ECON 310 - MACROECONOMIC THEORY

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Chapter 14: New Keynesian Economics - Sticky Prices

Topics

- Construction of the **New Keynesian Sticky Price Model** - extending the Monetary Intertemporal Model based on Clarida, Gali and Gertler (1999) and Woodford (2003)
- The Role of Government Policy - Monetary and Fiscal Stabilization
- How does the model fit the data?
- Total Factor Productivity Shocks
- Critique
- Big Difference to Chapter 12: Some prices are sticky and money is not neutral

The Sticky Price Model

- Sticky prices through
  - Menu cost as fixed cost of price adjustment, or
  - Calvo (1983)Price Fairy $\Rightarrow$ probability p that firm can change price (with $(1-p)$ it cannot)
- Either way, firms form expectations about future prices because they know they'll be stuck with a price for some time
- Firm forward looking behavior

- In our model, firms charge price P today and cannot adjust when demand shifts

The Sticky Price Model

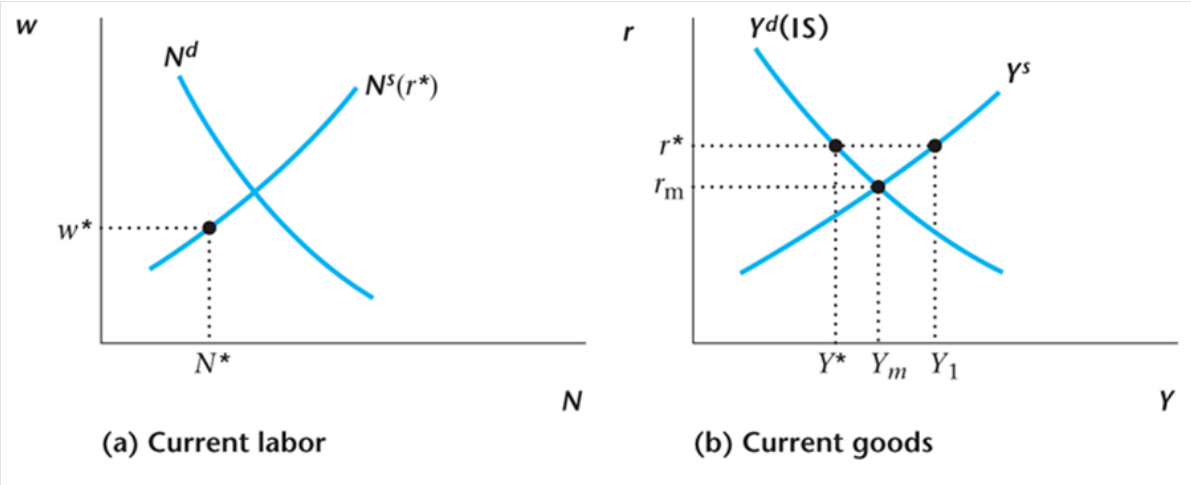
- Firms sell as much output as is demanded in the short run at a **fixed price**.
- Model monetary policy as a fixed target for the interest rate r, supported by setting the money supply appropriately.
- Employment determined as the quantity of labor required to produce the quantity of output demanded at the fixed price of goods

