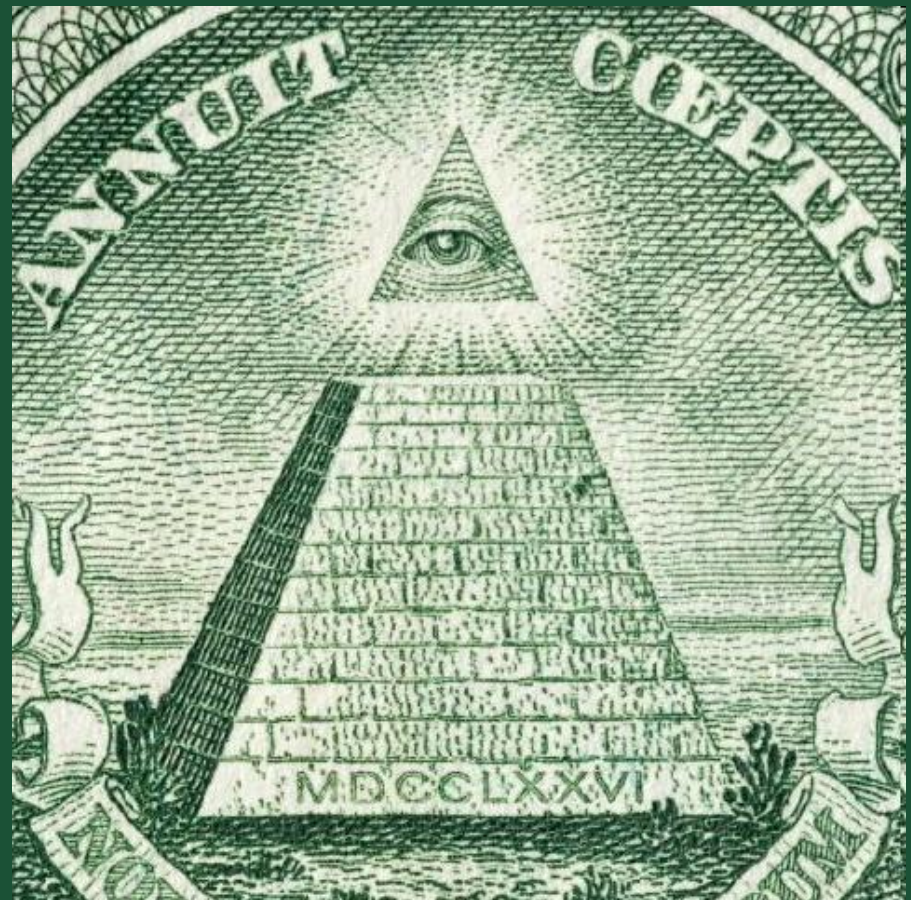


Fractional Reserve Banking

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OUTLINE

- How is money created in a fractional reserve system?
- What tools do central banks use to control money supply and how effective are they?
- How much do the Fed, BoE, ECB, and BOJ vary in their approach to monetary policy?
- What challenges has the recent crisis posed for central banks and what solutions have been implemented to date?

