

Business Cycles

Part 5: Financial Crises

Lecture 9: Monetary Policy and the Zero Lower Bound

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Outline

Part 1: Introduction

Part 2: Microeconomic Foundations

Part 3: The Real Business Cycle Model

Part 4: The New Keynesian Model

Part 5: Financial Crises

- **Lecture 9: Monetary Policy and the Zero Lower Bound on Interest Rates**
- Lecture 10: The Great Recession

Learning Objective of Today's Lecture

1. Learning how the model changes when the interest rate cannot be lowered, i.e. is stuck at the zero lower bound.
2. Understanding, why monetary policy becomes ineffective in this case.
3. Understanding why demand shocks have larger effects at the zero lower bound.
4. Understanding why this situation is dangerous.
5. What policy measures can be used to escape the zero lower bound?

Literature

Required reading:

- Textbook chapter 29 (Monetary Policy with Zero Lower Bound)

Optional reading:

- Textbook chapter 28 (Monetary Policy without Zero Lower Bound)

Inefficiency in the New Keynesian Model

- Backbone of the New Keynesian model is the neoclassical model
- The optimal equilibrium of the New Keynesian model is the hypothetical equilibrium which would occur in the neoclassical model, i.e. the allocation that prevails in the absence of price rigidities.
- Call the hypothetical neoclassical level of output Y_t^f
- No guarantee that $Y_t = Y_t^f$, hence equilibrium of New Keynesian model is in general inefficient.
- Optimal monetary policy:
If $Y_t \neq Y_t^f$, adjust policy to aim at $Y_t = Y_t^f$.
- Given exogenous shocks, adjust M_t (equivalently, interest rates) to make the equilibrium of the New Keynesian model mimic the equilibrium of the neoclassical model.

Optimal Monetary Policy Responses: IS and Supply Shocks

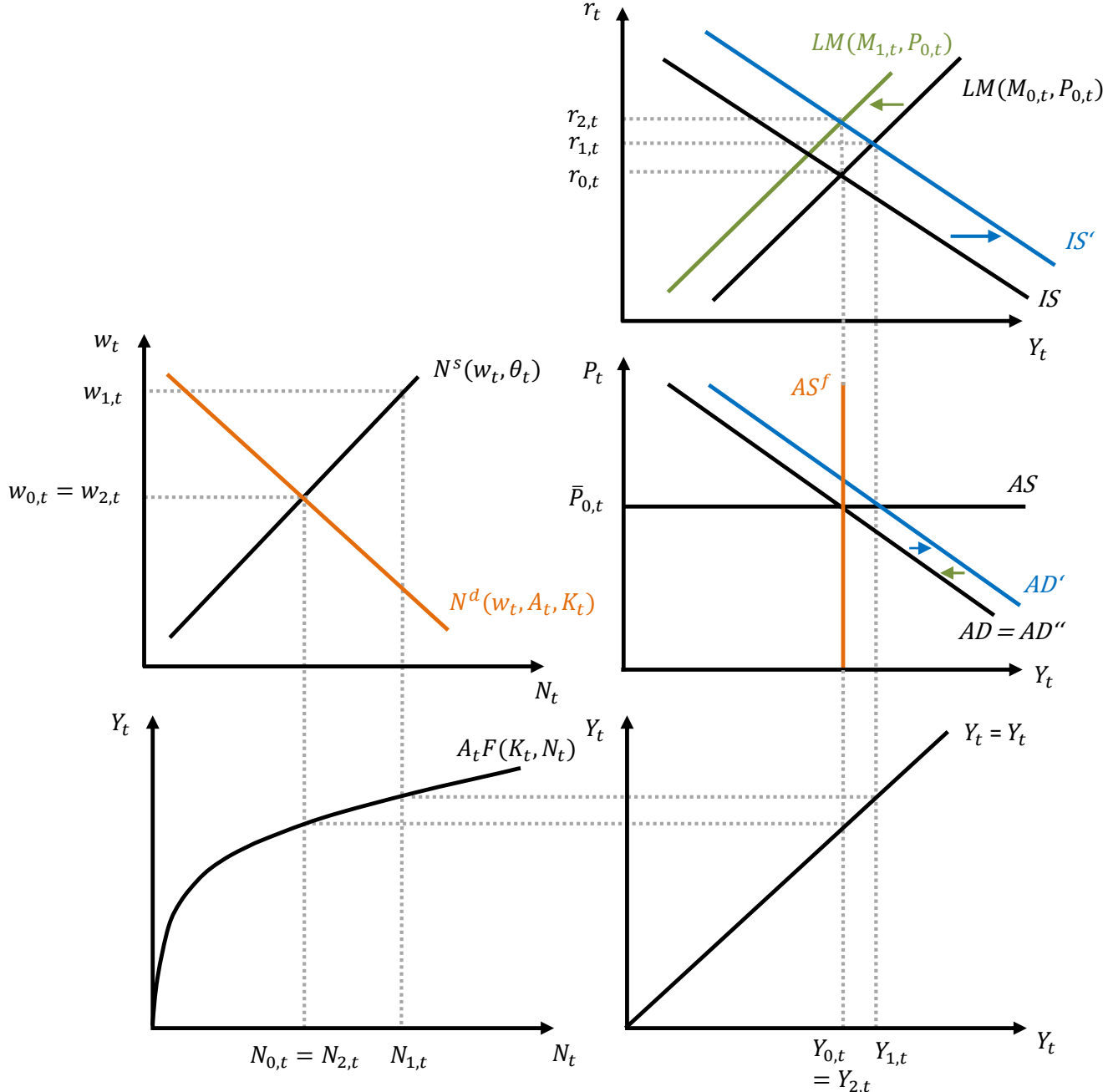
IS shocks:

- Positive IS shocks cause output to rise, but do not affect Y_t^f
- If nothing done, will open up a positive output gap, $Y_t - Y_t^f$
- Optimal policy should reduce M_t (equivalently, raise r_t / i_t) to counteract the IS shock

Supply shocks:

- Supply shocks (changes in A_t or θ_t) do not impact output in the NK model, but affect Y_t^f
- Optimal policy should increase M_t (equivalently, lower r_t / i_t) to accommodate positive supply shocks (increase in A_t or decrease in θ_t)
- Intuition: $\frac{M_t}{P_t}$ needs to adjust to implement neoclassical equilibrium. If P_t can't adjust, adjust M_t .

