

Problem Set 3 - Suggested Solutions

Chapter 15: Questions 4, 11-15, 25

4. Reserves will decrease by \$1000, checkable deposits will decrease by \$1000, but the monetary base will be unchanged, since reserves decrease by the same amount as currency increases.
11. False. As the formula in Equation (4) indicates, if $rr + e$ is greater than 1, the money multiplier can be less than 1. In practice, however, e is so small that $rr + e$ is less than 1 and the money multiplier is greater than 1.
12. A financial panic would probably decrease the money multiplier and the money supply, for a given monetary base. In a financial panic, you would expect banks to want to make less risky loans, and have more liquidity on hand, which would increase the excess reserve ratio and decrease the money multiplier. In addition, depositors may get worried about the health of banks, and increase their holdings of currency, which also would decrease the money multiplier.
13. Both of these factors worked to reduce the money multiplier. This can be seen in Figure 3 in the chapter, which indicates a dramatically declining money supply, while the monetary base grew modestly, if at all.
14. Paying interest on reserves gives banks incentive to hold more reserves rather than lend them out, which should raise the excess reserve ratio, reduce the money multiplier, and reduce the money supply, holding the monetary base constant.
15. The difference is that the monetary base increased dramatically during the recent financial crisis, which was more than enough to offset the fall in the multiplier. During the Great Depression, the monetary base rose modestly, if at all.
25. (a) The money supply is given as $M = C + D = \$600 \text{ billion} + \$900 \text{ billion} = \$1500 \text{ billion}$; $c = C/D = 600/900 = 0.667$; $e = ER/D = 15/900 = 0.017$; $m = (1 + c)/(rr + e + c) = 1.667/0.783 = 2.13$. (b) The monetary base will increase to $\$600 + \$90 + \$15 + \$1400 = \$2105 \text{ billion}$; given the money multiplier calculated in part (a), this implies the money supply should increase to $\$2105 \times 2.13 = \4483.65 billion . (c) $ER = \$1415 \text{ billion}$; $e = \$1415/\$900 = 1.57$; $m = (1 + 0.667)/(0.1 + 1.57 + 0.667) = 0.71$. The money supply is still \$1500 billion, since both currency and deposits have not changed. (d) The results from part (c) demonstrate that if large amounts of reserves enter the banking system but are held as excess reserves, it is possible for the money multiplier to fall below one.

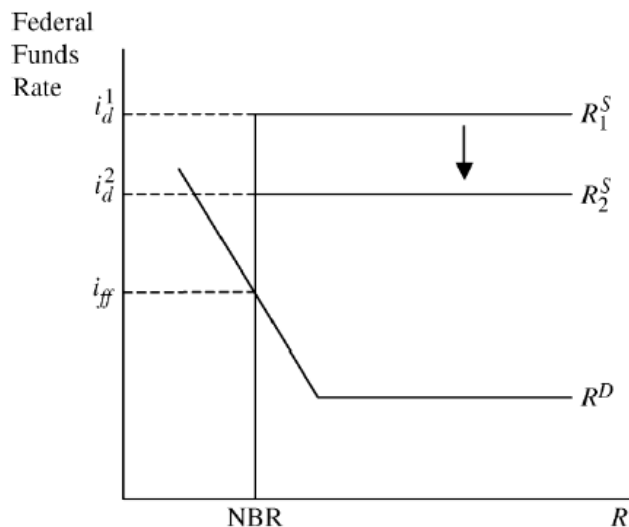
Chapter 16: Questions 1, 2, 6, 8, 16, 24, 25

1. The snowstorm would cause float to increase, which would increase the monetary base. To counteract this effect, the manager will undertake a defensive open market sale of securities using a reverse repo transaction.
2. When the public's holding of currency increases during holiday periods, the currency-checkable deposits ratio increases and the money supply falls. To counteract this decline in the money supply, the Fed will conduct a defensive open market purchase of securities.

