Determinants of the Money Supply

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11. 20. 2014
The Fed is not the only player

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- **Depositors’** decisions regarding how much currency to hold

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- **Depositors’** decisions regarding how much currency to hold
- **Borrowers’** decisions on how much to borrow from banks

The Fed can exert more precise control over the MB than it can over total reserve alone
The money multiplier

\[ M = m \times MB \]

Deriving the Money Multiplier
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Deriving the Money Multiplier

\[ c = \frac{C}{D} = \text{currency ratio, reflects depositors' and borrowers' decisions} \]

\[ e = \frac{ER}{D} = \text{excess reserves ratio, reflects banks', and depositors' decisions} \]
■ Deriving the Money Multiplier (continued)
  
  ■ \( R = RR + ER = rr \times D + e \times D \)

■ M1 is the money supply as currency plus checkable deposits
Deriving the Money Multiplier (continued)

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- $MB = R + C = rr \times D + e \times D + c \times D$

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- \( R = RR + ER = rr \times D + e \times D \)
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- **M1** is the money supply as currency plus checkable deposits

  - \( M = D + c \times D = \frac{1+c}{rr+e+c} MB \)
  - \( m = \frac{1+c}{rr+e+c} \)
  - \( \Delta M = m \times \Delta MB \)
1 < m < 1/r (when m = 1/r?)

c > 0 ⇒ the level of currency increases when MB and D increase. That is, some portion of the increase in high-powered money finds its way into currency. Currency does not undergo multiple deposit expansion.

e > 0 ⇒ an increase in MB and D leads to higher excess reserves. ⇒ the reserves used to support checkable deposit and the money supply will not increase as much as it otherwise would
Intuition behind the money multiplier

- $r_r=0.1$, $C=$400, $D=$800, $E_R=$0.8, $M=$1,200

Although there is multiple expansion of deposits, there is no such expansion for currency.
Intuition behind the money multiplier

- \( r_r = 0.1, \ C = \$400, \ D = \$800, \ ER = 0.8, \ M = \$1,200 \)
- \( c = ?, \ e = ? \)

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Intuition behind the money multiplier

- $r = 0.1$, $C = 400$, $D = 800$, $ER = 0.8$, $M = 1200$
- $c = ?$, $e = ?$
- $m = ?$

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Money Multiplier

- **Money supply responses to changes in the factors**
  - $rr=0.15$, $c=0.5$, $e=0.001$
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- $rr=0.15, c=0.5, e=0.001$
- $rr=0.1, c=0.75, e=0.001$
Money Multiplier

Money supply responses to changes in the factors

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- $rr=0.1$, $c=0.75$, $e=0.001$
- $rr=0.1$, $c=0.5$, $e=0.005$
Things that change $m$

- $m$ decreases in $r$
Things that change \( m \)

- \( m \) decreases in \( r \)
  - \( r \uparrow \Rightarrow \) deficiency in reserves \( \Rightarrow \) banks must contract loans \( \Rightarrow \) decline in deposits and hence in the money supply (M1)
Thangs that change m

- m decreases in r
  - r↑⇒deficiency in reserves⇒banks must contract loans⇒decline in deposits and hence in the money supply (M1)
  - The reduced money supply relative to the same MB ⇒decrease in money multiplier
Determinants of the Money Supply and Tools of Monetary Policy

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  - r↑ ⇒ deficiency in reserves ⇒ banks must contract loans ⇒ decline in deposits and hence in the money supply (M1)
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- As long as r+e<1, m decreases in c
Things that change m

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  - $r^\uparrow \Rightarrow$ deficiency in reserves $\Rightarrow$ banks must contract loans $\Rightarrow$ decline in deposits and hence in the money supply (M1)
  - The reduced money supply relative to the same MB $\Rightarrow$ decrease in money multiplier
- As long as $r+e<1$, m decreases in c
  - $c^\uparrow \Rightarrow$ depositors are converting some of their checkable deposits into currency. $\Rightarrow$ overall level of multiple expansion declines
Things that change m

- m decreases in e
■ Things that change m

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■ e↑ ⇒ the banking system is using fewer reserves to support checkable deposits ⇒ loans will contract ⇒ a decline in checkable deposits and a decline in the money supply (M1) given the same level of MB ⇒ m↓
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  - \(e \uparrow \Rightarrow\) the banking system is using fewer reserves to support checkable deposits \(\Rightarrow\) loans will contract \(\Rightarrow\) a decline in checkable deposits and a decline in the money supply (M1) given the same level of MB \(\Rightarrow\) m \(\downarrow\)
  - e decreases in market interest rate i. More costly for banks to hold excess reserves
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  - e↑ → the banking system is using fewer reserves to support checkable deposits → loans will contract → a decline in checkable deposits and a decline in the money supply (M1) given the same level of MB → m↓
  - e decreases in market interest rate i. More costly for banks to hold excess reserves
  - e increases in expected deposit outflows. Expected benefits for holding excess reserves increase
Summary: Factors that determine the money supply

- Non-borrowed monetary base (+)
  - $MB_N = MB - \text{discount loans} = MB - DL \Rightarrow MB = MB_N + DL$
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Non-borrowed monetary base(+) 

- $MB_N = MB - \text{discount loans} = MB - DL \Rightarrow MB = MB_N + DL$
- $MB_N$ increases with open market purchases, decreases with open market sales
- Directly under the control of the Fed
Things that change m

- **Discount Loans** (+)
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Discount Loans (+)

- Fed sets $i_D$ = discount rate
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- $i_D > i$ market interest rate $\Rightarrow$ banks rarely borrow from Fed
Changes in the required reserve ratio
Changes in currency holdings
Changes in excess reserve
Monetary policy: the management of money supply and interest rates

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Federal funds rate: the interest rate on overnight loans of reserves from one bank to another
Monetary policy: the management of money supply and interest rates
  - Interest rates are price or cost of borrowing
Federal funds rate: the interest rate on overnight loans of reserves from one bank to another
  - The market for reserves is where the federal funds rate is determined
3 Monetary policy tools

\[ M1 = m \times (MB_N + BR) \]

- Discount window, Discount Rate \( i_d \)
- Open Market Operation
- \( r \): Required Reserve Ratio
The federal funds rate is the primary indicator of the stance of monetary policy

All three tools of monetary policy affect the federal funds rate
Supply and Demand in the Market for Reserves
Supply and Demand in the Market for Reserves
The discount rate puts a ceiling on the Fed funds rate.

The interest rate paid on reserves, $i_{er}$, sets a floor for the federal funds rate.
Ex 1: An open market purchase
Ex 2: The discount rate is lowered by the Fed I
Ex 2: The discount rate is lowered by the Fed II
Ex 3: The required reserve is raised by the Fed II
Monetary policy goals

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- Steady economic growth
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Financial market stability
- Fostered by interest-rate stability
- Financial crises lead to a sharp contraction in economists activity
- Foreign exchange stability
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- Uncertainty
Tim inconsistency: Incentive to deviate from optimal long-run policy in short run, leads to suboptimal long-run policies

Central bank’s time inconsistency

- Anticipated inflation has little real effect: Prices rise, but employment, real output, etc., stay the same

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Credibility and Low Inflation

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- Low inflation is not time consistent

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Policies tools → operating/policy instrument → intermediate target → goals

3 tools of monetary policy: OMO, reserve requirement, and the discount rate

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  - reserve aggregate
  - federal funds rate and other short-term interest rates
  - exchange rate (small countries)
Intermediate target:
- monetary aggregate like M2
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- long-term interest rates