Managing Economic Fluctuations

• Build on New-Keynesian macro:
  - Fed controls short-term nominal interest rates.
  - Fed’s objectives: high employment & low inflation = macroeconomic goals.
  - Main obstacles: Shocks to the economy – reflected in IS, MP, AS, \( Y^p \).

• Systematic approach here:
  1. Review sources of disturbances: What will happen without policy responses?
     Answer: Economy converges to a long-run equilibrium with \( Y = Y^p \).
  2. Review impact of Fed policy: How can the Fed influence the economy?
     Answer: Fed can shift the MP curve, which also shifts AD.
  3. Combine: How can the Fed respond to shocks, so the combined effect of
     shocks and response produces desirable macroeconomic outcomes?

• Follow Mishkin – though with critical perspective: What could go wrong?
  - Mishkin assumes “normal” conditions = ZLB not binding, Taylor principle.
  - Exceptional conditions discussed separately.
Review: New Keynesian Model

• Equations describing short-run macroeconomics:
  1. Short-run supply (AS): \[ \pi = \gamma (Y - Y^P) + \pi^e + \rho \]
      with slope \( \gamma > 0 \), expected (adaptive) inflation \( \pi^e \), and price shocks \( \rho \).
  2. Demand for GDP (IS) \[ Y = Y^d (r, ...) = \bar{Y} - d \cdot r, \] with negative slope.
  2. Interest rate policy (MP): \[ r = \bar{r} + \lambda \cdot \pi \] with slope \( \lambda > 0 \).

• Graphical analysis: AS and AD diagram (with AD from MP & IS)

• Equations describing long-run macroeconomics:
  - Equilibrium output: \( Y = Y^P \) when \( \pi^e = \pi \) and \( \rho = 0 \). (“Natural rate hypothesis”)
  - Equilibrium real rate \( r = r^* \) (“Natural real rate”) obtained from \( Y^d (r, ...) = Y^P \)
  - Inflation rate from MP; or set \( \bar{r} = r^* - \lambda \cdot \pi^* \) to attain inflation target \( \pi^* \)

• Temporary disturbances leave long-run variables unchanged.
• Permanent supply shock = persistent change in \( Y^P \).
Part 1: Disturbances and their effects:

**Aggregate Demand Shock & No Response**

- Disturbance: IS shifts left. AD-AS shows $\pi \downarrow$. Unchanged MP curve implies $r \downarrow$.
  - Longer-run adjustment: $Y < Y^p$ and $\pi < \pi^e \Rightarrow$ AS shifts down until $Y = Y^p$
  - Inflation response often small in short run: suggests that AS is nearly horizontal.
- Here negative shock. Similar logic in opposite direction for positive shock.
Temporary Aggregate Supply Shock & No response

- Two Reasons for AS to shift up (see Mishkin ch.22)
  1. Expected inflation shock = sudden change in expectations.
  2. Price shock = firms suddenly charge higher prices
     Usually motivated by in costs (e.g. oil prices, wage contracts…).
     May also reflect desire to sell less, e.g. due to temporary productivity decline.
- Main result: slow return to $Y^p$ and to the original inflation rate.
Permanent Aggregate Supply Shock & No Response

- Main result: Permanent reduction in output; no tendency to return to original $Y^p$.
  (Over time, output will surpass original level due to normal economic growth)
- Pure LRAS-decline implies higher inflation and (via MP) higher $r$. However:
  (a) Shocks that shift LRAS may also reduce demand $\Rightarrow$ shift IS and AD left. Then no clear predictions about inflation and interest rates.
  (b) Shocks that shift LRAS may also act as price shocks. Then fast adjustment to long run $Y^p$. 

Managing Macroeconomic Fluctuations
Part 2: Disturbances and policy responses – with focus on monetary policy:

**Aggregate Demand Shock with Monetary Response**

- **Disturbance:** Negative demand shock: IS & AD shift left.
- **Fed response:** Expansionary open market operation $\Rightarrow i \downarrow$ via Liquidity Effect $\Rightarrow r \downarrow$ MP-curve shifts down $\Rightarrow$ AD right. If calibrated perfectly: stabilize output & inflation.

**Questions: How does the Fed know…**

1. how far IS has shifted? (A: estimate slope of IS, target for r)
2. how many bonds the Fed needs to buy? (A: set target for i, buy as much as needed)
3. that LRAS is unchanged?! If $Y^p$ has declined, monetary response causes inflation!
Temporary Supply Shock: Policy Options

1. Stabilize inflation
   - Fed response: Open market sale => i↑ => r↑
   => AD shifts left: output declines further
   - Longer run: Policy can be reversed as the price shock fades out.

