

## Questions

1. Explain the concept of time inconsistency.
2. Why are rules useful? What's the cost?
3. One solution to the time inconsistency problem is to appoint a conservative central banker with a strong distaste for inflation. Explain why this is a solution. Does it have downsides?
4. What is the basic rationale for having now the vast majority of central banks being only concerned about inflation?
5. What is the importance of the concept of Rational Expectations to the rationale mentioned in the previous question?
6. Assume that private agents have backward looking expectations. Do the major result "rules are better than discretion" apply in this case.
7. There is a famous rule in modern monetary policy: the Taylor Rule (after John Taylor, from Stanford University). This rule *grosso modo* says that central banks should determine interest rates by looking at the evolution of 3 major variables: inflation, natural interest rate, and the output gap. In the next two figures, you will find the application of this rule for the USA and the EU. What do the figures tell you about the conduct of monetary policy for the last 5 years or so? Do you see any danger of tying ones hands with a rule like this (or another one)?

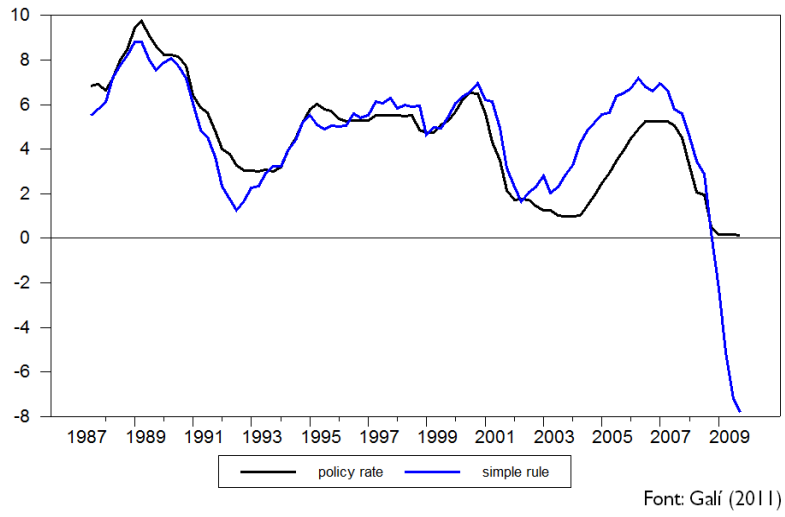


Figure 1: The Taylor Rule for the USA. From Jordi Galí (2011)

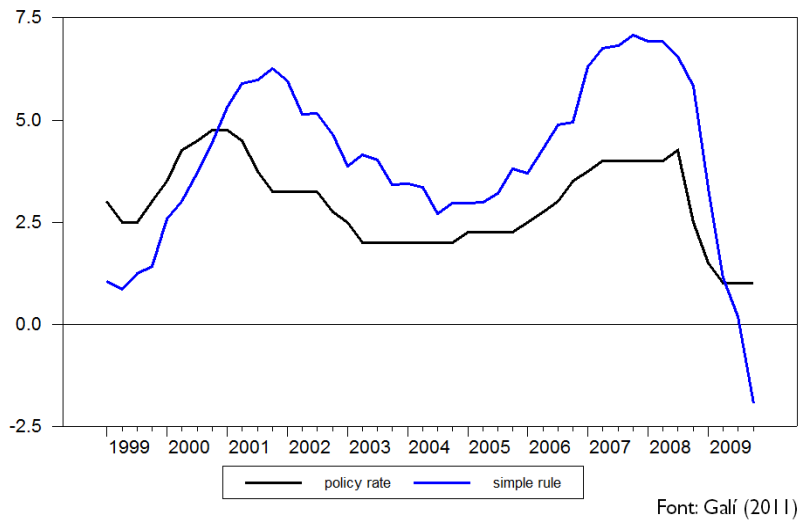


Figure 2: The Taylor Rule for the EU. From Jordi Galí (2011)

## Problem 1

Assume that the Central Bank's loss function is given by the following function:

$$L = \beta (u - u^*) + \gamma (\pi - \pi^*)^2$$

$u$  is the unemployment rate,  $\gamma$  is a parameter, and  $\pi$  is the inflation rate. An asterisk is used to represent the central bank's desired values for each variable.

We know that the behavior of the supply side of the economy can be described by the following Phillips curve:

$$u = u^n - \alpha(\pi - \pi^e)$$

where  $u^n$  is the natural level of unemployment,  $\pi^e$  is the level of expected inflation, and  $\alpha = 15$ . Finally assume that private agents have rational expectations

$$\pi^e = \pi.$$

1. Explain the logic behind the Loss function above, as far as the targets of the central bank are concerned.
2. Assuming that  $u^* = 4, \pi^* = 0$ , determine the level of optimal inflation in the case of discretionary behavior by the central bank.
3. Determine the same as in the previous question, but now having the central bank displaying commitment to maintain inflation at the level of its natural rate.
4. Explain why the result in (2) is better than the result in (1).
5. What is the condition that should hold in order to have the same result in both scenarios: discretion and commitment. Explain.

## Problem 2

Assume that the Central Bank's loss function is given by the function:

$$L = \gamma u + (\pi - \pi^*)^2$$

$u$  is the unemployment rate,  $\gamma$  is a parameter,  $\pi$  is the inflation rate. The Central Bank has announced that its target (or desired) level of inflation is  $\pi^* = 0$ .

We know that  $\gamma = 0.1$  and that the behavior of the supply side of the economy can be described by the following Phillips curve:

$$u_t = u_t^n + a(\pi_t - \pi_t^e) + e_t$$

where  $u^n = 0.04$  is the natural level of unemployment,  $\pi^e$  is the level of expected inflation,  $e_t$  is an exogenous shock with zero mean and variance equal to 1, and  $a = -0.5$ . Finally assume that private agents have rational expectations

$$\pi^e = \pi.$$

1. Assuming that  $e_t = 0$ , determine the level of optimal inflation in the case of discretionary behavior by the central bank.
2. Determine the same as in the previous question, but now having the central bank displaying commitment to maintain inflation at its target level.
3. Explain why the result in (2) is better than the result in (1).
4. Now **abandon** the assumption  $e_t = 0$ . Considering only discretion, would you expect any changes to the optimal level of inflation? Explain.

### Problem 3

Assume that the Central Bank's loss function is given by the quadratic function:

$$L = u^2 + \gamma\pi^2$$

$u$  is the unemployment rate,  $\gamma$  is a parameter, and  $\pi$  is the inflation rate. We know that  $\gamma = 2.5$  and that the behavior of the supply side of the economy can be described by the following Phillips curve:

$$u = u^n - \alpha(\pi - \pi^e)$$

where  $u^n$  is the natural level of unemployment,  $\pi^e$  is the level of expected inflation, and  $\alpha = 15$ . Finally assume that private agents have rational expectations

$$\pi^e = \pi.$$

1. Determine the level of optimal inflation in the case of discretionary behavior by the central bank.
2. Determine the same as in the previous question, but now having the central bank displaying commitment to maintain inflation at the level of its natural rate.
3. Explain why the result in (2) is better than the result in (1).
4. Explain either by your own words, or by some sophisticated approach, what would happen in both scenarios above, if private agents had adaptive expectations instead of rational expectations.