Macroeconomics

Week 9: Macroeconomic Policy: The AD/AS/MP Model

Ricardo Gouveia-Mendes
ricardo.mendes@iscte-iul.pt

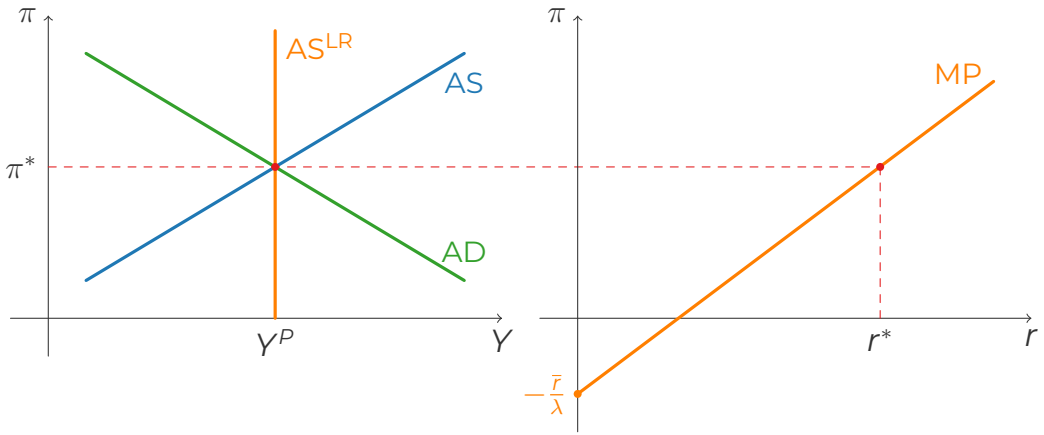
Undergraduate in Economics
1st Semester 2023-24

Theoretical Review

The Mathematical Representation

- The Aggregate Demand: $Y = m\overline{A} - m\,\phi\,(\overline{r} + \lambda\,\pi)$
- The Monetary Policy: $r = \overline{r} + \lambda\,\pi$
- The Aggregate Supply: $\pi = \pi^e + \gamma\left(Y - Y^P\right) + \rho$, with $\pi^e = \pi_{t-1}$
- The Long-run Aggregate Supply: $Y = Y^P$

The Graphical Representation



Exercises

Exercise 1. Divine coincidence

Olivier Blanchard, a former MIT professor and IMF Chief Economist, wrote this in 2016:

"In the benchmark [macroeconomic] model, stabilizing inflation keeps the unemployment rate at the natural rate, and the natural rate in turn is the best rate that can be achieved by policy. Jordí Gali and I have called this proposition the ***"divine coincidence"****.*

a) How do we represent the term coined as "divine coincidence" as a set of conditions that describe society's best possible outcome in our model?

a) The Divine Coincidence can be represented as:

$$Y = Y^P, \quad U = U_n, \quad \pi = \pi^e = \pi_{t-1}$$

Exercise 1. Divine coincidence

b) Do you consider that a 10% unemployment rate may be reasonably acceptable as ”natural”?

b) A 10% unemployment rate seems to be too high to be natural. Recall our discussion about measuring unemployment in week 3. The natural rate of unemployment accounts for ***frictional*** (switching) and ***structural*** (market failures) unemployment, that subsist in equilibrium.

Exercise 2. The Fed's dual mandate

"In conducting monetary policy, we will remain highly focused on fostering as strong a labor market as possible for the benefit of all Americans. And we will steadfastly seek to achieve a 2 percent inflation rate over time." Jerome Powell, Aug. 27, 2020 speech here.

The sentence above by the Fed's Chair highlights the two main goals of the Fed. What are those two goals?

The two goals of the Fed are: **(i)** full employment ($Y = Y^P$ which implies $U = U_n$); and **(ii)** an inflation rate of 2%.

Exercise 3. Why 2% inflation?

