Course Companion

AP Macroeconomics

Every topic handout in one volume

全部专题讲义合集

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Basic Economic Concepts

AP Macroeconomics

Scarcity



An open-pit mine: land and minerals are scarce resources with opportunity cost

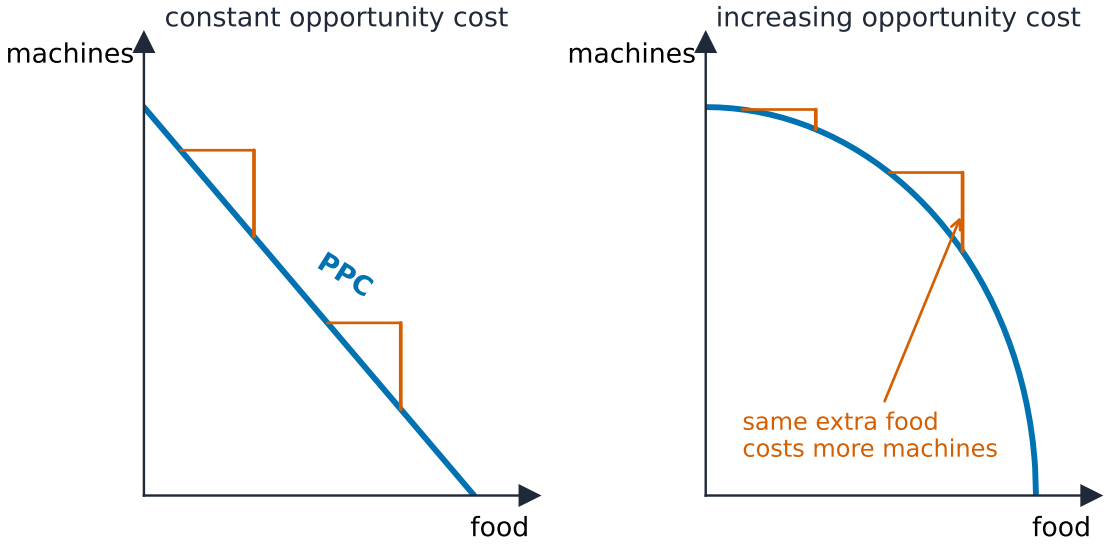
In April 2020, General Motors turned part of its plant in Kokomo, Indiana – a factory that made electronics for cars – into a line building hospital ventilators. The workers' time, equipment and materials had alternative uses, so producing ventilators involved opportunity costs. No society can have everything it wants, so every use of a resource is a choice against another use. That is where economics starts.

Economics 经济学 begins with **scarcity** 稀缺性: people's wants are unlimited, but the **resources** 资源 to satisfy them are limited. The resources – the **factors of production** 生产要素 – are **land**, **labor** 劳动, **capital** 资本, and **entrepreneurship** 企业家才能. Scarcity forces every society to choose **what**, **how**, and **for whom** to produce, and it makes **trade-offs** 权衡 unavoidable.

Who makes the choices? In a **market economy** 市场经济 the "what, how and for whom" questions are answered mostly by prices and private decisions; in a **command economy** 计划经济 a government plans them. Real economies, including the US and China, are **mixed economies** 混合经济: markets decide most production, and government provides things such as defence, roads and schooling.

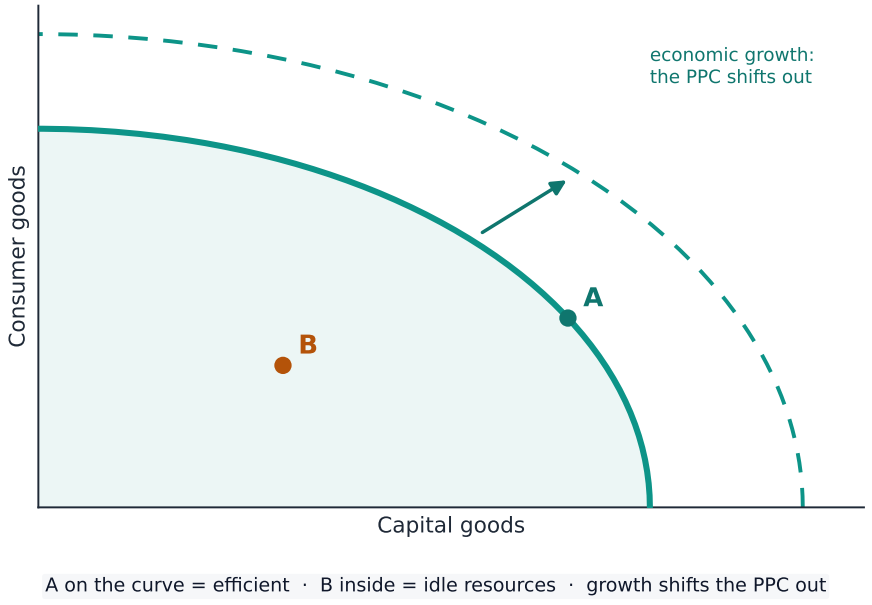
Opportunity Cost and the Production Possibilities Curve (PPC)

Every choice has an **opportunity cost** 机会成本 – the value of the next-best alternative given up. The **production possibilities curve (PPC)** 生产可能性曲线 shows the maximum combinations of two goods an economy can make when resources are fully and efficiently used.



A straight PPC means constant opportunity cost; a bowed one means increasing cost

- Points **on** the curve are efficient; **inside**, inefficient (unemployed resources); **outside**, unattainable.
- The downward slope shows opportunity cost; a **bowed-out** curve shows **increasing opportunity cost**.
- More resources or better technology cause **economic growth** 经济增长, shifting the PPC **outward**.



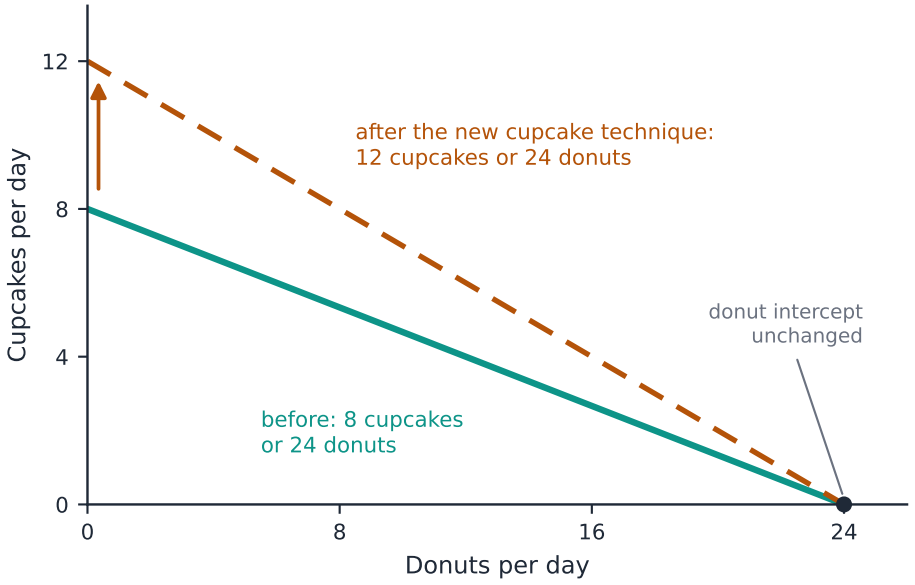
A production possibilities curve; investing in capital goods shifts it outward

Reading a PPC with numbers. Suppose an economy's PPC passes through these points (capital goods, consumer goods): $(0, 100)$, $(10, 90)$, $(20, 70)$, $(30, 40)$, $(40, 0)$. Moving from 10 to 20 capital goods costs $90 - 70 = 20$ consumer goods, so each capital good costs 2. From 30 to 40 the cost is 40 consumer goods, 4 each. The cost per unit **rises**, so the curve is bowed out: resources are **not equally good** at making both goods, and the economy moves the least suitable ones last.

Today's choice shifts tomorrow's curve. A country that picks a point with more **capital goods** (machines, factories, infrastructure) gives up consumer goods now, but its PPC shifts out faster in the future. A country that picks mostly consumer goods enjoys more now and grows more slowly.

When technology improves for one good only, the PPC does not shift in parallel: it **pivots** outward along that good's axis, and the other intercept stays fixed.

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A new cupcake technique raises only the cupcake intercept, so the PPC rotates outward about the donut axis.

Common mistakes. Shifting the whole PPC out when only one good's technology changed; drawing a recession as an inward shift (a recession puts the economy at a point **inside** an unchanged PPC – the resources still exist but sit idle); and drawing a straight PPC when the question says opportunity cost is increasing.

Comparative Advantage and Gains from Trade

A producer has an **absolute advantage** 绝对优势 in a good if it can make more of it. It has a **comparative advantage** 比较优势 if it has the **lower opportunity cost**. Nations should specialize in their comparative-advantage goods and trade – both gain if the **terms of trade** 贸易条件 lie between the two opportunity costs. Trade lets a country consume beyond its own PPC.

> **Worked example.** Country A can make 10 wheat **or** 5 cloth per day; Country B can make 8 wheat **or** 8 cloth. For A, one cloth costs $\frac{10}{5} = 2$ wheat; for B it costs $\frac{8}{8} = 1$ wheat. B's opportunity cost of cloth is lower, so **B specializes in cloth**. Checking wheat: A gives up 0.5 cloth per wheat and B gives up 1, so **A specializes in wheat**. Trading at any rate between the two costs, both consume beyond their own PPC.

Check the gains with numbers. Before trade, each country splits its day in half: A makes 5 wheat and 2.5 cloth, B makes 4 wheat and 4 cloth. After specializing, A makes 10 wheat and B makes 8 cloth. They trade 4 wheat for 3 cloth, a price of $\frac{4}{3} \approx 1.33$ wheat per cloth, which lies between B's cost (1) and A's cost (2). A now has 6 wheat and 3 cloth; B has 4 wheat and 5 cloth. Both have more than before, so both points lie outside their own PPCs.

Output or input data? AP questions give one of two kinds of table, and the method differs.

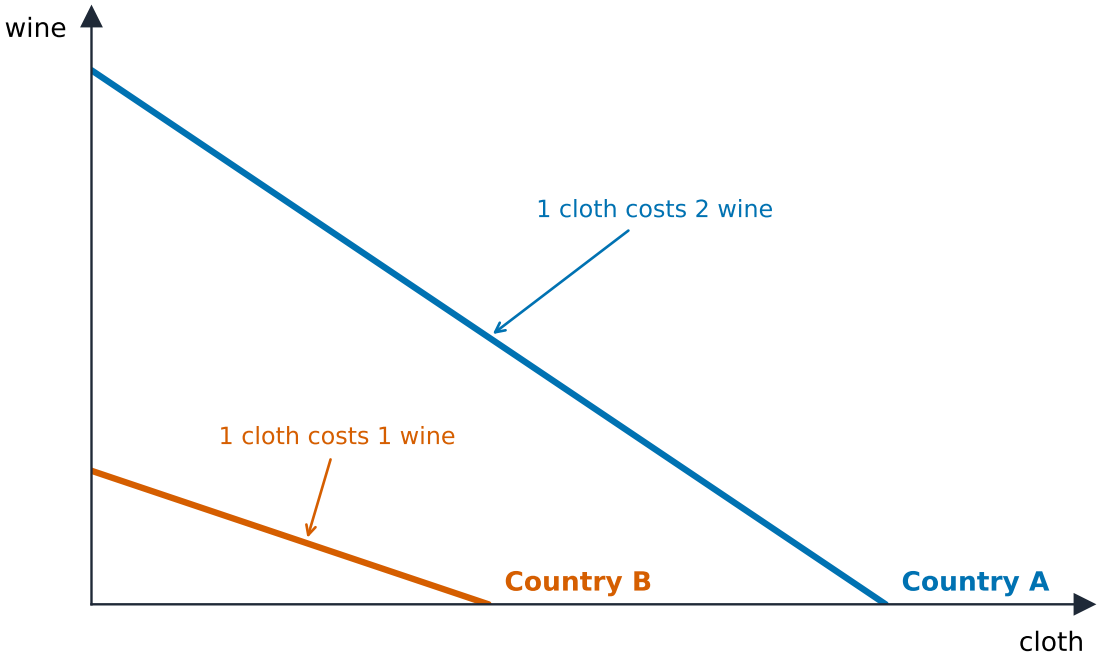
- **Output** (units made with the same resources), as above: the opportunity cost of good X is $\dfrac{\text{units of Y}}{\text{units of X}}$ ("other over").
- **Input** (hours or workers needed to make one unit): the opportunity cost of X is $\dfrac{\text{hours per X}}{\text{hours per Y}}$ ("same over").

Input example. Country C needs 2 hours for a shirt and 4 hours for a bike; Country D needs 3 hours for a shirt and 9 hours for a bike. C has the absolute advantage in both goods (fewer hours each). One shirt costs C $\frac{2}{4} = 0.5$ bike but costs D only $\frac{3}{9} \approx 0.33$ bike, so **D has the comparative advantage in shirts**. One bike costs C $\frac{4}{2} = 2$ shirts but costs D $\frac{9}{3} = 3$ shirts, so **C has the comparative advantage in bikes**.

> **Worked example (should a country import?).** Country X can make 10 solar panels or 30 furnaces with its resources. At home, one solar panel costs $\frac{30}{10} = 3$ furnaces. If the terms of trade are 2 furnaces for 1 solar panel, X can get a panel by trading only 2 furnaces – less than the 3 it would give up to make one. So X should **import** solar panels and make furnaces. A country gains from trade whenever the terms of trade are better than its own opportunity cost.

> **Worked example (individuals).** Erica can bake 8 cupcakes or 24 donuts a day; John can bake 6 cupcakes or 30 donuts. John has the absolute advantage in donuts ($30 > 24$); Erica has it in cupcakes. A cupcake costs Erica 3 donuts and John 5 donuts, so Erica has the comparative advantage in cupcakes and John in donuts. At 1 cupcake for 4 donuts, Erica gets 4 donuts for each cupcake instead of the 3 she could make herself, and John pays 4 donuts for a cupcake instead of 5: trade benefits **both**.

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Comparative advantage comes from differently-sloped production possibilities curves



Container shipping: comparative advantage and trade let countries specialise and gain

Demand

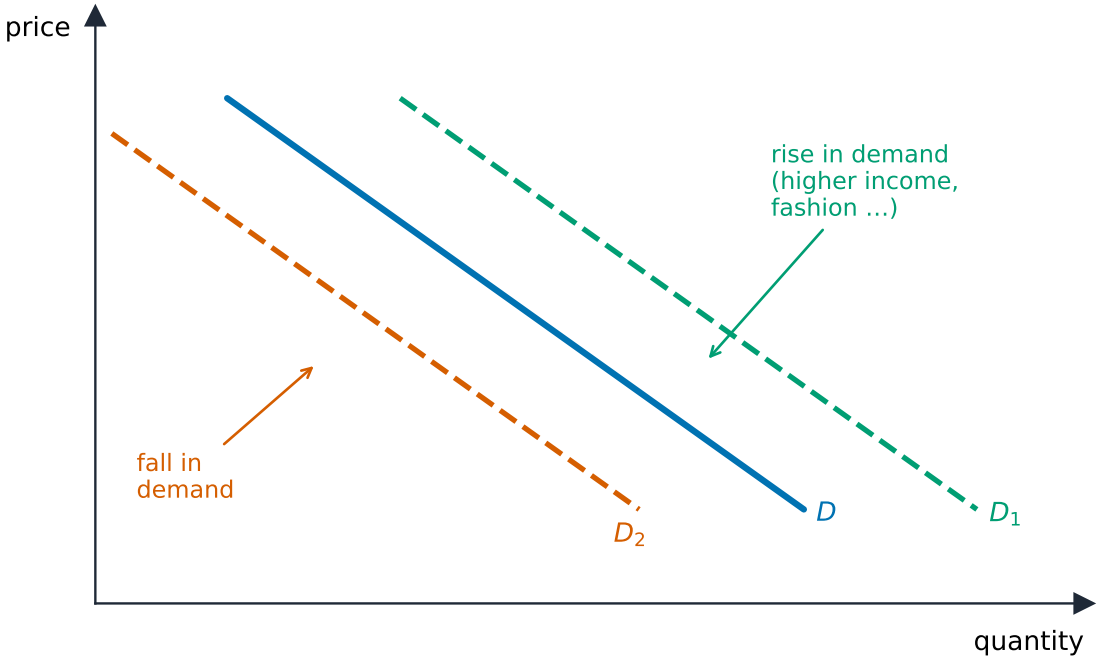
Demand 需求 relates price to the quantity buyers will buy. The **law of demand** 需求定律 makes the curve slope **downward**. A change in the good's **own price** is a movement along the curve; the **determinants** (income, tastes, prices of **substitutes**

替代品 and **complements** 互补品, number of buyers, expectations) **shift** the whole curve.

Shift or movement? A change in the good's own price changes the **quantity demanded** 需求量 (a movement along the curve). Anything else changes **demand** (a shift).

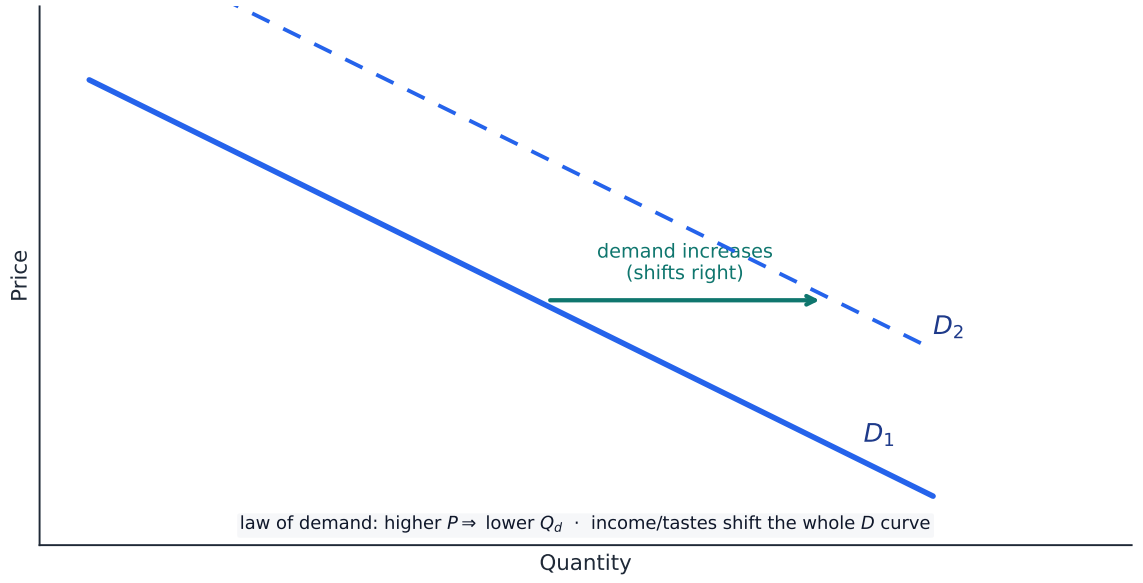
- Income rises: demand for a **normal good** 正常品 (restaurant meals) shifts right; demand for an **inferior good** 低档品 (instant noodles, bus rides) shifts left.
- The price of coffee rises: demand for tea (a substitute) shifts right; demand for coffee filters (a complement) shifts left.
- Buyers expect the price to rise next month: demand shifts right **now**.

