Antai College of Economics & Management
Shanghai Jiao Tong University

Department of Finance, Li Nan
Semester I, AY 2022-2023

Advanced Econometrics III: Time Series Analysis

Course Description:

This course focuses on the advanced methods and tools to analyze time series in finance and macroeconomics. The first part of the course introduces the foundation and building blocks for time series analysis, such as stationarity, nonstationarity, cointegration, impulse responses and shock identification etc.

The students are expected to understand ARMA, VAR, and other models as well as methods such as Spectral Analysis, GMM and Kalman Filter that are important tools in the time series analysis of macroeconomics and financial economics. More importantly, students are expected to be able to apply the methods and tools learned to set up appropriate empirical models to analyze the problem in macroeconomics and financial economics, and to estimate and test these models.

In the second part of the course, various macro-asset pricing models are introduced and the students are expected to understand the empirical tests of implication of these asset pricing model, both time-series and cross-section tests.

The prerequisite for this course is intermediate-level courses in finance and macroeconomics and econometrics (for example, Econometrics Analysis by William Greene).

Course Code:

In this semester, this course is a hybrid course offered to graduate students and senior undergraduate students, offline and online, via Tencent Meeting in the Global Virtual Classroom Shanghai Jiao Tong University and Virtual Exchange Program of the APRU (Association of Pacific Rim Universities)

Course code for undergraduate students: EC347

Course code for graduate students: ECON9004

Time and Location:

- Time: Fridays 14:00-16:45
- Location：新上院S204
- Virtual Classroom: Tencent Meeting

NOTE:

1. This course is offered to registered students only. Please do **not share** any course material (Tencent Meeting information, lecture notes, homework, references, wechat group code and etc) without my permission. Unauthorized sharing/copying might result in failing or being banned from the course.
2. Students in SJTU are required to attend the class in the classroom (offline).

Contact Information:

- The most efficient way to contact me is by email, and I will usually reply in 24 hours. Office hour is available by appointment. My email address is nanli@sjtu.edu.cn My office is in Antai College of Economics and Management, B705.
- Join the course wechat group by scanning the QR code
  Note:
  1.Please change your group Nickname to
  "real name" + University + PhD/MA/Undergraduate + Year.

2. Please do not post anything in this group irrelevant to this course. I will kick out and ban anyone who violates this rule without warning.

- Course Website: Canvas, https://oc.sjtu.edu.cn
- Personal Website: https://www.acem.sjtu.edu.cn/en/faculty/linan.html

Homework/Grading

There will be homework, final exam, and group project. The final grade is based on the weighted average of the homework, online practice competition, group project and final exam grades. The following weighting schemes will determine your final grade for the course:

- Homework: 20%
- Group Project: 30%
- Class Participation: 10%
- Final Exam: 40%

Homework is ***individual task***, you are encouraged to discuss homework in groups, but each one of you must ***complete homework on your own*** and hand in a copy of homework separately. For empirical parts of the homework, do NOT submit your program codes or raw data, please submit the final results of your computation with explanation. No late submission of homework will be accepted.

Warning:

- ***Plagiarism is taken very seriously.*** *Students had been caught plagiarizing in homework, term paper, and/or quizzes in this course have been severely penalized. Any student caught cheating in any homework, term paper, and/or exams will be failed in this course and reported to the school for further penalty.*
- *If a student is absent from the exam or late for more than 30 minutes without any medical certificate or other verifiable excuses (subject to the approval of lecturer), there will be no make-up exam and the grade will be counted as zero.*

Group Project:

You are required to form a group of ***no more 5*** students. Each group must sign up to do a 30-minute class presentation and write a report of your group project. You should submit your presentation slides at CANVAS at least 12 hours before the presentation. In addition, a report is due by the end of the semester. The report should be no more than 10 pages with at least 11pt Time New Roman Font and 1.5 line spacing.