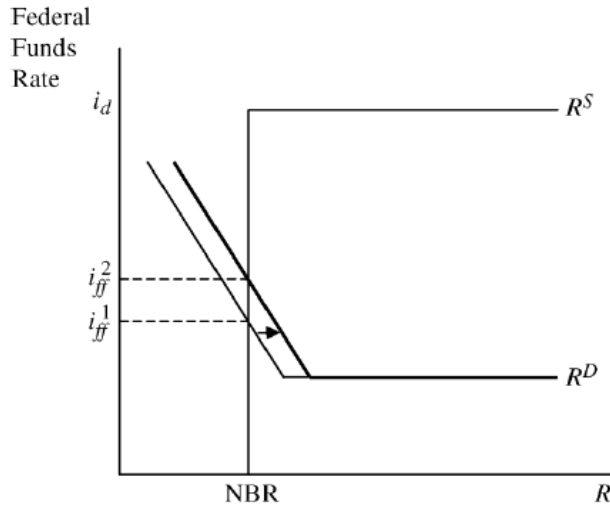
6. Uncertain. In theory, the market for reserves model indicates that once the fed funds rate reaches the discount rate, it would never surpass the discount rate since banks would then borrow directly from the Fed, and not in the fed funds market, which would prevent the fed funds rate from ever rising above the discount rate. However, in practice, the fed funds rate can (and has) been above the discount rate. This may occur due to the stigma associated with banks borrowing directly from the Fed; i.e., banks may prefer to pay a higher market rate than to borrow directly from the Fed and incur the perceived stigma. In addition, nonbank financial institutions, which do not have access to the discount window, can and do participate in the federal funds market. The extent to which nonbank financial companies participate in the fed funds market may mean that the gap when the fed funds rate is above the discount rate may not be arbitrated away.
8. During crises, the Fed may need to provide a large amount of liquidity to the banking and financial system, which would reduce the fed funds rate. If the Fed needs to sterilize these effects, it would need to conduct open market sales of securities to maintain a given fed funds rate target. If the liquidity provision is large, then offsetting the liquidity could eventually result in the Fed running out of securities to sell. In this case, the interest rate on reserves can be raised to push the fed funds rate

up, without having to conduct offsetting open market sales that decrease the holdings of government securities by the Fed.

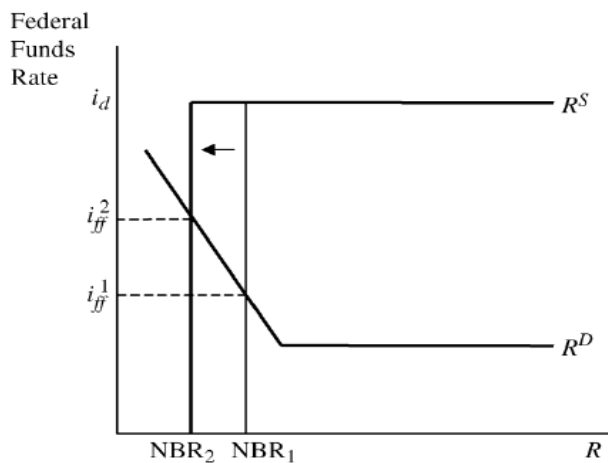
16. False. As the analysis in the market for reserves demonstrates, central banks can still tightly control interest rates by putting in place standing facilities where the difference between the interest rate paid on reserves kept at the central bank and the interest rate charged by the Fed to banks is kept small.
24. In most cases, the discount rate is set far enough above the fed funds target rate such that, even if there was a reduction in the discount rate with no change in the target fed funds rate, the equilibrium rate would still be below the discount rate, thus banks would still be better off borrowing at the market rate rather than the discount rate. In other words, even if the discount rate decreases, the amount of borrowed reserves may not change since the equilibrium will still fall below the discount rate, as shown in the graph below.