Common mistake. "The price of pizza rose, so demand for pizza fell." The price change causes a fall in **quantity demanded**, not a shift of demand.



The demand curve slopes down; income, tastes, and related prices shift it

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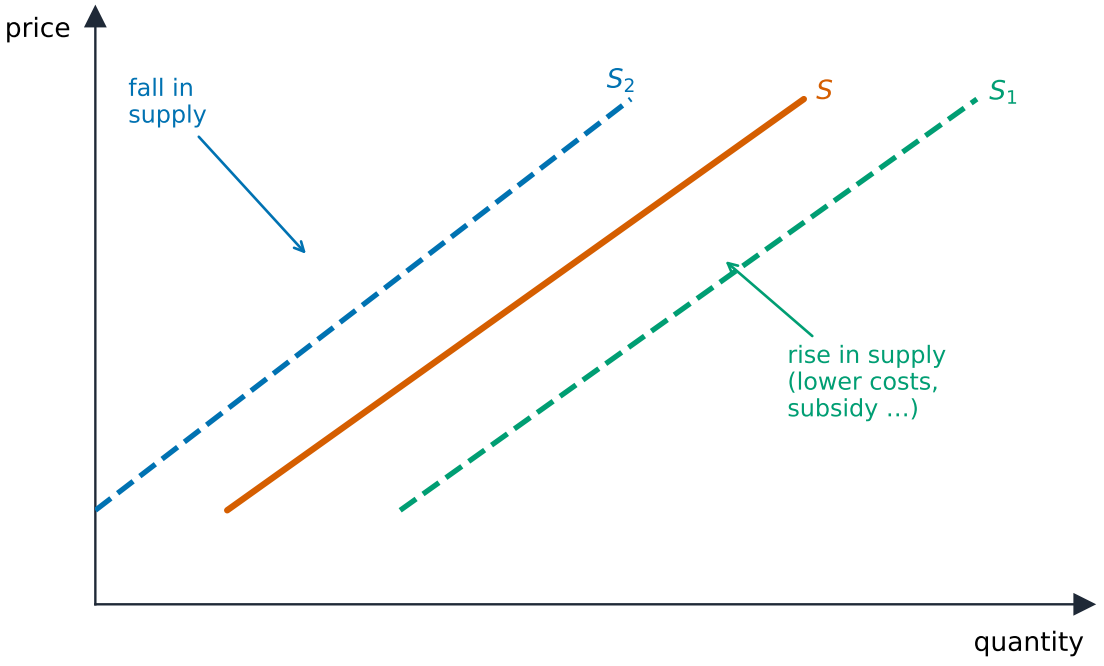
The law of demand slopes the curve downward; a determinant shifts the whole curve

Supply

Supply 供给 relates price to the quantity sellers will offer; the **law of supply** 供给定律 makes it slope **upward**. Its determinants – input prices, technology, taxes and **subsidies** 补贴, number of sellers, expectations – shift the curve, while the good's own price moves along it.

Likewise, a change in the good's own price changes the **quantity supplied** 供给量, while a change in a determinant shifts supply. Examples: higher wages for bakers shift the supply of bread left; a better oven technology shifts it right; a per-unit tax shifts it left (up by the tax); a subsidy shifts it right.

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The supply curve slopes up; costs, technology, tax, and subsidy shift it

Market Equilibrium, Disequilibrium, and Changes in Equilibrium



A busy market: demand and supply meet where buyers and sellers agree a price

Equilibrium 均衡 is where supply meets demand, clearing the market. Above the equilibrium price a **surplus** 过剩 pushes price down; below it a **shortage** 短缺 pushes

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price up. When a determinant shifts one curve, price and quantity move predictably; when both shift, one of them is **indeterminate**.

> **Worked example.** A new technology lowers producers' costs, shifting **supply right**. Along the unchanged demand curve, the equilibrium **price falls** and the equilibrium **quantity rises**. If instead a rise in incomes shifts **demand right** at the same time, quantity clearly rises but the effect on price depends on which shift is larger – the "both shift" indeterminate case.

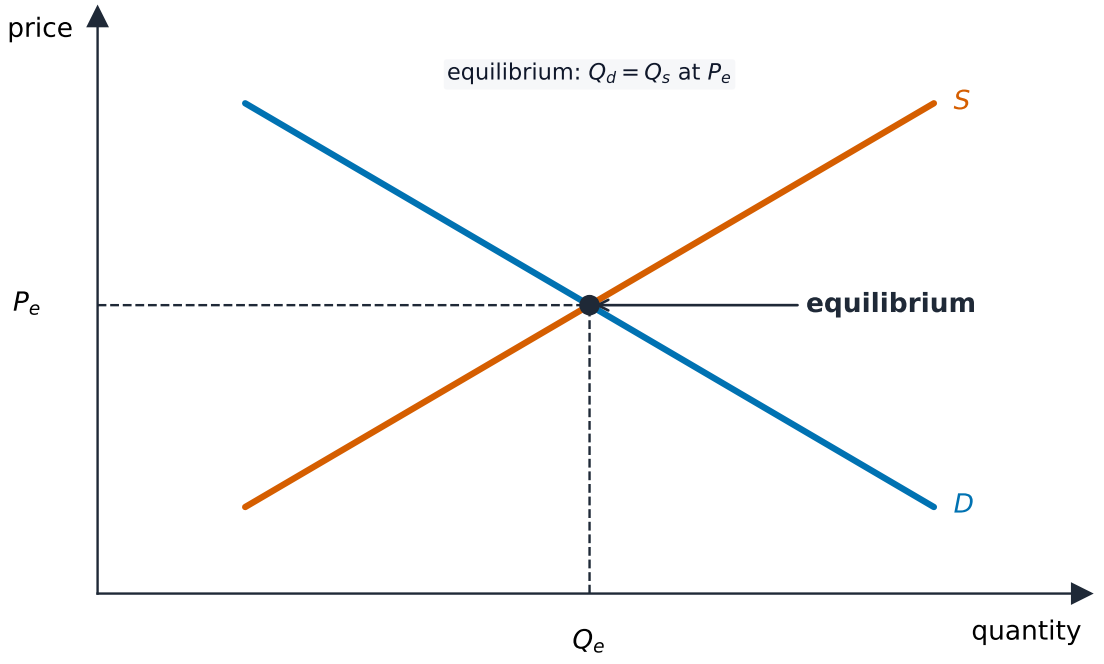
Both curves shift	Price	Quantity
demand right, supply right	indeterminate	rises
demand left, supply left	indeterminate	falls
demand right, supply left	rises	indeterminate
demand left, supply right	falls	indeterminate

When the two shifts move one variable in the same direction, that variable's change is certain; the other depends on which shift is larger.

> **Worked example (numbers).** Demand is $Q_d = 100 - 2P$ and supply is $Q_s = 3P - 20$. Setting $Q_d = Q_s$: $100 - 2P = 3P - 20$, so $P = 24$ and $Q = 52$. At a price of 20, $Q_d = 60$ and $Q_s = 40$: a **shortage** of 20 units, so buyers bid the price up towards 24. At a price of 30, $Q_d = 40$ and $Q_s = 70$: a **surplus** of 30, so sellers cut the price.

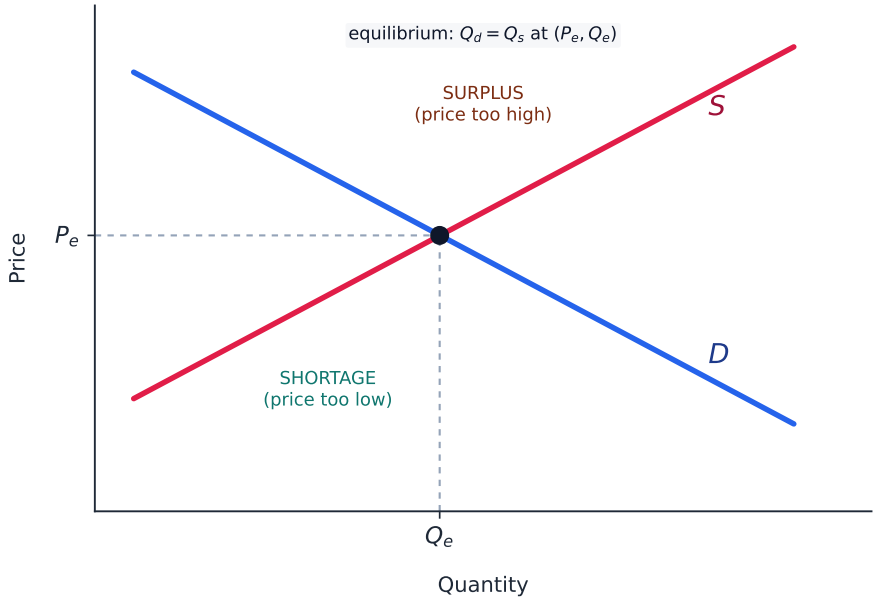
A real case. An outbreak of bird flu in 2022 killed tens of millions of US egg-laying hens. Supply shifted left, and because people keep buying eggs when prices rise, the price rose sharply: the average US price of a dozen large eggs reached $4.82 in January 2023, more than double its level a year earlier.

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Equilibrium price and quantity where demand meets supply

Exam skill: macro builds on these micro tools – you must draw and shift supply-and-demand and PPC graphs correctly, because the same shift logic drives the aggregate (whole-economy) models later in the course.



Market equilibrium sits where supply meets demand; away from it lie surplus and shortage

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Exam tips

- Opportunity cost is what you **give up** – read it off a PPC as the slope; a bowed-out PPC shows increasing opportunity cost.
- **Comparative advantage** (lower opportunity cost), not absolute advantage, decides who should specialise and trade.
- Points inside the PPC are inefficient, outside unattainable; more resources/technology shift it out (growth).
- Check whether a trade table gives **output** (units made: "other over") or **input** (hours per unit: "same over") before computing opportunity cost.
- Distinguish a **movement along** a demand/supply curve (own price) from a **shift** (a determinant).
- These micro tools drive the aggregate models later – draw and shift the correct curve in the correct direction.

Practice.

1. A PPC is drawn with consumer goods on the horizontal axis and capital goods on the vertical axis. Where would an economy in a recession be? What happens to the PPC if the labour force grows?
2. Country A needs 2 hours to make a chair and 6 hours to make a table; Country B needs 3 hours for a chair and 12 for a table. Who has the comparative advantage in tables?
3. With the countries in question 2, would trade at 3.5 chairs per table benefit both?
4. A frost destroys part of the orange crop while a health report raises the popularity of orange juice. What happens to the price and quantity of orange juice?
5. Incomes fall. What happens to the demand for an inferior good, and to its equilibrium price?
6. $Q_d = 80 - 4P$ and $Q_s = 2P + 20$. Find the equilibrium, and the shortage or surplus at $P = 6$.

Answers.

1. At a point inside the PPC. Growth of the labour force shifts the whole PPC outward.
2. A table costs A $\frac{6}{2} = 3$ chairs and B $\frac{12}{3} = 4$ chairs. A has the lower opportunity cost, so A has the comparative advantage in tables (and B in chairs).
3. Yes: 3.5 chairs per table lies between A's cost (3) and B's cost (4).
4. Supply shifts left and demand shifts right: the price rises; the change in quantity is indeterminate.
5. Demand for an inferior good shifts right, so its equilibrium price and quantity rise.
6. $80 - 4P = 2P + 20$ gives $P = 10$, $Q = 40$. At $P = 6$: $Q_d = 56$, $Q_s = 32$, a shortage of 24.

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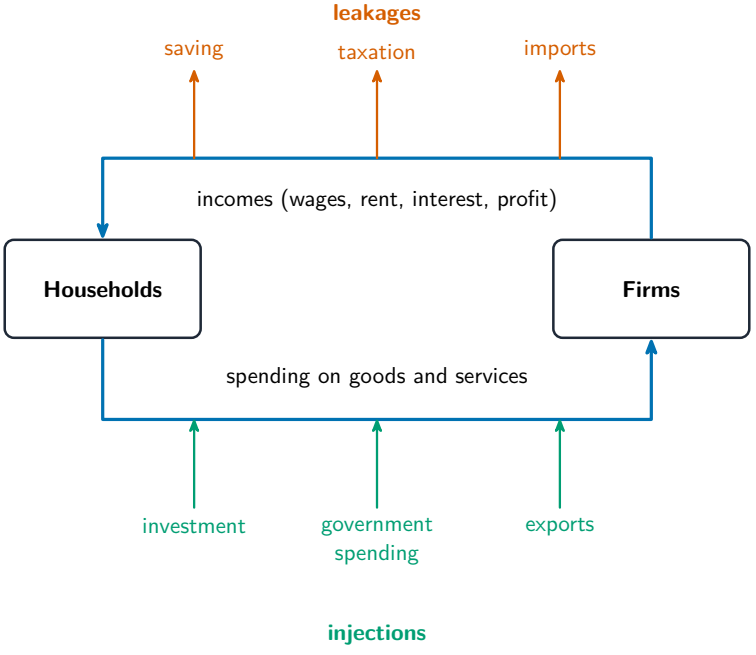
Economic Indicators and the Business Cycle

AP Macroeconomics

The Circular Flow and GDP

In April 2020 the US unemployment rate jumped from 4.4% to 14.7% in a single month, the highest figure since the series began in 1948. Governments, central banks and businesses reacted within weeks, and they could only do so because statistical agencies measure the economy every month. This unit is about those measurements: output (GDP), unemployment and prices.

The **circular-flow model** 循环流动模型 links **households** supplying factors and earning income with **firms** producing goods and services. Spending on current domestic production generates income; transfers and existing financial assets do not themselves add to GDP.



The circular flow of income, with its leakages and injections

Gross domestic product (GDP) 国内生产总值 is the market value of all **final** goods and services produced **within a country** in a year. Three ways to measure it give the same number:

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- **Expenditure approach:** $GDP = C + I + G + X_n$ – **consumption** 消费, **investment** 投资 (business spending on capital, plus new housing and inventory), **government purchases** 政府购买, and **net exports** 净出口 (exports minus imports).
- **Income approach:** add the incomes earned in production: wages, rent, interest, and profit.
- **Value-added approach:** add each producer's sales minus its purchases of intermediate goods. For example, grain sells for \$2, flour for \$5, and bread for \$8. Total value added is $2+(5-2)+(8-5) = 8$ dollars, equal to the final bread sale. Adding all three sales would double count.

> **Worked example (billions of dollars).** If $C = 700$, $I = 200$, $G = 300$, exports are 150 and imports 100, GDP is $700 + 200 + 300 + (150 - 100) = 1250$. Buying shares is not investment in this GDP formula; a new factory machine is.

Exclude intermediate goods (avoid double counting), used goods, purely financial transactions, and transfer payments.

Does it count in this year's US GDP?

transaction	in GDP?	why
A family buys a new car made in Ohio	yes, C	final good, produced here this year
A family buys a used car	no	produced in an earlier year (only a dealer's service fee counts)
A firm buys steel to make the car	no	intermediate good; counted inside the car
A firm buys a new robot for its factory	yes, I	new capital
A student buys shares in Apple	no	a financial transaction
The government pays unemployment benefits	no	a transfer payment: nothing is produced
The government pays a teacher's salary	yes, G	a purchase of a service
A US firm sells wheat to Japan	yes, X	produced here; adds to net exports
A Toyota made in Kentucky	yes	made **within** the US, whoever owns the firm

Common mistake. Calling the purchase of shares or bonds "investment". In GDP,

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investment means spending on **new physical capital**, new housing and inventory changes.

Limitations of GDP

GDP measures market output, not well-being. It **omits** non-market production (unpaid housework, volunteering), unreported production in the **underground economy** 地下经济, leisure, and the **distribution** of income, and it ignores **environmental** damage and resource depletion. So a higher GDP does not automatically mean a better standard of living. **Real GDP per capita** (real GDP ÷ population) is a better welfare proxy than total GDP.

GDP per capita **shows**

- ✓ average output per person
- ✓ domestic production
- ✓ real change, if price-adjusted
- ✓ one living-standard indicator

but it **misses**

- ✗ how income is distributed
- ✗ unpaid household services
- ✗ pollution and resource use
- ✗ leisure, health, wellbeing

also check distribution, living conditions and measurement quality

Real GDP per capita measures average output, not its distribution or all aspects of welfare

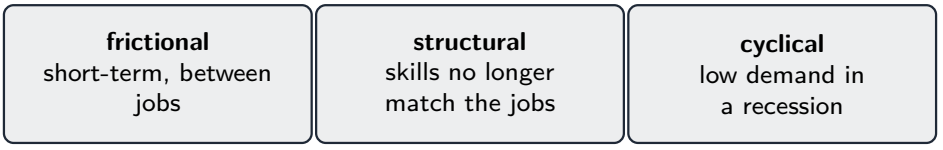


Museum visitors illustrate leisure and tourism, not unemployment. A queue alone cannot reveal employment status.

Comparison example (AP 2024 Set 1, Q2). Year 1: real GDP \$800,000, population 1,000, so output per person \$800. Year 2: nominal GDP \$1,035,000, deflator 115 (year 1 = 100), so real GDP \$900,000. Population 1,200 gives \$750 per person. Total real output rose 12.5%; output per person fell 6.25%. Neither average proves every household's welfare.

Unemployment

The **labor force** 劳动力 is the employed plus the **unemployed** (those without work who are available and actively looking). People not looking are **not** in the labor force.



Three types of unemployment: frictional, structural, and cyclical

$$\text{Unemployment rate} = \frac{\text{unemployed}}{\text{labor force}} \times 100\%, \qquad \text{Labor-force participation} = \frac{\text{labor force}}{\text{working-age population}} \times 100\%.$$

> **Worked example.** A country has 150 million employed and 10 million unemployed (actively looking), with 40 million working-age adults not looking. The labor force is $150 + 10 = 160$ million, so the unemployment rate is $\dfrac{10}{160} \times 100\% = 6.25\%$ and the participation rate is $\dfrac{160}{200} \times 100\% = 80\%$.

