Policy, Aggregate Demand, and Business Cycles

Session 9 – Introduction to Macroeconomics

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Recap: Monetary Policy

Answer the questions individually.

1. Do central banks target interest rates or money? How do reserve requirements and interest on reserves affect banks?
2. Why do banks borrow or lend reserves overnight? How do standing facilities form a corridor, and what happens when their rates fall?
3. What is an open market operation? What policy rates do the ECB and the Fed use?
4. What is the Taylor rule, and what rates does it recommend in the scenarios below?
   - Use $r^* = 2\%$, inflation target 2%, and response coefficients 0.5. Find the rate when: (a) inflation 6%, gap 0%; (b) inflation 6%, gap -2%; (c) inflation 1%, gap -2%.
5. What happened in 2007–09? What are the effective lower bound, a liquidity trap, forward guidance and quantitative easing?

Recap 1: The Policy Instrument and Reserves

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- In the textbook model, the central bank sets M. In practice, central banks typically steer a short-term **interest rate**.
- Reserve requirements set a minimum holding of reserves. In the simple multiplier model, a higher reserve ratio reduces deposit expansion, other things equal.
- Interest on eligible reserves changes banks' incentives to hold them. Actual lending also depends on borrowers, capital and regulation.

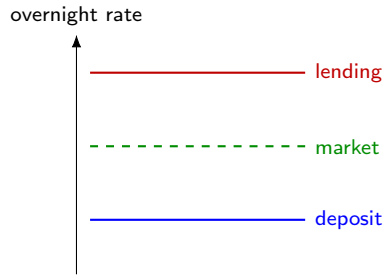
Recap 2: The Overnight Corridor

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- Payments and reserve requirements create different overnight needs across banks.
- Banks can lend to one another, deposit overnight at the central bank, or borrow from it against collateral.
- In the simple corridor, the deposit facility rate is the **floor**; the marginal lending rate is the **ceiling**.
- Lower facility rates shift the corridor down and tend to lower overnight market rates and borrowing costs.
  - Lower returns on reserves and cheaper borrowing can encourage lending if loan demand and bank capital permit.



Recap 3: Open Market Operations

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- To buy a bond from a bank, the central bank credits that bank's reserve account: the bank receives reserves in exchange for the bond.
- The ECB's three policy rates are the **deposit facility** and **marginal lending** rates for overnight facilities, and the **main refinancing** rate for regular collateralized loans to banks.
- The Federal Reserve targets a range for the federal funds rate.
- Reserves, customer deposits and bank lending are connected, but are distinct quantities.

Recap 4: The Taylor Rule

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3. Inflation 1%, gap -2%: **1.5%**. Below-target inflation lowers it further.

All rates and gaps are in percent.

Recap 5: Crisis and the Lower Bound

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5. What happened in 2007–09? What are the effective lower bound, a liquidity trap, forward guidance and quantitative easing?

- The 2007–09 financial crisis and recession weakened spending and credit; central banks cut policy rates sharply.
- The **effective lower bound** is the point below which cutting the policy rate further becomes difficult or less effective.
- In a **liquidity trap**, additional money has little effect on short rates and spending through the usual channel.
- **Forward guidance** communicates future policy intentions.
  - It works better when people trust the central bank's commitment.
- **Quantitative easing** involves large-scale asset purchases.
  - Its effectiveness and side effects are debated.
- Bank lending and borrowers' willingness to spend affect how strongly monetary policy reaches the economy; other channels include asset prices and expectations.

Session 9: Outline

1. **Policy in IS–LM**
   Fiscal and monetary policy, crowding out, and policy interactions.

2. **Aggregate Demand**
   From IS–LM to AD and its shifts.

3. **AS–AD, Inflation, and Policy**
   Stabilization, inflation pressure, and the Phillips curve.

4. **Shocks, Credit Cycles, and the Housing Crisis**
   Amplification, competing theories, and the 2007–09 crisis.

1. Policy in IS–LM

How do fiscal and monetary policy change short-run equilibrium?

Short-Run Equilibrium in IS–LM

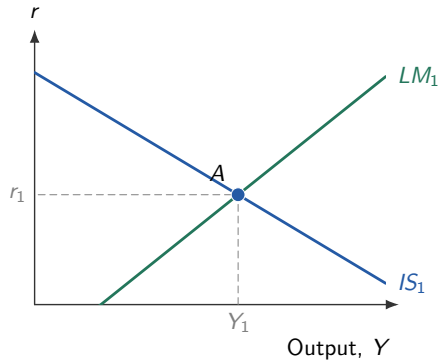
Goods market:

$$Y = C(Y - \bar{T}) + I(r) + \bar{G}.$$

Money market:

$$\frac{\bar{M}}{\bar{P}} = L(r, Y).$$

- IS and LM jointly determine output Y and the interest rate r.
- $\bar{G}$, $\bar{T}$, $\bar{M}$, and $\bar{P}$ are given; T is taxes net of transfers.
- Closed economy; expected inflation is zero.



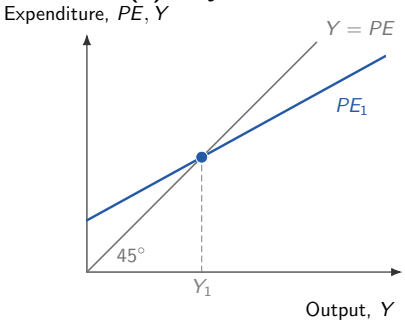
Fiscal Expansion in IS–LM

Government purchases rise: which curve shifts, IS or LM?

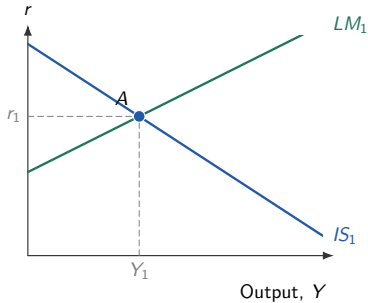
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Government purchases rise: which curve shifts, IS or LM? IS shifts right. Why?

