

Intermediate Macroeconomics II

Lecture 2: From RBC to IS–LM

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Today: why we move from RBC to IS–LM

- Last time (RBC): output and the **real interest rate** are pinned down by **real** constraints and intertemporal choices.
- This semester's focus: **inflation and the price level** — so we must add a **nominal side**.
- IS–LM is our **first bridge model**:
 - IS = goods market equilibrium (a reduced-form view of intertemporal demand)
 - LM = money market equilibrium (how nominal variables enter)

What you should be able to do after Lecture 2

Explain how **goods demand** and **money demand** jointly determine (Y, r) in the short run, and how policy shifts the system.

Recap: what RBC gives us

RBC in one slide: what we learned (and what we did *not*)

- **RBC core idea:** flexible prices \Rightarrow markets clear \Rightarrow output is tied to productivity and factor supply.
- The key intertemporal price is the **real rate** r_t :

$$1 = \beta \mathbb{E}_t \left[\frac{u'(C_{t+1})}{u'(C_t)} (1 + r_t) \right].$$

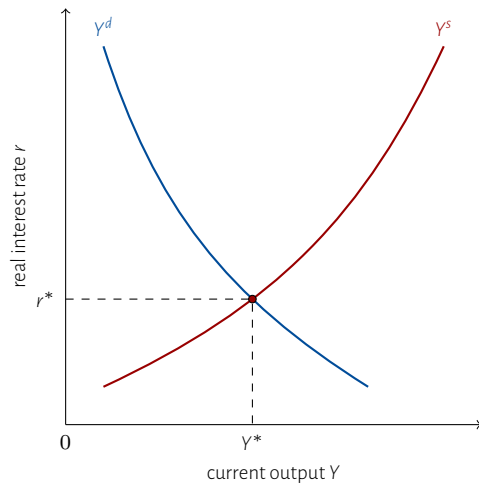
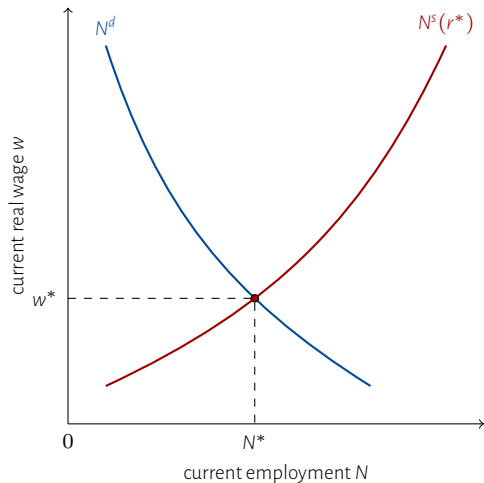
- In that world, monetary variables are typically **neutral** for real allocations (classical dichotomy logic).

So why add IS–LM?

Because once we care about **nominal interest rates, money demand, and the price level**, we need equations that speak to them explicitly.

Competitive Equilibrium

Figure 11.21 The Complete Real Intertemporal Model



A clean map: same economy, more markets on the board

Think of the macro economy as **two big clearing conditions** plus a policy rule:

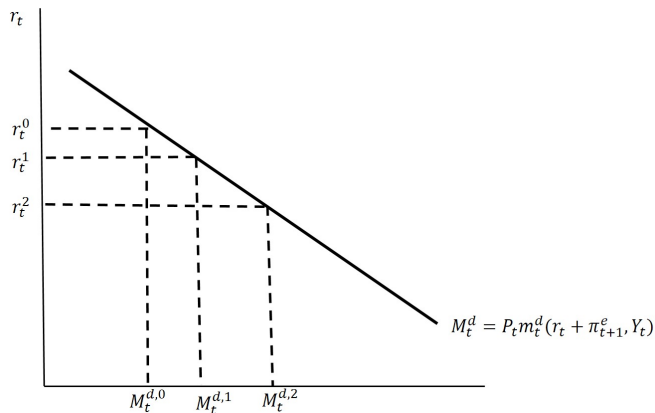
- **Goods market:** planned spending equals production (IS logic).
- **Money market:** money supplied equals money demanded (LM logic).
- **Policy:** central bank and fiscal authority pick instruments / regimes.

