



ธนาคารแห่งประเทศไทย

Money multiplier (m)

m tells us how much the money supply changes for a given change in the monetary base.

$$\text{Money supply } M = m \cdot \text{monetary base MB}$$

money multiplier

$m > 1 \Rightarrow$ Monetary base is called high-powered money

eg. \$1 change in monetary base leads to more than a \$1 change in the money supply.

① Deriving the money multiplier:

$$\text{Currency ratio } c = \frac{C}{D} \quad \leftarrow \text{public desired holding of currency}$$

$$\text{Excess reserve ratio } e = \frac{ER}{D} \quad \leftarrow \text{checkable deposit}$$

$$\text{Excess reserve ratio } e = \frac{ER}{D} \quad \leftarrow \text{excess reserve.}$$

Assume that c & e are constant in equilibrium:

$$\text{Reserve equation } R = RR + ER \quad (1), \quad ER > 0 \text{ in equilibrium.}$$

$$R = RR$$

$$R = m \cdot D \quad (2)$$

$$\text{substitute } RR = m \cdot D \text{ in (1); } R = m \cdot D + ER$$

$$\text{From } MB = R + C; \quad MB = m \cdot D + ER + C$$

$$= (m \cdot D) + (e \cdot D) + (c \cdot D) = (m + e + c) \cdot D$$

$$\therefore D = MB / [m + e + c] \quad (3)$$



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using M1 definition of money supply as currency (C) plus checkable deposit (D) in circulation

$$M = D + C$$

$$= D + c \cdot D = (1+c) \cdot D$$

$$M = (1+c) \cdot D$$

subst. equation (3);

$$M = \frac{(1+c) \cdot MB}{\underbrace{(rr+e+c)}_{m}}$$

$$\therefore m = \frac{1+c}{rr+e+c}$$

$\uparrow$ set by Fed $\uparrow$ set by Bank $\uparrow$ set by depositors

ex $rr = 0.1$, $C = \$400$ billion, $D = \$800$ billion, $ER = \$0.8$ billion

$M = \text{money supply (M1)} = C + D = \$1,200$ billion. find $m = ?$

$$m = \frac{1 + \left(\frac{400}{800}\right)}{0.1 + \left(\frac{0.8}{800}\right) + \left(\frac{400}{800}\right)} = \frac{1.5}{0.601} \approx 2.5$$

$\therefore$ a \$1 increase in monetary base leads to a \$2.5 increase in money supply (M1).

Note: $m = 2.5$ is a lot less than in previous case ($m = 10$), because the assumption of $ER = 0$, no expansion of currency is relaxed here.



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Money supply in response to changes in the factors

$$MB = MB_n + BR$$

$$\therefore M = m \cdot MB$$

$$= m [MB_n + BR], m > 1$$

Case 1; rr increase from 10% to 15% $\therefore m$ falls from 2.5 to

$$m = \frac{1 + 0.5}{(0.15) + 0.001 + 0.5} = 2.3$$

Case 2; ρ increase from 0.5 to 0.75 $\therefore m$ falls from 2.5 to

$$m = \frac{1 + (0.75)}{0.1 + 0.001 + (0.75)} = 2.06$$

Case 3; e increase from 0.001 to 0.005 $\therefore m$ falls from 2.5 to

$$m = \frac{1 + 0.5}{0.1 + (0.005) + 0.5} = 2.48$$

$\hookrightarrow e$ plays little role on m