# Monetary Policy Implementation in the US
## ECON 40364: Monetary Theory & Policy

Eric Sims

University of Notre Dame

Fall 2020

# Readings

- Mishkin Ch. 15, pg. 341-348

# Modern Monetary Policy

- For the last three or four decades, central banks around the world have moved away from paying much attention to monetary aggregates and instead focus more directly on interest rates

- Think (roughly) of central banks as wanting to stabilize nominal expenditure

- From the quantity equation:

$$M_t V_t = \overline{PY}$$

- If $V_t$ is stable, targeting $M_t$ makes sense

- But if it's not, paying attention to money supply is not that useful and may be counterproductive

# Instability of Velocity: Movement Away from Focusing on Monetary Aggregates

- ▶ Paul Volcker and the Fed experimented with targeting monetary aggregates in the early 1980s
- ▶ This brought inflation down from the 1970s, but led to high and variable interest rates
- ▶ Most monetary economists concluded that the demand for money is not in fact stable, i.e. a rejection of monetarism
- ▶ If the money supply is not closely and predictably connected to aggregate spending, targeting the money supply probably not a good policy
- ▶ This has led most monetary economists to instead favoring focusing on short term interest rates as the target of monetary policy, as we saw with a discussion of the Taylor rule and the Fed controlling the Fed Funds Rate (FFR)

# The Taylor Rule

- Since the early 1980s, the Fed focuses more on *interest rates* than monetary aggregates in implementing policy
  - Since 1994, have formally announced target FFR (level or range)
  - From 1982-1994, this was implicitly done by the FOMC
- John Taylor (1993) posited that the Fed sets interest rates (the Federal Funds rate) as a function of the deviations of inflation from target and output from "potential":

$$i_t = r^P + \pi_t^* + \phi_\pi(\pi_t - \pi_t^*) + \phi_Y(Y_t - Y_t^*) + e_{i,t}$$

- $r^P$ is the natural rate of interest (think about this as long run average real interest rate), $\pi_t^*$ is an exogenous inflation target, $Y_t^*$ is "potential output," and $e_{i,t}$ is an exogenous shock (0 on average)
- Taylor argued that roughly: $r^P = 2$, $\pi_t^* = 2$, $\phi_\pi = 1.5$, and $\phi_Y = 0.5$
- Some ambiguity about how to measure $Y_t^*$
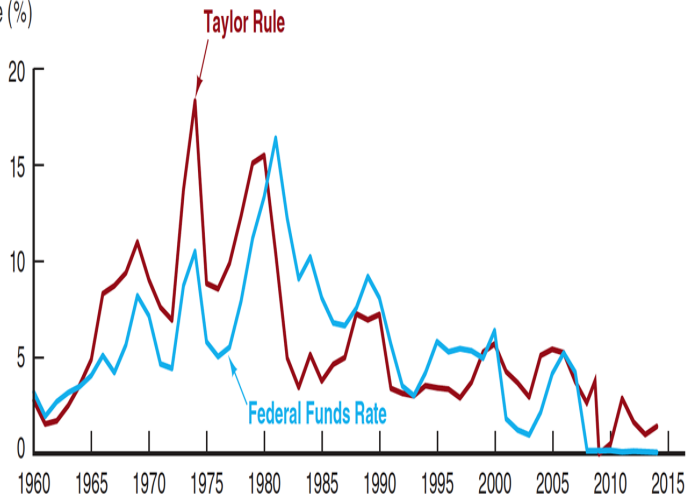
# How Does Fed Target FFR?