Three types of unemployment:

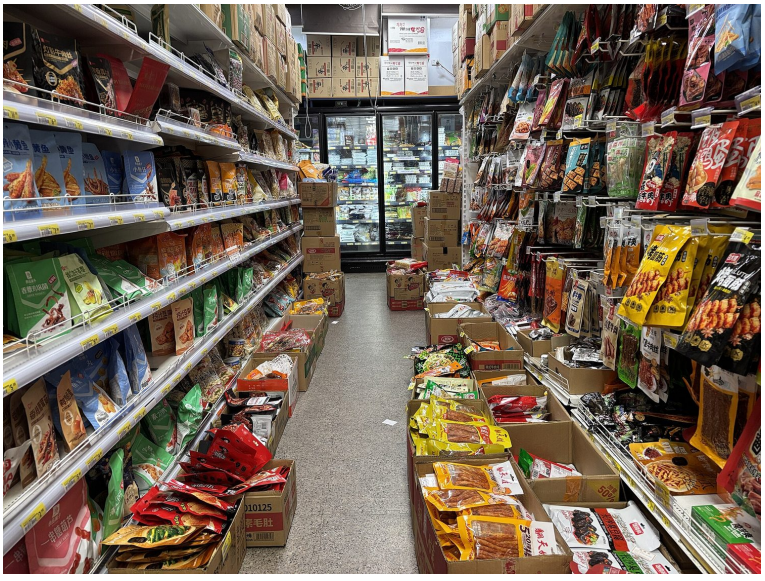
- **Frictional** 摩擦性失业: between jobs or searching for a first job (normal, short).
- **Structural** 结构性失业: skills or location don't match available jobs (technology, trade).
- **Cyclical** 周期性失业: caused by a recession (a downturn in the business cycle).

Frictional + structural make up the **natural rate of unemployment** 自然失业率. At the natural rate cyclical unemployment is zero and the economy is at **full employment** 充分就业. The rate does not describe all unused labor. **Discouraged workers** 灰心工人 have stopped looking, so are outside the labor force. **Underemployed** people working part time who want full-time work count as employed, not unemployed. If 5 million of the 10 million unemployed stop looking, with no new jobs, unemployment becomes $5/155 \times 100\% = 3.23\%$ and participation $155/200 \times 100\% = 77.5\%$. A falling unemployment rate need not mean more jobs.

Classify the cause. First-job search is frictional; skills mismatch is structural; recession layoffs are cyclical. Actual unemployment 8% minus cyclical 3% gives natural 5%; subtract frictional 4% to find structural 1% (AP 2024 Set 1, Q1a). The natural rate can change.

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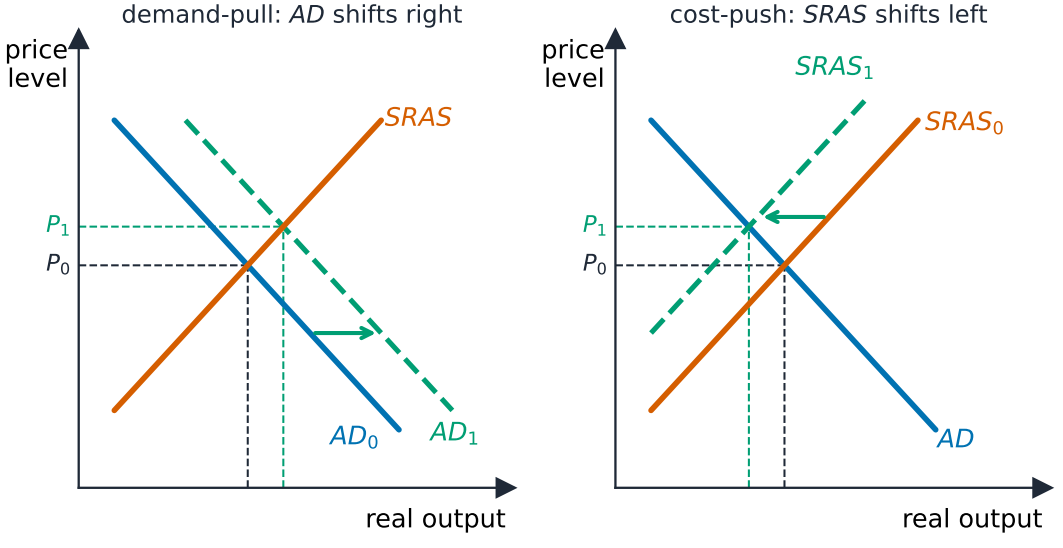
Price Indices and Inflation



A supermarket aisle: a fixed basket of goods measures inflation via a price index

Inflation 通货膨胀 is a sustained rise in the average price level. It is measured with a **price index** 价格指数, most often the **consumer price index (CPI)** 消费者价格指数, built from a fixed **market basket** of goods a typical household buys:

$$CPI = \frac{\text{cost of basket this year}}{\text{cost of basket in base year}} \times 100.$$



Unit 3 preview: demand-pull and cost-push inflation on the AD-AS diagram. Unit 2 calculations below use price indices.

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The **inflation rate** is the percent change in the index between two years. **Deflation** 通货紧缩 is a falling price level; **disinflation** is a slowing of inflation.

Read a series. In a fictional example, CPI values of 100, 110, 115 and 112 in four consecutive years imply inflation of 10%, 4.55% and -2.61%. Year 3 has disinflation: prices still rise, but more slowly. Year 4 has deflation: prices fall from year 3, yet remain 12% above the base year.

> **Worked example (a two-good basket).** Flowerland's basket is 10 bottles of lavender oil and 20 roses.

	price of oil	**price of a rose**	**cost of the basket**
2019 (base year)	\$5	\$2	$10(5) + 20(2) = \$90$
2020	\$6	\$2.40	$10(6) + 20(2.4) = \$108$

$CPI_{2020} = \dfrac{108}{90} \times 100 = 120$, so prices rose 20%. The quantities stay fixed; only the prices change.

Is anyone better off? If nominal incomes in Flowerland also rose 20% from 2019 to 2020, real income – and the average standard of living – stayed the **same**: incomes rose exactly as fast as prices. A rough rule: % change in real income ≈ % change in nominal income − inflation rate.

Substitution bias. If beef becomes dearer, households may buy more chicken. A fixed basket keeps the old quantities, so it can overstate the increase in the cost of maintaining living standards.

> **Worked example.** If the CPI is 200 this year and was 190 last year, the inflation rate is $\dfrac{200 - 190}{190} \times 100\% = 5.3\%$. A basket that cost \$190 then costs \$200 – the same goods, more dollars.

Costs of Inflation

Inflation redistributes and distorts:

- Unexpected inflation above the expected rate **hurts lenders** and **helps borrowers** on existing fixed nominal interest-rate loans: repayments buy less than expected. Unexpected deflation reverses this effect. Cash and incomes that do not adjust lose purchasing power when prices rise; indexed incomes may adjust.
- **Menu costs** and uncertainty discourage investment.
- **Anticipated** inflation can be allowed for in contracts and interest rates, reducing surprise redistribution; menu costs can still remain. This is why we separate **nominal** and **real** values.

The real interest rate. Real interest rate ≈ nominal interest rate − inflation rate (Unit 4 uses it in the loanable-funds market). A bank lends at 6% expecting 2% inflation, so it expects a real return of 4%. If inflation turns out to be 8%, the real

rate is $6 - 8 = -2\%$: the bank is repaid with dollars that buy less than the dollars it lent, and the borrower gains. **A real case:** US CPI inflation reached 9.1% in June 2022, the highest since 1981, while many savings accounts paid close to 0%. Savers earned a real return of about -9%.



Unexpected inflation hurts lenders and fixed incomes and helps borrowers; it also brings menu and shoe-leather costs

Real v. Nominal GDP

- **Nominal GDP** 名义 GDP is valued at **current** prices, so it rises with both output and prices.
- **Real GDP** 实际 GDP is valued at **constant** (base-year) prices, stripping out inflation, so it reflects true output. Compare real GDP across periods to measure output growth.

$$\text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP deflator}} \times 100, \qquad \text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100.$$

Worked example. Nominal GDP is \$22 trillion and the GDP deflator is 110. Real GDP is $\frac{22}{110} \times 100 = \$20$ trillion. The \$2 trillion difference reflects different price bases, not growth. If last year's real GDP was \$19 trillion, real growth is $(20 - 19)/19 \times 100\% = 5.26\%$. Growth needs an earlier value.

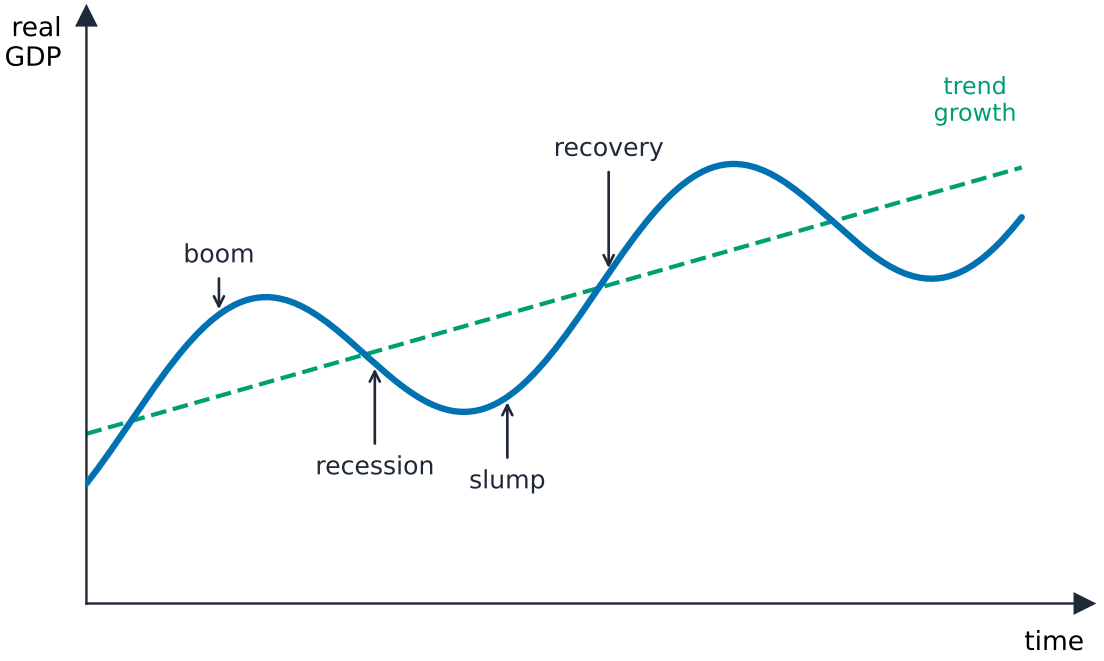
Reasoning without numbers. If nominal GDP rises while real GDP stays constant, all of the rise is in prices: the price level (the GDP deflator) must have risen. If nominal GDP rises 3% and prices rise 5%, real GDP has **fallen** about 2%.

Exam skill: be fluent converting nominal to real using a price index, and computing an inflation rate or a growth rate as a percent change.

Business Cycles

The **business cycle** 经济周期 describes real GDP fluctuating around its long-run trend. **Expansion** 扩张 (rising output) ends at a **peak** 顶峰; **contraction/recession** 衰退 (falling output) ends at a **trough** 谷底. These are two phases and two turning points. Recessions raise cyclical unemployment, but inflation need not fall: an adverse supply shock can reduce output while raising prices.

Output-gap example. Potential output is real GDP at full employment. If actual real GDP is \$1,140 billion and potential output \$1,200 billion, the gap is minus \$60 billion, or -5% of potential output: a recessionary gap. Positive gaps indicate actual output above potential, not automatically a higher long-run growth rate.



Real GDP swinging around its long-run trend

Worked FRQ: Measuring the Economy

The data. Country Z (all figures in millions of people, and billions of dollars for GDP):

	Year 1 (base year)	Year 2
Employed	95	95.5
Unemployed	5	4
Working-age population	152	152
Cost of the market basket	\$400	\$420
Nominal GDP	\$2,000	\$2,205

(a) Calculate the unemployment rate in each year. Labor force = employed + unemployed: 100 million in year 1 and 99.5 million in year 2. Unemployment rate: $\frac{5}{100} \times 100\% = 5\%$ in year 1 and $\frac{4}{99.5} \times 100\% \approx 4.02\%$ in year 2.

(b) Unemployment fell by 1 million, but employment rose by only 0.5 million. Explain. The labor force shrank by 0.5 million. Some people may have stopped looking because they were discouraged, retired or returned to study; the totals do not identify their reasons. People who leave the labor force are no longer counted as unemployed, so the rate can fall without an equal rise in jobs. Labor-force participation fell from $\frac{100}{152} \approx 65.8\%$ to $\frac{99.5}{152} \approx 65.5\%$.

(c) Calculate the CPI in year 2 and the inflation rate. $CPI = \frac{420}{400} \times 100 = 105$; year 1 is the base year, so its CPI is 100. Inflation $= \frac{105 - 100}{100} \times 100\% = 5\%$.

(d) The GDP deflator in year 2 is 105. Calculate real GDP in year 2 and the real growth rate. Real GDP $= \frac{2205}{105} \times 100 =$ \$2,100 billion. In the base year real GDP equals nominal GDP (\$2,000 billion), so real growth $= \frac{2100 - 2000}{2000} \times 100\% = 5\%$. Nominal GDP rose 10.25%; about half of that rise is higher prices.

(e) In year 1 Ana borrowed at a fixed nominal interest rate of 6%, expecting 2% inflation. Inflation was 5%. Did she gain or lose? She expected a real rate of $6 - 2 = 4\%$ but paid only $6 - 5 = 1\%$. Unexpected inflation helped Ana, the borrower, and hurt her lender.

(f) Which phase of the business cycle is Country Z most likely in? Real GDP is rising (5% growth), so it is in an **expansion**. State the evidence (real, not nominal, GDP) and the phase.

Common errors: dividing the unemployed by the population instead of the labor force; quoting the CPI (105) as the inflation rate; measuring growth with nominal GDP; saying inflation always hurts borrowers.

Exam tips

Show the formula and denominator before substituting. Distinguish final output from intermediate sales, unemployment from non-participation, and index levels from inflation rates. For growth, compare real values across years; for living standards, divide by population and state the limitations.

Practice.

1. Which of these are counted in GDP: (a) a new house, (b) a pension paid to a retiree, (c) a haircut, (d) flour bought by a bakery?
2. Country Zeta has a labour force of 50 million and an unemployment rate of 6%. How many people are unemployed?

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3. The natural rate of unemployment is 5% and actual unemployment is 7.5%. What is the cyclical rate, and what phase of the business cycle is likely?
4. A basket cost \$250 in the base year and \$270 this year. Find this year's CPI and the inflation rate since the base year.
5. Nominal GDP is \$1,320 billion and the GDP deflator is 120. Find real GDP.
6. Loans were made expecting 3% inflation; actual inflation was 6%. Are lenders better or worse off? Explain.

Answers.

1. (a) yes, investment; (b) no, a transfer payment; (c) yes, a service (consumption); (d) no, an intermediate good.
2. $0.06 \times 50 = 3$ million.
3. $7.5\% - 5\% = 2.5\%$; a contraction (recession), with real GDP below potential.
4. $CPI = \frac{270}{250} \times 100 = 108$; inflation 8%.
5. $\frac{1320}{120} \times 100 = \$1{,}100$ billion.
6. Worse off: they are repaid in dollars that buy less than expected, so the real interest rate they receive is about 3 points lower than planned.

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National Income and Price Determination

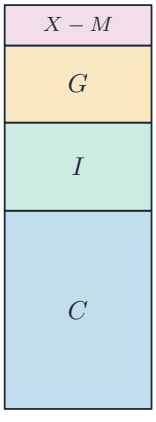
AP Macroeconomics

Aggregate Demand



A city skyline: national output and aggregate demand reflect economy-wide spending

Aggregate demand (AD) 总需求 shows the total quantity of real output ($C + I + G + X_n$) buyers want at each **price level** 价格水平. It slopes **downward** for three reasons special to the whole economy:



net exports: exports − imports

government spending

investment - spending by firms on capital

consumption - spending by households (the biggest part)

$AD = C + I + G + (X - M)$: total spending on a country's goods and services

Aggregate demand is total spending: consumption, investment, government, and net exports

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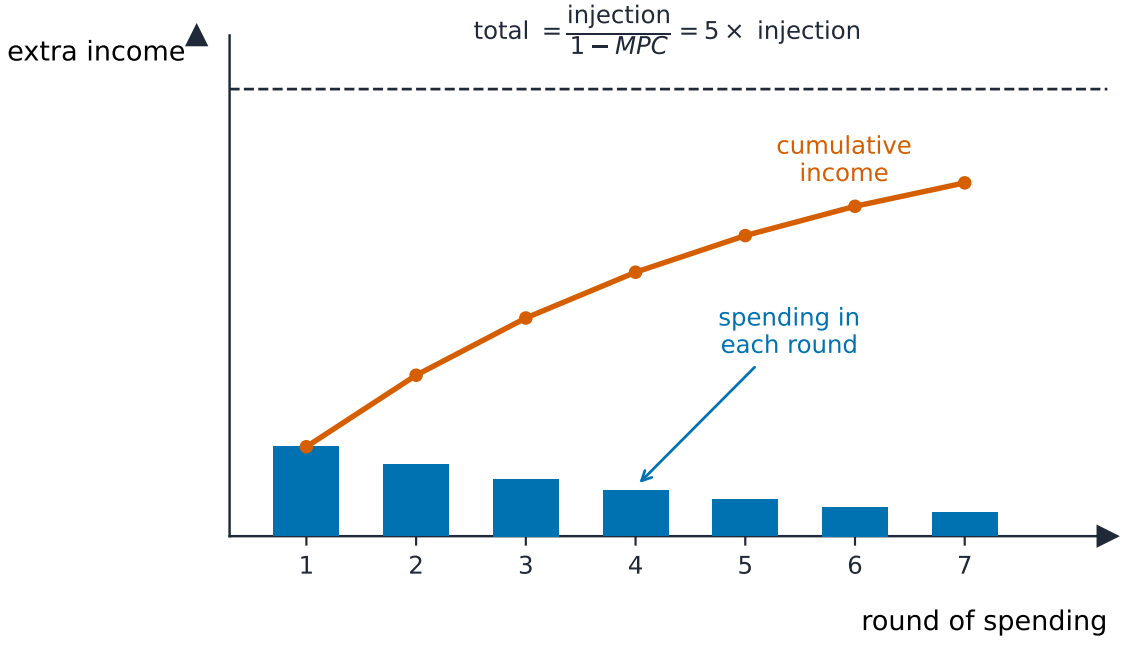
- the **wealth effect** 财富效应 (a higher price level shrinks the real value of money, so people buy less),
- the **interest-rate effect** 利率效应 (a higher price level raises money demand and interest rates, cutting investment),
- the **net-export effect** 净出口效应 (a higher domestic price level makes exports dearer and imports cheaper).

A change in the price level is a **movement along** AD. AD **shifts** when any component of $C + I + G + X_n$ changes for another reason – **consumer confidence** 消费者信心, business expectations, government spending, taxes, or foreign incomes.

