UNIVERSITÀ DEGLI STUDI DI TRIESTE

KING'S College LONDON

MACROECONOMICS 042EC

02 – Analysis in the short run

The goods market (Ch 3)

Ludovico Carrino

The Washington Post

Business Economy Economic Policy Media Personal

U.S. employers added 130,000 jobs in January, the strongest gain in months

The unemployment rate ticked down to 4.3 percent, a slight improvement, while large revisions slashed job gains from 2024 and 2025.

Updated February 11, 2026

February 2026 Labor Market Review: Job Gains Exceed Expectations

February 12, 2026 | Sydney Ross

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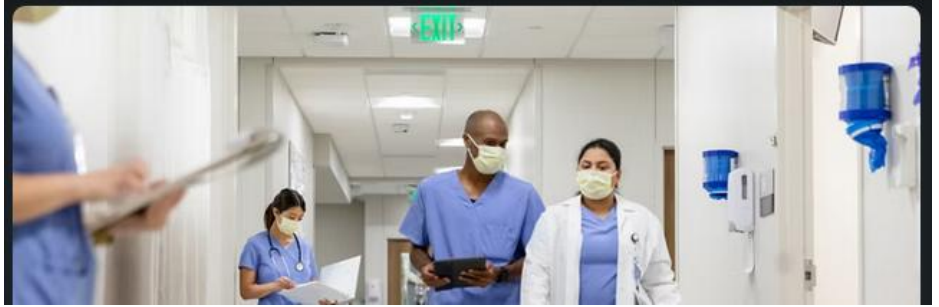

Good news for employment, bad for stocks?

The Washington Post

Business Economy Economic Policy Media Personal

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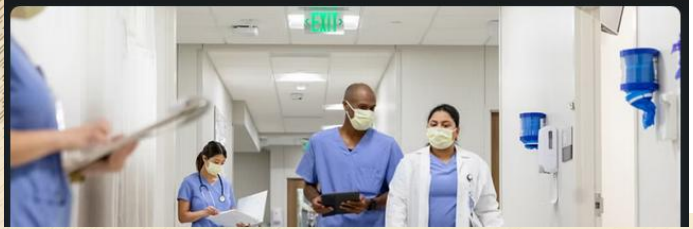
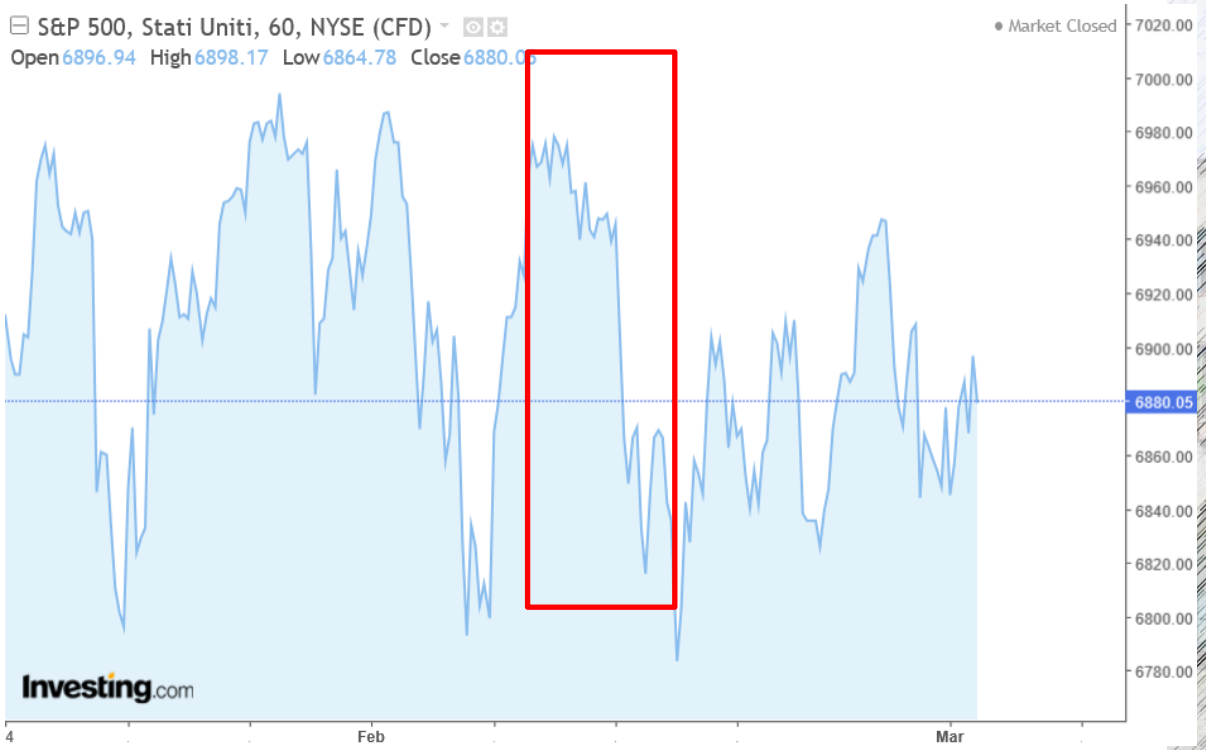




Stocks drop with tech slide and caution over inflation; yields also fall

By **Caroline Valetkevitch**

February 12, 2026 2:45 AM GMT+1 · Updated February 12, 2026

Macroeconomics questions we would like to answer

- What happens to a country's GDP (i.e., to production and income of residents)
  - when the central bank decides to change the interest rate?
  - when the government decides to increase taxes
  - when consumers become more pessimistic about the future
- What are the links between the economic performance of a country (levels of production, labour market outcomes, wages, profit, legislations) and changes in price level?
- How do changes in price levels in turn affect production and economic performance?
- For how long can fiscal and/or monetary policy sustain economic growth?
- What are the determinants of economic growth?

SHORT RUN

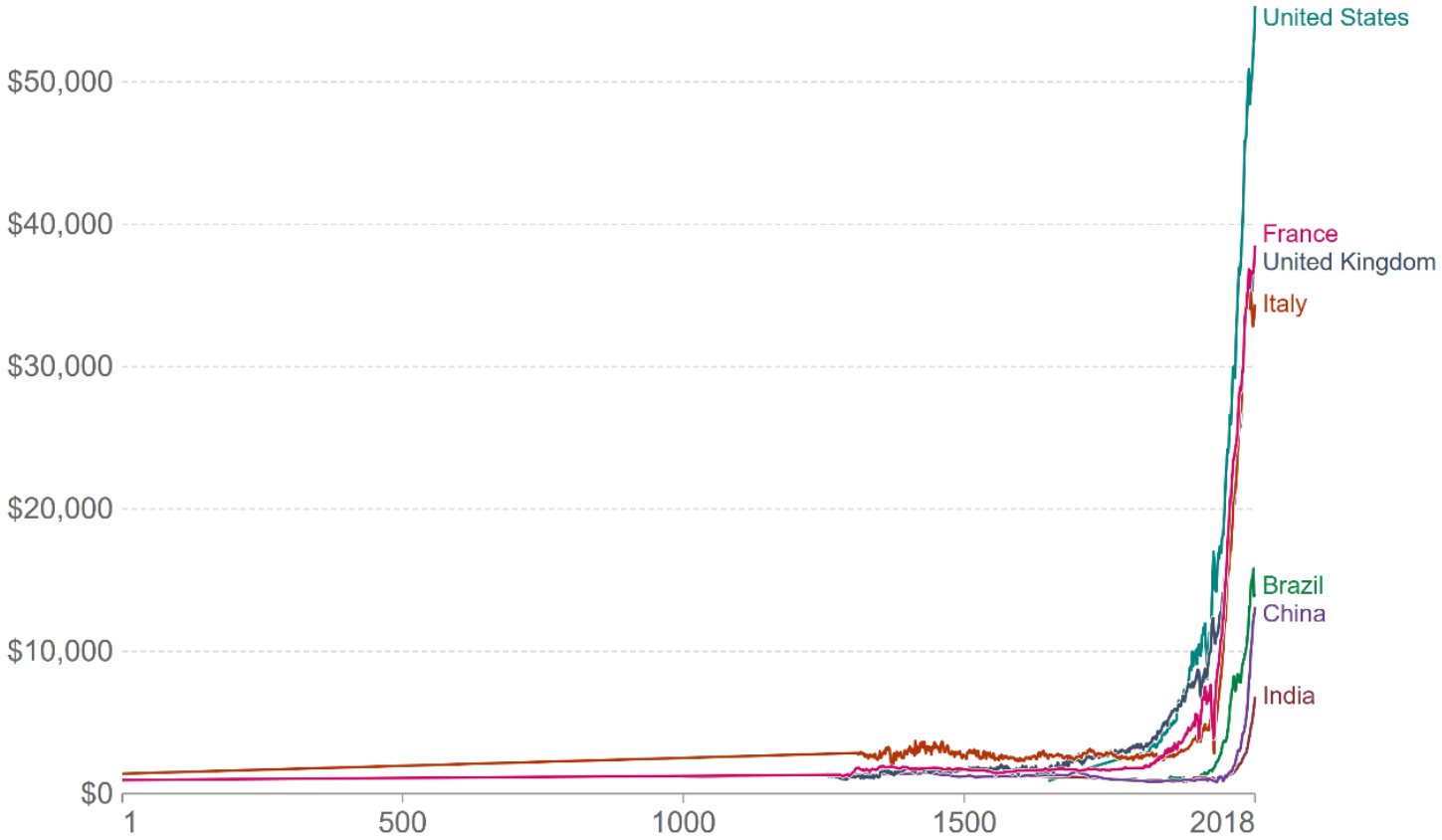
MID RUN

LONG RUN

GDP per capita, 1 to 2018

GDP per capita adjusted for price changes over time (inflation) and price differences between countries – it is measured in international-$ in 2011 prices.

Our World in Data



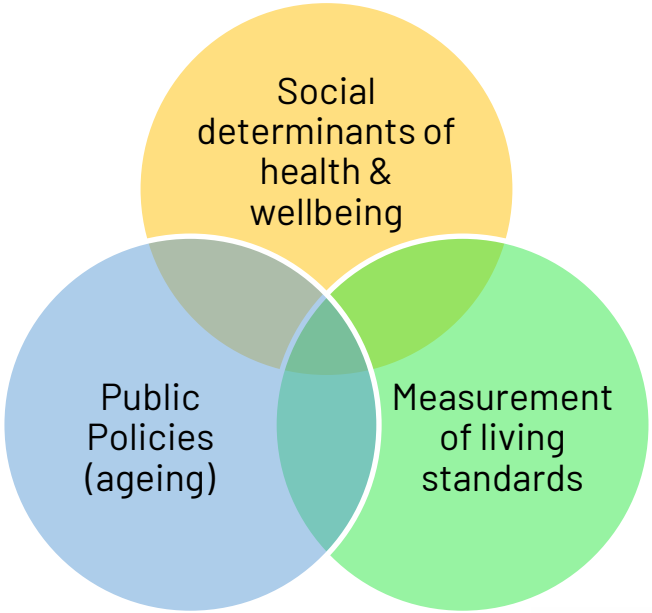
Source: Maddison Project Database 2020 (Bolt and van Zanden, 2020)

OurWorldInData.org/economic-growth • CC BY

Remember this on the short, medium and long run

- In the **short run** (e.g., a few years), year-to-year movements in output are primarily **driven by movements in demand**.
- In the **medium run** (e.g., a decade), the economy tends to return to the **level of output determined by supply factors, such as the capital stock, the level of technology, and the size of the labor force**.
- In the **long run** (e.g., a few decades or more), the economy depends on its **ability to innovate and introduce new technologies**, and how much people **save**, the quality of the country's education system, the quality of the government, and so on.