Counteracting an IS Shock



Monetary Policy in Practice

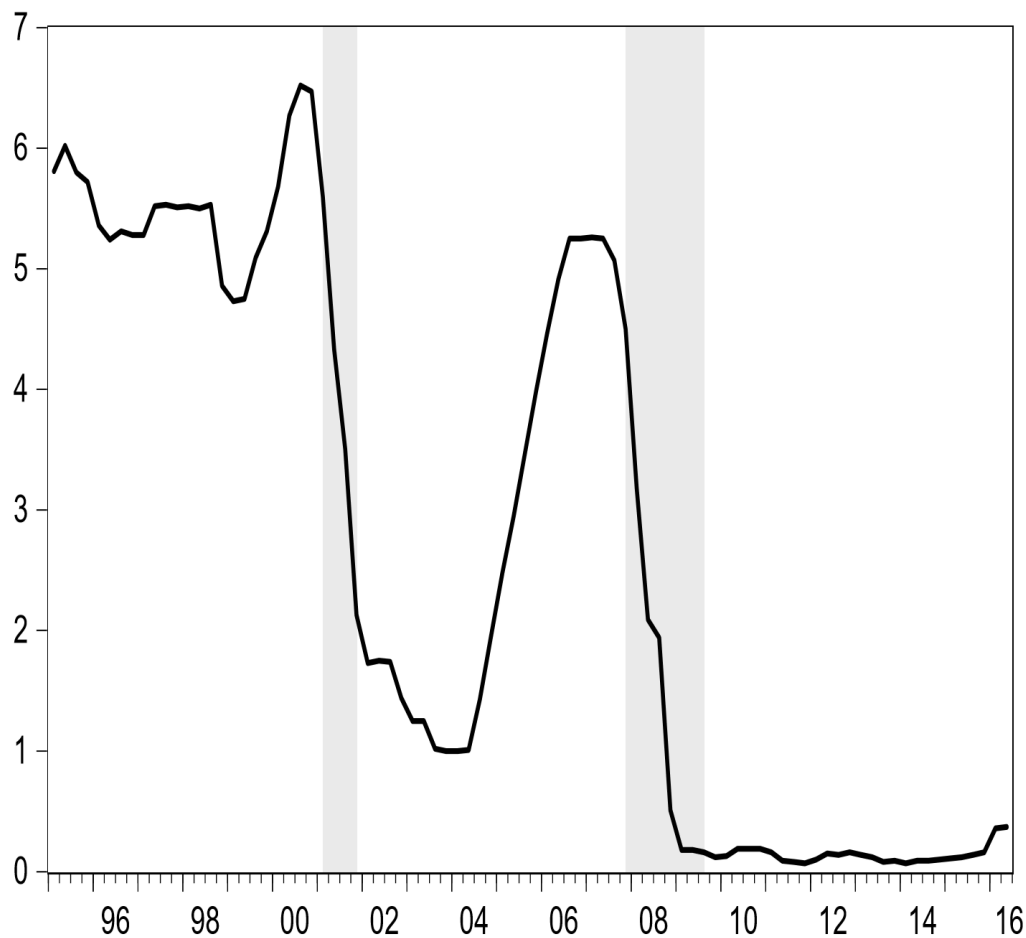
- Taylor (1993) argues that a fairly simple rule written in terms of inflation and the output gap fits data well:

$$i_t = r^* + \pi^* + \varphi_\pi(\pi_t - \pi^*) + \varphi_y(Y_t - Y_t^f)$$

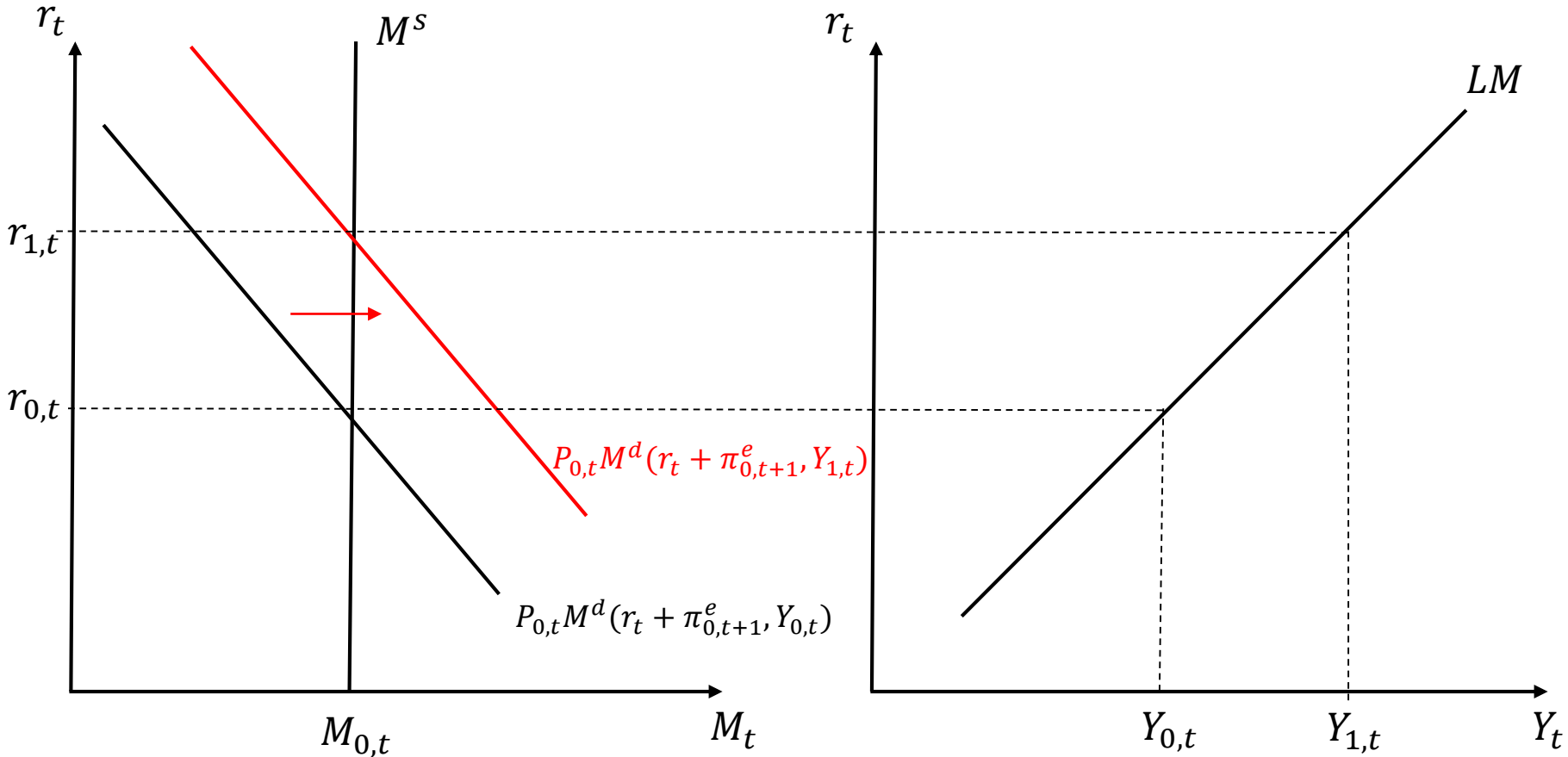
- r^* and π^* are long run values, and φ_π and φ_y are positive coefficients
- Not exactly the optimal policy response we discussed above, and phrased in terms of nominal interest rate rather than money supply
- But embodies some of the features of optimal policy:
 - Positive output gap: raise nominal interest rate
 - If inflation above target, likely that output gap is positive (e.g. basic Phillips Curve idea), so responding to inflation kind of makes sense as well
 - Hence, the “Taylor rule” has some desirable normative properties