(a) Keynesian cross



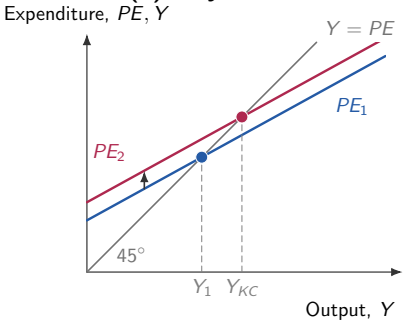
(b) IS–LM



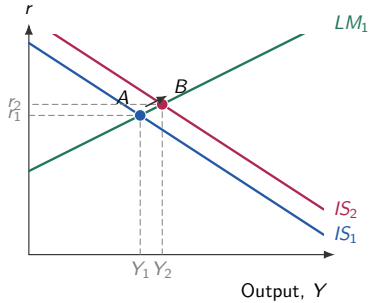
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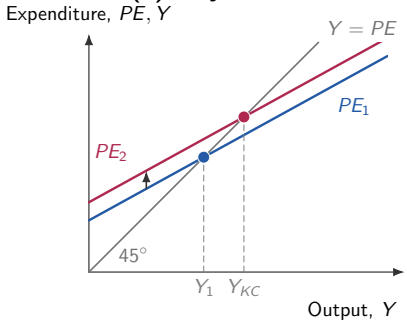
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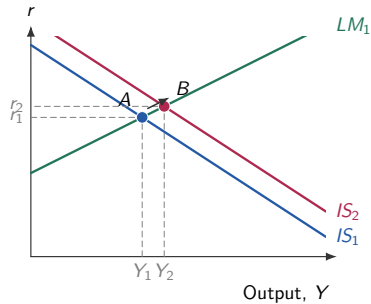
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At fixed r, output would rise to Y_{KC}. In IS–LM, higher money demand raises r: **crowding out** makes $Y_2 < Y_{KC}$.

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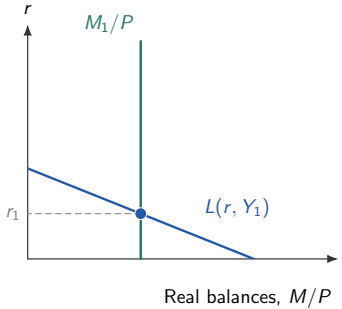
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2. At that same r, goods-market equilibrium output is higher: **IS shifts right**.
3. Higher Y means more transactions and higher money demand. With money supply fixed, the interest rate rises to restore money-market equilibrium.
4. Higher r reduces investment: **partial crowding out** makes the rise in output smaller than at fixed r.

Monetary Expansion in IS–LM

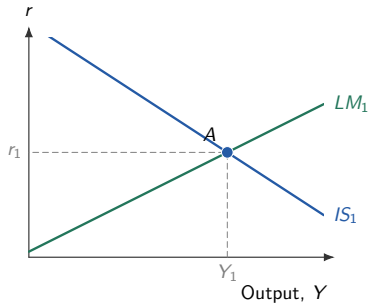
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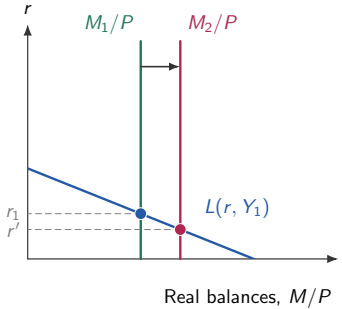


LM shifts down and right. Why?
(b) IS–LM

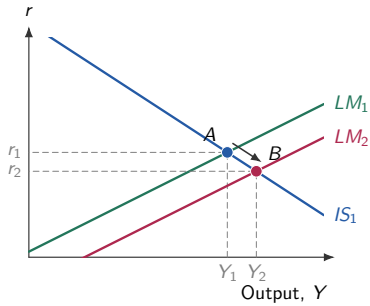


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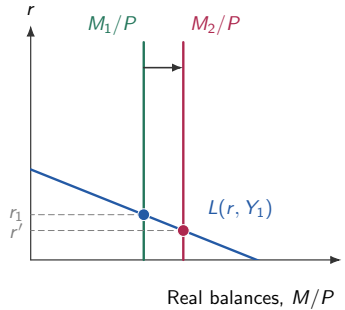


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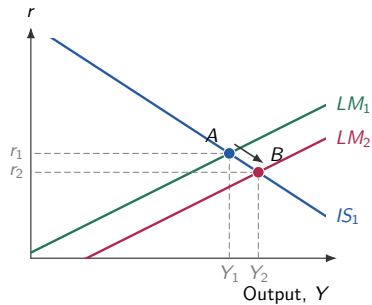


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At initial Y, higher real balances lower r to r'. Investment and output rise, raising money demand and partly reversing the rate fall to r_2.

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2. Bond prices rise and yields fall. At each given Y, the money market clears at a lower rate: **LM shifts down and right**.
3. Lower r stimulates investment, raising planned expenditure and output.
4. Higher Y raises money demand, partly offsetting the initial fall in r; the economy moves along IS to the new equilibrium.

Comparing the Two Policies

	Fiscal expansion	**Monetary expansion**
Initial curve	IS shifts right	LM shifts down/right
Output	Rises	Rises
Interest rate	Rises	Falls
Investment	Partly crowded out	Stimulated by lower rate
Policy instrument	G, net taxes, transfers	Money supply in the textbook model

The result depends on what the other policymaker holds fixed. A central bank that targets an interest rate may accommodate or offset a fiscal change.

Fiscal–Monetary Interactions

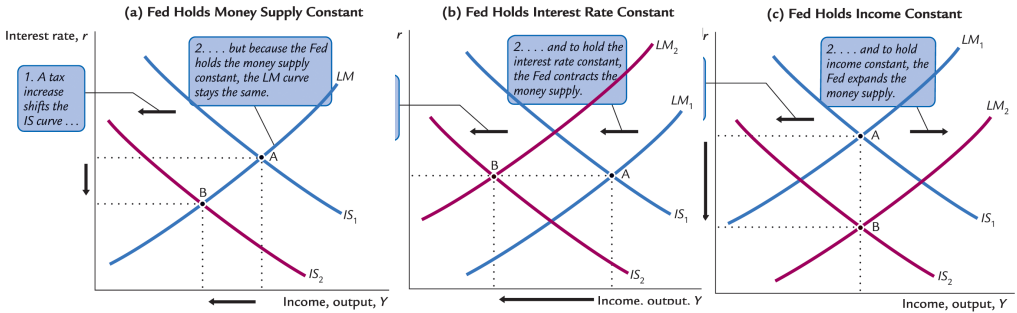
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Higher taxes shift IS to the left. Compare three possible monetary-policy responses:

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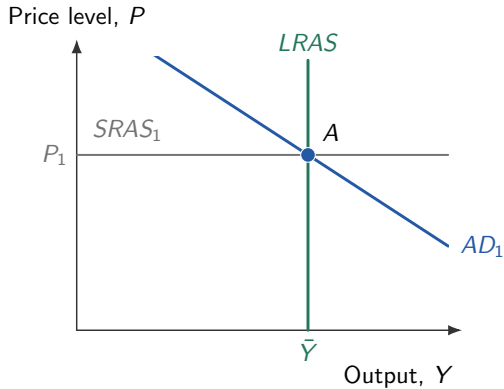
Source: Mankiw, *Macroeconomics*.

