Announcements
Online Later Today
Midterm 2 guide & Problem Set 4 Key
Midterm 2
lecture, section, problems set, past exam,
text (see guide)Extra OH F 1-3
Problem Set 5
Online later in week, New Due Date: 8/8 5P
Coverage: Lecture 7 & Lecture 12 topics
Make photocopy & submit to mail box of
GSI (5th floor)

Practice Problems
Lecture 11
From Section:
Chapter 23: Problems 1,3,6
Chapter 27: Problem 3, 5,6, 8
(Can try others in chapter 27)

Continuing Last Time
Automatic Stabilizer
Chapter 26, 10 d
t=0.25, Cbar=500,Ip=1500,G=2000
NX=0, c=0.8
Multiplier = 1/1 - 0.8(1-0.25)=1/1-
0.6=2.5
Set Y=PAE, Solve for Y
Y=2.5 x (4000)=10,000

Continuing Last Time
Automatic Stabilizer
Past Midterm Question
Assume the economy is characterized by the
simple SR Keynesian model and that
G=S G S = -k(Y-Y*) with 0<k<1.
1) What is the purpose of this automatic
stabilizer?
set level G_s, so G increases as Y decreases
during rec gap

Continuing Last Time
Automatic Stabilizer
Past Midterm Question
If , and all other PAE components except
C and G are autonomous, what is the
income-expenditure multiplier? Is it lower
or higher than if all of G were
autonomous?
1/[1-(c-k)].
So c-k < c so 1/1-c+k < 1/1-c .
Multiplier with stabilizer smaller.

Money and Its Uses
Medium of Exchange
An asset used in purchasing goods and
services
Unit of Account
A basic measure of economic value
Store of Value
An asset that serves as a means of
holding wealth
Components of M1 and M2, July 2002 (billions of dollars)

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
<th>M2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency</td>
<td>615.1</td>
<td>1,197.8</td>
</tr>
<tr>
<td>Demand deposits</td>
<td>303.8</td>
<td>1,197.8</td>
</tr>
<tr>
<td>Other checkable deposits</td>
<td>270.3</td>
<td>2,552.8</td>
</tr>
<tr>
<td>Travelers’ checks</td>
<td>8.6</td>
<td>920.8</td>
</tr>
<tr>
<td></td>
<td>1,197.8</td>
<td>5,641.2</td>
</tr>
</tbody>
</table>

Money: M1 & M2

M1
- currency outstanding and checking account balances

M2
- M1 plus some additional assets that are usable in making payments but at greater cost

Econ 1: M1

Fractional Reserves System

Creation of Money

Bank Reserves
- Cash or similar assets held by banks
- Use for depositor withdrawals and payments

Consolidated Balance Sheet of Gorgonzolan Commercial Banks

Initial Deposit: 1M Guilders

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency (= reserves) 1,000,000 guilders</td>
<td>Deposits 10,000,000 guilders</td>
</tr>
<tr>
<td>Loans to farmers 9,000,000 guilders</td>
<td></td>
</tr>
</tbody>
</table>

Observations:
- Lending will continue until the reserve to deposit ratio = 10%
- When loans = 9,000,000 guilders
  - Deposits = 10,000,000 guilders
  - Reserves = 1,000,000 guilders
  - Reserve to deposit ratio = 10%
- No excess reserves
- The money supply = 10,000,000 guilders

Fractional Reserve System:

Money supply grows as a multiple of the reserves

Gorgonzola: with a 10% reserve-deposit ratio, 1 guilder in reserve can support 10 guilders in deposit.

Commercial Banks and the Creation of Money

Bank deposits = bank reserves/ desired reserve-deposit ratio

eg. 100/.10=1000
Money Supply 
Both Currency and Deposits

Gorgonzola residents

500,000 guilders as currency
Deposit 500,000 in the banks
Reserve-deposit ratio = 10%
Bank deposits = 500,000/.10 = 5,000,000

Money supply = currency + bank deposits
5,500,000 = 500,000 + 5,000,000

The Money Supply at Christmas

Currency = 500
Bank reserves = 500
Reserve-deposit ratio = 0.20
Money supply = 500 + 500/.20 = 500 + 2,500 = 3,000

The Federal Reserve System

Responsibilities

Monetary policy
Oversight and regulation of financial markets

The Federal Reserve System

The History and Structure of the Federal Reserve System

Founded by the Federal Reserve Act of 1913
The primary mission of the Fed is to promote economic growth, low inflation, and stable financial markets.

The Federal Reserve System

The Structure
12 regional Federal Reserve banks
Assess economic conditions in their regions to assist in national policymaking
Provide service to the commercial banks in their districts
The Federal Reserve System

The Structure
Board of Governors
Seven governors
Appointed by the president to 14 year staggered terms
Chairman of the Board of Governors
Selected by the president from the governors
Serves a four year term

The Federal Reserve System

Federal Open Market Committee (FOMC)
Members include:
The seven Fed governors
President of the New York Fed
Four presidents, chosen on a rotating basis, from the remaining Federal Reserve Banks
Determines monetary policy

The Federal Reserve System

Controlling the Money Supply:
The Fed controls the money supply by changing the supply of bank reserves.