The Zero Lower Bound (ZLB)

Taylor rule policy not possible if the nominal interest rate hits the zero lower bound: Interest rate cannot be lowered in response to adverse demand shocks

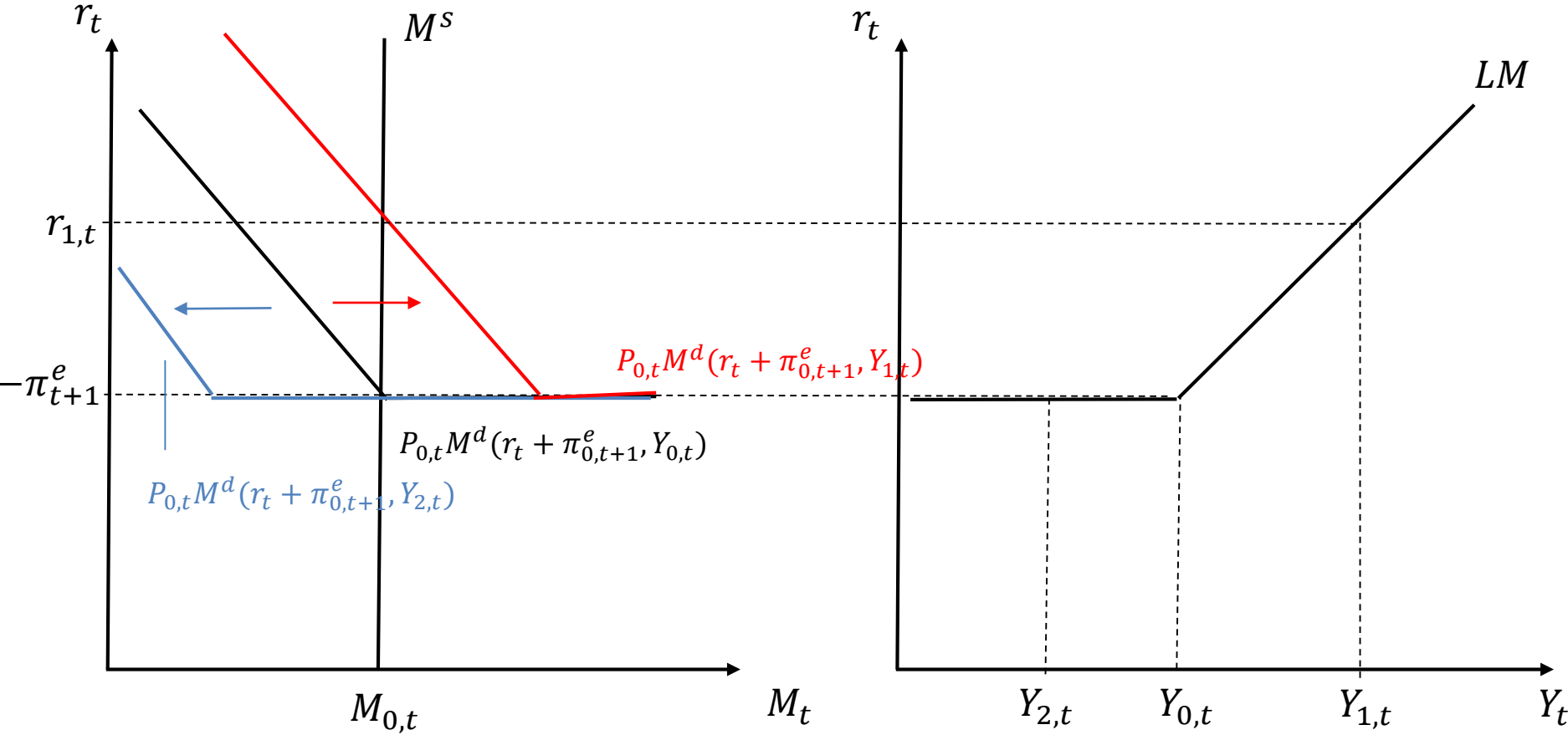


Graphical Derivation of the LM Curve without ZLB



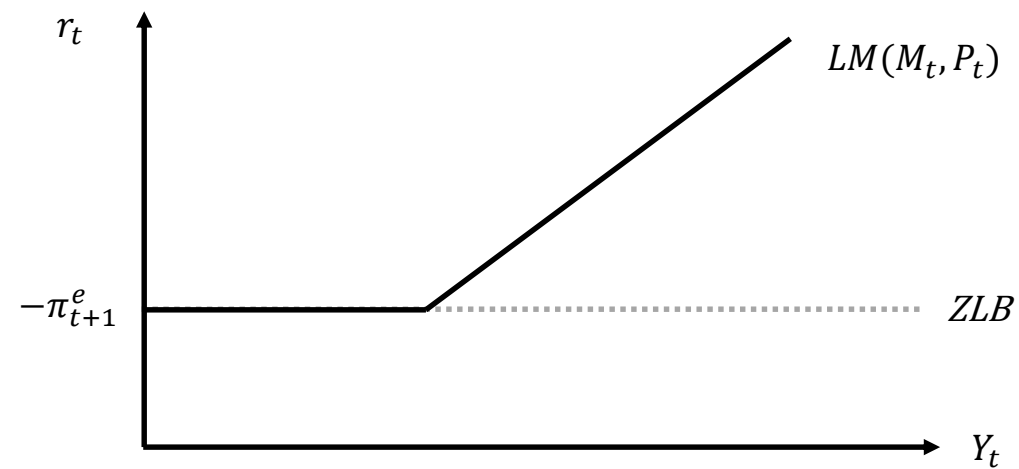
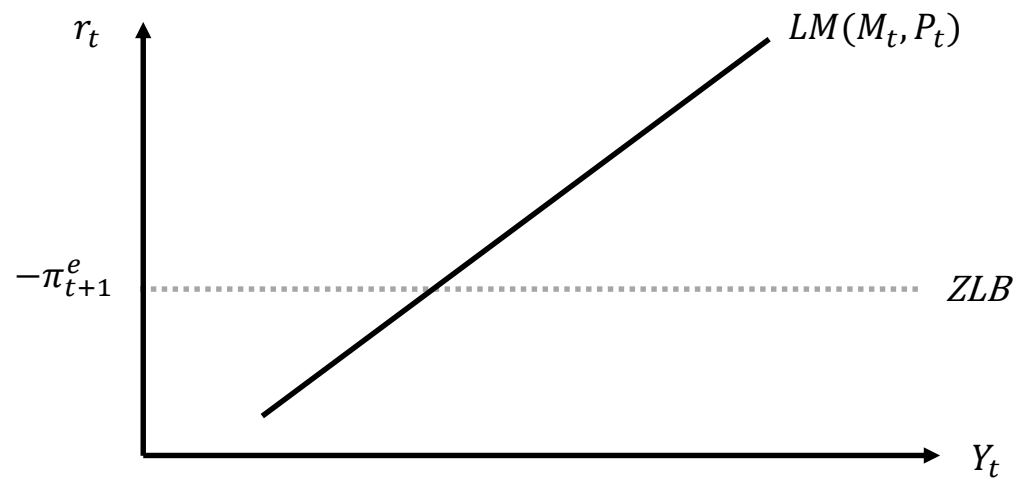
Graphical Derivation of the LM Curve without ZLB

