

Ch.25 The Money System

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25.1 Money

The Function of Money and Types of Money

- The function of money:
 - A medium of exchange.
 - A store of value.
 - A unit of account.
- Types of money:
 - Fiat money
 - Commodity money: precious metal, goats, chickens, ...

25.1 Money

Why Do People Hold Money At All?

- Money is not unique as a store of value.
 - Its storability depends on price level.
- Stocks, bonds, land, houses, art, or jewelry can be used to store wealth.
 - Many assets even pay the owner a higher interest rate than money.
- The answer is **liquidity**.
 - The relative ease and speed with which an asset can be converted into a medium of exchange.
 - Other assets involve transaction costs when they are converted into money.

25.1 Money

Whether Money is Involved in the Transaction?

- ❑ Cigarettes in prison camps during World War II.
- ❑ Medium of exchange
- ❑ Store of value
- ❑ Unit of account
- ❑ Credit cards.

- ❑ Stocks and bonds.
 - ❑ Medium of exchange
 - ❑ Store of value
 - ❑ Unit of account



25.1 Money

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25.1 Money

Money Supply

- M1: the narrowest measure of money (the most liquid assets)
 - Currency, checking account deposits, and traveler's checks.
- M2: M1 + other assets that are not quite as liquid as those included in M1
 - Assets that have check-writing features (money market deposit accounts and money market mutual fund shares)
 - Other assets (savings deposits and small-denomination time deposits) that can be turned into cash quickly and at very little cost.