The Spending and Tax Multipliers

A change in spending sets off further rounds of spending, so the final change in GDP is **larger** than the initial change – the **multiplier effect** 乘数效应. It depends on the **marginal propensity to consume** 边际消费倾向 (MPC), the fraction of extra income that is spent (the rest is the **marginal propensity to save** 边际储蓄倾向, MPS, with $MPC + MPS = 1$):

$$\text{spending multiplier} = \frac{1}{1 - MPC} = \frac{1}{MPS}.$$



One injection multiplies into a larger overall rise in income

A tax cut works through the multiplier too, but more weakly, because part of the tax cut is saved:

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$$\text{tax multiplier} = -\frac{MPC}{1 - MPC} = -\frac{MPC}{MPS}.$$

The tax multiplier is **smaller in size** and **negative** (a tax cut raises GDP; a tax rise lowers it). Total change in GDP = (multiplier) × (initial change).

> **Worked example.** If $MPC = 0.8$, the **spending multiplier** 支出乘数 is $\frac{1}{1 - 0.8} = 5$, so a \$10 billion rise in government spending lifts real GDP by $5 \times \$10 = \$50$ billion. The tax multiplier is $-\frac{0.8}{0.2} = -4$, so a \$10 billion **tax cut** 减税 raises GDP by only \$40 billion – weaker, because part of the tax cut is saved.

Exam skill: compute both multipliers from the MPC and find the resulting change in real GDP – an almost-guaranteed calculation.

> **Worked example: spending and taxes together.** The government raises spending by \$100 billion and, instead of borrowing, raises taxes by \$100 billion. With $MPC = 0.75$:

- spending: $+100 \times \frac{1}{0.25} = +\$400$ billion;
- taxes: $+100 \times \left(-\frac{0.75}{0.25}\right) = -\$300$ billion;
- net effect: real GDP can rise by at most \$100 billion.

An equal rise in G and T still raises GDP, by exactly the amount of the spending (the **balanced-budget multiplier** 平衡预算乘数 is 1), because the tax cuts spending by less than the government adds. The word "maximum" in a question means: use the simple multiplier, ignoring crowding out and leakages to imports.

Common mistakes. Using $\frac{1}{MPC}$ instead of $\frac{1}{1-MPC}$; forgetting the minus sign on the tax multiplier; multiplying a tax change by the **spending** multiplier.

Short-Run Aggregate Supply

Short-run aggregate supply (SRAS) 短期总供给 slopes **upward**: in the short run some **input prices** 投入品价格 (especially **nominal wages** 名义工资) are **sticky** 粘性, so a higher output price level widens profit margins and firms produce more. SRAS **shifts** with input prices, **productivity** 生产率, taxes or subsidies on producers, and **supply shocks** 供给冲击 (e.g. an oil-price change). A rise in input costs shifts SRAS left.

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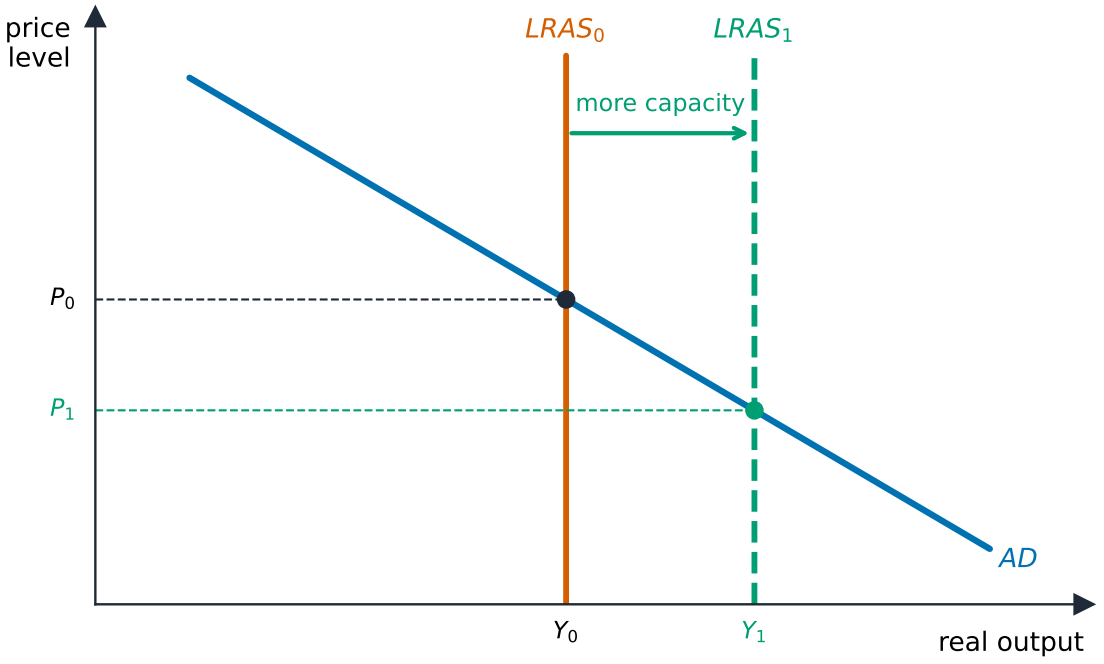


A power plant and industrial site: short-run aggregate supply depends on production costs

Long-Run Aggregate Supply

Long-run aggregate supply (LRAS) 长期总供给 is **vertical** at the economy's **full-employment (potential) output** 潜在产出 Y_f. In the long run **all** prices and wages are fully **flexible** (only in the short run are some input prices fixed), so output depends only on real factors – resources, technology, institutions – not the price level. LRAS shifts only with **economic growth** 经济增长 (more or better resources). LRAS corresponds to the **production possibilities curve (PPC)** 生产可能性曲线: both mark the economy's **maximum sustainable capacity**, so an outward LRAS shift and an outward PPC shift are the same event drawn two ways. The vertical LRAS is why, in the long run, demand policy changes prices, not output.

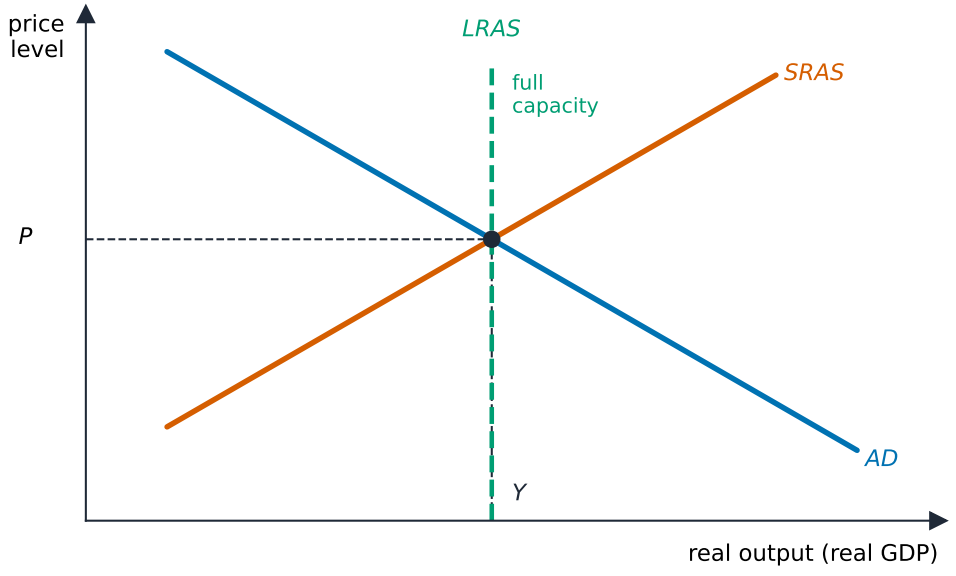
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Supply-side policy shifts long-run aggregate supply right: more output, lower prices

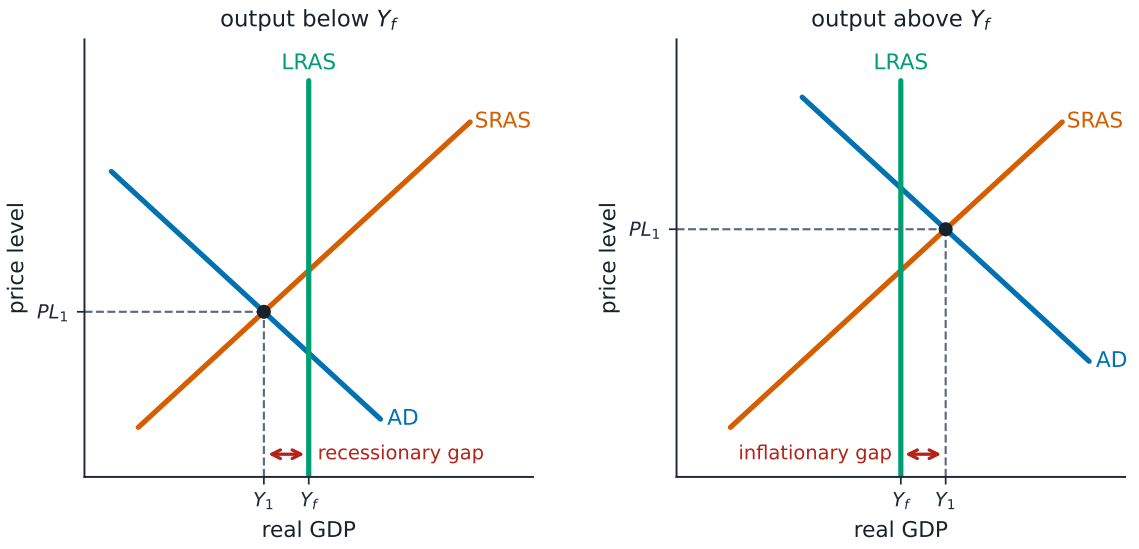
Equilibrium in the AD-AS Model

The economy settles where **AD meets SRAS**, fixing the equilibrium **price level** and **real GDP** 实际国内生产总值. Comparing that output to Y_f (the LRAS line) gives the economy's state:



Macroeconomic equilibrium where aggregate demand meets aggregate supply

- output $< Y_f$: a **recessionary gap** 衰退缺口 (cyclical unemployment),
- output $> Y_f$: an **inflationary gap** 通胀缺口 (overheating),
- output $= Y_f$: **long-run equilibrium** 长期均衡.



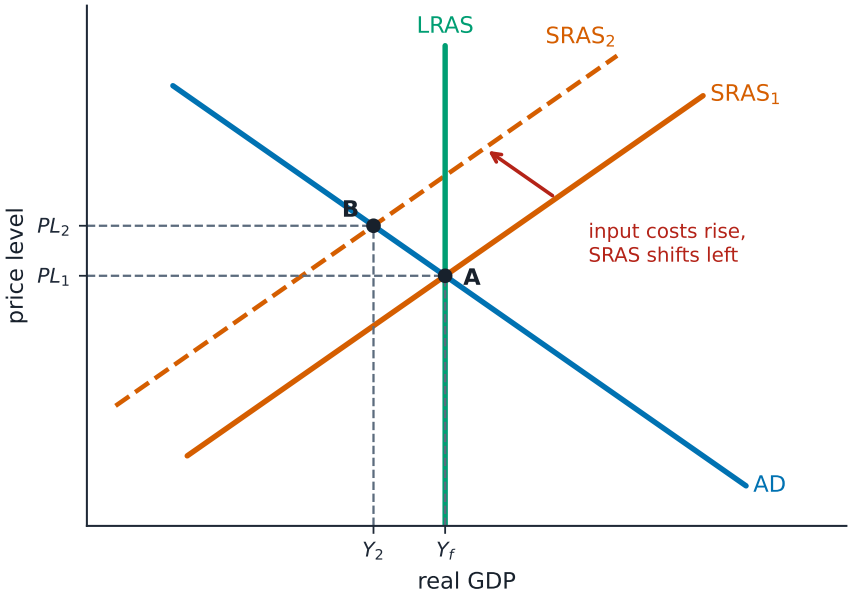
A recessionary gap (output below full employment) and an inflationary gap (output above it)

How to label the graph for full marks. Label the vertical axis *price level* (never "price") and the horizontal axis *real GDP* (never "quantity"). Draw LRAS as a vertical line, label the equilibrium output Y_1 and full-employment output Y_f on the horizontal axis, and the price level PL_1 on the vertical axis. A recessionary gap needs Y_1 to the **left** of LRAS; an inflationary gap needs it to the **right**. Readers check the position of Y_1 against Y_f, so draw that relationship clearly.

Unemployment and the gap. In a recessionary gap the actual unemployment rate is **above** the natural rate (there is cyclical unemployment). In an inflationary gap it is **below** the natural rate: firms work overtime and hire people who would normally still be searching.

Short-Run Changes: Demand and Supply Shocks

- A **demand shock** 需求冲击 shifts AD: a positive one (more spending) raises both price level and output (and lowers unemployment); a negative one lowers both.
- A **supply shock** shifts SRAS: a negative one (higher input costs) raises the price level **and** lowers output at once – **stagflation** 滞胀 – the hardest case for policy-makers, because fixing one worsens the other.



A negative supply shock: SRAS shifts left, so the price level rises while real GDP falls

A real example. When Russia invaded Ukraine in February 2022, world prices of oil, gas and wheat jumped. For energy-importing economies such as the euro area this was a negative supply shock: inflation in the euro area reached 10.6 % in October 2022, while output growth slowed close to zero. An AD-only story cannot explain prices rising *while* output weakens; the leftward SRAS shift can.

Which curve moves? Ask what changed first.

Event	Curve	Direction	Price level	Real GDP
Consumers become more confident	AD	right	up	up
Foreign incomes fall, so exports fall	AD	left	down	down
Nominal wages rise across the economy	SRAS	left	up	down
A new technology lowers production costs	SRAS (and LRAS)	right	down	up
The price level rises	none	movement along AD and SRAS	–	–

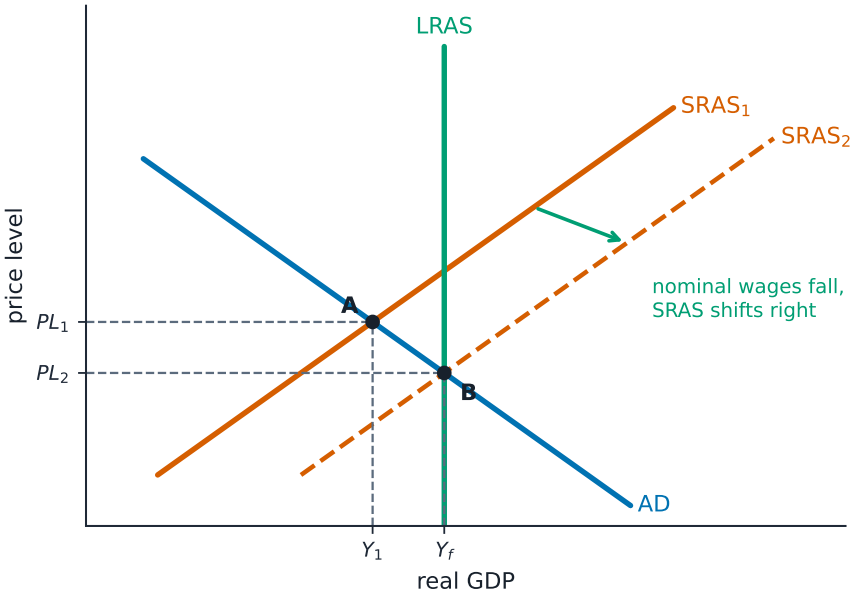
The last row is the classic trap: a change in the price level never shifts AD or SRAS.

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Long-Run Self-Adjustment

Left alone, the economy self-corrects through flexible wages:

- In a **recessionary gap**, high unemployment eventually pushes **nominal wages down**, shifting SRAS **right** until output returns to Y_f at a lower price level.
- In an **inflationary gap**, labor shortages push **wages up**, shifting SRAS **left** back to Y_f at a higher price level.



Self-adjustment from a recessionary gap: falling nominal wages shift SRAS right from A to B, back to full employment at a lower price level

Notice what moves and what does not. In self-adjustment **only SRAS shifts**; AD stays where it is, and LRAS does not move because the economy's capacity has not changed. The new long-run equilibrium is always on LRAS, where AD, SRAS and LRAS all cross.

> **Worked example (no policy action).** Country X is in a recessionary gap and its government does nothing. In the long run: AD **stays the same**; SRAS **shifts right** as nominal wages fall; LRAS **stays the same**. Real GDP returns to Y_f, unemployment returns to the natural rate, and the price level ends **lower** than its current recessionary-gap level.

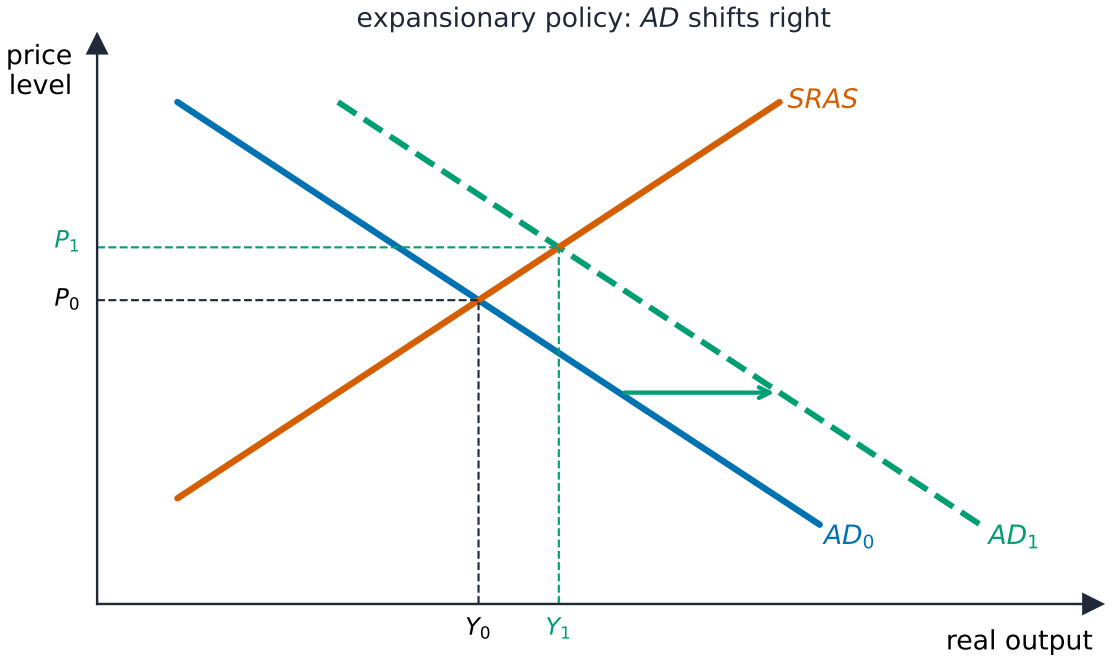
The debate over how **fast** this happens is the case for (or against) active policy: self-adjustment is slow and painful, which is the argument for intervening.

