Written Exam for the M.Sc. in Economics summer school 2013

Theoretical and Empirical Foundations of DSGE Modeling

Master's Course

July 20, 2013 – August 2, 2013

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by "eksamen på dansk" in brackets, you must write your exam paper in Danish.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students' self-service system.

The paper must be uploaded as <u>one PDF document</u> (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, 2013

Notes:

1. Some specific support files have been made available at the *Absalon* webpage of the course. These can be reached through the path **Take home exam–>Exam files**;

2. All the codes employed in the empirical and computational analysis should be attached as a separate appendix.

The present exam focuses on the co-movement between durable and non-durable spending in response to monetary policy shocks. In this respect, the key reference is: Monacelli, T., 2009, "New Keynesian Models, Durable Goods, and Collateral Constraints", *Journal of Monetary Economics*, Volume 56:2, pp. 242–254.

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.

Question 1

A structural VAR should be specified along the lines of Monacelli (2009). Raw data are contained in the **data.xlsx** file and need to be preliminarily transformed as indicated by Monacelli (2009). After these preliminary steps, the following points should be addressed:

1. Apply a standard recursive identification scheme to identify monetary policy shocks (see, e.g., Christiano et al., 1999).
2. Generate a one-standard deviation innovation in the federal funds rate.
3. Graph the estimated responses of real GDP, real non-durable spending, real durable spending, and total private debt, together with their two-standard error bands.
4. What is the sign of the co-movement between durable and non-durable spending?
5. As you should see, the sensitivity of durable spending to policy shocks is substantially larger than that of non-durable spending. Provide an intuition for this fact.

Question 2

According to Monacelli (2009), a standard two-sector New Keynesian model with perfect financial markets is at odds with the co-movement evidence. In particular, the standard model featuring relatively more flexible durable prices and stickier prices for non-durables produces negative co-movement between the two components of private spending.

1. Set up borrowers', savers' and firms' optimization problems as in Monacelli (2009), derive the first order conditions and briefly comment on their economic meaning.
2. The *Dynare* code named **TSNK_nocredfrictions.mod** replicates a two-sector New Keynesian model with perfect financial markets (i.e., a representative agent economy with no financial frictions). Show that, in the face of a monetary tightening, negative co-movement between aggregate durable and non-durable spending emerges when non-durable prices are sticky (i.e., duration set at 4 quarters) and durable prices are fully flexible. Illustrate the "co-movement puzzle", emphasizing the role of the relative price of durables.

3. The *Dynare* code named **TSNK_credfrictions.mod** replicates a two-sector New Keynesian model with imperfect financial markets (i.e., a heterogenous agents economy with borrowers facing a binding collateral constraint). Graph the response of aggregate durable and non-durable spending, holding the average duration of non-durable prices fixed at 4 quarters, while considering the following values for the average duration of durable prices: full flexibility, 1.5 quarters, 2 quarters, 2.5 quarters, 3 quarters, 4 quarters.

4. Under which average duration of durable goods prices (as measured in quarters) positive co-movement between aggregate durable and non-durable spending can be observed?

Question 3

The key message of Monacelli (2009) is that frictions in lending between households may solve the difficulties new-Keynesian models have in predicting a decline in both durable and non-durable consumption following a monetary tightening.

1. Is this finding robust? To address this question, compare the responses of aggregate durable and non-durable spending in the model with and without credit frictions, reporting them on the same graph for each of the variables of interest. Hold the average duration of non-durable prices fixed at 4 quarters, while considering the following values for the average duration of durable prices: full flexibility, 1.5 quarters, 2 quarters, 2.5 quarters, 3 quarters, 4 quarters.

2. Do credit frictions really enhance positive co-movement? Please illustrate and discuss your answer extensively.

References

[1] Christiano L., M. Eichenbaum and C. Evans, 1999. In: Taylor J.B. and Woddford M. (Eds.), *Handbook of Monetary Economics*, Elsevier, Amsterdam, pp. 65-148.

[2] Monacelli, T., 2009, "New Keynesian Models, Durable Goods, and Collateral Constraints", *Journal of Monetary Economics*, Volume 56:2, pp. 242–254.