Macroeconomics

Output Gaps, Unemployment & Inflation
Measuring Unemployment Rate
Measuring Inflation

Potential Output & Output Gaps
- **Potential Output**: Output produced when economy uses capital and labor at normal rates (near full capacity)
- Think of it as the economy has some long run rising path of potential output. In the short run there are deviations from potential

Potential Output & SR Output Gaps

Output $Y$, $Y^*$

$Y > Y^*$ Potential or trend output $Y^*$

$Y < Y^*$

$t$: time

Recessions (Latest NBER Announcement)

Output

peak

trough

rec

exp

3/01 11/01

time

Calling Recessions
- Last week National Bureau of Economic Research announced that the recent recession ended in November 2001 (recession trough). Policy makers rely on NBER to make these judgments.
- Hard call since 1 million jobs have been lost since November 2001 and unemployment rate risen from 5.6% to 6.4%
- Committee observes real GDP. It now is 3.3% above pre-recession peak & 4% above trough. Personal income, manufacturing, wholesale, retail sales also above pre-recession peak.

SR Output Gaps: Why They Matter
- **Output Gap** = Potential Output - Actual Output
  $$= Y^* - Y$$
- $Y^* - Y > 0$ positive output gap called recessionary gap
- $Y^* - Y < 0$ negative output gap called expansionary gap
Output Gaps: Why They Matter

- $Y^* - Y > 0$: recessionary gap
  - Unemployment rate high (above normal)
  - Economy incurs costs of unemployment
- $Y^* - Y < 0$: expansionary gap
  - Inflation can be high
  - Economy incurs costs of inflation

Output Gaps: Why They Occur

- **Main Reason**: Fluctuations in Spending
- **Tale of Al's Ice Cream Parlor**
  - Hot day, demand increases, meet demand at set prices, increase output, use resources at max or higher capacity
  - Eventually increase prices, quantity demanded falls, output falls back to potential

Output Gaps: Why They Matter

- $Y^* - Y > 0$: recessionary gap, unemployment more than "normal"
- **Natural (or normal) Unemployment**
- **Structural**: outmoded skills, declining industry
- **Frictional**: due to search process, right match

Okun’s Law

- **Cyclical Unemployment**
  - Actual unemployment rate = $u$
  - Natural unemployment rate = $u^*$
  - Cyclical unemployment rate = $u - u^*$
  - Recessionary Gap: $u - u^* > 0$ (extra high)
  - Expansionary Gap: $u - u^* < 0$ (extra low)

Okun’s Law

- (Based on Empirical Observation)
  - Output Gap = $Y^* - Y$
  - Cyclical unemployment rate = $u - u^*$
  - Every 1% rise in cyclical unemployment associated with rise in output gap that is 2% of potential output

- **eg.** $Y^* = 100B$
  - $u - u^* = 1.5\%$, then
  - $Y^* - Y = 0.03 \times 100B = 3B$, rec gap
  - $u - u^* = -2.5\%$, then
  - $Y^* - Y = 0.05 \times 100B = -5B$, exp gap
**Economic Costs of Gaps**

- **Recessionary Gap**: extra high unemployment, lost output

- Lost Output: eg from earlier example, output gap=3B. Suppose population is 1M. Means loss of $3000 each.

- Additional costs: costs of unemployment

- **Expansionary Gap**: “extra high inflation” (as opposed to steady, expected inflation)

- Costs of inflation (unexpected inflation, ie unexpectedly high inflation)

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**Unemployment**

- **Current U.S. Unemployment Situation**

- 2.5 Million jobs lost since March 2001 (peak)

- 1 Millions Jobs lost since November 2001 (trough)

- Unemployment Rate = 6.4%

- Natural rate = 5.2%

- Situation varies by state

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**The U.S. Unemployment Rate since 1960**

![Unemployment Rate Graph]

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**Measuring Unemployment**

- **Working Age Population**: Age 16 and over

- Labor Force: employed or unemployed among working age population, exclude full-time student, retirees, military

- Participation Rate = LF / Wg Age Pop

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**Measuring Unemployment**

- Among age 16 and over in survey

- Unemployed = did not work past week & actively sought work some time in past 4 wk

- Employed = worked full/partime in past wk

- Unemployment Rate = Unemployed / LF

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**Unemployment**

- 1) Larry (age 26) was fired 2 months ago, looked for job for 7 weeks, gave up 1 week ago.

