Notes lecture 2

Replacing the LM curve with a policy rule

From the previous Keynesian IS/LM model we shall use the same IS curve

$$Y = Y(r) \tag{1}$$

and a similar Phillips curve. But we shall replace the LM curve with a curve describing the central bank policy rule, the MR curve. This has been suggested as a way to more realistically describe the behavior of modern central banks and has been suggested previously by (Wendy Carlin and David Soskice, 2005) and (David Romer, 2000). In this description I mainly follow the former authors. The model they describe is much in line with (Lars E. O. Svensson, 1997).

The central bank has preferences for stabilizing inflation and some real variable around target levels as described by a quadratic loss function

$$L = (Y - Y_e)^2 + \beta(\pi - \pi^T)^2 \tag{2}$$

showing the central bank's choice of inflation target, π^T, and their perception of the equilibrium output, Y_e. The Phillips curve has a standard textbook form, consistent with underlying models with staggered wage contracts as in (Robert E Hall and John B. Taylor, 1997) or with a Wage Setting/Price Setting model as in (Olivier Blanchard, 2003):

$$\pi_t = E_{t-1}\pi_t + \alpha\left(Y - Y_e\right) + z_t \tag{3}$$

where inflation depends on $E_{t-1}\pi_t$, the in period t-1 expected rate of inflation in period t, the output gap and a supply shock, assumed $z_t = 0$. In the following we assume $E_{t-1}\pi_t = \pi_{t-1}$. It is also assumed that the central bank can determine the real interest rate and determine the aggregate demand through the IS curve. The central bank minimizes the social loss by setting the interest rate and taking account of the private sector behavior as given by the Phillips curve. This is done by substituting (3) into (2) and minimizing with respect to *Y*, i.e.

$$\frac{\partial L}{\partial Y} = (Y_t - Y_e) - \alpha\beta\left(\pi_{t-1} - \alpha\left(Y - Y_e\right) - \pi^T\right) = 0$$

which gives the monetary policy rule MR as

$$Y = Y_e - \alpha\beta\left(\pi - \pi^T\right) \tag{4}$$

and the interest rate given by (1). The policy rule – the slope of the MR curve - not only depends on the central bank's preferences β but also on the behavior of the private sector, the price flexibility as given by the parameter α.

This can also be described in familiar diagrams with inflation and output on the axes, as shown below.

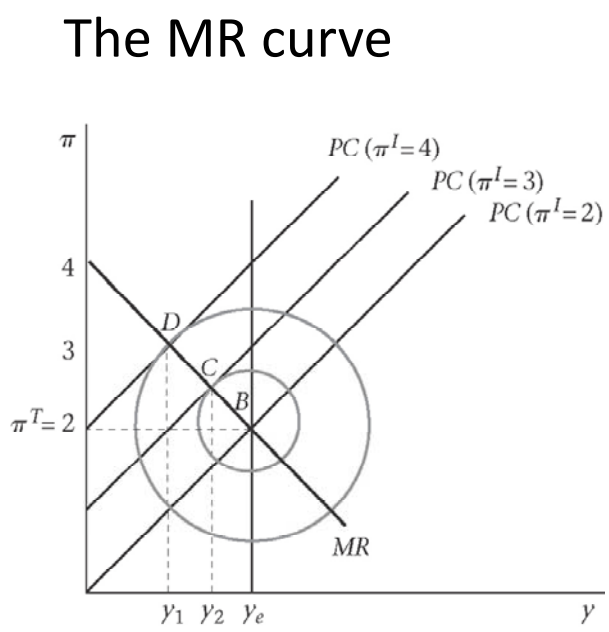

Diagram 1. The MR curve, loss function and Phillips curve.

The diagram shows the loss function as circles or ellipses, the Phillips curves as positively sloping (short run) and the MR curve as a negatively sloping curve. The position of the MR curve depends on the target values of inflation and output while the slope depends on α and β. The slope of the Phillips curve depends on α and the position on the expected rate of inflation π_{t-1}.

