Monetary Policy and Endogenous Duration Spent at the Zero Interest Rates

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Introduction

Great recession caused Fed quickly to drop interest rates to zero, where they stayed from the end of 2008 till 2014 interests rates were kept by around zero level.

Thinking about zero lower bound (ZLB) is hard, because it is an example of occasionally binding constraint. Constraints that are occasionally binding are non-differentiable, and thus do not allow to use standard perturbation methods.

In this paper we try to use the structure of stochastic discrete models and identical paths of exogenous variables, with the difference that in our framework movement on impact from the steady state is totally unexpected for agents, while after path of exogenous variables is completely known by the agents. The only limitation of our approach relative to global methods approach is that we do not capture precautionary savings channel. However, we believe that for small shocks precautionary motives do not change much around steady state or ergodic mean, so that deviation of endogenous variables from the steady state in discrete deterministic framework is similar to the deviation of endogenous variables from their ergodic mean for discrete stochastic methods.

We study the effect of interest rate, discounting and technology shocks in the standard New Keynesian model with perfect foresight. We find that effect of exogenous variables on output is very non-linear. When shocks are small enough, model behave in identical way to the standard New Keynesian model. However, when shocks large the threshold, so that zero lower bound constraint starts binding, amplification increases exponentially, so that for medium shocks, that would cause a few percentage decline of output in the model without zero lower bound, would move output to zero in the model with zero lower bound. This result holds for the model with Taylor rule, discretionary policy or optimal monetary policy with commitment. In this presentation we will focus only on discounting shocks. The next natural step of the project is to expand the framework to two countries open economy setup.

Notation

x_t – the difference between actual economy output and the full employment output

i_t – nominal interest rate in the economy

π_t – inflation rate

g_y – share of government expenditures in gdp

σ – risk-aversion of households

u_t – preference shock, that creates incentives for housholeds to save more and to spend less, which might drive the economy into recessions

β, k – sensitivity of inflation to inflation expectations and output gap

Baseline System of Equations

From the optimization problem of the housholed and from the equilibrium in the markets for goods and assets we arrive to the following system:

$$x_t = x_{t+1} - \frac{1-g_y}{\sigma}(i_t - E_t\pi_{t+1} + u_t)$$

$$\pi_t = \beta\, E_t\pi_{t+1} + kx_t$$

$$i_t = \max(\delta\pi_t, -\bar{\imath})$$

Solution Method

First, we compute the solution for the cases where the ZLB constraint does not bind using standard methods. This applies to the case of smaller shocks. Second, we compute the solution for the case when the shock binds only for one period, using the previous step. This procedure allows us to solve the model recursively and find out for every size of the shock how many periods ZLB constraint will hold, and thus find out the behavior of endogenous variables in response to the shock.

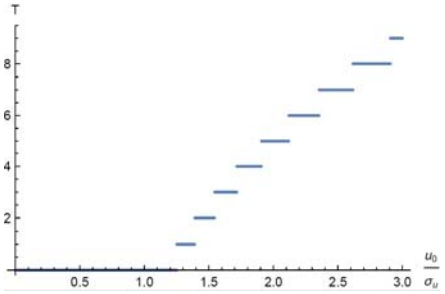

Figure 1: the vertical axe represent duration of ZLB binding, while the horizontal axe represent the size of the shock affecting the economy

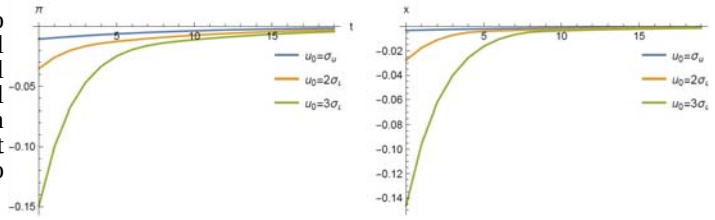

Figure 2: (left) shows reaction of inflation in percentage points to the negative preference shocks; (right) shows the reaction of output in percentages to negative preference shocks. It is clear from the figure that doubling the size of the shocks has much greater effect on output and inflation.

Conclusions

(i) Under zero lower bound effect of the shocks is non-linear with respect to not only time, but also with respect to the size of the shock;

(ii) The economy requires additional stalibilizing mechanism in addition to monetary policy for large shocks;

(iii) Under zero lower bound effects of temporary shocks can be magnified to the extreme scales and cause a permanent damage to the economy

This project was funded in part by the FSU FYAP grant 2015.

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