- 2) Barry (age 45) was fired 5 weeks ago. Has not looked for a job. Did consulting work during the past week.

- 3) Data at www.bls.gov (1000s)

- Civilian Labor Force = 147,096

- Employed = 137,738

- Unemployed = 9,358

- Not in Labor Force = 73,918

- PR = UR =
Unemployment

- Imperfect Measure:
  - does not count those who are discouraged (so understates true rate)
  - counts those who work part-time (so overstates "employment" and understates true unemployment rate)
- Costs of Unemployment
  - psychological damage and social stigma
  - underutilized resource, so output could be more

Measuring Inflation

- Use Price Index
  - Many price indexes available: CPI, PPI, CPI (excl food/energy), WPI
  - We consider most commonly used: CPI
  - CPI = Consumer Price Index

Consumer Price Index

- Bureau of Labor Statistics (BLS)
  - Base year
  - Base-year basket of goods and services
  - Measure prices in current & base-year basket

\[
\text{CPI} = \frac{\text{Cost of base-year basket of goods and services in current year}}{\text{Cost of base-year basket of goods and services in base year}}
\]

CPI Measures Change in Cost of Living

Hypothetical CPI

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Rent, two-bedroom apartment</td>
<td>$630</td>
<td>$500</td>
</tr>
<tr>
<td>Hamburgers (60 at $2.00 each)</td>
<td>150</td>
<td>120</td>
</tr>
<tr>
<td>Movie tickets (10 at $6.00 each)</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>Total expenditure</td>
<td>$850</td>
<td>$680</td>
</tr>
</tbody>
</table>

- Base year basket of goods = 2BR apt, 60 burgers, 10 tickets
  - CPI (2000) = $850/$680 = 1.25
  - CPI (1995) = 1.00 (ALWAYS IN BASE YEAR)
  - Cost of living increased by 25% from 1995 to 2000

Inflation

- Price Index (like CPI)
  - Measures the average level of prices relative to prices in the base year

- Inflation Rate
  - Rate of change in average price level over time
  - Deflation = negative inflation rate

Calculating Inflation Rates 1930-31 & 1973-74

<table>
<thead>
<tr>
<th>Year</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>0.167</td>
</tr>
<tr>
<td>1931</td>
<td>0.152</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1973</td>
<td>0.444</td>
</tr>
<tr>
<td>1974</td>
<td>0.493</td>
</tr>
</tbody>
</table>

Inflation rate: 1930-’31 = \( \frac{0.152 - 0.167}{0.167} = -0.090 \times 100 = -9.0\% \)

Inflation rate: 1973-’74 = \( \frac{0.493 - 0.444}{0.444} = 0.110 \times 100 = 11.0\% \)
Adjusting for Inflation

Why: to make comparisons over time
to set level of salary/payment adjustments

■ How: Deflate Nominal Quantity
  - Divide nominal quantity by price index to express the quantity in real terms
  - eg. Income, wage,

■ Example: Top Baseball Players
  1930 Babe Ruth’s salary = $80,000
  1998 Mark McGwire’s salary = $8.3 million
  CPI (1982 - 84 = 100)
  - CPI 1930 = 0.167
  - CPI 1998 = 1.64
  - Real Salary:
    - BR $80,000 / 0.167 = $479,000
    - MM $8,300,000 / 1.64 = $5,060,000
  - Nominal Terms: about 100 times more
  - Real Terms: Only about 10 times more!!

Adjusting for Inflation

■ Indexing
  - Rule to increase nominal quantity each period by some percentage increase in a specified price index
  - Enables stable purchasing power

■ Example: indexed labor contract, Year 1 wage = $12/hr
  CPI Year 1 = 1.00 & CPI Year 2 = 1.05
  Method 1: Contract specifies real wage to increase 2 percent each year
  Year 2 Real Wage = 1.02 x Year 1 Real Wage w / 1.05 = (12 / 1) x 1.02 = 12.24,
  w = 1.05 x 12.24 = 12.85 is Year 2 wage
  Method 2: Contract specifies wage to increase by 2% of CPI
  Year 2 wage = 1.02 x 1.05 x 12 = 12.85

Adjusting for Inflation

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Adjusting for Inflation

■ Every few years there is a well-publicized battle in Congress over whether the minimum wage should be raised.
■ Why do these heated debates recur so regularly?