MONEY CREATION

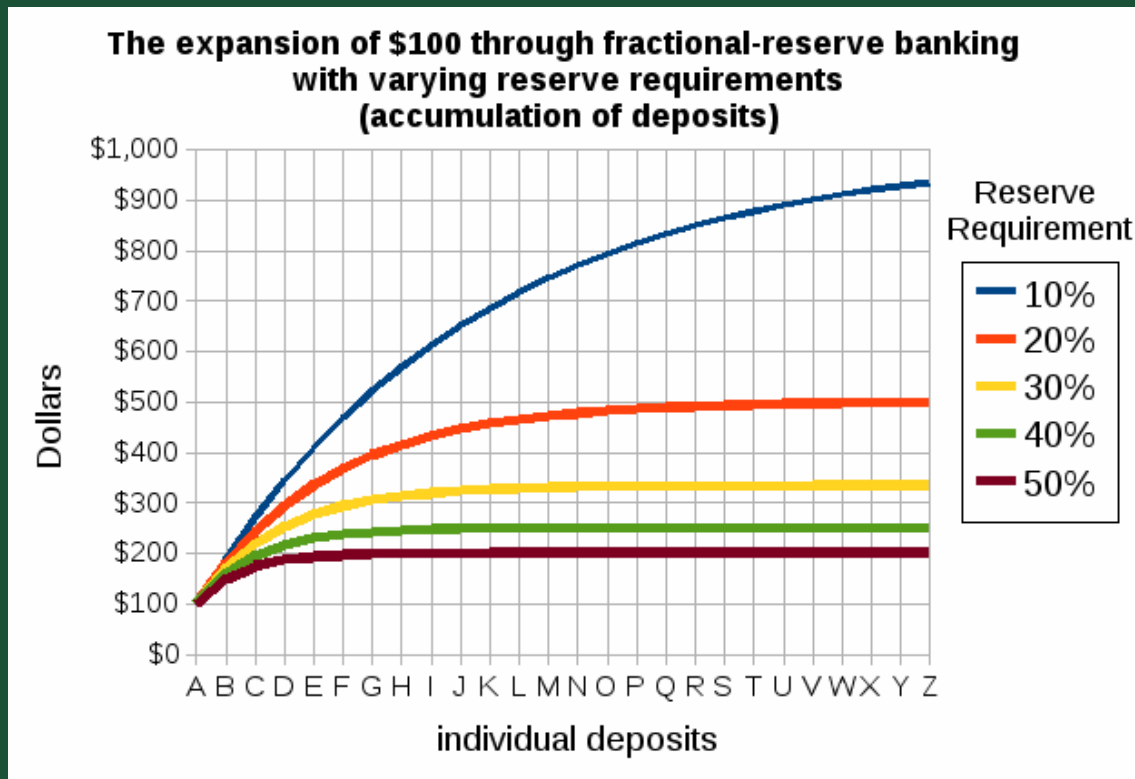
- An effect known as the “money multiplier” demonstrates that a sum of money introduced into the monetary system will increase the money supply by more than its notional value. Let’s appeal to an illustrative example...

Individual Bank	Amount Deposited	Lent Out	Reserves
A	100	80	20
B	80	64	16
C	64	51.20	12.80
D	51.20	40.96	10.24
E	40.96	32.77	8.19
F	32.77	26.21	6.55
G	26.21	20.97	5.24
H	20.97	16.78	4.19
I	16.78	13.42	3.36
J	13.42	10.74	2.68
K	10.74		
			Total Reserves:
			89.26
	Total Amount Deposited:	Total Amount Lent Out:	Total Reserves + Last Amount Deposited:
	457.05	357.05	100
	Commercial Bank Money Created + Central Bank Money:	Commercial Bank Money Created:	Central Bank Money:
	457.05	357.05	100

Say, for instance, that \$100 is deposited in a bank with a required reserve ratio of 20%. The bank will keep \$20 of that \$100 on reserve and provide the remaining \$80 to someone who needs a loan. That person spends the \$80, and he who receives the \$80 will deposit that sum in a bank. This bank holds 20% of the \$80 and lends out the remainder just as the first bank did. This process repeats, and we see the cumulative effect in the table on the left.

MONEY CREATION

- This graph illustrates the importance of the reserve requirement. These graphs asymptotically approach the geometric sum, which equals (original deposit) / R.



The “original deposit” in this example is \$100, and the reserve requirement, R, is different for each line.