The ZLB means there is a lower bound on the *real* interest rate of $r_t = -\pi_{t+1}^e$ ($i_t = r_t + \pi_{t+1}^e \geq 0$). It introduces a kink into the money demand and the LM curve.

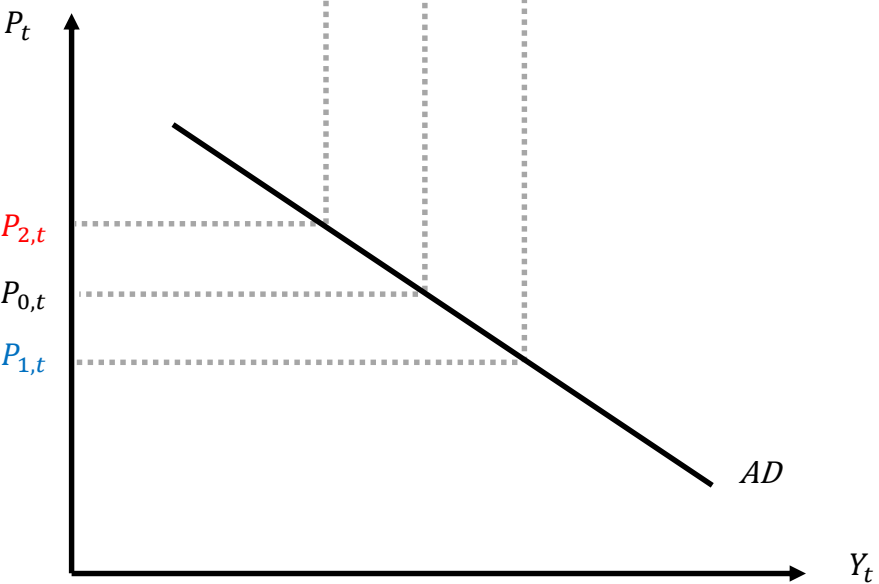
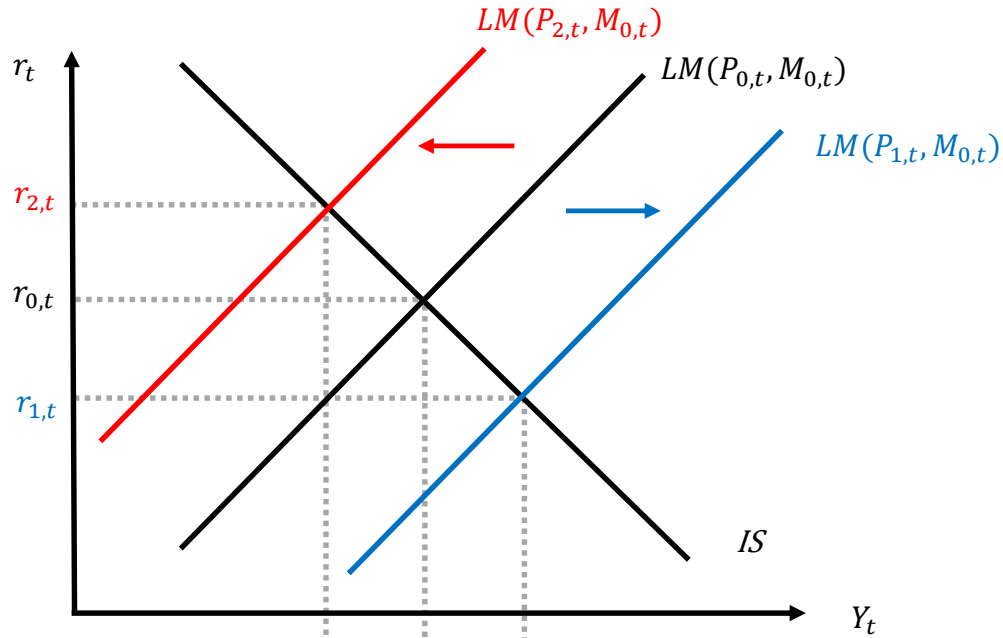


The LM Curve with ZLB

The ZLB means there is a lower bound on the *real* interest rate of $r_t = -\pi_{t+1}^e$ ($i_t = r_t + \pi_{t+1}^e \geq 0$). It introduces a kink into the LM curve.

