

Written Exam for the M.Sc. in Economics, Summer school 2015

Theoretical and Empirical Foundations of DSGE Modeling

Master's Course

July 11-17, 2015

This exam question consists of 6 pages in total, including this one.

The page limit for solutions is 15 pages (in addition, a maximum of 15 pages of supplementary material (graphs, tables, etc.) can be submitted).

The paper must be uploaded as one PDF document (including the standard cover and the appendices). The PDF document must be named with exam number only (e.g. '1234.pdf') and uploaded to Absalon.

Focus on Exam Cheating

In case of presumed exam cheating, which is observed by either the examination registration of the respective study programmes, the invigilation or the course lecturer, the Head of Studies will make a preliminary inquiry into the matter, requesting a statement from the course lecturer and possibly the invigilation, too. Furthermore, the Head of Studies will interview the student. If the Head of Studies finds that there are reasonable grounds to suspect exam cheating, the issue will be reported to the Rector. In the course of the study and during examinations, the student is expected to conform to the rules and regulations governing academic integrity. Academic dishonesty includes falsification, plagiarism, failure to disclose information, and any other kind of misrepresentation of the student's own performance and results or assisting another student herewith. For example failure to indicate sources in written assignments is regarded as failure to disclose information. Attempts to cheat at examinations are dealt with in the same manner as exam cheating which has been carried through. In case of exam cheating, the following sanctions may be imposed by the Rector:

- 1. A warning
- 2. Expulsion from the examination
- 3. Suspension from the University for at limited period or permanent expulsion.

The Faculty of Social Sciences
The Study and Examination Office
October 2006

Take-home Exam

Theoretical and Empirical Foundations of DSGE Modeling
Summer School, 2015

Notes:

1. For additional instructions on the computational and empirical parts of the exam, please refer to the *readme* file in the exam folder;
2. The submission deadline is July 17, 2015, no later than 12:00 noon;
3. All *Matlab* codes employed in the empirical and computational analysis should be attached as a separate appendix.

The student is asked to address each and every point listed below, providing adequate comments to the empirical and computational evidence that she/he will produce.

Part 1

This part of the exam partly draws on Galí, Lopez-Salido and Vallés, 2007, “Understanding the Effects of Government Spending on Consumption”, *Journal of the European Economic Association*, vol. 5 (1), 227-270.

Question 1 Independent of the labor market structure, it is possible to derive the following intertemporal equilibrium condition for aggregate consumption:

$$c_t = E_t \{c_{t+1}\} - \sigma (r_t - E_t \{\pi_{t+1}\}) - \Theta_n E_t \{\Delta n_{t+1}\} + \Theta_\tau E_t \{\Delta t_{t+1}^r\}$$

Derive the expression above under the assumption of perfectly competitive labor markets. Show that, in this case, the following parameterization applies:

$$\begin{aligned}\sigma &\equiv (1 - \lambda) \Gamma [\mu^p \varphi \gamma_c + (1 - \alpha)], \\ \Theta_n &\equiv \lambda \Gamma (1 - \alpha) (1 + \varphi) \varphi, \\ \Theta_\tau &\equiv \lambda \Gamma \varphi \mu^p, \\ \Gamma &\equiv \frac{1}{\mu^p \varphi \gamma_c + (1 - \alpha) (1 - \lambda (1 + \varphi))}.\end{aligned}$$

Question 2 From now on, we will consider the model of Galí, Lopez-Salido and Vallés (2007) with imperfect competition in the labor market. Consider the *Dynare* code *GLSV.mod*, which replicates the DSGE model of Galí *et al.* (2007) with an imperfectly competitive labor market under the baseline calibration described in the paper. In addition, a monetary policy shock has been added to the model, along with the shock to government spending studied in the paper. Consider first the effects of an increase in government spending. Compare the response of aggregate private consumption under $\lambda = 0.1$ and $\lambda = 0.5$. Comment on the occurrence of crowding-out/crowding-in of public spending on private consumption, providing some intuition on why the model returns different scenarios under the two parameterizations for λ .

Question 3 Generate a positive monetary policy shock (i.e., an increase in the nominal interest rate) under $\lambda = 0.1$ and $\lambda = 0.5$. Display in one diagram the impulse response of aggregate private consumption for both values of λ , and in another diagram the response of inflation in both cases. Explain why both aggregate private consumption and inflation display greater sensitivity to the policy shock (i.e., they drop by more) in the presence of a greater share of rule-of-thumb consumers. To provide an intuitive argument, you might find it useful to refer to the elasticity of current consumption with respect to the real rate of interest, σ , evaluating its partial derivative with respect to λ . In the case of an imperfectly competitive labor market, σ is given by:

$$\sigma \equiv \frac{(1 - \lambda) \gamma_c \mu^p}{\gamma_c \mu^p - \lambda (1 - \alpha)}.$$

Question 4 Based on your answer to the previous point, provide an intuitive argument on why the Blanchard-Kahn condition is not satisfied under $\lambda = 0.6$ (keeping the remaining parameter values unchanged) and the equilibrium is not locally determinate. To address this question, it will be useful to plot σ as a function of λ for $\lambda \in [0, 1]$, and explain how σ depends on the value of λ .

Part 2

Question 1 Consider the standard 3-equation New Keynesian Model. Briefly describe the transmission of these shocks: (a) a demand shock, (b) a cost-push shock, and (c) a monetary policy shock.

The file `DanishData.xlsx` includes Danish macroeconomic data on (log of) industrial production (y_t), the (log of) consumer price index (p_t) and the central bank reference interest rate (Nationalbankens diskonto) (i_t) from 1985 to 2008. All data are monthly. Estimate a VAR with 12 lags.

Question 2 Given your answer to Question 1, list the sign restrictions you can impose to the data in order to identify the three shocks. Impose the restrictions only on impact and plot the impulse responses for 1000 random rotations that satisfy the restrictions.

Question 3 Another possible way of identifying a monetary policy shock follows from Christiano *et al.* (1999). Briefly discuss the rationale behind this identification scheme. Impose the restriction in the Danish data (include the 68% confidence interval).

Question 4 Describe the main differences in the identified impulse responses between your evidence from addressing Question 3 and Question 2.

References

- [1] Galí, Lopez-Salido and Vallés, 2007, “Understanding the Effects of Government Spending on Consumption”, *Journal of the European Economic Association*, vol. 5 (1), 227-270.
- [2] Christiano L., M. Eichenbaum and C. Evans, 1999. In: Taylor J.B. and Woodford M. (Eds.), *Handbook of Monetary Economics*, Elsevier, Amsterdam, pp. 65-148.