My research agenda: public economics



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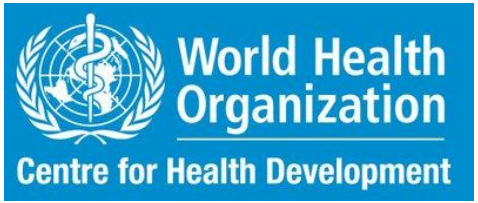

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REACH OUT
AND LISTEN


When I hurt my back:
When I had depression:
GET WELL SOON
we miss you!
take as long as you need...
Silence

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The Goods Market

- When economists think about year-to-year movements in economic activity, they focus on the interactions among demand, production, and income:
  - Changes in the demand for goods lead to changes in production
  - Changes in production lead to changes in income
  - Changes in income lead to changes in the demand for goods
- Our aim: understand what determines the demand of good, and what is the equilibrium between demand and supply in the short-term.
- **One basic message to remember: in the short run, demand determines output**.

The Composition of GDP: the "spending" definition

- **Consumption (C):** goods and services purchased by consumers
- **Investment-spending (I)** or fixed investment: the sum of nonresidential investment and residential investment
- **Government spending (G)**: purchases of goods and services by the federal, state, and local governments; excluding government transfers
- **Exports (X)**: purchases of U.S. goods and services by foreigners
- **Imports (IM)**: purchases of foreign goods and services by U.S. consumers, U.S. firms and the U.S. government
  - **Net exports or trade balance: X – IM**
  - Exports > Imports ⇔ trade surplus
  - Imports > Exports ⇔ trade deficit
- **Inventory investment**: difference between production and sales

		Per cent of GDP
	GDP (*Y*)	100.0
1	Consumption (*C*)	55.3
2	Investment (*I*)	+ 20.4
3	Government spending (*G*)	+ 20.2
4	Net exports	+ 3.3
	Exports (*X*)	46.4
	Imports (*IM*)	−43.0
5	Inventory investment	+ 0.8

Assumptions on short-term economy

- We will study that, in the LONG RUN, aggregate (=total) supply of goods/services Y is typically influenced by production factors such as labour, physical capital and technology.
- In the short term, we assume that capital and technology don't change, and firms are able to vary labour input to produce any amount which is demanded, at a given price level.
- We assume there is ONE single good which can be consumed and invested upon.
- We assume the economy is closed (no trade)
- We assume firms do not have inventory investments

Aggregate Demand for Goods (Z)

$$Z \equiv C + I + G + X - IM$$

- aggregate (=**total) supply of goods/services in the economy = Y**
- the **total demand for goods (Z)** in an economy is made of consumption, plus investment, plus government, plus export, minus imports.
- In a closed economy, where there is no foreign trade, X = IM = 0: hence

$$Z \equiv C + I + G$$

- In equilibrium, supply must be equal to demand, so $Y = Z$

Components of aggregate Demand: consumption

$$Z \equiv C + I + G$$

- Consumption (C) is a function of ("depends on / is caused by") disposable income (Y_D), which is the income that remains once consumers have received government transfers and paid their taxes.

$$\mathrm{C} = \mathrm{C}(Y_\mathrm{D})$$
$$(+)$$

- $C(Y_D)$ is called the **consumption function**.
  - Functional form unknown. Must be hypothesized or empirically estimated
- This is a **behavioral equation** that captures the behavior of consumers.

$$Z \equiv C + I + G$$

- Assume that the consumption function is a **linear relation** with two parameters, c_0 and c_1:

$$C = c_0 + c_1 Y_D$$

- c_1 is the **marginal propensity to consume**.
  - If the disposable income increases by 1, C changes by c_1. c_1 is the partial derivative of C with respect to Y_D.
  - We typically assume $c_1 > 0$ → positive marginal propensity
  - **And we assume $c_1 > 0$ & $c_1 < 1$ → positive but less than full marginal propensity**
  - If $c_1 < 1$, not all the increase in income goes into consumption. Where does the rest go?
- c_0 is what people would consume regardless of their income (e.g., if their disposable income equals zero). **Autonomous component of consumption**.
- Changes in c_0 reflect changes in consumption for a given level of disposable income.

$$Z \equiv C + I + G$$

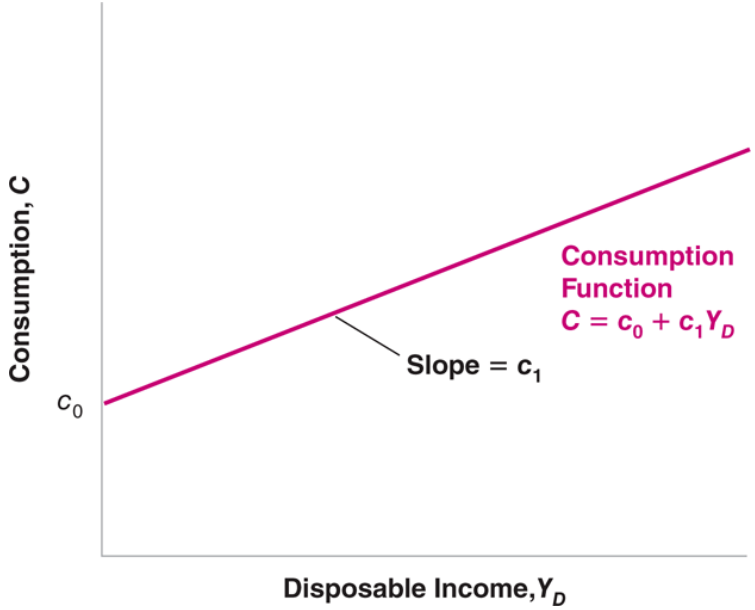
$$C = c_0 + c_1 Y_D$$

Consumption increases with disposable income but less than one for one.

A lower value of c_0 will shift the entire line down.

How can c_0 change? Consumers might find it easier or more difficult to borrow, or may become more or less optimistic about the future

- Figure 3.1 Consumption and Disposable Income if we assume consumption is a linear function of disposable income



$$Z \equiv C + I + G$$

$$C = c_0 + c_1 Y_D$$

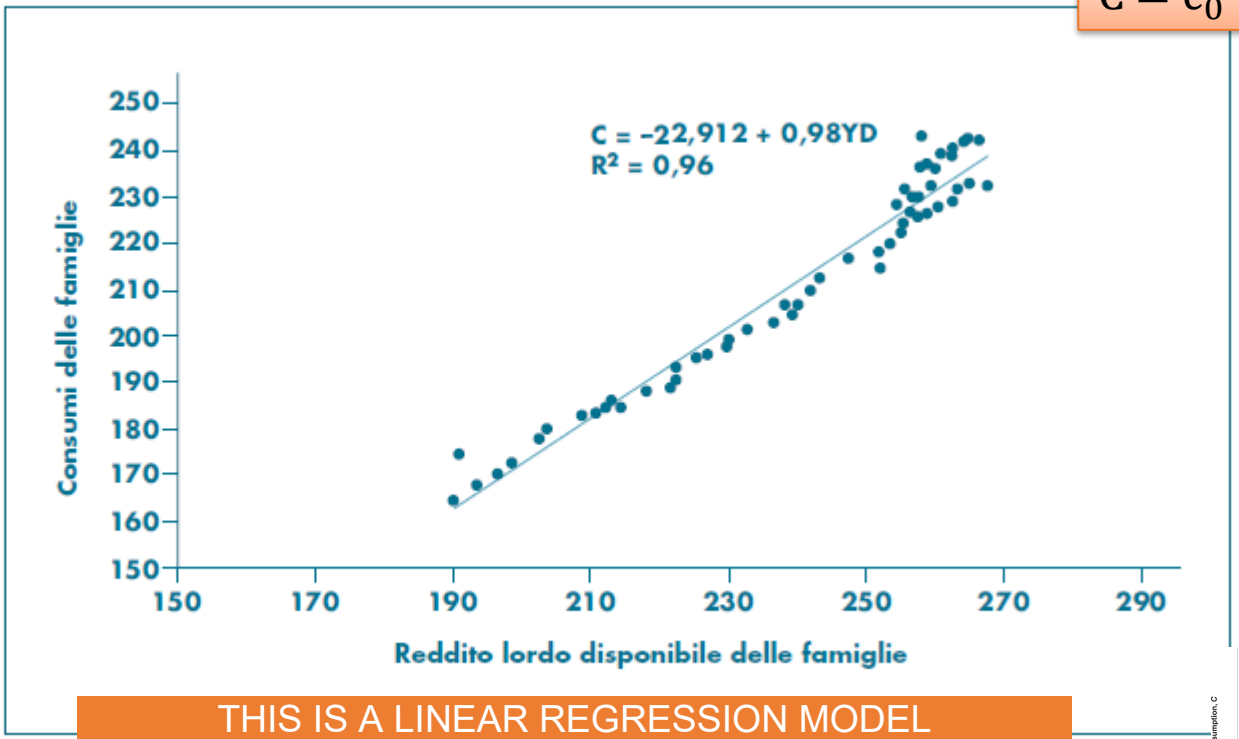
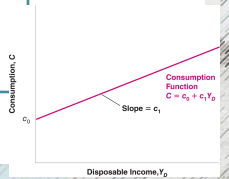


Figura 4.2*b*
Relazione consumo-reddito Italia, dati trimestrali 1999-2013 (miliardi di euro, prezzi 2000)

(*Fonte*: ISTAT, Reddito e risparmio delle famiglie, 2013.)

THIS IS A LINEAR REGRESSION MODEL (STATISTICS, ECONOMETRICS)



$$Z \equiv C + I + G$$

$$C = c_0 + c_1 Y_D$$

- Disposable income is:

$$Y_D \equiv Y - T$$

where *Y* is income and *T* is taxes minus government transfers.

- Replacing Y_D gives:

$$C = c_0 + c_1(Y - T)$$

Components of aggregate Demand: investment spending

$$Z \equiv C + I + G$$

- Endogenous variables: variables depend on other variables in the model
- Exogenous variables: variables not explained within the model but are instead taken as given

$$I = \bar{I} \quad (3.4)$$

- A bar on investment spending means that investment spending is taken as given.
- We assume, for now, that investment spending is not dependent on any variable in our model.
- We will later relax this assumption and model investments as positively related to production levels (Y) and negatively related to interest rates (i) on loans.