MONEY CREATION: Two Points of Possible Disruption

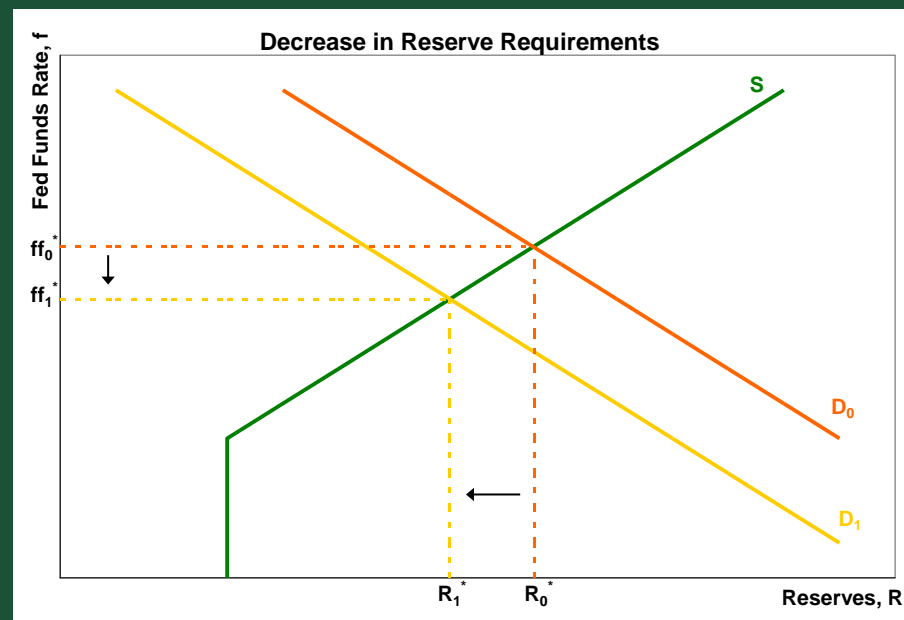
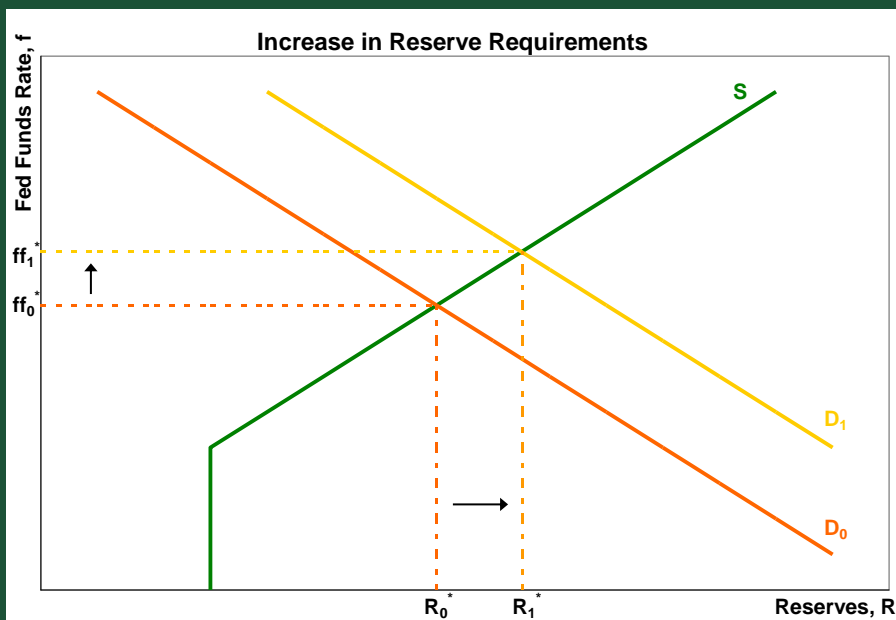
- First, some guy could opt not to put his money in a bank. For example, he may prefer to bury his money in his backyard. We don't know, however, where in the infinite procession of depositing and lending this guy breaks the cycle.



- Second, a bank may decide against lending out money. The bank might be concerned that depositors will withdraw their funds thereby leaving the bank in a tight spot when the Fed checks that reserve ratios are satisfied.

