1 Review

1.1 Demand side

Changes in variables	IS	LM	AD
$A_{t+1} \uparrow$	Right	/	Right
$G_t \uparrow$	Right	/	Right
$G_{t+1} \uparrow$	Left	/	Left
Uncertainty	Left	/	Left
$M^s \uparrow$	/	Right	Right
$P_t \uparrow$	/	Left	/
$\pi^e_{t+1} \uparrow$	/	Right	Right

Summary:

- Factors that shift the IS curve will also shift the AD curve in the same direction.
- Factors other than the price level P_t that shift the LM curve will also shift the AD curve in the same direction.

Some tips on the LM curve:

- The AD curve is derived from the intersection of the IS curve and a set of LM curves. Each LM curve corresponds to a different price level.
- Factors other than the price level—such as the money supply or expected inflation—shift all LM curves in the IS-LM graph. As a result, these factors also shift the AD curve.
- Since the price level is on the y-axis of the AD curve graph, a change in price causes a movement along the AD curve, rather than a shift of the curve itself.
- When the price level changes, the economy "moves" from one LM curve to another, rather than experiencing a shift in all LM curves.

1.2 Supply side

Changes in variables	Simple Sticky Price	Partial Sticky Price	Flexible Price (Neoclassic)
$A_t \uparrow$	/	AS^f right, AS right	AS right
$\theta_t \uparrow$	/	AS^f left, AS left	AS left
$P_t \uparrow$	AS up	AS^f unchanged, AS up	/

1.3 Short summary

- Demand side
  - Real shock shifts the IS curve
  - Nominal shock shifts the LM curve
  - The AD curve shifts in the same direction as the shifts in IS or LM
- Supply side

  - Real shock shifts the vertical AS curve
  - Nominal shock shifts the upward-sloping or horizontal AS curve

- Both sides
  - Expansionary shock: normally shift right
  - Contractionary shock: normally shift left

- Intersections:
  - The output level associated with the IS and LM curves is always the same as that associated by the AD and AS curves (note that this refers to the AS curve(could be vertical, horizontal, or upwarsloping), not the AS^f curve).

2 Shocks in Neoclassical Model

Neoclassical Model:

- Vertical AS
- Output is determined by labor demand, labor supply, and production function

Shocks:

- Monetary policy: Increase(or decrease) in money supply M^s. If there is an increase in M^s:
  - LM shifts right.
  - AD is derived by the intersection of IS curve and a set of LM curves. So, AD shifts right. Then price goes up.
  - Because price goes up, then LM moves left
- Current tech shock: Increase(or decrease) in A_t. If there is an increase in A_t:
  - Supply side: N^d shifts right, production function curve shifts up. So, the output goes up. Then AS curve shifts right.
  - Since the equilibrium output is higher, the LM curve shifts right to remain consistent with the increased output.
- IS shock: IS curve shifts right or left. If IS curve shifts right:
  - AD is derived by the intersection of IS curve and a set of LM curves. So, AD curve shifts right. Then price goes up.
  - Because price goes up, then LM moves left.

3 Shocks in Simple Sticky Price Model

Simple sticky price model:

- Horizontal AS
- Output is determined by the intersection of AD curve and the horizontal AS curve

- The output determines the equilibrium level of labor and wages

Shocks:

- Monetary policy: Increase(or decrease) in money supply M^s. If there is an increase in M^s:
  - LM shifts right
  - AD is derived by the intersections of IS curve and a set of LM curves. Since the price level is fixed in this model, output goes up.
- Current tech shock: Increase (or decrease) in A_t. If there is an increase in A_t:
  - The production function curve shifts up.
  - In the simple sticky price model, the output is determined by the AD and AS curve, so the change in the supply side won't change the output level.
  - Because the production function curve shifts up(the economy becomes more productive but the output is fixed), the equilibrium level of wage and label decrease.
- IS shock: IS curve shifts right or left. If IS curve shifts right:
  - AD is derived by the intersections of IS curve and a set of LM curves. IS curve shifts right, so AD curve shifts right. The equilibrium output increases.
  - Given the production function, the equilibrium level of wage and labor go up because the economy has to produce more.
- Labor market shock: Increase(or decrease) in θ_t. If there is an increase in θ_t:
  - Output doesn't change since it is determined by the intersection of AD curve and AS curve.
  - N^s shifts right because workers become "lazier".
  - Given the output level, the equilibrium level of labor is fixed. But workers now becomes "lazier", firms have to offer a higher wage. So, the equilibrium level of wage goes up.
- "Cost-push" shock: Increase in the price level, $\bar{P}_t$:
  - In this model, output is determined by the intersection of AD curve and AS curve. The horizontal AS curve goes up, so the equilibrium level of output goes down.
  - Price level goes up, LM curve moves left.