- The Federal Funds Rate (FFR) is the interest rate on interbank loans of reserves – the federal funds market
- Though not directly relevant for households and firms, this influences rates relevant to them (as we shall see)
- Banks have to meet their reserve requirement daily. If they have too few reserves, they can go to the Federal Funds market and borrow. If they have too many reserves, they can go to the Federal Funds market and lend
- The FFR is an *equilibrium* interest rate that balances the supply and demand for reserves in the interbank market. The Fed does not literally "set" the FFR
- Alternatively, if a bank has a reserve deficiency, it can borrow reserves directly from the Fed at the discount rate. The discount rate is set by the Fed
- If banks have excess reserves, they may be able to earn interest (since 2008) on reserves held at the Fed. This is the interest rate on reserves

# Demand for Reserves Federal Funds market

- ▶ Banks are required to hold reserves and can choose to hold excess reserves
- ▶ Excess reserves are insurance against unexpected withdrawals
- ▶ The FFR represents an opportunity cost of holding excess reserves – the higher it is, the more interest a bank is giving up by holding excess reserves
- ▶ Hence, the demand for excess reserves (and hence the total demand for reserves) is decreasing in the FFR
- ▶ The demand for reserves is bound from below by the interest rate on reserves: if interest on reserves is higher than FFR, banks would want to borrow funds in the interbank market to earn the higher rate on holding reserves, which would drive up the FFR to the interest rate on reserves
- ▶ Notation: $i_{ff}$ is the FFR, $i_d$ is the discount rate, and $i_{or}$ is the interest rate on reserves

# Demand in the Federal Funds Market
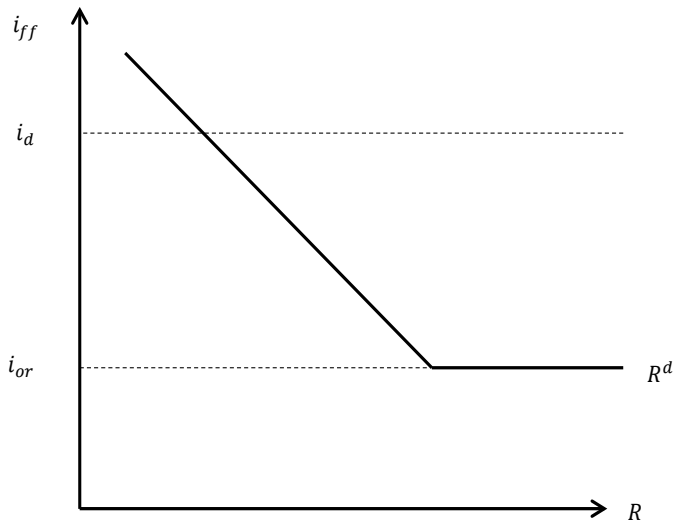
# Supply for Reserves Federal Funds market

- If $i_{ff} < i_d$, banks will not borrow from the Fed. Hence, the supply of reserves just equals non-borrowed reserves, which the Fed can set

- Hence, the supply curve for reserves is vertical at $i_{ff} < i_d$

- But $i_d$ places a ceiling on $i_{ff}$. If $i_{ff} > i_d$, then banks would borrow from the Fed to lend in the interbank market (i.e. engage in arbitrage). Hence, borrowed reserves would rise infinitely with $i_{ff} > i_d$