2. Aggregate Demand

How does IS–LM explain the aggregate demand curve and its shifts?

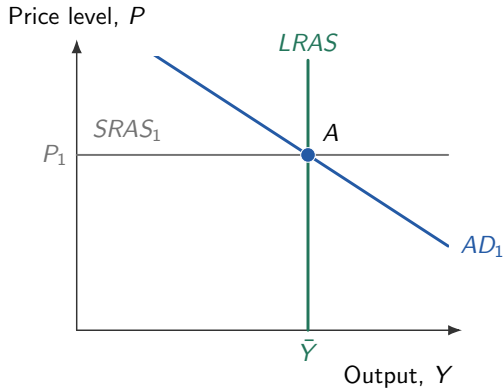
Return to the AS–AD Model

- AS–AD determines the price level P and output Y.
- IS–LM determines the interest rate r and output Y **for a given price level**.



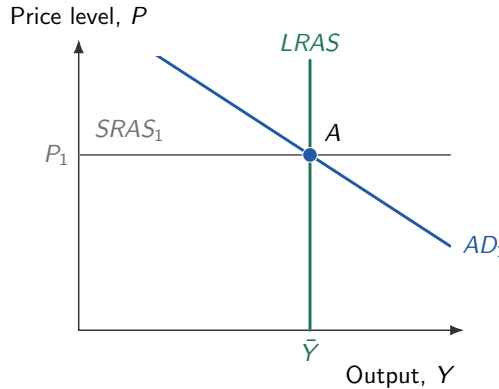
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- **How can we translate from (r, Y) to (P, Y)?**



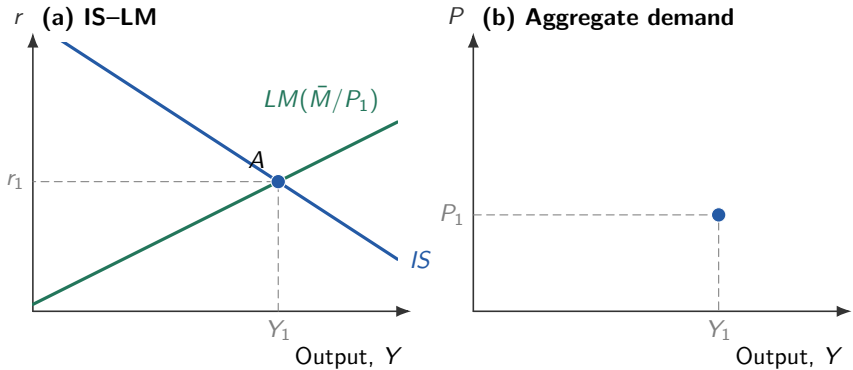
Return to the AS–AD Model

- AS–AD determines the price level P and output Y.
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- **How can we translate from (r, Y) to (P, Y)?**
- Choose a price level, solve IS–LM for Y, and repeat. The resulting (P, Y) combinations trace AD.



Deriving the Aggregate Demand Curve

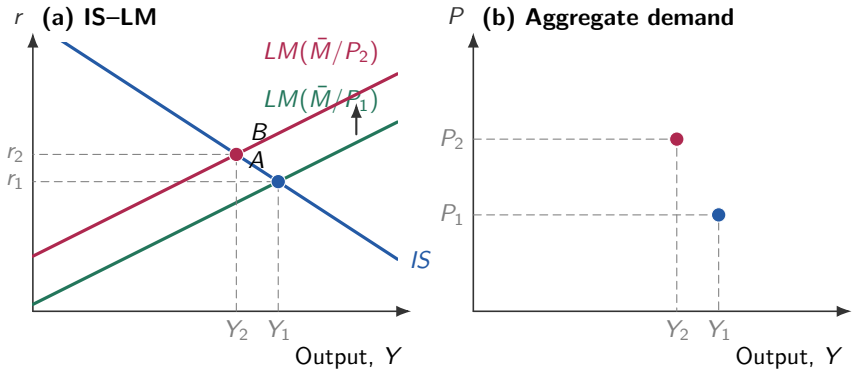
Raise the price level from P_1 to P_2, holding nominal money and IS fixed. Higher P lowers real balances $\bar{M}/P$.



At P_1, IS–LM equilibrium gives output Y_1.

Deriving the Aggregate Demand Curve

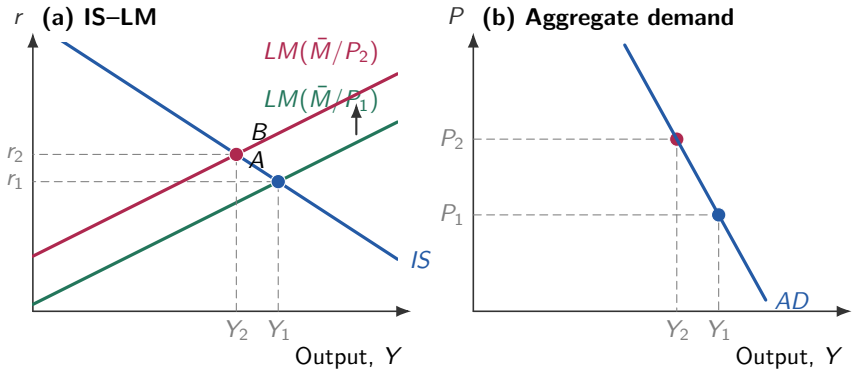
Raise the price level from P_1 to P_2, holding nominal money and IS fixed. Higher P lowers real balances $\bar{M}/P$.



At $P_2 > P_1$, $\bar{M}/P_2 < \bar{M}/P_1$: LM shifts up and equilibrium output falls to Y_2.

Deriving the Aggregate Demand Curve

Raise the price level from P_1 to P_2, holding nominal money and IS fixed. Higher P lowers real balances $\bar{M}/P$.



Repeating the experiment for many price levels traces the downward-sloping AD curve.

Why Does Aggregate Demand Slope Down?

