1 Overview

1.1 Equations

Equations of the New Keynesian and Neoclassical models:

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$

$$N_t = N^s(w_t, \theta_t)$$

$$N_t = N^d(w_t, A_t, K_t)$$

$$P_t = \overline{P}_t + \gamma \left(Y_t - Y_t^f\right)$$

$$I_t = I^d(r_t, A_{t+1}, K_t)$$

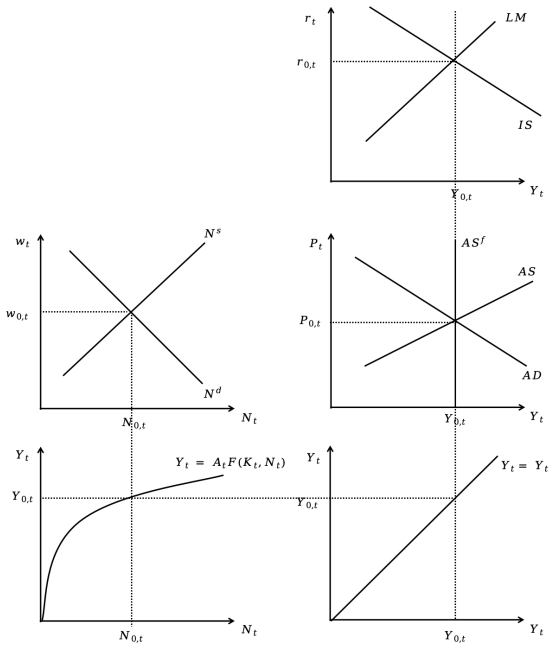
$$Y_t = A_t F(K_t, N_t)$$

$$Y_t = C_t + I_t + G_t$$

$$M_t = P_t M^d(r_t + \pi_{t+1}^e, Y_t)$$

$$r_t = i_t - \pi_{t+1}^e$$

1.2 Graph



2 Demand Side

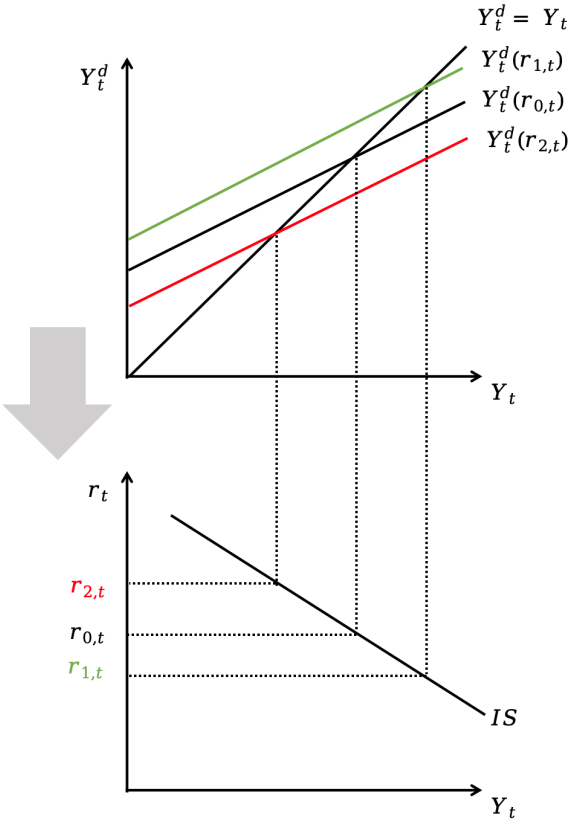
2.1 IS Curve

Ever point on the IS curve satisfies **goods market equilibrium**.

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$

$$I_t = I^d(r_t, A_{t+1}, K_t)$$

$$Y_t = C_t + I_t + G_t$$



Mechanism: $r \uparrow \Rightarrow I \downarrow$

Change in related factors other than r will shift the IS curve.

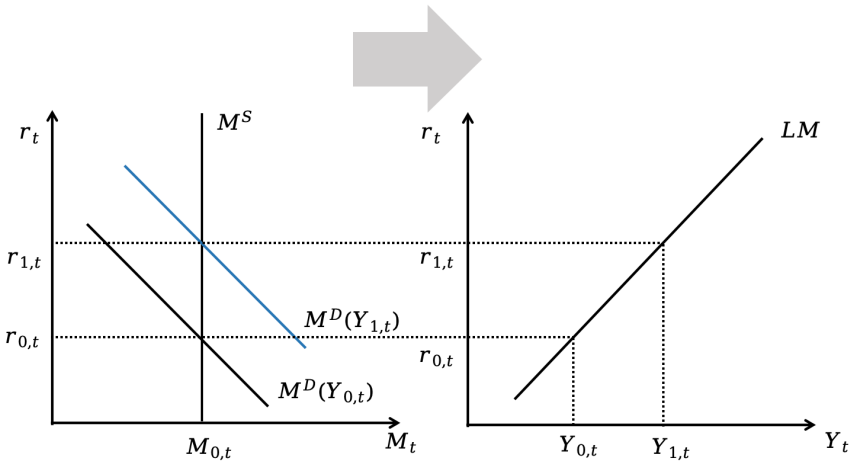
Change in Variable	Mechanism	Direction of Shift of IS
$A_{t+1} \uparrow$	Increase in I_t	Right
$G_t \uparrow$	Increase in G_t	Right
$G_{t+1} \uparrow$	Decrease in C_t	Left