- Therefore, the supply curve of reserves, which is the sum of non-borrowed reserves ($NBR$, which the Fed sets) and borrowed reserves ($BR$, which is determined by banks borrowing at the discount window), is horizontal at $i_{ff} = i_d$.
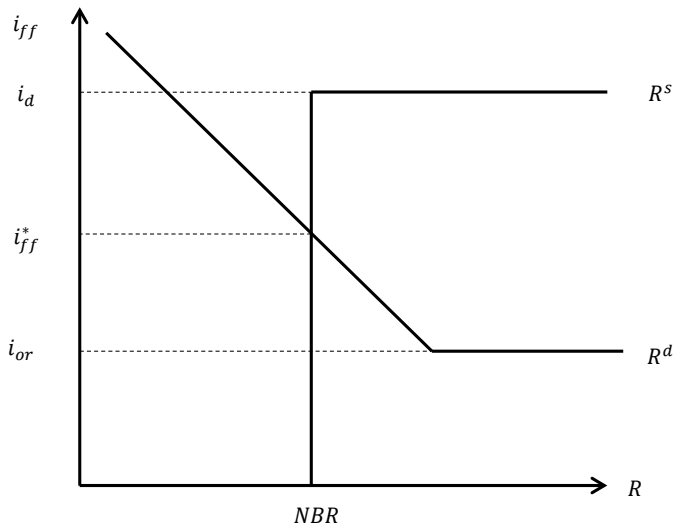
# Supply in the Federal Funds Market
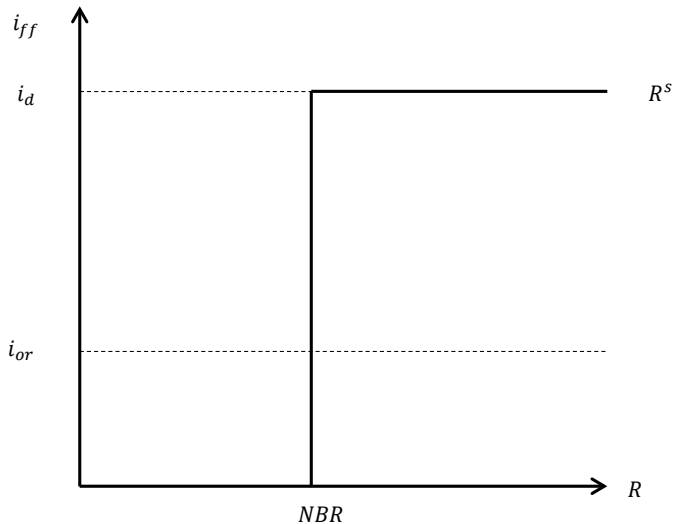
# Equilibrium in Normal Times

- Prior to the Great Recession, we had $i_{or} = 0$ and $i_{ff} < i_d$
- Hence, the equilibrium FFR was determined where the downward-sloping demand for reserves intersects the vertical supply of reserves set by the Fed
- Call this equilibrium FFR $i_{ff}^*$

# Equilibrium in the Federal Funds Market

# How Does Fed Target FFR?

▶ Since 1994, the Fed formulates its target monetary policy through a target (range) for the FFR, $i_{ff}^*$

▶ How can it do this? Four ways:
  1. Open market operations: change position of supply of non-borrowed reserves
  2. Discount rate: changes upper bound on reserve supply
  3. Reserve requirement: changes demand for reserves
  4. Interest on reserves: changes lower bound on reserve demand

▶ (1)-(2) impact reserve supply, (3)-(4) impact reserve demand

▶ In "normal" times, (2) and (4) do not affect the FFR

▶ In practice, prior to 2008 open market operations the most important tool ("corridor system"). Post 2015, interest on reserves ("floor system")

# Open Market Purchase
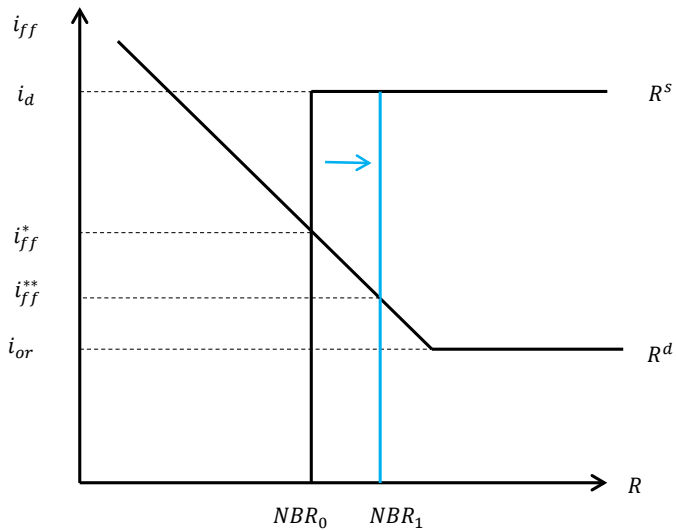
# Open Market Purchase

- An open market purchase shifts the supply curve of reserves to the right, which lowers the FFR in normal times
- More reserves results in more money supply via the standard money multiplier argument
- Hence, can think of lowering the FFR as equivalent to increasing the money supply
- And vice-versa

