Zero lower bound in a New Keynesian model

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1. Open the file `nk3.mod`. Observe that it describes a minimal New Keynesian model with 3 equations (Euler equation, Phillips curve, Taylor rule) and three shocks.

2. Run the file. Observe the IRFs. In particular, notice that the zero-lower bound is crossed for the IRF related to the productivity shock (recall that IRFs are plotted by Dynare in deviation from the steady state for a positive one-standard-deviation shock).

3. Modify the file by enforcing the zero-lower bound in the Taylor rule. You will need the `max` operator. What do you observe in the IRF? Why?

4. Transform the file into a perfect foresight simulation. You will need to completely rewrite the `shocks` block, by hard coding a positive productivity shock (in period 1) of the size of one standard deviation of the stochastic version. Display the interest rate with `rplot`. What do you observe?

5. Now, transform the previous example by adding a *negative* (`i.e.` inflationary) one-standard-deviation productivity shock in period 5, in two different ways. In the first version, the shock will be anticipated; in the second one, the shock will be unexpected (for the latter, you will need to run `perfect_foresight_solver` twice, and manipulate matrices by hand). Verify that in the first version the ZLB is never hit, and in the second version the ZLB is left at the time of the unexpected shock (and is therefore shorter than in question 4).

6. Finally, transform the file into an extended path simulation. You will need to revert the `shocks` block into the form used in the stochastic case. Again, use `rplot` to display the interest rate. Observe that the ZLB is enforced on the simulation path.