25.1 Money

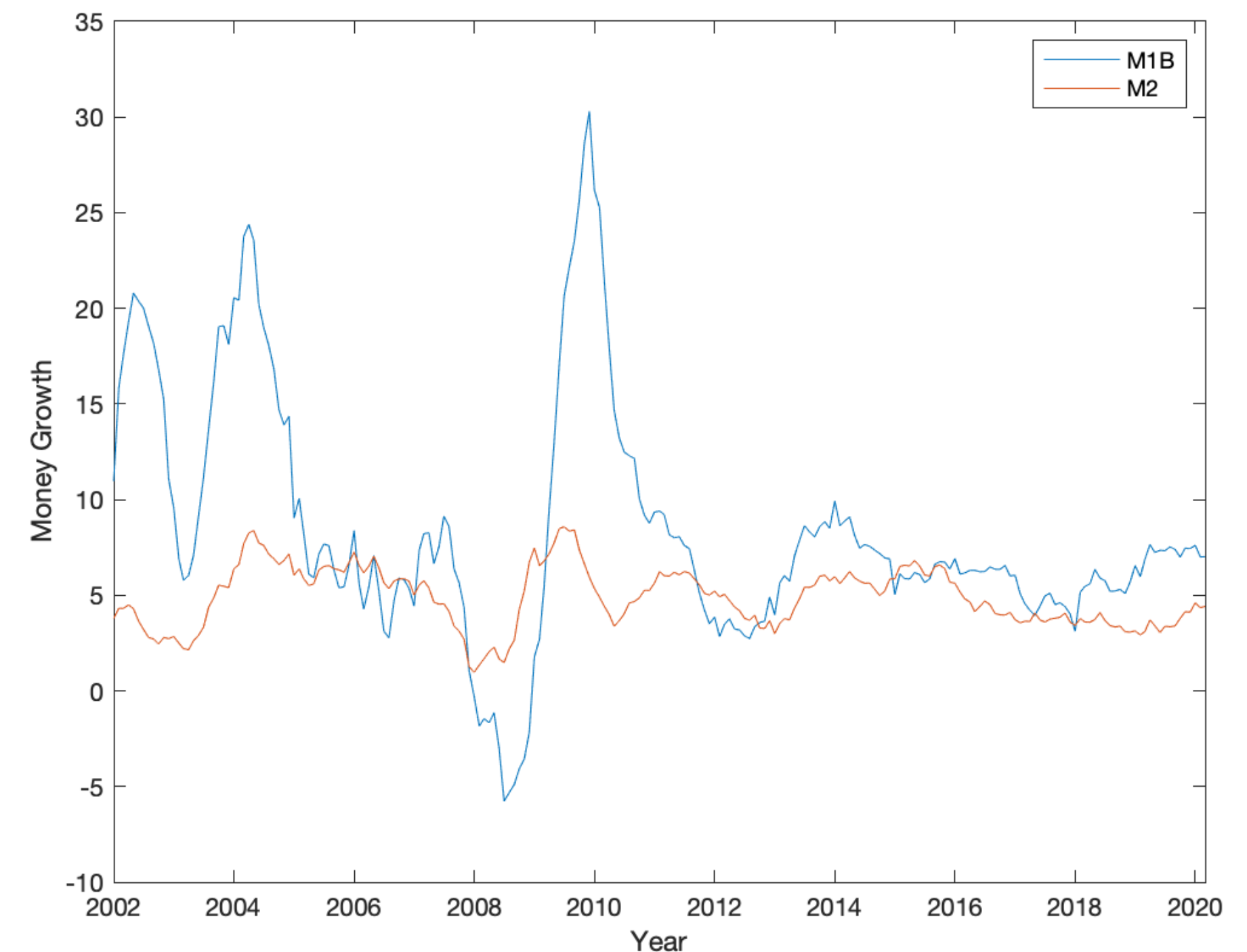
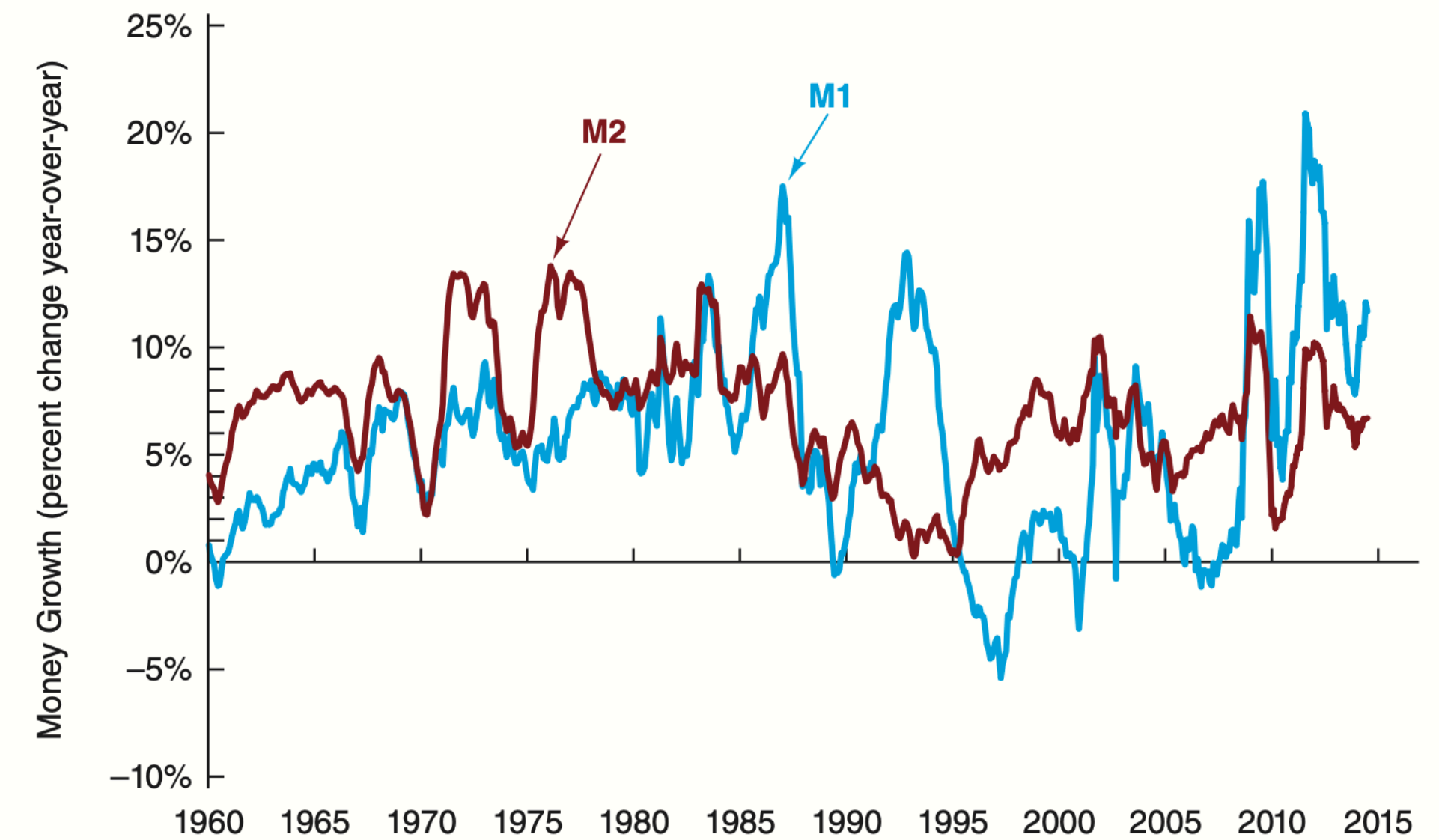
Money Supply