# Changes in Discount Rate

- In ordinary circumstances, changes in the discount rate have no effect on the FFR
- For example, a (sufficiently small) cut in the discount rate shifts the flat portion of the supply curve down, but this does not affect the FFR
- But if demand intersects supply at the flat portion, a cut in the discount rate results in the FFR falling
- If $i_{ff} = i_d$, then there will be some borrowed reserves, $BR$
- A cut in the discount rate will lead to an increase in borrowed reserves and therefore an increase in total reserves and an expansion in the money supply

# "Non-Binding Cut" in Discount Rate
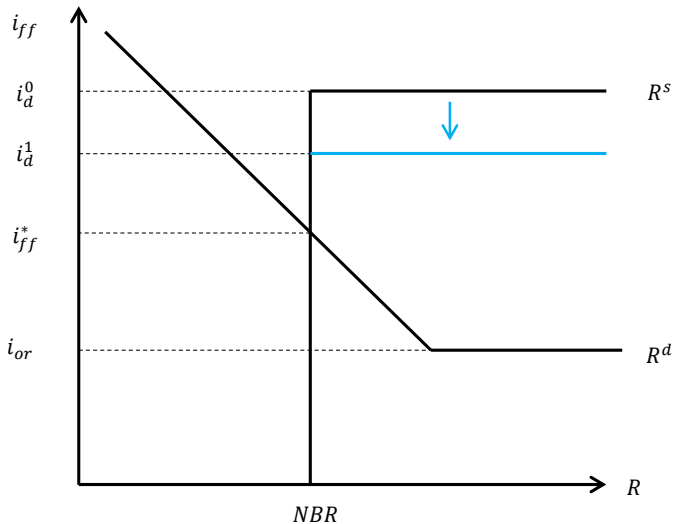
# "Binding" Cut in Discount Rate
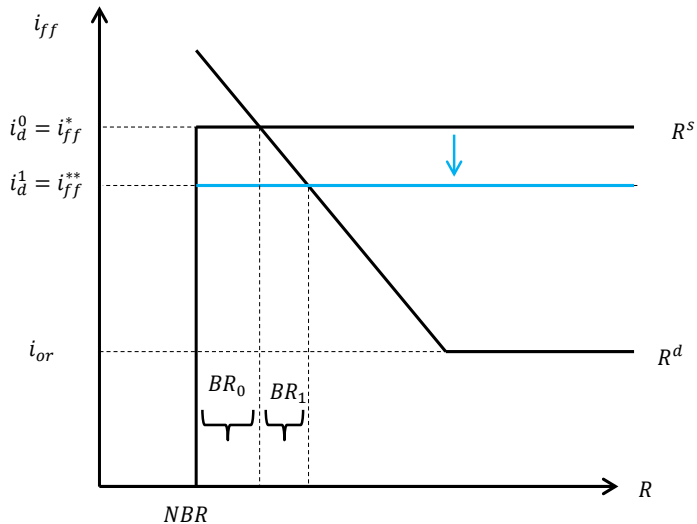
# Changes in Required Reserve Ratio

- A higher reserve requirement means banks will want more reserves, other things being equal
- Increase in the reserve requirement increases the demand for reserves
- The rightward shift of the demand curve will result in the FFR rising
- Though total reserves don't change (in normal times), the money multiplier will be smaller, so the money supply falls