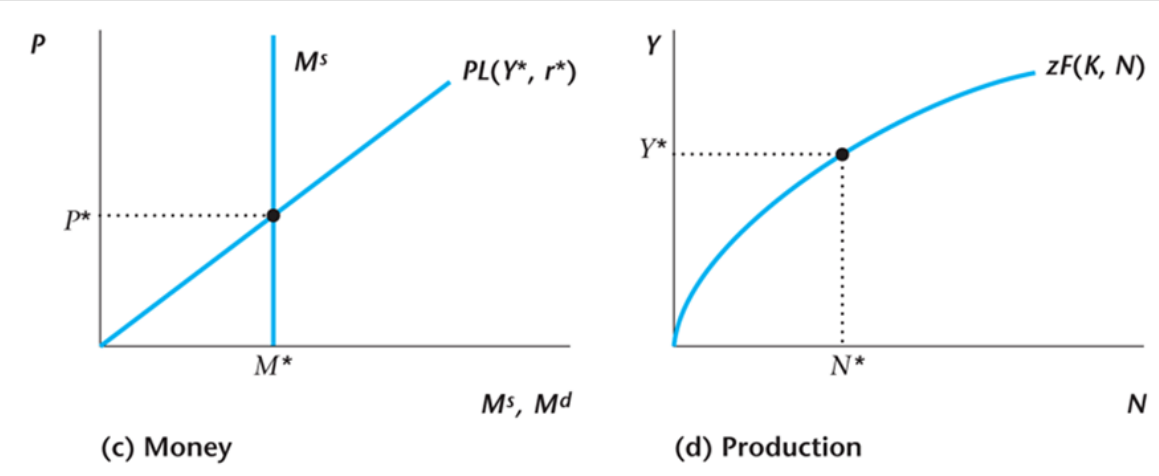
The New Keynesian Model

1. CB targets r^*which fixes price at P^* (sticky price)
2. $i = 0$, so according to Fisher $r = R$
3. Aggregate output is therefore $Y^* \Rightarrow$ **output gap** $Y_m - Y^*$
4. CB sets M^* to target r^*
5. Labor markets hire N^* just enough to produce Y^*
6. Some markets clear (money market) others don't (labor market, output market)
7. r_m is referred to as **natural rate of interest**

- 1.-7. is the short-run solution with sticky prices! It results in an output gap. There's not "enough demand," or prices are too high.

The New Keynesian Model (cont.)





Two Key Concepts

- The **output gap** is the difference between equilibrium output (if prices were flexible) and actual output.
- The **natural rate of interest** is the equilibrium rate of interest if prices were flexible.

The Non-Neutrality of Money in the New Keynesian Model

The Non-Neutrality of Money in the New Keynesian Model

- A reduction in the central bank's interest rate target, supported by an increase in the money supply, acts to increase aggregate output and employment.
- The demand for output rises at the fixed price of goods, and firms accommodate the increase in demand by hiring more workers.
- Consumption, investment, real wage, increase

Non-Neutrality of Money - Decrease Target Interest Rate in the New Keynesian Model

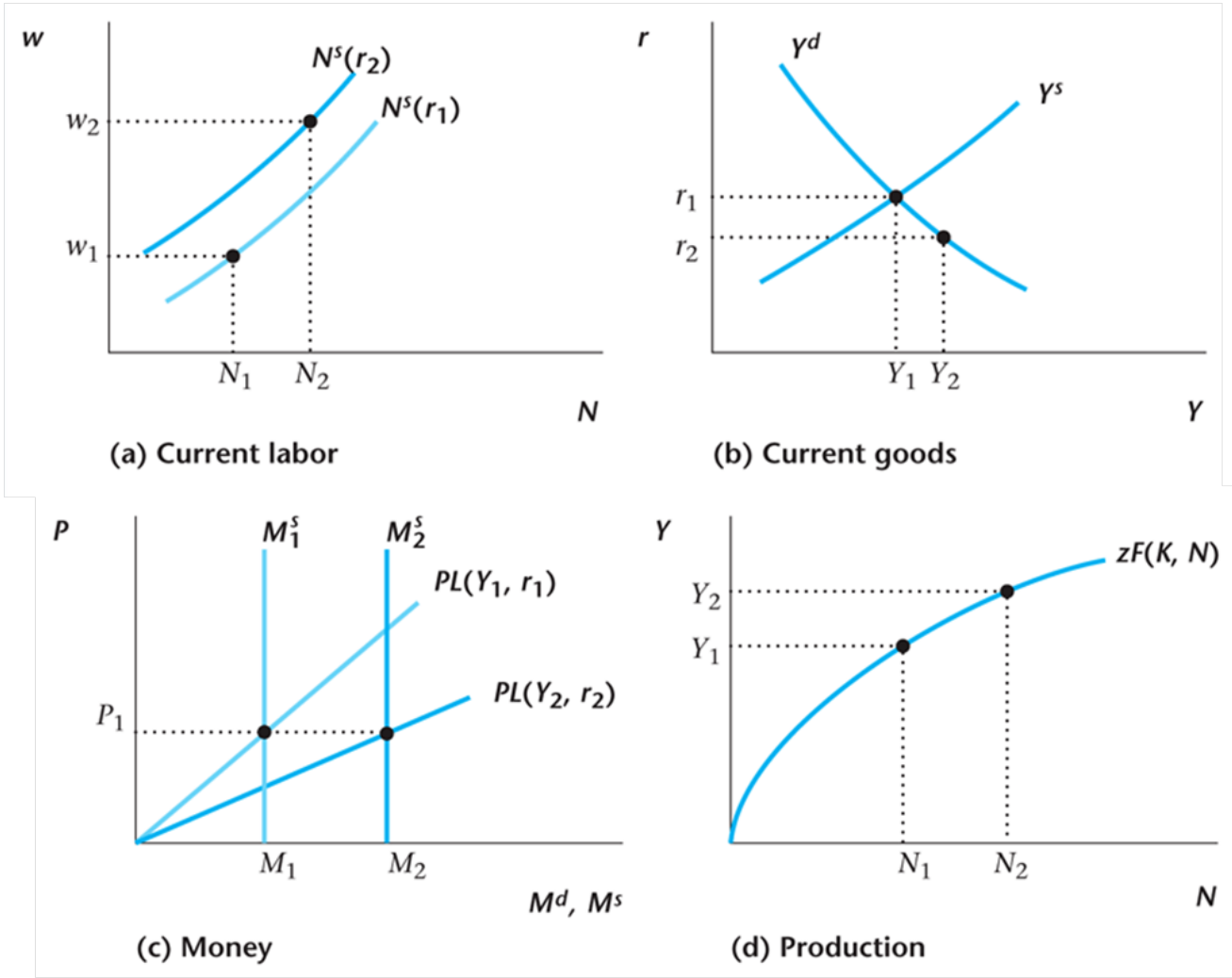
1. Start at long-run equilibrium, variables with subscript 1.
2. CB lowers target interest to r_2
3. Price is fixed at P_1 in short-run (doesn't decrease) so firms supply extra demanded goods $\Rightarrow$ GDP$\uparrow$ to Y_2
4. Money demand rotates out to $P \times L(Y_2, r_2)$
5. To support lower interest rate target of r_2, the CB must $\uparrow M^s$ to M_2.
6. Labor supply shifts left to $N^s(r_2)$because of intertemp. substitution triggered by lower r_2
7. Real wage must rise to w_2 so that consumers supply extra labor required, N_2 in order to produce Y_2