- 央行定義: (資料來源 - 央行金融統計編制方法說明)
- $M1A = \text{通貨淨額}$ (通貨發行額 - 全體貨幣機構庫存現金) + 企業及個人 (含非營利團體) 在其他貨幣機構 **支票存款** 以及 **活期存款**。
- $M1B = M1A + \text{個人 (含非營利團體) 在其他貨幣機構之活期儲蓄存款}$ 。
 - 活期儲蓄存款利率較活期存款高，可查詢你存款的銀行比較這兩種的差別。
- $M2 = M1B + \text{準貨幣}$ 。
 - 準貨幣: 定期存款、定期儲蓄存款、外匯存款、中華郵政公司的郵政儲金總數、附買回交易餘額、外國人持有的新台幣存款、貨幣市場共同基金。

25.1 Money

The Best Measure of Money

- 經濟學家或政府在制定政策時，需要依賴數據了解貨幣的總供給量。
- M1或M2何種是好的衡量貨幣數量的標準呢？
- 如果M1與M2幾乎同步移動的話，用哪一種標準都沒關係。
- 然而情況並非如此
 - 1990s以前兩者大致同步移動
 - 1992 - 1994; 2004 - 2007; 2009 - 2011有異



25.2 Money, Prices, and GDP

The Quantity Theory of Money

- Irving Fisher, 1911, “The Purchasing Power of Money”.
 - 檢視貨幣供給數量 M 和最終財總消費 (名目GDP) $P \times Y$ 的關係。
 - P : price level; Y : aggregate output/real GDP.
- 貨幣流通速度 (Velocity of money) : $V = \frac{P \times Y}{M}$.
- $MV = PY \Rightarrow \ln(M) + \ln(V) = \ln(P) + \ln(Y)$.
- 假設貨幣流通速度不變 ($\% \Delta V = 0$) ,
 - $\% \Delta M = \% \Delta P + \% \Delta Y \Rightarrow \pi = \% \Delta P = \% \Delta M - \% \Delta Y$ (inflation eq.)

25.3 Inflation

What Causes Inflation?

- Milton Friedman: “inflation is always and everywhere a monetary phenomenon.”
- Hyper-inflationary episodes are always related to extremely rapid growth of the money supply.
- 央行印鈔票是否需要準備相對應的黃金呢？
 - Ans: 央行發行新台幣必須準備相對應的黃金以及外匯儲備。

項目	新台幣發行數額		黃金準備			外匯準備		
單位: 10億	鈔票	硬幣	重量 (kg)	價格 (千)	金額	美元	匯率	金額
109/3/31	2,351	116	410,237	1,553	637	57	30.231	1,713

25.3 Inflation

What Causes Inflation?