MONETARY POLICY: Reserve Requirements

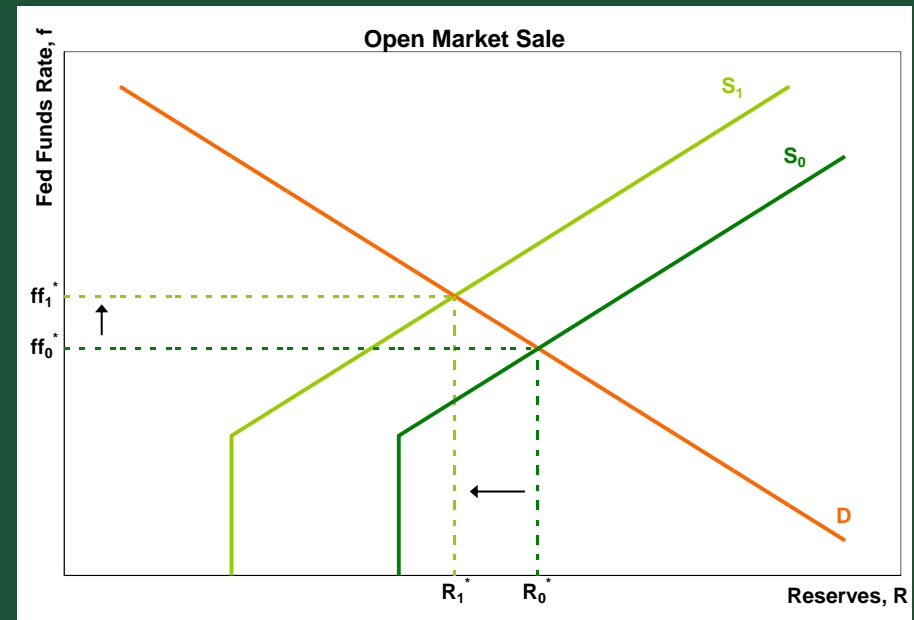
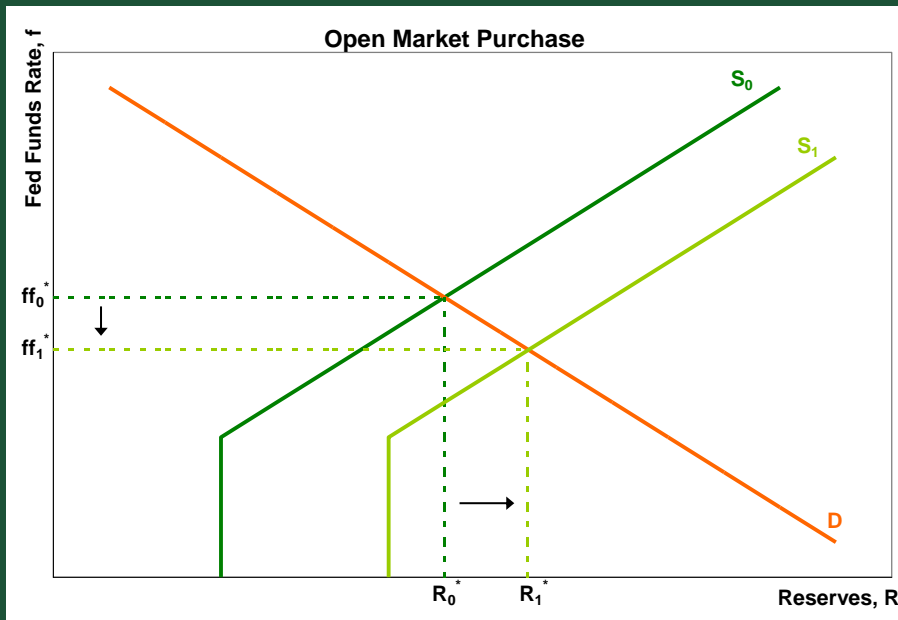
- Fraction of deposits to be held in cash or with the central bank
- Determinant of the money multiplier
- Drawback: tax on financial intermediation, does not prevent bank runs



When the Required Reserve Ratio is increased, the demand for reserves increases, so the demand curve shifts to the right. This leads to a higher Federal Funds rate and more reserves in equilibrium.