The Federal Reserve System

Controlling the Money Supply: Open-Market Operations
Open-market operations are the most important method of changing the supply of bank reserves.

The Federal Reserve System

Controlling the Money Supply: Discount Window Lending
Banks can borrow reserves from the Fed.
Discount window lending
The lending of reserves to commercial banks
The discount rate
The interest rate charged on these loans

The Federal Reserve System

Controlling the Money Supply: Changing Reserve Requirements
The Fed sets the reserve-deposit ratio
Called the reserve requirement

Reduction: allow the money supply to increase.
Increase: can reduce the money supply.
Open Market Operations

Increasing The Money Supply
Fed purchases government bonds from the public.
People deposit the funds they get from their sale of bonds to the Fed.
Increase in deposits increase bank reserves.

The Federal Reserve System

Increasing The Money Supply
The increase in reserves will lead to an expansion of the money supply as banks make more loans.
The change in the money supply is a multiple of the change in reserves.

The Federal Reserve System

Reducing The Money Supply
Fed sells government bonds to the public.
Fed presents the checks from the sale of the bonds to the banks for payment.
Bank’s reserves will fall when checks clear.
Money supply will fall by a multiple of the decrease in reserves.

The Federal Reserve System

Open-Market Purchase
Purchase of government bonds from the public by the Fed for the purpose of increasing the supply of bank reserves and the money supply.

The Federal Reserve System

Open-Market Sale
Sale by the Fed of government bonds to the public for the purpose of reducing bank reserves and the money supply.

Example
Increasing the money supply by open-market operations.
Currency = 1,000 shekels
Reserves = 200
Reserve-deposit ratio = 0.2

Fed does Open Market

(Has a store of bonds on hand for this)
The Federal Reserve System

Example
Increasing the money supply by open-market operations
Money supply = 1,000 + 200/0.2 = 2,000 shekels

For Example: Open market purchase = 100
Reserves increase to 300
Money supply = 1,000 + 300/0.2 = 2,500 shekels

Summary
A fractional reserve banking system enables creation of deposits that are a multiple of level of reserves. This enables creation of money supply.
The Federal Reserve Bank (central bank of the U.S.) influences the level of the money supply by influencing the level of reserves primarily via open market operations.

Money Supply & Interest Rate

FOMC controls money supply

Supply of money determines the interest rate, given the demand for money.

Demand for Money

Ways to hold wealth:

- Cash
- Checking accounts
- Bonds
- Stocks
- Collectables

Demand for Money = Amount of wealth an individual chooses to hold in the form of money (cash & checking accounts)

Example
Louis’ wealth = $10,000
Holds $10,000 in cash
His demand for money = $10,000
Example
Louis' wealth = $10,000
If he allocates his wealth to:
$1,000 cash
$2,000 checking account
$2,000 government bonds
$5,000 rare stamps
His demand for money = ________

Consuelo's Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>Student loan</td>
</tr>
<tr>
<td>$80</td>
<td>$3,000</td>
</tr>
<tr>
<td>Checking account</td>
<td>Credit card balance</td>
</tr>
<tr>
<td>$1,200</td>
<td>$250</td>
</tr>
<tr>
<td>Shares of stock</td>
<td></td>
</tr>
<tr>
<td>$1,000</td>
<td></td>
</tr>
<tr>
<td>Car (market value)</td>
<td></td>
</tr>
<tr>
<td>$3,500</td>
<td></td>
</tr>
<tr>
<td>Furniture</td>
<td></td>
</tr>
<tr>
<td>$500</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>$6,280</td>
<td>$3,250</td>
</tr>
<tr>
<td>Net Worth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$3,030</td>
</tr>
</tbody>
</table>

Demand for money = $1,280
To hold more money
• Sell stocks
• Credit card cash advance

Money & Interest Rates
Bonds, Interest Rate, Money
Buy bonds at face value to earn some yield coupon rate establishes coupon payments
Suppose, don't want to hold on to bond for full term. Sell. Then WTP of buyer determined by prevailing interest rates (yields)
r inc means P bonds falls.

Suppose Demand bonds inc. P bonds rise. Yields, interest rates fall.

Suppose interest rates high and expected to fall. Means expect bond prices to rise. Demand for bonds high, Demand for money low.

Suppose interest rates low and expected to rise. Means expect bond prices to fall. Demand for money high, demand for bonds low.

Macroeconomic Factors that Affect the Demand for Money
Cost of holding money
nominal interest rate (i)
The quantity of money demanded is inversely related to the nominal interest rate

Macroeconomic Factors that Affect the Demand for Money
Benefit of holding money
Real income or output (Y)
An increase in real income will increase the demand for money and vice versa
The price level (P)
The higher the price level, the greater the demand for money and vice versa
The Money Demand Curve

- Money demand curve, $MD$
- Inversely related to nominal interest rate ($i$)

MD: Shifts

- Changes in $Y$ or $P$
- Technological changes
- Foreign demand

Example: Increase in $Y$ or $P$

Supply of Money and Money Market Equilibrium

- Fed controls the supply of money with open-market operations.
- Open-market purchase of bonds increases the money supply.
- Open-market sale of bonds decreases the money supply.