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Fiscal Policy

Fiscal policy 财政政策 is the government's use of **spending** and **taxes** to shift AD:

- **Expansionary** 扩张性 (more spending or lower taxes) shifts AD **right** to close a **recessionary** gap.
- **Contractionary** 紧缩性 (less spending or higher taxes) shifts AD **left** to close an **inflationary** gap.



Expansionary fiscal policy shifts AD right, raising output and prices

Size the policy with the multipliers: to close a gap of a given size, the required change in spending is (gap) ÷ (spending multiplier). Limits include **time lags** 时滞, **crowding out** 挤出效应 (below), and political difficulty.

> **Worked example.** An economy has a \$100 billion recessionary gap and $MPC = 0.75$ (spending multiplier $= \dfrac{1}{0.25} = 4$). To close it, the government must raise spending by $\dfrac{\$100 \text{ billion}}{4} = \$25$ billion. Using a tax cut instead (tax multiplier -3) would require a larger $\dfrac{100}{3} \approx \$33$ billion cut.

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Worked example (a tax cut). The government lowers income-tax rates to close a recessionary gap. Disposable income rises, so consumption and **AD increase**. In the short run real GDP and the price level both rise, and unemployment falls. **LRAS stays the same**: a short-run demand policy does not change the economy's resources or technology. (Questions on tax incentives that raise work or investment over many years are the exception; read the question.)

Worked example (minimum change). The recessionary gap is \$300 billion and $MPC = 0.8$. The minimum rise in government spending is $\frac{300}{5} = \$60$ billion. Using taxes alone, the cut must be $\frac{300}{4} = \$75$ billion – **greater** than the spending change, because the tax multiplier is smaller.

Exam skill: you must draw the correctly labeled AD-AS graph, identify the gap, prescribe the right fiscal action and its direction, and often calculate the exact spending or tax change needed.

Worked FRQ: A Recession Step by Step

This practice question is in the style of the long AP free-response question. Try each part before reading the answer.

The economy of Lumeria is in short-run equilibrium with real GDP of \$900 billion. Full-employment output is \$1,000 billion. The marginal propensity to consume is 0.8.

(a) Draw a correctly labeled AD-AS graph showing Lumeria's current situation. Draw AD, SRAS and a vertical LRAS. Label the axes *price level* and *real GDP*. Mark equilibrium output Y_1 to the **left** of Y_f on LRAS, and the price level PL_1. (This is the left panel of the output-gaps figure above.)

(b) Is the unemployment rate above, below or equal to the natural rate? Explain. **Above** the natural rate. Output is below full employment, so there is cyclical unemployment.

(c) Calculate the maximum change in real GDP that a \$20 billion increase in government spending could cause. Spending multiplier $= \frac{1}{1 - 0.8} = 5$, so the maximum change $= 5 \times \$20$ billion $= \$100$ billion. That is exactly the size of the gap. Write "maximum" because crowding out or price-level rises can make the actual change smaller.

(d) Instead of spending, the government cuts taxes. What is the smallest tax cut that could close the gap? Tax multiplier $= -\frac{0.8}{0.2} = -4$. The gap is \$100 billion, so the tax cut is $\frac{\$100 \text{ billion}}{4} = \$25$ billion. A tax cut must be **larger** than a spending rise (\$25 billion against \$20 billion), because households save part of it.

(e) If the government does nothing, what happens to nominal wages and to

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SRAS in the long run? What happens to the price level? High unemployment pushes **nominal wages down**, so SRAS shifts **right**. Real GDP returns to \$1,000 billion and the price level **falls**.

Common ways to lose the mark: writing "price" on the vertical axis; showing Y_1 on the wrong side of LRAS; raising taxes when the gap calls for a tax cut (the tax multiplier is negative, so a cut raises GDP); saying AD shifts in self-adjustment (only SRAS shifts).

Automatic Stabilizers

Automatic stabilizers 自动稳定器 are features that dampen the cycle **without new legislation**. In a downturn, **progressive taxes** 累进税 collect less and **transfer payments** 转移支付 (unemployment benefits, welfare) rise automatically – cushioning incomes and spending; in a boom they do the reverse. They soften the cycle and act instantly, avoiding the lags of **discretionary** 相机抉择 policy.

Exam tips

- Aggregate demand slopes down for the wealth, interest-rate, and net-export effects; it **shifts** when C, I, G, or X_n changes.
- Compute the **spending multiplier** $\frac{1}{1-MPC}$ and the smaller, negative **tax multiplier** 税收乘数 $-\frac{MPC}{1-MPC}$.
- Draw a correctly labeled AD–AS graph, identify a recessionary or inflationary gap, and prescribe the right fiscal action.
- Short-run AS slopes up (sticky wages); long-run AS is **vertical** at full-employment output.
- Size a policy with the multipliers: required spending = gap ÷ spending multiplier.

Practice.

1. $MPS = 0.25$. Find the spending and tax multipliers.
2. Investment falls by \$20 billion and $MPC = 0.9$. What is the maximum change in real GDP?
3. State the direction of the shift: (a) a rise in the price of imported raw materials; (b) a fall in household wealth after a stock-market crash; (c) a rise in productivity.
4. An economy is in an inflationary gap and the government does nothing. What happens to SRAS, the price level and real GDP in the long run?
5. Real GDP is \$500 billion below full employment and $MPC = 0.75$. Find the smallest change in government spending, and in taxes, that could close the gap.
6. The government raises spending and taxes by \$50 billion each. With $MPC = 0.8$, what is the maximum change in real GDP?

Answers.

1. Spending multiplier $\frac{1}{0.25} = 4$; tax multiplier $-\frac{0.75}{0.25} = -3$.

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2. Multiplier 10: real GDP falls by up to \$200 billion.
3. (a) SRAS left; (b) AD left; (c) LRAS and SRAS right.
4. Nominal wages rise, SRAS shifts left, the price level rises further and real GDP falls back to full-employment output.
5. Spending $+\frac{500}{4} = \$125$ billion; or a tax cut of $\frac{500}{3} \approx \$167$ billion.
6. $50 \times 5 - 50 \times 4 = +\$50$ billion.

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Financial Sector

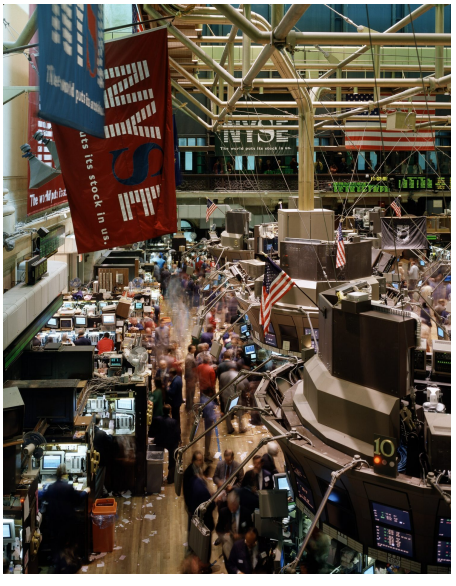
AP Macroeconomics

Financial Assets

On 10 March 2023, Silicon Valley Bank – then the sixteenth-largest bank in the United States – failed after depositors tried to withdraw $42 billion in a single day. The bank had put much of its customers' money into long-term bonds, and when interest rates rose, those bonds fell in value. Interest rates, bond prices and bank reserves are the subject of this unit.

A **financial asset** 金融资产 is a claim that stores value: **money**, **stocks** 股票 (ownership shares), **bonds** 债券 (loans that pay interest), and bank deposits. Assets trade off **liquidity** 流动性 (how easily converted to cash), **risk**, and **return**. A key inverse relationship: **bond prices and interest rates move in opposite directions** – when market interest rates rise, existing bonds paying the old, lower rate are worth less, so their price falls.

> **Worked example (why bond prices and interest rates move oppositely).** An existing perpetual bond (no maturity repayment) pays a fixed $50 a year and sells for $1000: its yield is $\frac{50}{1000} = 5\%$. If new bonds now pay 4%, buyers compete for the old bond, whose $50 is attractive; its price rises until $\frac{50}{\text{price}} = 4\%$, a price of $1250. Higher bond prices mean lower interest rates, and the reverse. This is the trap that hurt Silicon Valley Bank: when rates rose, its bonds' prices fell.



A stock exchange is where financial assets are bought and sold, setting prices from supply and demand

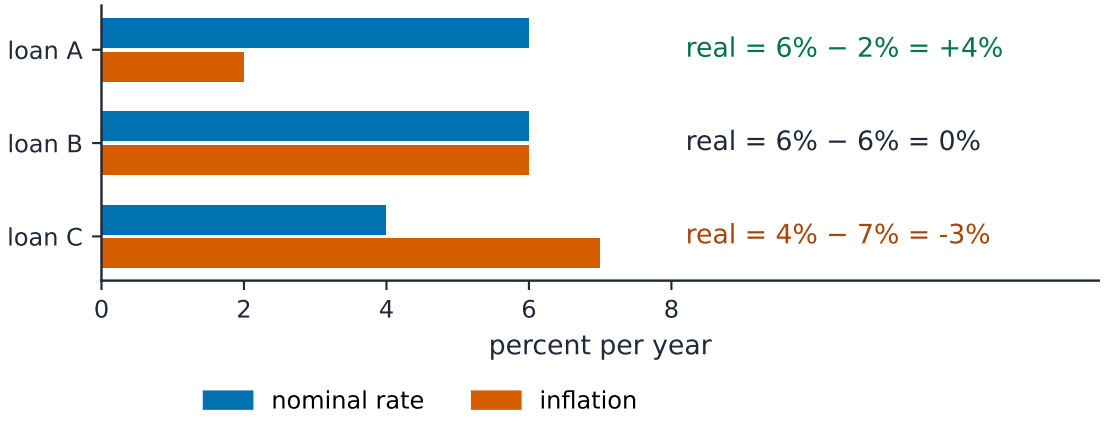
Nominal versus Real Interest Rates

- The **nominal interest rate** 名义利率 is the stated rate, not adjusted for inflation.
- The **real interest rate** 实际利率 is what you actually earn in purchasing power:

$$\text{real rate} \approx \text{nominal rate} - \text{inflation rate} \quad \text{(Fisher equation)}.$$

Lenders and borrowers care about the **real** rate. If inflation turns out higher than expected, real rates fall – helping borrowers and hurting lenders.

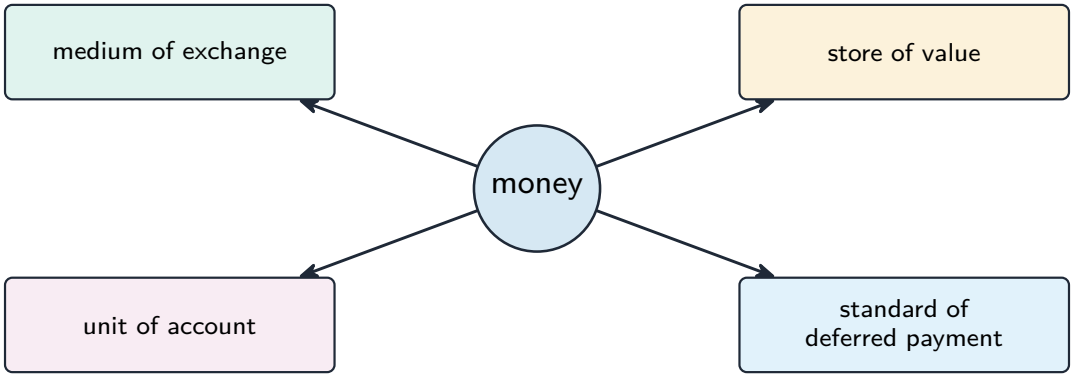
> **Worked example.** A loan carries a nominal rate of 6% while inflation runs at 2%. The real rate is $6\% - 2\% = 4\%$, so the lender's purchasing power grows by 4%. If inflation instead jumped to 7%, the real rate would be -1% – the lender would actually lose purchasing power.



Real interest rate = nominal interest rate − inflation rate

The Definition, Measurement, and Functions of Money

Money 货币 is anything widely accepted in exchange. Its three **functions**: a **medium of exchange** 交换媒介 (avoids barter), a **unit of account** 记账单位 (a common measure of value), and a **store of value** 价值储藏 (holds value over time). Modern money is **fiat money** 法定货币 – valuable because the government declares it legal tender and people trust it, not because it is backed by gold.



The functions of money – the AP exam tests the first three (medium of exchange, unit of account, store of value); standard of deferred payment is beyond the CED

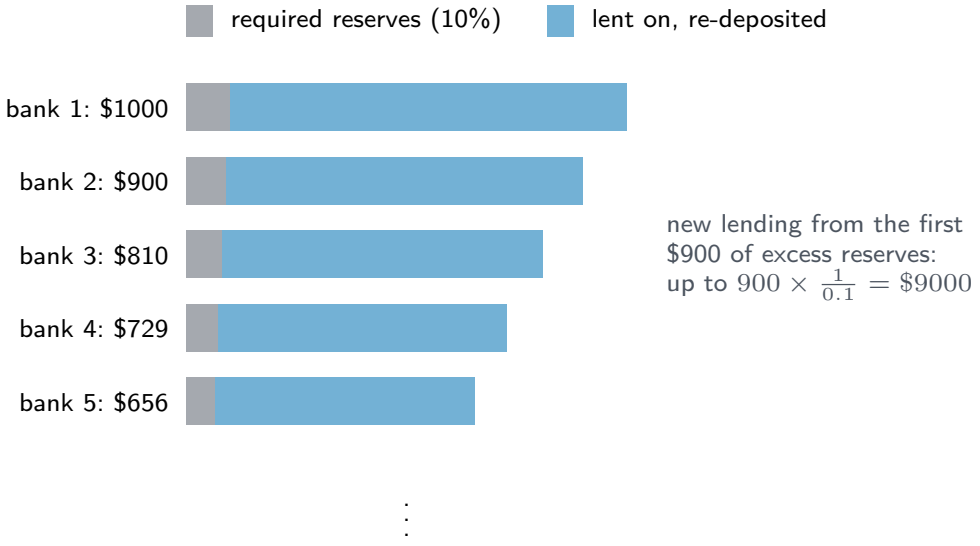
Money is measured in tiers by liquidity: **M1** (currency plus checkable deposits – the most liquid) and the broader **M2** (M1 plus savings deposits and other near-money). Use these AP definitions in exam answers; Fed statistics have counted savings deposits in M1 since May 2020, so published M1 data jump that month. Below M1 is the **monetary base** 基础货币 (M0, or MB) – currency in circulation **plus** bank reserves. The **money multiplier** equals money supply ÷ monetary base, so a central-bank action that raises reserves expands the money supply by a larger amount through the multiplier.



Money works because everyone accepts it: a shared unit of account, medium of exchange, and store of value

Banking and the Expansion of the Money Supply

Banks operate on a **fractional reserve** 部分准备金 system: they keep a fraction of deposits as **reserves** 准备金 and lend the rest. The fraction they must keep is the **required reserve ratio** 法定准备金率 (rr). Lending creates new deposits, which are re-deposited and re-lent, expanding the money supply by the **money multiplier**:



Each round keeps 10 percent and lends the rest.

$$\text{money multiplier} = \frac{1}{rr}.$$

A new \$1000 deposit with $rr = 0.1$ leaves \$900 in excess reserves, so the banking system can expand the money supply by up to $900 \times \frac{1}{0.1} = 9\,000$. Use a bank's **T-account** (assets = reserves + loans; liabilities = deposits) to track required reserves and **excess reserves** 超额准备金 (the amount available to lend).

> **Worked example.** A bank receives a \$1000 deposit with $rr = 0.20$. It must hold $0.20 \times 1000 = \$200$ as required reserves, leaving \$800 of **excess reserves** to lend. With a money multiplier of $\frac{1}{0.20} = 5$, that \$800 of new lending can expand the money supply by up to $800 \times 5 = \$4000$ across the banking system.

The T-account after a \$1000 cash deposit ($rr = 0.10$):

Assets		**Liabilities**	
Required reserves	\$100	Demand deposits	\$1000
Excess reserves	\$900		

The two sides must balance. A single bank can lend only its **excess** reserves (\$900); the **banking system** as a whole can create up to $\$900 \times 10 = \$9000$ of new deposits.

Where the money comes from changes the answer. AP questions test this trap often:

- *Cash already in circulation is deposited.* The \$1000 was already counted in M1 as currency, so the deposit itself does not change the money supply. Only the lending adds money: maximum change = \$900 × 10 = \$9000.
- *The Fed buys \$1000 of bonds from a bank.* The bank swaps bonds for \$1000 of reserves, all of them excess. Maximum change in the money supply = \$1000 × 10 = \$10 000.
- *The Fed buys \$1000 of bonds from a household, which deposits the payment.* The new deposit is new money (+\$1000 at once), and banks can lend the \$900 of excess reserves (+\$9000). Total maximum change = \$10 000.

The multiplier gives a **maximum**: the real change is smaller if banks keep extra reserves or people hold some of their loans as cash.

In practice. The Federal Reserve cut the required reserve ratio to **zero** in March 2020, and it has stayed there. The simple money multiplier is still on the AP exam, but in the real U.S. economy the Fed now controls short-term interest rates mainly through the interest it pays on reserves (see Monetary Policy below).

Exam skill: given a required reserve ratio and a deposit, compute excess reserves, the money multiplier, and the maximum change in the money supply.

> **Worked example (the full FRQ chain).** $rr = 0.20$. Mr Smith deposits \$100 of cash in First Superior Bank.