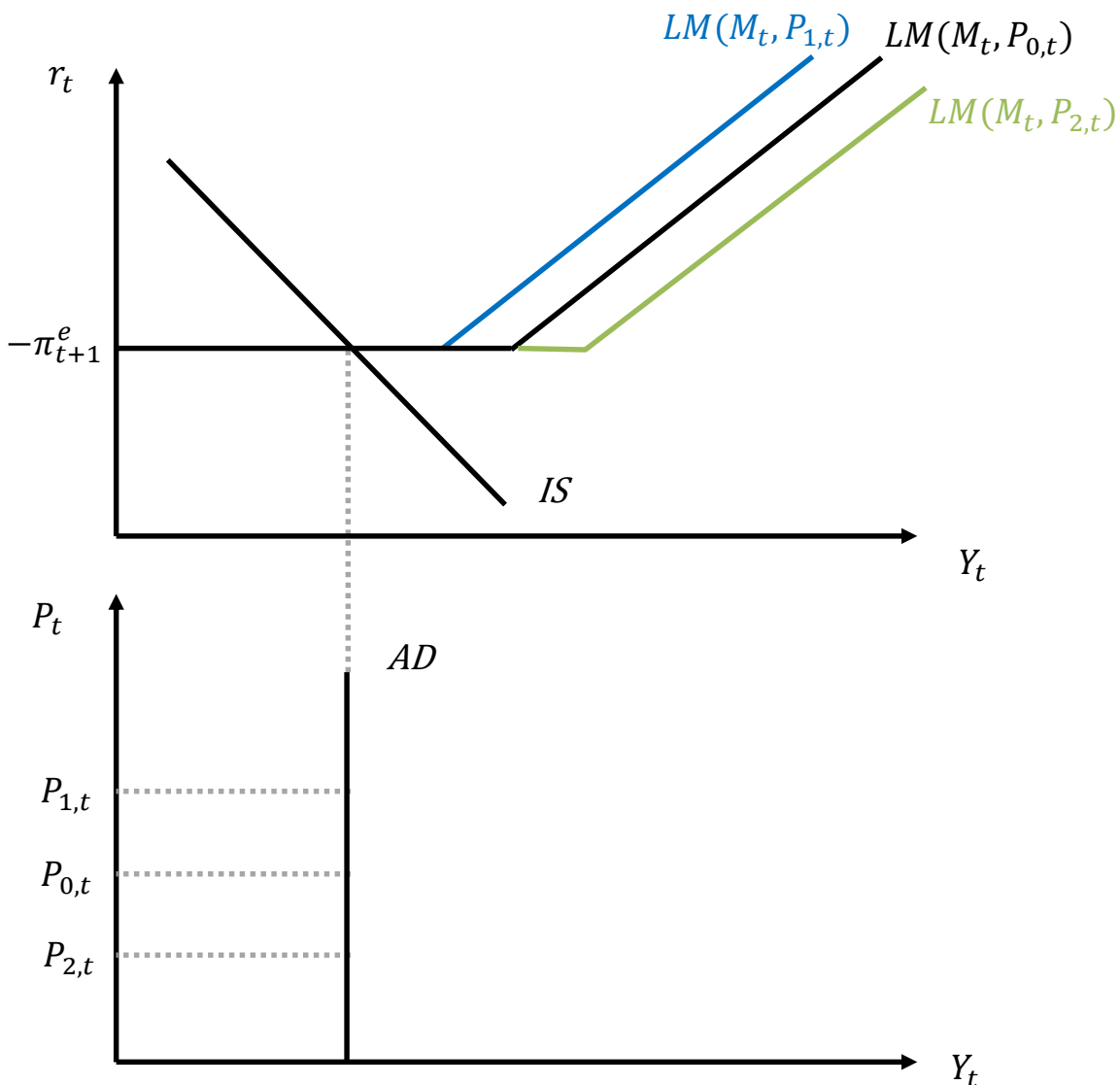


Deriving the AD Curve without ZLB



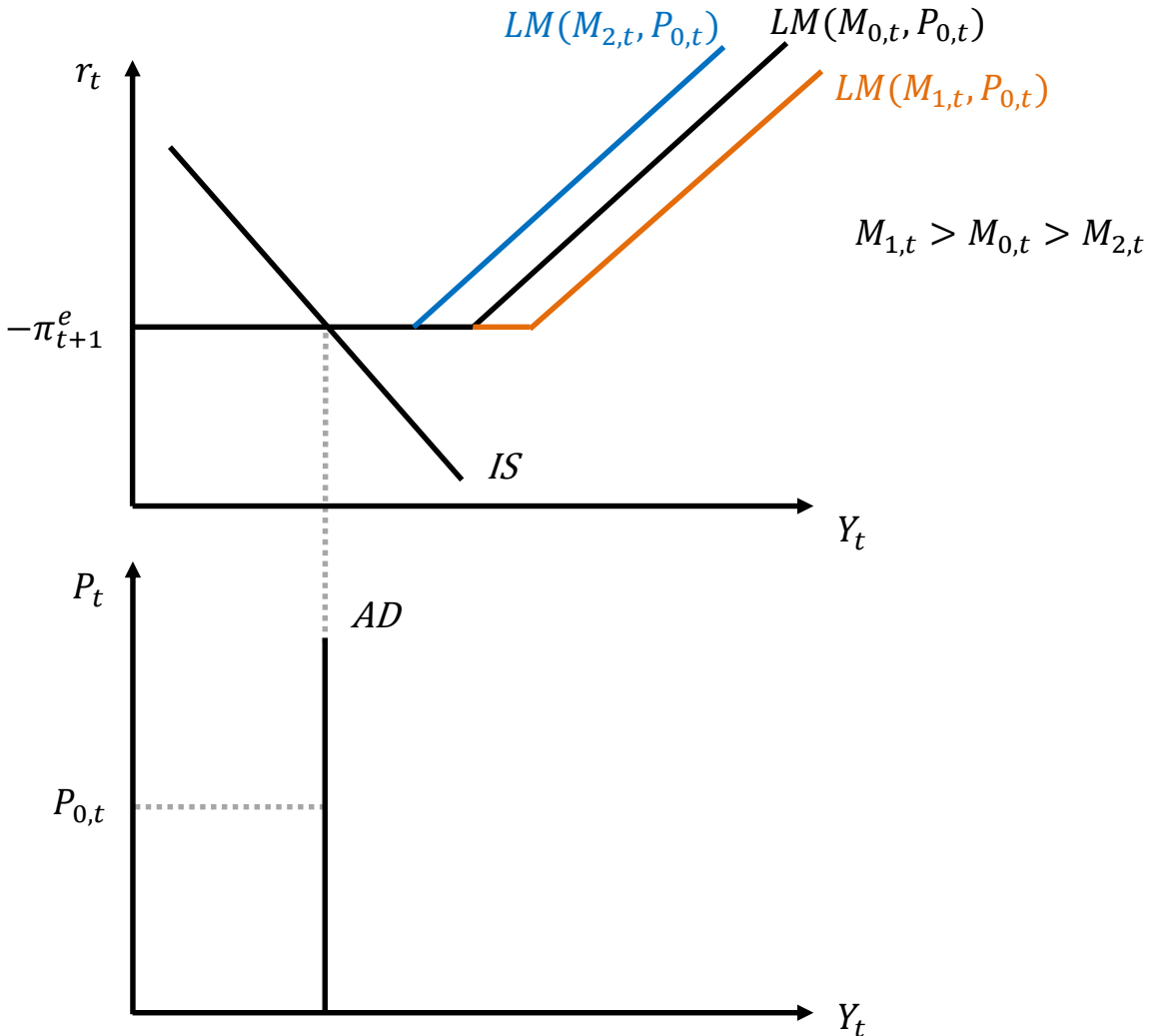
The AD Curve with ZLB

The AD curve becomes completely vertical when the ZLB binds



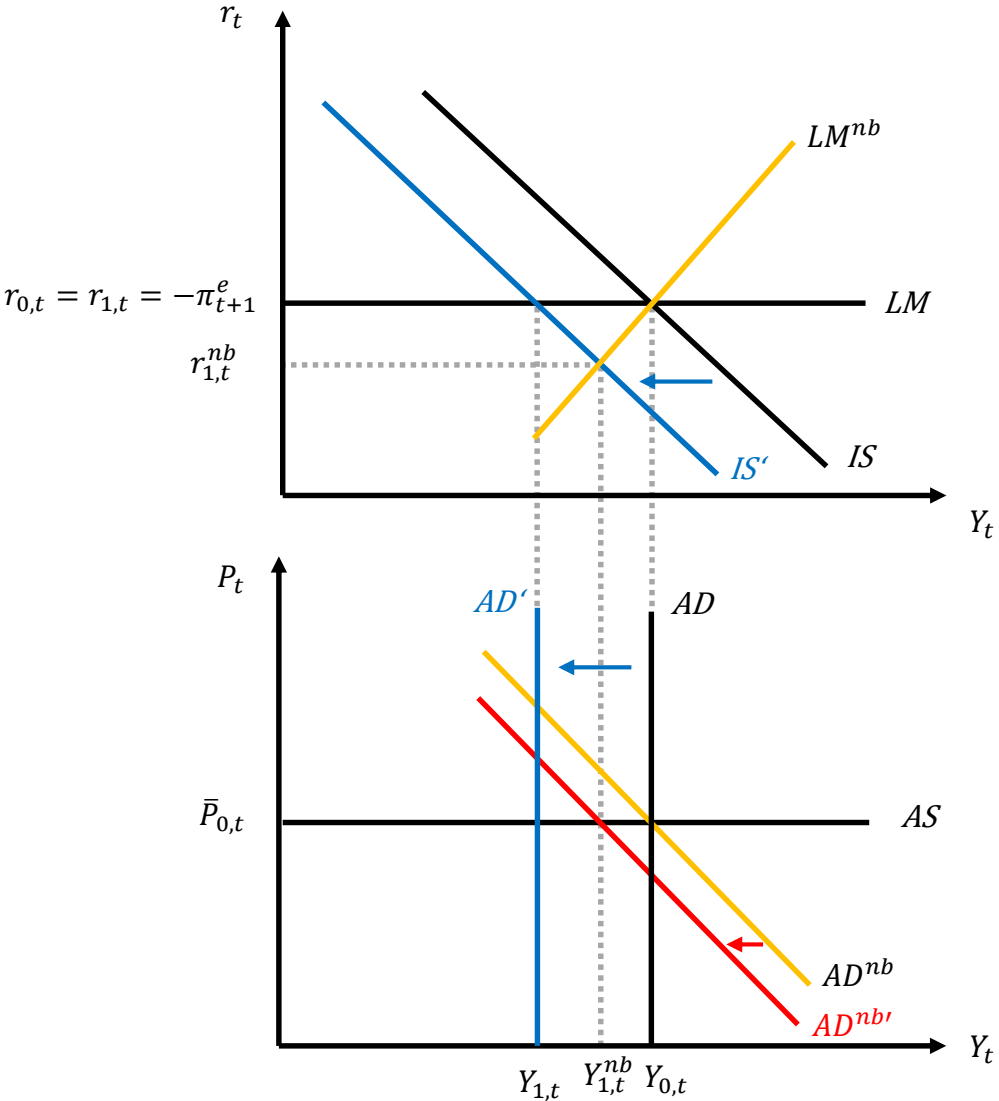
The Ineffectiveness of Monetary Policy at the ZLB

