Central Bank Definitions of Money

- There are alternative definitions of the total money stock: monetary aggregates.

- **M0**: Monetary base, the stock of fiat money.

- **M1**: This is the narrowest measure of money. It includes only highly liquid assets that can be used to make transactions: currency held outside commercial banks and checkable deposits.

- **M2**: This measure of money includes M1 plus assets that can easily be converted into a medium of exchange, like savings deposits, for example.

- **M3**: This is the broadest measure of money. It includes M2 plus some relatively illiquid assets like large-denomination time deposits.
Total Money Supply in Our Model

- The monetary base is $M_0 = M_t$.

- Let $M_1$ be called the money supply, the total nominal stock of deposits in period $t$:
  \[ M_t = \gamma(M_1)_t \iff (M_1)_t = \frac{M_t}{\gamma}. \]

- An increase of one unit in the monetary base will result in an increase of \( \frac{1}{\gamma} > 1 \) units in $M_1$.

- \( \frac{1}{\gamma} \) is called the money multiplier and the monetary base is called high powered money.

- The price level still obeys the Quantity Theory of Money:
  \[ p_t = \frac{M_t}{\gamma N_t h_t} = \frac{(M_1)_t}{N_t h_t}. \]
Total Money Supply in Our Model

- If the demand for deposits does not depend on the rate of return on deposits \((M1)_t\) is more useful than \(M_t\) in predicting the behavior of prices.

- Given the amount of deposits, prices change proportionally to \((M1)_t\) regardless of the tool used to change \((M1)_t\) (a change in \(M_t\) or a change in \(\gamma\)).

- If the demand for deposits depends on the rate of return on deposits, then the change in prices depends on the tool used to change \(M1\):
  - \(\gamma \downarrow \ M1 \uparrow \ r^* \uparrow \ h \uparrow\), but
  - \(z \uparrow \ M1 \uparrow \ r^* \downarrow \ h \downarrow\).

- In this economy, the effects on seigniorage and output of a change in \(M1\) also depend on the tools used to change it, thus we may not want to look only at \(M1\) when discussing monetary policy.
Central Bank Lending

If banks fall short on their reserve requirements they can:

1. sell interest-bearing assets;
2. borrow from other banks; or
3. borrow from the central bank.

Central bank lending, by altering the effective reserve requirement, can be used to affect output, capital, and price level.

A central bank lending policy consists on the amount it is willing to lend and the rate of return it charges.

Suppose the central bank sets a limit $\delta$ on the share of banks’ reserves that it will finance.

This is given by $\delta = \frac{\Gamma_t^B}{\Gamma_t^B + M_t}$, where $\Gamma_t^B$ is the nominal amount of borrowed reserves.
Central Bank Lending

To understand the effect of $\delta$ on the price level note that the demand for money comes from the reserve requirement which can be satisfied by borrowed and non-borrowed reserves:

$$\delta \gamma N_t h_t + v_t M_t = \gamma N_t h_t.$$

Meaning $p_t = \frac{1}{v_t} = \frac{M_t}{\gamma (1-\delta) N_t h_t}$.

Central bank lending raises the price level, and if all reserves are provided by the central bank, the effect is the same as of having no reserve requirements.

Central bank lending also increases the size of intermediated investment to

$$ (1 - \gamma) N_t h_t + \delta \gamma N_t h_t = [1 - \gamma (1 - \delta)] N_t h_t.$$
Central Bank Lending

- Central bank lending also affects the total money stock, since required reserves must now equal the sum of borrowed and non-borrowed reserves:

\[ \gamma(M1)_t = \delta \gamma(M1)_t + M_t. \]

- Meaning \((M1)_t = \frac{M_t}{\gamma(1-\delta)}\).

- To analyze the effect of central bank lending on the interest rate on deposits, let \(\psi\) be the real gross rate of return paid on central bank loans. Then:

\[ r^* = \gamma \left( \frac{n}{z} \right) + [1 - \gamma(1 - \delta)]x - \psi \delta \gamma. \]

- What if \(\delta = 0, \psi = x,\) and \(\psi = \frac{n}{z}\)?

- Central bank lending is generally equivalent to a decrease in reserve requirement.