Important perspective

IS–LM is a **different representation** that highlights **demand** and **nominal variables**. Later we replace its weak spots with NK microfoundations.

Money market and LM

Step 1: Money demand (why people hold money)



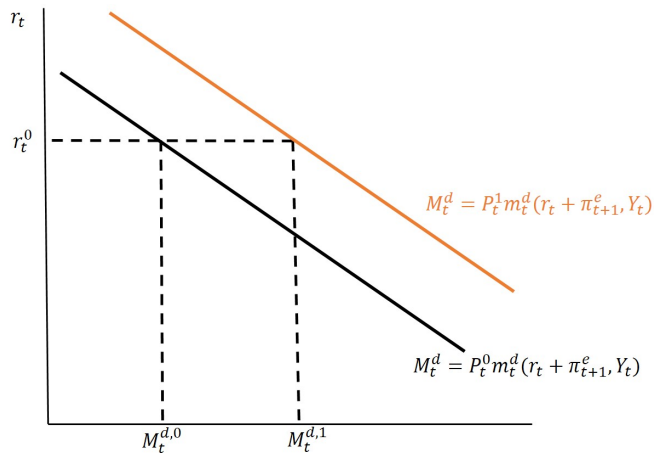
- Money provides **liquidity** (transactions/convenience).
- Holding money has an **opportunity cost**: the interest you could earn on bonds.
- A standard reduced form:

$$\frac{M_t^d}{P_t} = L(Y_t, i_t), \quad L_Y > 0, \quad L_i < 0.$$

Connection to inflation

Later: $i_t \approx r_t + \mathbb{E}_t \pi_{t+1}$ (Fisher). Expected inflation raises the nominal opportunity cost of money.

Money demand shifts I: higher price level means higher *nominal* money demand

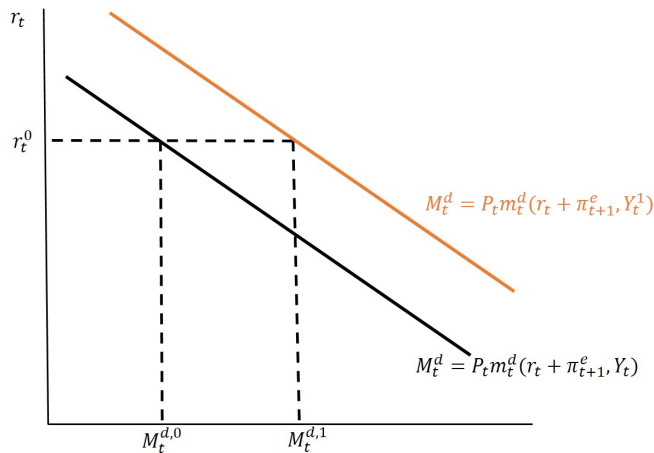


- Real balances are what matter for transactions: M/P .
- If P rises, then to keep the same real balances you need **more nominal money**.
- So for given (Y, i) , the **nominal** money demand curve shifts outward.

Why this matters

Because later, the price level P will be one of the key objects we want to understand.

Money demand shifts II: higher income means more transactions

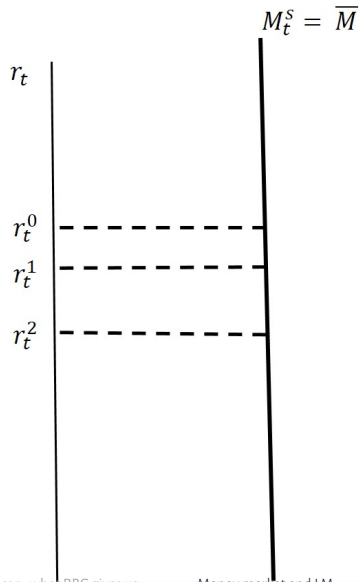


- Higher Y means more purchases, payroll, invoices, etc.
- That raises desired transaction balances.
- So money demand increases with output.