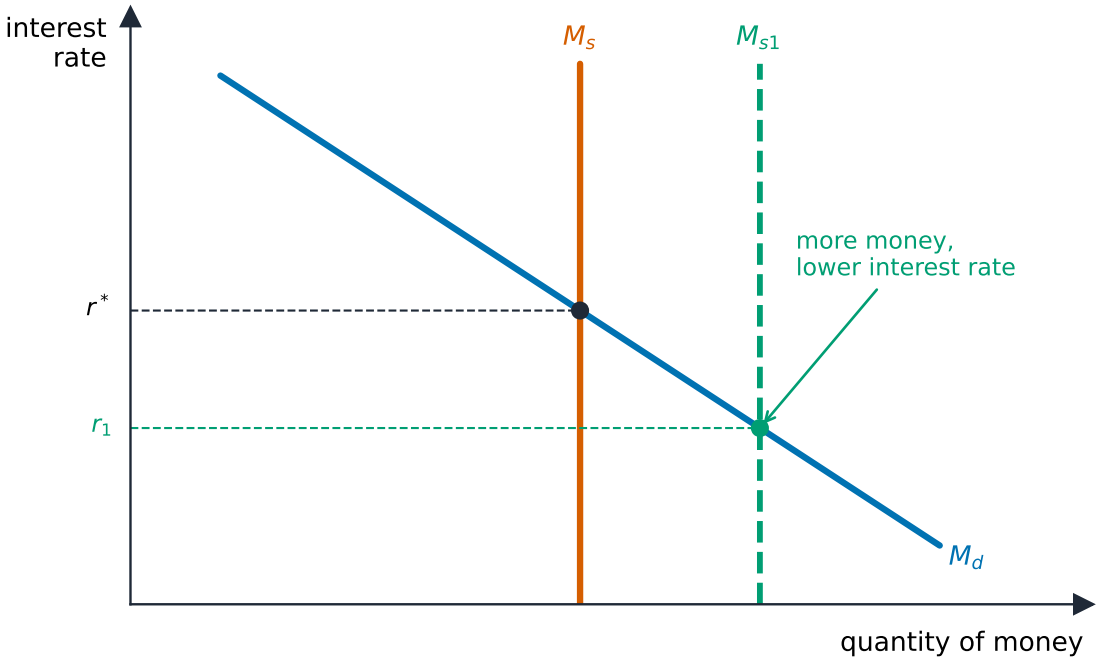
- Required reserves rise by 0.20 × 100 = \$20; the bank can make **\$80** of new loans (its excess reserves).
- Maximum change in demand deposits in the banking system: $100 \times \frac{1}{0.20} = \$500$ (the original \$100 plus \$400 created by lending).
- Maximum change in the money supply: only the lending is new money, 80 × 5 = \$400, because the \$100 of cash was already in the money supply.

Common mistakes. Saying one bank can lend the multiplied amount (only the **system** can); multiplying the whole deposit when the cash was already in circulation; and saying the Fed buying bonds **from banks** changes required reserves. It does not: deposits are unchanged, so required reserves stay the same, and only excess reserves rise.

The Money Market

The **money market** 货币市场 determines the **nominal interest rate**:

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The interest rate is set by the demand for and supply of money

- **Money demand** 货币需求 slopes **downward** against the interest rate – the rate is the opportunity cost of holding money instead of interest-bearing assets. It shifts right with a higher price level or more real GDP.
- **Money supply** 货币供给 is **vertical** – set by the central bank, independent of the interest rate.

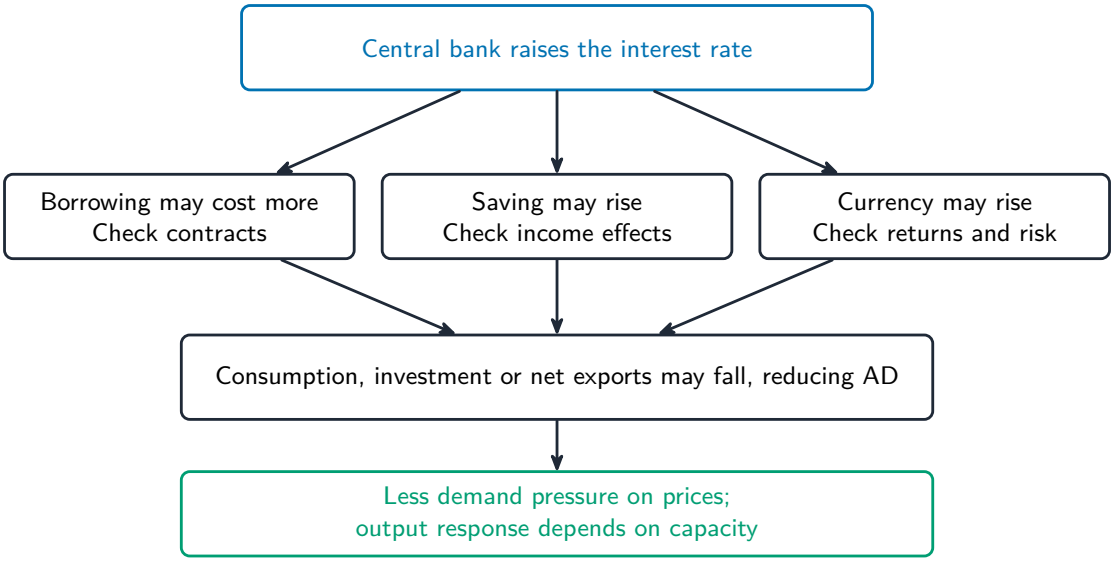
Their intersection sets the equilibrium interest rate. If the central bank increases the money supply, the supply line shifts right and the interest rate **falls**.

Shifts of money demand. If people decide to hold less money at every interest rate (for example, because card payments replace cash), money demand shifts **left** and the nominal interest rate **falls**. If the price level or real GDP rises, people need more money for transactions, money demand shifts **right** and the rate **rises**.

Monetary Policy

Monetary policy 货币政策 is the central bank's (the Federal Reserve's) use of the money supply to steer the economy, working **through the interest rate**:

- **Expansionary (easy)** 扩张性: increase the money supply → interest rate falls → investment and consumption rise → AD shifts **right** (fights recession).
- **Contractionary (tight)** 紧缩性: decrease the money supply → interest rate rises → AD shifts **left** (fights inflation).



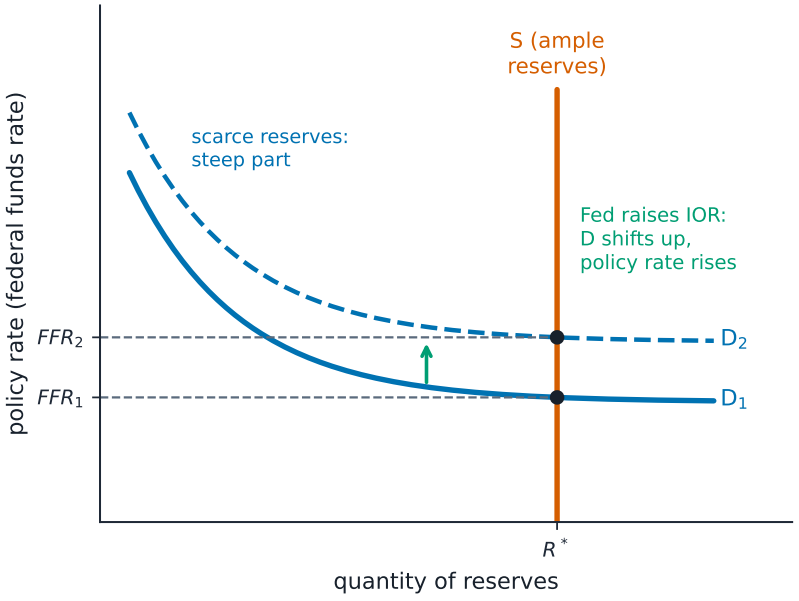
Possible interest-rate channels: lower AD can reduce demand pressure on prices; contracts, confidence and capacity affect the response

Tools: **open-market operations** 公开市场操作 (buying bonds injects money, selling bonds withdraws it – the main tool), changing the **reserve requirement**, and changing the **discount rate** 贴现率 (the rate banks pay to borrow from the central bank). Follow the full chain on the exam: money supply → interest rate → investment → AD → output, price level, unemployment.

> **Worked example (fighting unemployment).** To lower unemployment, the Fed should **buy** government bonds (an expansionary open-market operation). The chain: banks' reserves rise → the money supply shifts right → the nominal interest rate falls → with expected inflation unchanged in the short run, the **real** interest rate also falls → investment and interest-sensitive consumption rise → AD shifts right → real GDP rises and unemployment falls (the price level rises). The Fed's purchases also raise bond prices.

To fight inflation the Fed does the reverse: it **sells** bonds or targets a **higher** federal funds rate.

Modern central banks run an **ample-reserves** system. Rather than nudging the money supply, the Fed sets **administered rates** – chiefly the **interest on reserves (IOR)** 准备金利息 it pays banks – and this steers the **policy rate** 政策利率 (the federal funds rate, the overnight rate banks charge one another). In the **reserve market**, reserve demand slopes downward before becoming flat near IOR, while the central bank sets the quantity of reserves (a vertical supply line); raising IOR lifts the whole policy rate to fight inflation, lowering it eases to fight recession. (In the older **limited-reserves** system the Fed instead shifted the reserve supply through open-market operations.)



The reserve market with ample reserves: raising the interest on reserves lifts the flat part of reserve demand, so the policy rate rises while the quantity of reserves stays the same

Banks will not lend reserves to each other for less than the Fed pays them to hold reserves, so IOR acts as a **floor** under the policy rate. With ample reserves the supply line cuts the **flat** part of demand, and a small change in the quantity of reserves hardly moves the rate. That is why the Fed moves IOR instead.

A real example. To fight inflation that peaked at 9.1 % in June 2022, the Fed raised its target range for the federal funds rate from near zero in early 2022 to 5.25–5.50 % by July 2023, the fastest rise in four decades. Mortgage rates more than doubled, house sales fell and inflation came down to about 3 % by mid-2024. As inflation slowed, the Fed began cutting in September 2024.

Worked FRQ: monetary policy. *Assume an economy is in a short-run equilibrium with an inflationary gap. The central bank operates with ample reserves.*

1. *Identify an action the central bank can take to close the gap.* **Raise the interest on reserves** (IOR). (In a limited-reserves question: sell bonds through open-market operations.)
2. *What happens to the policy rate?* It **rises**.
3. *Explain how this affects real GDP.* A higher interest rate makes borrowing dearer, so **investment and interest-sensitive consumption fall**. AD shifts **left**, so real GDP falls back towards full employment and the price level falls (or rises more slowly).

4. *Draw the reserve market with the policy.* Label the axes policy rate and quantity of reserves. Keep reserve supply vertical and unchanged on the flat portion of reserve demand. Raising IOR shifts that flat portion **up**, so the policy rate rises without a decrease in reserve supply.

Write every link of the chain. "The Fed raises rates so inflation falls" loses the explanation mark; "higher rates reduce investment, AD shifts left, so the price level falls" earns it.



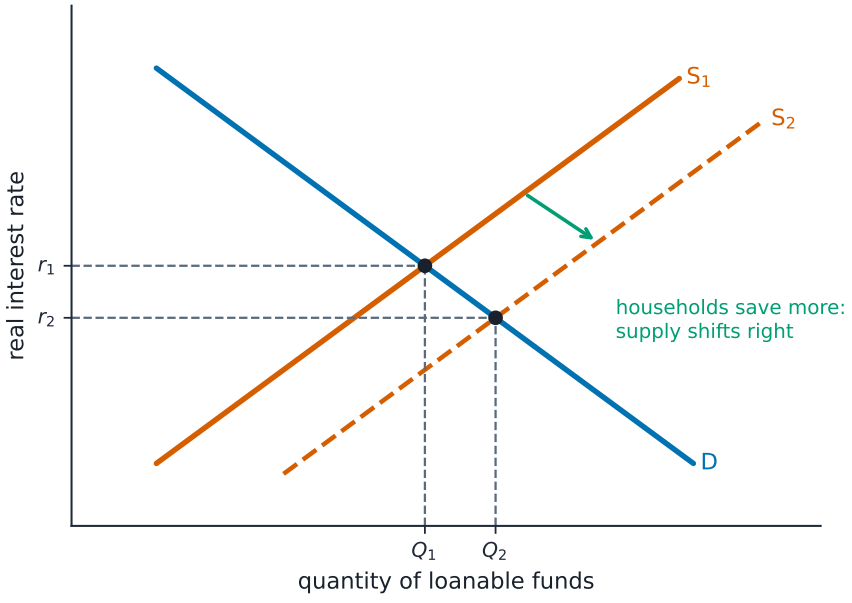
A central bank building: monetary policy sets interest rates and the money supply

The Loanable Funds Market

The **loanable funds market** 可贷资金市场 determines the **real interest rate** and connects saving to investment:

- **Supply of loanable funds** comes from **saving** and slopes upward.
- **Demand for loanable funds** comes from **borrowers** (firms investing, government borrowing) and slopes downward.

That saving is the economy's **national savings** 国民储蓄 = **private savings** (households and firms) + **public savings** (the government's budget balance – a surplus adds to saving, a deficit subtracts from it). For an open economy, investment = national savings + net capital inflow from abroad. So a bigger budget deficit is negative public saving that shrinks the supply of loanable funds and crowds out investment.



Higher private saving shifts the supply of loanable funds right: the real interest rate falls and the quantity of funds lent rises

More saving shifts supply right and lowers the real rate; more government borrowing shifts demand right and **raises** the real rate – the mechanism behind **crowding out**. Distinguish the two graphs: the **money market** sets the **nominal** rate (vertical money supply), while **loanable funds** sets the **real** rate (upward-sloping saving supply).

What shifts which curve.

Event	Curve	Real interest rate
Households save more (or a tax incentive for saving)	supply right	falls
Government runs a larger budget deficit	demand right (AP's usual answer)	rises
Firms expect higher profits and invest more	demand right	rises
Foreign savers send more capital into the country	supply right	falls

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Worked example (a budget deficit). Japan's government budget deficit increases. The government borrows more, so the demand for loanable funds shifts right (or, equivalently, public saving falls and supply shifts left). The real interest rate **rises**, and private investment that would have taken place at the old rate is **crowded out**. Draw the loanable funds graph with "real interest rate" on the vertical axis and "quantity of loanable funds" on the horizontal axis.

Exam skill: know which graph to draw – money market for monetary policy, loanable funds for saving, deficits, and crowding out – and trace how a shift in one feeds into AD-AS.

Exam tips

- Know money's three functions and the M1/M2 measures.
- The **money market** sets the nominal interest rate (vertical money supply); more money supply lowers the rate.
- Compute the **money multiplier** $\frac{1}{rr}$ and the maximum change in the money supply from a new deposit.
- Trace monetary policy: money supply $\rightarrow$ interest rate $\rightarrow$ investment $\rightarrow$ AD $\rightarrow$ output.
- Distinguish the money market (nominal rate) from the loanable-funds market (real rate); use the real rate = nominal − inflation.

Practice.

1. A perpetual bond pays \$60 a year with no maturity repayment. What is its price if market interest rates are 3%?
2. $rr = 0.25$ and a bank has \$4000 of deposits and \$1500 of reserves. What are its excess reserves, and how much can it lend?
3. The Fed buys \$200 of bonds from a commercial bank, with $rr = 0.10$. What happens to the bank's required reserves, and what is the maximum change in the money supply?
4. Give one reason why the actual change in the money supply can be smaller than the maximum.
5. Show, in words, the effect on the money market of an increase in real GDP.
6. The government cuts its budget deficit. What happens to the real interest rate and to private investment?

Answers.

1. $\frac{60}{0.03} = \$2000$.
2. Required reserves $0.25 \times 4000 = \$1000$, so excess reserves are \$500; it can lend \$500.
3. Required reserves do not change (deposits are unchanged); all \$200 is excess reserves. Maximum change: $200 \times 10 = \$2000$.

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4. Banks keep some excess reserves, or borrowers hold some of their loans as cash.
5. Money demand shifts right against a vertical money supply, so the nominal interest rate rises.
6. Demand for loanable funds falls (or supply rises), so the real interest rate falls and private investment rises (less crowding out).

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Long-Run Consequences of Stabilization Policies

AP Macroeconomics

Fiscal and Monetary Policy in the Short Run



A parliament building: governments use spending and taxes as fiscal policy tools

In 2020 the US government spent trillions of dollars on relief payments while the Federal Reserve cut interest rates to almost zero. Unemployment fell quickly – and by 2022 inflation was the highest in forty years. Whether that inflation was the price of a fast recovery is exactly the trade-off this unit studies.

Both policies work by shifting **AD** in the short run. **Fiscal policy** 财政政策 changes government spending or taxes; **monetary policy** 货币政策 changes the **money supply** 货币供给 and thus the interest rate. They can work **together** (both expansionary to fight a deep recession) or be **mixed** (e.g. loose fiscal + tight monetary). In the short run, expansionary policy raises output and the price level and lowers unemployment; contractionary policy does the reverse.

The policy mix in one table. Use it to check the direction of each effect before you write an answer.

Policy	Interest rate	Investment	AD	Real GDP and price level
Expansionary fiscal (more G or lower taxes)	rises (government borrows)	may fall (crowding out)	right	both rise
Contractionary fiscal	falls	may rise	left	both fall
Expansionary monetary (buy bonds or lower IOR)	falls	rises	right	both rise
Contractionary monetary	rises	falls	left	both fall
Loose fiscal **and** tight monetary	rises clearly	falls	uncertain	uncertain: depends on sizes

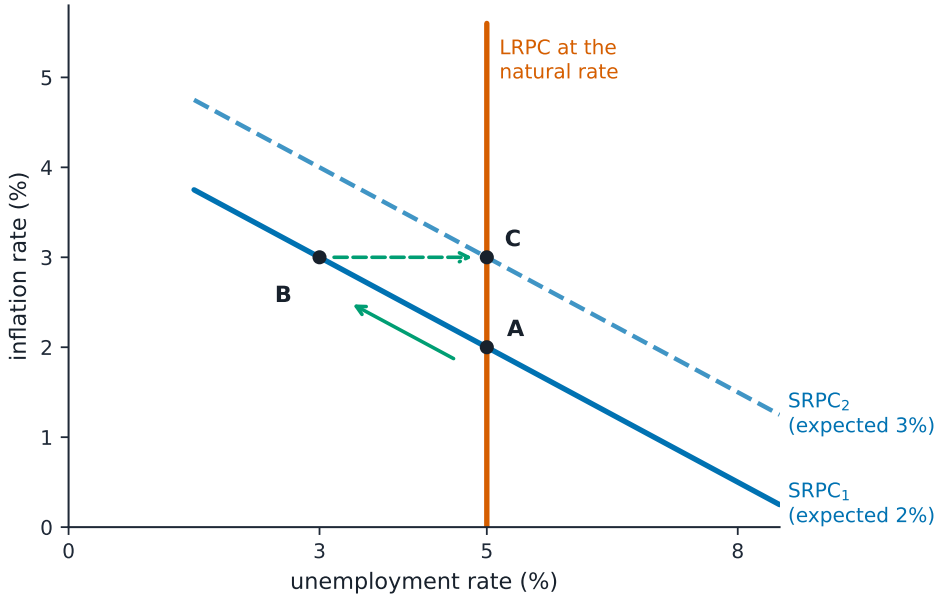
When two policies push AD in opposite directions, the effect on output is **indeterminate**. Say so in an FRQ, and explain that it depends on which shift is larger.

