

Lecture 17

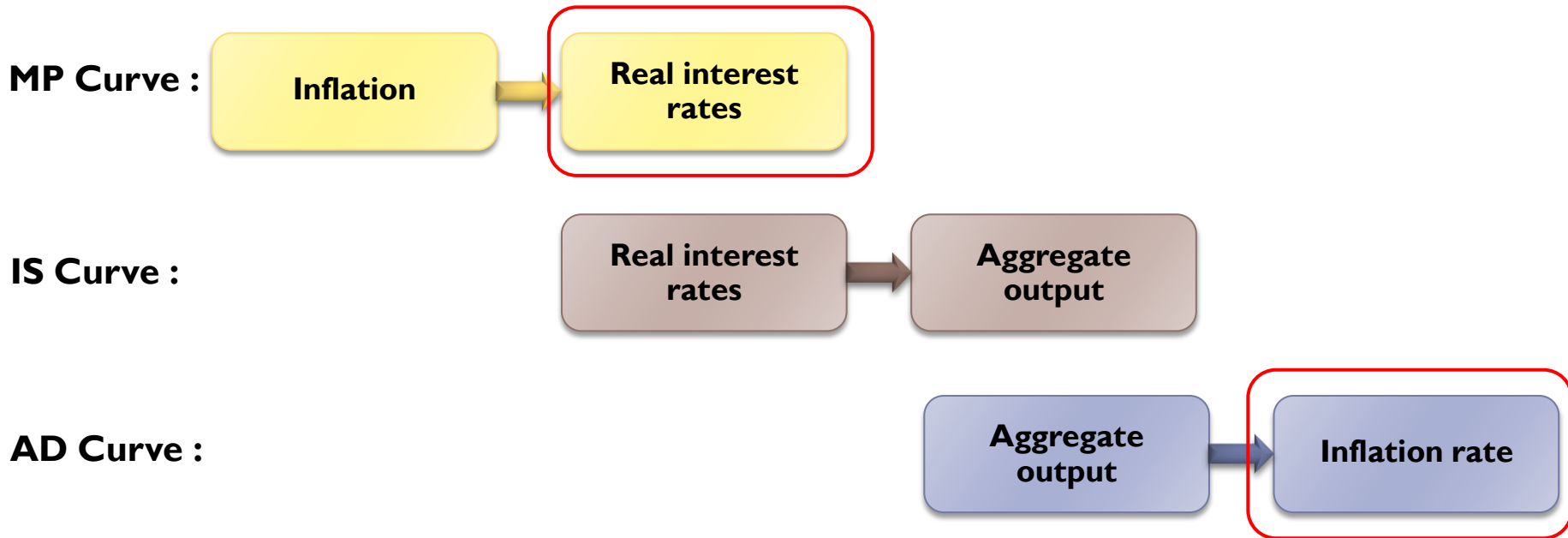
IS, Monetary Policy, and Aggregate Demand curve

What to explore:

- ▶ Aggregate demand (AD): basic model for explaining short run fluctuation in aggregate output.
- ▶ **AD curve** is derived from **IS curve** and **MP curve**.



How monetary policy action affects the economy?



IS Curve



IS Curve

- ▶ **IS curve** is relationship between real interest rates and aggregate output when the goods market is in equilibrium.
- ▶ It helps explain the following:
 - Why fluctuation in economic activity occur
 - How fiscal stimulus package affected economy
 - The role of monetary policy in economic fluctuations



IS curve

▶ **Aggregate Demand** : $Y^{ad} = C + I + G + NX$

Y^{ad} = aggregate demand for goods & service (planned expenditure)

▶ **Equilibrium**: $Y = Y^{ad}$

Y = actual amount of goods and services produced

Aggregate demand explains the level of aggregate output when goods market is in equilibrium

▶ Aggregate demand (Y^{ad}) = sum of 4 types of spending:

- 1) Consumption expenditure (C)
 - 2) Planned investment expenditure (I)
 - 3) Government purchase (G)
 - 4) Net export (NX)
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Consumption expenditure (C)

Consumption Function: $C = \bar{C} + (mpc \times Y_D)$

- ▶ $\bar{C}$ is autonomous consumption (amount of consumption expenditure that is exogenous (such as optimism about future income, household wealth)
- ▶ mpc is marginal propensity to consume (change in consumption expenditure that result from additional dollar of disposable income)
- ▶ Y_D is disposable income (income after tax)

Planned investment expenditure (I)

- ▶ Only planned investment is included in Y^{ad}
- ▶ Investment means purchase of real physical asset that add to Y^{ad} . It is not the purchase of common stock or bond that do not necessarily produced goods and services.

