Problem set – Aggregate demand and supply

Keywords: Phillips curve; Taylor rule; Aggregate demand.

1. Consider the following equation for the Taylor rule: $i = \bar{\bar{r}} + \pi + (\alpha - 1)(\pi - \bar{\pi}) + \beta(Y/\bar{Y} - 1)$ and the following parameterization: $\bar{\pi} = 0.03$, $\bar{r} = 0.05$, $\bar{Y} = 100$, $\alpha = 0.5$, $\beta = 0.5$. Also consider the following equation describing the money demand $m^d = y/(1+i)$ and $P = 1$.

a) Describe, in two different graphs, the TR - space (i, Y) - and the money market equilibrium - space $(i, M/P)$ – an initial equilibrium, assuming that parameterization: $\pi = 0.03, Y = 100$. How much is the money supply, M, in this case?

b) Departing from (a), assume that Y increases to Y=108. How will the central bank react? Describe the adjustment process in the money market and in the TR locus.

c) Departing from (a), assume that π increases to $\pi = 0.11$. How will the central bank react? Describe the adjustment process in the money market and in the TR locus.

2. Consider a closed economy described by the following equations: market of goods and services: $q = k\left[\overline{A} - dr\right] + \varepsilon$ where $\overline{A} = 25$, $k = 5$, $d = 100$, and ε is a stochastic process with zero mean. Monetary policy: $i = \overline{i} + a\left[\pi - \overline{\pi}\right]$, where $\overline{\pi} = 0.02$, and $a = 2$. Phillips curve: $\pi = \pi^e + \gamma\left[q - q_n\right]$, with $\gamma = 0.002$ and $q_n = 100$.

a) Find out the natural real interest rate r_n in this economy. Which nominal interest rate $\overline{i}$ shall the central bank target?

b) Find out the expression of the aggregate demand. Explain its slope.

c) Describe a long run equilibrium in a graph.

d) Analyse the short run and the long run impacts of a one-period shock amounting to $\varepsilon = 10$, distinguishing the following two cases: (i) prices and wages are flexible and expectations are well anchored at $\pi^e = \overline{\pi} = 0.02$; (ii) $\pi^e = \pi_{-1}$. (iii) $\pi^e = \pi_{-1}$ and the shock dissipates slowly over time. Use graphical analysis.

3. Consider a closed economy described by the following equations: market of goods and services: $q = k\left[\overline{A} - dr\right]$. Monetary policy: $r = \overline{r} + b\left[q - \overline{q}\right]$. Phillips curve: $\pi = \pi^e + \gamma\left[q - q_n\right]$.

a) Show that the IS curve can be described as $q = q_n - kd\left[r - r_n\right]$

b) Find out the expression of aggregate demand. Represent in a graph.

c) Describe the short-run equilibrium assuming that the central bank targets $\overline{q} > q_n$. Represent in a graph. Discuss the dynamic implications of the central bank policy.