Components of aggregate Demand: Government spending and taxation

- T and G describe fiscal policy—the choice of taxes and spending by the government.
- G and T are exogenous because:
  - Governments do not behave with the same regularity as consumer or firms.
  - We will use G and T as 'policy' variables, which can be changed by the government, and are not determined by other variables in the model.

$$Z \equiv C + I + G$$

Determination of short-term equilibrium Output in a linear model

AGGREGATE DEMAND IN CLOSED ECONOMY: $Z \equiv C + I + G$

- Recall that I is fixed and that C is assumed linear, such as $C = c_0 + c_1(Y - T)$

$$Z = c_0 + c_1(Y - T) + \bar{I} + G$$

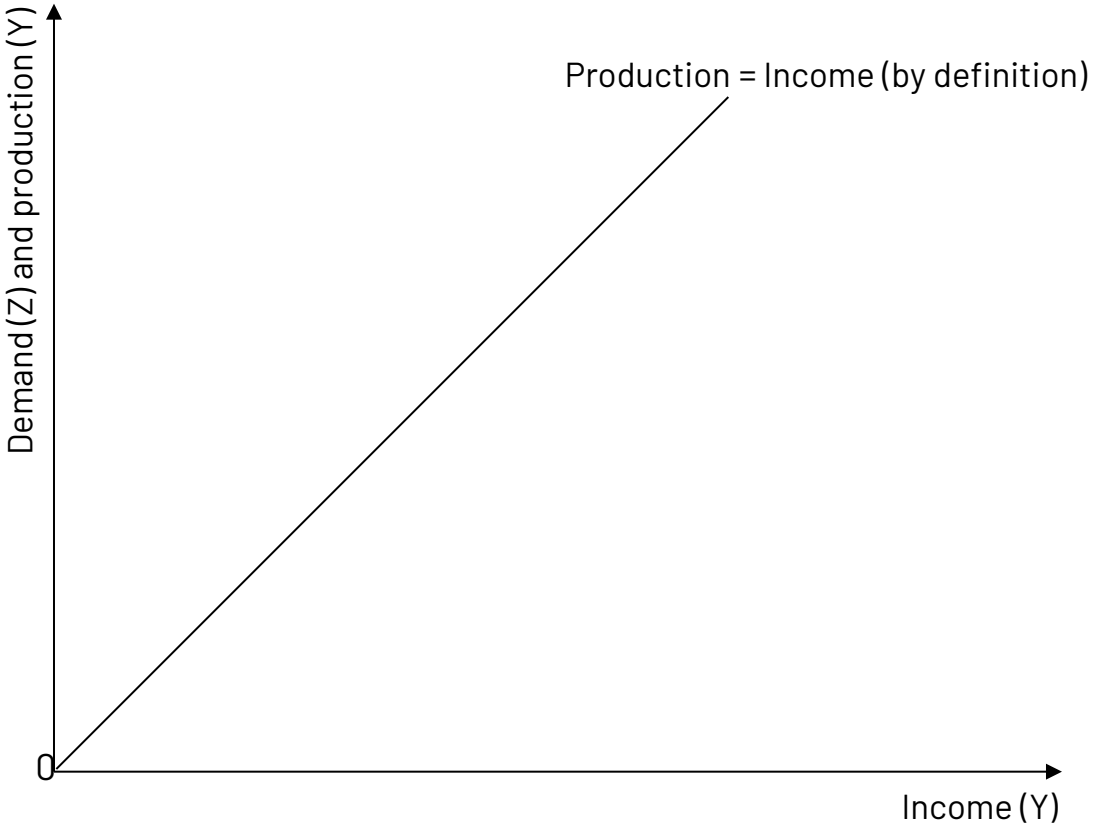
- **But equilibrium in the goods markets** requires Y = Z (production = demand)
- So our economy is in equilibrium only when Y reaches the same amount as Z

demand

$$Y = c_0 + c_1(Y - T) + \bar{I} + G \quad (3.7)$$

income

- This is an **equilibrium condition:** *In equilibrium, production (Y) is equal to demand, which in turn depends on income (Y), which is itself equal to production.*



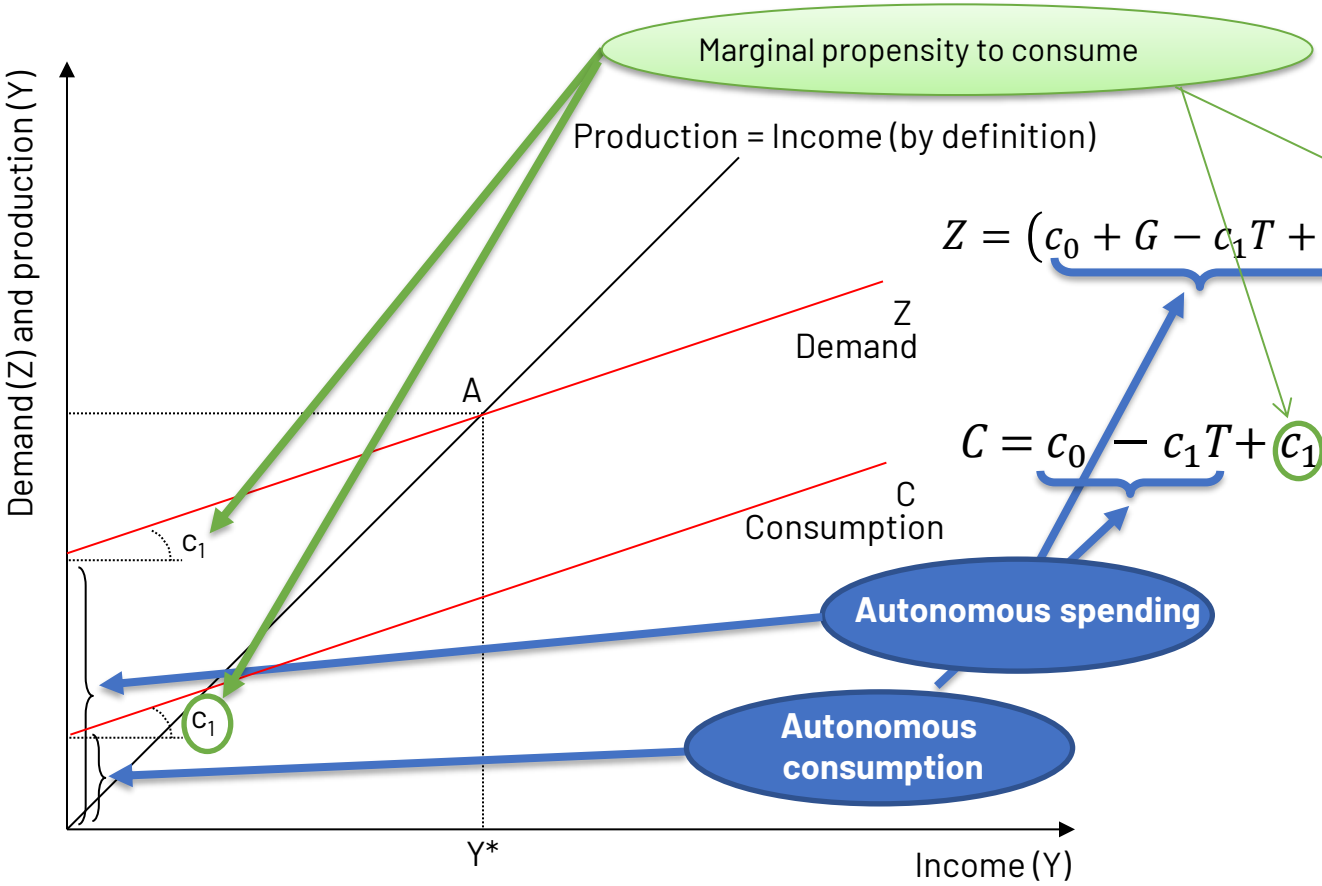
- I want to plot production and demand as function of income and study the dynamics
- Because in equilibrium production equals income, I show all the equilibrium points with a 45-degree line.
- How do I plot the demand curve Z?

- I want to plot production and demand as function of income and study the dynamics
- to plot the demand curve $Z = c_0 + c_1(Y - T) + \bar{I} + G$

I need to express it as function of income for mathematical purposes (I need to put demand on the vertical axis)

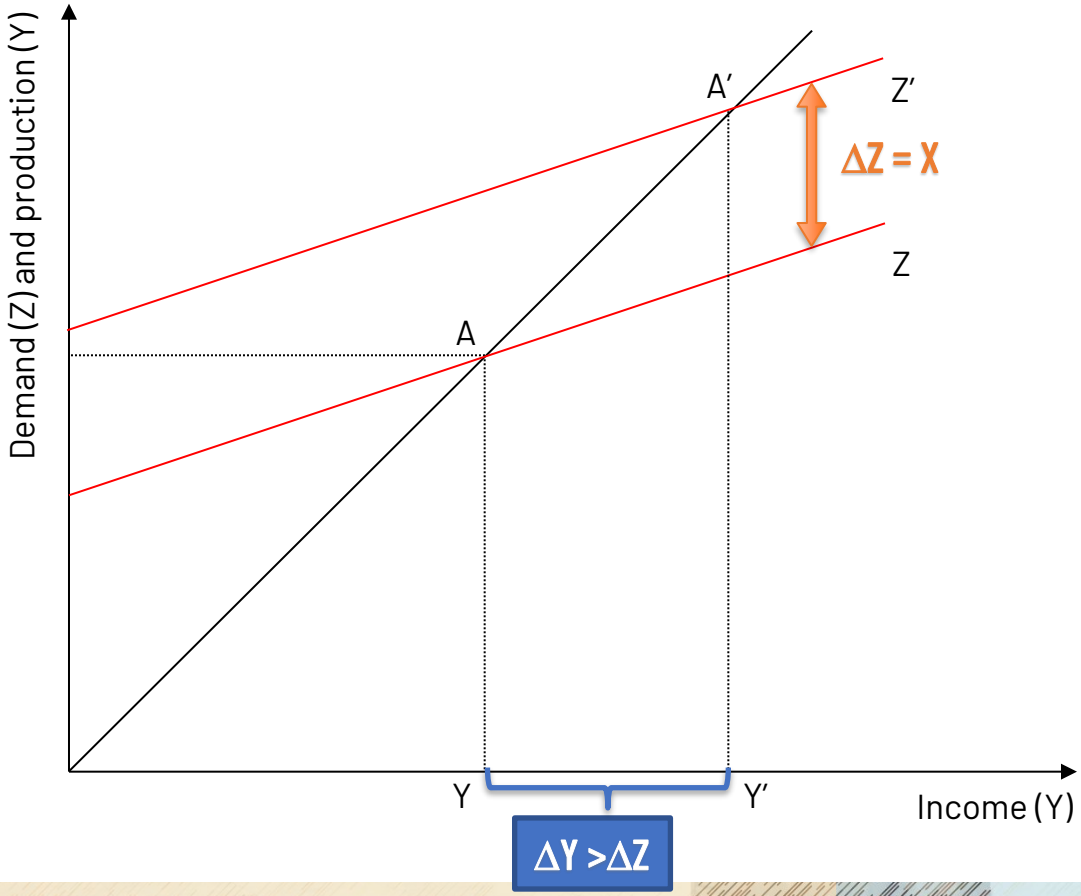
$$Z = \underbrace{(c_0 + G - c_1 T + \bar{I})}_{\text{Autonomous spending}} + c_1 Y$$

- **Autonomous spending** is positive because if T = G (balanced budget) and c_1 is between 0 and 1, then ($G - c_1 T$) is positive, and so is autonomous spending



- **In equilibrium (A), demand = production.**
- Y* is the level of income and production for which production = demand, that is, equilibrium
- For lower levels of income then Y* (=left of Y*), demand exceeds production
- To the right of Y*, production exceeds demand

- Suppose non-income factors change: e.g. c_0 increases by X and becomes $c_0' = c_0 + X$
- **Assume this shifts demand curve Z upward by amount X. What happens to the old equilibrium level Y?**



$$Z = (c_0 + G - c_1 T + \bar{I}) + c_1 Y$$
$$Z' = (c_0' + G - c_1 T + \bar{I}) + c_1 Y$$

