ECON 815

Interest Rate Rules

Winter 2015

Monetary Policy

A monetary authority controls the short-term nominal interest rate.

A rule is formalized as the nominal interest rate i_t reacting to some relevant variables such as π_t or x_t.

$$i_t = \bar{\iota} + f(\pi_t, x_t, \dots)$$

We will ask three questions.

- Does the interest rule lead to a determinate equilibrium?
- How does the economy react to shocks for a given rule?
- What is the optimal monetary policy rule?

The Classical Model

Recall that the monetary and the real side are separated.

Monetary policy follows an interest rate rule of the form

$$i_t = \bar{\iota} + \phi_\pi \pi_t + v_t$$

where v_t follows an AR(1) process, or $v_t = \rho_v v_{t-1} + \epsilon_t^v$.

We require $\phi_\pi > 1$ to obtain a unique, stable solution (determinancy).

For $\bar{\pi} = 0$, we get that $\bar{\iota} = \bar{r} = \rho$, the rate of time preference.

Solving forward we obtain

$$\pi_t = \frac{1}{\phi_\pi} \left(E_t[\pi_{t+1} - v_t] \right) = -\frac{1}{\phi_\pi} \sum_{s=0}^{\infty} \left(\frac{\rho}{\phi_\pi} \right)^s \epsilon_t$$