- 並非所有的央行印鈔票都需要準備黃金。
- Fed FAQ: Does Federal Reserve own or hold gold?
 - Short answer: no!
 - Federal Reserve Bank of New York雖然負責保管一些黃金 (\$600 million)，但所有者是美國財政部 (U.S. Treasury)，其中U.S. Mint代為保管 \$10.4 billion的黃金。
- Fed FAQ: Is U.S. currency still backed by gold?
 - Federal Reserve notes are not redeemable in gold, silver, or any other commodity.
 - Federal Reserve Banks must hold **collateral** equal in value to the Federal Reserve notes that the Federal Reserve Bank puts in to circulation.

25.3 Inflation

What Causes Inflation?

- 央行宣布即日起，市面上流通的新台幣面額將提高10倍，也就是百元紙鈔代表千元，而千元紙鈔代表萬元。並且所有人的銀行帳戶金額也跟著同步調整10倍，例如你原有銀行存款十萬元，即日起變為百萬。
- 請問這項政策會使你比昨日更富有十倍嗎？為什麼？
 - 不會，根據inflation equation: $\% \Delta M = \pi + \% \Delta Y$ 。
 - 由於實質產出不會一夜之間改變， $\% \Delta Y = 0$ 。
 - $\% \Delta M = 1,000\%$ ， $\pi = 1,000\%$ ，物價會一夕提高10倍，因此並不會變富有。
 - 有些受法律限制可能無法調整，例如借貸契約，貨到30天付款合約等。

補充: Multiple Deposit Creation

Simple Model - The Single Bank

- \$100 million open market purchase was conducted with First National Bank.
- First National Bank loans \$100 million and sets up checking accounts for the borrowers.
- These reserve will not stay at the bank for very long, because the borrowers will make purchases.
- A bank cannot safely make a loan for an amount greater than the excess reserves that it has before it makes the loan.

First National Bank		
Assets		Liabilities
Securities	-\$100m	
Reserves	+\$100m	

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Assets		Liabilities	
Securities	-\$100m	Checkable Deposits	+\$100m
Reserves	+\$100m		
Loans	+\$100m		

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補充: Multiple Deposit Creation

Simple Model - Banking System

- \$100 million of deposits created by First National Bank's loan is deposited at Bank A.
- If the require reserve ratio is 10%, this bank will have \$90 million of excess reserves.
- Bank A will make loans.

Bank A			
Assets		Liabilities	
Reserves	+\$100m	Checkable deposits	+\$100m

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Bank A			
Assets		Liabilities	
Reserves	+\$10m	Checkable deposits	+\$100m
Loans	+\$90m		

補充: Multiple Deposit Creation

Simple Model - Banking System

- \$90 million lent by Bank A is deposited in Bank B.
- If the require reserve ratio is 10%, this bank will have \$81 million of excess reserves.
- Bank B will make loans.

Bank B			
Assets		Liabilities	
Reserves	+\$90m	Checkable deposits	+\$90m

補充: Multiple Deposit Creation

Simple Model - Banking System

- Bank B will make loans.
- The \$81 million spent by the borrowers will be deposited in another bank.
- The initial \$100M increase of reserves becomes \$271M increase of checkable deposits in the system.
- If the banks choose to invest their excess reserves in securities, the result is the same.

Bank B			
Assets		Liabilities	
Reserves	+\$9m	Checkable deposits	+\$90m
Loans	+\$81m		

補充: Multiple Deposit Creation

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Assets		Liabilities	
Reserves	+\$9m	Checkable deposits	+\$90m
Securities	+\$81m		

補充: Multiple Deposit Creation

Simple Model - Banking System

- A single bank cannot by itself generate multiple deposit expansion.
- The banking system as a whole can generate a multiple expansion of deposits.
- The multiple increase in deposits is called the simple deposit multiplier.