MONETARY POLICY: Open Market Operations

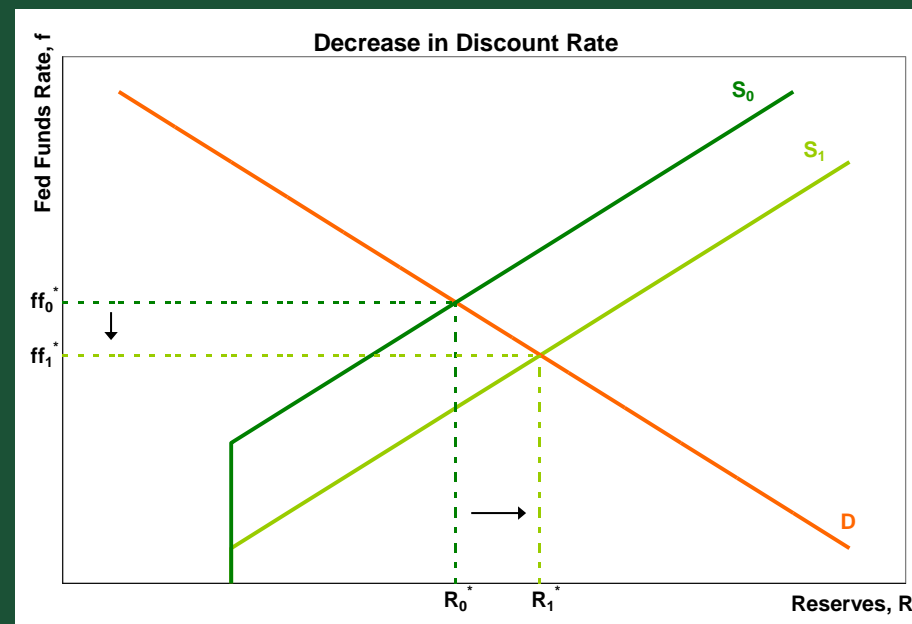
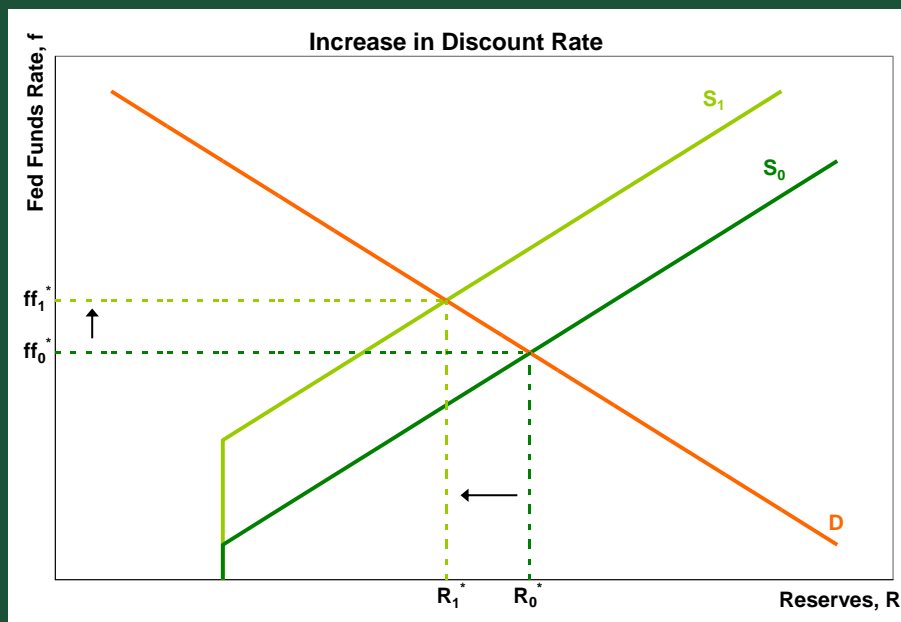
- Trading of Treasury securities and repurchase agreements with Primary Dealers
- Drawback: requires highly liquid market for government securities



An open market purchase increases nonborrowed reserves thereby shifting the supply curve to the right. In equilibrium, the Federal Funds rate decreases and the number of reserves increases.

