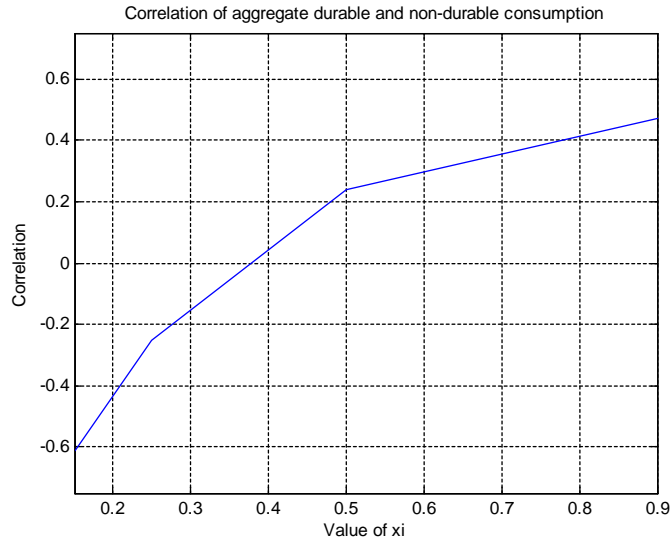


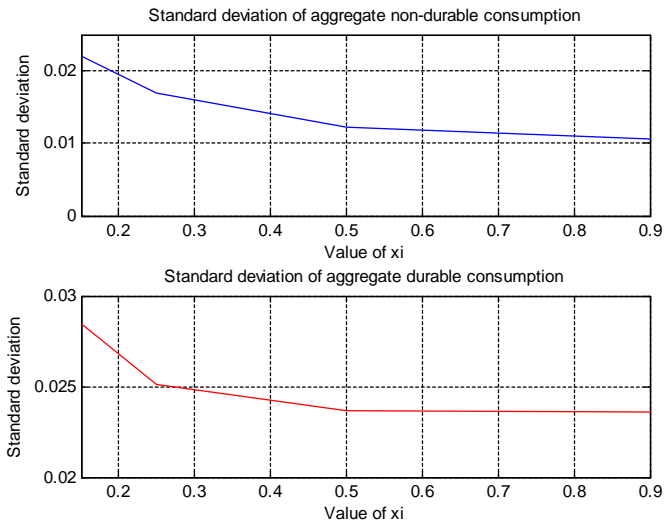
*Indicative Answers to the Take-home Exam*  
Theoretical and Empirical Foundations of DSGE Modeling  
Summer School, 2014

## Part 1

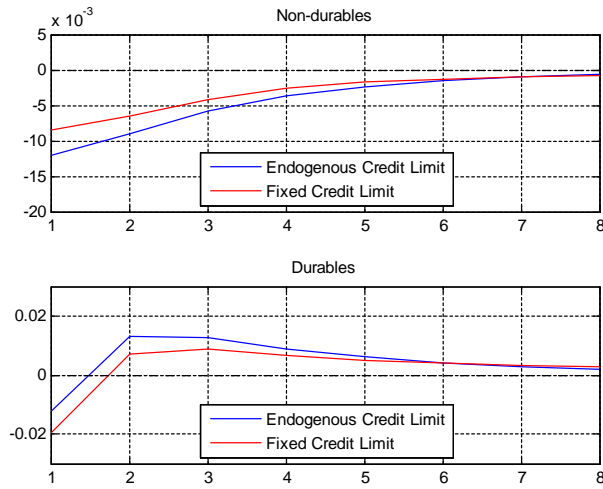
- Question 1 The first order conditions from the borrowers' problem are reported in Monacelli (2009). The first order conditions for the savers are isomorphic to those of the borrowers, once the multiplier attached to their collateral constraint is set to zero (recall that savers are not financially constrained).
- Question 2 Since durable and non-durable goods feature the same degree of price stickiness, their relative price is not affected by the monetary policy shock and their degree of substitutability remains constant. This implies positive comovement in the face of the monetary policy shock, as explained by Monacelli (2009).
- Question 3 Monacelli (2009) suggests that a model with financial frictions is able to resolve the comovement puzzle that arises when durable and non-durable goods feature asymmetric price stickiness. The exercise should show that, as  $\chi$  increases – and credit conditions become tighter – the correlation between durable and non-durable expenditure should increase, as illustrated in the figure below. To see why this is the case, recall that under perfect financial markets positive comovement is hindered by the tight link between the user cost ( $Z_t$ ) and the relative price of durables ( $q_t$ ). Monacelli (2009) shows that introducing collateralized borrowing into an otherwise standard two-sector economy produces a de-linking between  $Z_t$  and  $q_t$ , so that positive comovement can be attained even in the presence of asymmetric degrees of price stickiness for different types of goods. Such a de-linking reinforces as credit conditions become tighter. One can show this analytically by looking at Equation (16) in Monacelli (2009).