- $$\Delta D = \frac{1}{rr} \times \Delta R.$$

Creation of Deposits (10 % reserve requirement)

Bank	Increase in Deposits	Increase in Loans	Increase in Reserves
First National	0m	100m	0m
A	100m	90m	10m
B	90m	81m	9m
C	81m	72.9m	8.1m
Total	1,000m	1000m	100m

補充: Multiple Deposit Creation

Critique of the Simple Model

- 央行看似可以透過改變法定準備率 (required reserve ratio) 來操控貨幣供給，實際上創造的過程並不是如此機械化的。
- 假使Bank A貸放出的\$90M未被存在銀行，而是用通貨的形式保留下來，\$100M的準備金最後只會創造出 $\$100M + \$90M = \$190M$ 貨幣供給。
- 另一個問題就是銀行可能不會貸放所有的超額準備，或是全數購買有價證券。
- 結論
 - 央行並不是唯一可影響貨幣供給的角色。
 - 存款戶的決策與銀行的決策都可能會影響貨幣供給。
 - 可以把牛牽到水邊，但牛不一定會喝水。

25.5 Bank Reserves and the Plumbing of the Monetary System

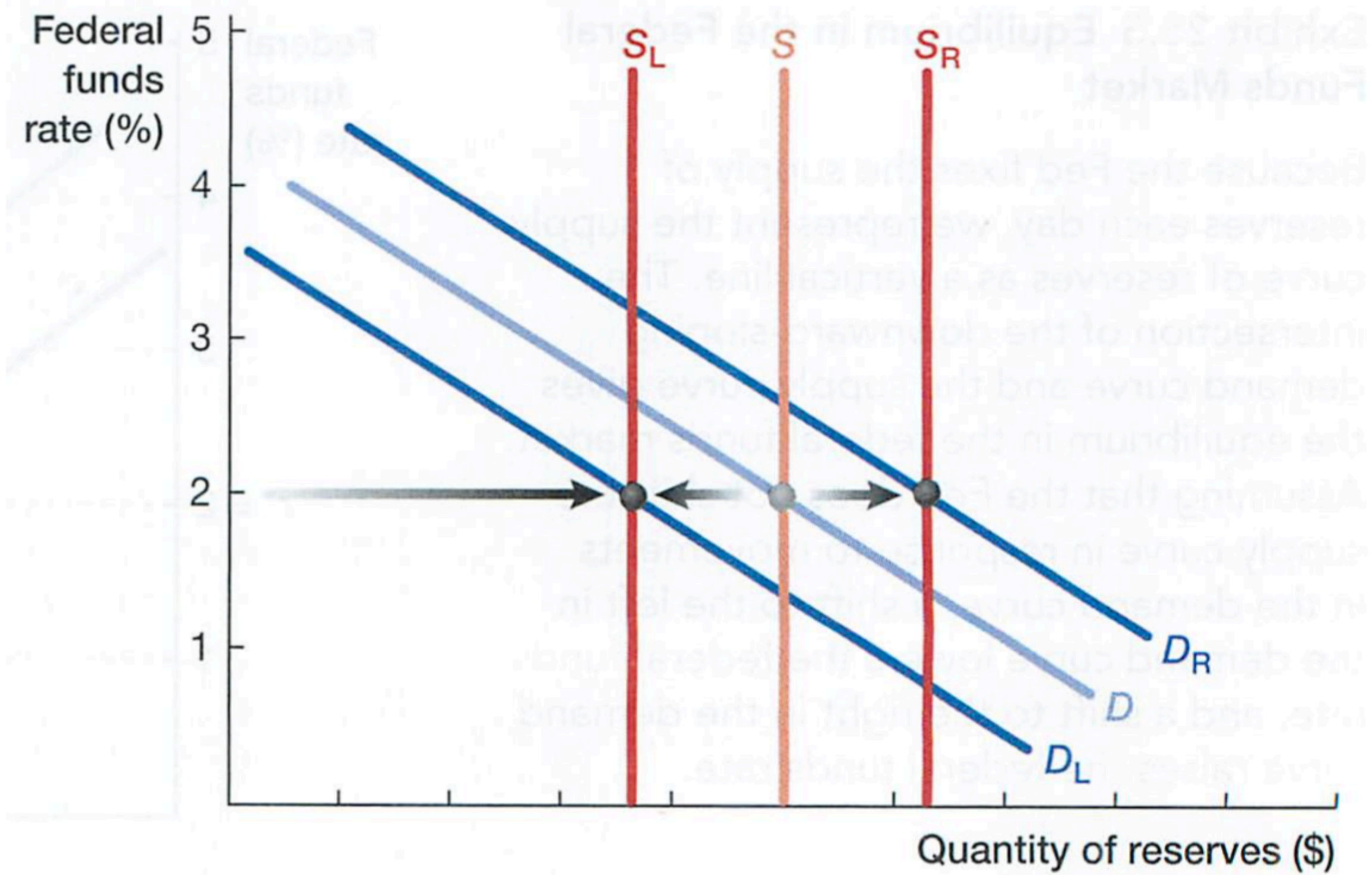
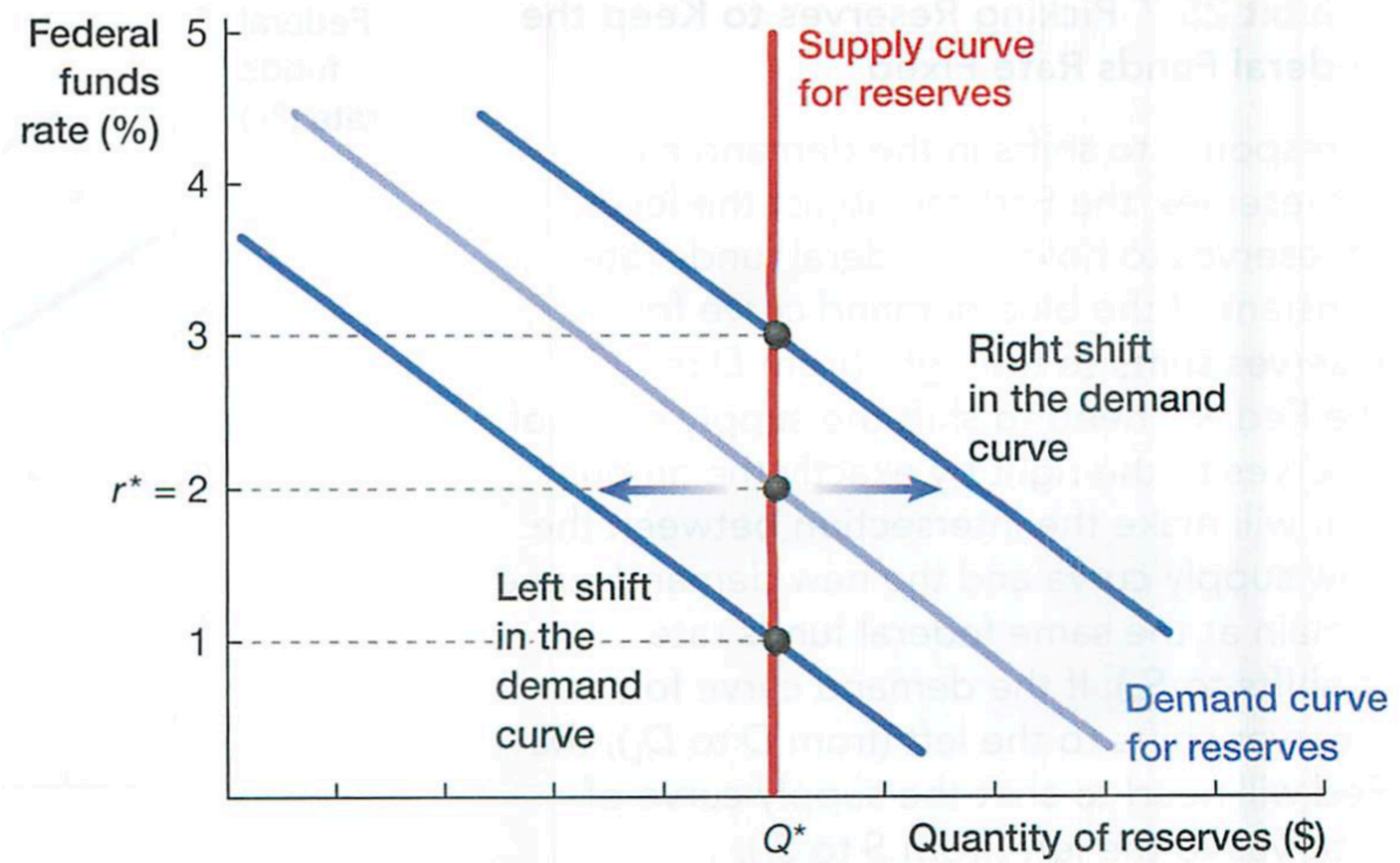
Federal Funds Market: Demand Side