Investment

1. Fixed investment: planned spending on equipment, structure, new housing.
2. Inventory investment: spending on additional holding of raw materials, parts, finished goods (only planned inventory investment is counted in Y^{ad})



Planned investment expenditure (I)

Investment function:

I = planned investment spending

$\bar{I}$ = autonomous investment spending

r = interest rate on default free debt instrument

$\bar{f}$ = financial friction (from asymmetric information in financial market)

d = response of investment to real cost of borrowing

$$I = \bar{I} - d(r - \bar{f})$$



Planned investment expenditure (I)

▶ Planned investment and real interest rates:

Real interest rate on loan is low $\rightarrow$ real interest cost of borrow fund low $\rightarrow$ firm invest more in physical capital $\rightarrow$ planned investment spending $\uparrow$

Real interest rate and opportunity cost of investing $\downarrow \rightarrow$ invest in physical capital give higher return than security

▶ Planned investment and business expectation:

Planned investment spending is heavily influenced by business expectation about the future, which is autonomous investment (). It is completely exogenous and is unexplained by output and interest rates. It is emotional waves of optimism and pessimism $\rightarrow$ animal spirits.



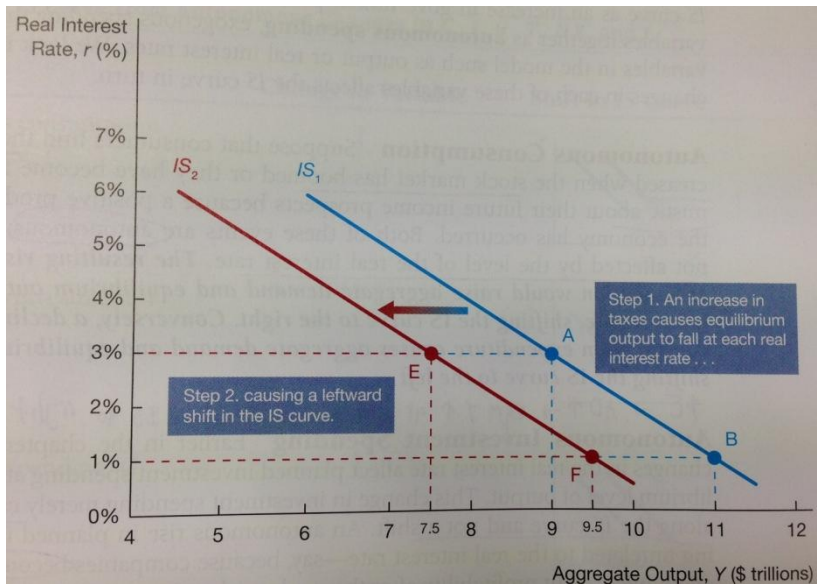
Net exports (NX)

- ▶ **Net export function:** $NX = \overline{NX} - xr$
 - ▶ $\overline{NX}$ is autonomous net export: the level of net export that is treated as exogenous (such as poor harvest in foreign country resulting in higher foreign demand for domestic goods, higher demand by domestic residents for foreign goods due to the change in taste).
 - ▶ x is response of net export to real interest rates
 - ▶ Real interest rates affect the amount of net export through exchange rate. (domestic real interest rate $\uparrow \rightarrow$ relative return on domestic asset $\uparrow \rightarrow$ demand for domestic asset $\uparrow \rightarrow$ local currency appreciate $\rightarrow$ export more expensive in foreign currency, import good less expensive in domestic currency $\rightarrow$ import $\uparrow$, export $\downarrow \rightarrow$ net export $\downarrow$)
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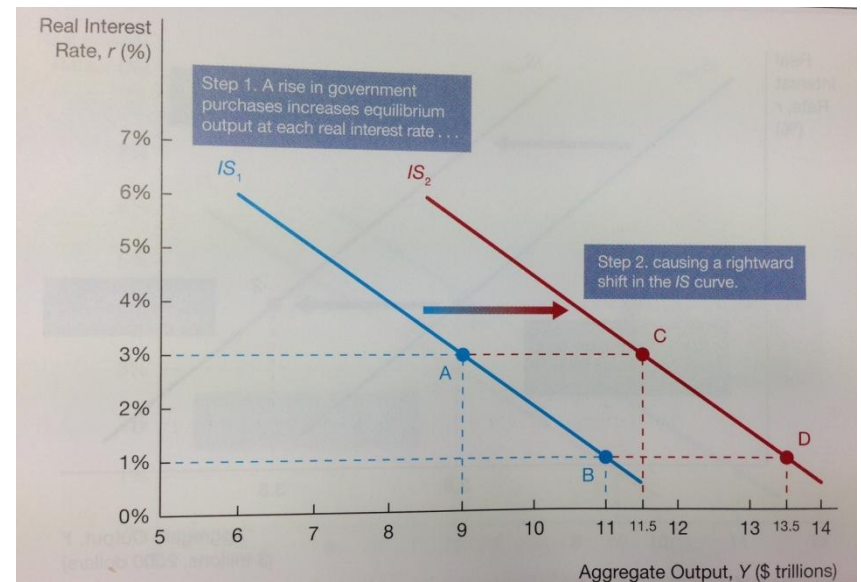


