Monetary System 2

Prof. Ed Cho

Outline: Unit III, Section MP2

I. Money Multiplier
   A. First Steps
   B. ΔTotal Deposits & ΔMoney Supply
   C. Money Multiplier in Reverse

II. Federal Reserve System
   A. Open-Market Operations
   B. Tools of the Fed

I.A. Money Multiplier: First Steps

- M^S = Money Supply ≈ M1
- M^S = Total Deposits + Cash = Tot Dep + Cash
- $\Delta M^S = \Delta$Tot Dep + ΔCash

Simple E.g.: Person 1 has $10,000 in a mattress, Person 2 has $20,000 in a checking account.

M^S = $20,000 + $10,000 = $30,000

Set up

- Consider how the money supply changes when Person 1 deposits the $10,000 she was hiding in her mattress.

- Keep track of:
  - ΔTot Dep
  - Note: ΔM^S = ΔTot Dep + ΔCash
    = ΔTot Dep + [-10,000]

Overall Steps

- Assumptions
  - R = Required reserve ratio= 10%
  - E = Excess reserve ratio= 0%

Steps:

1. Person 1 deposits $10,000 in Bank 1
2. Bank 1 loans out $9000 to Person 2 in cash
3. Person 2 deposits $9000 in Bank 2
4. Bank 2 loans out $8100 to person 3 in cash
5. ….

Person 1 deposit $10,000 in Bank 1

Bank 1 R = 10%

Assets		Liabilities	
ΔReserves	+ 10,000	+ 10,000	ΔDeposits
		+0	ΔNW

ΔTot Dep = + 10,000

Bank 1 loans out $9000 to Person 2 in cash

Bank 1 R = 10%

Assets		Liabilities	
ΔReserves	+ 10,000	+ 10,000	ΔDeposits
ΔReserves	-9,000		
ΔLoans	+9,000		
		+0	ΔNW

ΔTot Dep = + 10,000 + 0

Person 2 deposits $9000 in Bank 2

- Person 2 takes $9000 and can
  - Spend it [C] => Someone else deposits it in a bank
  - Invest it in K [I] => Someone else deposits it in a bank
  - Put it into bank => Person 2 deposits it in a bank
  - Put it under the mattress => Money creation process stopped [assume this away]

Person 2 deposits $9000 in Bank 2

Bank 2

R = 10%

Assets		Liabilities	
ΔReserves	+ 9000	+ 9000	ΔDeposits
		+0	ΔNW

ΔTot Dep = + 10,000 + 0 + 9000

Bank 2 loans out $8100 to Person 3 in cash

Bank 2

R = 10%

Assets		Liabilities	
ΔReserves	+ 9000	+ 9000	ΔDeposits
ΔReserves	-8100		
ΔLoans	+8100		
		+0	ΔNW

ΔTot Dep = + 10,000 + 0 + 9000 + 0

Person 3 deposits $8100 in Bank 3

Bank 3 R = 10%

Assets		Liabilities	
ΔReserves	+ 8100	+ 8100	ΔDeposits
		+0	ΔNW

ΔTot Dep = + 10,000 + 0 + 9000 + 0 +8100

I.B. ΔTotal Deposits & ΔMoney Supply

ΔTot Dep =+ 10,000 + 9000 + 8100 + …

ΔTot Dep = 10,000 [1+0.9+0.9^2+0.9^3+ ⋯]

$$\Delta\text{Tot Dep} = 10{,}000\left(\frac{1}{0.10}\right) = 10{,}000\left(\frac{1}{R}\right)$$

$$= 10{,}000(10) = 100{,}000$$

$$where\ R\ = Required\ Reserve\ Ratio$$

$$MM = Money\ Multiplier = \left(\frac{1}{R}\right)$$

ΔTotal Deposits & ΔMoney Supply

$$\Delta \text{Tot Dep} = (\text{Original Deposit}) * (\text{MM})$$
$$= (10{,}000)\ (10) = 100{,}000$$