Preview

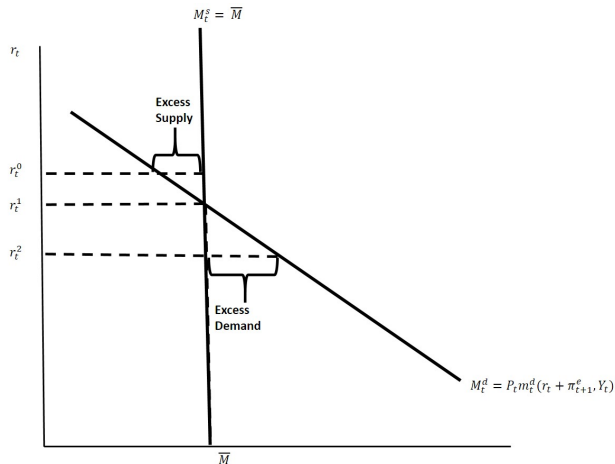
This positive $Y \rightarrow M^d$ link is what will make the LM curve slope upward in (Y, i) space.

Money supply: the central bank side (first pass)



- Textbook IS–LM starts by treating M_t^s as a policy choice.
- Modern institutions often set an **interest rate** instead.
- We start with M -supply to build intuition, then switch to rate rules (Taylor) in NK.

Money market equilibrium: where $M^s = M^d$

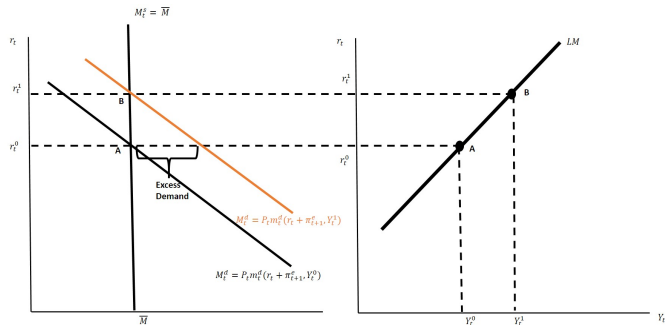


- Equilibrium nominal rate i adjusts so that money demand equals money supply.
- At a higher i , people hold less money.
- At a higher Y , people want more money.

Key takeaway

Money market equilibrium is a restriction linking (Y, i) given (M, P) .

From money market equilibrium to the LM curve

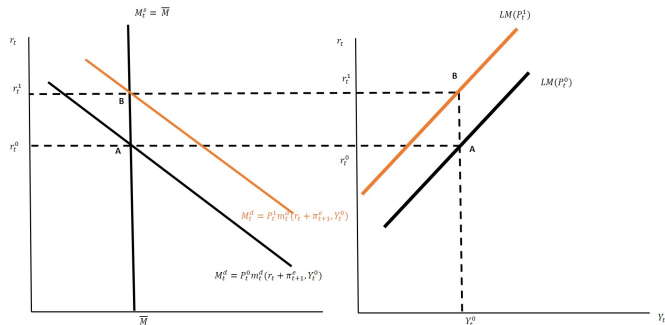


- Start at point A: (Y^0, i^0) clears the money market.
- Raise output to Y^1 :
 - transaction demand rises \Rightarrow excess money demand at i^0
 - interest rate must rise to reduce money demand
- Connecting such equilibria gives an **upward-sloping LM**.