- **New equilibrium level of production is Y'**
- **The total increase in production (Y'-Y) is larger than the original increase in demand (Z'-Z).**
- This is due to the **multiplier process**

OECD

OECD Economic Outlook

Resilient Growth but with Increasing Fragilities

December 2025

Volume 2025/2, No. 118

Consumer Sentiment indices (Conference Board and OECD)

Includes

- consumer attitudes,
- buying intentions,
- vacation plans
- consumer expectations for inflation, stock prices and interest rates

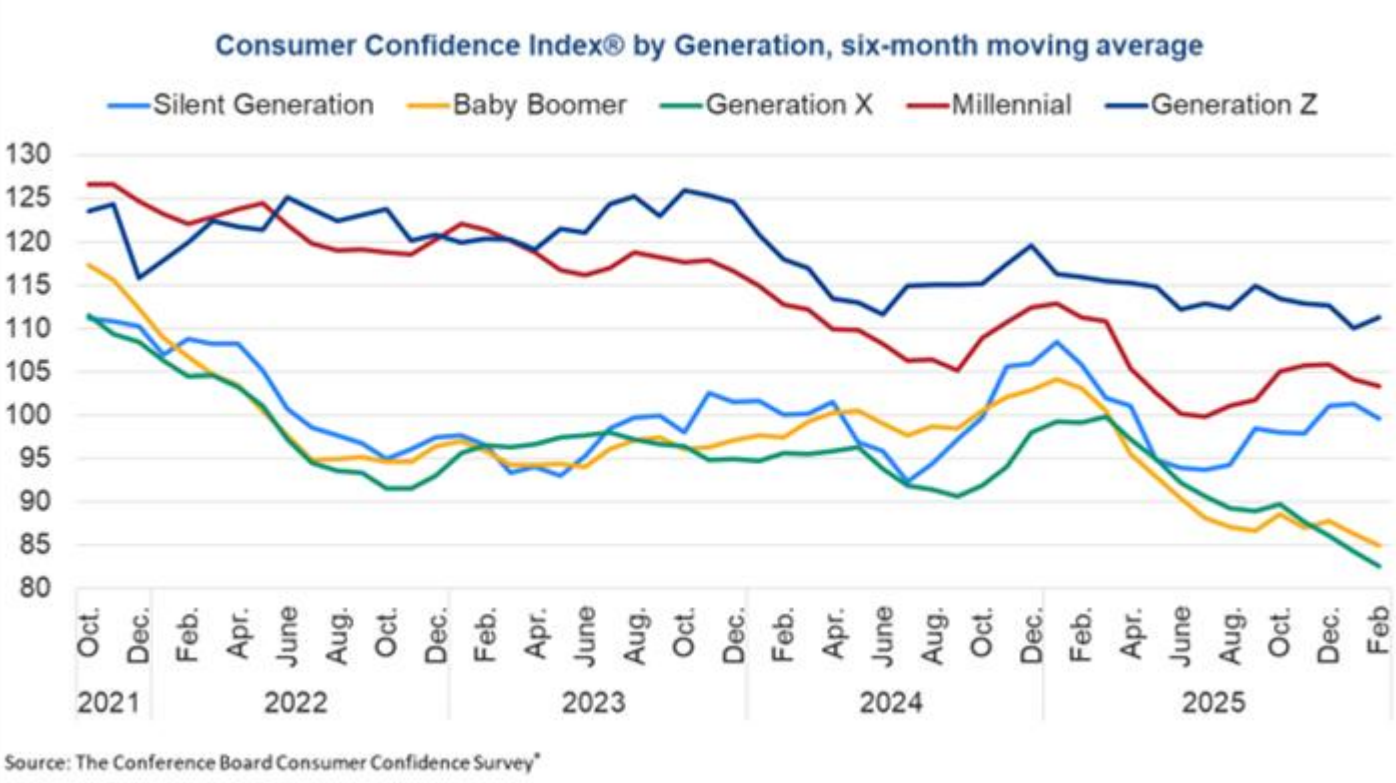
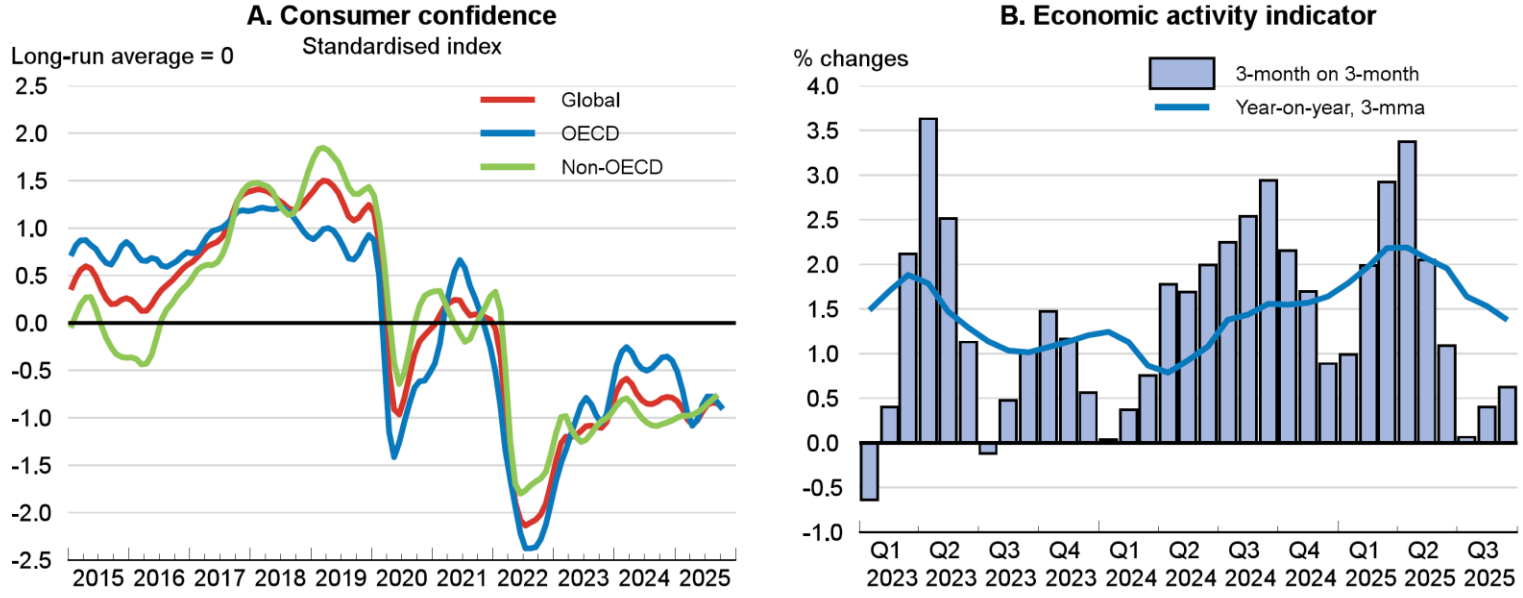


Figure 1.6. Consumer sentiment remains subdued and some indicators of economic activity have slowed



Note: In Panel A, the global, OECD and non-OECD aggregates are derived using moving PPP weights. Panel B is based on monthly activity (largely output) data from 14 countries (Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Finland, Japan, Korea, Mexico, Norway, Peru, Sweden and the United Kingdom) up to 28 November 2025, weighted using moving nominal GDP shares in PPP terms. Bars show the annualised percentage change of the indicator average over the 3 months ending in the month depicted relative to the previous 3 months.
Source: OECD Main Economic Indicators database; LSEG; and OECD calculations.

StatLink https://stat.link/63igo5

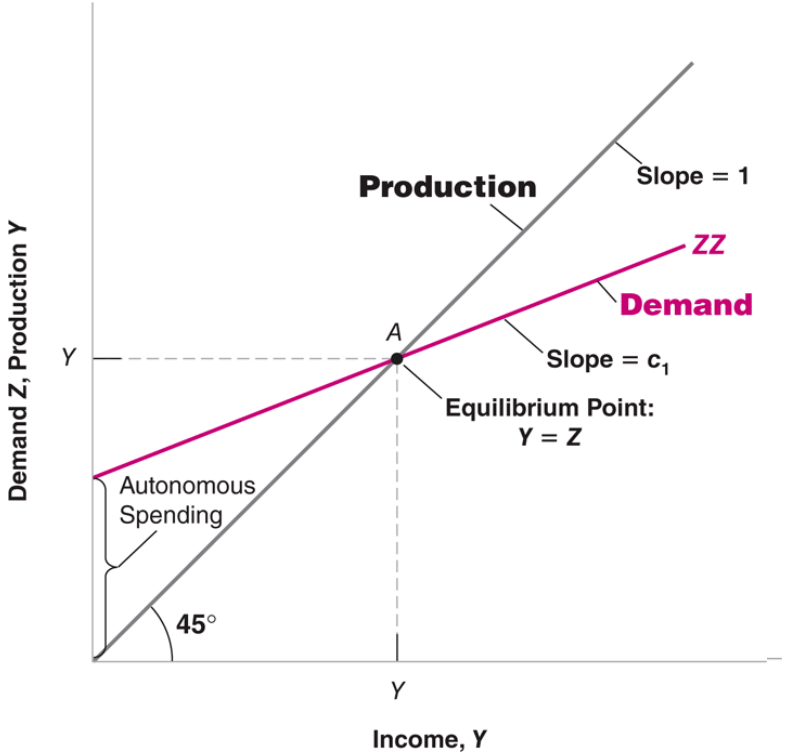
$$Y = Z = c_0 + c_1(Y - T) + \bar{I} + G$$

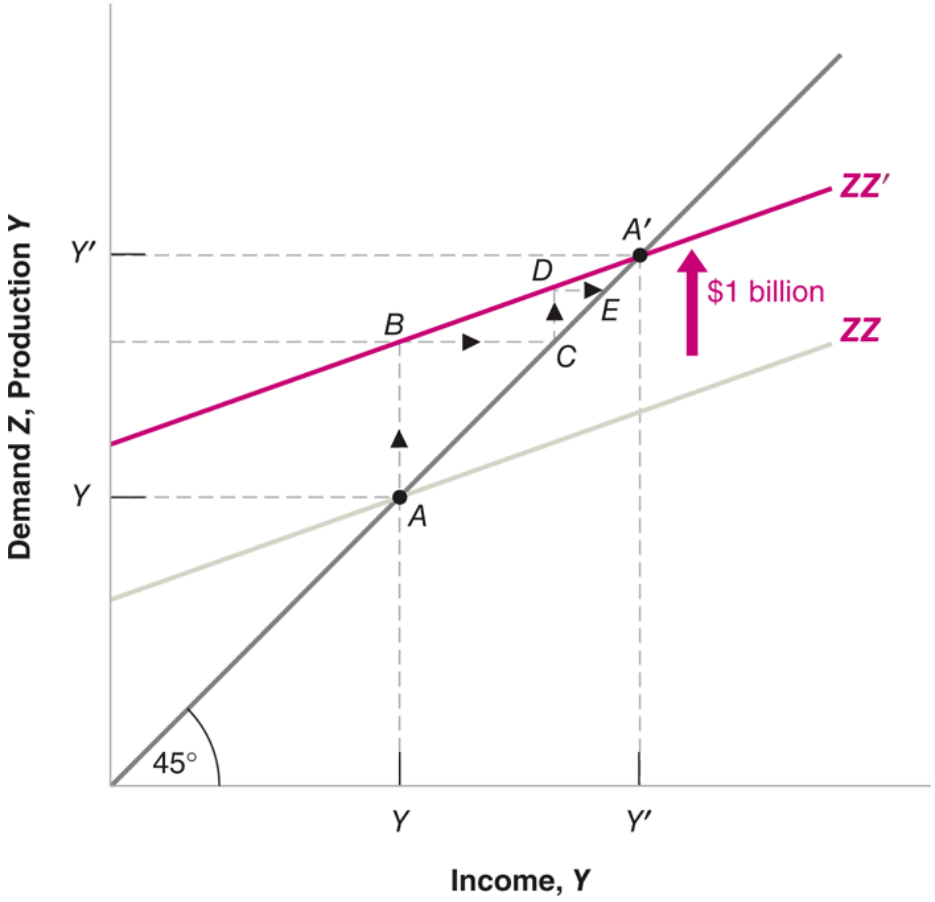
- an increase in c_0 increases demand Z.
- The increase in demand must lead to an increase in production Y (GDP).
- The increase in production leads to an equivalent increase in income (remember the two are identically equal: all the production is sold and generates income).