Response to a MP Shock

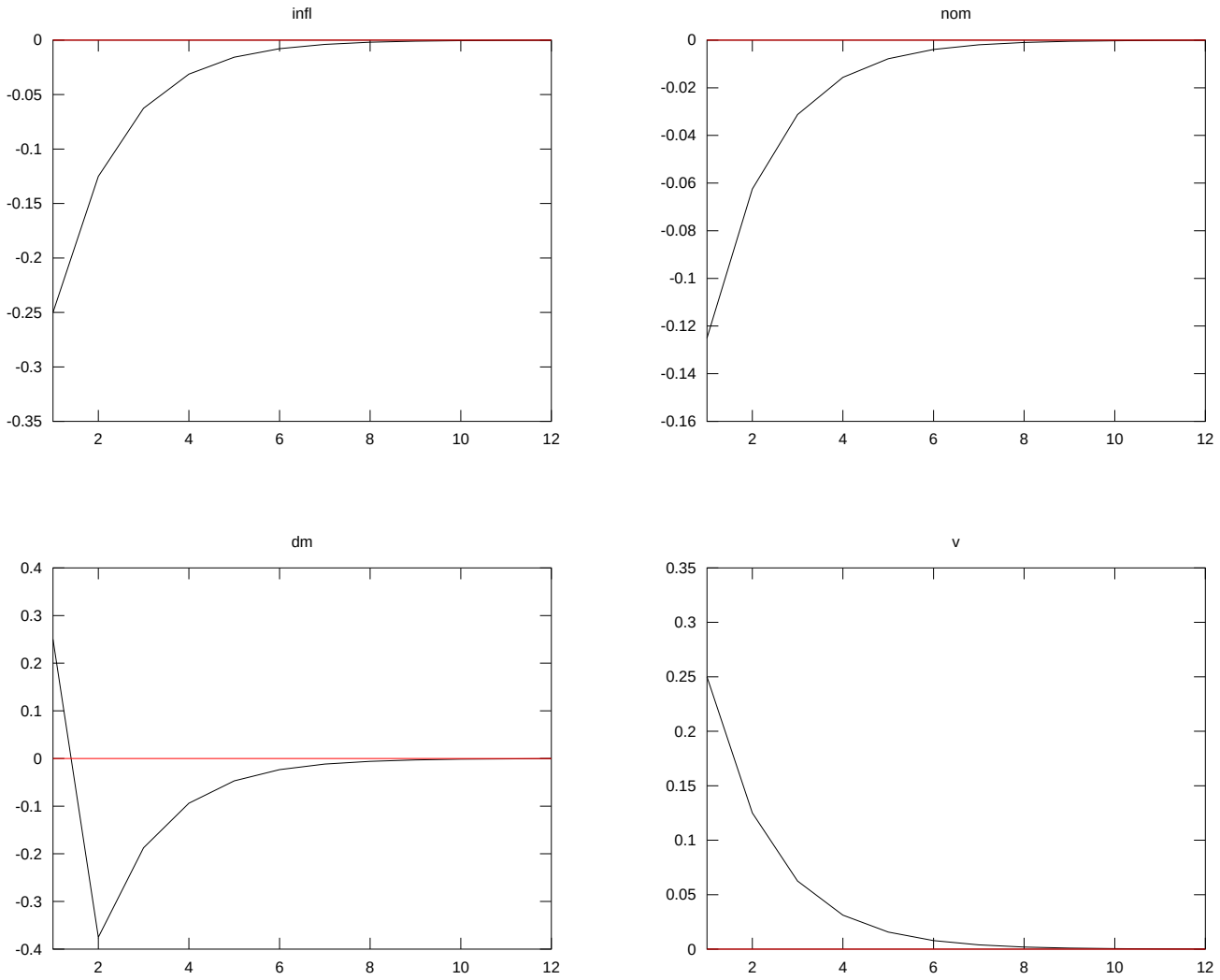

Figure : 25 bps increase in v_t ($\rho_v = 1.5$, $\phi_\pi = 1.5$)

Response to a Technology Shock

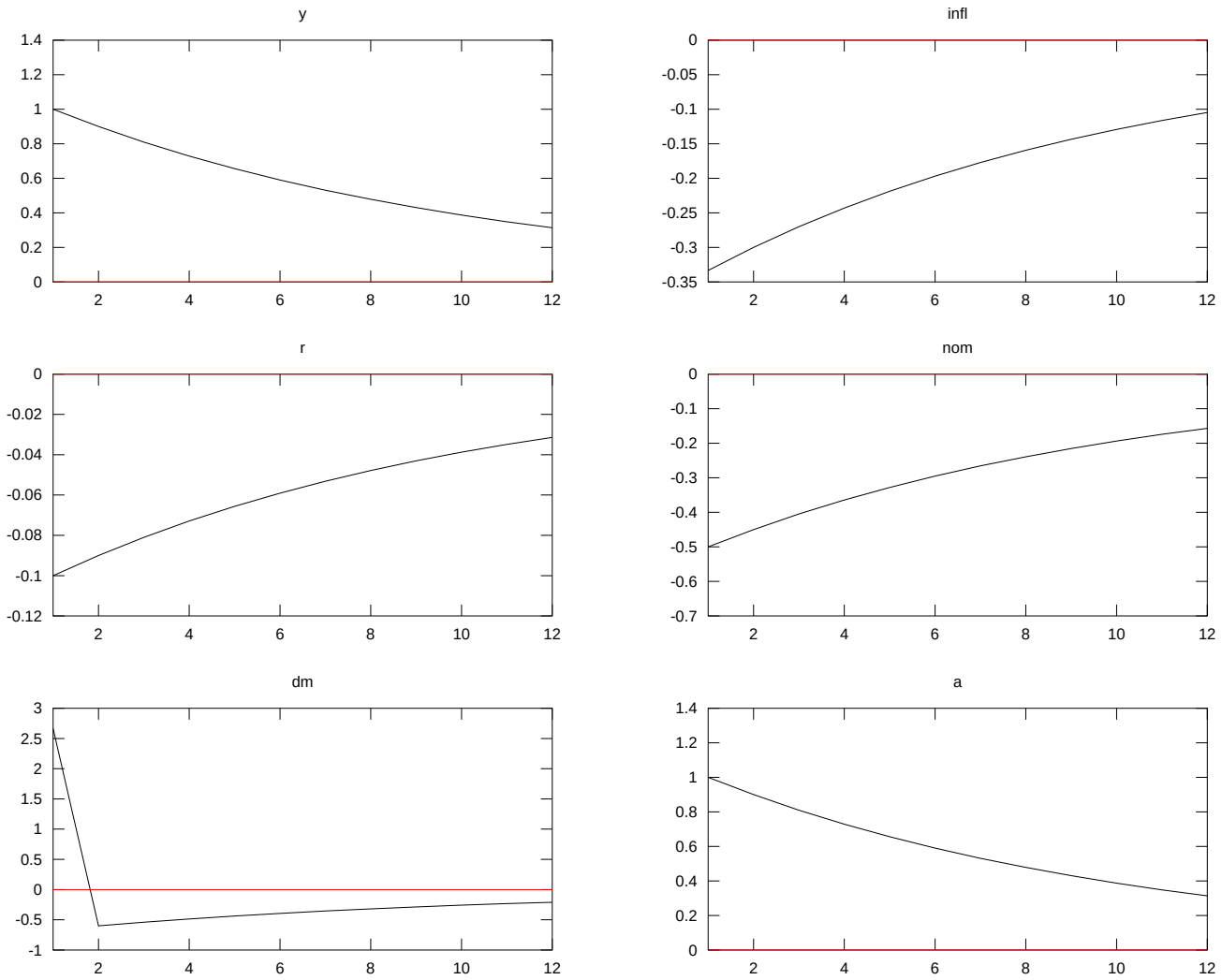

Figure : 1% increase in a ($\rho_a = 0.9$)

The NK Model

Monetary policy is described by a *Taylor-rule*

$$i_t = \bar{\iota} + \phi_\pi \pi_t + \phi_x x_t + v_t$$

where x_t is the output gap.