MONETARY POLICY: Discount Window

- Loans extended to banks by the central bank through the discount window
- Drawback: discount window stigma - Why did the bank not borrow from another bank?



An increase in the Discount Window Rate shifts the supply curve directly up. Accordingly, the Federal Funds rate increases and the number of reserves decreases.

CROSS-COUNTRY COMPARISON

Reserve Requirements

- Considerable variation in reserve requirement systems in terms of ratios, qualifying liabilities, and interest payment
- Growing support for interest payment
- Required reserve ratios changed very infrequently in developed economies

	Reserve Ratio	Reservable Liabilities*	Interest on Required Reserves?	Interest on Excess Reserves?	Maintenance Period
USA	3% 10%	net transaction accounts: \$10.3 - \$44.4million above \$44.4 million	starting 10/08, <i>average</i> target fed funds rate	starting 10/08, <i>lowest</i> target fed funds rate	1-2 weeks depending on institution size
UK	voluntary: +/-1% within chosen target	~ short-term sterling deposits, net foreign currency liabilities if positive	official Bank rate	penalty! official Bank rate	1 month = MPC inter- meeting period
EU	2%	overnight deposits, money mkt paper, liabilities with up to 2- year maturity	average interest rate	no	1 month
Japan	0.05-1.3% based on amount of liabilities	time and other deposits (excluding foreign currency), debentures	no	no generally, temporarily 0.1% 11/08-3/09	

* Long-term liabilities and other short-term liabilities not listed have an effective required reserve ratio of 0%. In addition, most central banks admit for a lump sum allowance thus freeing small banks from reserve requirements.

CROSS-COUNTRY COMPARISON

Discount Window & Open Market Operations

USA

- Open market operations (OMOs) are the preferred policy tool
 - The Fed initiates open market sales and purchases → directly controls the magnitude of change in the monetary base
 - Easily executed and reversible
- Discount lending available but discouraged
 - Mainly used to insure bank liquidity
 - The Fed cannot completely control the volume of reserves added to or taken from the monetary base
 - More difficult to change the discount rate

UK and EU

- Also heavily rely on OMOs, use the discount window (Standing facilities) to manage overnight liquidity

Japan

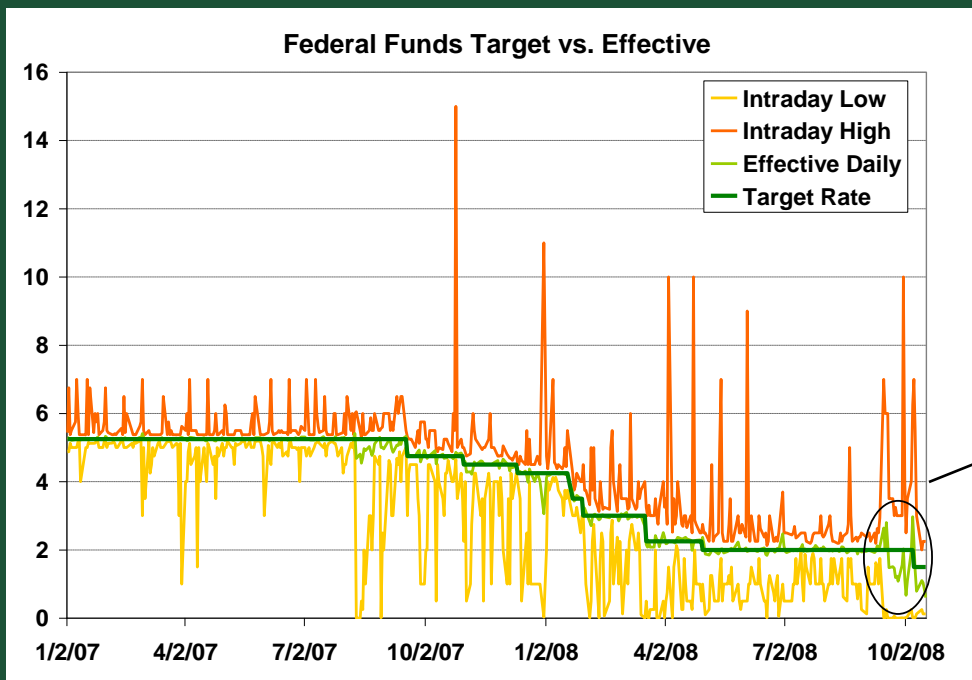
- Established a market for government securities only in mid-1980s → historically, relied more on discount lending than OMOs