2. Stabilize output
   - Fed response: Open market purchase => i↓ => r↓
   => AD shifts right: inflation increases further

• Conclusions:
  - Price shocks create conflict between output & inflation goals. Fed can (must!) choose.
  - No conflict in the long run, provided LRAS remains unchanged: return to $Y^p$. 
Permanent Supply Shock: Policy Options

1. Stabilize inflation
   - Fed response: Open market sale => i↑ => r↑ => AD shifts left: output declines further => reach long run Y=Y_p more quickly.

2. Stabilize output
   - Fed response: Open market purchase => i↓ => r↓ => AD shifts right: inflation increases further
   - Longer run: Y >> Y_p => Accelerating inflation

- Conclusions:
  - Fed can always stabilize inflation, but it cannot stabilize output when LRAS has moved.
  - Initially, LRAS shock and Price shock look identical – but policy options differ.
  - Danger of activist policy: Attempts to “stabilize” output at Y<> Y_p can cause inflation.
    Presentation in Mishkin: Demand-Pull Inflation versus Cost-Push inflation
Demand-Pull Inflation

- Basic story in Mishkin: Inflation resulting from a misguided attempt to raise \( Y \) above \( Y^P \).
  Conclude: Policy must be abandoned or it leads to hyperinflation.
- Question: Are policy makers so foolish?
  Alternative story: Mistake in estimating \( Y^P \) – excessive optimism.
Cost-Push Inflation

- Basic story in Mishkin: Firms are to blame for inflation because they raise prices. Policy makers just try to get back to $Y^p$, but firms keep causing problems.
- Alternative view: Same phenomenon as demand pull: same picture—just different beliefs about $Y^p$. If firms keep raising prices, chances are that LRAS has moved.
Why shifts in LRAS create complications:

**Information: How much do we know about shocks?**

- **Information about \((Y, \pi, r)\) is widely available:**
  - Observed values of \((Y, \pi)\) reveal the positions of AD and AS curves.
  - Observed values of \((Y, \pi, r)\) reveal the positions of IS and MP curves.
  => When \((Y, \pi, r)\) change, one can infer which curves have shifted, and how much:
    Shocks to demand, to monetary policy, and to short-run supply are identifiable.

- **Practical complication:** only interest rates are observed instantly.
  - **Inflation** measured monthly with ~ ½-month delay;
  - **Real interest rate** requires estimates of expected inflation; or TIPS rates.
  - **GDP** measured quarterly with ~ 1-month delay. Employment report provides advance information – interpreted primarily as signal about aggregate demand.

- **LRAS is not directly observable** – must be estimated:
  - From inflation, via price adjustment logic: rising inflation signals that \(Y > Y^p\);
    declining inflation signals that \(Y < Y^p\).
  - From the unemployment rate, by comparison to the natural rate (next slide).

=> *Disagreement about LRAS is a source of policy disputes.*
Output and Unemployment: Okun’s Law

• Okun’s law: quantitative relationship about unemployment and output; provides clues about potential output and the output gap.

• Theory of unemployment:
  - Finding a job requires search => measured unemployment is positive even when the labor market is in equilibrium.
  - Interpret equilibrium as unemployment rate that exert no pressure on aggregate wages to rise or fall. Called Natural Rate $\bar{U}$.

• Negative relation between output and unemployment: $U > \bar{U} \iff Y < Y^P$
  - Define potential output $Y^P = \text{output at the natural rate of unemployment}$.
  - Okun’s law:

\[
U - \bar{U} \approx -\frac{1}{2} \left( \frac{Y - Y^P}{Y^P} \right) = -\frac{1}{2Y^P} (Y - Y^P)
\]

Remember as: ONE percentage point more unemployment ⇔ TWO percent gap between actual and potential output.

• Problems: Natural rate of unemployment varies over time; measured employment and unemployment numbers are frequently revised

=> Real-time information about potential output is imperfect.

Mishkin’s Figures: Demand-pull in the 1960s, cost-push in the 1970s. Assumes constant natural rate.

Question: What do we know about the natural rate of unemployment?

(Demographic & structural changes in labor market)

Figure 6. The Unemployment Rate and the Natural Rate

Note: Shaded bars indicate recessions.
Source: Bureau of Labor Statistics; authors’ calculations

Source: Estimates by the FRB Cleveland in 2010
Updated Chart: August 2017

- Conclude: Natural Rate of Unemployment changes over time. Estimates are not precise.
More on: why shifts in LRAS create complications

**Linkages between Supply and Demand**

- **Economic disturbances that changes supply often have an impact on demand**
  - Graphical analysis is most insightful if curves move one at a time.
  - Examples: shocks to IS and MP; several identifiable causes for each => nice graphs.
  - Broader perspective:

- **Dynamic Stochastic General Equilibrium (DSGE) analysis**
  - Basic paradigm of macroeconomics – used by professional economists.
  - Individuals and firms maximize objectives subject to budget constraints.
  - Economic fluctuations are generated by **shocks** (= unexpected disturbances)
  - Shocks trigger **dynamic adjustment processes** that lead to a new long-run equilibrium – or a return to the original equilibrium.