- ***For Ph.D. students:***

Your group should write ***a referee report*** and give a 30-minutes presentation for a research paper of your choice within the pool of required readings (part II). The choice of the paper is subject to the approval of the lecturer. (See the last page for detailed requirement of the referee report)

- ***For Undergraduate and Master Students:***

Your group can either choose to write a referee report for a research paper or to write a report of your participation at ETF Global Portfolio Challenge (etfportfoliochallenge.com)

Timeline for the ETF Global Portfolio Challenge:

- Friday, September 16: Last date for Enrolment
- Monday, September 19: Performance period begins
- Friday, September 23: 1st Rebalance/Reselection Date
- Weekly Portfolio Rebalancing to rebalance every week by Friday at 4:00 PM ET
- Friday, December 2: Final Rebalance/Reselection Date
- Friday, December 9: Performance period concludes
- Monday, December 12: Contest Winners Announced

Report requirement:

State your portfolio position, and trading strategy, and justify your strategy by data analysis.

Textbooks and References:

- **Journal Articles in the Reading List**

- **Require textbooks and manuscripts**
  1. ***Time Series Analysis***, by James D. Hamilton, Princeton University Press; 1st Edition, Kindle Edition, ISBN 9780691218632, 2020/09/01
  2. **Lectures in Quantitative Economics** by **Thomas J. Sargent** and **John Stachurski** (online)
  3. **Time Series Analysis, Regression and Forecasting with tutorials in Python** (online)
  4. ***Asset Pricing***, by **John H. Cochrane**, New Age International Publisher, January 1, 2010, 978-8122431247 (AP)
  5. ***Time Series Analysis for Macroeconomics and Finance***, by John H. Cochrane, Lectures Notes for Ph.D. Students in Finance, The University of Chicago, 2005. (TSMF)
  6. ***Financial Markets and the Real Economy***, by John H. Cochrane, CHAPTER 7 - Financial Markets and the Real Economy, Editor(s): Rajnish Mehra, In Handbooks in Finance, Handbook of the Equity Risk Premium, Elsevier, 2008, Pages 237-325, 9780444508997, (FMRE)

- **Recommended references:**
  1. *Beyond Diversification: What Every Investor Needs to Know About Asset Allocation*, by Sébastien Page, McGraw-Hill Education; 1st edition, November 10, 2020, 1260474879
  2. *The Econometrics of Financial Markets*, by John Campbell, A. Lo, and C. MacKinlay, Princeton University Press, 1997.
  3. *Econometric Analysis,* by William Greene, Macmillan Publishing Company, 1990.
  4. Monetary Economics PhD course — John H. Cochrane (johnhcochrane.com)
  5. Tips on preparation of presentation and writing papers
     - Cochrane, J. (2005) **Writing tips for PhD students**

- Useful websites for data and programming
  - **http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/**
  - **http://wrds.wharton.uppen.edu**
  - **http://www.bea.gov/beahome.html**
  - **http://www.federalreserve.gov/releases/**
  - **http://timeseriesreasoning.com**

Reading List and Class Schedule (tentative and subject to changes):

1. **Lecture 1-3 ARMA Models, Autocorrelation, Prediction and Impulse-Response Functions**
   - TSMF Chapter 1-5
   - TSA Chapter 3-5
   - Bloom, N. (2009), The Impact of Uncertainty Shocks. Econometrica, 77: 623-685.
   - Bayer, C., Luetticke R., Pham-Dao L., Tjaden V. (2019), Precautionary Savings, Illiquid Assets, and the Aggregate Consequences of Shocks to Household Income Risk. Econometrica, 87: 255-290.

2. **Lecture 4-6 Wold representation, VAR, Granger Causality, Kalman Filter**
   - TSMF Chapter 6-7
   - TSA Chapter 11, 13, Appendix A
   - Cochrane, John (1991), "Volatility Tests and Efficient Markets: A Review Essay", Journal of Monetary Economics 27, 463-485.
   - Cochrane, John (1992), "Explaining the Variance of Price-Dividend Ratios", Review of Financial Studies, 5(2), 243-280
   - Cochrane, John (2007), "The Dog that Did Not Bark: A Defense of Return Predictability", Review of Financial Studies Advance, Access September 2007
   - Cochrane, John H. (2021), "The Dog and the Straw Man: Response to "Dividend Growth Does Not Help Predict Returns Compared to Likelihood-Based Tests: An Anatomy of the Dog"", Critical Finance Review: Vol. 10: No. 3, pp 465-470.
   - Goyal, Amit and Ivo Welch (2008), "A Comprehensive Look at The Empirical Performance of Equity Premium Prediction", Review of Financial Studies 21(4) 1455-1508.
   - Hjalmarsson, Erik and Tamas Kiss. forthcoming. "Dividend Growth Does Not Help Predict Returns Compared to Likelihood-Based Tests: An Anatomy of the Dog." Critical finance review.