- Changes in the money supply do not affect AD
- Monetary policy is rendered ineffective



IS Shocks Have Bigger Effects on Y_t at the ZLB

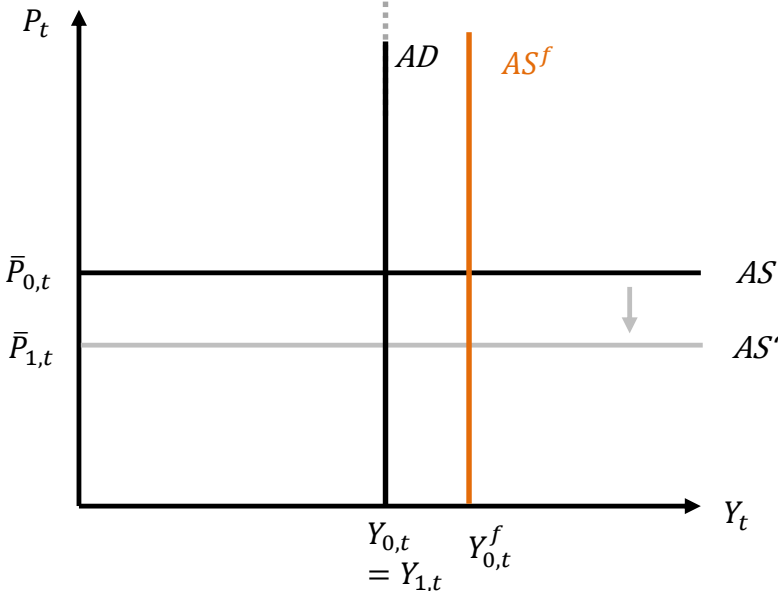
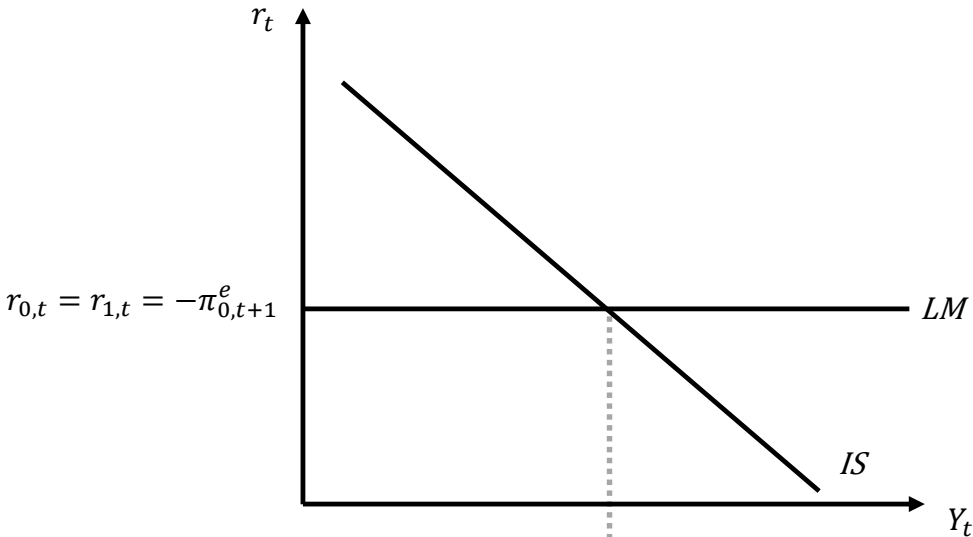
- This is because r_t cannot react to partially offset them



Why is the ZLB Costly?