Question 4 The standard deviation of both durable and non-durable expenditure should decrease as  $\chi$  increases, as shown below. As less credit is injected into the system for a given collateral value, the amplification effect induced by the collateral constraint is progressively muted.



Question 5 It turns out that the model with the fixed credit limit generates a higher drop in durable expenditure, as compared with the model with the endogenous credit limit. By contrast, non-durable expenditure drops by more in the model with the endogenous credit limit. This is illustrated in the figure below. To see why this is the case, one can show that the multiplier attached to the collateral constraint ( $\hat{\psi}_t$ ) drops (on impact) in the model with the fixed credit limit, while increasing with the endogenous credit limit. This is because imposing fixed credit limits allows the borrower to cushion the effects of the negative shock, as she is able to borrow the same amount regardless of the drop in the collateral value. By contrast, with the endogenous credit limit the borrower finds herself more financially constrained.

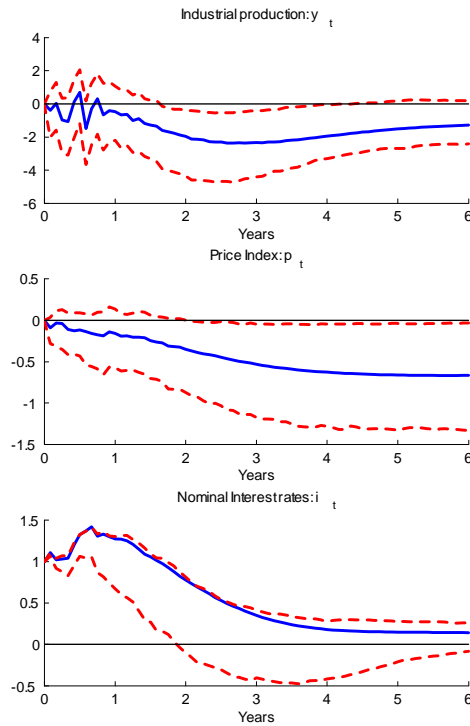


As was discussed during lectures, durable goods play a dual role in the presence of an endogenous credit limit. In the case of a fixed credit limit, however, this is no longer the case. For that reason, borrowers have less of an incentive to accumulate durable goods. As a result, borrowers are more willing to decrease their consumption of durable goods after a contractionary shock, so as to limit the drop in their non-durable consumption (which has a larger weight in the utility function). With an endogenous credit limit, instead, borrowers are less willing to substitute from durable to non-durable consumption, since durable goods serve as a collateral object. As a result, durable consumption drops by less, and non-durable consumption by more with an endogenous credit limit.

## Part 2

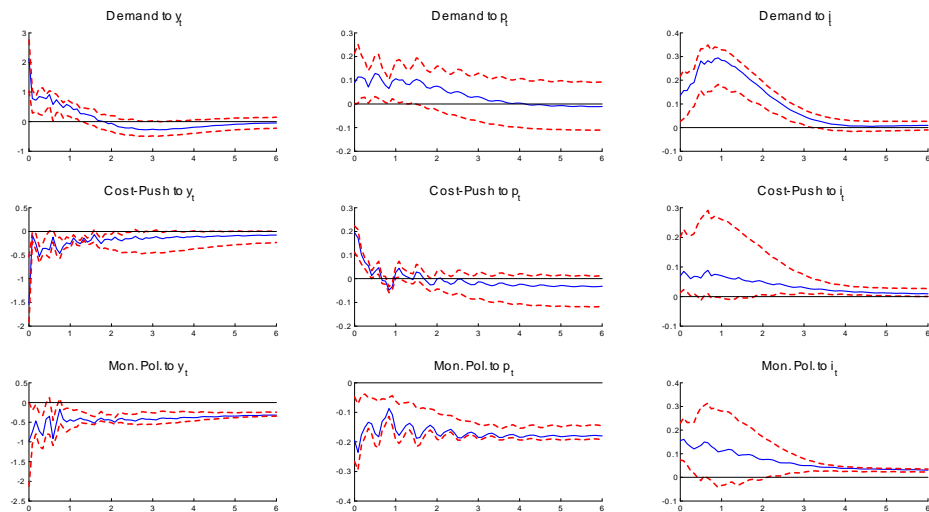
Question 1 One widely used strategy for estimating the effects of a monetary policy shock is based on the recursiveness assumption (see, e.g., Christiano et al., 1999). According to this monetary policy shocks are orthogonal to the information set of the monetary authority. This implies that the variables in the monetary authority information set – output and prices – are (contemporaneously) uncorrelated to the monetary policy