- Alternative view:
  - CB $\uparrow M^s$ so that interest rate falls to r_2
  - $\uparrow C^d$, $\uparrow I^d$ and given prices are fixed at P_1 firms supply extra output

Non-Neutrality of Money - Decrease Target Interest Rate in the New Keynesian Model (cont.)

- In short-run money is not neutral $\Rightarrow$ expansionary MP $\Rightarrow$ $Y \uparrow$
- In long-run MP is neutral again $\Rightarrow$ it only raises the price level in long-run (remember AD/AS-long-run graph from principles)

Non-Neutrality of Money - Decrease Target Interest Rate in the New Keynesian Model (cont.)



The Role of Government Policy in the New Keynesian Model

Principles of New Keynesian Stabilization Policy

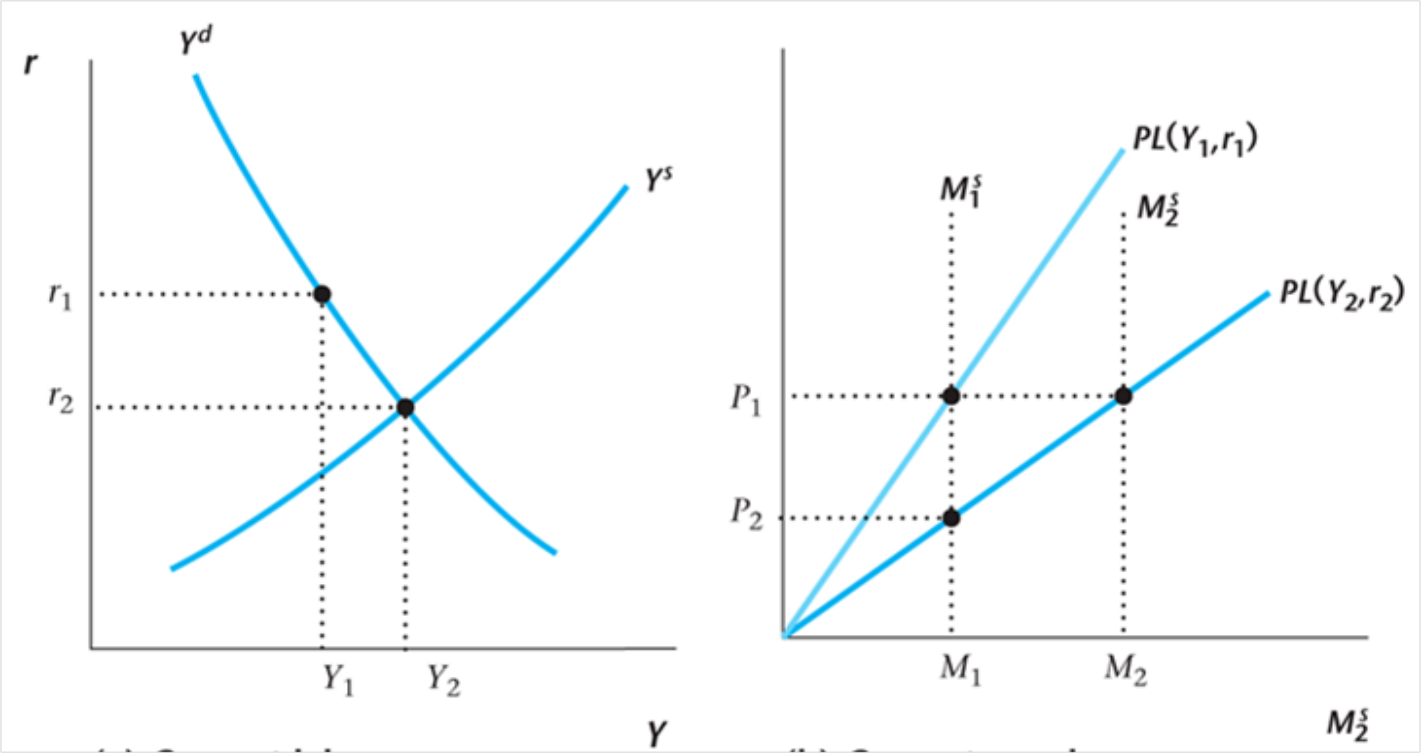
- Private markets cannot work efficiently on their own. Prices (and/or wages) do not move quickly enough to clear all markets in the short run.
- Fiscal and/or monetary policy decisions can be made quickly enough, and policy actions work quickly enough that the government can improve economic efficiency by smoothing out business cycles.
- Whether fiscal or monetary policy is used matters for the allocation of resources between the private sector and the government sector