The shape of the loss function, depending on the value of β, are shown In diagram 2

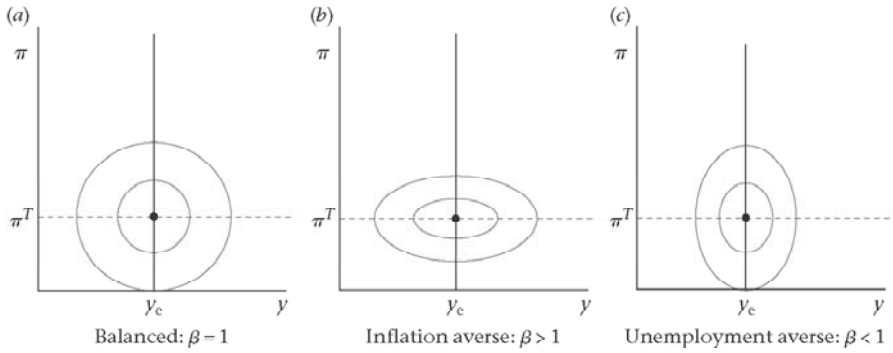

Diagram 2. Central bank preferences.

The complete model is depicted in diagram 3 below showing the behavior in the event of a shock

3-equation model

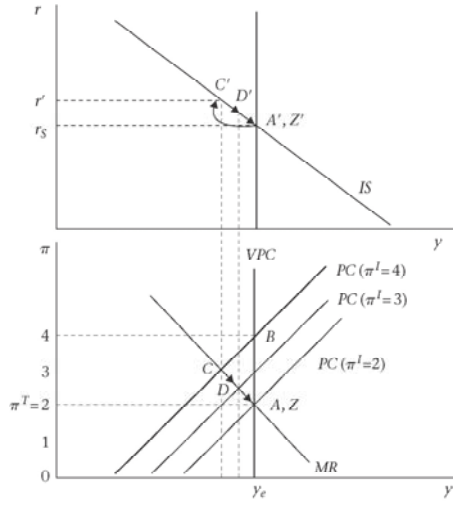

Diagram 3. Monetary policy with a shock in inflation expectations.

in inflation expectations. As the Phillips curve shifts upwards from the targeted 2 percent to 4 percent rate of inflation the central bank notices the need to raise the interest rate – as shown on the IS curve in the upper part of the diagram - to acquire the optimal level of aggregate demand, at

point C. The lowered output gap lowers actual inflation and expected inflation in the next period as shown at point D. The dynamic adjustment continues until the convergence where targets are met. Of course, in practice there are always shocks and social losses.

This particular model is interesting since it extends the conventional IS/LM model in a useful way. However, it still lacks the micro foundations of the New Keynesian model, as remarked by (Jordi Gali, 2008) as not-fully-microfounded.

An interesting theoretical result that can be illustrated here is the so called *inflation bias*, as initially developed by (Finn E. Kydland and Edward C. Prescott, 1977) and (Robert J. Barro and David B. Gordon, 1983). This is the case in which the central bank sets a too optimistic goal for the real variable, such that $Y^T > Y_e$. This is illustrated in diagram 4 below.

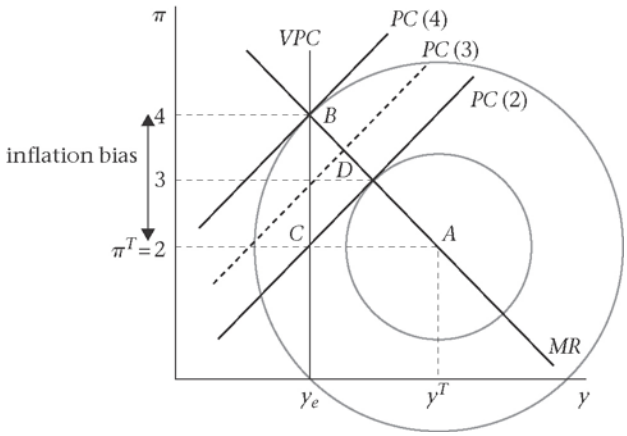

Diagram 4. The inflation bias.

The central bank has the 2 percent inflation target but sets the real target too optimistic. Once done, it is optimal to lower interest rates and increase aggregate demand. However, this increases actual and by the time expected inflation and hence implies a shift in the Phillips curve in the diagram. This triggers a dynamic process which continues until the output gap is closed at point B. Then, there are no incentives for anyone to diverge. The real output is the same as before the change in policy but at the cost of an increased rate inflation, the inflation bias.

References

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