Multiple Deposit Creation

There are 4 players in the process of money creation

1. The central bank: issue currency, set required reserve ratio, making discount loans to banks
2. Depository institutions: money creation through loan making, borrow from central bank (discount loans), excess reserves
3. Depositors: currency-deposit ratio
4. Borrowers: borrow from banks

Balance Sheet of the Central Bank

Assets	Liabilities
Government Securities	Currency Issued
Discount Loans	Deposits with CB
Foreign Assets	…

準備貨幣 (Reserve Money; High-powered Money; Monetary Base (MB)) = 流通中通貨 (Currency in Circulation) + 金融機構準備金 (Total Reserves)
(=通貨發行額(Currency Issued) + 存放央行與其他行庫(Deposits with CB) - 央行庫存現金)

金融機構準備金(Total Reserves) = 存放央行與其他行庫(Deposits with CB) + 庫存現金(Vault cash)

準備貨幣 (RESERVE MONEY)

日平均數 單位：新台幣百萬元

年月	金融機構準備金 Total Reserves			貨幣機構及中華郵政儲匯處以外各部門持有通貨(通貨淨額) Currency in Circulation			準備貨幣
	計 Sub-total (1)=(2)+(3)	庫存現金 [1] Cash in vaults (2)	存放央行 Deposits with CB (3)	計 Sub-total (4)=(5)-(6)	通貨發行額 Currency issued (5)	庫存現金 [2] Cash in vaults (6)	Reserve money (7)=(1)+(4)
Jan. 2010	1,402,822	206,500	1,196,322	936,490	1,143,237	206,747	2,339,312

1 係指存款貨幣機構及中華郵政公司儲匯處持有部分。

2 係指全體貨幣機構及中華郵政公司儲匯處持有部分。

Remarks:

(1) The central bank can control MB better than it can control total reserves, because C/D may change.

(2) Total reserves (TR) include non-borrowed reserves (NBR) and borrowed reserves (BR) through discount loans (DL). Discount loans are partially determined by the decision of banks. Thus, what the central bank can fully control is non-borrowed reserves (NBR or TR-DL).

Deposits Creation by the Banking System

Recall M1B = C + D

Let required reserve ratio is r=10%.

Thus, TR = RR + ER = r×D + ER

Assumptions

(1) Banks do not hold excess reserves (ER = 0).

(2) Depositors do not hold currency (C = 0)

Suppose central bank use open market purchase to buy \$100 of Gov. bond from Bank 1,

Bank 1			
TR	+100		
S	-100		

Bank 1			
TR	+0		
S	-100		
L	+100		

Bank 2			
TR	+100	D	+100

Bank 2			
TR	+10	D	+100
L	+90		

Bank 3			
TR	+90	D	+90

Bank 3			
TR	+9	D	+90
L	+81		

Total deposits created is

$\Delta D = 100 + 90 + 81 + \ldots = \Delta TR + \Delta TR \times (1\text{-}r) + \Delta TR \times (1\text{-}r)^2 + \ldots$

$= \frac{\Delta TR}{r} = \frac{\$100}{0.1} = \$1000.$

When the process of money creation is completed

The Banking System			
TR	+100	D	+1000
L	+1000		
S	-100		

Central Bank		
S	+100	Deposits at CB +100

Recall that given the above two assumptions, total changes in the monetary aggregate is $\Delta M1B = \Delta D = \$1000$.

Since ER=0 and C=0,

TR = RR + ER = r×D, and MB=C+TR=TR.

Thus, $\Delta D = \frac{1}{r}\Delta TR$, and $\Delta M1B = \Delta C + \Delta D = \frac{1}{r}\Delta TR = \frac{1}{r}\Delta MB$.

Q: If r=0, will M1B does to infinity?

Example: Let the required reserve ratio for demand deposit be 10% and that for time deposit is 0%. Suppose a depositor transfers $100 from demand deposit to time deposit.

(1) The instant impact is that M1 decreases by $100 and M2 remains unchanged.

(2) What happen when the process of money creation is completed?

Bank 1			
RR	-10	D	-$100
ER	+10	TD	+100

Bank 1			
RR	-10	D	-$100
ER	+0	TD	+100
L	+10		

Bank 2			
TR	+10	D	+10

Total change in time deposit is +$100.

Total change in demand deposit is -$100 + $10 + $9 + $8.1 + … = $0.