The model can then be rewritten as

$$\begin{pmatrix} x_t \\ \pi_t \end{pmatrix} = \mathbf{A} \begin{pmatrix} E_t[x_{t+1}] \\ E_t[\pi_{t+1}] \end{pmatrix} + \mathbf{B}(r_t^n - \bar{r}_t^n - v_t)$$

where $\mathbf{A}$ and $\mathbf{B}$ are functions of parameters.

For determinacy/stability, we need to have eigenvalues of $\mathbf{A}$ to be less than 1 in modulus. This is the case if and only if

$$\kappa(\phi_\pi - 1) + (1 - \beta)\phi_y > 0.$$

We us Taylor's original estimates $\phi_\pi = 1.5$ and $\phi_y = 0.5/4$.

Response to a MP Shock

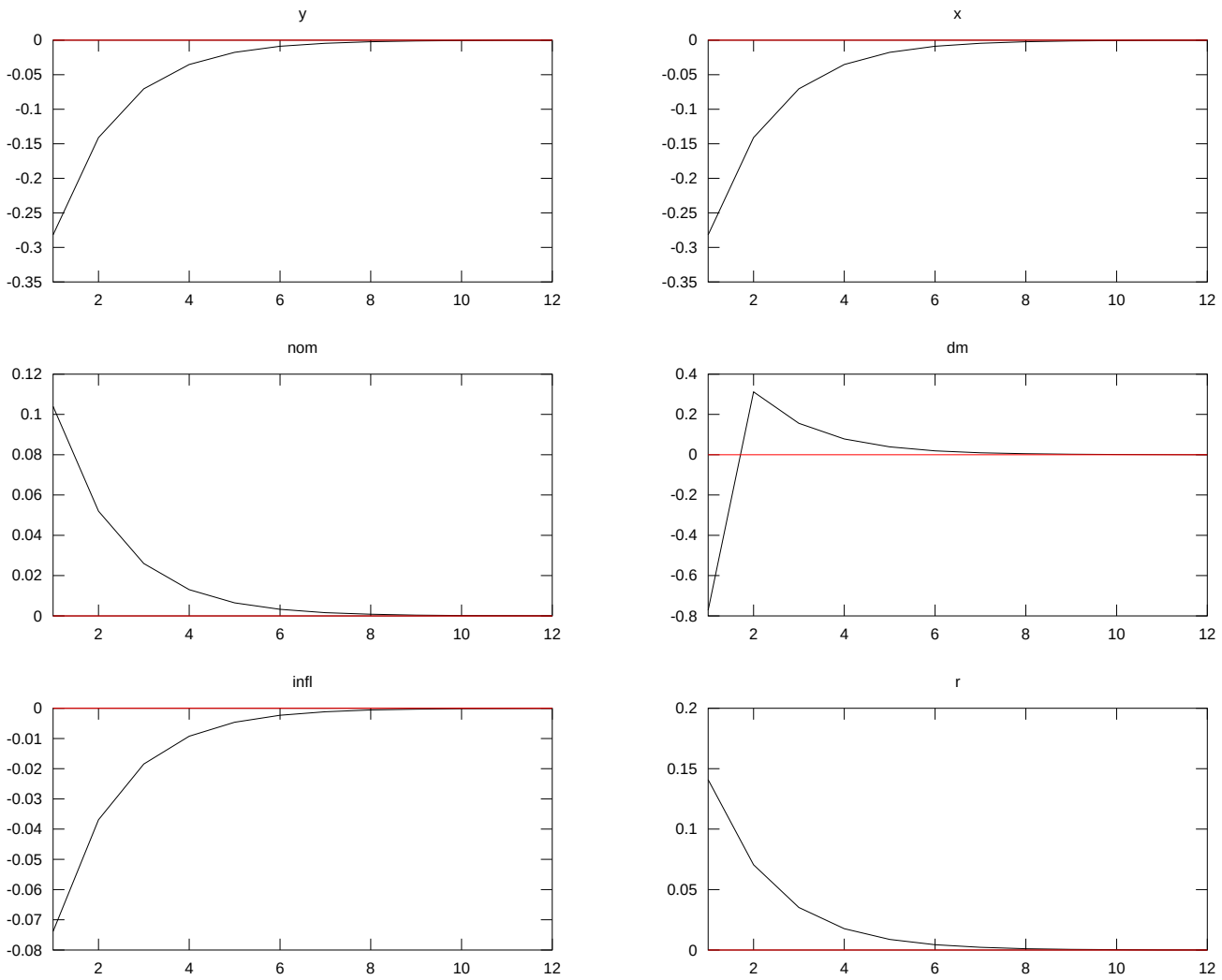

Figure : 25 bps increase in v_t – $\theta = 0.66$

Think about the MP shock as a *tightening* of policy in $\bar{\iota}$.