Money Market

- Money supply curve, $MS$
- Money demand curve, $MD$
- People sell interest-bearing assets
- Hold more money
- Price of financial assets fall and interest rates rise

The Fed Lowers the Nominal Interest Rate

- Money supply increases
- Non-money asset prices rise and interest rates fall

Supply of Money and Money Market Equilibrium

- Fed wants to raise $i$
- Fed sells bonds
- The money supply falls
- Creates a shortage of money
- People sell non-money assets
- Non-money asset prices fall and the interest rate increases
The Federal Reserve and Interest Rates

How the Fed Controls the Nominal Interest Rate
The Fed cannot set the interest rate and the money supply independently.

Fed: Money Supply and Interest Rates
1) Set MS means set i. Set i means set MS.
2) Advantages of Targeting the Interest Rate
   a. Effects of monetary policy work via interest rates
   b. Public familiar with interest rates
   c. Interest rates can be monitored easily

Federal Funds Rate

Interest rate commercial banks charge each other for very short-term (usually overnight) loans (ED/ES reserves)
Fed often makes policy announcements using this rate. Rate is watched closely.

The Federal Funds Rate, 1970-2002

Current Federal Funds Rate = _______%

The Federal Reserve and Interest Rates

Can the Fed Control the Real Interest Rate?
The real interest rate = nominal interest - inflation
\[ r = i - \pi \]

Can the Fed Control the Real Interest Rate?
The Fed controls the nominal interest rate.
Inflation adjust slowly to changing economic conditions.
So, changing nominal rate changes real rate by about same amount
Short-run impact of Fed policy

Prices do not vary greatly in the short run, so inflation not likely to change much.

Real rate change determined by nominal rate change.

Real interest influences consumption and investment. Fed’s ability to influence spending is strongest in the short run.

Prices do adjust to changing economic conditions.

Real interest rate is determined by the balance of savings and investment.

Fed has less effect on spending in the long run.

How much control does the Fed have over spending?

Federal funds rate may influence, but does not control other interest rates which influence spending.

Monetary policy effects not perfectly predictable.

The Fed can control $i$ and $r$ in the short run. $PAE$ is influenced by $r$.

Lower $r$ increases $PAE$.

Higher $r$ reduces $PAE$.

Fed can stabilize output and employment.

PAE & $r$

Real interest rates and consumption

High real interest rates increase the incentive to save. If savings increase, consumption decreases.

High real interest rates reduce consumption.

Real interest rates and investment spending

High real interest rates increase the cost of investment spending. The increased cost reduces profitability of investment spending and investment falls.

High real interest rates reduce investment spending.
Example (Algebraic)
Assume:
\[ C = 640 + 0.8(Y - T) - 400r \]
- 400\(r\) means % increase in \(r\) reduces \(C\) by 4 units
\[ I^p = 250 - 600r \]
- 600\(r\) means 1% increase in \(r\) reduces \(I\) by 6 units
\[ G = 300 \]
\[ NX = 20 \]
\[ T = 250 \]

Example
Planned aggregate expenditure PAE
\[ PAE = C + I^p + G + NX \]

\[ PAE = [640 + 0.8(Y - 250) - 400r] + [250 - 600r] + 300 + 20 \]

\[ PAE = [640 - 0.8x250 - 400r] + (250 - 600r) + 300 + 20 + 0.8Y \]

\[ PAE = [1,010 - 1,000r] + 0.8Y \]

The Fed Fights A Recession

- Multiplier = 5
- Output gap = 200
- Fed wants to increase \(PAE\) by 200/5 = 40
- 1% change in \(r\) will change \(C\) by 10
- Reduce \(r\) to 0.01

The Fed Fights Inflation

- Multiplier = 3
- Expansion gap = 200
- Fed wants to increase \(PAE\) by 200/3 = 67
- An increase in \(r\) shifts the expenditure line downward

Economic Naturalist 27.4
How did the Fed respond to recession and the terror attacks in 2001?

- Slowing economy in 2000
- Terrorist attacks in 2001
- December 2000, federal funds rate = 6.5%
- Fed cut fed funds rate 0.5 percentage points in January, 2001

(Week after September 11th, temporary reduction in the federal funds rate to 1.25%) 9 cuts in 2001 by Nov 2002 rate=1.25%
**Policy Reaction Function: Taylor rule**

\[ r = 0.01 - 0.5 \left( \frac{Y^* - Y}{Y^*} \right) + 0.5 \pi \]

The Fed responds to output gaps and inflation:
- If the output gap = 1% of \( Y^* \) (0.01), the Fed will lower \( r \) by 0.005 or 0.5 percentage points.
- If inflation rises 1% (0.01), the Fed will raise \( r \) by 0.005 or 0.5 percentage points.

**An Example of A Fed Policy Reaction Function**

**Summary**

Fed enacts monetary policy by changing MS (nominal interest rates)

In SR, real rates and nominal rate change about same, given inflation

Fed Fights Recession: Open market purchases of bonds increase MS, lower r. Lower r means C and I higher, so PAE rises to close output gap.