

课程大纲 COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	FIN5017 金融时间序列分析 Analysis of Financial Time Series
2.	课程性质 Compulsory/Elective	选修课 Elective Course
3.	课程学分/学时 Course Credit/Hours	3/48
4.	授课语言 Teaching Language	中英双语 English & Chinese
5.	授课教师 Instructor(s)	孙便霞 SUN Bianxia
6.	是否面向本科生开放 Open to undergraduates or not	是 Yes
7.	先修要求 Pre-requisites	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) 概率论与数理统计 Probability and Statistics MA212
8.	教学目标 Course Objectives	
	<p>此课程旨在讲授金融时间序列分析领域里的经典模型以及分析方法, 使学生在掌握时间序列模型理论内容的同时, 学会对真实金融市场上的数据进行建模分析。同时, 该课程也会介绍目前该领域里处于研究前沿的相关内容和研究方向。</p> <p>This course aims to teach students the classical models and analysis methods in the field of financial time series. Besides mastering the theoretical knowledge of time series models, students are also expected to be capable of modelling the time series data in real financial markets. In addition, this course also introduces some related contents at the forefront of research in this field.</p>	
9.	教学方法 Teaching Methods	
	<p>本课程通过课堂讲授的方式讲解理论内容, 同时时间序列模型的实际应用部分将结合 R 软件来进行。</p> <p>The theoretical contents of this course will be instructed in details in class, and the software R will be used in the real applications of time series models.</p>	
10.	教学内容 Course Contents	
	Section 1	<p>Characteristics of financial time series data</p> <p>In this chapter, students will learn about the characteristics of financial time series data, mainly related to the distribution of asset returns, the stability of time series data, and how to make white noise test. Students are expected to have a better foundation for future learning of financial time series models</p>
	Section 2	<p>Properties, estimate, and forecast of Moving Average models</p> <p>This chapter will illustrate the simple financial econometric model for modelling asset returns. Students will learn the moving average model, including weak stationary property, reversible property. The teacher will also explain how to identify the order of the moving average model by using</p>

	the autocorrelation function. Estimating the parameters of the model using maximum likelihood estimation is quite essential. The teacher will introduce how to use the moving average model for prediction as well.
Section 3	Properties, estimate, and forecast of Auto-Regressive models In this chapter, students will learn about the characteristics of AR models. They are expected to grasp the stationary condition of AR process, the idea of PACF, how to use the LS method to estimate model's parameters, and how to test the model's sufficiency of fitting the data through the Ljun-Box statistic test.
Section 4	Properties, estimate, and forecast of Auto-Regressive and Moving Average models This chapter will introduce the characteristics of the ARMA (1,1) model, and the students will learn about using the extended autocorrelation function (EACF) to determine the order of the ARMA model, and how to use the ARMA model for prediction.
Section 5	Non-stationary time series and unit root test In this chapter, students will learn about the unit root non-stationary time series and the random walk time series with drift. At the same time, the teacher will introduce the time series with trend and the general unit root non-stationary model, as well as the unit root test method.
Section 6	Multivariate time series and Vector Auto-Regressive models In this chapter, students will learn about financial econometrics models for studying multivariate time series. They are expected to grasp the concept of cross-correlation matrix and the simple commonly used vector autoregressive model (VAR). The teacher will illustrate the form and stationary conditions of the VAR(1) model, how to estimate the parameters and how to test for the specified VAR model.
Section 7	Impulse response function and variance decomposition This chapter will introduce the impulse response function and variance decomposition for a fitted vector autoregressive model. The teacher will demonstrate how to analyze financial data and make predictions based on the learned models through statistical software.
Section 8	Co-integration test and Error Correction Model In this chapter, students will learn about the idea of co-integration, and co-integrated VAR model estimations as well. The teacher will explain co-integration test methods and error corrected models in details.
Section 9	Mid-term Review Review all of the contents covered in the former half semester and make students prepare for the mid-term exam.
Section 10	Properties, estimate, and forecast of ARCH models In this chapter, students will begin to learn about the econometric models of asset return volatilities. The teacher will introduce the characteristics of volatility, basic properties of the ARCH model, the determination of the order for ARCH model, the estimation of the parameters and the test of the model.
Section 11	Properties, estimate, and forecast of GARCH models In this chapter, students will learn about a model that could more fully describe the volatility process of assets' return: the generalized autoregressive conditional heteroskedasticity (GARCH) model. The teacher will introduce the basic properties of the GARCH model, what are the pros and cons of the model, how to estimate the GARCH model by the two-step estimation method, and the prediction of the model.

Section 12	<p>Properties, estimate, and forecast of asymmetric GARCH models</p> <p>In this chapter, students will learn about asymmetric GARCH models. The teacher will introduce the asymmetric effects of the EGARCH model on positive and negative return of assets, the estimation methods of the model, and how to use the asymmetric GARCH model for prediction.</p>
Section 13	<p>Volatility estimates based on high-frequency data and market microstructure</p> <p>In this chapter, students will learn about the unique characteristics of financial high-frequency data and how to estimate the volatility based on high-frequency data. Besides this, the teacher will introduce some core contents related to market microstructure, such as asynchronous transactions, bid and offer spread, and empirical characteristics of trading data.</p>
Section 14	<p>Risk measures and calculating methods of VaR</p> <p>In this chapter, students will learn about the various ways to calculate the value at risk (VaR). The teacher will introduce the concept of VaR, Risk Metrics's method and econometric methods of VaR calculation. The idea of expected shortfall will also be covered.</p>
Section 15	<p>Introduction to factor models</p> <p>In this chapter, students will learn the basic knowledge of macroeconomic factor models, fundamental factor models, and statistical factor models. In the part of fundamental factor models, the estimate methodology of BARRA model will be introduced briefly.</p>
Section 16	<p>Project Presentation and Final Review</p> <p>Students are required to present their project results in class. The teacher will review all of the contents covered in this course and make students prepare for the final exam.</p>
<p>11. 课程考核 Course Assessment</p>	
<p>(① 考核形式 Form of examination; ②. 分数构成 grading policy; ③ 如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)</p> <p>15% 平时作业 + 10% 小测验 + 15% 期末报告 + 30% 期中考试 + 40% 期末考试 15% Assignments + 10% Quiz + 15% Final Report + 30% Midterm Exam + 30% Final Exam</p>	
<p>12. 教材及其它参考资料 Textbook and Supplementary Readings</p>	
<p>指定教材 Textbook: Ruey S. Tsay, Analysis of Financial Time Series, 3rd edition, Wiley, 2010.</p>	