Lecture 11: How Banks “Make” Money

October 13, 2016

Prof. Wyatt Brooks
Overview

- Pick up from last time
- Where does money come from? How does the Fed control it?
- The Fed lives in interesting times... lots of problems that they currently face
Banks and the Money Supply: An Example

Suppose $100 of currency is in circulation.

To determine banks’ impact on money supply, we calculate the money supply in 3 different cases:

1. No banking system

2. 100% reserve banking system: banks hold 100% of deposits as reserves, make no loans

3. Fractional reserve banking system
Banks and the Money Supply: An Example

**CASE 1:** No banking system

Public holds the $100 as currency.

Money supply = $100.
Banks and the Money Supply: An Example

**CASE 2**: 100% reserve banking system

Public deposits the $100 at First National Bank (FNB).

FNB holds 100% of deposit as reserves:

<table>
<thead>
<tr>
<th>FIRST NATIONAL BANK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
</tr>
<tr>
<td>Reserves</td>
</tr>
<tr>
<td>Loans</td>
</tr>
</tbody>
</table>

Money supply:
= currency + deposits = $0 + $100 = $100

*In a 100% reserve banking system, banks do not affect size of money supply.*
**CASE 3**: Fractional reserve banking system

Suppose $R = 10\%$. First National Bank loans all but 10\% of the deposit:

<table>
<thead>
<tr>
<th>FIRST NATIONAL BANK</th>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>$10</td>
<td>Deposits</td>
</tr>
<tr>
<td>Loans</td>
<td>$90</td>
<td>$100</td>
</tr>
</tbody>
</table>

Money supply = $190 (!!!)

Depositors have $100 in deposits,
Borrowers have $90 in currency.
Banks and the Money Supply: An Example

CASE 3: Fractional reserve banking system

How did the money supply suddenly grow?

When banks make loans, they create money. The borrower gets

- $90 in currency (an asset counted in the money supply)
- $90 in new debt (a liability)

A fractional reserve banking system creates money, BUT NOT WEALTH.
Banks and the Money Supply: An Example

**CASE 3:** Fractional reserve banking system

Suppose borrower deposits the $90 at Second National Bank (SNB).

Initially, SNB’s T-account looks like this:

<table>
<thead>
<tr>
<th>SECOND NATIONAL BANK</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
</tr>
<tr>
<td>Reserves</td>
<td>$9</td>
</tr>
<tr>
<td>Loans</td>
<td>$81</td>
</tr>
<tr>
<td>Deposits</td>
<td>$90</td>
</tr>
</tbody>
</table>

If \( R = 10\% \) for SNB, it will loan all but 10% of the deposit.

If \( R = 10\% \) for SNB, it will loan all but 10% of the deposit.
Banks and the Money Supply: An Example

CASE 3: Fractional reserve banking system

The borrower deposits the $81 at Third National Bank (TNB).

Initially, TNB’s T-account looks like this:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves $8.10</td>
<td>Deposits $81</td>
</tr>
<tr>
<td>Loans $72.90</td>
<td></td>
</tr>
</tbody>
</table>

If $R = 10\%$ for TNB, it will loan all but 10\% of the deposit.
Banks and the Money Supply: An Example

CASE 3: Fractional reserve banking system

The process continues, and money is created with each new loan.

Original deposit = $100.00
FNB lending = $ 90.00
SNB lending = $ 81.00
TNB lending = $ 72.90

In this example, $100 of reserves generates $1000 of money.

Total money supply = 1000.00
The Money Multiplier

- **Money multiplier**: the amount of money the banking system generates with each dollar of reserves
- The money multiplier equals $1/R$.
- In our example,
  \[ R = 10\% \]
  money multiplier = $1/R = 10$
  $100$ of reserves creates $1000$ of money
The Fed’s 3 Tools of Monetary Control

1. **Open-Market Operations (OMOs)**: the purchase and sale of U.S. government bonds by the Fed.

   - To increase money supply, Fed buys government bonds, paying with new dollars.
     ...which are deposited in banks, increasing reserves
     ...which banks use to make loans, causing the money supply to expand.

   - To reduce money supply, Fed sells government bonds, taking dollars out of circulation, and the process works in reverse.
The Fed’s 3 Tools of Monetary Control

1. **Open-Market Operations (OMOs):** the purchase and sale of U.S. government bonds by the Fed.
   - OMOs are easy to conduct, and are the Fed’s monetary policy tool of choice.
   - Most OMOs are carried out by central bankers at the New York Fed.
The Fed’s 3 Tools of Monetary Control

2. Reserve Requirements (RR):
   affect how much money banks can create by making loans.
   - To increase money supply, Fed reduces RR. Banks make more loans from each dollar of reserves, which increases money multiplier and money supply.
   - To reduce money supply, Fed raises RR, and the process works in reverse.
   - Fed rarely uses reserve requirements to control money supply: frequent changes would disrupt banking.
The Fed’s 3 Tools of Monetary Control