- Demand = required reserves + excess reserves demanded.
- The five key reasons to shifts in the demand curve:
 - Economic expansion (\rightarrow) or contraction (\leftarrow).
 - Changing liquidity needs (\rightarrow).
 - Changing deposit base (\rightarrow).
 - Changing reserve requirement (\rightarrow).
 - Changing interest rate paid for having reserves on deposit at the Fed (\rightarrow).

25.5 Bank Reserves and the Plumbing of the Monetary System

Federal Funds Market: Supply Side

- Because the Fed fixes the supply of reserves each day, the supply curve of reserves is a vertical line.
- Open market operation: buying (\rightarrow)/ selling (\leftarrow) government bonds.
- The three basic policy levers for influencing the federal funds rate:
 - (S2: Exhibit 25.7) Changing the quantity of reserves supplied.
 - (S1: Exhibit 25.5) Changing the reserve requirement (has been phased out).
 - (S1: Exhibit 25.5) Changing the interest rate paid on reserves.



25.5 Bank Reserves and the Plumbing of the Monetary System

The Fed's Influence on the Money Supply and the Inflation Rate

- The Fed cannot directly control either the money supply or the inflation rate.
 - The Fed does controls the quantity of bank reserves, but the bank reserves are not part of the money supply.
 - The money supply includes deposits by households and firms and currency in circulation.
 - The money supply increases when banks make new loans.
 - The federal funds rate influences the long-term interest rates that affect the quantity of new loans demanded by households and firms.
- Federal funds rate (\uparrow), money supply (\downarrow), inflation (\downarrow).

25.5 Bank Reserves and the Plumbing of the Monetary System

降息

- 2007 - 2008 金融危機期間許多國家的央行都降息。日本銀行 (Bank of Japan) 甚至對超額準備採負利率，日本央行將對其存款 (也就是商業銀行的超額準備) 收取0.1%的利息。請問此項政策會如何改變銀行的誘因？為何會有央行要採取負利率政策？
- 如果存放超額準備在央行需要支付利息，則銀行會減少超額儲備。因此，對於準備金的需求就會減少，使得federal funds rate下降，最終會使長期名目/實質利率下降。
- 低利率鼓勵企業貸款與聘雇員工、鼓勵一般大眾借款消費。
- 然而當利率接近於0的時候，央行就難以使用其政策工具使利率下降。
- 此時央行就可能採取極端的手段，以進一步操縱federal funds market好刺激經濟。
- Note: federal funds rate is the interest rate that banks charge each other.