- The AD curve shows the equilibrium quantity of output demanded at each price level.
- In the textbook IS–LM derivation:

$$P \uparrow \Rightarrow M/P \downarrow \Rightarrow LM \text{ shifts up} \Rightarrow r \uparrow \Rightarrow Y \downarrow .$$

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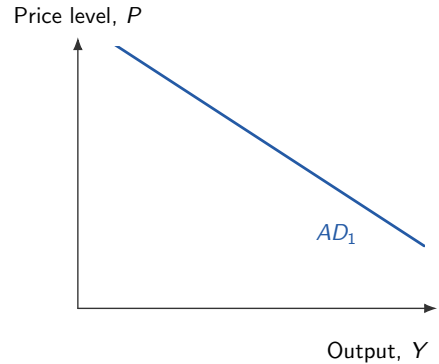
$$P \uparrow \Rightarrow M/P \downarrow \Rightarrow LM \text{ shifts up} \Rightarrow r \uparrow \Rightarrow Y \downarrow .$$

- This is a **movement along AD**: the price level changes while fiscal policy, nominal money, and other spending determinants remain fixed.
- AD is an equilibrium relationship for the entire demand side, not the demand curve for one good.

What Can Shift Aggregate Demand?

Does a change in P shift AD?

What about a change in Y?

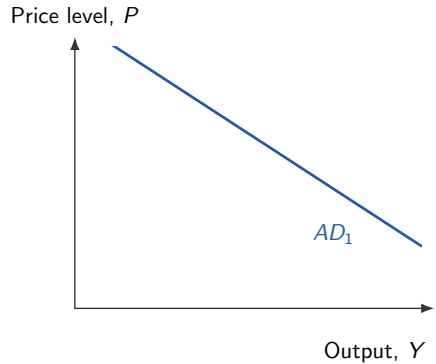


What Can Shift Aggregate Demand?

Does a change in P shift AD?

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- A change in P produces a **movement along AD**.
- Y is the outcome on the horizontal axis.
- A shift requires another determinant of spending to change.



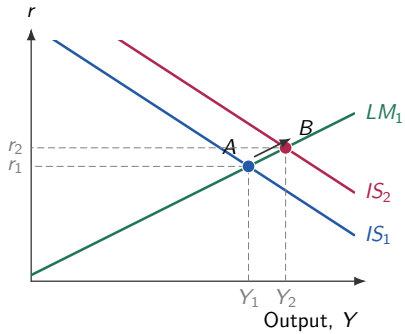
Fiscal Policy Shifts Aggregate Demand

Government purchases rise. What happens to AD?

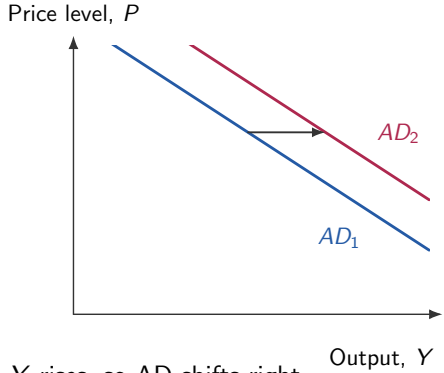
Fiscal Policy Shifts Aggregate Demand

Government purchases rise. What happens to AD?

IS–LM at a given P



Aggregate demand



$G \uparrow$ shifts IS right. At every given P, equilibrium Y rises, so AD shifts right.

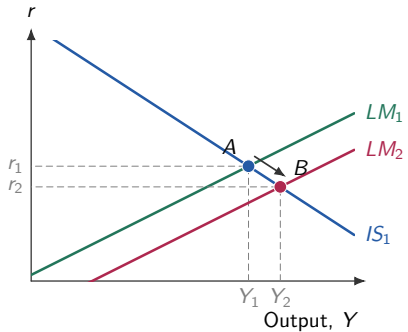
Monetary Policy Shifts Aggregate Demand

Nominal money rises. What happens to AD?

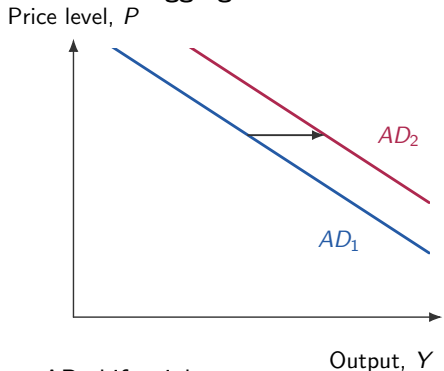
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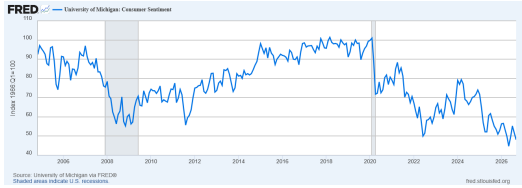
Aggregate demand



At each P, M/P rises, LM shifts down and Y rises: AD shifts right.

What Else Can Shift Aggregate Demand?

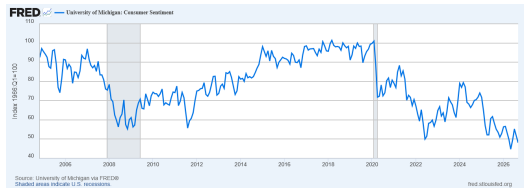
- What else, beyond fiscal and monetary policy, shifts AD?



University of Michigan consumer sentiment, US; shaded areas: recessions. Data: FRED.

What Else Can Shift Aggregate Demand?

- What else, beyond fiscal and monetary policy, shifts AD?
- **Investment:** optimism about profitable AI projects can raise investment and shift AD right.
- **Confidence:** worried households may spend less, shifting AD left.
- **Exports:** stronger foreign demand shifts AD right.
- An unexpected change in spending at a given price level is a **demand shock**; it shifts AD.



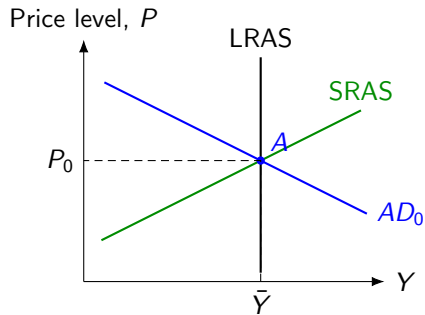
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3. AS–AD, Inflation, and Policy

How can policy stabilize output, and when can inflation become a concern?

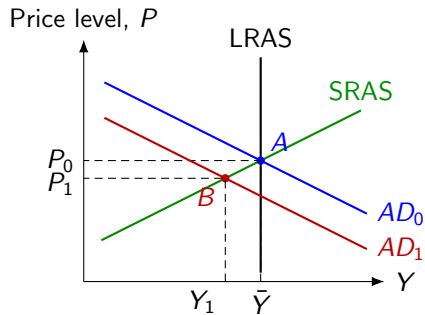
A Negative Demand Shock: What Can Policy Do?