3. **Lecture 6-8 Spectral Analysis**
   - TSMF Chapter 8
   - TSA Chapter 3, 6
   - Lucas, R.E. and E. C. Prescott (1974), "Equilibrium Search and Unemployment," Journal of Economic Theory, 7(2), 188-209
   - Kydland, F.E. and E.C. Prescott (1982), "Time to Build and Aggregate Fluctuations," Econometrica, 50(6), 1345-70.
   - Cochrane, John (1989), "The Return of the Liquidity Effect: A Study of the Short Run Relation between Money Growth and Interest Rates" Journal of Business and Economic Statistics 7, 75-83.
   - King, Robert G. and Mark W. Watson (1996), "Money, Prices, Interest Rates, and the Business Cycle" Review of Economics and Statistics 78:35-53.

4. **Lecture 9-12 Unit Root and Cointegration**
   - TSMF Chapter 10, 11
   - TSA Chapter 17, 18, 19.
   - Campbell, John Y. and P. Perron (1991), Pitfall and Opportunities: What Macroeconomists Should Know about Unit Roots, in O.J. Blanchard and S. Fisher (eds.), *NBER Macroeconomics Annual*, The MIT Press, 141-201.

- Campbell, John Y. and Robert J. Shiller (1987), "Cointegration and Tests of Present Value Models" *Journal of Political Economy* 95, 1062–1088.
- Campbell, John Y., and Robert J. Shiller (1988a), "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors", *Review of Financial Studies* 1:195–228.
- Campbell J., and Shiller R. (1988b), "Stock Prices, Earnings and Expected Dividends," *Journal of Finance*, 43, 661-676.
- Campbell, J. and T. Vuolteenaho (2004), "Bad Beta, Good Beta", *American Economic Review* 94, 1249-1275
- Cochrane, John (1988), How Big is the Random Walk in GNP? *Journal of Political Economy* 96 (October 1988) 893-920.
- Cochrane, John (1991a), Comments on Campbell and Perron, in O.J. Blanchard and S. Fisher (eds.), *NBER Macroeconomics Annual*, The MIT Press, 201-210.
- Cochrane, John (1991b), A Critique of The Application of Unit Root Tests *Journal of Economic Dynamics and Control* 15 (April 1991) 275-284.
- Cochrane, John (1994), Permanent and Transitory Components of GNP and Stock Prices" *Quarterly Journal of Economics* CIX (February 1994) 241-266.
- Cochrane, John (1999), New Facts in Finance, Economic Perspectives XXIII (3) (Federal Reserve Bank of Chicago), NBER working paper 7169.
- Engle, R. and C. W. J. Granger (1987), "Cointegration and Error Correction: Representations, Estimation and Testing," *Econometrica*, 55, 252-76.
- Stock, J.H. and M.W. Watson (1988), "Testing for Common Trends," *Journal of American Statistical Association*, 83, 1097-1107.

5. Lecture 13-14 GMM

- TSMF Chapter 14
- AP Part II Chapter 10-16.
- Hansen, Lars P. (1982), "Large Sample Properties of Generalized Method of Moments Estimators", *Econometrica*, Vol. 50, No. 4, 1029-1054.
- Hansen, Lars P. and Kenneth J. Singleton(1982), "Generalized Instrumental Variables Estimation of Nonlinear Rational Expectation Models", *Econometrica*, Vol. 50, No. 5, 1269-1286.
- Petersen, Mitchell A., (2008) "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches", *Review of Financial Studies*, forthcoming.