3. The Discount Rate:
   the interest rate on loans the Fed makes to banks
   - When banks are running low on reserves, they may borrow reserves from the Fed.
   - **To increase money supply**, Fed can lower discount rate, which encourages banks to borrow more reserves from Fed.
   - Banks can then make more loans, which increases the money supply.
   - **To reduce money supply**, Fed can raise discount rate.
The Fed’s 3 Tools of Monetary Control

3. The Discount Rate:
   the interest rate on loans the Fed makes to banks

- The Fed uses discount lending to provide extra liquidity when financial institutions are in trouble, e.g. after the Oct. 1987 stock market crash.

- If no crisis, Fed rarely uses discount lending – Fed is a “lender of last resort.”
Problems Controlling the Money Supply

- Households affect how much money there is
  - If households decide to hold more cash, the money supply falls

- Banks affect how much money there is
  - If banks choose not to lend out some money when they can, then the money supply falls

- So the Fed must pay attention to what households and banks are doing to control the money supply
Bank Runs and the Money Supply

- **A run on banks:** When people suspect their banks are in trouble, they may “run” to the bank to withdraw their funds, holding more currency and less deposits.

- Under fractional-reserve banking, banks don’t have enough reserves to pay off ALL depositors, hence banks may have to close.

- Also, banks may make fewer loans and hold more reserves to satisfy depositors.

- These events increase $R$, reverse the process of money creation, cause money supply to fall.
Excess Reserves

- When banks hold reserves above their reserve requirement, these are called *excess reserves*.
- Banks might hold excess reserves because:
  - Not enough lending opportunities
  - Perceived risks
- Excess reserves reduce the money supply.
Excess Reserves Example

Suppose $R = 10\%$. First National Bank loans all but 10\% of the deposit:

<table>
<thead>
<tr>
<th>FIRST NATIONAL BANK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
</tr>
<tr>
<td>Required Reserves</td>
</tr>
<tr>
<td>Excess Reserves</td>
</tr>
<tr>
<td>Loans</td>
</tr>
<tr>
<td>Deposits</td>
</tr>
</tbody>
</table>

Money supply = $190

All banks do the same, which this results in $1000
Excess Reserves Example

Suppose $R = 10\%$. First National Bank loans all but 40\% of the deposit:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Reserves</td>
<td>Deposits</td>
</tr>
<tr>
<td>Excess Reserves</td>
<td>$100</td>
</tr>
<tr>
<td>Loans</td>
<td>$60</td>
</tr>
</tbody>
</table>

Money supply = $160

All banks do the same, which this results in $700
Excess Reserves and Money Supply

- For every $1 the banks keep in excess reserves, they prevent $1/R$ dollars from being created.
- If banks suddenly start lending these excess reserves, it could cause a huge increase in money.
- Important because there is a huge increase in excess reserves since the last recession.
Excess Reserves of Depository Institutions

Source: Federal Reserve Bank of St. Louis
Shaded areas indicate US recessions - 2015 research.stlouisfed.org
The Federal Funds Rate

- On any given day, banks with insufficient reserves can borrow from banks with excess reserves.
- The interest rate on these loans is the federal funds rate.
- The FOMC uses OMOs to target the fed funds rate.
- Many interest rates are highly correlated, so changes in the fed funds rate cause changes in other rates and have a big impact in the economy.
The Fed Funds Rate and Other Rates, 1975-2010

- Fed Funds
- 30-Year Mortgage
- Prime Rate
- 3-Month Treasury Bill

Date Range:
- 1975-01-01
- 1978-01-01
- 1981-01-01
- 1984-01-01
- 1987-01-01
- 1990-01-01
- 1993-01-01
- 1996-01-01
- 1999-01-01
- 2002-01-01
- 2005-01-01
- 2008-01-01
Zero Lower Bound

- Since money can be stored, no one would accept a negative nominal interest rate.
- Negative nominal interest rate: you give me one dollar today, I pay you back less than one dollar in a year.
- Money can be stored: I could just keep the dollar under my mattress for a year and have more cash a year from now.
- This means that interest rates can only be decreased to zero, and not lower.
Negative Interest Rates?

- Yet some central banks are trying to implement negative nominal interest rates.
- Physical money can be stored, but the vast majority of money is held in reserve accounts.
- The Fed could tax these reserve accounts.
  - Fed taxes them at 2%, so if I leave my dollar in my reserve account, I have $0.98 in a year.
  - Then I might accept a loan that would pay me $0.99 in a year (-1% interest rate).
- This is uncharted territory.
Next Class

- After fall break, we’ll talk about the US financial crisis of 2007-08
- I’ll send you background material to prepare for that

Enjoy your break!