CPI: Imperfect Measure of Inflation

■ Quality adjustment Bias
■ Substitution Bias
■ Boskin Commission: CPI overstates inflation by 1 to 2 percent/year
■ 1) Excessive increase in indexed payments
■ 2) Understates true rise in standard of living
■ (from overstating rise in cost of living)
Costs of Inflation

- Noise in price system
- Unexpected Redistribution of Wealth
  - borrower & lender
  - employer & employee
- Long run planning difficult (retirees, firms)
- Distorts tax system: nominal income tax brackets

Avoiding Costs of Inflation: Lenders & Borrowers

Lenders set nominal rates so as to avoid unexpected costs of inflation

They decide on an acceptable real rate $r$

Set nominal interest rate so that

$$ r = i - \pi $$

Avoiding Costs of Inflation

- Fisher-Effect: Tendency for nominal interest rates to be high when inflation is high and low when inflation is low
- Lenders try to set nominal interest rates are being set to try to avoid unexpected redistribution of wealth

Inflation and Interest Rates in the United States, 1960 - 2001

Avoiding Costs of Inflation

- Cousin Martha lends $1000 to Pudge for 1 year
- Agree real interest = 2%
- Expect annual inflation rate = 10%
- What interest rate does Martha ask for?

Summary

Short run output gaps occur due to fluctuations in demand. Recessionary gaps are costly due to high unemployment and lost output. Expansionary gaps can be costly due to high inflation.

Measurement of unemployment and inflation rates help to monitor state of macroeconomy.

Indexing of labor contracts and transfer payments and making decisions with real interest rates helps to overcome costs of inflation.
National Savings, Investment, International Capital Inflows

Standards of living rise with APL
Physical capital increases APL
Financial Institutions mobilize saving so that firms can purchase physical capital

Well-functioning Financial System

Key to Rising Standard of Living (growth)
1) High rates of national saving
2) National savings allocated to most productive investments

Efficient financial system Improves the allocation of savings
1) Provides information
2) Helps savers share the risk

Savings & Investment

Saving = Current income minus spending on current needs
Saving Rate = Saving divided by income
Investment = creation of new capital goods and housing

Investment Spending Decision
Compare benefit or value of marginal product to the cost of the investment

Savings Decision
Life-cycle, Precautionary, Bequest motives, Demonstration effect, Self-control. See notes.

Saving, Investment, and Financial Markets

Supply of Savings (S)
Quantity supplied (of saved funds) is positively related to the real interest rate (r)

Demand for Saving (I)
Quantity demanded (for investment) is negatively related to r.

National Saving

Real income or expenditures (Y)

\[ Y = C + I + G + NX \]

For now, take \( NX = 0 \)
\[ Y = C + I + G \]
Saving = \( Y \) - spending on current needs
National Saving: Current Needs

\[ I = \text{spending on capital goods and residential housing} \]

Assume \( C \) and \( G \) are current need expenditures

\( C \) includes durable goods which may be current and future needs

\( G \) may also include current and future needs

National Saving

\[ S = Y - C - G \]

National Saving Rate = \( S / Y \)

U.S. National Saving Rate 1960 - 2001

National Saving: Private & Public

\[ S = Y - C - G + T - T \]

\[ S = (Y - T - C) + (T - G) \]

Private saving = \( S_{\text{private}} = Y - T - C \)

Public saving = \( S_{\text{public}} = T - G \)

Public Saving: Budget Deficit & Surplus

Government Budget Deficit

excess of spending over tax revenue \((G - T)\)

Government Budget Surplus

excess of tax revenue over spending \((T - G)\)

budget surplus = public saving
Public Saving: 1995 & 2000

\[ S_{\text{public}} = T - G \]

2000

Federal: \(218.5 = 2,046.8 - 1,828.3\)
State & local: \(32.8 = 1,222.6 - 1,189.8\)
\[ S_{\text{public}} = 251.3 = 3,269.4 - 2,018.1 \]

1995

Federal: \(-174.4 = 1,460.3 - 1,634.7\)
State & local: \(111.7 = 997.7 - 886.0\)
\[ S_{\text{public}} = -62.7 = 2,458.0 - 2,520.7 \]

What do you expect for 2003?