LM equation (reduced form)

$$M_t^s = M_t^d = P_t \cdot m_t^d(Y_t, r_t + \pi_{t+1}^e).$$

How LM shifts I: higher P shifts LM left

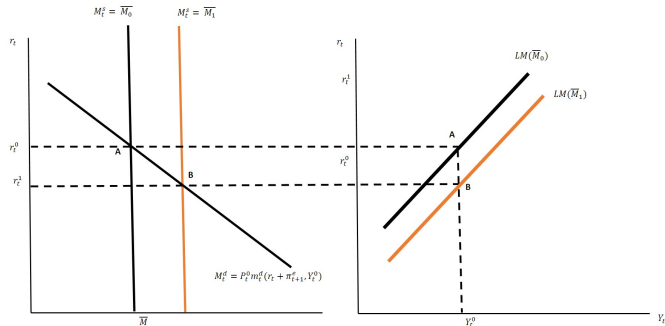


- If P rises, then at a given (Y, i) people need **more nominal money** to support the same real balances.
- With M^s fixed, equilibrium requires a **higher** interest rate (to discourage money holding).
- So the LM curve shifts **up/left**.

Interpretation

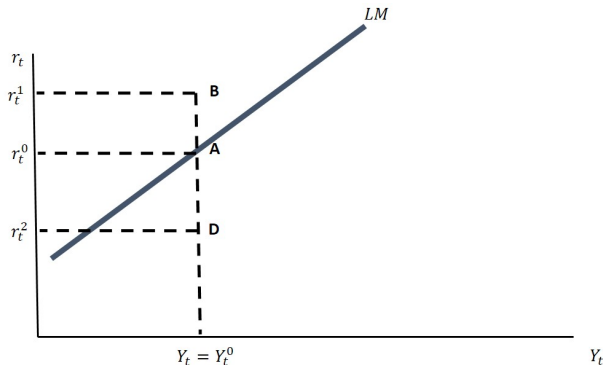
Inflation/price level changes affect money market tightness.

How LM shifts II: higher M^s shifts LM right



- Raise money supply (holding P fixed).
- At the old interest rate, there is excess money supply.
- The nominal rate falls until people are willing to hold the extra money.
- So LM shifts **down/right**.

What LM is (and is not): avoid a common confusion



- **On LM:** money market clears.
- **Off LM:** excess money demand or supply.
- LM does *not* mean “money market alone determines i .”
- It is one equilibrium condition inside a general equilibrium system.

Good habit

Whenever you see a point in (Y, i) space, ask: does it clear the money market?

Goods market and IS

IS: goods market equilibrium (bridge from RBC to textbook)

- In RBC, the intertemporal Euler equation is the foundation.
- IS–LM uses a reduced-form but keeps the same comparative statics:

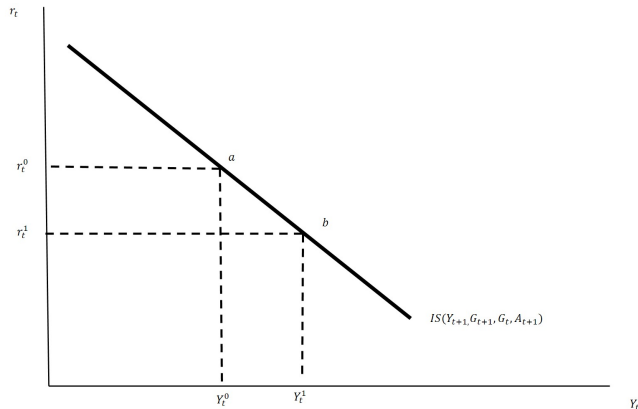
$$Y_t = C(Y_t - T_t, i_t) + I(i_t) + G_t.$$

- Lower interest rates stimulate spending (especially investment) \Rightarrow higher goods demand.

Interpretation

IS is a schedule of (Y, i) pairs where the **goods market clears**.

IS curve (visual): why it slopes downward



- Move down along IS: i falls.
- Lower i raises investment and interest-sensitive spending.
- To clear the goods market, output must rise to meet higher demand.

