

TA Session 12: Monetary Policy under Price Rigidity

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- Review: a negative productivity shock in GE with flexible price;
- Sticky-price GE;
- Monetary policy responses to a decrease in productivity.

Review: Flexible-price Equilibrium

Recall what would happen if current productivity z decreases in a two-period model:

- Direct effect:

$z \downarrow$, $MPN \downarrow$, labor demand today shifts in $\rightarrow N \downarrow, w \downarrow$;

$z \downarrow$, Y^s curve should shift to the left $\rightarrow Y \downarrow, r \uparrow$;

- Indirect effects (not complete):

$w \downarrow \rightarrow c \downarrow$, shifting Y^d in $\rightarrow Y \downarrow$ further.

$r \uparrow \rightarrow N^s \uparrow$, shifting labor supply curve out $w \downarrow$.

- For simplicity, assume that indirect effects are negligible.

Money Market Equilibrium

Recall that in the money market:

- Money supply M^s is determined by the central bank;
- Money demand M^d is given by

$$M^d = PY$$

- It pins down equilibrium nominal price P .
- From the graph, we know that a negative productivity shock is inflationary: $P \uparrow$.

→ Relevance: oil price shock (1973), stagflation, covid shock.

Flexible Price Equilibrium

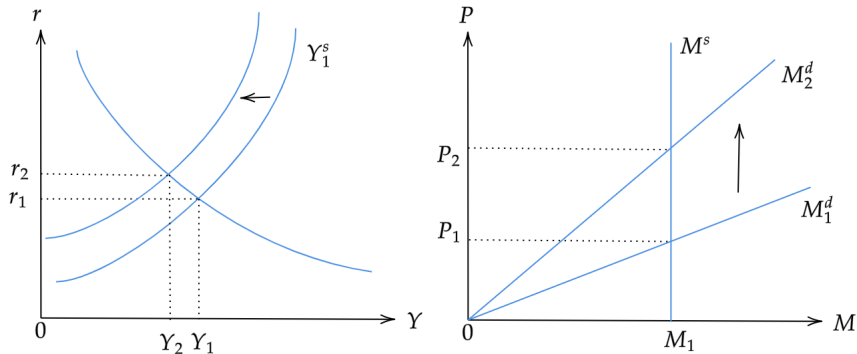


Figure: Flexible Price Equilibrium: $Y \downarrow, r \uparrow, P \uparrow$.

Sticky Price

Now, suppose price cannot adjust and is fixed at the initial level:

- If firms & consumers are still optimizing, there is at least one market in disequilibrium.
 - Now we allow firms to hire and produce sub-optimally: at each interest rate r , they produce whatever level of output demanded Y^d at interest rate r by consumers and firms.
- Money and goods market always clear;
- However, it is no longer true that $MPN = w$;
- There is no longer a “supply curve” in the goods market: the production is “demand-driven”.
- Correspondingly, labor demand is also driven by output demand: the firm hires whatever amount it takes to produce demanded output, at whatever wage where labor supply fulfills the labor demand.

Sticky Price

Now, suppose price cannot adjust and is fixed at the initial level:

- If the central bank does nothing to M^s , then P and M remains at the initial level;
- Equilibrium output Y has to be the same as the initial level Y_1 , so that $M^d = M^s$.
- There is a gap between the equilibrium output under sticky price Y_1 and equilibrium output under flexible price Y_2 , which we call “**output gap**”:

$$\hat{Y} = Y_1 - Y_2 > 0$$

- A positive output gap means the firms are **over-producing**:
 - Firms would like to lower N and Y^s in response to lower z , but they cannot.
 - To guarantee market clearing, they have to produce at an **inefficient** level: $MPN < w$.

Sticky Price

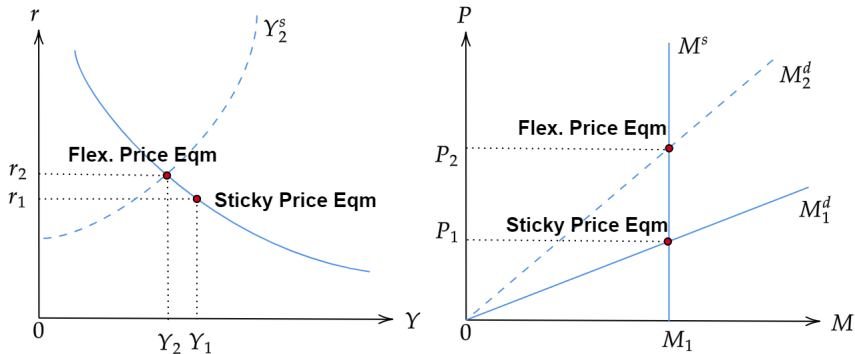


Figure: Sticky-price equilibrium vs flexible-price equilibrium in goods and money market.

Sticky Price

In sum, under sticky price, if central bank does nothing to M^s , then

- Equilibrium money in circulation M and equilibrium price level P remain fixed;
- Equilibrium output Y remain fixed at initial level;
- Equilibrium real interest rate r remain fixed at initial level;
- Equilibrium employment has to go up, since

$$Y = zK^\alpha N^{1-\alpha}$$

we know that $z \downarrow$ and Y remains unchanged, hence N has to go up.

- As a result, equilibrium wage w goes up.

Monetary Policy: Closing output gap I

Is it possible for the monetary policy to improve efficiency?

- Yes.
- Let central bank shifts M^s to

$$M_2^s = P_1 Y_2$$

where Y_2 is the flexible-price equilibrium output.

- $P_1 Y_2$ is the money demand when price is fixed at P_1 and output is at flexible price equilibrium Y_2 ;
- Basically, the central bank is “inducing” the firm to produce at the flexible-price level.

Monetary Policy: Closing output gap

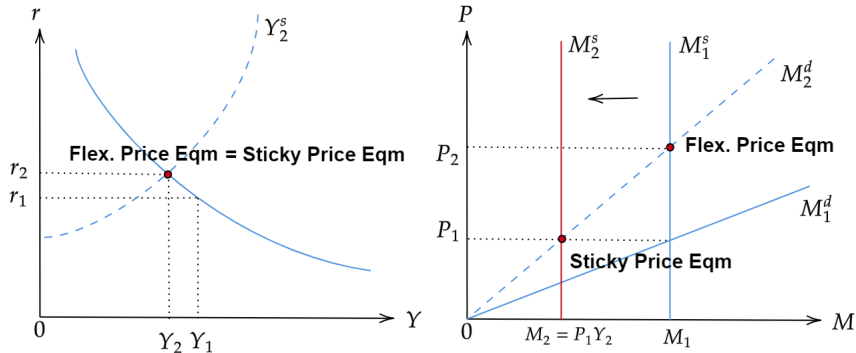


Figure: Monetary policy can “replicate” flexible-price equilibrium with a sticky-price equilibrium and close the output gap.

Monetary Policy: Closing output gap

- At M_2^s , money market clears, so that the goods market has to clear with equilibrium output Y_2 ;
- Real interest rate has to rise to r_2 , so that goods demanded by consumers and firms is exactly equal to Y_2 .
- Hence the firm produces at Y_2 , and it happens that Y_2 is efficient: $MPN = w$.
- Output gap is closed.