- Central bankers are afraid of the ZLB
- Two principal reasons:
 1. Normal stabilization policy is not available. Negative demand shocks are much more costly than otherwise
 2. Things could get worse. The transition from short run to medium run can make the ZLB worse over time. “Deflationary spiral”

Medium Run Dynamics: $Y_t < Y_t^f$, ZLB binds

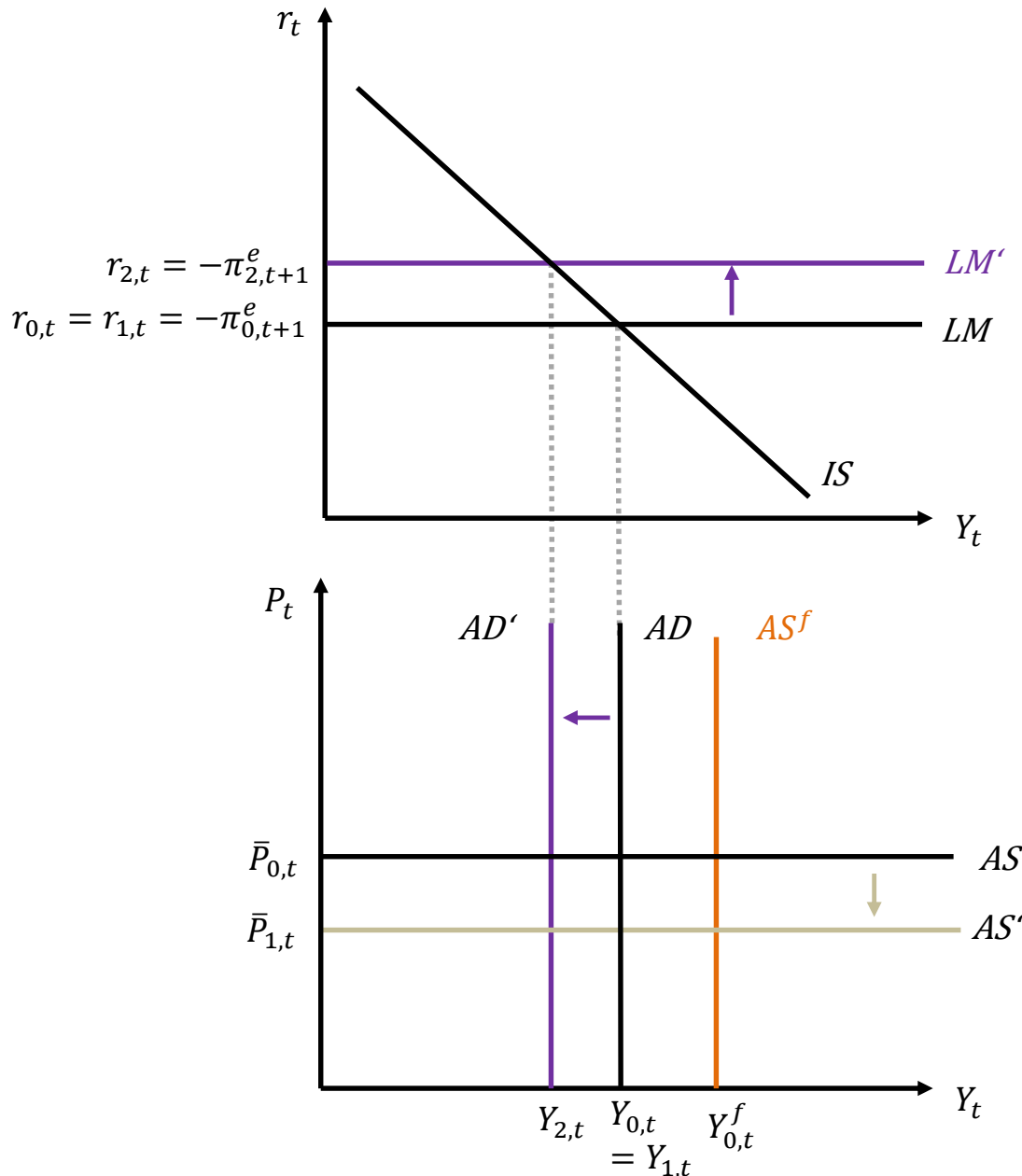


Price adjustment, will not close the output gap. Economy gets stuck at negative output gap.

Deflationary Expectations

- What we will tend to observe is prices falling but the output gap not closing if the ZLB binds
- What if agents begin to expect falling prices?
- We've thought of π_{t+1}^e as exogenous, but what if a binding ZLB causes agents to begin to expect prices to continue falling (i.e. π_{t+1}^e to fall)?
- This will drive up the real interest rate, reducing demand, and making the output gap bigger

Deflationary Spiral



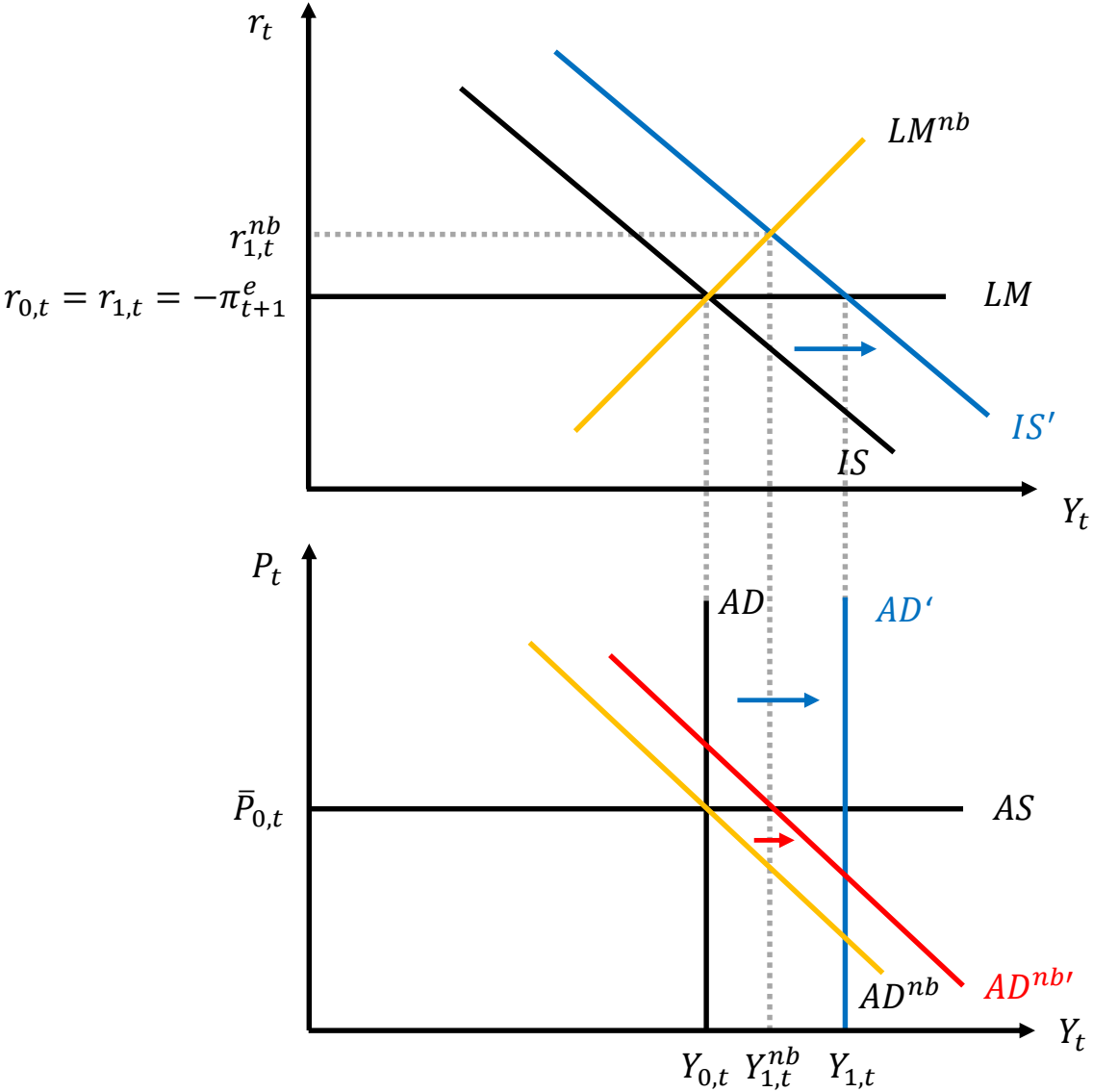
Historical deflation episodes (Borio et al., 2015)