2.2 LM Curve

Every point on the LM curve satisfies **money market equilibrium**

$$M_t = P_t M^d(r_t + \pi^e_{t+1}, Y_t)$$

$$r_t = i_t - \pi^e_{t+1}$$



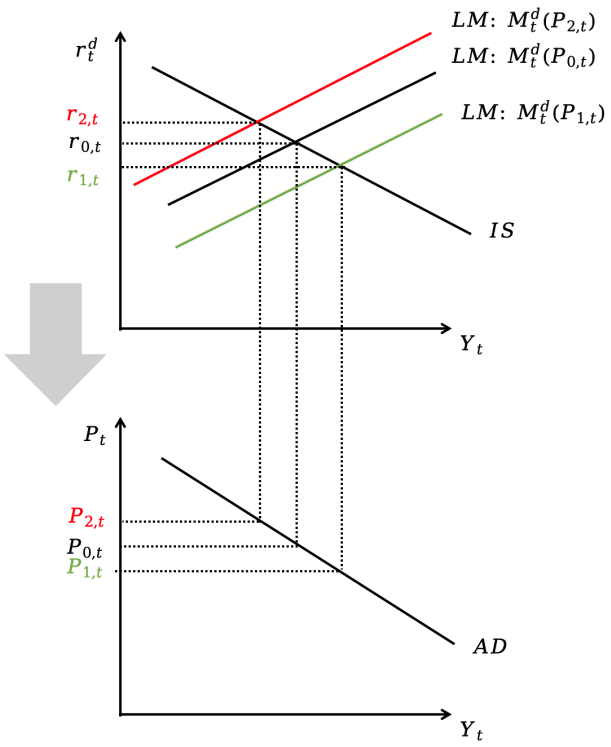
Mechanism: $Y \uparrow \Rightarrow M^d \uparrow$

Changes in related factors other than r will shift the LM curve.

Change in Variable	Mechanism	Direction of Shift of LM
$M^s \uparrow$	Increase in M^s	Right
$P_t \uparrow$	Increase in M^d	Left
$\pi^e_{t+1} \uparrow$	Decrease in M^d	Right

2.3 AD Curve

Every point on AD curve satisfies goods market equilibrium and money market equilibrium. Since it is derived by the intersection of IS curve and different LM curve.



Changes in related factors other than P will shift the AD curve.

Change in Variable	Mechanism	Direction of Shift of AD
$M^s \uparrow$	LM shifts right	Right
$\pi^e_{t+1} \uparrow$	LM shifts right	Right
$A_{t+1} \uparrow$	IS shifts right	Right
$G_t \uparrow$	IS shifts right	Right
$G_{t+1} \uparrow$	IS shifts left	Left
Uncertainty $\uparrow$	IS shifts left	Left

Tips:

- Expansionary shock will cause AD curve to shift right
- Contractionary shock will cause AD curve to shift left

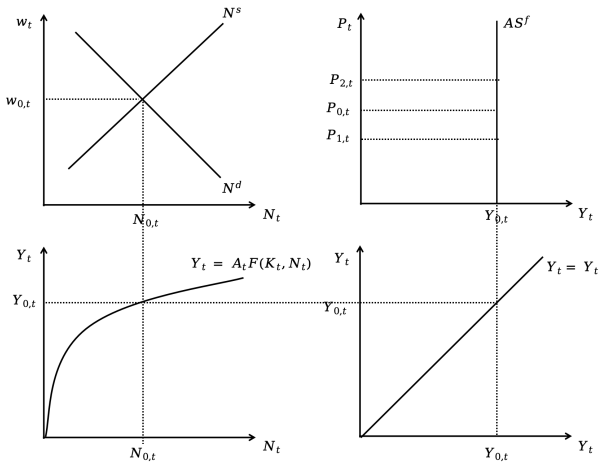
3 Supply Side: AS Curve

3.0.1 Flexible price: Vertical AS curve

Neoclassic aggregate supply:

- Price is fully flexible
- AS curve is vertical
- Output doesn't change no matter how the price level changes

$$N_t = N^s(w_t, \theta_t)$$
$$N_t = N^d(w_t, A_t, K_t)$$
$$Y_t = A_t F(K_t, N_t)$$