Shift in IS curve

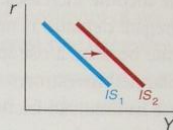
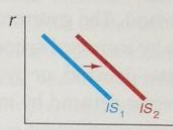
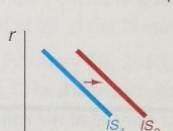
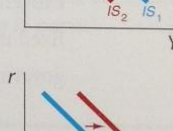
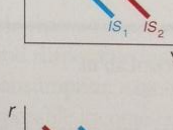
Increasing tax



Increasing government purchase



Shift in IS curve from autonomous changes

Variable	Change in Variable	Shift in IS Curve	Reason
Autonomous consumption expenditure, $\bar{C}$	$\uparrow$		$C \uparrow Y \uparrow$
Autonomous investment, $\bar{I}$	$\uparrow$		$I \uparrow Y \uparrow$
Government spending, $\bar{G}$	$\uparrow$		$G \uparrow Y \uparrow$
Taxes, $\bar{T}$	$\uparrow$		$T \uparrow \Rightarrow C \downarrow Y \downarrow$
Autonomous net exports, $\bar{NX}$	$\uparrow$		$\bar{NX} \uparrow Y \uparrow$
Financial frictions, $\tilde{f}$	$\uparrow$		$I \downarrow Y \downarrow$

MP Curve



Monetary Policy curve

- ▶ MP curve explain change in **real interest rates** set by monetary authority in response to change in **inflation rate**.
- ▶ Central bank set nominal short term interest rates and implicitly control real interest rates.

$$\text{Real interest rates } (r) = \text{nominal interest rates } (i) - \text{expected inflation } (\pi^e)$$

- ▶ i can change r only if *actual* π and π^e remain unchanged in short run.
 - ▶ Prices typically are slow to move that is they are sticky—changes in monetary policy will not have an immediate effect on inflation and expected inflation.
 - ▶ ***When central bank lowers policy rates, real interest rates fall.***
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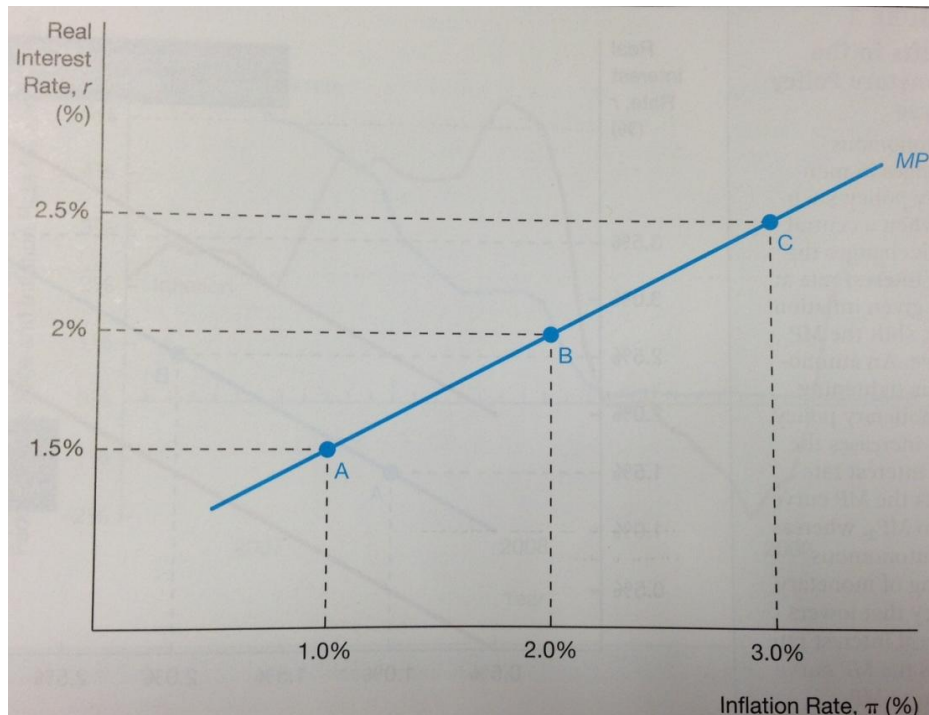