$$Y = Z = c_0 + c_1(Y - T) + \bar{I} + G$$

- 2nd round starts: the increase in income further increases consumption (through c_1)
- → increases demand → increases production = increases income → increases consumption (through c_1), and so on with 3rd , 4th round etc.
- Because the marginal propensity to consume (c_1) is less than 1, each increase in income and each corresponding increase in consumer spending is smaller than in the previous round.
  - Recall that at each round some of the increase in income goes into savings.
- As a result, although production (GDP) grows at each round, the increase diminishes from each round to the next.
- At some point the increase in production is negligible, and the economy converges to a new income–expenditure equilibrium (point A').

- Equilibrium in the Goods Market: equilibrium output is determined by the condition that production is equal to demand.





- From the equilibrium point A (income=Y), consumption exogenously increase by 1 billion.
- demand shifts to point B: 1 billion higher.
- To satisfy this increase in demand, firms increase production by 1 billion. This increase in production implies that income increases by 1 billion (recall: income = production), so the economy moves to point C.
- The increase in income leads to a further increase in demand. Demand is now shown by point D.
- Point D leads to a higher level of production, and so on, until the economy is at A′, where production and demand are again equal. This is therefore the new equilibrium.

$$Y = Z = c_0 + c_1(Y - T) + \bar{I} + G$$

- 1st round: consumption c_0 up by 1 billion → demand Z up by 1 billion → production Y up by 1 billion = income Y up by **1** billion.
- 2nd round: an increase in income by 1 billion increases demand by c_1 billions (less than 1 billion) → increase production = income by **c_1** billion.
- 3rd round: an increase in income by [c_1 billions] increases demand by c_1 * [c_1 billions] → increase production = income by **c_1 * c_1** billion.
- 4th round: an increase in income by [c_1 * c_1 billions] increases demand by c_1 * [c_1 * c_1 billions] → increase production = income by **c_1 * c_1 * c_1** billion.

1st round outcome:
1 billion increase Y

2nd round outcome:
+ c_1 billion Y increase

3rd round outcome:
+ c_1^2 billion Y increase

4th round outcome:
+ c_1^3 billion Y increase

- … after n+1 rounds, the total increase in production (billion) is: $1 + c_1 + {c_1}^2 + \cdots + {c_1}^n$
- which is a **geometric series**. For n → infinite, The value of the multiplier approaches → $\frac{1}{1-c_1}$ billion
- If c_1 = 0.6, an increase in c_0 by 1 billion would lead to an increase in Y by 1/(1-0.6) billion = 1/0.4 = **2.5 billion**

APPENDIX 2 A maths refresher

This appendix presents the mathematical tools and mathematical results used in this text.

Geometric series

Definition: a **geometric series** is a sum of numbers of the form:

$$1 + x + x^2 + \cdots + x^n$$

where x is a number that may be greater or smaller than one, and x^n denotes x to the power n; that is, x times itself n times.

Examples of such series are:

- The sum of spending in each round of the multiplier (Chapter 3). If c is the marginal propensity to consume, then the sum of increases in spending after rounds is given by:

$$1 + c + c^2 + \cdots + c^n$$

- The present discounted value of a sequence of payments of €1 each year for n years (Chapter 15), when the interest rate is equal to i:

$$1 + \frac{1}{1+i} + \frac{1}{(1+i)^2} + \cdots + \frac{1}{(1+i)^{n-1}}$$

We usually have two questions we want to answer with such a series:

1. What is the sum?
2. Does the sum explode as we let n increase, or does it reach a finite limit (and, if so, what is that limit)?

The following propositions tell you what you need to know to answer these questions.

Proposition 1 tells you how to compute the sum:

Proposition 1:

$$1 + x + x^2 + \cdots + x^n = \frac{1 - x^{n+1}}{1 - x} \qquad \text{(A2.1)}$$

Here is the proof: Multiply the sum by $(1 - x)$ and use the fact that $x^a x^b = x^{a+b}$ (that is, you must add exponents when multiplying):

$$\begin{aligned}(1 + x + x^2 + \cdots + x^n)(1 - x) &= 1 + x + x^2 + \cdots \\ &\quad + x^n - x - x^2 - \cdots - x^n - x^{n+1} \\ &= 1 - x^{n+1}\end{aligned}$$

All the terms on the right, except for the first and the last, cancel. Dividing both sides by $(1 - x)$ gives equation (A2.1).

This formula can be used for any x and any n. If, for example, x is 0.9 and n is 10, then the sum is 6.86. If x is 1.2 and n is 10, then the sum is 32.15.

Proposition 2 tells you what happens as n gets large:

Proposition 2: if x is less than one, the sum goes to $1/(1 - x)$ as n gets large. If x is equal to or greater than one, the sum explodes as n gets large.

Here is the proof: if x is less than one, then x^n goes to zero as n gets large. Thus, from equation (A2.1), the sum goes to $1/(1 - x)$. If x is greater than one, then x_n becomes larger and larger as n increases, $(1 - x_n)$ becomes a larger and larger negative number and the ratio $(1 - x^n)/(1 - x)$ becomes a larger and larger positive number. Thus, the sum explodes as n gets large.

Application from Chapter 15: consider the present value of a payment of $1 forever, starting next year, when the interest rate is i. The present value is given by:

$$\frac{1}{(1+i)} + \frac{1}{(1+i)^2} + \cdots \qquad \text{(A2.2)}$$

Factoring out $1/(1 + i)$, rewrite this present value as:

$$\frac{1}{(1+i)}\left[1 + \frac{1}{(1+i)} + \cdots\right]$$

The term in brackets is a geometric series, with $x = 1/(1 + i)$. As the interest rate i is positive, x is less than 1. Applying Proposition 2, when n gets large, the term in brackets equals:

$$\frac{1}{1 - \frac{1}{(1+i)}} = \frac{(1+i)}{(1+i-1)} = \frac{(1+i)}{i}$$

Replacing the term in brackets in the previous equation by $(1 + i)/i$ gives:

$$\frac{1}{(1+i)}\left[\frac{(1+i)}{i}\right] = \frac{1}{i}$$

The present value of a sequence of payments of €1 a year forever, starting next year, is equal to €1 divided by the interest rate. If i is equal to 5% per year, the present value equals €1/0.05 = €20.

Analytical derivation of equilibrium output

- Rewrite equation $Y = c_0 + c_1 Y - c_1 T + \bar{I} + G$

so that it tells us the level of Y as function of the exogenous variables

- Collect Y $$(1 - c_1)Y = c_0 + \bar{I} + G - c_1 T$$

- Divide both sides by $(1 - c_1)$

$$Y = \frac{1}{1 - c_1}[c_0 + \bar{I} + G - c_1 \mathrm{T}]$$

- When ANY component of autonomous spending increases by 1, Y increases by $1/(1 - c_1)$, which is exactly the multiplier we already found
  - the multiplier is larger when c1 is closer to 1. Can you explain the intuition?

Summary

- To summarize our findings using words:
  - Production depends on demand, which depends on income, which is itself equal to production.
  - An increase in demand leads to an increase in production and income, which in turn leads to a future increase in demand.
  - The increase in output is larger than the initial shift in demand, by a factor equal to the multiplier.
- The multiplier depends on the propensity to consume, which can be estimated using econometrics—the set of statistical methods used in economics.

Adjustment timing

- The adjustment of output over time is called the dynamics of adjustment.
- In the real world, the adjustment from A to A′ is not instantaneous:
  - firms facing an increase in demand might well decide to wait before adjusting production (meanwhile drawing down inventories to satisfy demand).
  - workers who get a pay raise might not adjust their consumption right away.
- How long the adjustment takes depends on how and when firms revise their production schedule.

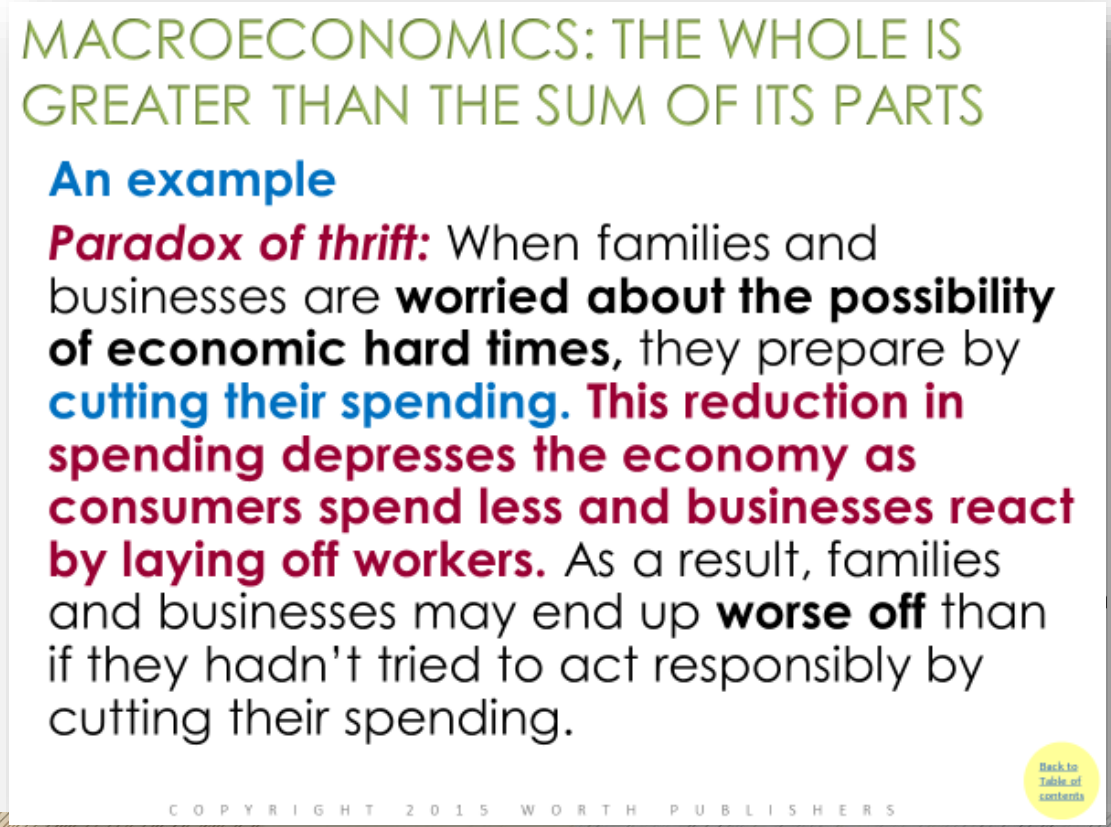
The crisis of 2008-9

- Before the Covid-19 crisis and Russia-Ukraine war, the world economy had just barely recovered from the Great Financial Crisis of 2008-09
- Expansion + shady regulations: home prices rose dramatically and doubled between 2000 and 2007
- Investment banks such as Lehman Brothers had invested heavily in financial products (securities) based on subprime mortgages—loans to home-buyers with too little income or too few assets to qualify for standard mortgages.
- Since 2007, house prices declined.