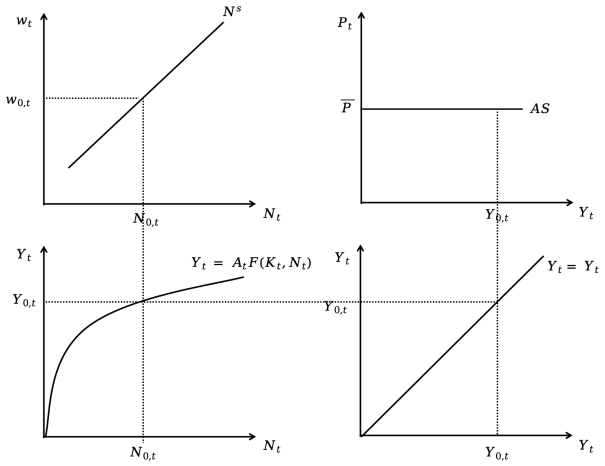
Change in Variable	Mechanism	Direction of Shift of AS
$A_t \uparrow$	N^d shifts right	Right
$\theta_t \uparrow$	N^s shifts left	Left

3.0.2 Simple sticky price: horizontal AS curve

Exogenous price level:

- Price is sticky
- AS curve is horizontal
- No N^d curve. Firms set their prices in advance and cannot adjust them, so firms hire workers based on what is available

$$N_t = N^s(w_t, \theta_t)$$
$$P_t = \bar{P}_t$$
$$Y_t = A_t F(K_t, N_t)$$



Change in Variable	Mechanism	Direction of Shift of AS
$P_t \uparrow$	Sticky price, output unchanged	Up

3.0.3 Partial sticky price: upward sloping AS curve

Combine the neoclassical case and simple sticky price case, New keynesian aggregate supply:

- Price is partial sticky
- AS curve is upward sloping
  - The Sticky-Wage Theory: Nominal wages are slow to adjust to changing economic conditions. Nominal wages are based on expected prices and do not respond immediately when the actual price level turns out to be different from what was expected.
  - The Sticky-Price Theory: Prices of some goods and services adjust slowly in response to changing economic conditions because there are costs to adjusting prices, called **menu costs**, such as the cost of printing and distributing new catalogs and the time it takes to change price tags. Failure to lower (raise) one's prices when the price level falls (rises) results in a fall (rise) in customers, motivating a decrease (increase) in production and hiring.
  - Misperceptions Theory: Changes in the overall price level can temporarily mislead suppliers about what is happening in the individual markets in which they sell their output, confusing overall prices changes with changes in the relative price of their good. Suppliers respond by changing the amount they produce, thereby affecting the overall quantity of goods and services available.

Short run: price is partial sticky

$$N_t = N^s(w_t, \theta_t)$$

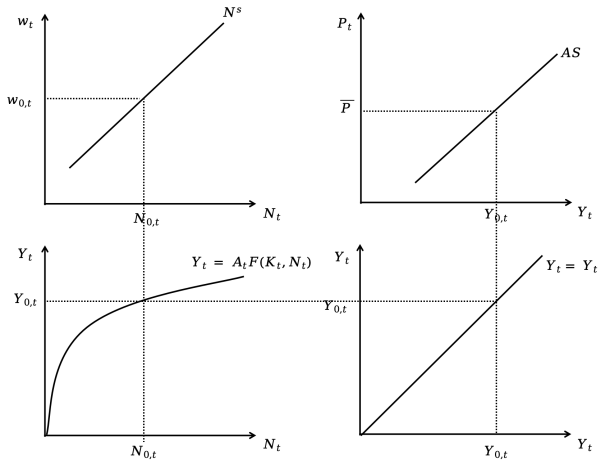
$$P_t = \overline{P}_t + \gamma \underbrace{(Y_t - Y_t^f)}_{\text{Output Gap}}$$

$$Y_t = A_t F(K_t, N_t)$$

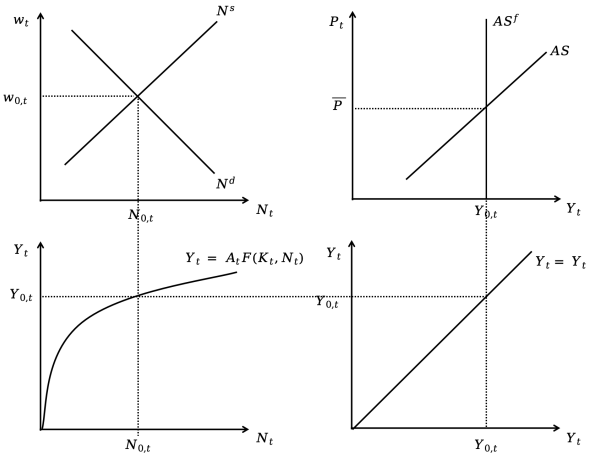
Long run: price is flexible

$$N_t^f = N^s(w_t^f, \theta_t)$$
$$N_t^f = N^d(w_t^f, A_t, K_t)$$
$$Y_t^f = A_t F(K_t, N_t^f)$$

Graph: Long run
Same as neoclassical case
Graph: Short run



Graph: Combine short run and long run cases



The intersection of AS and AS^f is $Y^f, \bar{P}$

Change in Variable	Direction of Shift of AS^f	Direction of Shift of AS
$A_t \uparrow$	Right	Right
$\theta_t \uparrow$	Left	Left
$P_t \uparrow$	Unchanged	Up(Left)