The Phillips Curve

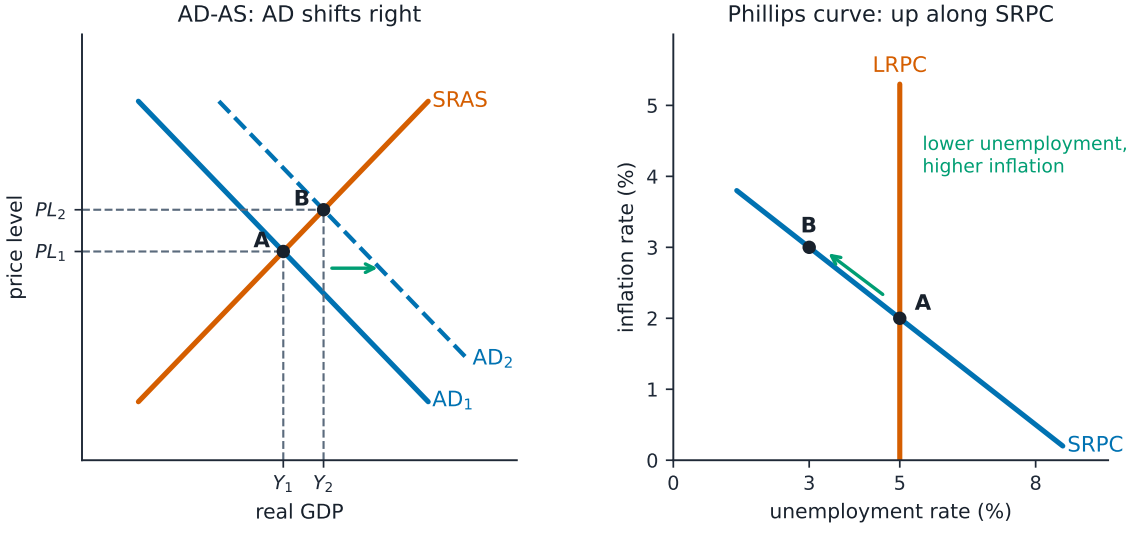
The **Phillips curve** 菲利普斯曲线 shows the short-run trade-off between **inflation** and **unemployment**:

- The **short-run Phillips curve (SRPC)** 短期菲利普斯曲线 slopes **downward** – lower unemployment comes with higher inflation. It is the mirror image of AD-AS: a rightward AD shift moves the economy up-left along the SRPC (less unemployment, more inflation).
- The **long-run Phillips curve (LRPC)** 长期菲利普斯曲线 is **vertical** at the **natural rate of unemployment** 自然失业率 – the counterpart of vertical LRAS. In the long run there is **no** trade-off: policy changes inflation, not unemployment.

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Expansionary policy moves the economy from A to B along SRPC1; when expected inflation catches up, SRPC shifts up and unemployment returns to the natural rate at C



One demand shock on two graphs: AD shifts right on the AD-AS graph (A to B), and the economy moves up-left along the short-run Phillips curve

Translate between the two graphs. A shift of **AD** is a **movement along** the SRPC (right on AD means up-left on the SRPC). A shift of **SRAS** is a **shift** of the SRPC, in the opposite direction: SRAS left means SRPC right. Point A on LRAS matches point A on LRPC, because full-employment output goes with the natural rate of unemployment.

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- A **supply shock** 供给冲击 shifts the SRPC (a negative shock moves it right – worse inflation *and* unemployment, i.e. **stagflation** 滞胀). A change in **expected inflation** 预期通货膨胀 also shifts the SRPC.

> **Worked example (expectations).** The natural rate of unemployment is 5% and people expect 3% inflation. The economy is at point B: unemployment 7%, inflation 1%.

- Unemployment is above the natural rate, so the economy is in a recession (a recessionary gap), to the right of the LRPC.
- Actual inflation (1%) is **less than** expected inflation (3%).
- With no policy action, people lower their expected inflation, and the SRPC shifts **left (down)** until unemployment is back at 5% – the Phillips-curve version of SRAS shifting right as wages fall.

Exam skill: link the AD-AS and Phillips graphs – a recessionary gap in AD-AS corresponds to a point on the SRPC to the **right** of the natural rate; know what shifts SRPC versus moves along it.

Money Growth and Inflation

In the long run, **inflation is a monetary phenomenon**. The **quantity theory of money** 货币数量论 states $M \times V = P \times Y$ (money supply × velocity = price level × real output). In the long run velocity V is roughly stable and real output Y grows at its own pace, set by real resources and technology, not by money. So growth in the **money supply** above output growth translates almost one-for-one into **inflation**: inflation ≈ money growth − real output growth. Printing money faster than the economy grows raises the price level, not real output – the root of high inflation and, in the extreme, **hyperinflation** 恶性通货膨胀.

> **Worked example.** An economy has a money supply of \$2 trillion, velocity of 5 and real output of \$5 trillion. Then $P = \dfrac{M \times V}{Y} = \dfrac{2 \times 5}{5} = 2$. Next year the money supply grows by 8 %, real output grows by 3 % and velocity does not change. Inflation $\approx 8\% - 3\% = 5\%$, so the price level rises to about $2 \times 1.05 = 2.10$. Check: $\dfrac{2.16 \times 5}{5.15} \approx 2.10$.

> **Worked example (velocity).** If the money supply is constant and nominal GDP ($P \times Y$) rises, then $V = \dfrac{P \times Y}{M}$ must have **increased**: each dollar is being spent more times a year.

A real example. Zimbabwe's government financed its spending by printing money in the 2000s. By late 2008 monthly inflation was in the billions of percent, and in 2009 the country stopped using its own currency and switched to the U.S. dollar and other foreign currencies.

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More money chasing goods: sustained money growth tends to raise the price level over time

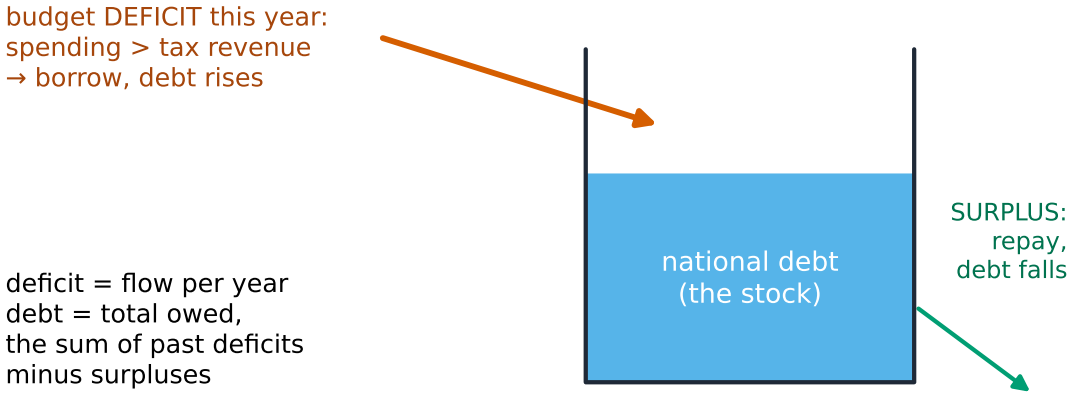
Government Deficits and the National Debt

A **budget deficit** 预算赤字 occurs when government spending exceeds tax revenue in a year (a **budget surplus** 预算盈余 is the reverse). The accumulated total of past deficits is the **national debt** 国债. For example, if the debt is \$10 trillion and this year's deficit is \$1 trillion, the debt becomes \$11 trillion; a \$0.5 trillion surplus the next year would reduce it to \$10.5 trillion. A falling deficit still **adds** to the debt – only a surplus reduces it. Deficits are financed by **borrowing** – selling **government bonds** 政府债券 – which adds to the debt and to future interest payments. Persistent deficits raise concerns about crowding out and the burden of servicing the debt.

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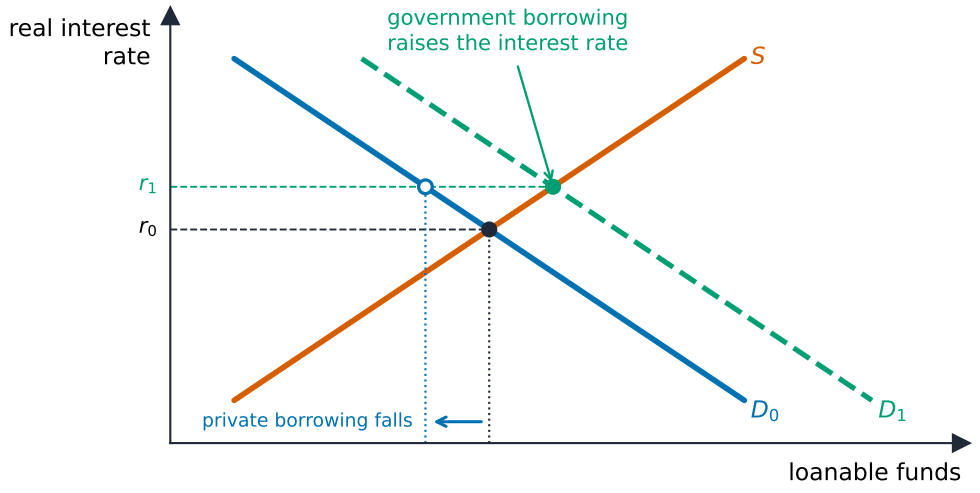
Bond and equity markets: government borrowing competes for loanable funds and can crowd out private investment



A deficit is a yearly flow; the national debt is the stock it adds to

Crowding Out

Crowding out 挤出效应 is the main long-run cost of deficit-financed fiscal policy. When the government borrows heavily, it increases the **demand for loanable funds** 可贷资金需求, raising the **real interest rate** 实际利率. Higher rates **reduce private investment** (and interest-sensitive consumption). So expansionary fiscal policy partly cancels itself: the AD boost is offset by weaker investment. Worse, less investment today means a smaller capital stock and **slower long-run growth**.



govt borrow $\Rightarrow r \uparrow \Rightarrow$ private $I \downarrow$

Government borrowing raises interest rates and crowds out private investment

Exam skill: show crowding out on the **loanable funds** graph – government borrowing shifts demand right, the real interest rate rises, and private investment falls.

> **Worked example.** A government borrows \$500 billion to finance a deficit. On the loanable funds market this shifts the demand for funds right, pushing the real interest rate up (say from 3% to 4%). At the higher rate firms scale back investment – perhaps by \$150 billion – so the net boost to AD is smaller than the \$500 billion, and the lost investment slows long-run growth.

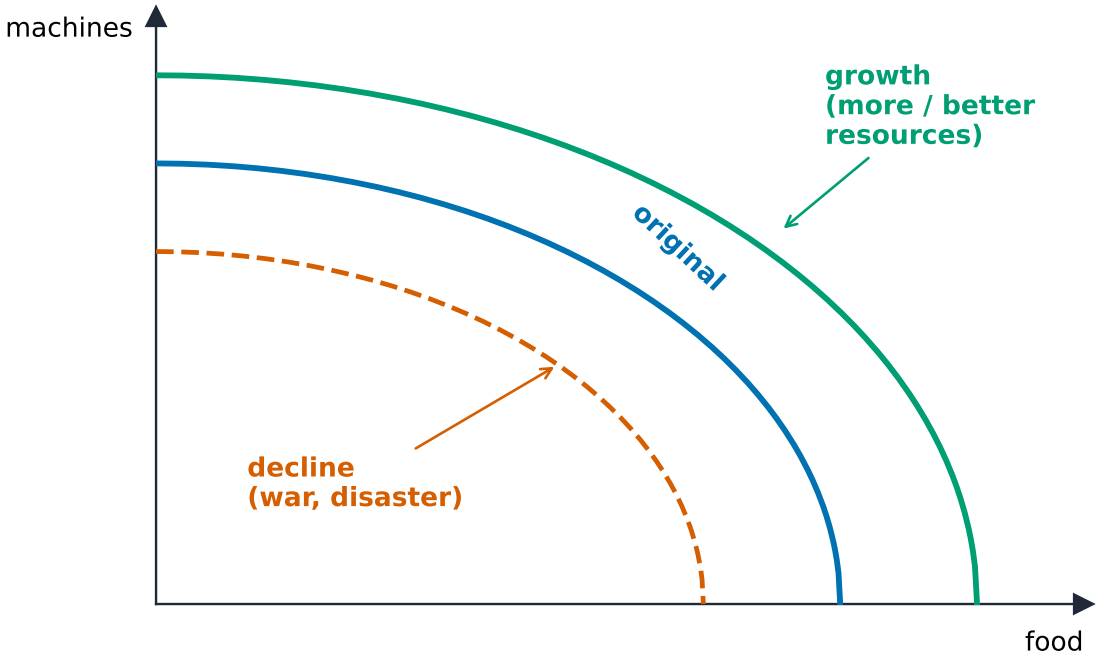
Following it to the long run. Less private investment means less new physical capital. With a smaller capital stock than otherwise, productivity grows more slowly, so the **long-run growth rate falls** and LRAS shifts right **more slowly** than it would have. The reverse also holds: a government that cuts its deficit lowers the real interest rate, which encourages investment and raises long-run growth.

Economic Growth

Economic growth 经济增长 is a sustained rise in an economy's productive capacity. Growth in **real GDP per capita** 人均实际国内生产总值 raises average material living standards; total capacity can grow without output per person rising. It comes from more or better resources and is shown as a **rightward shift of LRAS** (and an outward shift of the PPC). Its main drivers:

- **physical capital** 实物资本 (more tools and machines per worker),
- **human capital** 人力资本 (education, skills, health),
- **technology** 技术 and innovation,

- **productivity** 生产率 (output per worker) growth, the deepest driver.



Economic growth shifts the production possibilities curve outward

Public Policy and Economic Growth



A wind farm: public investment in capital can raise long-run economic growth

Governments can raise long-run growth by policies that build capital and productivity: investment in **infrastructure** 基础设施 and education, **research and development**

研究与开发 incentives, protecting **property rights** 产权 and the **rule of law** 法治, encouraging **saving and investment** (which finances capital), and keeping inflation low and stable. The recurring long-run theme: policies that **crowd out** or discourage investment slow growth, while those that **encourage** capital formation speed it up.

Worked FRQ: The Phillips Curve

An economy is in long-run equilibrium with an unemployment rate of 5 % and an inflation rate of 2 %.

(a) Draw a correctly labeled graph of the short-run and long-run Phillips curves. Label the current point A. Label the axes *inflation rate* (vertical) and *unemployment rate* (horizontal). Draw a downward-sloping SRPC and a vertical LRPC at 5 %. A is where they cross, at (5 %, 2 %).

(b) The government increases spending. Show the short-run effect as point B. AD shifts right, so unemployment **falls** below 5 % and inflation **rises**. B is up-left of A **on the same SRPC**.

(c) Over time, people expect the higher inflation. What happens to the SRPC? Where does unemployment end up? Higher expected inflation shifts the SRPC **up (right)**. Unemployment returns to the **natural rate, 5 %**, at a higher inflation rate (point C on the LRPC). This is the same story as SRAS shifting left back to LRAS.

(d) Instead, a sharp rise in oil prices hits the economy at A. What happens to the SRPC? It is a negative supply shock: SRAS shifts left, so the **SRPC shifts right**. Unemployment and inflation both rise (stagflation).

Common ways to lose the mark: swapping the axes; drawing the LRPC at an unemployment rate other than the natural rate; *shifting* the SRPC for a demand shock (a demand shock is a movement along it); putting the long-run point anywhere but on the LRPC.

Exam tips

- The short-run **Phillips curve** shows the inflation–unemployment trade-off; the long-run curve is **vertical** at the natural rate.
- In the long run inflation is a **monetary** phenomenon (money growth beyond output growth → inflation).
- Show **crowding out** on the loanable-funds graph: government borrowing raises the real rate and cuts private investment.
- Growth comes from more/better resources – physical capital, human capital, technology – shifting LRAS right.
- A supply shock moves inflation and unemployment the same way (stagflation), unlike a demand shock.

Practice.

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1. Expansionary fiscal policy and contractionary monetary policy are used at the same time. What happens to the interest rate, and to real GDP?
2. The economy is at an unemployment rate of 4% with inflation of 6%; the natural rate is 5% and expected inflation is 3%. Is actual inflation above or below expected? What happens to the SRPC in the long run with no policy?
3. $M = \$4$ trillion, $V = 5$, real output $Y = \$10$ trillion. Find the price level. If M doubles with V and Y unchanged, what happens to P?
4. A government runs deficits of \$300 billion and \$200 billion in two years, starting with a debt of \$5 trillion. What is the debt after two years?
5. Explain how higher government borrowing can reduce long-run growth.
6. Name two policies that shift LRAS to the right.

Answers.

1. The interest rate rises; the effect on real GDP is indeterminate (it depends on which shift of AD is larger).
2. Above expected ($6\% > 3\%$). Expected inflation rises, so the SRPC shifts right (up), and unemployment returns to 5% at a higher inflation rate.
3. $P = \frac{4 \times 5}{10} = 2$. Doubling M doubles P to 4.
4. \$5 trillion $+0.3 + 0.2 = \$5.5$ trillion.
5. Borrowing raises the real interest rate, which crowds out private investment; with less capital, productivity and LRAS grow more slowly.
6. For example: subsidies for education or training (human capital), investment tax credits, R&D incentives, infrastructure spending.

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Open Economy–International Trade and Finance

AP Macroeconomics

Balance of Payments Accounts

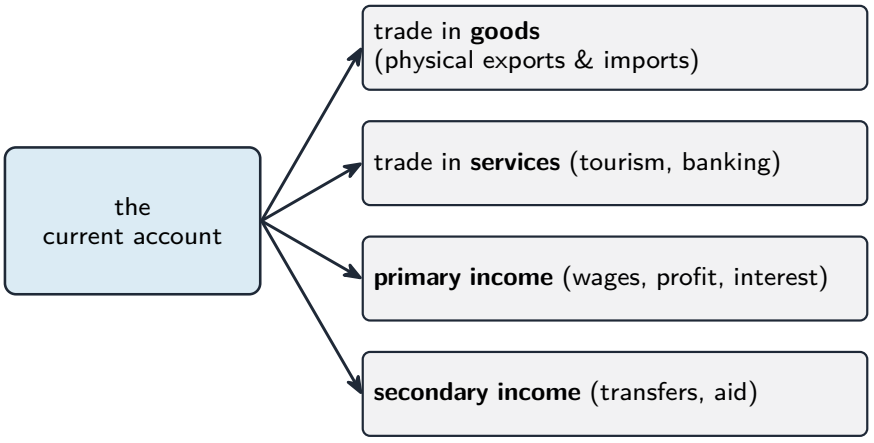


A container terminal: exports and imports appear in the balance of payments

An iPhone is designed in California, assembled largely in China from parts made in Japan, South Korea and Taiwan, and sold in more than a hundred countries. Each step is a payment across a border, often in a different currency. This unit follows those payments: how they are recorded, how exchange rates are set, and how they feed back into output and prices at home.

The **balance of payments** 国际收支 records all **transactions** 交易 between a country and the rest of the world, in two main accounts:

- The **current account** 经常账户 tracks trade in **goods and services** 商品和服务 (**exports** 出口 minus **imports** 进口), plus income and **transfers** 转移支付. A **trade deficit** 贸易逆差 lowers its balance, but net income or transfers can offset it.
- The **capital (financial) account** 资本账户 tracks flows of **financial assets** 金融资产 – foreigners buying domestic assets, and residents buying foreign assets.