Thus, M1 remains the same, while M2 rises by $100.

To derive the general formula of money multiplier, we relax the above two assumptions.

Assume $\frac{ER}{D}$ (controlled by banks and borrowers) and $\frac{C}{D}$ (controlled by the public) are constant in the short-run.

Since TR = RR + ER = r×D + ER,

MB = C + TR = C + r×D + ER;

$MB = C + TR = (\frac{C}{D} + r + \frac{ER}{D})\times D;$

By the definition of M1B,

$$M1B = C + D = (\frac{C}{D} + 1)\times D = \frac{\frac{C}{D}+1}{\frac{C}{D}+r+\frac{ER}{D}}\times MB$$

$= \boldsymbol{m}\times MB,$

where $\boldsymbol{m}$ is the money multiplier.

Remarks:

(1) The money multiplier decreases in ER/D, r, and C/D.

(2) The money multiplier reflects the maximum extent of a given amount of MB can expand. It represents an upper bound of money creation by the banking system.

Example: r=10%, C/D=0.5, ER/D=0.001, D=$1000.

(1) What are MB, M1B, and ***m***?

$$\boldsymbol{m} = \frac{\frac{C}{D}+1}{\frac{C}{D}+r+\frac{ER}{D}} = \frac{0.5+1}{0.5+0.1+0.001} = 2.4958.$$

M1B = C + D = $500 + $1000 = $1500.

MB = C + TR =$500 + (0.1+0.001)$1000 = $601.

(2) The Fed purchases $10 of Gov. bond in the open market operation, what are changes in M1B, C, and D after the process of money creation is completed?

$\Delta M1B = \mathrm{m} \times \Delta MB = 2.4958 \times (\Delta C + \Delta R) = 2.4958 \times \Delta R = 24.958.$

Thus, new M1B=1524.958.

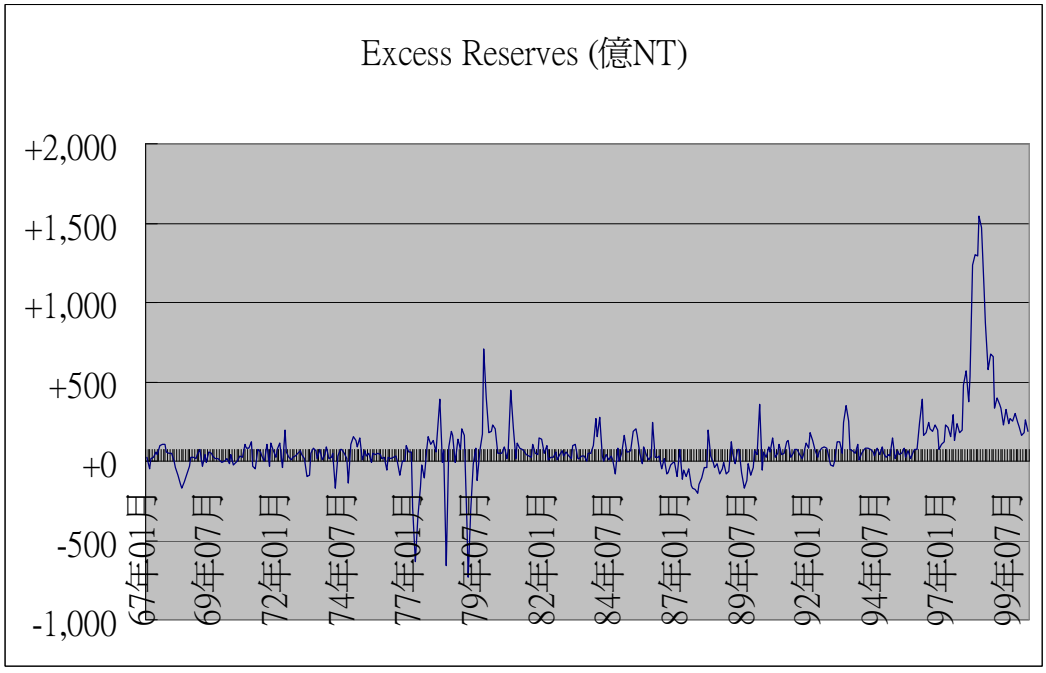
$M1B = 1524.958 = C + D = D(1+\frac{C}{D})$. Thus, new D = 1016.639 and C = 508.314.

