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These lecture notes are meant as complement to the textbook and not a substitute. They are created for pedagogical purposes to provide a link to the textbook. These notes can be distributed with prior permission. This version compiled May 9, 2017.
Chapter 14: New Keynesian Economics - Sticky Prices
Topics


- 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.
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 \( Y^* \Rightarrow \text{output gap} Y_m - Y^* \)

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 \textbf{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.)

(a) Current labor

(b) Current goods

(c) Money

(d) Production
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↑ 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 ⇒ expansionary MP ⇒ $Y \uparrow$
- In long-run MP is neutral again ⇒ 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 $r_1, P_1$ ⇒ we produce $Y_1$ ⇒ 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 $r_1, P_1$ ⇒ we produce $Y_1$ ⇒ 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.)

Diagram (a) shows the relationship between the interest rate (r) and national income (Y). The downward-sloping line represents the demand for output (Y^d), while the upward-sloping line represents the supply of output (Y^s). The intersection of these two lines determines the equilibrium national income (Y_1) and interest rate (r_1).

Diagram (b) illustrates the relationship between price (P) and money supply (M). The line PL(Y_1,r_1) represents the money demand schedule at the initial interest rate (r_1). The line PL(Y_2,r_2) represents the money demand schedule at a lower interest rate (r_2). The intersection of these lines determines the equilibrium price (P_1) and money supply (M_1).
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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>Procyclical</td>
<td>Procyclical</td>
</tr>
<tr>
<td>Investment</td>
<td>Procyclical</td>
<td>Procyclical</td>
</tr>
<tr>
<td>Price Level</td>
<td>Countercyclical</td>
<td>Acyclical</td>
</tr>
<tr>
<td>Money Supply</td>
<td>Procyclical</td>
<td>Procyclical</td>
</tr>
<tr>
<td>Employment</td>
<td>Procyclical</td>
<td>Procyclical</td>
</tr>
<tr>
<td>Real Wage</td>
<td>Procyclical</td>
<td>Procyclical</td>
</tr>
<tr>
<td>Average Labor Productivity</td>
<td>Procyclical</td>
<td>Countercyclical</td>
</tr>
</tbody>
</table>
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

Dr. Juergen Jung

ECON 310 - Macroeconomic Theory

Towson University
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 for MP: Increase the nominal interest rate when inflation is too high, decrease nominal interest rate when output gap is too high.

Example:

\[ R = 2.0 + 1.2 \times i - 1.5 \times \text{gap} \]

Then some argue that if Taylor rule predicts \( R < 0 \) then that is the time for unconventional MP.
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.)