- Many of the borrowers had taken too large a loan and were increasingly unable to make the monthly payment. With their house having current value lower than in their mortgage contract, they often had incentive to default.
- Banks realized that the value of their mortgage-based securities was lower than expected. Banks stopped lending money to other banks, fearing that the borrower would not have been able to repay. Stock prices of banks and firms plummeted.

Paradox of thrift

- Consumers face tragic combo: drop in house values, drop in stock values → cut their consumption → firms stopped investing and laid off personnel
- Crisis expanded to non-US countries. In Europe this mean much more pressure on government debts (already high for some countries) → financial, real, and public crisis.



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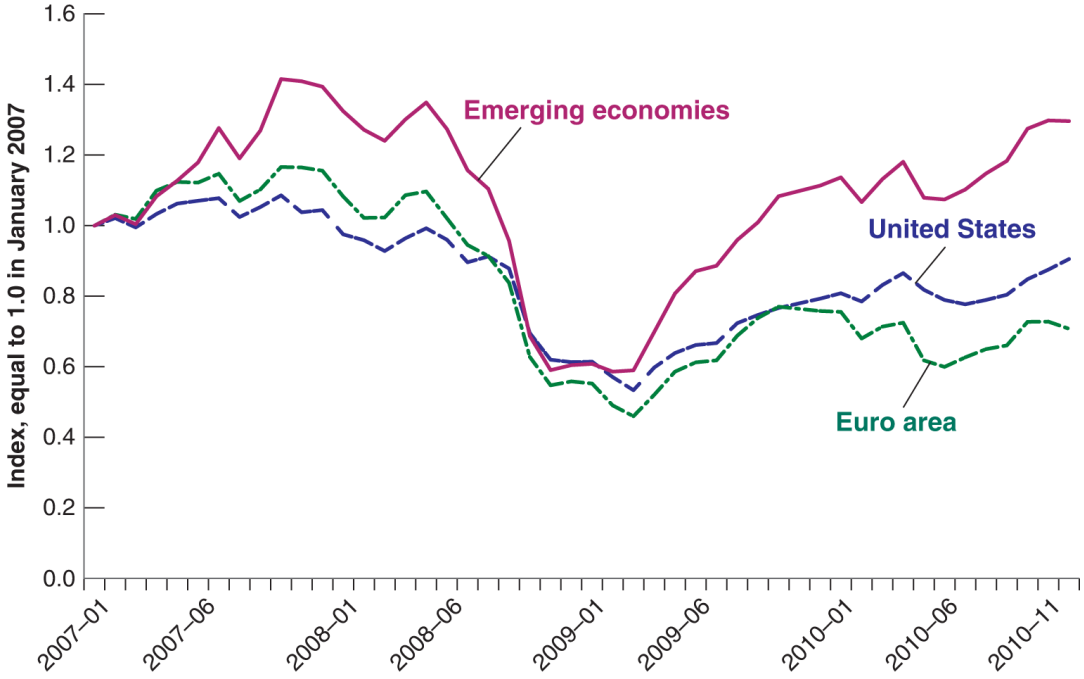
MACROECONOMICS: THE WHOLE IS GREATER THAN THE SUM OF ITS PARTS

An example.

Paradox of thrift: When families and businesses are **worried about the possibility of economic hard times**, they prepare by **cutting their spending. This reduction in spending depresses the economy as businesses sell less and workers lose their paychecks.** As a result, families and businesses may end up **worse off** than if they hadn't tried to act responsibly by cutting their spending.

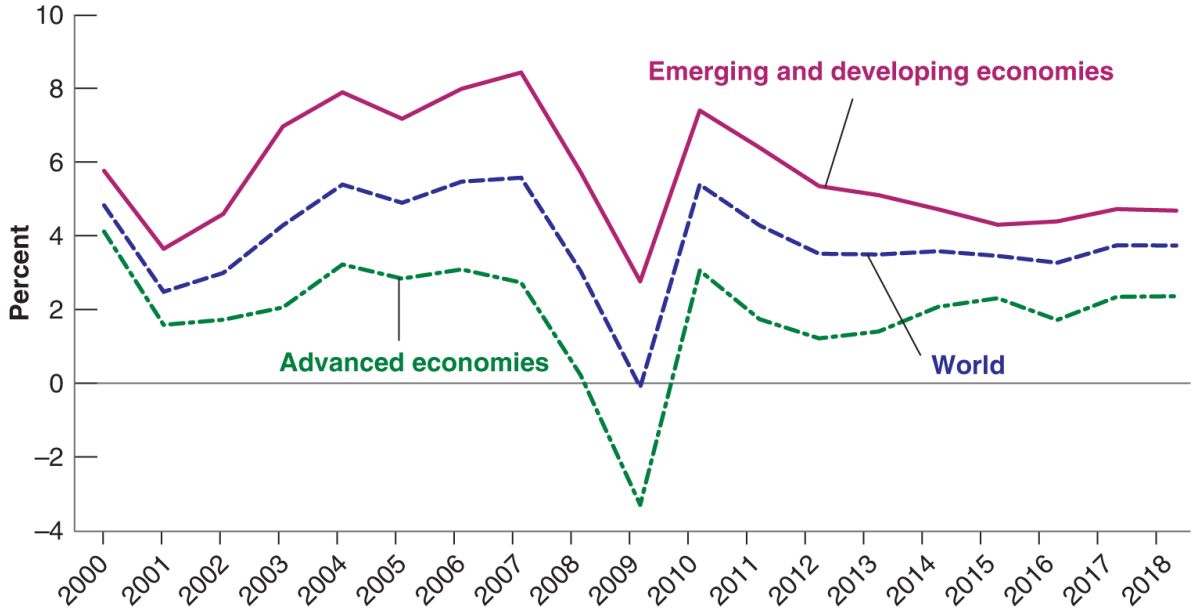
Figure 1.8
Stock prices in the United States, the euro area and emerging economies, 2007–10



Source: Haver Analytics USA (S111ACD), Eurogroup (S023ACD), all emerging markets (S200ACD), all monthly averages.

Figure 1.7
Output growth rates for the world economy, for advanced economies and for emerging and developing economies, 2000–18

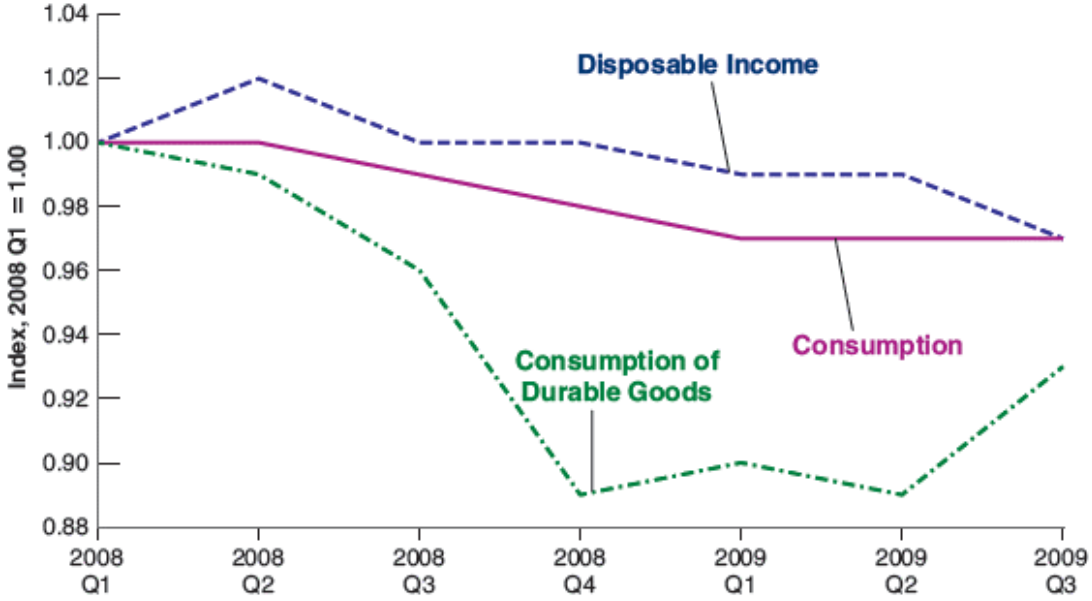
- Source: IMF, World Economic Outlook Database, July 2018. NGDP_RPCH.A.



FOCUS: The Lehman Bankruptcy, Fears of Another Great Depression, and Shifts in the Consumption Function

- Disposable Income, Consumption, and Consumption of Durables in the United States, 2008:1 to 2009:3

Source: FRED: DPIC96, PCECC96, PCDGCC96.



- When people start worrying about the future, they decide to save more even if their current income has not changed.
- News about Lehman Brothers going bankrupt in September 2008 reminded people of the Great Depression, as confirmed by the number of searches for “Great Depression” in Google.
- Consumption fell even if disposable income had not yet changed.
- Using the multiplier, we can now see exactly how this scenario unfolds.
- Suppose that there is a slump in consumer spending or investment spending, or both, just like the slump in residential construction investment spending leading up to the 2007–2009 recession.
- This causes a fall in income–expenditure equilibrium GDP that is several times larger than the original fall in spending. The fall in (real) GDP leaves consumers and producers worse off than they would have been if they hadn’t cut their spending.
- This is the ‘thrift’ paradox

$$Y = Z = c_0 + c_1(Y - T) + \bar{I} + G$$

Exercise 1

- Suppose that the economy is characterised by the following behavioural equations (where Y_D is disposable income):
  - $C = 60 + 0.85Y_D$
  - $I = 140$
  - $G = 250$
  - $T = 180$
- Solve for the following variables.
  - Disposable income (Y_D)
  - Consumption spending (C)
  - Solve for equilibrium output. Is it equal to total demand?

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MACROECONOMICS 042EC

02 – Analysis in the short run

Investment spending, saving and financial markets (Ch 3, 4)

Ludovico Carrino

Investment-spending = saving

An alternative condition for the Goods–Market Equilibrium

Introducing financial markets

- Distinguish 'INVESTMENT SPENDING' from 'making an investment'
  - investment spending = spending on new **physical capital**.
    - only spending that adds to the economy's stock of physical capital is "investment spending."
  - The act of purchasing an asset such as a share of stock, a bond, or existing real estate is "making an investment."