$\Delta M^S = \Delta$Tot Dep + ΔCash

ΔM^S = \$100,000+ -\$10,000 = \$90,000

- If Person 1 takes \$10,000 from her mattress, and deposits it in a bank

  => ΔTot Dep = 100,000 & ΔM^S= \$90,000

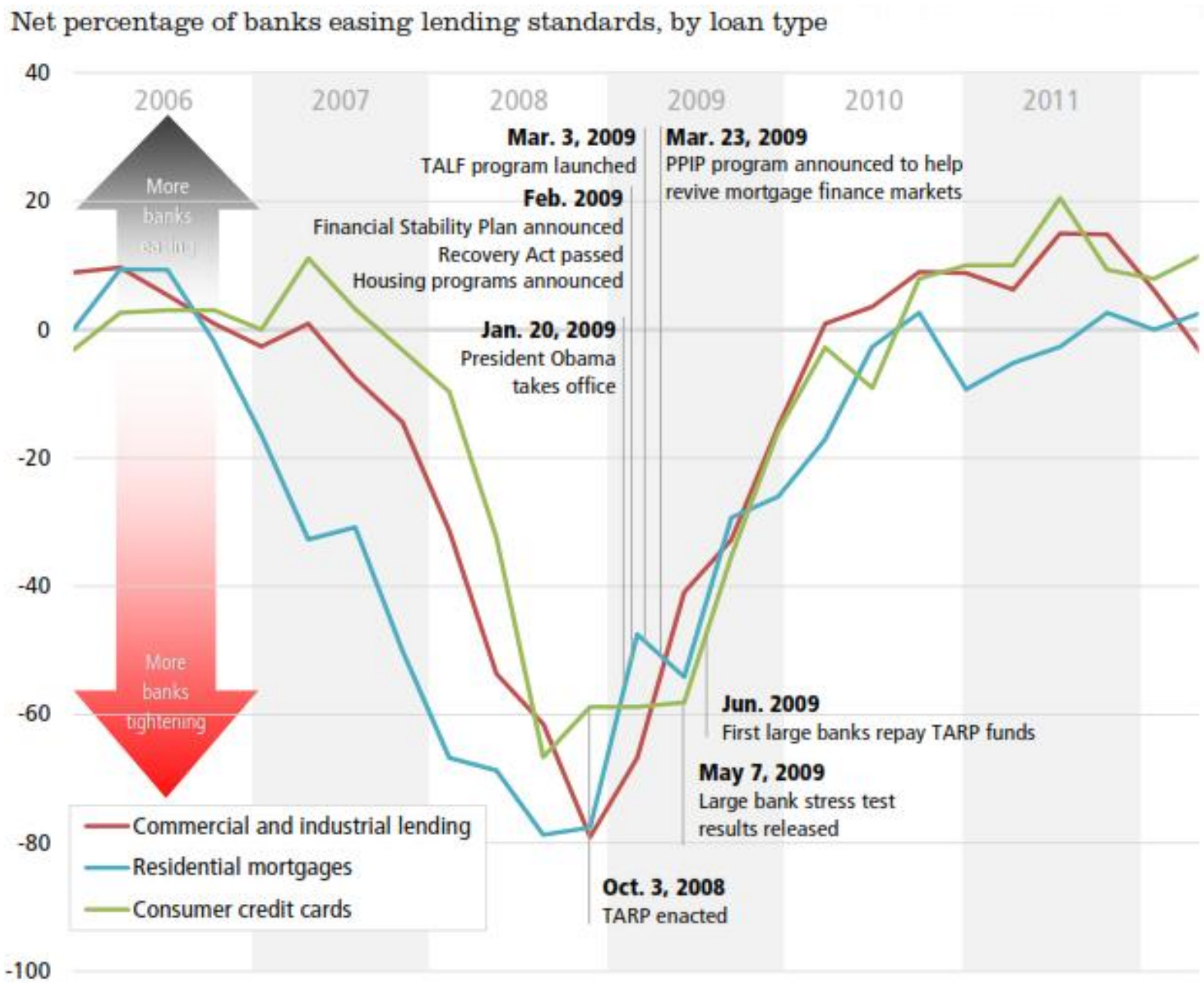
Money Multiplier in Practice

Assumptions in the basic previous exercise:

- Banks are "fully loaned up," => E = 0
  - Practically: $\mathrm{E} > 0$, $MM = \left(\frac{1}{R+E}\right)$

- People do not hold any additional currency as they obtain loans from banks
  - If so => Money creation process halted

- If R = 10%, E = 10% => MM = 5
  - Less Money Creation
  - Post Financial Crisis