- Diagrams and curve-shifts are meant to illustrate DSGE reasoning and to provide correct answers without complicated math (= graduate macro).
  - Difficult when shocks affect multiple curves.
  - Simplified in Mishkin: Assume supply shocks do not change demand.
Lessons about Stabilization Policy
(Debate: Activist vs. Non-Activist)

1. Monetary and fiscal policy can speed-up recovery after negative demand shocks.
   - Effectiveness depends on various lags in policy: Recognition, implementation...
   - Pre-crisis consensus: Monetary policy more effective (nimble) than fiscal policy.

2. Monetary and fiscal policy cannot stop output from adjusting to changes in $Y^p$.
   - Attempts to block supply-side adjustments cause inflation and will eventually fail.

3. Monetary policy is responsible for inflation.
   - Milton Friedman: “Inflation is always and everywhere a monetary phenomenon.”
   - Applies to discretionary changes in inflation targets (MP shift). Applies to stabilization policy that causes inflation by mistake (errors in estimating $Y^p$)

• Conclude: If supply is predictable ($Y^p$ growing smoothly; fluctuations mostly caused by demand), activism can be helpful. If supply shocks are frequent and sometimes permanent, activist policy can be destabilizing.

• Caution: When expectations matter, speculation about policy shifts can become a separate source of shocks [e.g., uncertainty about future taxes may disturb IS and LRAS (via labor supply, investment); uncertainty about money growth may trigger price shocks]
Guide to Problem Solving – Systematic Approach

- Scenario: Initial equilibrium. Then policy changes or a “shock” occurs.
  1. Short run analysis:
     - Which of the 3 main equations/curves is affected, and how? [AS, IS, MP]
     - In the graphs, which curves are affected, and in which direction?
     => Infer SR answers about Y, π, and r from how the intersections shift.
  2. Longer run analysis:
     - Hint: What would Classical Theory say?
     - Is long run aggregate supply affected, and how? [LRAS]
     => Infer long-run answers by imposing Y=Y^p.
  3. How must expectations adjust over time to be correct?
     => Reconcile short run and long run by shifting AS until Y=Y^p.

- Examples so far:
  1. Monetary: e.g. Fed reduces interest rates: MP shifts down. AD shifts right …
  2. Fiscal: e.g. higher government spending: IS shifts right. AD shifts right…
  3. Shocks to private demand (C, I, NX, …): shifts in IS & AD s…
  4. Shocks to supply (productivity, labor, material prices, …): shifts in AS …
Examples from U.S. History:

**Negative Supply Shocks: 1973-75, 1978-80**

(The famous “Oil Shocks.” Ask: Was LRAS unaffected?)

(a) Aggregate Demand and Aggregate Supply Analysis


<table>
<thead>
<tr>
<th>Year</th>
<th>Unemployment Rate (%)</th>
<th>Inflation (Year to Year) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>4.8</td>
<td>6.2</td>
</tr>
<tr>
<td>1974</td>
<td>5.5</td>
<td>11.0</td>
</tr>
<tr>
<td>1975</td>
<td>8.3</td>
<td>9.1</td>
</tr>
<tr>
<td>1978</td>
<td>6.0</td>
<td>7.6</td>
</tr>
<tr>
<td>1979</td>
<td>5.8</td>
<td>11.3</td>
</tr>
<tr>
<td>1980</td>
<td>7.1</td>
<td>13.5</td>
</tr>
</tbody>
</table>
Examples from U.S. History:

**Paul Volcker’s Disinflation: 1980-86**

(Escape from the Great Inflation.)

(a) Aggregate Demand and Aggregate Supply Analysis

<table>
<thead>
<tr>
<th>Year</th>
<th>Unemployment Rate (%)</th>
<th>Inflation (Year to Year) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>7.1</td>
<td>13.5</td>
</tr>
<tr>
<td>1981</td>
<td>7.6</td>
<td>10.3</td>
</tr>
<tr>
<td>1982</td>
<td>9.7</td>
<td>6.2</td>
</tr>
<tr>
<td>1983</td>
<td>9.6</td>
<td>3.2</td>
</tr>
<tr>
<td>1984</td>
<td>7.5</td>
<td>4.3</td>
</tr>
<tr>
<td>1985</td>
<td>7.2</td>
<td>3.6</td>
</tr>
<tr>
<td>1986</td>
<td>7.0</td>
<td>1.9</td>
</tr>
</tbody>
</table>
Examples from U.S. History #3:


(Decline in IT prices. Internet productivity. Skip 1987-1994)

