PART 4 Theory of Economic Fluctuations

4.1 Business Cycles
4.2 The IS-LM model
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PART 4.5 New Keynesian Models of Fluctuations

(New)-Keynesianism: the macroeconomics of wage and price rigidity.

Two key questions about business cycles:

- What are the underlying shocks/events?

  New-Keynesian theory: A large role aggregate demand shocks

- What should government policymakers do about them?

  New-Keynesian theory: output fluctuations are to a large extent undesirable and government can act to stabilize the economy.
Models of the SRAS

\[ Y^{SRAS} = \bar{Y} + b(P - P^e), \ b > 0 \]

Before we saw models in which \( Y \) depends positively on \( P \) in the short run based on imperfect information:

1. Worker Misperceptions Model
2. Lucas Island Model

Now we will see two more models that also imply the above specification of SRAS:

3. Sticky Wage Model
4. Sticky Price Model
**The Sticky Wage Model**

Firms and workers negotiate contracts and fix the nominal wage *before* they know what the price level will turn out to be.

The nominal wage they set is the product of a target real wage \( w^* \) and \( P_e \).

\[
W = w^* P_e \quad \Rightarrow \quad w = \frac{W}{P} = w^* \frac{P_e}{P}
\]

\( P = P_e \) Unemployment and output are at their natural rates.

\( P > P_e \) Real wage is less than its target, so firms hire more workers and output rises above its natural rate.

\( P < P_e \) Real wage exceeds its target, so firms hire fewer workers and output falls below its natural rate.
The Sticky Wage Model

\[ Y = A K^\alpha N^{1-\alpha} \Rightarrow \frac{dY}{Y} = \frac{dA}{A} + \alpha \frac{dK}{K} + (1 - \alpha) \frac{dN}{N} \quad \text{(Production)} \]

\[ w = w^* \frac{P^e}{P} \Rightarrow \frac{dw}{w} = \frac{dP^e}{P^e} - \frac{dP}{P} \quad \text{(Wage Setting)} \]

where \( P^e \) is the expected price level

\[ w = A \left( \frac{K}{N} \right)^\alpha \Rightarrow \frac{dw}{w} = \frac{dA}{A} + \alpha \frac{dK}{K} - \alpha \frac{dN}{N} \quad \text{(Labor Demand)} \]

where \( P \) is the actual price level
The Sticky Wage Model

\[ \frac{dY}{Y} = \frac{1}{\alpha} \frac{dA}{A} + \frac{dK}{K} + \frac{1 - \alpha}{\alpha} \left( \frac{dP}{P} - \frac{dP^e}{P^e} \right) \]

\[ \Leftrightarrow \frac{dY}{Y} = \frac{dY^{LRAS}}{Y^{LRAS}} + \frac{1 - \alpha}{\alpha} \left( \frac{dP}{P} - \frac{dP^e}{P^e} \right) \]

Note

- Labor supply (and wage elasticity \( \xi \)) does not matter.
- Employment is determined only by labor demand.
- \( Y^{LRAS} \) is determined by \( w^* \), which is generally higher than neoclassical level because of real wage rigidities (trade unions, efficiency wages, ...)
- \( P > P^e \) involuntary unemployed become employed
- \( P < P^e \) increase in involuntary unemployment
Labor Market with Real Wage Rigidity

- **Real wage**
  - **Rigid real wage**
  - **Amount of labor hired**

- **Demand**
  - **Amount of labor willing to work**

- **Supply**

Graph showing the relationship between real wage and labor market conditions.
Suppose $P > P^e$

(a) Labor Demand

Real wage, $W/P$

$W/P_1$

$W/P_2$

$L_1 \rightarrow L_2$

Labor, $L$

$L = L^d(W/P)$

2. ... reduces the real wage for a given nominal wage, ...

(b) Production Function

Income, output, $Y$

$Y_1 \rightarrow Y_2$

Labor, $L$

$Y = F(L)$

3. ... which raises employment, ...

(c) Aggregate Supply

Price level, $P$

$P_1 \rightarrow P_2$

$Y = \bar{Y} + \alpha(P - P^e)$

6. The aggregate supply curve summarizes these changes.

1. An increase in the price level ...

5. ... and income.
The Sticky Wage Model

Productivity shocks cannot drive the business cycle.

A positive shock shifts out labor demand and employment increases but,

- In AS-driven booms, when $P$ falls, $w$ should rise.
- In AS-driven recessions, when $P$ rises, $w$ should fall.