Is 2% Really the Right Inflation Target for Central Banks?, Project Syndicate, July 27, 2020. Michael J. Boskin, a Professor of Economics at Stanford University and a former Chairman of George H.W. Bush's Council of Economic Advisers, provided this answer:

«Winston Churchill famously quipped that "democracy is the worst form of government except for all the other forms that have been tried." The same logic applies to advanced-economy central banks' inflation targets: compared to anything higher or lower (by a non-trivial margin), 2% is likely to be better.»

a) Why do central banks have a target level for the inflation rate?

To anchor inflation expectations and so stabilize inflation.

Exercise 3. Why 2% inflation?

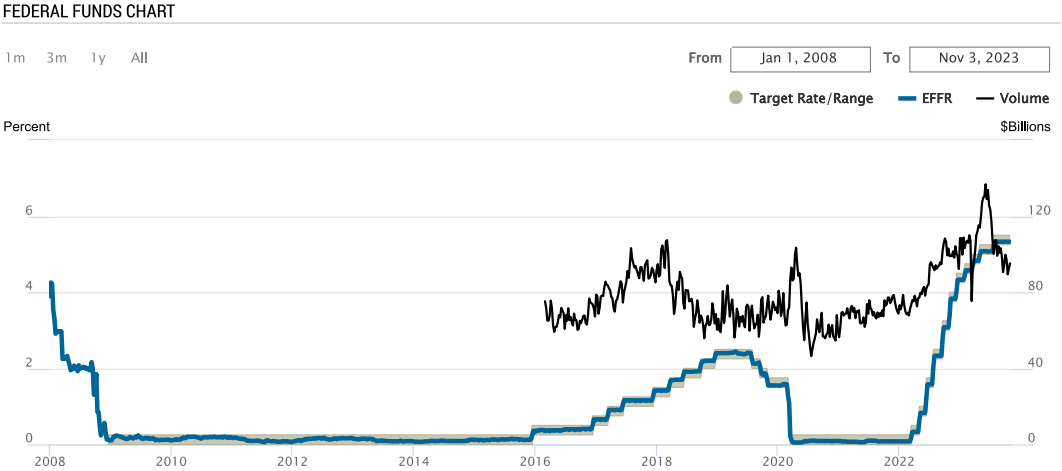
b) Why a target of 2%?

- Inflation is like oil in the engine — a good level is neither too high nor too low
- If too high: increases uncertainty and risk, which is bad for economic activity
- If too low: there is a risk of deflation and Central Banks may loose control

Exercise 4. The Fed's response to shocks

From the FRB of New York we can download the figure below, where we can see the range for the Fed's nominal interest rate target value. The chosen period is from May 2008 to November 2022 *[Notice that I have increased the time-span of the data, covering from January 2008 to April 2023]*. The shaded interval show three main types of decisions by the Fed: (i) keep the range unchanged, (ii) small and gradual changes in the range, and (iii) dramatic changes in at least three occasions.

Exercise 4. The Fed's response to shocks



Exercise 4. The Fed's response to shocks

a) Can we associate different magnitudes of shocks to these policy decisions?

a) Yes, we can clearly distinguish *five periods*:

From September 2008 to December 2008: the Fed reduced the Fed Funds Rate (FFR) from 2.16% to 0.1% to fight giant exogenous shocks that were hitting the US economy.

From 2016 to 2019: stairway increases to accommodate small shocks.

Exercise 4. The Fed's response to shocks

From early August to October 2019: Fear of a severe recession led the Fed to revert previous increases.

March 2020 (the COVID19 pandemic): the same type of reaction (from 1.58% to 0.06%).

Since early 2022: fast and big increase due to oil prices peak, disruptions in supply-chain and war on Ukraine.

Exercise 4. The Fed's response to shocks

b) Can we see a "Zero Lower Bound" (ZLB) on nominal interest rates in the figure? How likely is it to be found over the last fifteen years or so?

b) Yes: 2008–2016 and again March 2020–early 2022. The ZLB is quite prevalent in modern economies.

