A Guideline for Computation Study Group

Prepared by Ding Dong and Zhaorui Li

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A Guideline

- **Group Member** Group members are second-year PhD students and graduate students who have needs for studying computational methods in macroeconomics.

- **Schedule**

  Group members meet once a week or once for two weeks, depending on workload of group homework.

  Our study group will last for about 8 weeks

  The meeting is on Friday afternoon, 3:30-5:30 pm.

- **Homework Rule**

  Each member is required to finish assigned homework. To ensure everyone's participation and quality of our study group, we have the following rule: each member only have one chance to dishonour the homework; anyone who gives up homework for two times shall be asked to leave our group.

- **Tips**

  You never learn coding without getting your hands dirty;
  Being able to use one method $>>$ knowing one hundred methods;
  There are always something you can learn from others' codes

- **Road Map**

  Rep-Agent RBC (NK) model $\rightarrow$ Rep-Agent RBC model solved at higher order $\rightarrow$ Steady State Hetero-Agent RBC model $\rightarrow$ Dynamics of tractable Hetero-Agent RBC model $\rightarrow$ Full-Fledged Hetero-Agent RBC model

Syllabus

Week 1: Introduction to Dynare (May 28, 2021)

- Introduction to Dynare.

    - ABC of Dynare
    - steady state
    - deterministic simulation
    - stochastic simulation

- Baseline RBC model and beyond

    - variable capital utilization
    - alternative preference function

- Reference

  King, R. G., & Rebelo, S. T. (1999). Resuscitating real business cycles. Handbook of macroeconomics, 1, 927-1007.

Problem Set 1: Beyond Baseline RBC

- Task 1: News shocks and comovement

  Reference:

  Greenwood, J., Hercowitz, Z., & Huffman, G. W. (1988). Investment, capacity utilization, and the real business cycle. The American Economic Review, 402-417.

  Jaimovich, N., & Rebelo, S. (2009). Can news about the future drive the business cycle?. American Economic Review, 99(4), 1097-1118.

  Wang, P. (2012). Understanding Expectation-Driven Fluctuations: A Labor-Market Approach. Journal of Money, Credit and Banking, 44(2-3), 487-506.

- Task 2: Macroeconomic effect of financial shocks

  Reference:

  Jermann, U., & Quadrini, V. (2012). Macroeconomic effects of financial shocks. American Economic Review, 102(1), 238-71.

  Liu, Z., Wang, P., & Zha, T. (2013). Land-price dynamics and macroeconomic fluctuations. Econometrica, 81(3), 1147-1184. (baseline rep-agent model)

- You will be given two weeks to finish PS1.

Week 2: Higher Order Approximation (June 11, 2021)

- Higher-order methods

  - when to do higher-order approximations
  - how to implement high-order approximation
  - application to welfare analysis

Problem Set 2: Application to Uncertainty Shock

- Task 1: Uncertainty shock in sticky price model

  Reference:

  Leduc, S., & Liu, Z. (2016). Uncertainty shocks are aggregate demand shocks. Journal of Monetary Economics, 82, 20-35.

  Basu, S., & Bundick, B. (2017). Uncertainty shocks in a model of effective demand. Econometrica, 85(3), 937-958.

- Task 2: Uncertainty shock in flexible price model

  Reference:

  Bloom, N., Floetotto, M., Jaimovich, N., Saporta-Eksten, I., & Terry, S. J. (2018). Really uncertain business cycles. Econometrica, 86(3), 1031-1065.

  Dong, Liu and Wang. (2021). Misallocation Channel of Uncertainty Shock. Mimeo.

- You will be given two weeks for PS2.

Week 3: Stationary Equilibrium of HA Model (June 28, 2021)

- Stationary equilibrium of workhorse heterogeneous agent model

    - value function iteration (VFI)
    - "Howard acceleration" in VFI
    - Euler equation iteration
    - application to a simple neoclassical growth model

    Reference:

    Numerical method course note by Prof. Jinhui Bai at PHBS

    Numerical analysis course notes by Prof. Alisdair Mckay

PS 3: Stationary Equilibrium of HA Model

- Task 1

    Replicate:

    Hopenhayn, H. A. (1992). Entry, exit, and firm dynamics in long run equilibrium. Econometrica: Journal of the Econometric Society, 1127-1150.

- Task 2

    Replicate:

    Khan, A., & Thomas, J. K. (2008). Idiosyncratic shocks and the role of nonconvexities in plant and aggregate investment dynamics. Econometrica, 76(2), 395-436.

- You will be given 2 weeks to finish PS3.

Week 6: Dynamics of Heterogeneous Agent Model

- Homework presentation and discussion

- Dynamics of heterogeneous agent model

  Reference:

  TBA

- Simulate dynamics of heterogeneous agent model by Dynare

Homework 4: Dynamics of Heterogeneous Agent Model

- Goal of the week:

  Use Macro Processors in Dynare to solve dynamics of simple heterogeneous agent model.

- Members are divided into three groups.

- Group 1

  Replicate:

  TBA

- Group 2

  Replicate:

  TBA

- Group 3

  Replicate:

  TBA

Week 8: Dynamics of Heterogeneous Agent Model

- Homework presentation and discussion

- Dynamics of heterogeneous agent model

  Reference:

  Maliar, L., Maliar, S., & Valli, F. (2010). Solving the incomplete markets model with aggregate uncertainty using the Krusell–Smith algorithm. Journal of Economic Dynamics and Control, 34(1), 42-49.

  Young, E. R. (2010). Solving the incomplete markets model with aggregate uncertainty using the Krusell–Smith algorithm and non-stochastic simulations. Journal of Economic Dynamics and Control, 34(1), 36-41.

  Winberry, T. (2018). A method for solving and estimating heterogeneous agent macro models. Quantitative Economics, 9(3), 1123-1151.

Week 10: Selected Topics in Numerical Methods

- Continuous-Time Models and Solution