- Initially, output is at potential, $\bar{Y}$.



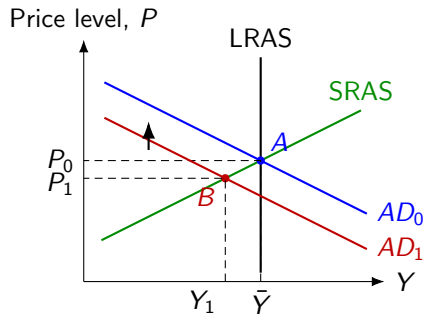
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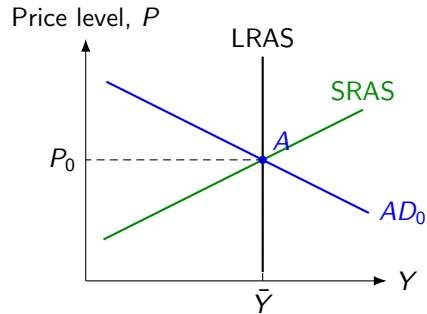
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- Expansionary fiscal or monetary policy can support demand and move output back toward potential.
- Taylor rule: a negative output gap calls for a lower policy rate, other things equal, to help boost the economy.



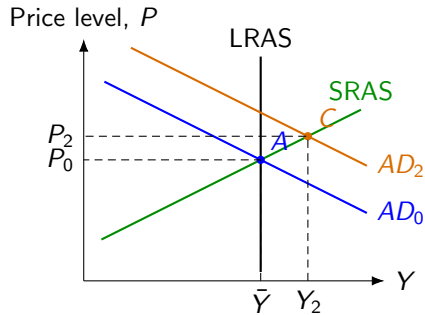
What If Demand Keeps Rising?

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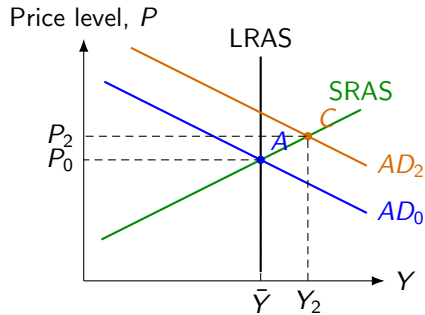
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- Suppose demand has returned output to potential.
- A further rightward AD shift raises output above potential and pushes up the price level in the short run.
- With last period's price level given, a higher price level also means higher inflation this period.
- In the Taylor rule, a positive output gap and above-target inflation both call for a higher policy rate to **cool down the economy**.



Stabilization Can Involve Trade-offs

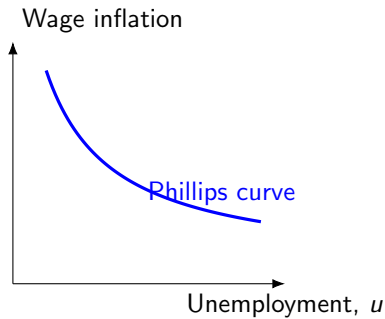
- With a negative demand shock, supporting spending can help bring output back toward potential.
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Stabilization Can Involve Trade-offs

- With a negative demand shock, supporting spending can help bring output back toward potential.
- When demand is too strong and inflation is above target, a higher policy rate can cool spending.
- An adverse **supply shock** can reduce output and raise inflation at the same time: stabilizing both becomes harder.
  - Examples: an oil-price surge, a poor harvest, or a disruption to production.
- How are inflation and unemployment related in the short run? The **Phillips curve** gives us a way to discuss that question.

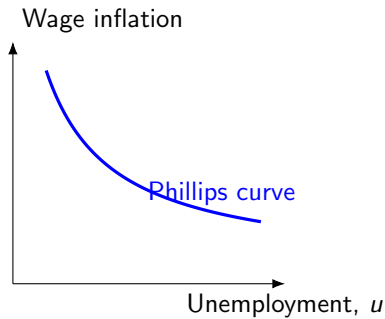
The Phillips Curve: Origins

- In 1958, A. W. Phillips documented a negative relationship between unemployment and **wage inflation** in UK data.



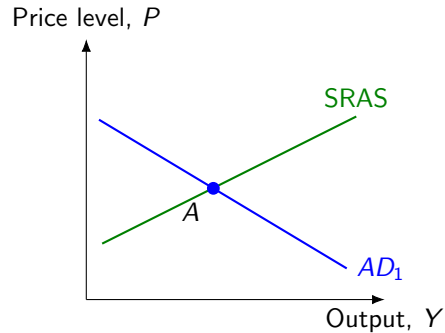
The Phillips Curve: Origins

- In 1958, A. W. Phillips documented a negative relationship between unemployment and **wage inflation** in UK data.
- In a tight labor market (few workers are available and unemployment is low), firms compete to recruit and retain workers, contributing to faster wage increases.
- Phillips documented an **empirical relationship** in the data. Can our model help explain it?



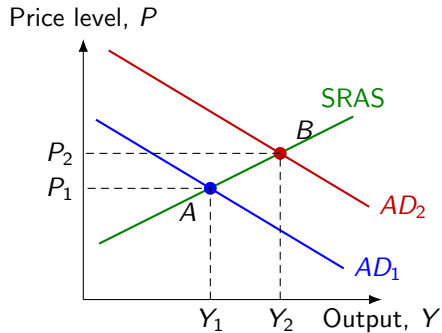
From AS–AD to the Phillips Curve

- Suppose AD shifts right while short-run aggregate supply slopes upward.

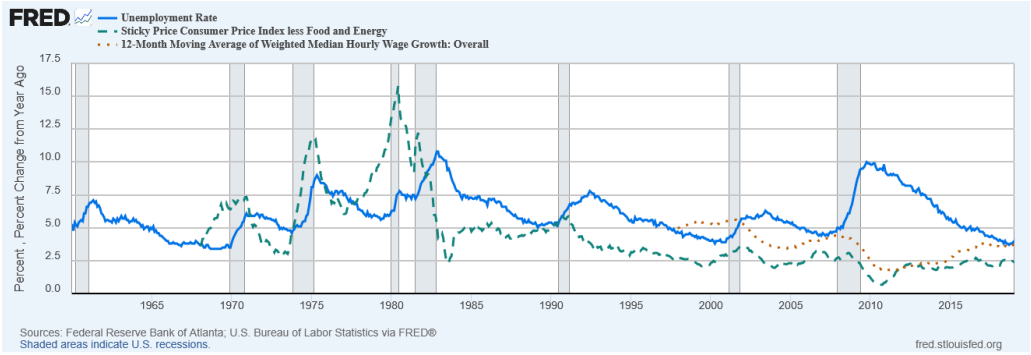


From AS–AD to the Phillips Curve

- Suppose AD shifts right while short-run aggregate supply slopes upward.
- Output and the price level rise. More production tends to reduce cyclical **unemployment**.
- Given last period's price level, a higher P this period also means higher inflation this period.
- This is a **short-run** relationship, conditional on expected inflation and supply conditions.