CURRENT CHALLENGES:

- Highlight importance of the Required Reserve Ratio in giving the Fed control over Fed Funds rate
- Good case study in how monetary policy is conducted in real world and the contribution of banks and non-banking public in monetary policy outcomes

CURRENT CHALLENGES: Deviation From Target

- Fed's inability to match overnight lending to target Federal Funds Rate
 - Loss of main monetary policy tool
 - Blow to credibility

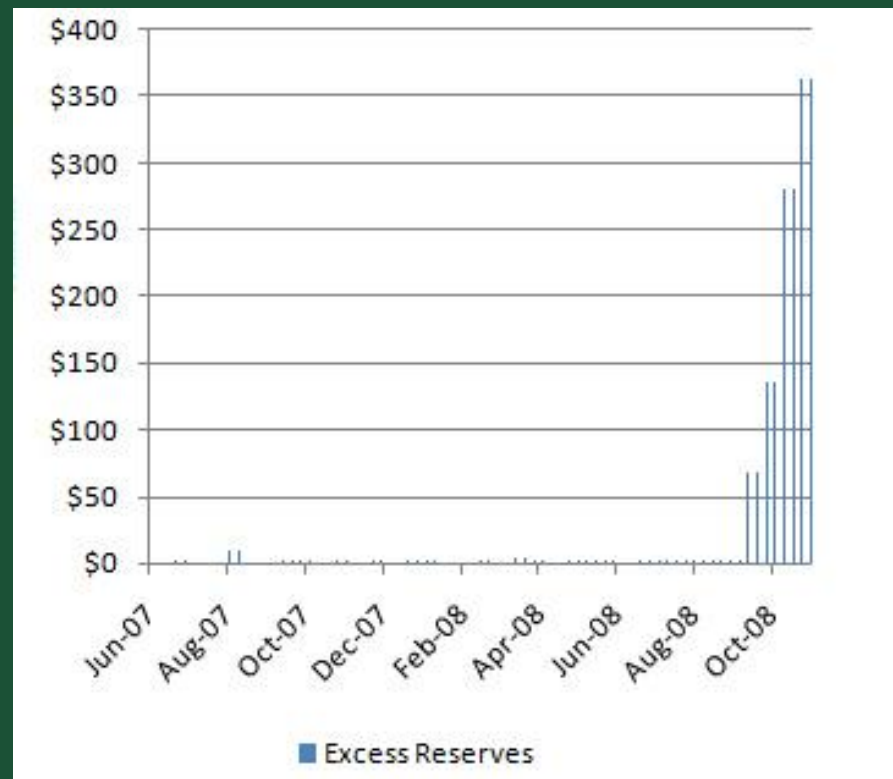


Cash hoarding is one explanation...

CURRENT CHALLENGES:

Cash Hoarding by Banks

- Excess reserves far above normal
- Highlights the Fed's lack of power in controlling how the Monetary Base translates into the Money Supply via the Money Multiplier
- Post Lehman bankruptcy:
 - \$ 301bn in reserves at the Fed
 - € 199bn in reserves at the ECB
- Pre Lehman bankruptcy:
 - < \$10bn in reserves at the Fed
 - < €1bn in reserves at the ECB
- Instability and unpredictability of multiplier is main concern of Fed in execution of Open Market Operations.