6. Lecture 15-16 Measuring Uncertainty and Long-Run Risk*

- Ai, Hengjie (2010), "Information Quality and Long-Run Risk: Asset Pricing Implications", *Journal of Finance*, Vol. 65, No. 4, 1333-1367.
- Anderson, E.W., Hansen, L.P., Sargent, T.J., 2003. A quartet of semigroups for model specification, robustness, prices of risk, and model detection. *Journal of the European Economic Association*, 1, 68-123.
- Anderson, R., Karim, M., Li, N., Reeb, D., 2022. The family firm ownership puzzle. *Review of Corporate Finance*, Special Issue on Finance and Family Business, forthcoming.
- Bali, Turan G., Stephen J. Brown, Yi Tang. 2017. Is economic uncertainty priced in the cross-section of stock returns?, Journal of Financial Economics, Vol. 126, no. 3, 471-489
- Bansal and Yaron (2004) , "Risks for the Long Run: A Potential Resolution of Asset Pricing Puzzles," *Journal of Finance 59*, August 2004: 1481-1509

- Bansal, R. R. F. Dittmar and C. T. Lundblad (2005), "Consumption, Dividends, and the Cross Section of Equity Returns", *Journal of Finance*, Vol. 60, No. 4, 1639-167
- Barillas, Francisco, Lars Peter Hansen, Thomas J. Sargent (2009) "Doubts or variability?", *Journal of Economic Theory*, 144, 2388-2418
- Brenner, Menachem, Yehuda Izhakian. 2018. Asset pricing and ambiguity: Empirical evidence, *Journal of Financial Economics,* Vol. 130, no. 3, 503-531
- Hansen, L. P. (2020), Comment on: Pseudo-True SDFs in Conditional Asset Pricing Models, *Journal of Financial Econometrics*, Vol. 18, No. 4, 715–720
- Hansen, L. P. (2022), Research Reflection: Navigating Uncertainty
- Hansen, L.P., J. Heaton and N. Li (2008) "Consumption Strikes Back?: Measuring the Long-Run Risk", *Journal of Political Economy,* Vol. 116, no.2, 260-302
- Hansen, Lars Peter and Thomas J. Sargent. 2001. "Robust Control and Model Uncertainty." *American Economic Review,* 91(2): 60-66.
- Hansen, Lars Peter and Thomas J. Sargent (2021) Macroeconomic uncertainty prices when beliefs are tenuous, *Journal of Econometrics*, Vol. 223, No. 1, 222-250
- Hansen, Lars Peter, Sargent, Thomas J. (2022) Risk, Uncertainty, and Misspecification: Decision Theory, Robust Control, and Statistics, working paper.
- Izhakian, Y. (2017) Expected utility with uncertain probabilities theory. *Journal of Mathematical Economics*, 69, 91-103.
- Jurado, K., S.C. Ludvigson, Ng S. 2015. Measuring uncertainty, *American Economic Review*, 105, 1177-1216
- Li, N., Zhu, Y.H., 2021. The impact of Covid-19 on stock market in China. Frontiers of Economics in China, 16(4), 714-743.

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A Brief Guide for Writing Your Report as a Referee

Your report should not normally exceed 10 pages of A4 paper. Since you read papers from the journals, you may wish to choose one of these as a starting point. In your report as a referee you should consider the following issues.

1) How important is the question addressed in your chosen paper?

2) How important/interesting are the results which have been obtained in this area? When assessing this, consider the importance of the paper for financial economists in general.

3) How well are the conclusions of the paper supported? In particular:

- Are there any additional tests of the model/conclusions that should have, or could have reasonably been made to support the conclusions? (If it really is essential to make very extensive additions to the paper this is unlikely to be practical and therefore the paper would usually be rejected.)
- Are the data/conclusions internally consistent and consistent with other reports in the literature? If not, is there a concern about the present data and have the authors discussed plausible reasons for the discrepancy?
- Are the assumptions made likely to be valid? Should the authors perform additional checks?

You are free to decide on the format of a referee's report. However, there is often a first paragraph which summarizes the paper's conclusions, methods and significance (in the view of the referee). Often the strengths of the paper are highlighted here. This is then followed by a series of points detailing the possible concerns about the methods or conclusions. For the paper you cannot make some useful suggestions, you may want to present the results in the extended periods and see if there is any change in the results.