4 Shocks in Partial Sticky Price Model

Partial sticky price model:

- Two aggregate supply curves:
  - AS^f: The AS curve under the flexible price assumption. It is vertical and determined by the labor market and the production function.
  - AS: The AS curve under the partial sticky price assumption. It is upward sloping. **The position of the upward-sloping AS curve is determined by the condition that the price level at the intersection of AS and AS^f must equal the predetermined sticky price**, $\bar{P}_t$.

  - Given the sticky price level, if AS^f moves, AS will move.

- The intersection of AD curve and upward-sloping AS curve determines the current price and output.

Shocks:

- Monetary policy: Increase(or decrease) in money supply M^s. If there is an increase in M^s:
  - No change in supply side. So, AS^f doesn't shift. The position of the upward-sloping AS curve is determined by the condition that the price level at the intersection of AS and AS^f must equal the predetermined sticky price. And the sticky price level doesn't change. So, AS curve doesn't shift.
  - LM curve shifts right.
  - AD curve shifts right. The current price level is determined by the intersection of AD curve and upward-sloping AS curve. So, the price level goes up.
  - Because the price level goes up, LM curve moves left a little.
  - From the AD-AS graph, an increase in actual output leads to higher equilibrium levels of labor and wages, similar to the simple sticky-price model.
- Current tech shock: Increase (or decrease) in A_t. If there is an increase in A_t:
  - N^d curve shifts right. The production function curve shifts up. So the output under the flexible price assumption goes up. AS^f shifts right.
  - Because AS^f shifts right. The sticky price level doesn't change. So, the price level at the intersection of AS and AS^f doesn't change. Then, AS curve shifts right.
  - The current output level and price level are determined by the intersection of AD curve and the upward-sloping AS curve. So, the current output level goes up. The current price level goes down.
  - Since the current price level goes down, the LM curve moves right.
  - From the AD-AS graph, an increase in actual output leads to higher equilibrium levels of labor and wages, similar to the simple sticky-price model.
- IS shock: IS curve shifts right or left. If IS curve shifts right:
  - No change in supply side. So, both AS^f and AS remain unchanged.
  - IS curve shifts right, so AD curve shifts right.
  - According to the intersection of AD curve and upward-sloping AS curve, both the current price level and output level go up.
  - Because the current price level goes up, LM curve moves left a little.
  - From the AD-AS graph, an increase in actual output leads to higher equilibrium levels of labor and wages, similar to the simple sticky-price model.
- Labor market shock: Increase(or decrease) in θ_t. If there is an increase in θ_t:
  - N^s shifts left. So, the long term output goes down.
  - The position of AS^f is determined by the labor market and production function curve. So, AS^f shifts left. Then AS also shifts left to keep the sticky price level unchanged.

  - The current price level is determined by the intersection of AD curve and the upward-sloping AS curve. So, the current price level goes up.
  - Because the current price level goes up, LM curve moves left.
  - From the AD-AS graph, an decrease in actual output leads to lower equilibrium levels of labor and wages, similar to the simple sticky-price model. However, since the N^d curve also shifts left, the equilibrium level of wage goes up.

- "Cost-push" shock: Increase in the price level, $\bar{P}_t$:
  - No change to the supply side. So, AS^f doesn't shift.
  - Since the sticky price level goes up, AS shift left. So, the current price level goes up.
  - LM curve moves left.
  - From the AD-AS graph, an decrease in actual output leads to lower equilibrium levels of labor and wages, similar to the simple sticky-price model.