Introduction to Computational Methods in Economics

Fall 2022
Friday 12:30–15:20 @ TSMC 732

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Course Description

This course introduces fundamental computational methods in economics. The main purpose is to help students accumulate some experience in performing time series analysis and modern macroecnomic modeling, especially the applications of vector autoregression and DSGE models. The course focuses on the links between macroeconomic models and data. The language used for this course is Python. Experience with Python is a plus, but not required.

NOTICE: The lectures are taught in Chinese (Mandarin). Students who have difficulties in understanding Chinese are advised not to take this course.

Course Objectives

Giving students a taste of

1. how to apply numerical tools to solve economic problems;
2. how to apply times series methods to conduct economic forecasting and related research.

Textbooks

No standard textbook will be used. Yet, DeJong and Dave (2011), Shumway and Stoffer (2017), and Ghysels and Marcellino (2017) will be referred to from time to time.

Course Requirements & Grading Policy

Grades will be based on computational projects (80%) and presentation (20%). Students should work in teams to complete the requirements. To encourage participation and foster collaboration, students' performance in their teams will be graded by other members and classroom performance will be graded by the instructor. The final grade will be (project + presentation) multiplied by the evaluation of team colleagues multiplied by classroom performance. *However, the grading policy is subject to change, depending on the number of students.*

Important Dates & Holidays

- Meeting dates: September (16, 23, 30), October(7, 14, 21, 28), November(4, 11, 18, 25), December(2, 9, 16, 23, 30), January(6, 13).
- Holiday: None
- Project & presentation proposals deadline: November(18)
- Presentation: January(13)

Course Outline

♢ **Introducing Python (1)** Python Programming for Economics and Finance (https://python-programming.quantecon.org/intro.html); Bell (2018).

♢ **Basic Tools in Time Series Analysis (3)** Shumway and Stoffer (2017, Chs. 1–5); Ghysels and Marcellino (2017, Ch. 5); Peixeiro (2022)

♢ **Vector Autoregressions (2)** Ghysels and Marcellino (2017, Ch. 6); Kilian and Lütkepohl (2017, Chs. 2, 4, 7, 8)

♢ **RBC/DSGE Models (2)** Blanchard and Khan (1980); Klein (2000); DeJong and Dave (2011, Ch. 4).

♢ **State-Space Models (2)** Shumway and Stoffer (2017, Ch. 6); Ghysels and Marcellino (2017, Ch. 11)

♢ **Time-Varying Regressions and VAR (2)** Blake and Mumtaz (2017)

♢ **Monte Carlo Methods (2)** DeJong and Dave (2011, Chs. 9, 10, 14)

♢ **Bayesian DSGE and VAR (2)** Ghysels and Marcellino (2017, Ch. 8); Blake and Mumtaz (2017)

References

Bell, A. (2018). *Get Programming: Learn to Code with Python*. Manning Publications.

Blake, A. and H. Mumtaz (2017). *Applied Bayesian Econometrics for Central Bankers*. Bank of England.

Blanchard, O. J. and C. M. Khan (1980). The solution of linear difference models under rational expectations. *Econometrica 48*, 1305–1311.

DeJong, D. N. and C. Dave (2011). *Structural Macroeconometrics* (Second ed.). Princeton University Press.

Ghysels, E. and M. Marcellino (2017). *Applied Economic Forecasting Using Time Series Methods*. Oxford University Press.

Kilian, L. and H. Lütkepohl (2017). *Structural Vector Autoregressive Analysis*. Cambridge.

Klein, P. (2000). Using the generalized Schur form to solve a multivariate linear rational expectations model. *Journal of Economic Dynamics and Control 24*, 1405–1423.

Peixeiro, M. (2022). *Time Series Forecasting in Python*. Manning Publications.

Shumway, R. H. and D. S. Stoffer (2017). *Time Series Analysis and Its Applications with R Examples* (Fourth ed.). Springer.