Stabilization Using Monetary Policy

- Unanticipated shock hit economy, so price level is "too high" at r_1, P_1 $\Rightarrow$we produce $Y_1 \Rightarrow$ **output gap**
- Alternatively: CB interest target of r_1 is "too high", the goods market does not clear

1. Long-Run Do Nothing
   1. M^s stays constant
   2. $P \downarrow$ because of market pressures
   3. $r \downarrow \Rightarrow M^d \uparrow \Rightarrow P \downarrow \Rightarrow Y \uparrow$ automatic price adjustments and we move to P_2, Y_2
2. Short-Run with MP Intervention: $M^s \uparrow$
   1. $M^s \uparrow \Rightarrow r \downarrow \Rightarrow Y \uparrow \Rightarrow M^d \uparrow \Rightarrow P_1$stays the same.
   2. $C^d \uparrow$ and $I^d \uparrow$
   3. Results in P_1, Y_2 outcome

Stabilization Using Monetary Policy (cont.)

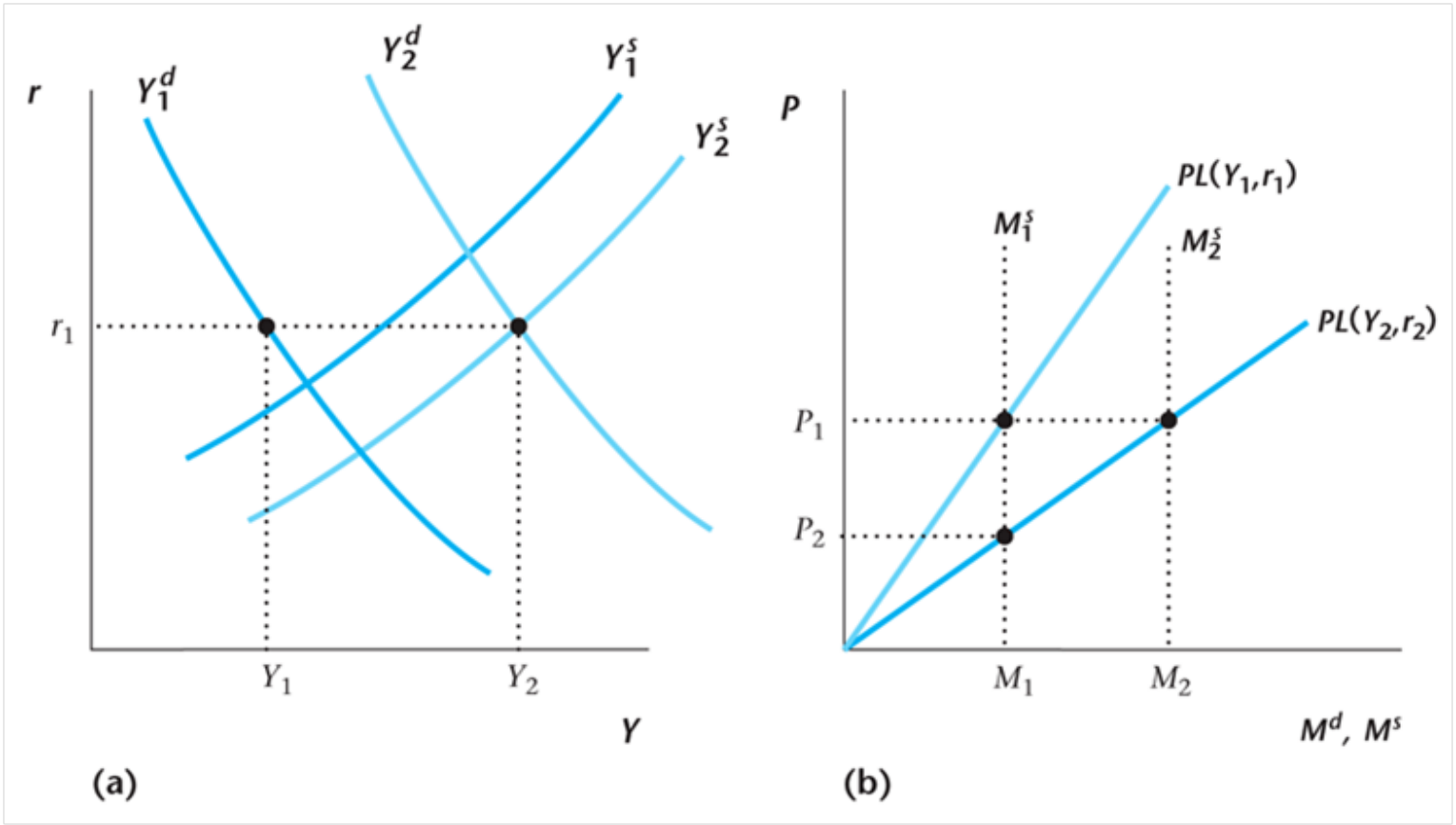


Stabilization Using Fiscal Policy

- Unanticipated shock hit economy, so price level is "too high" at r_1, P_1 $\Rightarrow$we produce $Y_1 \Rightarrow$ **output gap**