MP Curve

- ▶ MP curve: $r = \bar{r} + \gamma\pi$
- ▶ $\bar{r}$ is autonomous component of real interest rate set by monetary authority (factor unrelated to current level of inflation rate).
- ▶ γ is responsiveness of real interest rate to inflation rate.
- ▶ MP curve is upward sloping indicating that monetary policy makers raise real interest rates when inflation rate rises.



Automatic change: movement along MP Curve

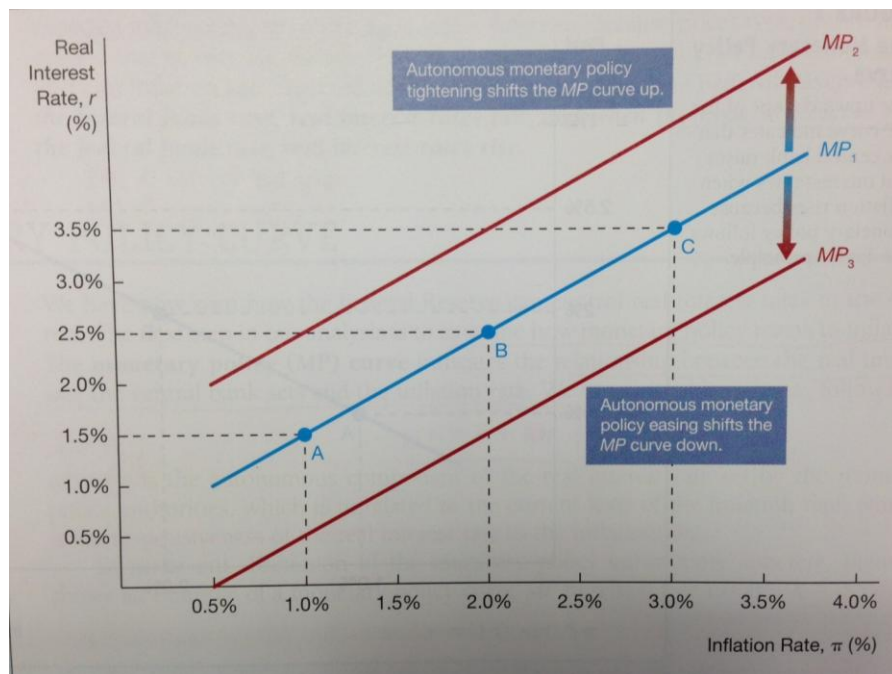


Central bank seek to keep inflation stable.

Taylor principle: monetary policy makers raise nominal interest rates by more than any rise in expected inflation.

The Taylor principle driven change reflects movement along MP curve, which are called automatic adjustments to interest rates

Autonomous change: a shift in MP curve



Bank may have information above and beyond what is happening to inflation that suggest interest rates must be adjusted to achieve good economic outcomes.