# Increase in the Required Reserve Ratio
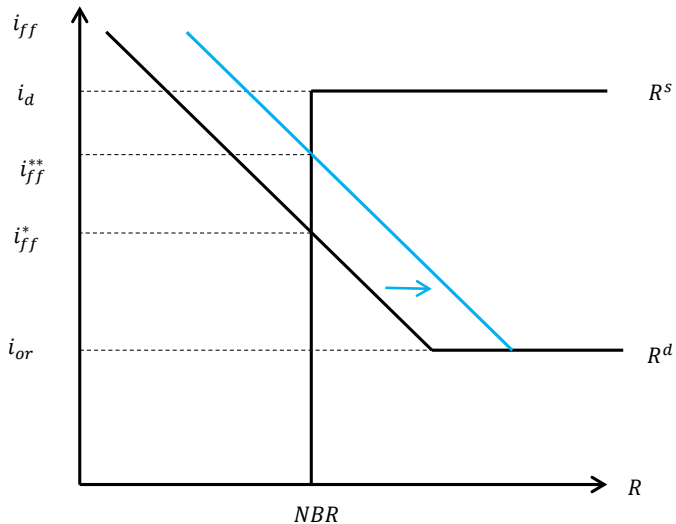
# Changes in Interest on Reserves

- ▶ In ordinary circumstances, increasing the interest on reserves does not affect the FFR
- ▶ But if equilibrium initially occurs on the flat portion of the demand curve, an increase in the interest rate on reserves raises the FFR
- ▶ Relevant for thinking about "post-crisis" monetary policy – reserves have been increased so much that equilibrium is now on the flat portion of the demand curve

# "Non-Binding" Increase in Interest on Reserves
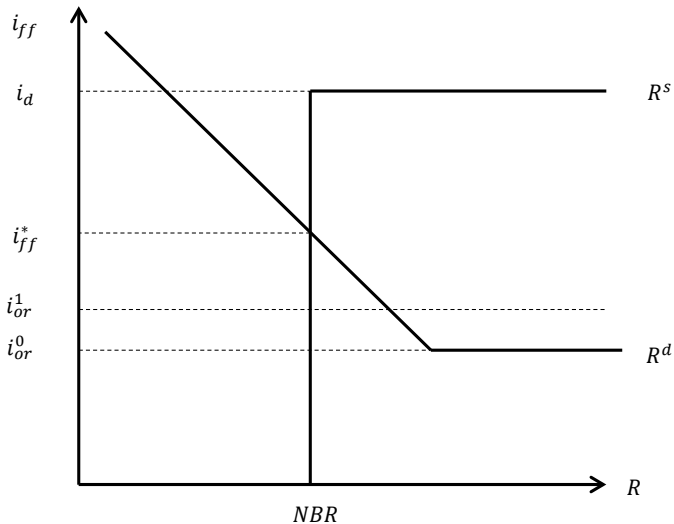
# "Binding" Increase in Interest on Reserves
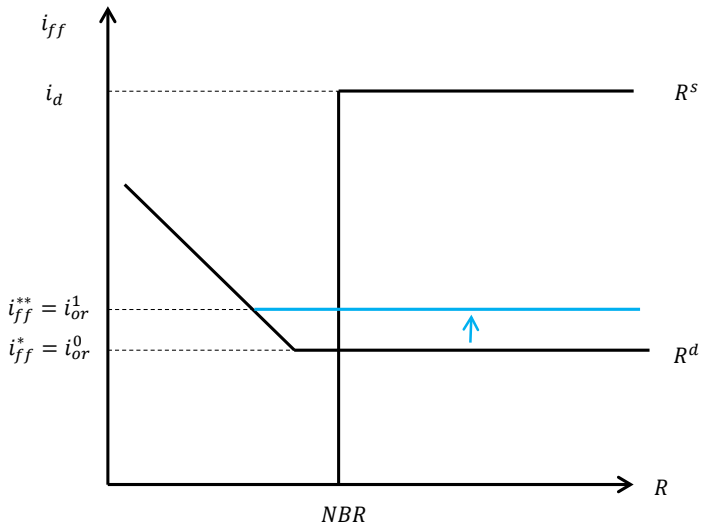
# Target FFR on Interest on Reserves Post-Crisis

# Summary: Tools of Managing Money Supply

- In practice, Fed tends to target interest rates (the FFR) rather than monetary aggregates (M1 or M2)
- Can target the FFR using four tools:
    1. Open market operations
    2. Required reserve ratio
    3. Discount rate
    4. Interest on reserves
- These move the money supply and FFR in opposite directions – (1)-(2) by changing monetary base (reserve supply), (3)-(4) by impacting multiplier (reserve demand)
- "Expansionary" monetary policy: raising money supply / cutting FFR