- Alternatively: CB interest target of r_1 is "too high", the goods market does not clear

1. Long-Run Do Nothing (same as above)
2. Short-Run with FP Intervention: $G \uparrow$
   1. $Y^d \uparrow$
   2. $Y^s \uparrow$
   3. $M^d \uparrow$
   4. now in reaction $M^s \uparrow$ to stabilize price level (goal of CB)
   5. C and I stay constant, only G increased!
   6. "Source" of growth is different from MP intervention where C and $I \uparrow$

Stabilization Using Fiscal Policy (cont.)



Choosing Between Monetary Policy and Fiscal Policy

- Fiscal policy or monetary policy can achieve stabilization – eliminating the output gap.
- But, fiscal policy has different implications than monetary policy for the allocation of resources
- Obtain different mixes of sectoral output – consumption/investment/government expenditure.

Does the New Keynesian Model Replicate the Data?

Data Versus New Keynesian Model

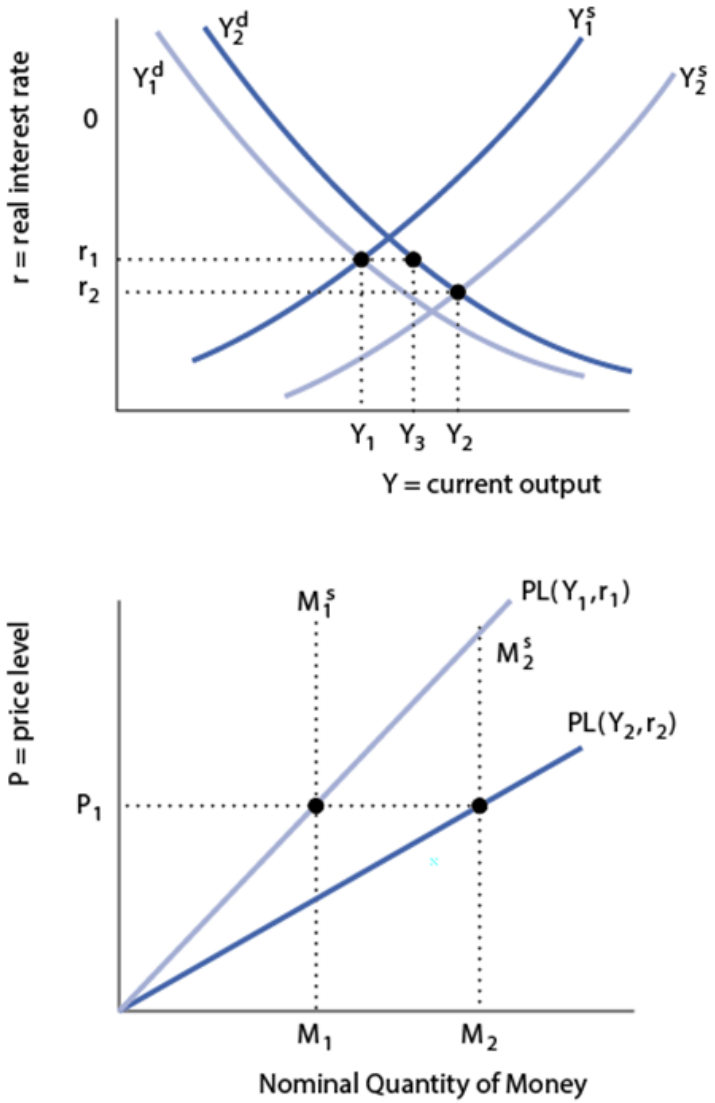
Table 13.1 Data Versus Predictions of the New Keynesian Model with Fluctuations in the Central Bank's Interest Rate Target

