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Figure 1: Effective federal funds rate and the upper and lower bounds of the target range

Line chart, January 2015 to March 2023. Units are basis points, or hundredths of one percentage point. The three series are Effective federal funds rate (EFFR) and the upper and lower bounds of the federal funds target range established by the Federal Open Market Committee. The EFFR remains between the target rate bounds for nearly the entire series. The three series begin near zero and increase at an accelerating rate until early 2019, plateauing near 250 basis points. The three series then quickly fell back to zero in early 2020 and remained there until early 2022 when the series started increasing at a rapid pace, ending on Mar. 17, 2023 near 450 basis points.

Note: This figure shows the effective federal funds rate and the upper and lower bounds of the federal funds target range established by the Federal Open Market Committee. A basis point is one hundredth of one percentage point. The gray shaded bar indicates a period of business recession as defined by the National Bureau of Economic Research. The shaded recession period extends from February 2020 through April 2020.

Source: Board of Governors of the Federal Reserve System.

Figure 2: Stylized Supply and Demand Curves For Reserves in the Federal Funds Market

Figure 2 illustrates a demand and supply curve. The y axis denotes the level of interest rates; the x axis denotes the quantity of reserves. The demand curve is a line drawn downward sloping. The y intercept is at a point labeled "discount rate" at a random, positive value above zero. The line then moves down steeply, so that one portion of the curve is steeply downward sloping. The line eventually levels off and becomes nearly flat (that is, has a slope of zero), so that a second portion of the curve is entirely nearly flat. The point that the curve levels off is between the two points labeled "IORB rate" and "ON RRP rate," which are below the "discount rate" but above zero. The supply curve is a vertical line. It intersects the demand curve on its flat portion. The intersection of the two curves has a y-axis value labeled "FFR."

Note: FFR is federal funds rate. IORB is interest rate on reserve balances. ON RRP is overnight reverse repurchase agreement.

Source: Figure 2 in Jane Ihrig and Scott Wolla (2022), "Let's Close the Gap: Updating the Textbook Treatment of Monetary Policy," *Journal of Economic Education,* vol. 53 (3), pp. 232–49.

Illustration of a Reverse Repo Transaction

The figure has two pictures. The first picture depicts the first leg of the RRP transaction and is labeled "reserve balances fall." On the left is a box that says "Fed sells security to counterparty,"

on the right is a box that says "Counterparty gives funds to Fed." There is an arrow from the left box to the right, and an arrow from the right box to the left. The second picture depicts the second leg of the RRP transaction and is labeled "reserve balances rise." On the left is a box that says "Fed returns funds to counterparty," on the right is a box that says "Counterparty returns security to Fed." There is an arrow from the left box to the right, and an arrow from the right box to the left.

Source: Figure 3 in Jane Ihrig, Zeynep Senyuz, and Gretchen Weinbach (2020), "The Fed's 'Ample-Reserves' Approach to Implementing Monetary Policy," Finance and Economics Discussion Series 2020-022 (Washington: Board of Governors of the Federal Reserve System, February), https://doi.org/10.17016/FEDS.2020.022.

Figure 3: Fed lowers the federal funds rate by decreasing administered rates

Figure 3 is the illustration of how the demand curve adjusts with the expansion of monetary policy. The y axis denotes the level of interest rates; the x axis denotes the quantity of reserves. The demand curve is a line drawn downward sloping. The demand curve's end points are lowered than Figure 2. The y intercept is at a point labeled "discount rate "with a lower discount rate than Figure 2. The line then moves down steeply, so that one portion of the curve is steeply downward sloping. The line eventually levels off and becomes nearly flat (that is, has a slope of zero), so that a second portion of the curve is entirely nearly flat. The point that the curve levels off is between the two points labeled "IORB rate" and "ON RRP rate," which are below the "discount rate" but above zero. However, the curve levels off lower than in Figure 2, because the IORB Rate and ON RRP rates are lower. The supply curve is a vertical line. It intersects the demand curve on its flat portion. The intersection of the two curves has a y-axis value labeled "FFR." The FFR is also lower than the FFR in Figure 2. There are two points on the supply line, the top point indicates the previous equilibrium effective federal funds rate. The lower point is at the intersection of the demand curve and supply line, indicating the new equilibrium effective federal funds rate.

Note: The blue dot indicates the previous equilibrium federal funds rate, and the red square indicates the new equilibrium federal funds rate. FFR is federal funds rate. IORB is interest rate on reserve balances. ON RRP is overnight reverse repurchase agreement.

Source: Figure 4 in Jane Ihrig and Scott Wolla (2022), "Let's Close the Gap: Updating the Textbook Treatment of Monetary Policy," Journal of Economic Education, vol. 53 (3), pp. 232–49.

Figure 4: Graphical comparison of scarce-reserves regime (left panel) and ample-reserves regime (right panel)

This figure has two panels and each panel contains charts demonstrating the same demand and supply curves as Figure 2 and 3 . There are two key differences between these figures. First, the demand curve on the left is flat around zero on the y axis (near the horizontal axis), while the demand curve on the right is flat above zero and lies between the "IORB rate" and "ON RRP Rate." Second, the vertical supply curve intersects the demand curve at different points. In the left figure the intersection is on the downward sloping portion of the demand curve, while on the right it is on the flat portion of the demand curve. For both charts, the intersection of the two curves has a y-axis value labeled "FFR."