Inflation and Unemployment in the 1970s



The 1970s saw episodes of high inflation and unemployment at the same time: **stagflation**.

Source: FRED: BLS unemployment rate; Atlanta Fed sticky-price CPI excluding food and energy (year-on-year change); median wage growth begins later. US data.

The Phillips Curve Can Shift

Chart 5: **The Phillips Curve Shifts, 1970-79**



Source: U.S. Bureau of Labor Statistics

- Higher expected inflation or adverse supply shocks can raise inflation **at a given unemployment rate**, shifting the curve upward.
- The 1970s combined high inflation and unemployment: the relationship is not a fixed policy menu.
- With adjusting expectations, this simple model does not imply a permanent inflation–unemployment trade-off.

▸ Curve shifts and expectations ▸ Limitations of IS–LM

4. Shocks, Credit Cycles, and the Housing Crisis

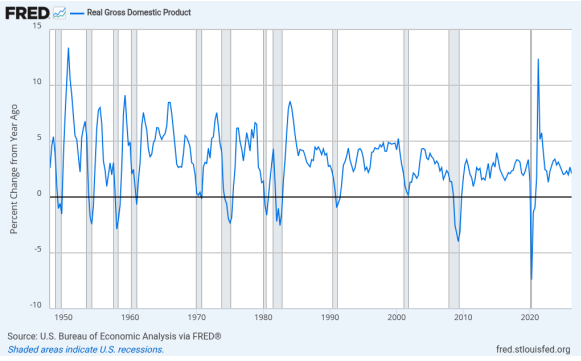
How can a shock become a boom or a deep recession?

From Shocks to the Housing Crisis

- **IMPORTANT: Watch the video for Session 9.**

1. **Shocks and amplification:** why does a disturbance move output, and why can its effects grow?
2. **Credit cycles:** how can many borrowers and lenders reinforce a boom and a bust?
3. **Confidence and competing theories:** why might lending and borrowing rise too far?
4. **The US housing crisis:** apply these mechanisms to the boom, the bust and the Great Recession.

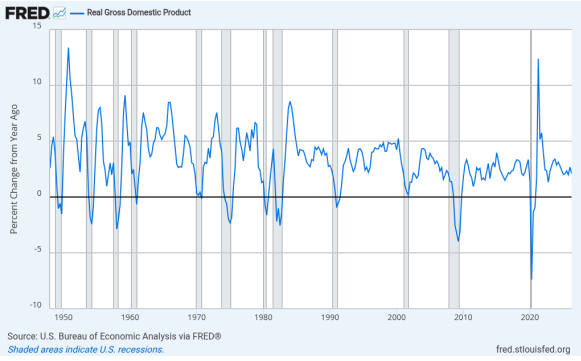
Business Cycles: Recurring, Not Regular



- Expansions end at a **peak**; recessions end at a **trough**.
- Recessions recur at irregular intervals.

Source: US Bureau of Economic Analysis via FRED; year-on-year real GDP growth. Shading: NBER recessions.

Business Cycles: Recurring, Not Regular



- Expansions end at a **peak**; recessions end at a **trough**.
- Recessions recur at irregular intervals.
- What shocks start these fluctuations, and what makes some downturns so deep?

Source: US Bureau of Economic Analysis via FRED; year-on-year real GDP growth. Shading: NBER recessions.

Shocks Start Fluctuations

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- A negative demand shock shifts IS and AD left: output and employment fall in the short run.
- An adverse supply shock shifts short-run aggregate supply left: output falls and the price level rises.
- **Amplification** occurs when the initial change sets off responses that deepen or prolong the fluctuation.

Multiplier and Accelerator: Amplifying a Shock

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- **Multiplier:** lower income leads households to cut consumption, reducing sales further.
- **Accelerator:** weaker output and sales can lead firms to cut investment in capacity.
- Lower investment is another fall in spending, creating a further round of lower income.

$$\text{spending} \downarrow \Rightarrow \; Y \downarrow \Rightarrow \; C \downarrow, \; I \downarrow \Rightarrow \; \text{spending} \downarrow .$$

The same mechanisms can reinforce an expansion.

The Accelerator: A Simple Example

Suppose desired capital is proportional to output. A simple accelerator is:

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- If output rises by 10 and $v = 0.5$, the accelerator adds 5 to investment.
- If output stops growing, the extra term becomes zero and investment returns to I_0 in this example, even if output stays high.

Borrowing and Spending Over Time

Example: annual income is EUR 40,000 and usual consumption is EUR 35,000. A household buys a EUR 20,000 car using EUR 5,000 of income and a EUR 15,000 loan.

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- Five equal, interest-free principal repayments are EUR 3,000 per year. With income still EUR 40,000, usual consumption of EUR 35,000 leaves EUR 2,000 after repayment.
- Borrowing shifts spending across time. Repaying the loan is a **financial transaction**, not a second purchase of the car.

From Individual Borrowing to a Credit Cycle

- One household's borrowing changes its spending over time. A **credit cycle** emerges when many borrowers and lenders expand and then contract credit together.

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- Lower spending reduces income and can weaken balance sheets further: the downturn feeds back into credit and demand.

Why Might a Credit Boom Become Excessive?

1. **Animal spirits:** optimism about future incomes and prices encourages spending and borrowing.
2. **Minsky:** a long period of stability can encourage fragile debt and lending arrangements.
3. **Austrian view:** low interest rates and credit expansion can encourage investments that are difficult to sustain.

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These are different interpretations of mechanisms that may interact. Their importance in a particular episode is an empirical question.