Variable	Data	Model
Consumption	Procyclical	Procyclical
Investment	Procyclical	Procyclical
Price Level	Countercyclical	Acyclical
Money Supply	Procyclical	Procyclical
Employment	Procyclical	Procyclical
Real Wage	Procyclical	Procyclical
Average Labor Productivity	Procyclical	Countercyclical

Does the New Keynesian Model Replicate the Data?

- Important in the New Keynesian model to recognize that monetary policy is endogenous.
- Since money is not neutral, the behavior of the central bank matters for what we will see in the data.
- Suppose that there are total factor productivity shocks, and central bank acts to close the output gap.

Persistent TFP Shocks with Optimal MP Response



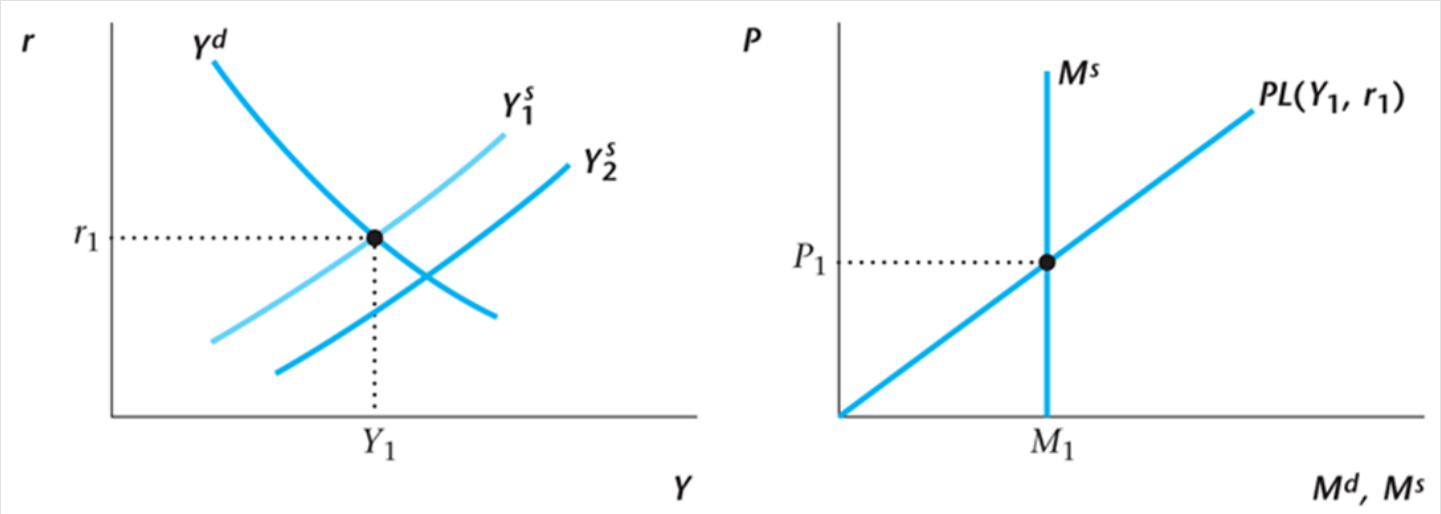
Hard to Distinguish Between New Keynesian and Real Business Cycle Models