- THE DIFFERENT KINDS OF CAPITAL
  - Physical capital: manufactured resources, such as buildings and machines.
  - Human capital: the improvement in the labor force generated by education and knowledge.
  - Financial capital: funds from wealth (savings) that are available for investment spending.

THE NECESSITY OF FINANCE

Having a good idea isn't enough to build a business.

Entrepreneurs need funds: You have to spend money to make money.

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MATCHING UP SAVINGS AND INVESTMENT SPENDING

Who pays for private investment spending?

In the modern economy, individuals and firms that create physical capital often do it with other people's money.

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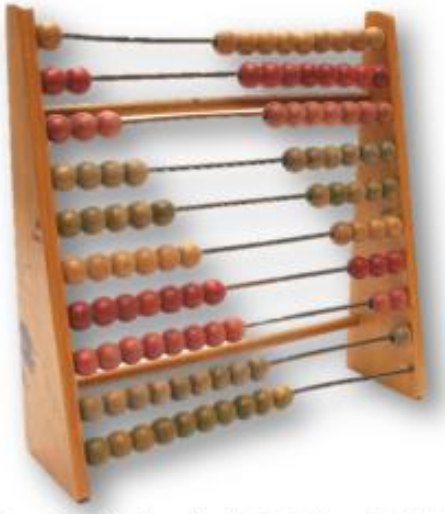
MATCHING UP SAVINGS AND INVESTMENT SPENDING

Savings–investment spending identity: savings and investment spending are always equal for the economy as a whole.



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Investment Equals Saving: An Alternative Way of Thinking about Goods—Market Equilibrium

- John Maynard Keynes articulated an alternative model that focuses instead on investment and saving in the General Theory of Employment, Interest and Money in 1936.

- **Private saving** (S) in a year is the part of after-tax income that you do not spend, and it is also a flow.
  - Do not get confused with wealth ('savings'): the value of what you have accumulated over time.

$$S \equiv Y_D - C \qquad S \equiv Y - T - C$$

- **Public saving** = T – G (by definition).
  - Public saving > 0 ⇔ Budget surplus
  - Public saving < 0 ⇔ Budget deficit

$$S \equiv Y - T - C$$

- In equilibrium: $Y = Z \leftrightarrow Y = C + I + G$
  - I = investment-spending
  - We note that the equation includes almost all components of saving (except T)
- Subtract *T* from both sides and move *C* to the left side:

$$Y - \boldsymbol{T} - C = I + G - \boldsymbol{T}$$

- The left side of the equation is simply *S*, so

$$S = I + G - T$$

- Or equivalently

$$I = S + (T - G)$$

- This is the ***IS relation***, which stands for "**I**nvestment-spending equals **S**aving".

$$I = S + (T - G)$$

- In equilibrium, investment-spending must equal savings. What firms want to invest must be equal to what people and the government want to save
- Our previous definition of equilibrium condition : demand must equal production.
  - The equation of output equilibrium was (assuming linear consumption function)

$$Y = \frac{1}{1 - c_1}[c_0 + \bar{I} + G - c_1 \mathrm{T}]$$

- Would the "IS" approach lead us to the same definition of equilibrium output?
- Start from $I = S + (T - G), with\ S \equiv \mathrm{Y} - \mathrm{T} - \mathrm{C}$

$$I = Y - T - C + (T - G) \rightarrow I = Y - C - G$$

- Recall that $\mathrm{C} = \mathrm{c}_0 + \mathrm{c}_1(\mathrm{Y} - \mathrm{T})$, that is, assuming linear consumption function:

$$I = Y - \mathrm{c}_0 - \mathrm{c}_1(\mathrm{Y} - \mathrm{T}) - G \rightarrow I = Y + \mathrm{c}_1 Y - \mathrm{c}_0 + \mathrm{c}_1 \mathrm{T} - G$$

- This leads to $Y + \mathrm{c}_1 Y = \mathrm{c}_0 + G + I - \mathrm{c}_1 \mathrm{T}$

$$Y = \frac{1}{1 - c_1}[c_0 + \bar{I} + G - c_1 \mathrm{T}]$$

- They are equivalent!

Financial markets

THE FINANCIAL SYSTEM

Most economies have some sort of financial system to handle household wealth and make loans.

Wealth is the value of a household's accumulated savings.

A ***financial asset*** is a paper claim that entitles the buyer to future income from the seller.

A ***physical asset*** is a tangible object that can be used to generate future income.

A ***liability*** is a requirement to pay income in the future.

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Financial Markets

- Financial markets play an essential role in the economy. They determine the cost of funds for firms, for households, and for the government and, in turn, affect their spending decisions.
- Players: banks, money market funds, mutual funds, investment funds and hedge funds.
- Trading involves ‘bonds’, ‘stocks’, ‘swaps’, ‘options’…
- Very common to read about interest rates on government bonds, on corporate bonds, etc…

Semantic Traps: Money, Income, and Wealth

- **Money** is what can be used to pay for transactions.
  - The **money supply** is the total value of financial assets in the economy that are considered money.
- **Income** is what you earn, and it is a flow.
- **Saving** is the part of after-tax income that you do not spend, and it is also a flow.
- **Wealth ('savings')** is the value of what you have accumulated over time.
- **Financial wealth** is the value of all your financial assets minus all your financial liabilities, and it is a stock variable.
- **Investment-spending**: the purchase of new physical capital goods.
- **Financial investment:** the purchase of shares or other financial assets.

TYPES OF FINANCIAL ASSETS

Bond: an IOU issued by the borrower, usually with a set interest and maturity date

A concern for investors is the possibility of **default** *(failure of a borrower to make payments as specified)*

More risky bonds carry higher interest rates

Loan-backed securities: assets created by pooling individual loans and selling shares in that pool (a process called securitization)

With so many loans packaged together, it can be difficult to assess the true quality of the asset, as in the financial crisis of 2008.

Stock: a share in the ownership of a company

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THE NEED FOR A SOUND FINANCIAL SYSTEM

A well-functioning financial system is a critical ingredient in achieving long-run growth because it encourages greater savings and investment spending.

It also ensures that savings and investment spending are undertaken efficiently.

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THREE TASKS OF A FINANCIAL SYSTEM

Task 1: reducing transaction costs

Transaction costs: the expenses of negotiating and executing a deal.

Task 2: reducing risk

Financial risk: uncertainty about future outcomes that involve financial losses or gains.

Diversification: investing in several assets with unrelated, or independent, risks; reduces risk.

Task 3: providing liquidity

Liquidity: a measure of how quickly an asset can be converted into cash with relatively little loss of value.

If it can be converted quickly, it's ***liquid;*** if not, ***illiquid.***

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The Demand for Money

- Suppose you only have a choice between two assets: money and bonds.
- Money are used for transactions, but it pays no interest.
  - Two types of money: currency and checkable deposits.
- Bonds pay a positive interest rate, i (the rate of interest), but cannot be used for transactions.

- The holding of money and bonds depends on:
  - Your level of transactions (we proxy this with your nominal income)
  - The interest rate on bonds
- You can hold bonds indirectly through money market funds, or money market mutual funds.
- Demand for money (Md) is equal to nominal income $Y times a decreasing function (generically called "L") of the interest rate i:

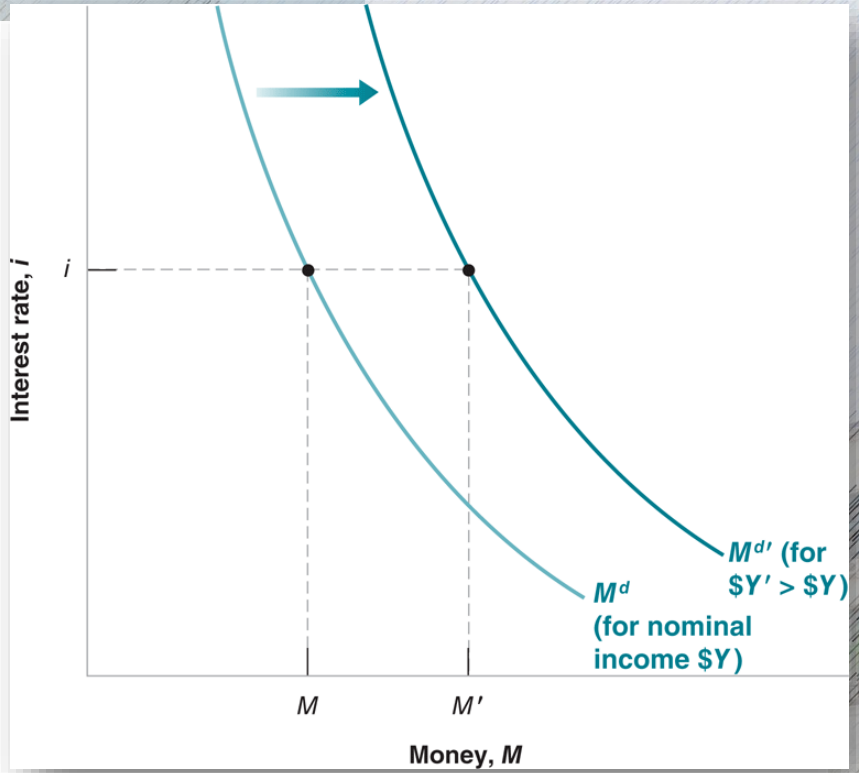
$$M^d = \$Y\ L(i) \qquad \frac{\partial M^d}{\partial i} < 0$$

$$(-)$$

- M^d is decreasing in *i* (L is a negative function of *i*): an increase in the interest rate incentives people to put more of their wealth into bonds (reducing their demand for money).
- M^d increases with nominal income (=proxy for levels of transactions)

$$M^d = \$Y\, L(i) \quad with \quad \frac{\partial M^d}{\partial i} < 0$$
$$(-)$$

- The M^d curve in the space [money in dollars; interest rate]: relationship between the demand for money (horiz. axis) and interest rate (vertical axis), for a given level of income $Y (hidden covariate not shown on graph)
- For a given level of nominal income, a lower interest rate increases the demand for money.
- At a given interest rate, an increase in nominal income shifts the demand for money to the right.



Supply and demand: Determining the interest rate

- Assume there is only one type of money: currency, supplied by Central Bank ('Central-Bank Money')
  - In reality we also have deposit-accounts supplied by banks
- Suppose the central bank decides that the quantity of money (reserves) in the economy (M^s) should be equal to amount M:

$$M^s = M$$

- As in any market, equilibrium in financial markets requires $M^s = M^d$
- Recalling the definition of M^d , we get

$$M = \$Y\ L(i)$$

$M^d = \$Y\ L(i)$

  - Given the amount of nominal income, the interest rate must be such that people are willing to hold an amount of money equal to the supply, that is M.