Animal Spirits, Confidence, and Credit

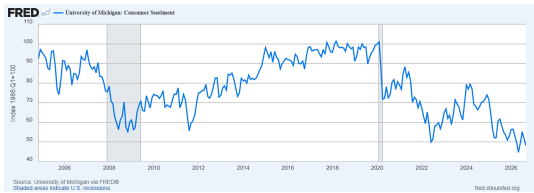
- **Animal spirits**: shifts in optimism or pessimism affecting decisions under uncertainty.
  - Optimism about artificial intelligence may raise firms' investment.
  - Pessimistic consumers may postpone spending.
- Optimistic households and firms may borrow and spend more; confident lenders may be more willing to lend.



University of Michigan consumer sentiment, US; shaded areas: recessions. Data: FRED.

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- When confidence falls, borrowers and lenders can pull back together, shifting IS and AD left.



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Financial Instability: Minsky's View

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- A reversal can expose fragile balance sheets, tighten credit and reduce spending.

An Austrian Interpretation of Cycles

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- In the Austrian view, central-bank policies that keep interest rates too low can encourage credit expansion and investment plans that are difficult to sustain.
- When financing conditions or expectations change, projects are reassessed and resources reallocated; the boom can turn into a downturn.
- This emphasizes **interest rates and the composition of investment**. Other approaches emphasize aggregate demand, confidence or financial fragility.
- The importance of each mechanism is debated and must be assessed against evidence.

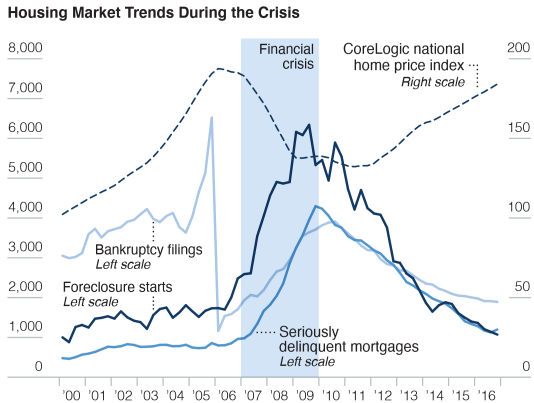
Credit, Expectations, and Housing Bubbles

- An **asset-price bubble** is a price sustained above fundamental value by expectations of future price increases.
- If buyers expect house prices to keep rising, they may be more willing to buy and borrow; lenders may also feel safer accepting houses as collateral.

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- Easier credit supports housing demand and prices, potentially reinforcing optimism and lending.
- Fundamentals are difficult to observe: rapid price growth alone does not prove a bubble.

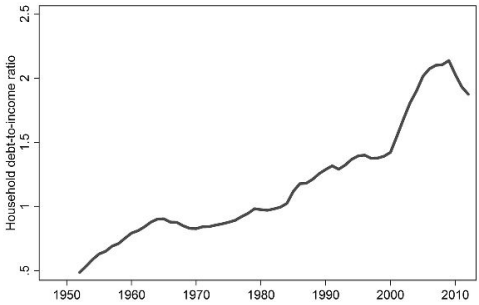
The Housing Boom and Bust



- US house prices rose before the crisis and then fell; foreclosures and serious delinquencies increased.

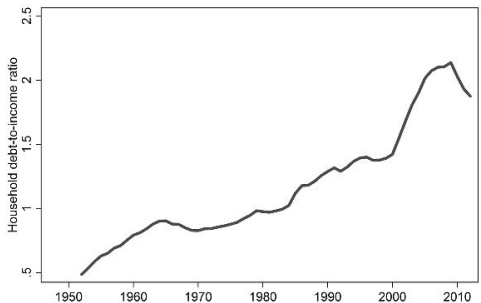
Source: Yale Program on Financial Stability / Brookings (2020), *Housing Market Trends During the Crisis*. Left scale: bankruptcies and foreclosure starts in hundreds; delinquent mortgages in thousands. Right scale: CoreLogic national home-price index.

The US Housing Boom: Several Forces Together



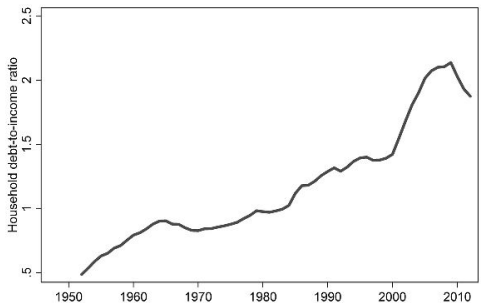
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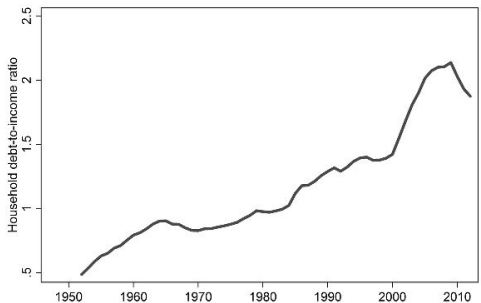
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- Higher housing demand, prices, collateral values and credit could reinforce one another.

How Mortgages Became Securities

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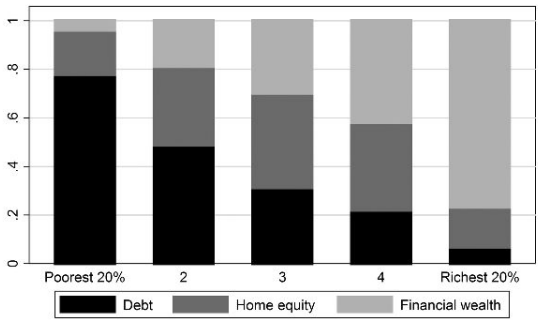
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- If house prices fall together across the country, defaults can rise together: pooling cannot eliminate **common risk**.
- Selling loans and earning fees could weaken screening incentives; some banks also retained substantial exposure.

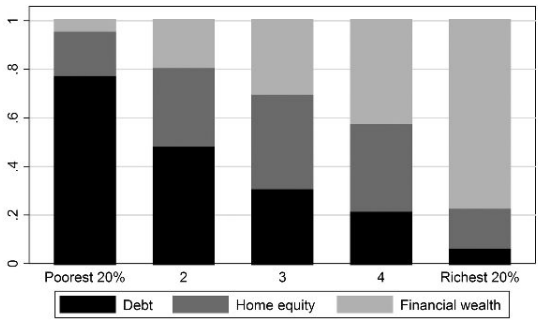
Household Debt: Who Was Exposed?



- Among US homeowners in 2007, poorer net-worth groups were more leveraged.

Source: Mian and Sufi, *House of Debt*, Figure 2.1: US homeowners grouped by net worth, 2007.

Household Debt: Who Was Exposed?