However, in the early 2000s, it was popular the idea that the probability of a ZLB was zero, for example:

"We show that the zero bound on the nominal interest rate, which is often cited as a rationale for setting positive inflation targets, is of no quantitative relevance".—Schmidt-Grohè, S., & Uribe, M. (2007).

Exercise 5. Macroeconomic equilibrium

Consider the four fundamental functions that allow us to analyze the entire functioning of the economy:

$$\begin{aligned}
\text{AD}: &\quad Y = m \cdot \overline{A} - m \cdot \phi \cdot (\overline{r} + \lambda\pi) \\
\text{AS}: &\quad \pi = \pi^e + \gamma \left(Y - Y^P \right) + \rho \\
\text{MP}: &\quad r = \overline{r} + \lambda\pi \\
\text{Fisher Eq.}: &\quad i = r + \pi
\end{aligned}$$

Exercise 5. Macroeconomic equilibrium

and the following information concerning exogenous variables and parameters:

$$\overline{A} = 7.6\ ,\ m = 2.0\ ,\ \phi = 0.2\ ,\ \overline{r} = 2.0\ ,\ \lambda = 0.5\ ,$$
$$\pi^e = 2.0\ ,\ \gamma = 4.5\ ,\ Y^P = 14.0\ ,\ \rho = 0.$$

a) Calculate the short-run equilibrium values for the inflation rate, the level of GDP, the real interest rate, as well as the nominal interest rate. Represent graphically, involving the AD and AS functions shown above.

Exercise 5. Macroeconomic equilibrium

- As usually we can solve the system using the package `NLSolve`
- Or, if you prefer, using standard linear algebra, defining the following matrices

$$\boldsymbol{A} \equiv \begin{bmatrix} 1 & m\phi\lambda & 0 & 0 \\ -\gamma & 1 & 0 & 0 \\ 0 & -\lambda & 1 & 0 \\ 0 & -1 & -1 & 1 \end{bmatrix} \qquad \boldsymbol{Y} \equiv \begin{bmatrix} Y \\ \pi \\ r \\ i \end{bmatrix} \qquad \boldsymbol{B} \equiv \begin{bmatrix} m\overline{A} - m\phi\bar{r} \\ \pi^e - \gamma Y^P + \rho \\ \bar{r} \\ 0 \end{bmatrix}$$

Exercise 6. A positive demand shock

Suppose the government, to stimulate economic activity, increases its spending on goods and services (G&S) by 0.2 trillion dollars. This decision is considered a demand shock and will have short-run and long-run impacts.

a) Using the slider $\Delta\overline{A}5$ and Fig. 3 and 4 below, describe the short-term impact of this shock on GDP, inflation, and the real interest rate.

b) What will be the long-run equilibrium that results from this shock? Give the values of GDP, the inflation rate, real and nominal interest rates. To answer these questions, use the slider `self_correction6` and Fig. 5 and 6 below.

c) Solve for the new long-term equilibrium using the `NLsolve` method.

Exercise 7. A positive supply shock

Consider the same values for the parameters and the exogenous variables of Exercise 5. However, due to a sharp decline in oil prices, there is a positive supply shock such that now we will have $\rho = -1.9$.

a) Using the slider $\rho 7$ below, calculate the short-run equilibrium values for the inflation rate, the level of GDP, the real interest rate, and the nominal interest rate resulting from such a shock. Represent graphically, involving the AD/AS and the MP curves.

b) Is the economy in a recession or a boom? Justify.

c) If there are no other supply or demand shocks, what will happen to the economy over time? Answer this question by manipulating the slider `self_correction7` below.

Exercise 8. A permanent postive supply shock

Consider the same data as in Exercise 5. However, suppose the supply shock is **permanent** instead of temporary (like in the previous exercise); oil prices go down, and then they will stay there for an extended period. This positive shock will cause Potential GDP to increase by 0.2 trillion dollars.

How would we change our answers to the three questions raised in the previous exercise? Use the slider `self_correction8` to answer this exercise.