This means that employment would not move much or even be countercyclical in the short run.

Therefore with sticky wages it must be AD shocks that drive business cycles.
The Sticky Wage Model

But AD driven booms imply that the real wage should be counter-cyclical, i.e. $w$ should move in the opposite direction as output during business cycles:

- In AD-driven booms, when $P$ rises, $w$ should fall.
- In AD-driven recessions, when $P$ falls, $w$ should rise.

This is exactly the opposite prediction of the RBC theory.

But in reality, real wages are if anything moderately *procyclical*, not countercyclical.

The Sticky Wage Model seems not fully consistent with the data either.
Real Wages

The graph shows the percentage change in real wages and real GDP over several years. Each year is represented by a data point, with the x-axis showing the percentage change in real GDP and the y-axis showing the percentage change in real wages.
The Sticky Price Model

Sticky prices requires firms to be price setters, i.e. they have some monopoly power.

There may be several reasons for sticky prices:

- Menu costs
- Long-term contracts between firms and customers
- Firms do not wish to annoy customers with frequent price changes
The Sticky Price Model

Monopolistic competition

- If markets had perfect competition, the market would force prices to adjust rapidly; sellers are price takers, because they must accept the market price

- In many markets, sellers have some degree of monopoly power; they are price setters under monopolistic competition

- Keynesians suggest that many markets are characterized by monopolistic competition

In monopolistically competitive markets, sellers do three things:

- They set prices in nominal terms and maintain those prices for some period

- They adjust output to meet the demand at their fixed nominal price

- They readjust prices from time to time when costs or demand change significantly
The Sticky Price Model

**Menu costs** and price stickiness:

- The term menu costs comes from the costs faced by a restaurant when it changes prices: it must print new menus.
- Even small costs like these may prevent sellers from changing prices often.
- With imperfect competition, having the wrong price temporarily does not affect profits much.
- The firm will change prices when demand or costs of production change enough to warrant the price change.
The Sticky Price Model

An individual firm’s desired price is

\[ p = P + \rho(Y - Y^{LRAS}), \rho > 0 \]

where

- \( p \) is the desired (profit maximizing) price for the firm
- \( P \) is the overall price level
- \( Y - Y^{LRAS} \) deviation of aggregate output from its natural level

Suppose there are two types of firms:
- firms with flexible prices, set prices as
  \[ p = P + \rho(Y - Y^{LRAS}) \]
- firms with sticky prices, must set their price before they know how \( P \) and \( Y \) will turn out:
  \[ p = P^e + \rho(Y^e - Y^{LRAS,e}) \]
The Sticky Price Model

\[ p = P^e + \rho(Y^e - Y^{LRAS,e}) \]

Assume sticky price firms expect that output will equal its natural rate. Then,

\[ p = P^e \]

for those firms.

To derive the SRAS curve, we first find an expression for the overall price level.

Let \( s \) denote the fraction of firms with sticky prices. Then, we can write the overall price level as

\[ P = sP^e + (1 - s)(P + \rho(Y - Y^{LRAS})) \]
The Sticky Price Model

\[ P = sP^e + (1 - s)(P + \rho(Y - Y^{LRAS})) \]
\[ \Leftrightarrow sP = sP^e + (1 - s)\rho(Y - Y^{LRAS}) \]
\[ \Leftrightarrow P = P^e + \frac{1 - s}{s} \rho(Y - Y^{LRAS}) \]

- **High** \( P^e \rightarrow \text{High} \ P): If firms expect high prices, then firms that must set prices in advance will set them high. Other firms respond by setting high prices.
- **High** \( Y \rightarrow \text{High} \ P): When income is high, the demand for goods is high. Firms with flexible prices set high prices. The greater the fraction of flexible price firms, the smaller is \( s \) and the bigger is the effect.
The Sticky Price Model

\[ P = P^e + \frac{1 - s}{s} \rho (Y - Y^{LRAS}) \]

\[ \Leftrightarrow Y = Y^{LRAS} + \frac{s}{\rho (1 - s)} (P - P^e) \quad \text{(SRAS)} \]

- If \( s \rightarrow 1 \) and all prices are sticky, \( P = P^e \) and the SRAS is horizontal.
- If \( s \rightarrow 0 \) and all prices are flexible, \( Y = Y^{LRAS} \) and the SRAS coincides with the vertical LRAS.
The Sticky Price Model

In contrast to the sticky wage model, the sticky price model implies a *procyclical* real wage:

- Suppose there is a negative AD shock.
- Firms see a fall in demand for their products.
- Firms with sticky prices reduce production, and hence reduce their demand for labor.
- The *leftward shift in labor demand* causes the real wage to fall.
Evidence on Sticky Prices

- Industrial prices seem to be changed more often in competitive industries, less often in more monopolistic industries (Carlton).
- Surveys of firms reveal a high degree of price stickiness. (Blinder)

<table>
<thead>
<tr>
<th>Frequency of price change (number of times per year)</th>
<th>Percentage of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than once</td>
<td>10.2%</td>
</tr>
<tr>
<td>Once</td>
<td>39.3</td>
</tr>
<tr>
<td>1.01 to 2</td>
<td>15.6</td>
</tr>
<tr>
<td>2.01 to 4</td>
<td>12.9</td>
</tr>
<tr>
<td>4.01 to 12</td>
<td>7.5</td>
</tr>
<tr>
<td>12.01 to 52</td>
<td>4.3</td>
</tr>
<tr>
<td>More than 52</td>
<td>10.2</td>
</tr>
</tbody>
</table>


The main reason given for price stickiness is managers’ fear that if they raised their prices, they would lose customers to rivals.
Evidence on Sticky Prices

- Catalog prices also do not seem to change much from one issue to the next and often change by only small amounts. (Kashyap)
  This suggests that while prices are sticky, menu costs may not be the reason.

- Other studies show that price stickiness may not be pervasive, as prices change on average every 4.3 months (Bils and Klenow)

- Relative prices may respond quickly to supply or demand shocks for a particular good, but the price level may change slowly to changes in monetary policy (Boivin-Giannoni-Mihov)

- After removing temporary sales, price on average change every 3 to 4 quarters (Steinsson and Nakamura)

- Recent evidence from scanner data reveals sticky reference prices (Eichenbaum, Jaimovich, Rebelo)
The Keynesian Theory of Business Cycles

Just as in models of imperfect information, the implication of a short run dependence of aggregate supply on the price level means that AD shocks can cause output fluctuations.

Suppose a positive AD shock moves output above its natural rate and $P$ above the level people had expected.

Over time, $P^e$ rises, SRAS shifts up, and output returns to its natural rate.
The Keynesian Theory of Business Cycles

Keynesians believe that AD shocks are an important source of business cycle fluctuations.

Aggregate demand shocks include

- changes in desired investment arising from changes in the expected future marginal product of capital
- changes in consumer confidence that affect desired saving
- changes in money demand or supply (monetary policy)
Empirical Success of Keynesian Theory

- If the economy is continuously buffeted by these demand shocks, there are **recurrent fluctuations in output**.
- The theory correctly predicts **procyclical employment**. The sticky price model correctly predicts **procyclical real wages**.
- The theory correctly predicts **procyclical consumption**.
- **Investment and durable goods spending is procyclical and volatile**
  - True if shocks to investment and durable goods spending are a main source of business cycles
  - Keynes’ “animal spirits”
- **Money is procyclical and leading.**
- **Inflation is procyclical and lagging.**
Empirical Success of Keynesian Theory

One problem for Keynesian theory is the fact that labor productivity is procyclical.

Answer: labor hoarding

- As seen before, firms may hoard labor in a recession rather than fire workers, because of the costs of hiring and training new workers.
- In a recession, measured productivity is low, even though the production function is stable.
- So labor hoarding explains why labor productivity is procyclical in the data without assuming that recessions and expansions are caused by productivity shocks.
Macroeconomic Stabilization

Nominal rigidities imply a role for government interventions to stabilize the economy.

Deviations from the natural output level are undesirable because they reduce welfare.

Suppose there is a negative demand shock:

- Without government intervention, eventually $P$ will decline, restoring ‘full employment’.
  But output and employment may remain below their full-employment levels for some time.
- Using monetary or fiscal policy to restore full employment has the advantage of acting quickly, rather than waiting some time for $P$ to decline.
Activist and Non Activist Policy

**Figure 11** The Choice Between Activist and Nonactivist Policy
Macroeconomic Stabilization

*Macroeconomic stabilization* is the use of monetary and fiscal policies to moderate the business cycle; also called *aggregate demand management*.

Problems for activist policies:

- In practice, macroeconomic stabilization has not been terribly successful.
- Measurement of the natural level of output is difficult.
- Imperfect knowledge of the quantitative impact on output of a change in policy.
- Information, decision and implementation lags.

Using policy to “fine tune” the economy may be difficult, but still desirable to combat major recessions.