- Among US homeowners in 2007, poorer net-worth groups were more leveraged.
- They held less financial wealth relative to assets, leaving fewer buffers when house prices or incomes fell.

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Housing, Leverage, and Losses

Example: a household buys a home for 100, financed with a mortgage of 90 and equity of 10.

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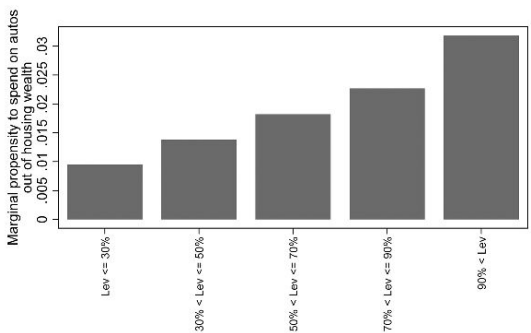
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- If the home price falls to 85 and mortgage debt is still 90, equity is $85 - 90 = -5$.
- Negative equity makes selling or refinancing harder and can increase default risk, especially when income falls.
- Highly indebted, cash-constrained households can cut consumption sharply when income or access to credit falls.

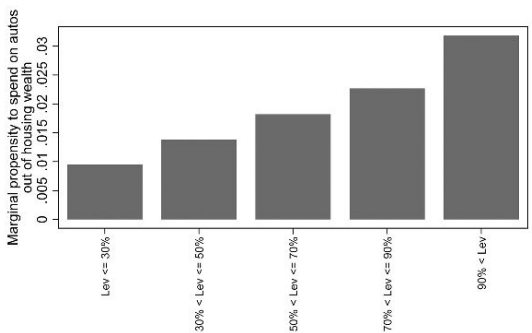
Housing Wealth, Leverage, and Spending



- Households with higher housing leverage showed a larger spending response to housing-wealth changes.

Source: Mian and Sufi, *House of Debt*, Figure 3.3: marginal propensity to spend on autos out of housing wealth, by housing leverage.

Housing Wealth, Leverage, and Spending



- Households with higher housing leverage showed a larger spending response to housing-wealth changes.
- With little liquid wealth, a fall in housing equity can make borrowing or refinancing harder and lead to a larger cut in spending.
- The graph concerns **spending on cars out of housing wealth**; it is not the MPC out of disposable income.

Source: Mian and Sufi, *House of Debt*, Figure 3.3: marginal propensity to spend on autos out of housing wealth, by housing leverage.

The Bust: A Feedback Loop

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3. Mortgage-backed securities lost value; financial institutions faced losses and funding strains, leading to tighter credit.

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1. Housing construction slowed and prices stopped rising in many markets. Some borrowers could no longer refinance or afford their payments.
2. Defaults and foreclosures rose; distressed sales added pressure to house prices. Falling prices left more households with weak or negative equity.
   - Cash-constrained households with high MPCs cut spending sharply. Lower income and investment can amplify the fall through the multiplier and accelerator.
3. Mortgage-backed securities lost value; financial institutions faced losses and funding strains, leading to tighter credit.
4. Falling wealth, weaker credit and uncertainty reduced consumption and investment; construction and employment fell.

Why Was the Downturn So Severe?

- Several vulnerabilities coincided: optimistic expectations, weak lending standards, high household debt, complex securities and fragile bank funding.
- Falling house prices weakened households *and* financial institutions. Each channel reinforced the other; there was no single universally agreed trigger.
- Household spending, housing construction and business investment fell, shifting IS and AD left. Job losses and lower income amplified the downturn.
- The US recession lasted from December 2007 to June 2009. Fiscal policy, central-bank rate cuts and emergency lending responded.

Connecting the Crisis to the Theories

- **Animal spirits:** optimism about house prices encouraged borrowing and housing demand.
- **Minsky:** heavy debt and reliance on refinancing made some borrowers and lenders fragile when conditions changed.
- **Austrian view:** low rates and credit expansion may have encouraged unsustainable housing investment.
- **Multiplier and accelerator:** lower consumption and construction reduced income and employment, creating further falls in spending.
- These mechanisms can coexist; their relative importance remains debated.

What to Remember

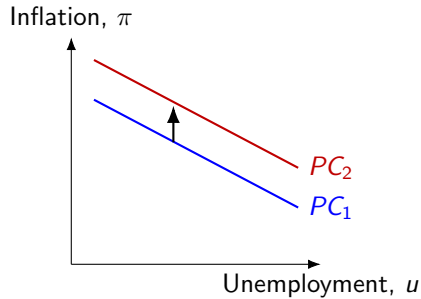
- **Policy in IS–LM.** Fiscal policy shifts IS; monetary policy shifts LM in the fixed-M model. The policy mix matters.
- **Aggregate demand.** IS–LM gives equilibrium output at each price level; policies and other spending shocks shift AD.
- **Inflation and unemployment.** The short-run Phillips relationship depends on expectations and supply shocks.
- **Cycles and amplification.** Investment, confidence, credit and balance sheets can reinforce shocks.
- **The 2007–09 crisis.** Housing and debt vulnerabilities interacted with financial distress and falling aggregate demand.

Next session: business-cycle recap and inequality.

Appendix: Expectations and Phillips-Curve Shifts

$$\pi = E\pi - \beta(u - u^n) + \nu, \qquad \beta > 0.$$

- $E\pi$: expected inflation; $u - u^n$: unemployment relative to its natural rate; ν: a supply shock.
- Higher expected inflation or an adverse supply shock can raise inflation at every unemployment rate.
- The short-run Phillips curve shifts up. As expectations adjust, the simple model offers no permanent trade-off.



Return to Phillips curve

Appendix: Limitations of IS–LM

- The basic short-run model fixes the price level; AS–AD adds price adjustment, while inflation needs an explicitly dynamic account.
- Simple consumption and investment functions omit many expectations and balance-sheet channels.
- The textbook LM curve treats nominal money as given; modern central banks commonly steer a policy rate.
- A basic IS–LM model leaves supply disturbances outside the model; broader AS–AD frameworks can analyze them.

◂ Return to Phillips curve

Appendix: Toward Modern Macroeconomics: DSGE

- The **Lucas critique**: people's decisions may change when the policy regime changes.
- **Dynamic stochastic general equilibrium (DSGE)** models study households and firms making decisions over time in an economy hit by shocks.
- Expectations and policy rules affect current choices; models differ in how they represent households, firms, markets and financial frictions.
- New Keynesian DSGE models include nominal rigidities and can show short-run effects of monetary policy.