shock.



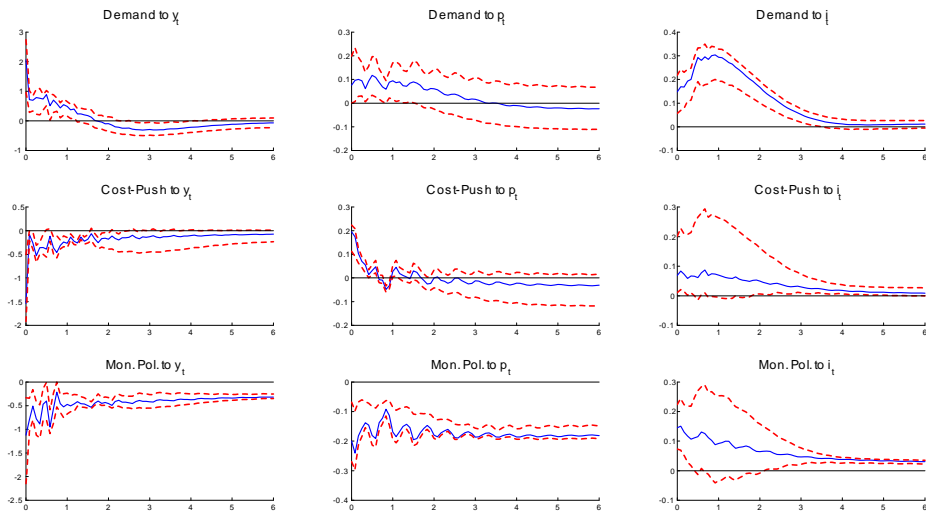
Question 2 Prices are slow to adjust to a tightening of the monetary policy stance. As a result, monetary policy has a transitory contractionary effect on output. This is broadly consistent with the basic transmission of a monetary policy shock in the New Keynesian model, which is centered around the assumption of nominal price ‘stickiness’.

Question 3



The figure above plots the entire coverage of random 1000 rotations that satisfy the sign restrictions in Table 1 (red line) and the median IRF (blue line). I am not considering estimation uncertainty: this is the reason why the confidence intervals typically remain thin, even at long horizons. Comparing the IRFs identified through sign restrictions with those identified in Question 1 (Part 2) we note that: (1) the response of output does not display an hump-shaped path; (2) there is less evidence of a slow price adjustment.

#### Question 4



The figure above plots the entire coverage of random 1000 rotations that satisfy the sign restrictions in Table 1 (red line) and the median IRF (blue line). I am not considering estimation uncertainty: this is the reason why the confidence intervals typically remain thin, even at long horizons. Comparing the new IRFs with the ones in the previous questions, we note that the responses to the demand and the cost-push shocks are hardly affected. Even though the restrictions for these two shocks – in terms of both sign and timing – are the same as those adopted in the previous question, changing the restriction to the other shock potentially affects the responses to all the shocks in the system.

When it comes to commenting the transmission of the monetary policy shock, it is evident that the responses of prices and the interest rate are not affected by the change in the timing restriction, whereas the output response is even more persistently negative during the first 6 months after the shock occurs (i.e., in the period in which we are not imposing the restriction). Yet, as in the previous question the output response does not display any hump-shaped path.

## References

- [1] 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.
- [2] Monacelli, T., 2009, “New Keynesian Models, Durable Goods, and Collateral Constraints”, *Journal of Monetary Economics*, Volume 56:2.