The four parts of the current account

The two are **mirror images** 镜像: a current-account deficit is matched by a **capital-account surplus** 资本账户顺差 (a country that imports more than it exports pays with assets, so **foreign investment** 外国投资 flows in). They sum to zero.

> **Worked example (computing the balances).** In one year a country records (billions of dollars):

item	value
exports of goods and services	500
imports of goods and services	620
net income from abroad	+30
net transfers to abroad	−10

Balance of trade in goods and services: $500 - 620 = -120$. Current account: $-120 + 30 - 10 = -100$, a deficit of \$100 billion. So the financial (capital) account shows a **surplus** of about \$100 billion: foreigners acquired \$100 billion more of this country's assets than its residents acquired abroad.

Common mistake. Putting a purchase of foreign **shares or bonds** in the current account. Buying assets is the financial account; buying goods and services is the current account.

Exchange Rates

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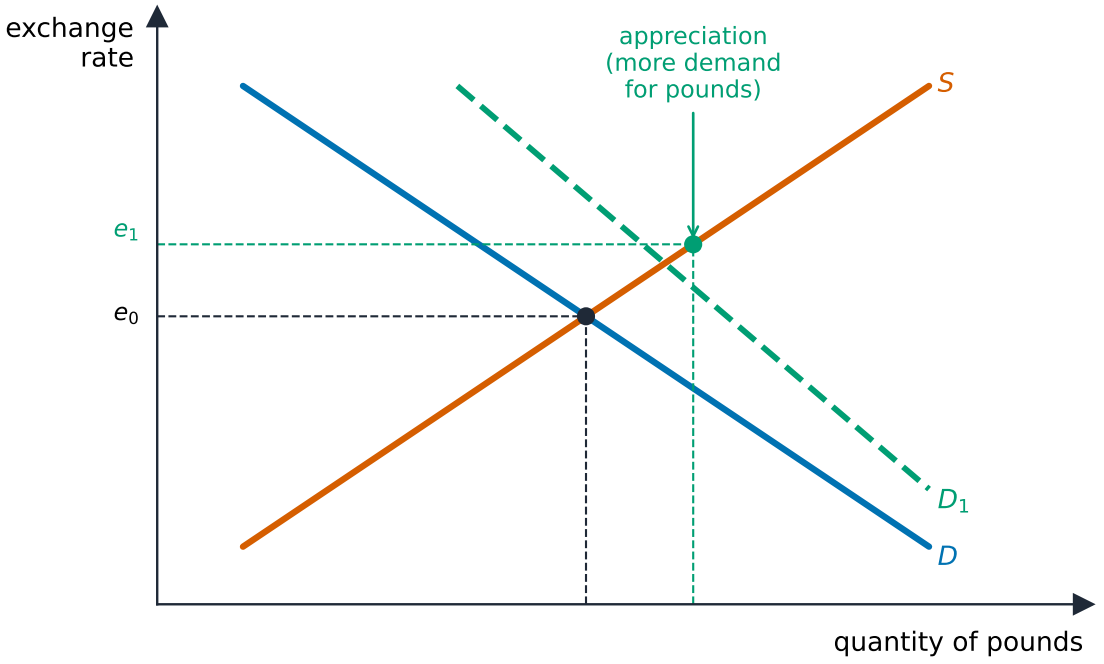


A currency exchange board: exchange rates are the price of one currency in terms of another

An **exchange rate** 汇率 is the price of one currency in terms of another. A currency **appreciates** 升值 when it gains value (buys more foreign currency) and **depreciates** 贬值 when it loses value. Always track *which* currency: if the US dollar appreciates against the euro, the euro depreciates against the dollar – the same event from two sides.

> **Worked example.** Suppose \$1 = €0.90, so €1 = $\frac{1}{0.90} \approx$ \$1.11. If the dollar then appreciates to \$1 = €1.00, each dollar now buys more euros, while the euro has *depreciated* – it now buys only \$1.00 instead of \$1.11. The single event is an appreciation of the dollar **and** a depreciation of the euro.

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A floating exchange rate set by the demand for and supply of a currency

In a **floating** 浮动 exchange-rate system, supply and demand in the **foreign-exchange market** 外汇市场 set the currency's price.

The Foreign Exchange Market

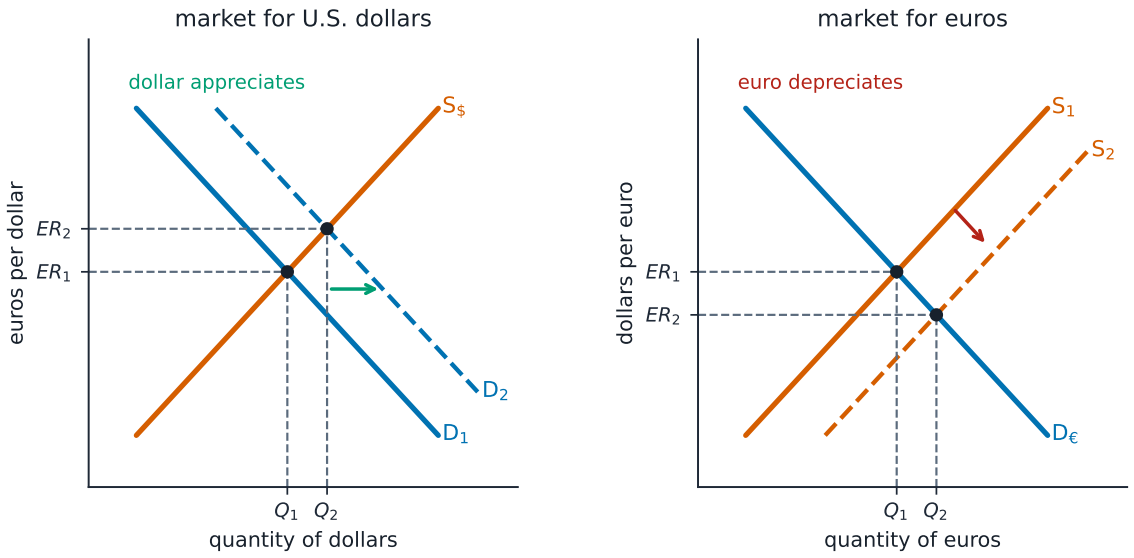
Each currency has its own supply-and-demand graph (price = the exchange rate, quantity = amount of that currency).

- **Demand** for a currency comes from foreigners wanting its goods, services, or assets.
- **Supply** of a currency comes from its own residents wanting foreign goods, services, or assets.

The **equilibrium exchange rate** 均衡汇率 is where they cross. A rightward shift in **demand** for a currency causes it to **appreciate**; a rightward shift in **supply** causes it to **depreciate**.

Exam skill: always draw the graph for the **currency named in the question**, label the axis with that currency's price, and shift the correct curve – mixing up the two currencies' graphs is the most common error.

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One event in both currency markets: European investors buy U.S. bonds, so demand for dollars rises (the dollar appreciates) and the supply of euros rises (the euro depreciates)

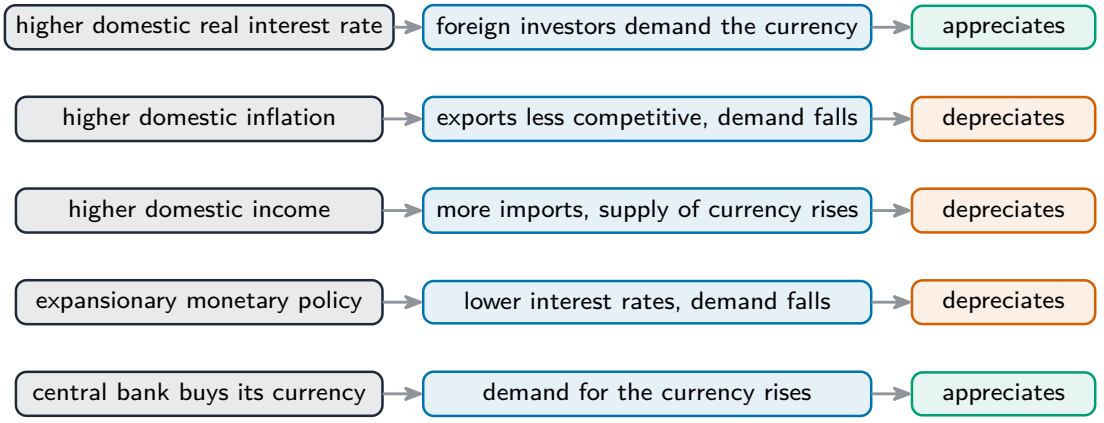
Read the two graphs together. To buy U.S. bonds, a European investor must **sell euros** and **buy dollars**. So one event moves a *demand* curve in the dollar market and a *supply* curve in the euro market. The vertical axes are each other's inverse: "euros per dollar" on the left, "dollars per euro" on the right. If the left price rises, the right price must fall.

Event (U.S. and euro area)	Market for dollars	Market for euros	Dollar
Europeans buy more U.S. goods or assets	demand for \$ right	supply of € right	appreciates
Americans buy more European goods or assets	supply of \$ right	demand for € right	depreciates
U.S. real interest rate rises	demand for \$ right (capital inflow)	supply of € right	appreciates
U.S. inflation rises faster than Europe's	demand for \$ left, supply of \$ right	the reverse	depreciates

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Changes in Policies and Economic Conditions

Exchange rates respond to:



Trace each change through demand or supply of the currency.

- **Relative interest rates:** a higher **domestic** 国内的 **real interest rate** 实际利率 attracts foreign financial investment, raising **demand** for the currency and causing **appreciation**.
- **Relative price levels/inflation:** higher domestic **inflation** 通货膨胀 makes goods less **competitive** 有竞争力的, lowering demand for the currency (**depreciation**).
- **Relative incomes:** higher domestic income raises imports, increasing the **supply** of domestic currency (depreciation).
- **Tastes** 偏好 and **expectations** 预期 about future value.

Monetary policy 货币政策 has a strong link: **expansionary** 扩张性 monetary policy lowers interest rates, reduces demand for the currency, and causes **depreciation** (which then boosts net exports).

> **Worked example (a partner's recession).** The euro zone, a major US trading partner, enters a recession. European incomes fall, so Europeans buy fewer US goods: US exports to the euro zone **fall**. Fewer euros are offered for dollars, so demand for the dollar falls and the dollar **depreciates**; equivalently, the euro **appreciates** against the dollar.

> **Worked example (lower US inflation).** If US inflation falls relative to South Korea's, US goods become relatively cheaper, so US exports to South Korea **increase**. Koreans need more dollars, so demand for dollars rises and the dollar **appreciates** against the won.

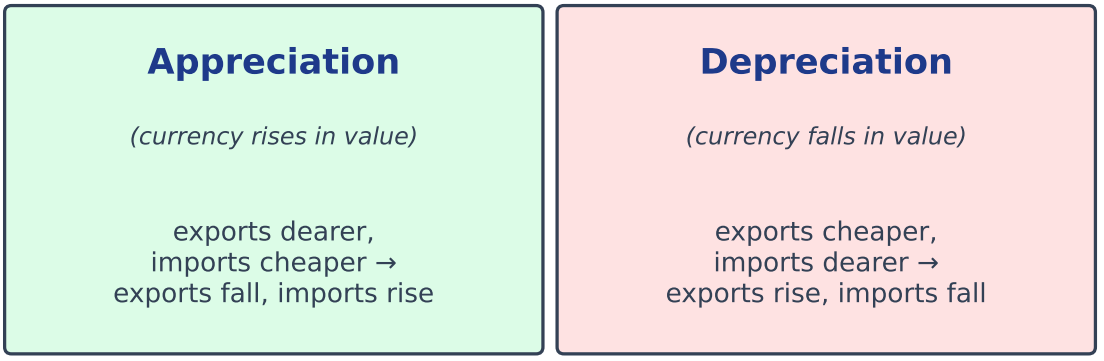
Central bank intervention. A central bank can push its currency's value with its own reserves. If the euro has **depreciated** against the yen and the European Central

Bank wants to reverse it, the ECB should **buy euros** (selling foreign currency): this raises demand for euros and the euro appreciates. To weaken a currency, the central bank sells it.

Exchange Rates and Net Exports

Exchange rates feed back into **aggregate demand** 总需求 (AD) through **net exports** 净出口:

- A **depreciation** makes exports cheaper for foreigners and imports dearer, so **net exports rise** and AD shifts right.
- An **appreciation** makes exports dearer and imports cheaper, so **net exports fall** and AD shifts left.



Appreciation makes exports dearer and imports cheaper; depreciation does the reverse

> **Worked example.** A US car priced at \$30,000 costs a European buyer €27,000 when \$1 = €0.90. If the dollar **depreciates** to \$1 = €0.80, the same car now costs only €24,000 – cheaper for foreigners, so US exports rise while imports (now dearer in dollars) fall, lifting net exports and shifting AD right.

This is how the foreign-exchange market and the AD-AS model connect – a currency change is a channel through which policy reaches output.

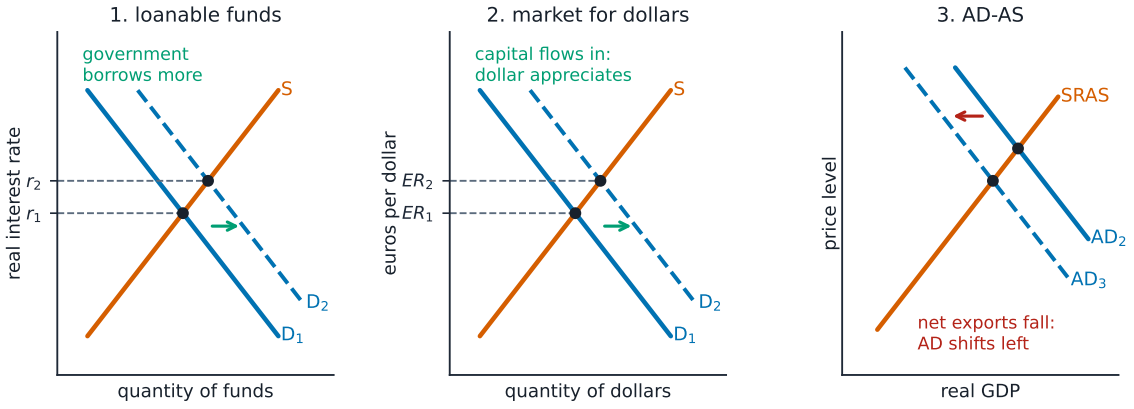
Real Interest Rates and International Capital Flows

Money chases the highest **real** return, so **capital flows** 资本流动 respond to real interest rates:

- A **higher** domestic real interest rate attracts **inflows** 流入 of foreign financial capital – foreigners buy domestic **bonds** 债券, raising currency demand and causing appreciation.
- A **lower** real rate causes **outflows** 流出 and depreciation.

This ties the whole course together: **government borrowing** 政府借款 raises the real

interest rate (**loanable funds** 可贷资金), which attracts foreign capital, appreciates the currency, and reduces net exports – so a **budget deficit** 预算赤字 can widen a trade deficit (the "**twin deficits** 双赤字 "). Tracing these linked effects across the loanable-funds, forex, and AD-AS graphs is the capstone skill of AP Macroeconomics.



A budget deficit traced across three graphs: government borrowing raises the real interest rate, foreign capital flows in and the dollar appreciates, so net exports fall and AD shifts left

A real example. In 2022 the Federal Reserve raised interest rates faster than the European Central Bank. Investors moved funds into U.S. dollar assets, and in July 2022 the euro fell below one dollar for the first time in twenty years. A stronger dollar made U.S. exports dearer abroad and imports cheaper at home, and the U.S. trade deficit in goods and services reached a record of about $950 billion that year.

Worked FRQ: Open-Economy Links

Country Z has a flexible exchange rate. Its central bank uses contractionary monetary policy to fight inflation, and its real interest rate rises relative to the rest of the world.

(a) What happens to financial capital flows into Country Z? Explain. Capital **inflows rise**: foreign savers earn a higher real return on Country Z's bonds.

(b) Draw the foreign-exchange market for Country Z's currency (the zed). Show the effect. Label the vertical axis with the zed's price in another currency (for example "dollars per zed") and the horizontal axis "quantity of zed". **Demand for zed shifts right**, so the zed **appreciates**. (Not supply: foreigners must *buy* zed to buy the bonds.)

(c) What happens to Country Z's net exports? Explain. Net exports **fall**: the stronger zed makes Country Z's exports dearer for foreigners and imports cheaper for its residents.

(d) Does this change in net exports strengthen or weaken the policy? It **strengthens** contractionary policy: lower net exports shift AD further **left**, adding to the fall in investment. Expansionary policy works the other way round, with a weaker

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currency raising net exports.

(e) Country Z's current account was balanced at first. What happens to its financial (capital) account? The financial account moves towards a **surplus** (more foreign purchases of Z's assets), and the current account moves towards a **deficit** by the same amount, because the two accounts sum to zero.

Common ways to lose the mark: drawing the graph for the wrong currency; shifting supply when the event is foreigners buying the currency; saying "exports rise because the currency is stronger"; leaving out the link from net exports to AD.

Exam tips

- The current account and financial account are **mirror images** and sum to zero.
- Always draw the forex graph for the **currency named**, and label its price with that currency; one currency appreciating is the other depreciating.
- A **depreciation** raises net exports (exports cheaper); an appreciation lowers them.
- Higher domestic real interest rates attract capital inflows → currency appreciates → net exports fall.
- Link it all: a budget deficit raises the real rate, appreciates the currency, and can widen the trade deficit (twin deficits).
- One event shows in both currency markets: buying a currency is **demand** in its own market and **supply** in the other currency's market.

Practice.

1. A country exports \$300 billion and imports \$350 billion of goods and services; net income and transfers are zero. What is its current-account balance, and what must be true of its financial account?
2. Japan's real interest rate falls relative to Europe's. What happens to the supply of euros in the foreign-exchange market, and to the yen price of the euro?
3. Country X's real GDP rises sharply. What happens to the supply of its currency, and does the currency appreciate or depreciate?
4. If £1 = \$1.25, how many pounds does a \$50 book cost? If the pound then depreciates to £1 = \$1.10, what does the book cost?
5. The US government runs a larger budget deficit. Trace the effect on the US real interest rate, the dollar and US net exports.
6. A central bank wants its currency to depreciate. Should it buy or sell its own currency?

Answers.

1. −\$50 billion (a deficit); the financial account has a surplus of \$50 billion.

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2. Japanese assets now pay less, so European savers buy fewer of them and sell fewer euros: the **supply** of euros decreases. (Japanese savers also move funds into euro assets, raising demand for euros.) The euro appreciates: the yen price of the euro rises.
3. Higher incomes raise X's imports, so the supply of X's currency increases and it depreciates.
4. £40; then about £45.45 – the book is dearer for British buyers.
5. The real interest rate rises, capital flows in, the dollar appreciates, and US net exports fall.
6. Sell its own currency.

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