(a) Aggregate Demand and Aggregate Supply Analysis

(b) Unemployment and Inflation, 1995–1999

<table>
<thead>
<tr>
<th>Year</th>
<th>Unemployment Rate (%)</th>
<th>Inflation (Year to Year) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>5.6</td>
<td>2.8</td>
</tr>
<tr>
<td>1996</td>
<td>5.4</td>
<td>3.0</td>
</tr>
<tr>
<td>1997</td>
<td>4.9</td>
<td>2.3</td>
</tr>
<tr>
<td>1998</td>
<td>4.5</td>
<td>1.6</td>
</tr>
<tr>
<td>1999</td>
<td>4.2</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Examples from U.S. History:

Negative Demand Shocks in 2001-2004
(End of the “.com” and Y2K investment boom)

(a) Aggregate Demand and Aggregate Supply Analysis

(b) Unemployment and Inflation, 2000–2004

<table>
<thead>
<tr>
<th>Year</th>
<th>Unemployment Rate (%)</th>
<th>Inflation (Year to Year) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>4.0</td>
<td>3.4</td>
</tr>
<tr>
<td>2001</td>
<td>4.7</td>
<td>2.8</td>
</tr>
<tr>
<td>2002</td>
<td>5.8</td>
<td>1.6</td>
</tr>
<tr>
<td>2003</td>
<td>6.0</td>
<td>2.3</td>
</tr>
<tr>
<td>2004</td>
<td>5.5</td>
<td>2.7</td>
</tr>
</tbody>
</table>
Examples from U.S. History:

Negative Shocks and the 2007-2009 Financial Crisis


(a) Aggregate Demand and Aggregate Supply Analysis

Step 1. A negative supply shock shifted AS upward and a negative demand shock shifted AD leftward . . .

Step 2. leading to an increase in inflation and a decline in output.

Step 3. Worsening financial crisis shifted AD further leftward, while AS shifted down . . .

Step 4. leading to a further decline in output and a fall in inflation.

Aggregate Output, Y

(b) Unemployment and Inflation During the Perfect Storm of 2007–2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Unemployment Rate (%)</th>
<th>Inflation (Year to Year) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>4.6</td>
<td>2.5</td>
</tr>
<tr>
<td>2007</td>
<td>4.6</td>
<td>4.1</td>
</tr>
<tr>
<td>2008, June</td>
<td>5.5</td>
<td>5.0</td>
</tr>
<tr>
<td>2008, Dec.</td>
<td>7.2</td>
<td>0.1</td>
</tr>
<tr>
<td>2009, June</td>
<td>9.5</td>
<td>-1.2</td>
</tr>
<tr>
<td>2009, Dec.</td>
<td>10.0</td>
<td>2.8</td>
</tr>
</tbody>
</table>
China in 2007-2009: Demand Shock Only

(Lower exports = Demand Shock. Supply positive: Oil price collapse.)

(b) Chinese Output Growth and Inflation, 2006–2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Output Growth (%)</th>
<th>Inflation (Year to Year) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>11.8</td>
<td>1.5</td>
</tr>
<tr>
<td>2007</td>
<td>12.4</td>
<td>4.8</td>
</tr>
<tr>
<td>2008, June</td>
<td>11.2</td>
<td>7.9</td>
</tr>
<tr>
<td>2008, Dec.</td>
<td>4.4</td>
<td>3.9</td>
</tr>
<tr>
<td>2009, June</td>
<td>11.1</td>
<td>-1.1</td>
</tr>
<tr>
<td>2009, Dec.</td>
<td>10.4</td>
<td>-0.3</td>
</tr>
</tbody>
</table>
The Taylor Rule

- Evidence on the Taylor principle, the MP curve, and on how U.S. monetary policy has responded to disturbances
- Famous regression by John Taylor (1993):

  \[
  \text{Fed Funds rate} = \text{Equilibrium real rate} + \text{Inflation rate} \\
  + 0.5 \times \text{Inflation Gap} + 0.5 \times \text{Output Gap}
  \]

  - Equilibrium real rate (estimate of long run r*) \(\sim\) 2%
  - Inflation Gap = Actual Inflation–Target, with Target = 2%
  - Output Gap = (-2) \times (Unemployment rate – Natural rate), with Natural Rate \(\sim\) 5.5%

- Implications:
  1. Evidence that U.S. policy has satisfied the Taylor principle
     1\% higher inflation \(\Rightarrow\) 1.5\% higher Fed Funds rate \(\Rightarrow\) 0.5\% higher real rate.
  2. Evidence of a systematic response to the output gap suggest the Fed typically tries to stabilize output – shifts MP down in recessions & up in booms.

- Sophisticated rules blur the distinction between activist & non-activist policy:
  - Definition of “active” (or “discretionary”) depends on what interest rate changes are considered non-active (component of the rule).
  - Keynesian textbook answer: active = shifting the basic MP curve.