Autonomous easing of monetary policy:

if economy is going into recession, policymaker would want to ↓ real interest rate at any given inflation rates → shift MP curve downward → stimulate economy → prevent inflation from falling

Autonomous tightening of MP:

Shift MP curve upward → economy contract → inflation ↓

AD Curve

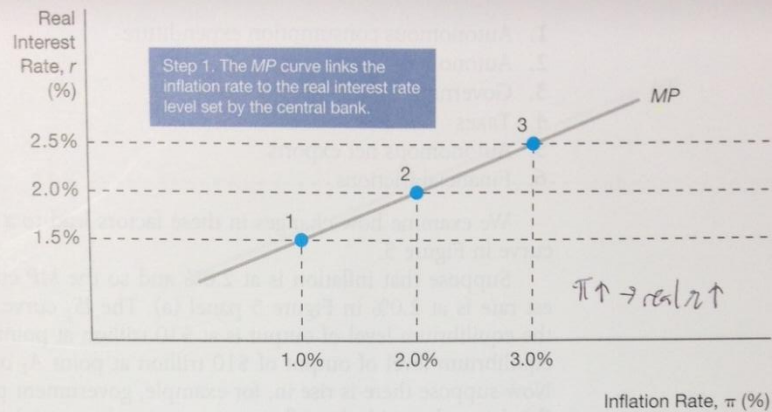


Aggregate demand curve

- ▶ AD curve explain relationship between **inflation rate** and **aggregate output** demanded when the goods market is in equilibrium (all other variables are held constant).
- ▶ Combining IS and MP to get AD; we can now link aggregate output demand with inflation rate, given public's expectations of inflation and the stance of monetary policy.
- ▶ Downward sloping AD curve:
Inflation rate $\uparrow \rightarrow$ central bank $\uparrow$ real interest rates $\rightarrow$ planned investment spending $\downarrow \rightarrow$ equilibrium aggregate output $\downarrow$



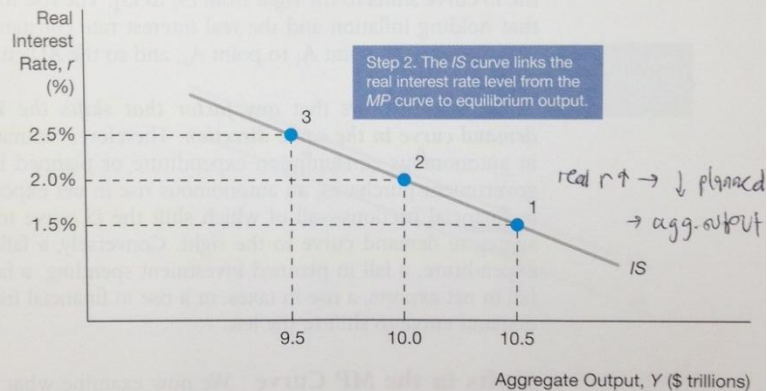
(a) MP Curve



MP:

$\text{inflation}(\pi) \uparrow \rightarrow \text{real interest rate } (r) \uparrow$

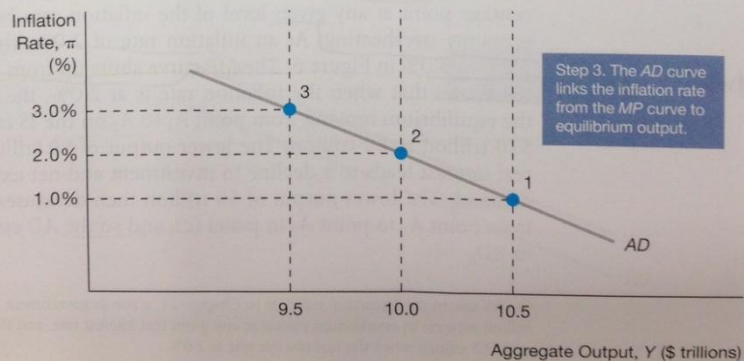
(b) IS Curve



IS:

$r \uparrow \rightarrow \text{aggregate output } \downarrow$

(c) Aggregate Demand Curve



AD:

$\pi \uparrow \rightarrow \text{aggregate output } \downarrow$

Factors that shift AD curve

- ▶ Movement along AD curve:

Describe how equilibrium level of aggregate output changes when the inflation rate changes.

- ▶ Shift in AD curve:

describes factors besides the inflation rate changes. Shift in AD curve comes from

- 1) Factors that shift IS curve

(autonomous consumption expenditure, autonomous investment spending, government purchases, taxes, autonomous net export, financial frictions)

- 2) Factors that shift MP curve

(autonomous tightening/loosening monetary policy)



Shift in AD curves

- ▶ Shift in AD curve means aggregate demand increases at any given inflation rate.
- ▶ AD curves shift to the right when there is demand shocks as follows:
 1. Autonomous easing of monetary policy ($\bar{r} \downarrow$)
 2. Increase in government purchase
 3. Decreases in taxes
 4. Increase in net export ($\overline{NX} \uparrow$)
 5. Increase in autonomous consumption expenditure ($\bar{C} \uparrow$)
 6. Increase in autonomous investment ($\bar{I} \uparrow$)
 7. Decrease in financial friction

Conversely AD curve shift to the left when all of these factors changes in opposite direction.

