Multiple Deposit Creation

There are 4 players in the process of money creation

1. The central bank
2. Depository institutions
3. Depositors
4. Borrowers

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) = 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 reserves, because C/D may change.
(2) Discount loans are partially determined by the decision of banks. Thus, what the central bank can fully control is non-borrowed reserves (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.

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 = $(\frac{C}{D} + r + \frac{ER}{D})$×D;

By the definition of M1B,

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

$= \boldsymbol{m}$×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: =10%, C/D=0.5, ER/D=0.001, D=$1000.

(1) What MB, M1B, and m?

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

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, what are changes in M1B and M2 after the process of money creation is completed?

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

$M1B = 1524.958 = C + D = D(1+\frac{C}{D})$. 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.