CENTRAL BANKS SET INTEREST RATES, NOT MONETARY AGGREGATES

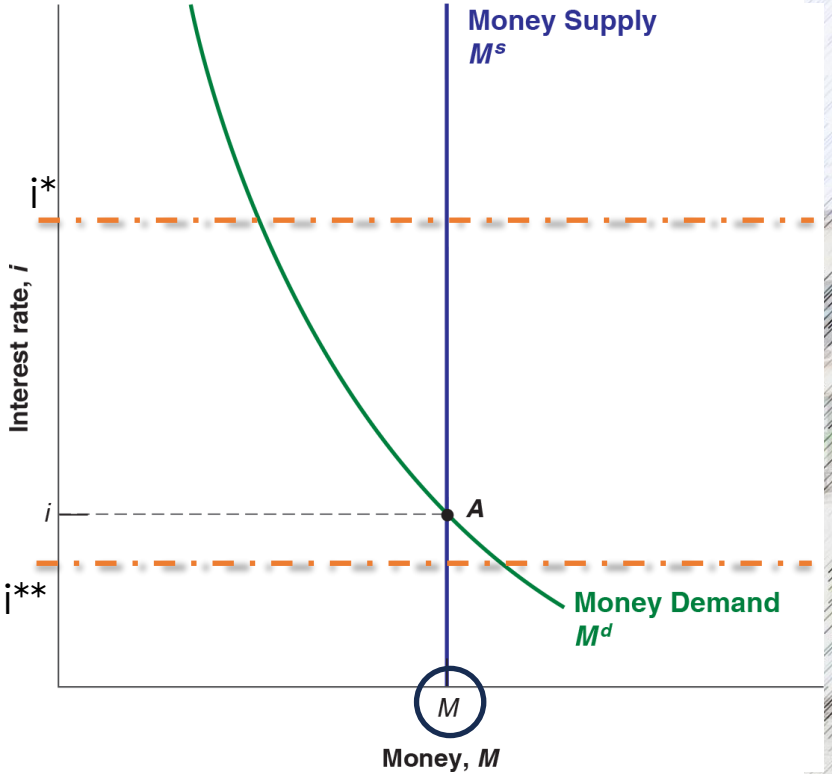
- OLD APPROACH: “The central bank decides to expand or contract the quantity of money first (actively choosing the amount), and then the interest rate emerges as a consequence”.

- MODERN REALITY: The central bank sets the interest rate it wants, announces it clearly, and then passively allows the quantity of money to adjust automatically to whatever banks need at that interest rate.

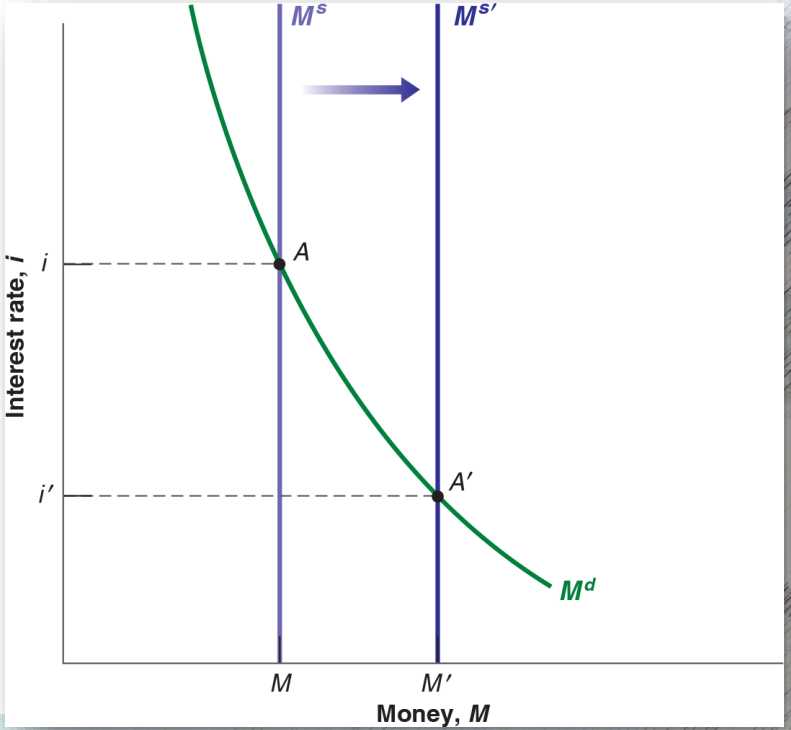
- If the Central Bank chooses $M^s = \bar{M}$, the equilibrium requires the interest rate to be at level *i*, point A.

- Suppose the interest rate is at i*>i
  - What kind of disequilibrium would that be?
  - Would it converge to an equilibrium? How?

- Suppose the interest rate is at i**<i
  - What kind of disequilibrium would that be?
  - Would it converge to an equilibrium? How?

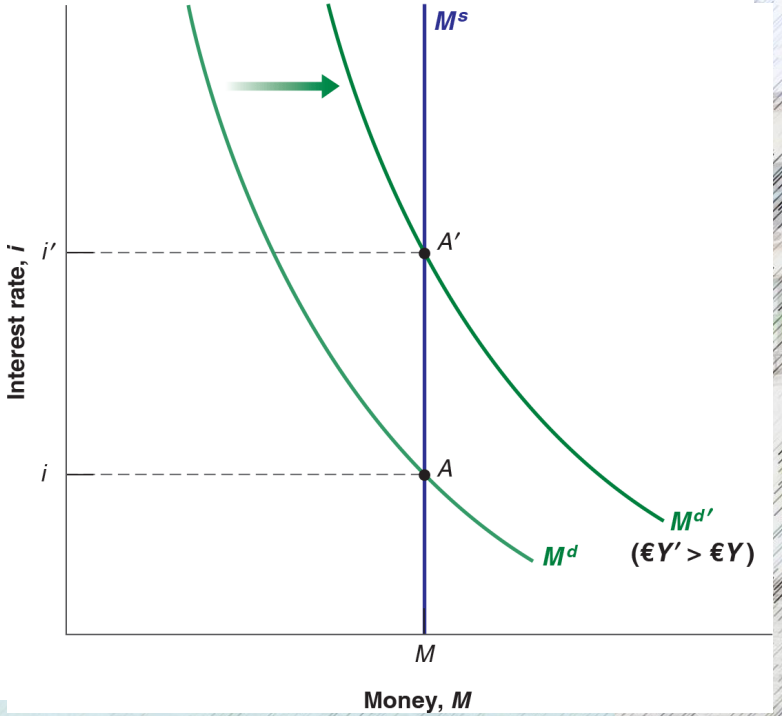


- An increase in the money supply leads to a decrease in the equilibrium interest rate
- The decrease in the interest rate increases the demand for money so it equals the now larger money supply



- Suppose that nominal income $Y increases. What effect on interest rate?
- Demand of money: $M^d = \$Y\ L(i)$
- Supply of money: $M^s = M$

- Only demand is affected: for any level of interest rate, an increase in $Y increases the demand of money
  - shifts to the right
- Old equilibrium: A
- If M^d shifts to right, *i* must increase
- New equilibrium: A'
  - same supply, higher *i*



- central banks change M^S by buying or selling bonds in the bond market
  - **open market operations**
  - to increase the amount of money in the economy, they buy bonds and pay for them by creating money. **Expansionary policy**
  - to decrease the amount of money in the economy, they sell bonds and remove from circulation the money they receive in exchange for the bonds. **Contractionary policy**

Central Bank Balance Sheet

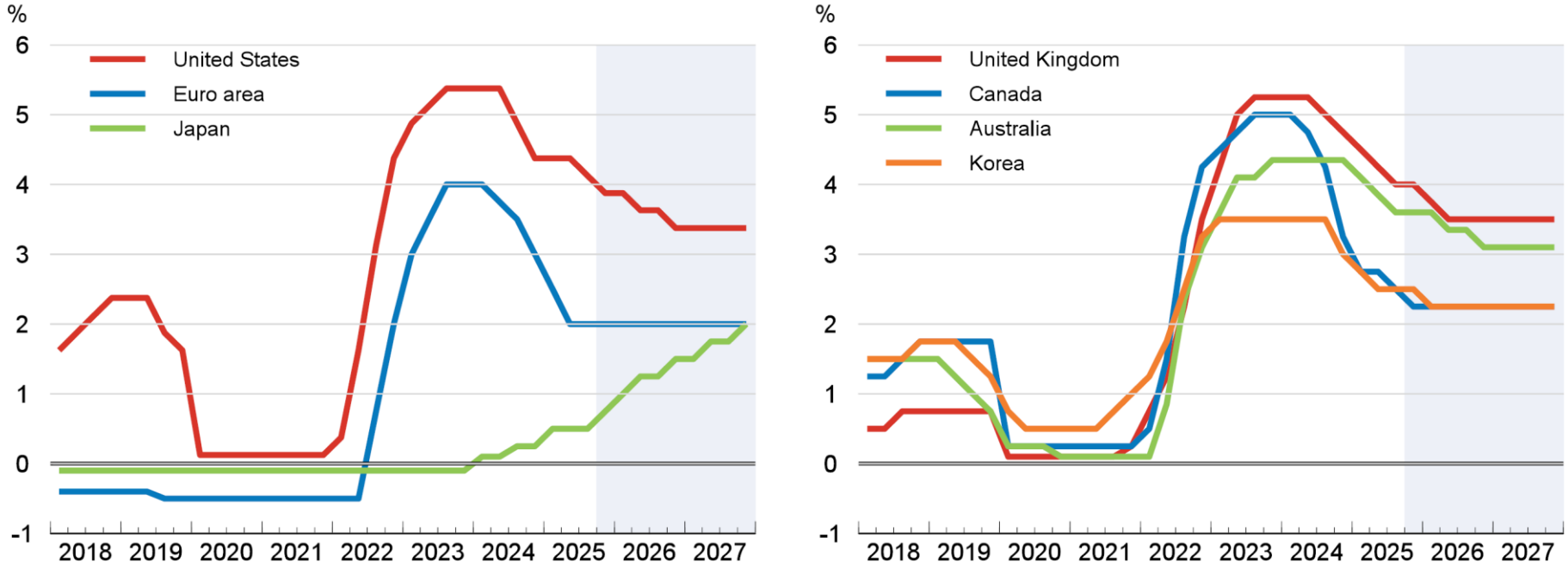
Assets	Liabilities
Bonds	Money (currency)

The Effects of an Expansionary Open Market Operation

Assets	Liabilities
Change in bond holdings: +€1 million	Change in money stock: +€1 million

Figure 1.31. Policy rate reductions are projected to end next year in many advanced economies

Policy interest rates



Note: The first panel shows the midpoint of the federal funds target range for the United States and the deposit facility rate for the euro area.
Source: OECD Economic Outlook 118 database.

Interest rates, bond prices and yields

- How are interest rates of bonds determined? They are determined indirectly, through market negotiations.
- Bonds promise a final payment (F) of a fixed amount when they mature
  - A bond which repays 100 euros in March 2026
- You buy it today on the market and hold it until maturity. The price today is P.
- Your rate of return on holding the bond for one year is the interest rate for the same period

$$i = \frac{F - P}{P} \quad \Longleftrightarrow \quad P = \frac{F}{(1+i)}$$

- The higher the price of the bond, the lower the interest rate.
  - Because the final value of the bond (at maturity) is fixed

How open market operations change the interest rates

- expansionary operation: the central bank buys bonds in the bond market and pays for them by creating money.
  - demand for bonds goes up, increasing their price → lowering their interest rate
  - the central bank has increased the money supply.
- contractionary operation: the central bank sells bonds in exchange of money
  - supply of bonds goes up, decreasing their price → increasing their interest rate
  - the central bank has reduced the money supply.

- The interest rate is determined by the equilibrium condition that the supply of money equals the demand for money.
- By changing the supply of money, the central bank can affect the interest rate, through open market operations (purchases or sales of bonds for money).
- Central banks have a target interest rate to achieve, and move the money supply to achieve it

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