Are ER/D and C/D constant over time?

(1) Take a look at ER/D of the banking system in Taiwan.

(2) During bank runs, panics, and contagion, C/D and ER/D rise substantially.

-- e.g., During 1930-33, MB increased by 20%, but M1 declined by 25% in U.S.



準備貨幣變動因素分析

以準備貨幣以外其它科目的資產或負債的變動，來說明影響準備貨幣變動的各個因素。

對於準備貨幣(通貨或存放央行)影響的方向

Assets		Liabilities	
國外資產	+	政府存款	-
對政府放款及墊款	+	國庫存款轉存款	-
公開市場操作買入有價證券	+	金融機構定期存款轉存款	-
對金融機構債權	+	央行發行之國庫券、定期存單及儲蓄券	-

(1) 國外資產: If the central bank interfere in the foreign exchange market, by buying foreign exchanges, then Deposits with CB rise.

(2) Discount Loans (DL)

Bank			
TR	+100	DL	+100

Central Bank			
DL	+100	Deposits at CB	+100

(3) Open Market Operation (OMO); e.g., open market purchase

Bank			
TR	+100		
S	-100		

Central Bank			
S	+100	Deposits at CB	+100

(4) 國庫存款轉存款：銀行業收受之國庫存款（稅收、國營事業盈餘繳庫）必須轉存央行。Then, banks' Deposits with CB declines and thus MB is lowered. For example, a household pays tax $100:

Bank 1			
TR	-100	D	-100

Bank of Taiwan			
TR	+100	稅款戶	+100

Central Bank			
		Deposits with CB	-100
		國庫轉存款	+100

On the other hand, when the government spends, it withdraws from 國庫轉存款 and make payments to contractors, public servants, etc., bank reserves increase.

Note: Changes of certain items in assets or liabilities may not cause MB to change if they do not affect C or TR. For example, interest incomes from foreign assets raise Foreign Assets of the central bank. This leads to a corresponding increase in the central bank's net worth, but has no effect on MB.

Tools of Monetary Policy

1. Open Market Operation (公開市場操作)
   中央銀行藉由在公開市場買賣證券來影響銀行準備金、準備貨幣及貨幣供給量，或者短期利率，以達成寬鬆或緊縮的貨幣政策。
   (a) Very often in Taiwan the central bank interferes in the foreign exchange market by buying foreign exchanges and issuing NT. To control for the monetary aggregates, the central bank will also use 公開市場賣出 (發行定期存單) and take back money from the banking system (沖銷（Sterilization）).
   (b) 動態操作（Dynamic Operation）vs. 防禦性操作（Defensive Operation）
   (c) 防禦性操作 example: 春節期間資金需求增加，央行可採
   (i) 換匯(swap): 購入美元，提供等值新台幣給市場，並在未來某一時點以事前議定價格賣出美元，收回新台幣。
   (ii) 附買回協定(repos)：央行向銀行買入附買回協定，釋出新台幣；在未來某一時點以事前議定價格賣回給銀行，收回新台幣。

2. Discount Lending: lender of last resort
   The central bank lends to financial institutions through the Discount Window, charging the discount rate (重貼現率).

3. Required Reserve Ratios (存款準備率)

4. 道義說服（moral suasion）
   中央銀行對各銀行表明其立場，不使用公開市場操作、重貼現率、存款準備率等工具，而希望藉說服的力量，來達成管制各銀行業務的目標。因此，此項政策又稱爲說教式管制（jaw-boning）。
   This monetary policy is an informal but usually quite effective and powerful tool.

5. Selective Credit Control(選擇性信用管制)
   (a) 保證金比率（Margin Requirement）：銀行對於以證券抵押申請貸款者，必須保留當時市價的某一比例作爲保證金。中央銀行可藉變更保證金比率以影響**證券市場**的活動、銀行的存款、與貨幣數量。
   (b) 消費者信用管制（Consumer Credit Control）：央行管制「分期付款信用」（installment credit）、信用卡等付款條件，藉調整分期付款信用的頭期款金額與償還期限與信用卡額度，削弱或刺激消費支出意願、銀行授信融通、與貨幣數量。
   (c) 不動產信用管制 (Real Estate Credit Control)：央行針對特定房地產開發、建築產業的融資進行數量與放款條件管制(for example, lowering the **loan-to-value ratio** of real estate development loans)。