Fiscal Policy at the ZLB

- As noted above, IS shocks have bigger effects on output at the ZLB because there is no counteracting movement in the real interest rate
- Fiscal policy shocks (increases in G_t or reductions in taxes if there is no Ricardian Equivalence) are IS shocks
- Hence, these will have bigger effects on output at the ZLB – there will be no “crowding out”
- Many (though not all) economists think fiscal expansion makes sense at the ZLB

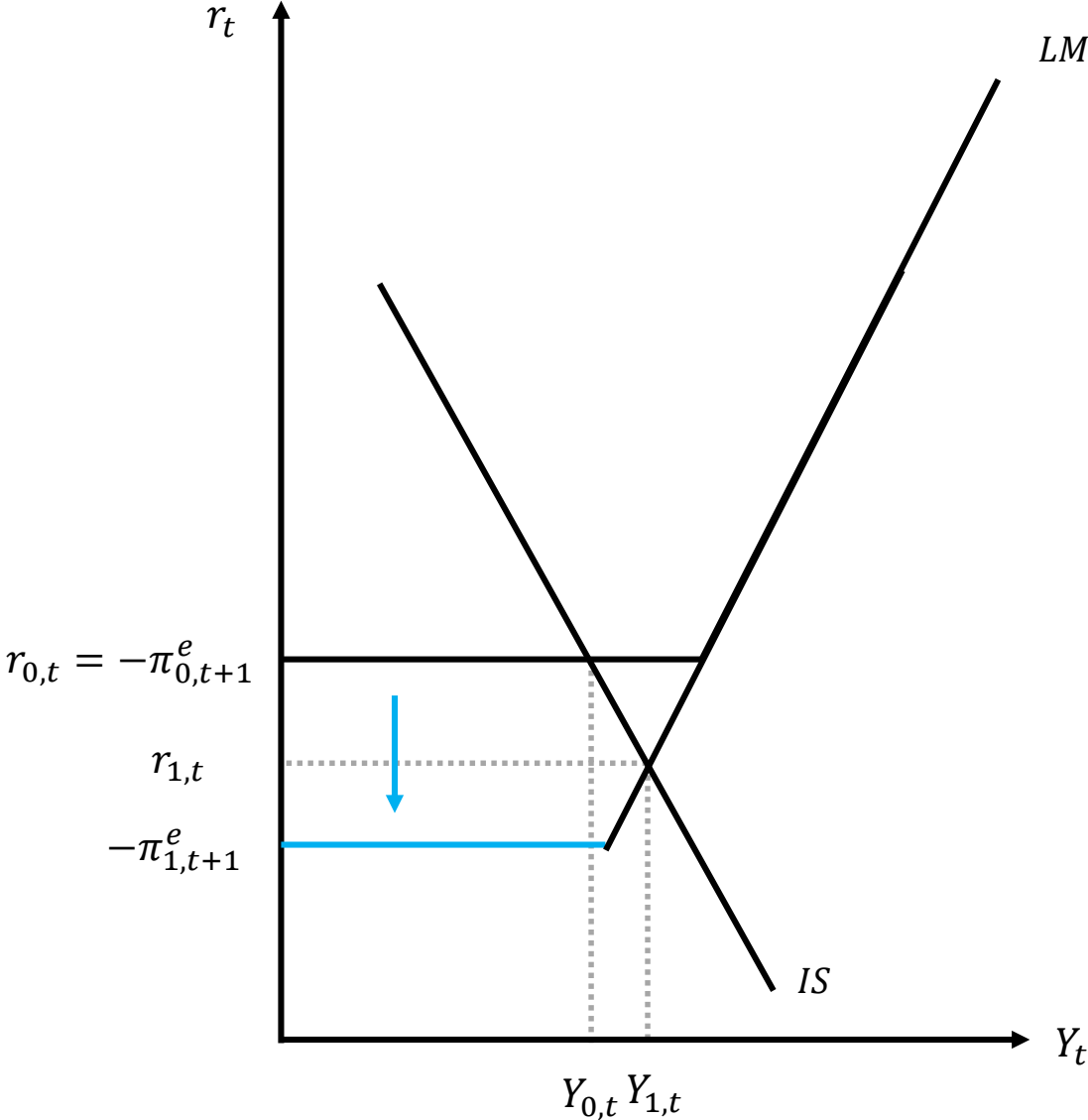
Increase in G_t at the ZLB



Escaping the ZLB

- To escape the ZLB, need to either (1) engage in sufficiently large fiscal expansion (see above) or (2) engineer higher (rather than lower) inflation expectations
- Higher expected inflation lowers the current real interest rate given a fixed nominal rate
- How to engineer higher inflation expectations?
 - Promise loose monetary policy in the period after the ZLB has ended (“forward guidance”)
 - Engage in non-standard open market operations, buying risky private sector debt or longer maturity government debt (“quantitative easing”)
 - Central bank credibility is critical to escape the ZLB

Inflation Expectations



Summary

- Since the alternative to holding bonds is holding money, which yields zero percent nominal interest rate, nominal interest rates cannot go (much) below zero.
- In the region near the ZLB, the LM curve is flat and the AD curve is vertical.
- At the ZLB, changes in monetary policy do not affect the AD curve.
- The effect of demand shocks is higher at the ZLB, including fiscal policy.
- Problems with the ZLB: no stabilization via conventional monetary policy possible, prevents dynamic transitioning from short to medium run, danger of deflationary spiral.
- Escape: fiscal policy, unconventional monetary policy, forward guidance.
- Higher inflation target lowers the frequency of hitting the ZLB, but has other disadvantages.