The increase in the nominal interest rate brings down inflation and output.

However, the interest rate rule moderates the MP shock.

This is the so-called *liquidity effect*.

- tightening implies an increase in the nominal interest rate
- this must be accompanied by a change in the money supply in the opposite direction

Money supply rules in the classic model cannot deliver this effect.

Question:

Is this necessarily a success story for the NK model?

How Sticky are Prices?

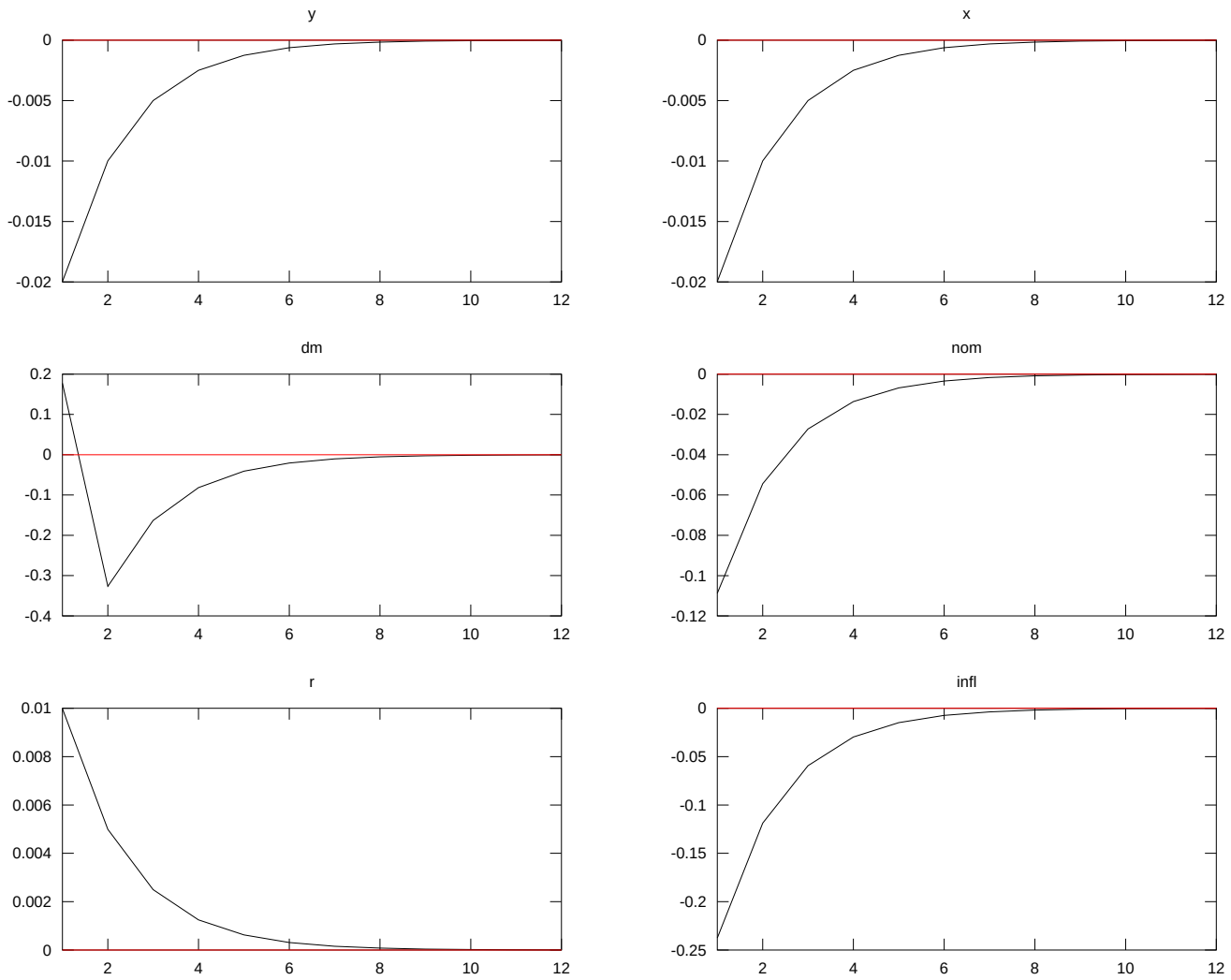

Figure : 25 bps increase in $v_t - \theta = 0.1$

Response to a Technology Shock

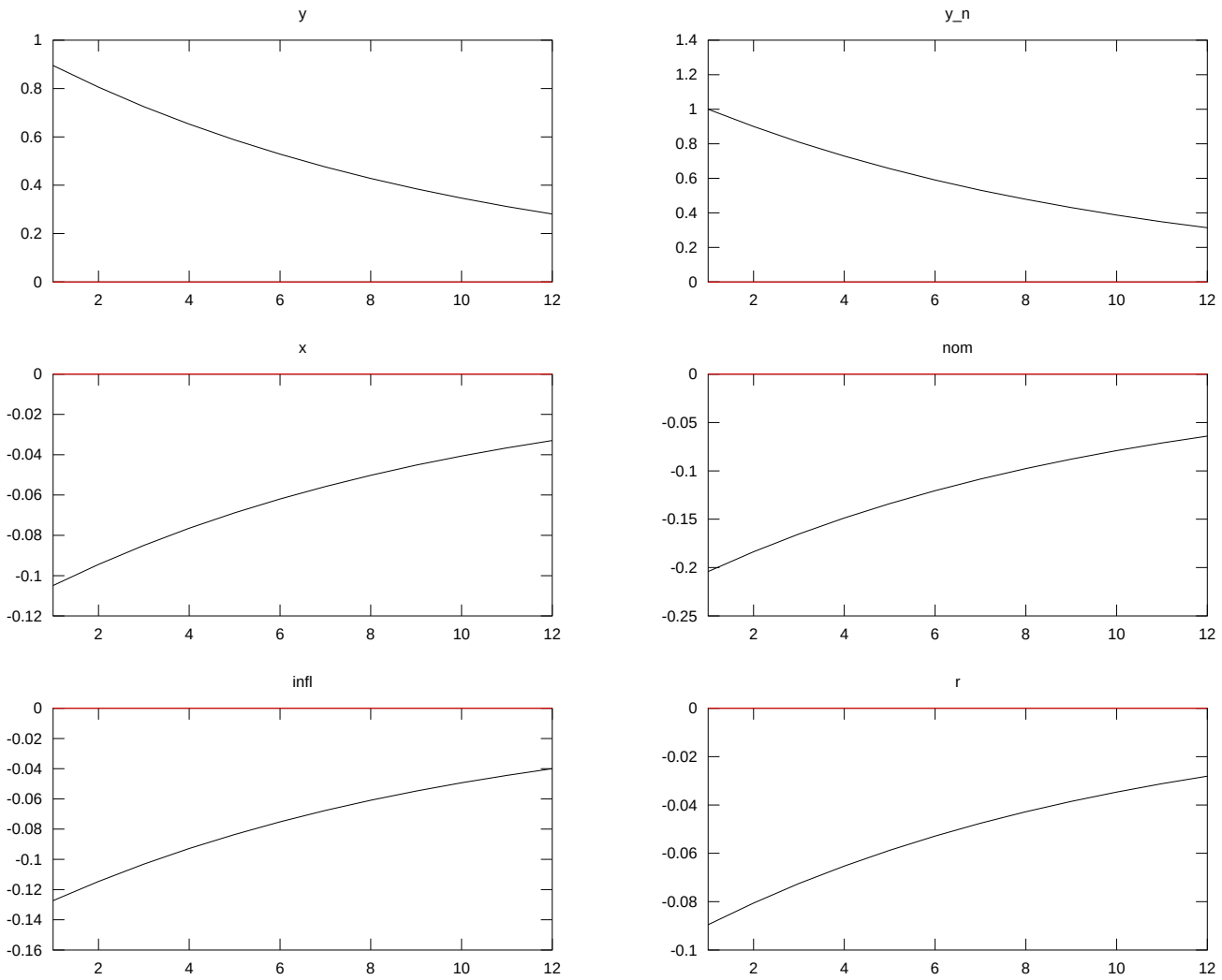

Figure : 1% increase in a

The response to a technology shock (supply shock) is counterintuitive.

Both, natural output and actual output go up. But there is a *negative* output gap.

This requires a *decrease* in the nominal interest rate, so that the MP accommodates the positive shock.

The reason is that there is too little demand as not all firms can react to the technology shock by decreasing their prices and hiring more people.

One can also think about different shocks such as "cost-push shocks" to the NK Phillips Curve or shocks to competitiveness that change the elasticity of demand/strategic complementarities between firms' price setting.