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**Investment Decision**

**Costs**
- Real interest rate \(r\) (opportunity cost)
- Price of capital goods

**Benefits**
- Value of marginal product
- Influenced by the relative price of the good or service produced by the capital

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**Saving, Investment, and Financial Markets**

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- Quantity supplied (of saved funds) is positively related to the real interest rate \(r\)

**Demand for Saving (I)**
- Quantity demanded (for investment) is negatively related to \(r\).

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**Market for Savings Funds**

Market determines equilibrium \(r\).
- If \(r\) above equilibrium, get surplus of savings
- If \(r\) below equilibrium, get shortage of savings.

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**The Three Components of National Saving, 1960-2001**

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**The Supply and Demand For Savings**
Effect of a New Technology

Effects of An Increase in the Government Budget Deficit

International Capital Flows

A country with greater investment opportunities than savings can fill the savings gap by borrowing from abroad.

International capital flows allow countries to run trade imbalances.

International Capital Flows

Trade Balance (or net exports)
The value of a country’s exports less the value of its imports in a particular time period

Trade Surplus: exports exceed imports

Trade Deficit: imports exceed exports,

The U.S. Trade Balance 1960 - 2001

Trade has become increasingly important
Since the 1970s, the U.S. has run trade deficits
International Capital Flows

Net Capital Flows

Difference between purchases of domestic assets by foreigners and the purchase of foreign assets by domestic residents.

International Capital Flows

Capital Flows and the Balance of Trade

\[ NX = \text{trade balance (net exports)} \]
\[ KI = \text{net capital inflows} \]
\[ NX + KI = 0 \]

\[ KI > 0 \text{ Net Capital Inflow} \]
\[ KI < 0 \text{ Net Capital Outflow} \]

NX + KI = 0

U.S. resident buys a $20,000 Japanese automobile

The Japanese car manufacturer receives $20,000 and can buy $20,000 of U.S. goods.

U.S. exports = imports

\[ NX = 20,000 - 20,000 = 0 \text{ and } KI = 0 \]
\[ NX + KI = 0 \]

International Capital Flows

The Japanese car manufacturer has $20,000 and can buy U.S. assets (land, bond, etc.)

\[ NX = -$20,000 \]

Capital inflow = \[ KI = $20,000 \]

\[ NX (-$20,000) + KI ($20,000) = 0 \]

Note: Japanese Manufacturer could have bought other country’s good or asset, get same result.

International Capital Flows

Determinants

Real interest rate

High domestic real interest rates will cause net capital inflows.

Low domestic real interest rates will cause net capital outflows.

Net Capital Inflows and The Real Interest Rate

Net capital inflows, \( KI \)

Domestic real interest rate, \( r \)
International Capital Flows

Risk
For a given real interest rate, an increase in riskiness in domestic assets will reduce net capital inflows and vice versa.

An Increase In Risk Reduces Net Capital Inflows

Net capital inflow $KI$
Domestic real interest rate $r$

Saving, Investment, and Capital Inflows
$S + KI = I$

$Y = C + I + G + NX$
Subtract $C + G + NX$ from both sides
$Y - C - G - NX = I$
National saving ($S$) = $Y - C - G$
$NX + KI = 0$; so, $KI = -NX$
Substitute $S$ for $Y - C - G$ & $KI$ for $-NX$
$S + KI = I$

The pool of saving available for domestic investment includes national savings and the funds from savers abroad.

The Saving-Investment Diagram For An Open Economy

S & I & KI

A country that attracts foreign capital will have lower real interest and higher investment.

Countries with a stable political environment and well defined property rights will attract more foreign capital.
Saving Rate and the Trade Deficit

A low rate of national saving is the primary cause of trade deficits.

\[
Y = C + I + G + NX
\]

Subtracting \(C + I + G\) from both sides

\[
Y - C - I - G = NX
\]

\[
S = Y - C - G
\]

\[
S - I = NX
\]

Low national saving: high \(C & G\)

High rates of spending: \(NX\) low

Increase imports.

Decrease exports.

(Likewise, high \(S\) means \(NX\) high)

International Capital Flows

Why is the U.S. trade deficit so large?

Is the U.S. trade deficit a problem?


Low national saving will also increase capital inflows.

- High spending creates investment opportunities
- Shortage of domestic saving will occur
- Real interest rates will rise
- Capital inflows will occur
Summary

National savings (sum of business, consumers & government) is necessary for capital formation.

Savings can be supplemented by international capital flows.

However, in the latter case the country is ultimately obligated to pay return to foreigners.