Introductory Macroeconomics

In-Tutorial #6
Week Starting 19th April 2021

Questions.

1. If the inflation target increases, the AD curve is unchanged but inflation increases along the AD curve. True or False?

2. If monetary policy really operated using a mechanical policy reaction function, we could replace a central bank governor with a computer that would determine interest rates. Why do you think central bank governors still exist and have not been replaced by computers? If policy rules do not reflect how central bank governors operate, do you think there is a problem in using them in macroeconomic models?

3. Consider the monetary policy reaction function $r = r^* + \alpha(\pi - \pi^*)$ with $r^* = 0.02$ and $\alpha = 0.5$. Suppose the economy has been in long run equilibrium with inflation $\pi^* = 0.12$ but the new governor of the central bank wants a lower inflation target, $\pi^{**} = 0.02$. What real interest rate will the central bank initially set so as to bring about this change in the inflation target? What will this do to the economy in the short run?

4. Consider the AD-AS model

$$Y = Y^* - \alpha\gamma(\pi - \pi^*) + \varepsilon_D$$

$$\pi = \pi^e + \phi\beta(Y - Y^*) + \varepsilon_S$$

   Suppose the parameter values are $\alpha = 0.5$, $\gamma = 2$, $\phi = 0.5$, $\beta = 2$ with inflation target $\pi^* = 0.02$ and natural output normalized to $Y^* = 1$.

   Suppose the economy begins in an initial long run equilibrium and there is then a temporary demand shock $\varepsilon_D = 0.04$. Compute the short run and long run effects of this shock on output and inflation.

Solutions to In-Tutorial Work.

1. False. An increase in the inflation target π^* shifts the AD curve out, increaseing output at each level of inflation. This will result in a new long run equilibrium with $Y = Y^*$ at a higher level of inflation.

2. There are a few key points:

   (i) The monetary policy reaction function is really an approximation of how central banks behave. A key part of central bank behaviour would be to use discretion or judgement in monetary policy. This discretion allows central bankers to set interest rates that may vary from what is implied by a policy reaction function. The following points highlight why judgement may be a useful aspect of monetary policy:

   - Central banks use a lot more information than just the output gap and interest rates in determining monetary policy. They would collect more detailed information regarding the state of the domestic economy and they would also have more information about the international economy and its expected future. This information may be important in assessing the current state of the economy and what is the appropriate policy stance.
   - Policy reaction functions are set as being dependent upon unobserved variables. The output gap, for example, is not something that a central banker or statistician can go out and measure. It requires some judgement to estimate the output gap.

   (ii) Second, the above points imply that policy reaction functions are really an approximation of the behaviour of how a central bank behaves. This does not necessarily mean that the use of a policy reaction function is problematic. As long as the policy reaction function is a relatively good approximation of reality, it may still be a useful element of macroeconomic models that helps simplify reality and provides insights.

3. We now rewrite the monetary policy reaction function in terms of the new inflation target

$$r = r^* + \alpha(\pi - \pi^{**})$$

   We are given the parameters $r^* = 0.02$ and $\alpha = 0.5$ and $\pi^{**} = 0.02$ so this simplifies to

$$r = 0.02 + (0.5)(\pi - 0.02) = 0.01 + 0.5\pi$$

   Suppose we were initially in equilibrium with $\pi = \pi^* = 0.12$ and $r = r^* = 0.02$. Then this shift in the monetary policy reaction function leads to real interest rates increasing to $r = 0.01 + 0.5\pi = 0.01 + (0.5)(0.12) = 0.07$, real interest rates rising from 2% to 7%. This would contract real output in the short run as the AD curve shifts in along the initial SRAS curve. Inflation would also fall as the economy begins to transition towards the new lower inflation target.

4. Substituting in the given parameter values the AD and AS equations become

$$Y = Y^* - (0.5)(2)(\pi - \pi^*) + \varepsilon_D$$

$$\pi = \pi^e + (0.5)(2)(Y - Y^*) + \varepsilon_S$$

Since we begin in an initial long run equilibrium with $\pi^e = \pi^*$ and the only shock is the demand shock we can write

$$Y = Y^* - (\pi - \pi^*) + \varepsilon_D$$

$$\pi = \pi^* + (Y - Y^*)$$

Subsituting the AS curve into the AD curve then gives

$$Y = Y^* - (Y - Y^*) + \varepsilon_D$$

or

$$2Y = 2Y^* + \varepsilon_D$$

Hence

$$Y = Y^* + (0.5)\varepsilon_D$$

Since we have a positive demand shock $\varepsilon_D = 0.04$ and $Y^* = 1$ we get

$$Y = 1 + (0.5)(0.04) = 1.02$$

We can then recover the associated value of inflation from the AS curve

$$\pi = \pi^* + (Y - Y^*) = 0.02 + (1.02 - 1) = 0.04$$

That is, in the short run equilibrium output $Y = 1.02$ is 2% above potential $Y^* = 1$ and inflation rises to $\pi = 0.04$ or 4%. Graphically, the positive demand shock shifts the AD curve out along the SRAS increasing output and increasing inflation. In the long run output returns to potential $Y^* = 1$ and inflation returns to target $\pi^* = 0.02$.