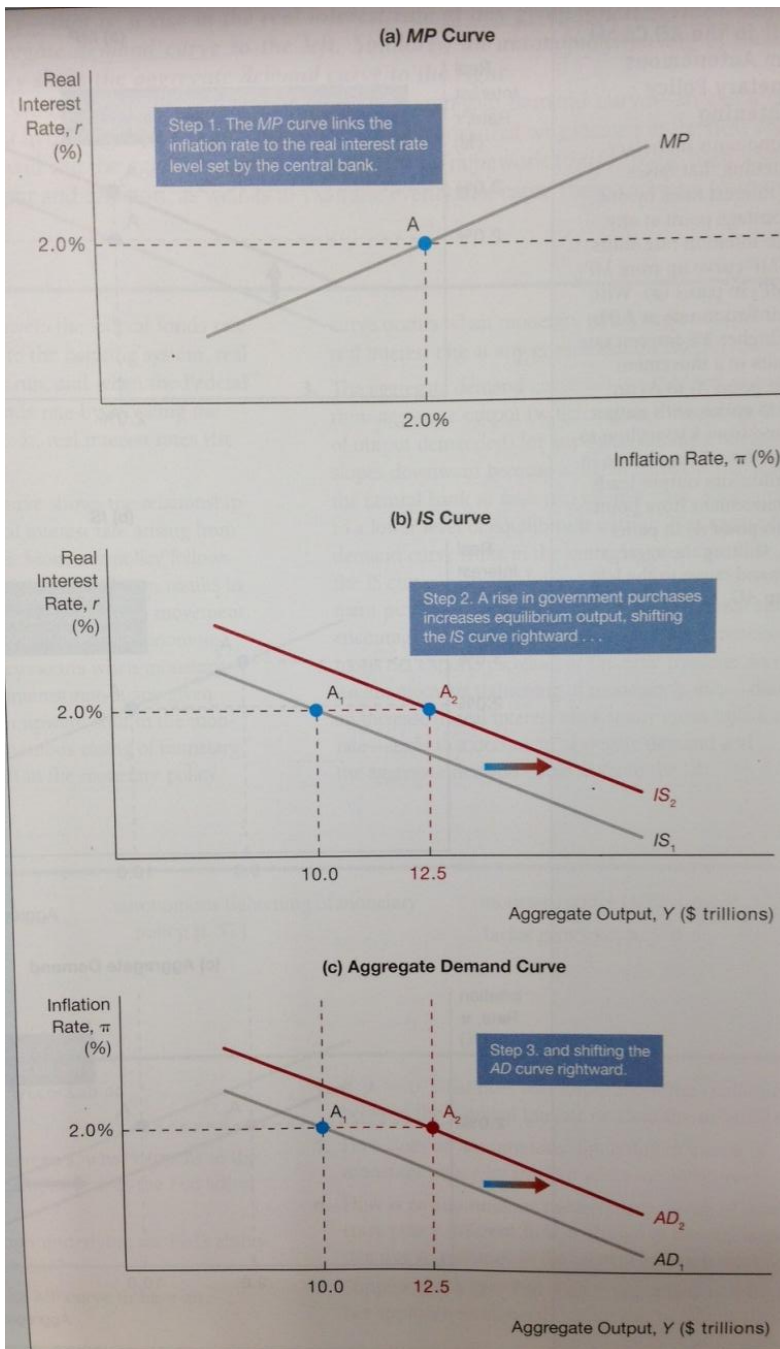


Shift in IS curve

Inflation rate is at 2%, MP curves show that real interest rates is at 2%

Increase government spending shift IS curve to the right

At a given inflation rate and real interest rates of 2%, equilibrium output rises to \$12.5T, shifting AD curve to the right



Shift in MP curve

Autonomous monetary tightening:
raising interest rates by 1% at any
given inflation rates (2% equilibrium)
shift the MP curve to the left

At inflation rate 2%, the higher
interest rates results in movement
along IS curve (equilibrium output ↓)

Inflation is the same but output
decline at any given level of inflation
→ AD curve shift to the left