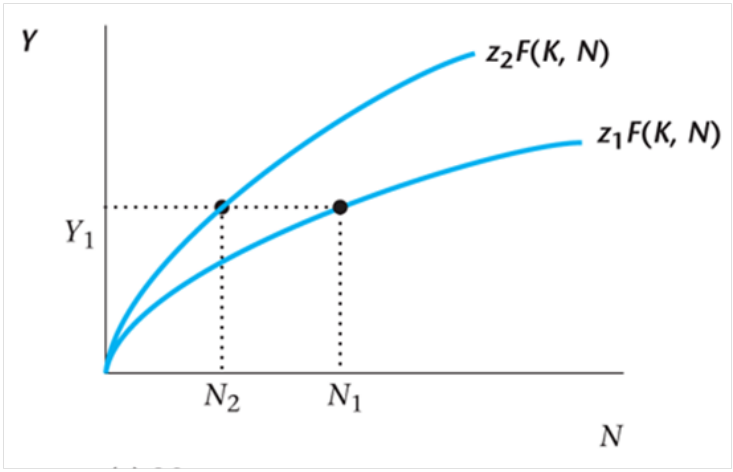
- New Keynesian Model: Suppose the central bank always closes the output gap.
- Real Business Cycle Model: Suppose the central bank stabilizes the price level.
- Cases 1 and 2 produce exactly the same data under persistent total productivity shocks.
- In both cases prices are observed to be "sticky," and real variables behave in the same way.

TFP Debate

- In the New Keynesian model, if TFP goes up, employment goes down, as fewer workers are need to produce the quantity of output demanded at a fixed price.
- In the real business cycle model, when TFP goes up, employment goes up.
- Whether fiscal or monetary policy is used matters for the allocation of resources between the private sector and the government sector

An Increase in Total Factor Productivity in the New Keynesian Model



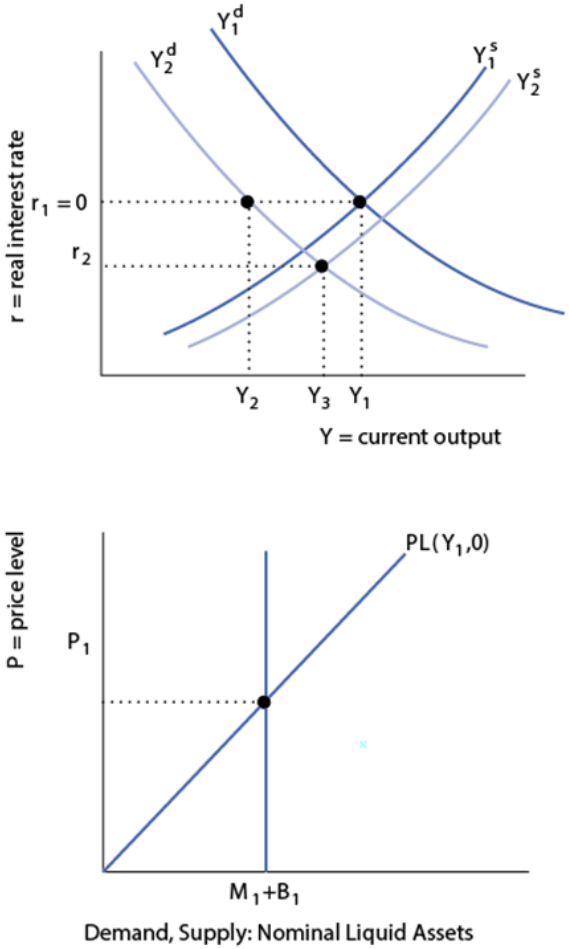


The Liquidity Trap and Sticky Prices

The Effects of Monetary Policy When the Nominal Interest Rate is Zero

- December 2008 Federal Reserve's target for the federal funds rate becomes 0 to 0.25 percent
- What is the effect of central bank policy when the central bank's target interest rate is close to zero
- Keynesian theory tells us there could be a liquidity trap - expansion of the money supply when the interest rate is zero has no effect
  - The zero lower bound on the nominal interest rate creates a problem for the use of monetary policy as a stabilization tool
  - Monetary policy cannot close the output gap at the zero lower bound

A Liquidity Trap in the New Keynesian Model



Unconventional Monetary Policy: Negative Nominal Interest Rates

- Zero need not be the lower bound on the nominal interest rate
- Effective lower bound less than zero - experience in Switzerland, Denmark, Euro Area, Sweden, Japan with negative interest rates.
- In New Keynesian model, may be able to eliminate the output gap at a negative nominal interest rate.

