Advanced Tools in Macroeconomics

Occasionally Binding Constraints

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Endogenously occasionally binding constraints

- If whether or not a constraint binds depends on the endogenous state variables we are in trouble
  - The timing of switching between regimes is endogenously determined (and unknown).
- In a recent paper Matteo Iacoviello and Luca Guerrieri addressed this issue and has written the software needed to make it run in Dynare
- But given what we have learnt today, it's easy to do yourself.

Endogenously occasionally binding constraints

The underlying idea goes as follows

- First, we are only going to analyse an impulse response of a shock occurring in period 0.
  - This can be generalised if we are willing make the assumption that agents do not *believe* any further shocks will occur that brings the economy to the constraint.
- Second the effect of the shock has completely subdued by period $\hat{T}$ (this can be set to a large number).
- Third the shock brings the economy to the occasionally binding constraint in periods $t \dots T$ (although it doesn't have to be an interval).

Endogenously occasionally binding constraints

- Fourth we are initially going to guess for t and T.
- Given a guess for t and T we now have an exogenous regime switching system
  - From period T onwards the economy is in the regime in which the constraint does not bind.
  - From period t to period T the economy is in the regime in which the constraint does bind
  - From period 0 to t the economy is in the regime in which the constraint does not bind

Endogenously occasionally binding constraints

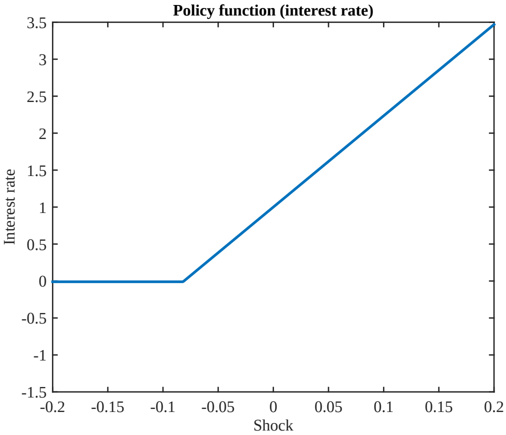
- Solving this by backward induction ensure that agent in periods t to T takes into account that the constraint will be slack after period T and act accordingly
- Also, agents in period 0 to t takes into account that the constraint will be binding in periods t to T (and that in this case it will not bind beyond period T)
- Then we check if it was true that the constrain was binding in periods t to T. If not update your guess.
- Does this procedure converge? It seems like.
- Is it accurate? It seems like.

An example

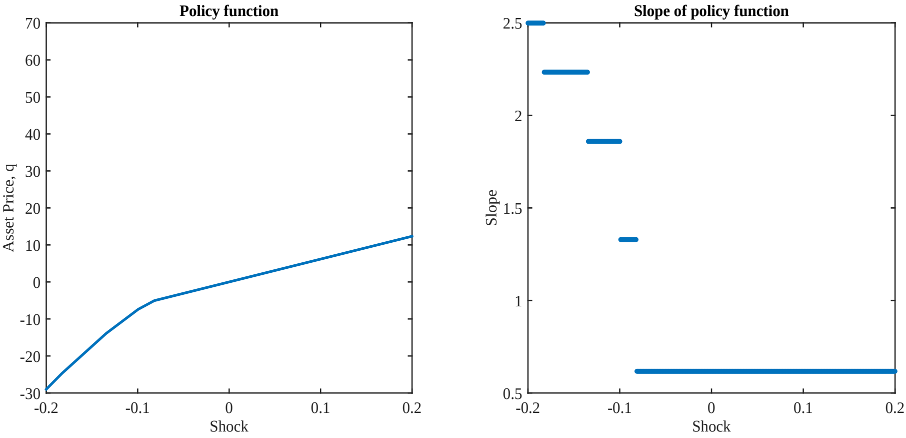
Model

$$
\begin{aligned}
q_t &= \beta(1-\rho)E[q_{t+1}] + \rho q_{t-1} - \sigma r_t + u_t \\
r_t &= \max\{r, \phi q_t\} \\
u_t &= \rho^u u_{t-1} + e_t
\end{aligned}
$$

Results


Policy function (interest rate)
Interest rate
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-0.2
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2
Shock

Results



Policy function
Asset Price, q
70
60
50
40
30
20
10
0
-10
-20
-30
-0.2
-0.1
0
0.1
0.2
Shock
Slope of policy function
Slope
2.5
2
1.5
1
0.5
-0.2
-0.1
0
0.1
0.2
Shock