

appendix 1  
to chapter

# I6

## The M2 Money Multiplier

The derivation of a money multiplier for the M2 definition of money requires only slight modifications to the analysis in the chapter. The definition of M2 is:

$$M2 = C + D + T + MMF$$

where  $C$  = currency in circulation  
 $D$  = checkable deposits  
 $T$  = time and savings deposits  
 $MMF$  = primarily money market mutual fund shares and money market deposit accounts, plus overnight repurchase agreements and overnight Eurodollars

We again assume that all desired quantities of these variables rise proportionally with checkable deposits so that the equilibrium ratios  $c$ ,  $t = \{T/D\}$ , and  $mm = \{MMF/D\}$  set by depositors are treated as constants. Replacing  $C$  by  $c \times D$ ,  $T$  by  $t \times D$ , and  $MMF$  by  $mm \times D$  in the definition of M2 just given, we get:

$$\begin{aligned} M2 &= D + (c \times D) + (t \times D) + (mm \times D) \\ &= (1 + c + t + mm) \times D \end{aligned}$$

Substituting in the expression for  $D$  from Equation 2 in the chapter,<sup>1</sup> we have

$$M2 = \frac{1 + c + t + mm}{r + e + c} \times MB \quad (1)$$

To see what this formula implies about the M2 money multiplier, we continue with the same numerical example in the chapter, with the additional information that  $T = \$2,400$  billion and  $MMF = \$400$  billion so that  $t = 3$  and  $mm = 0.5$ . The resulting value of the multiplier for M2 is:

$$m_2 = \frac{1 + 0.5 + 3 + 0.5}{0.10 + 0.001 + 0.5} = \frac{5.0}{0.601} = 8.32$$

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<sup>1</sup>From the derivation here it is clear that the quantity of checkable deposits  $D$  is unaffected by the depositor ratios  $t$  and  $mm$  even though time deposits and money market mutual fund shares are included in M2. This is just a consequence of the absence of reserve requirements on time deposits and money market mutual fund shares, so  $T$  and  $MMF$  do not appear in any of the equations in the derivation of  $D$  in the chapter.

An important feature of the M2 multiplier is that it is substantially above the M1 multiplier of 2.5 that we found in the chapter. The crucial concept in understanding this difference is that a lower required reserve ratio for time deposits or money market mutual fund shares means that they undergo more multiple expansion because fewer reserves are needed to support the same amount of them. Time deposits and MMFs have a lower required reserve ratio than checkable deposits—zero—and they will therefore have more multiple expansion than checkable deposits will. Thus the overall multiple expansion for the sum of these deposits will be greater than for checkable deposits alone, and so the M2 money multiplier will be greater than the M1 money multiplier.

## Factors That Determine the M2 Money Multiplier

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### Changes in $r$ , $c$ , and $e$

The economic reasoning analyzing the effect of changes in the required reserve ratio and the currency ratio on the M2 money multiplier is identical to that used for the M1 multiplier in the chapter. An increase in the required reserve ratio  $r$  will decrease the amount of multiple deposit expansion, thus lowering the M2 money multiplier. An increase in  $c$  means that depositors have shifted out of checkable deposits into currency, and since currency has no multiple deposit expansion, the overall level of multiple deposit expansion for M2 must also fall, lowering the M2 multiplier. An increase in the excess reserves ratio  $e$  means that banks use fewer reserves to support deposits, so deposits and the M2 money multiplier fall.

We thus have the same results we found for the M1 multiplier: ***The M2 money multiplier and M2 money supply are negatively related to the required reserve ratio  $r$ , the currency ratio  $c$ , and the excess reserves ratio  $e$ .***

### Response to Changes in $t$ and $mm$

An increase in either  $t$  or  $mm$  leads to an increase in the M2 multiplier, because the required reserve ratios on time deposits and money market mutual fund shares are zero and hence are lower than the required reserve ratio on checkable deposits.

Both time deposits and money market mutual fund shares undergo more multiple expansion than checkable deposits. Thus a shift out of checkable deposits into time deposits or money market mutual funds, increasing  $t$  or  $mm$ , implies that the overall level of multiple expansion will increase, raising the M2 money multiplier.

A decline in  $t$  or  $mm$  will result in less overall multiple expansion, and the M2 money multiplier will decrease, leading to the following conclusion: ***The M2 money multiplier and M2 money supply are positively related to both the time deposit ratio  $t$  and the money market fund ratio  $mm$ .***

The response of the M2 money supply to all the depositor and required reserve ratios is summarized in Table 1.

**SUMMARY** Table 1 Response of the M2 Money Supply to Changes in  $MB_n$ ,  $DL$ ,  $r$ ,  $e$ ,  $c$ ,  $t$ , and  $mm$ 

Variable	Change in Variable	M2 Money Supply Response	Reason
$MB_n$	↑	↑	More $MB$ to support $C$ and $D$
$DL$	↑	↑	More $MB$ to support $C$ and $D$
$r$	↑	↓	Less multiple deposit expansion
$e$	↑	↓	Fewer reserves to support $C$ and $D$
$c$	↑	↓	Less overall deposit expansion
$t$	↑	↑	More multiple deposit expansion
$mm$	↑	↑	More multiple deposit expansion

Note: Only increases (↑) in the variables are shown; the effects of decreases in the variables on the money multiplier would be the opposite of those indicated in the "Response" column.