Taylor Rules and Unconventional Monetary Policy

- Taylor rule for MP: Increase the nominal interest rate when inflation is too high, decrease nominal interest rate when output gap is too high
- Example:

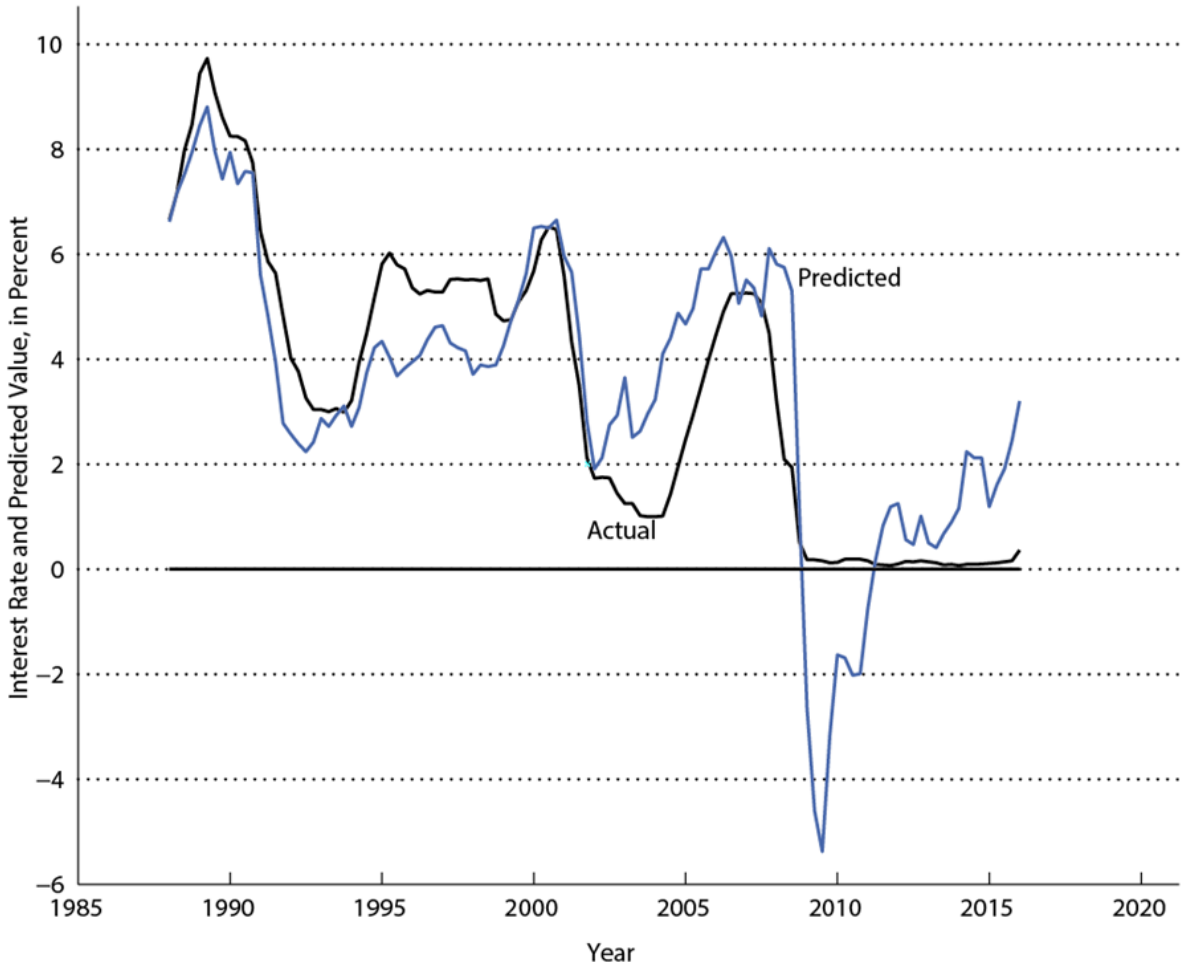
$$R = 2.0 + 1.2 \times i - 1.5 \times gap$$

- Then some argue that if Taylor rule predicts $R < 0$ then that is the time for unconventional MP

Actual Fed Funds Rate, and Fed Funds Rate Predicted by the Taylor Rule

- A Taylor rule was fit to the data prior to the 2008-2009 recession
- the figure shows the predicted interest rate from the Taylor rule, and the actual rate.
- As shown, the Taylor rule predicts a negative rate for some time after the recession.
- But if the Fed had been behaving in line with history, the interest rate target would have been higher in 2015 than it actually was.

Actual Fed Funds Rate, and Fed Funds Rate Predicted by the Taylor Rule (cont.)



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