tsinghua.edu.cn

Prerequisite: introduction to econometrics, basic-level investment theory, basic-level corporate

finance

References:

1. Analysis of Financial Time Series, Ruey S. Tsay, 3rd Edition, 2010.
2. **Slides should be the main focus for assignments and exams.**

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.

Tentative Time Table:

Date	Assignment Due	Topics
Sep 21		Preview Time Value of Money <ul style="list-style-type: none">– Discounted Cash Flow Analysis– Interest Rates– Equity Valuation– Mortgage Payments and Amortization Table
Sep 28		Asset Return and Volatility <ul style="list-style-type: none">– Statistical Characteristics– Portfolio Management, Efficient Frontier and Capital Market Line– CAPM model and Security Market Line
Oct 12	Assignment-1	Fama-Macbeth Regression Multi-factor Asset Pricing Model <ul style="list-style-type: none">– Fama-French-Carhart four factor model– Arbitrage Pricing Theory (APT)– model with security characteristics (e.g. fixed income securities)
Oct 19		Fixed Income Securities #1 <ul style="list-style-type: none">– main features of bonds– yield to maturity (YTM) and realized returns– yield curve
Oct 26		Fixed Income Securities #2 <ul style="list-style-type: none">– Interest Rate Risk: Duration and Immunization– Arbitrage Pricing– Liquidity Measures– Liquidity Risk and Liquidity Premium
Nov 2	Assignment-2	Options and Derivatives #1 <ul style="list-style-type: none">– Option Basics– Options: strategies and valuation prior to expiration

Date	Assignment Due	Topics
Nov 9	Assignment-3	Options and Derivatives #2 <ul style="list-style-type: none"> – Binomial Tree Option Pricing – Black-Scholes-Merton Formula
Nov 16		Review on Econometrics <ul style="list-style-type: none"> – Cross-Sectional Models: Simple Linear Model, Multivariate Linear Model – OLS Estimation, Heteroskedasticity, Generalized Least Square Estimation – Endogeneity, IV regression
Nov 23	Assignment-4	Time Series Analysis #1 <ul style="list-style-type: none"> – Stationarity – AR, MA, ARMA, ARIMA models
Nov 30		Time Series Analysis #2 <ul style="list-style-type: none"> – ARCH, GARCH – (not required) VAR, VEC, cointegration
Dec 7		Midterm Panel Data Models #1 <ul style="list-style-type: none"> – Fixed Effect Model
Dec 14		Panel Data Models #2 <ul style="list-style-type: none"> – Time Effect Model, Random Effect Model – (not required) Dynamic Panel Data Model, Varying-Coefficient Models
Dec 21	Assignment-5	Specific-form dependent/independent variables <ul style="list-style-type: none"> – indicator variable, difference-in-difference (DID) – Logit model, Probit model Causal Inference (if time permits) <ul style="list-style-type: none"> – Propensity Score Matching (PSM), difference-in-difference (DID)
Dec 28	Assignment-6	Machine Learning Applications (if time permits) <ul style="list-style-type: none"> – Regularized Regressions: Lasso, Ridge, ElasticNet – Tree Models, Network Models
Jan 4, 2024	Assignment-7	Group Presentations

Software: EXCEL/R/Stata/Python