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# FE670 Algorithmic Trading Strategies

## Course Catalog Description

### Introduction

This course investigates methods implemented in multiple quantitative trading strategies with emphasis on automated trading and quantitative finance-based approaches to enhance the tradedecision making mechanism. The course provides a comprehensive view of the algorithmic trading paradigm and some of the key quantitative finance foundations of these trading strategies. Topics explore markets, financial modeling and its pitfalls, factor model based strategies, portfolio optimization strategies, machine learning, and order execution strategies. The data mining and machine learning based trading strategies are introduced, and these strategies include, but not limited to, weak classifier method, boosting, random forest, deep neural network and genetic programming algorithmic emerging methods with multiple data sources. The trading strategy examples will be demonstrated in Python, and the course requires programming skills.

**Prerequisite:**

- FE 570– Market Microstructure and Trading Strategies

Campus	Fall	Spring	Summer
On Campus	X		
Web Campus			

## Instructors

Professor	Email	Office
Steve Yang ( <a href="https://web.stevens.edu/facultyprofile/?id=2359">https://web.stevens.edu/facultyprofile/?id=2359</a> )	syang14@stevens.edu	Babbio 536

## More Information

### Course Outcomes

After successful completion of this course, students will:

- The students will learn the tools and common methodology used in research and devel-opment of quantitative trading strategies.
- The process of finding new “alphas” will be illustrated using available datasets, the pro-jects will illustrate the details of “backtesting” and systematic portfolio construction.
- Most common trading strategies will be discussed in detail, while the exercises and pro-jects will offer the creative opportunities to refine the models.
- At the end of the course the students will be able to analyze and develop strategies inde-pendently, will develop the skills to build optimal portfolios, perform hedging and re-search new non-conventional ideas.

## Course Resources



Textbooks

(<https://fsc.stevens.edu>)

Raja Velu, Maxence Hardy, Daniel Nehren, Algorithmic Trading and Quantitative Strategies, Chapman and Hall/CRC Financial Mathematics Series, 1st Edition (2020) [Required]



Stefan Jansen, Machine Learning for Algorithmic Trading: Predictive models to extract signals, Packt Publishing, Ltd. 2nd Edition (2021) [Optional]

Frank J. Fabozzi, Sergio M. Focardi, and Petter N. Kolm, Quantitative Equity Investing: Techniques and Strategies (Wiley, 2010) [Optional]

Barry Johnson, Algorithmic Trading & DMA, 4Myeloma Press London, 2010 [Optional]

Grading

Grading Policies

		Weights
1	Homework Assignment	40%
2	Midterm Exam	30%
3	Final Project	30%
4	Total Grade	100%

Lecture Outline

	Topic	Reading	HW
Week 1	An Overview of Trading and Markets	Velu, Hardy, Nehren [1], Barry Johnson [1,2]	
Week 2	Basic Models and Empirics	Velu, Hardy, Nehren [2,3], Jansen [2,3]	
Week 3	Factor Models and Estimation	Fabozzi, Focardi, Kolm [5], Jansen [4]	HW1
Week 4	Alpha Factor Trading Strategies	Fabozzi, Focardi, Kolm [6-7], Jansen [7]	
Week 5	Mean Variance Portfolio Theory	Fabozzi, Focardi, Kolm [8] Jansen [5]	
Week 6	Portfolio Theory Beyond Markowitz	Fabozzi, Focardi, Kolm [9]	HW 2
Week 7	Robust Portfolio Optimization	Fabozzi, Focardi, Kolm [10]	EXAM 1
Week 8	Statistical Arbitrage and Pair Trading Strategies	Velu, Hardy, Nehren [4, 5] Jansen [6]	
Week 9	Machine Learning Trading Strategies: Random Forests, Ada Boosting, Gradient Boosting	Research Papers, Jansen [11, 12]	
Week 10	Trading Strategies based on Alternative Data: Topic Model and Sentiment Analytics	Research Papers, Jansen[15, 16, 18, 19]	HW 3
Week 11	Deep Learning Strategies: Autoencoder, GANs, and Reinforcement Learning	Research Papers, Jansen[20, 21, 22]	
Week 12	Trade Execution & Market Impact	Fabozzi, Focardi, Kolm [11], Velu, Hardy, Nehren [8]	Proposal
Week 13	Transaction Costs & Optimal Execution Strategies	Barry Johnson [7, 8, 9], Velu, Hardy, Nehren [9, 10]	HW 4 ^

Week 14	Enhancing Trading Strategies & Technology Considerations ( <a href="https://isc.stevens.edu">https://isc.stevens.edu</a> )	Barry Johnson [10], Velu, Hardy, Nehren [11, 12]	
Week 15	Final Project Presentation		EXAM 2



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