Connection to RBC

Think “intertemporal substitution in demand,” but represented in a static (Y, i) diagram.

Shifts in IS: what moves goods demand

- **Fiscal expansion** ($G \uparrow$ or taxes \downarrow) shifts IS right.
- **Optimism / higher expected income** shifts IS right (consumption rises today).
- **Higher uncertainty / tighter credit** shifts IS left (spending falls).

What IS is not

IS is not “Keynesian by assumption.” It is a **reduced-form representation** of intertemporal demand that we will later microfound (NK IS / Euler equation).

Putting IS and LM together

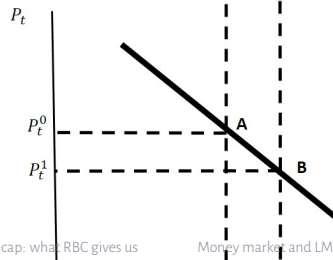
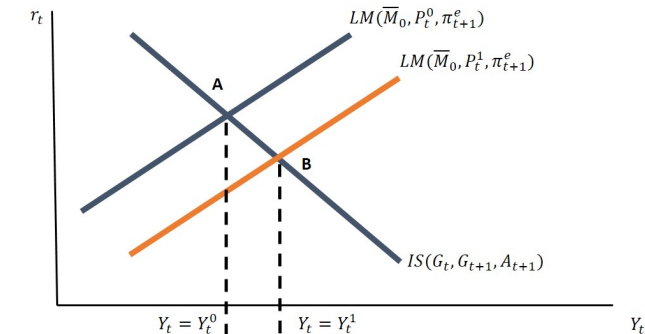
IS–LM equilibrium: one point that clears two markets

- IS: goods market clearing \Rightarrow a relation between (Y, i) .
- LM: money market clearing \Rightarrow another relation between (Y, i) .
- Their intersection gives (Y, i) consistent with both markets.

Why this is the “bridge model”

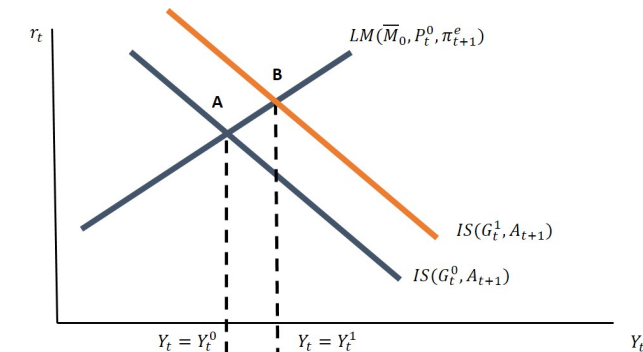
RBC emphasized **real** equilibrium. IS–LM adds a **money market** so we can start talking about nominal rates and (soon) the price level.

From IS–LM to Aggregate Demand: why AD slopes down

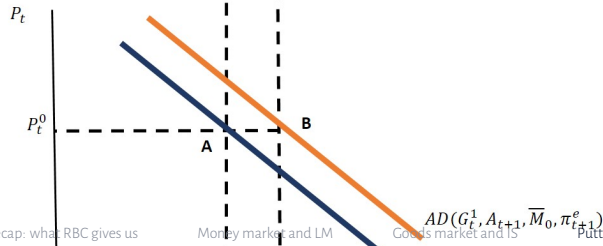


- Hold M fixed and lower P :
 - real balances M/P rise
 - money market becomes “looser” \Rightarrow LM shifts right
- New IS–LM intersection has higher Y .
- Therefore: lower P corresponds to higher $Y \Rightarrow$ AD slopes down.