US Department of Treasury 2012

I.C. Money Multiplier in Reverse

If Person 1 takes $10,000 out of her checking deposit, and puts it under her mattress

Assume: R = 10%, E = 0%

$$\Delta\text{Tot Dep} = (\text{Original Deposit}) * (\text{MM})$$
$$= (-10{,}000) * (10) = -100{,}000$$

$\Delta M^S = \Delta\text{Tot Dep} + \Delta\text{Cash}$

ΔM^S = -$100,000 + $10,000 = -$90,000

Reverse Money Multiplier

Person 1 take out $10,000 from bank 1 and put it under her mattress

1. At Bank 1:
   - Required Reserves decrease by (0.10)($10,000) = $1,000
   - Actual Reserves decrease by $10,000

     => Bank 1 must make up $9,000 in reserves

2. Bank 1 reduces loans by $9000 to Person 2:
   - Callback existing loans
   - Do not renew ST loans to loyal customers

3. Person 2 withdraws $9,000 from bank 2,….

Bank 1: Levels (Not Changes)

Bank 1 R = 10%

Assets		Liabilities	
Reserves	10,000	100,000	Deposits
Loans	90,000		
Bonds	50,000		
		50,000	NW

Person 1 withdraws $10,000 from Bank 1

Bank 1 R = 10%

Assets		Liabilities	
Reserves	0	90,000	Deposits
Loans	90,000		
Bonds	50,000		
		50,000	NW

Person 1 withdraws $10,000 from Bank 1

Bank 1 R = 10%

Assets		Liabilities	
Reserves	9,000	90,000	Deposits
Loans	81,000		
Bonds	50,000		
		50,000	NW

Bank calls back $9000 worth of “callable” loans,
or does not renew ST loans.

II.A.Federal Reserve System

- Created by Congress in 1913
  - Dual mandate of price stability (π) and maximum employment (μ)
- Separate Independent Authority
  - Recent challenges to Fed independence
    - AIG Hank Greenberg, other politicians "Audit the Fed"
- FOMC: Federal Open Market Committee
  - 7 Board of Governors (long-terms)
  - 12 Presidents of regional Fed Reserve Banks
  - Current Chairwoman: Janet Yellen

Source: *Federal Reserve Bulletin*, Board of Governors of the Federal Reserve System.

Federal Reserve Bank Balance Sheet

Assets	Liabilities
U.S. Treasury bonds (2,400B)	Currency Federal Reserve notes (1,500B)
Gold (11B)	Bank Reserve Deposits (2,700B)
Foreign-currency (20B)	
Discount Loans to Banks (approx 400B)	
MBS (1,700B)	NW
Total assets = 4.4 Trillion	

FOMC Increasing the M^S

Expansionary Monetary Policy

- Fed buys $10,000 of T-bonds from individuals
  - Individual deposits $10,000 in bank
  - ΔTot Dep = $10,000 $\left(\frac{1}{R}\right) = \$100{,}000$
  - $\Delta M^S = \Delta$Tot Dep + ΔCash

  ΔM^S = $100,000 + 0 = $100,000
- Note: Fed "prints" $10,000 of new money
  - $10,000 not taken from the mattress as in previous example

FOMC Decreasing the M^S

Contractionary Monetary Policy

- Fed sells \$10,000 of T-bonds from individuals
  - Individual withdraws \$10,000 from bank
  - ΔTot Dep = –\$10,000 $\left(\frac{1}{R}\right) = -\$100{,}000$
  - $\Delta M^S = \Delta$Tot Dep + ΔCash

  ΔM^S = -\$100,000 + 0 = -\$100,000
- Note: Fed removes \$10,000 of money
  - \$10,000 not put back into the mattress as in previous example

Main Tools of the Fed

- FOMC: Open-Market Operations
  - Buy and sell treasury bonds
- Discount Window
  - Lend to banks directly through the Discount Window
  - Interest rate is called the Discount Rate
- Change Reserve Requirement
  - Not common in US, more common in China

New Tools of the Fed

- Fed pays interest on Reserves
- After Financial Crisis
  - Quantitative Easing [QE1, QE2, QE3,..]
  - Additional Liquidity Facilities [TAF ($50B), TALF ($1T), TSLF ($200B), PDCF, ABCPMMMMFLF,…]