Note: FFR is federal funds rate. IORB is interest rate on reserve balances. ON RRP is overnight reverse repurchase agreement.

Source: Figure 5 in Jane Ihrig and Scott Wolla (2022), "Let's Close the Gap: Updating the Textbook Treatment of Monetary Policy," Journal of Economic Education, vol. 53 (3), pp. 232–49.

Figure 5: Pass-through of policy rate changes

Line chart, January 2015 to March 2023. Units are basis points, or hundredths of one percentage point. The four series are the interest on reserve balances (IOR), formerly interest on excess reserves and interest on required reserves, effective federal funds rate (EFFR), secured overnight financing rate (SOFR), and overnight reverse repurchase agreements award rate (ON RRP rate). All four series move together with EFFR and SOFR remaining between IOR and ON RRP rate for nearly the entire series. The four series begin near zero and increase at an accelerating rate until early 2019, plateauing near 250 basis points. Here SOFR frequently spikes beyond IOR, seeing spikes to 315 basis points and 525 basis points. The four series then quickly fell back to zero in early 2020 and remained there until early 2022 when the series started increasing at a rapid pace, ending on Mar. 17, 2023 near 450 basis points.

Note: This figure shows the interest on reserve balances (IOR)--formerly, interest on excess reserves and interest on required reserves--effective federal funds rate (EFFR), Secured Overnight Financing Rate (SOFR), and overnight reverse repurchase agreements (ON RRP) award rate. A basis point is one hundredth of one percentage point. The gray shaded bar indicates a period of business recession as defined by the National Bureau of Economic Research. The shaded recession period extends from February 2020 through April 2020.

Source: Federal Reserve Bank of New York; Board of Governors of the Federal Reserve System.

Figure 6: Federal Reserve total assets and reserve balances as a percentage of GDP

Line chart, January 2003 to March 2023. Units are percent. The two series are total assets less eliminations from consolidation on the balance sheet of the Federal Reserve and the sum of total reserve balances maintained plus vault cash used to satisfy required reserves, both divided by gross domestic product (GDP) of the United States. Both series move together, but total assets are larger throughout the series. Total assets start near 6% and reserve balances start near 0%. Both jump sharply in late 2008 and slowly climb to until 2014 peaking at 25% and 15% for total assets and reserve balances respectively. The series start to decline until late 2019 when both jump sharply to 36% and 16% for total assets and reserve balances respectively. Both series remain near these new elevated levels for the remainder of the series. Reserve balances ending in Jan. 2023 and Federal Reserve total assets ending in Mar. 2023.

Note: the figure shows total assets less eliminations from consolidation on the balance sheet of the Federal Reserve and the sum of total reserve balances maintained plus vault cash used to satisfy required reserves, both divided by gross domestic product (GDP) of the United States. Data for Federal Reserve assets are month−end values from weekly data and data for reserve balances are monthly. The gray shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. The two shaded recession periods extend from December 2007 through June 2009 and February 2020 through April 2020.

Source: Board of Governors of the Federal Reserve System; U.S. Bureau of Economic Analysis, Gross Domestic Product.

Figure 7: Measures of Corporate and Household Borrowing Rates

Line chart, January 2018 to March 2023. Units are percent. The three series are the effective federal funds rate (EFFR), ICE BofA BBB US Corporate Index effective yield, and 30-year fixed rate mortgage average in the United States. The EFFR begins around 1.5% and increase to around 2.5%. It then quickly fell back to 0% in early 2020 and remained there until early 2022 when it started increasing at a rapid pace, ending Mar. 17, 2023 near 4.5%. The ICE BofA BBB yield and 30-year fixed rate average move together very closely. Both series begin around 4%, increasing to 5% in late 2018 before beginning to slowly fall through 2021. The ICE BofA yield spiked sharply on the way down in early 2020, reaching close to 6%. After bottoming near 3%, both series begin to climb at an accelerating rate for the remainder of the series, ending for 30-year on Mar. 16, 2023 and ICE BofA on Mar., 20, 2023 near 6%-7%.

Note: This figure shows the effective federal funds rate, ICE Bank of Amaerica (BofA) triple-B US Corporate Index effective yield, and 30−year fixed rate mortgage average in the United States. Mortgage rate data are weekly, and the other series are daily. The gray shaded bar indicates periods of business recession as defined by the National Bureau of Economic Research. The shaded recession period extends from February 2020 through April 2020.

Source: Board of Governors of the Federal Reserve System; Ice Data Indices, LLC; Freddie Mac.

Figure 8: PCE inflation

Line chart, January 2008 to January 2023. Units are percent change from the same month one year ago. The series is percent change in the personal consumption expenditures price index (PCE) from 12 months ago. The series begins near 3.5% before quickly falling to -1.5% and reverting to 2% in 2009. The series remains between 1% and 3% for most of 2010 - 2020. The series increases sharply from 2020 to 2022 peaking near 7% and ending the series on Jan. 2023 near 5%.

Note: This figure shows the percent change in the personal consumption expenditures (PCE) price index from 12 months ago. The gray shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. The two shaded recession periods extend from December 2007 through June 2009 and February 2020 through April 2020.

Source: U.S. Bureau of Economic Analysis, Personal Consumption Expenditures Price Index.

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