Policy experiment I: fiscal expansion shifts AD right



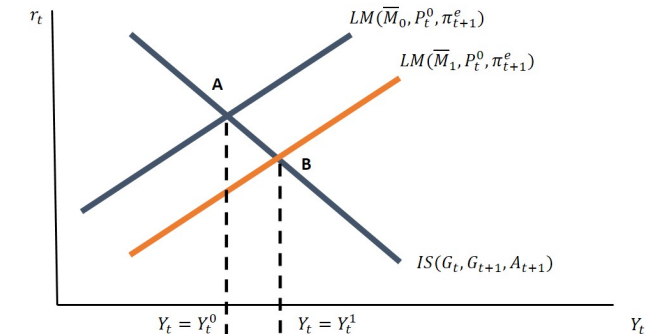
- $G \uparrow$ shifts IS right.
- For a given price level P , equilibrium output rises.
- In (P, Y) space: AD shifts right.



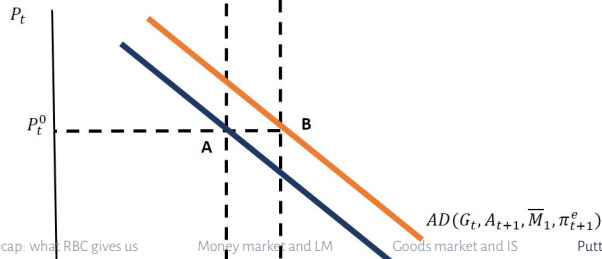
Language students should learn

Fiscal policy raises demand; how much it raises *output* versus *prices* depends on the supply side (next lectures).

Policy experiment II: monetary expansion shifts AD right



- $M^s \uparrow$ shifts LM right.
- For a given price level P , equilibrium output rises.
- In (P, Y) space: AD shifts right.



But modern central banks...

...often move i directly rather than M .
This is why we will transition to **Taylor rules** and the NK model.

Where we go next

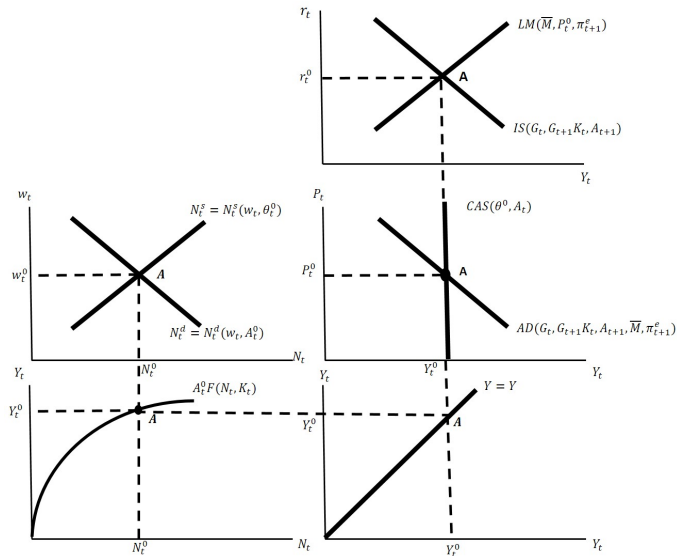
Why IS–LM is useful (and why we won't stop here)

- **Useful:** great for quick comparative statics and building intuition.
- **Limitations:**
 - Inflation expectations and credibility are awkward.
 - Central banks target interest rates, not money supply.
 - Price setting is not microfounded (no Phillips curve discipline).

Next step

Replace “LM + ad hoc IS” with the **New Keynesian triad**: NK IS (Euler), NK Phillips curve, Taylor rule.

Preview: the AD–AS view (one slide teaser)



- IS–LM gives us **AD**.
- To talk about inflation, we need a theory of **AS** (price setting).
- AD–AS is the next “bridge” before NK.

Big picture

RBC (real core) → IS–LM (add money) → NK (expectations + sticky prices) → inflation + price level regimes.

- AD–AS: what moves inflation vs what moves output?
- Short run vs long run: when do we get “crowding out” versus “inflation” ?
- Then: New Keynesian model as the modern workhorse.