CURRENT CHALLENGES:

Source of Inefficiency

- Required Reserves = Deposits at Central Bank + Borrowed Reserves
- Borrowed Reserves, BR, are usually > 0 since it is normally profitable for banks to hold reserves very close to the required amount, causing them to frequently fall short on a day to day basis .
 - Therefore many banks need to borrow in the overnight lending market, BR (from other banks with excess reserves or the Fed) to meet reserve requirements
 - Monitoring this systemic demand, the Fed can better understand what monetary actions it can take in order to control the overnight lending rate
- Now, with mostly all banks holding excess reserves this systemic demand no longer exists.

CURRENT CHALLENGES:

Fear of Lending

- Banks fear to lend to each other despite their strong liquidity profiles
- Difference between liquidity and solvency
 - Bank-run vs. Bankruptcy
- Banks may be overprotected against liquidity problems but still undercapitalized.

Assets	Liabilities	Equity
Subprime Loan - \$4M ? Cash - \$2M	Deposits - \$4M	Shareholders Equity - \$2M

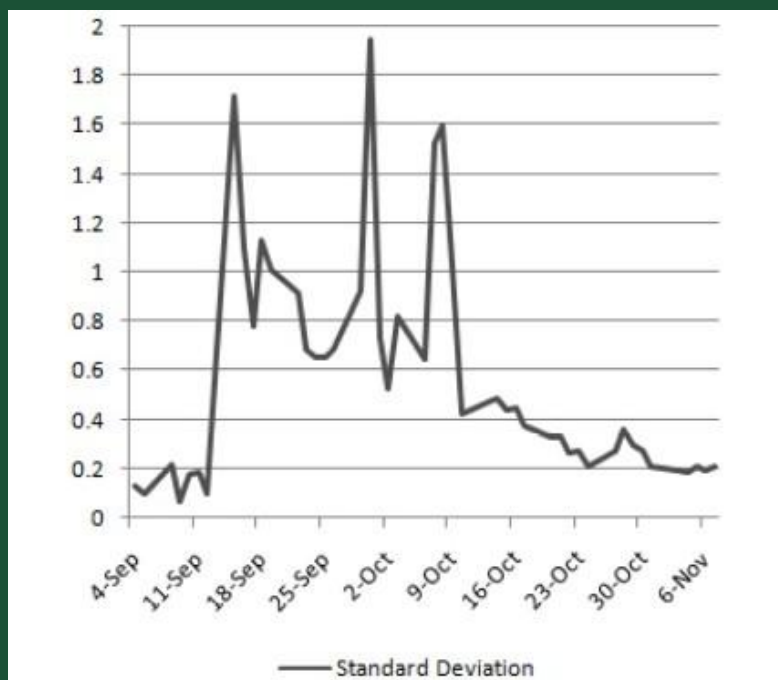
- If the subprime loan is really worth \$1M, deposits are still unsafe even with 50% reserves
- Main reason for excess reserves is the relative safety of depositing excess reserves at the Fed rather than trading them on an unsecured basis with other banks in the fed funds market

CURRENT CHALLENGES:

Solution to Inefficiency

- To bring market rates closer to the FOMC target, need to place a floor underneath the overnight market rate
- Emergency Economic Stabilization Act passed in early October
- Allowed the Fed to pay interest on required and excess reserves
- No bank “should” lend at a rate less than the excess reserve interest rate if they could place such money at the Fed without default risk

SOLVING CURRENT CHALLENGES: Success?



POSSIBLE FUTURE CHALLENGES

- Treasury is expected to issued \$3.3 tn during the coming year, with about \$2.3 tn in T-bills
- This, along with cash hoarding, could act to drain liquidity from the economy and further neutralize stimulative impact of Fed's liquidity programs

Q U E S T I O N S