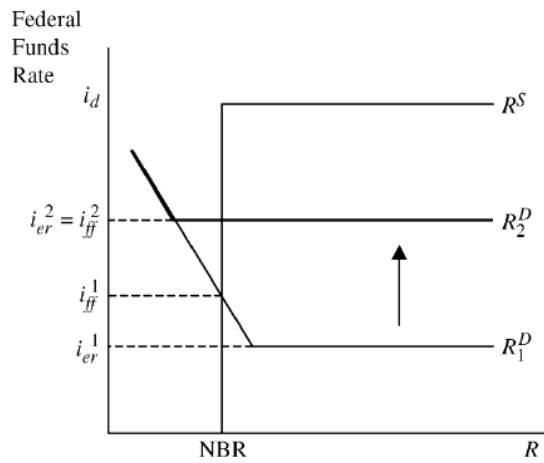
25. (a) A rise in checkable deposits leads to a rise in required reserves at any given interest rate, and thus shifts the demand curve to the right. If the federal funds rate is initially below the discount rate, this then leads to a rise in the federal funds rate. As shown below, borrowed reserves and non-borrowed reserves do not change. If the federal funds rate is initially at the discount rate, then the federal funds rate will just remain at the discount rate, but borrowed reserves will increase.



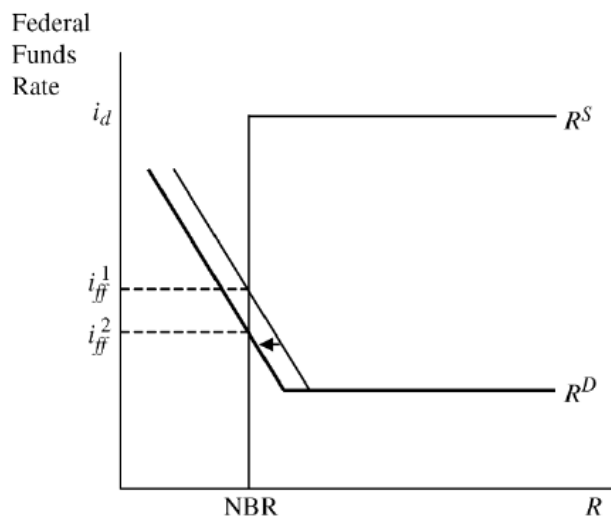
- (b) If banks expect that an unusually large increase in withdrawals will occur in the future, they will want to hold more excess reserves today, meaning the demand for reserves will increase at any given interest rate. This will have the same effect on the fed funds rate, NBR , and BR as in part (a) above.
- (c) To raise the target fed funds rate, the Fed will have to conduct an open market sale of securities, which will shift the supply of non-borrowed reserves to the left. The fed funds rate will increase, and as long as the equilibrium fed funds rate remains below the discount rate, borrowed reserves will remain the same.



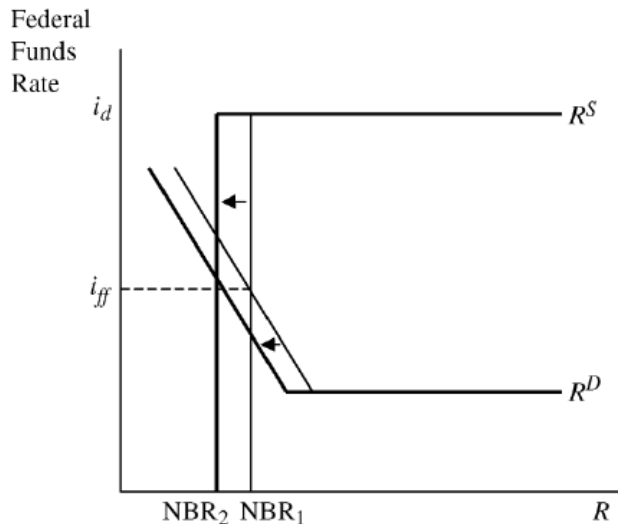
- (d) Raising the interest rate on reserves above the current fed funds rate means that the floor of reserve demand will push the equilibrium fed funds rate up along with the interest rate on reserves. Both borrowed reserves and non-borrowed reserves will remain the same.



- (e) A decrease in required reserves shifts the demand for reserves line to the left, at any given interest rate. The result is that the fed funds rate decreases, and NBR and BR remain unchanged.



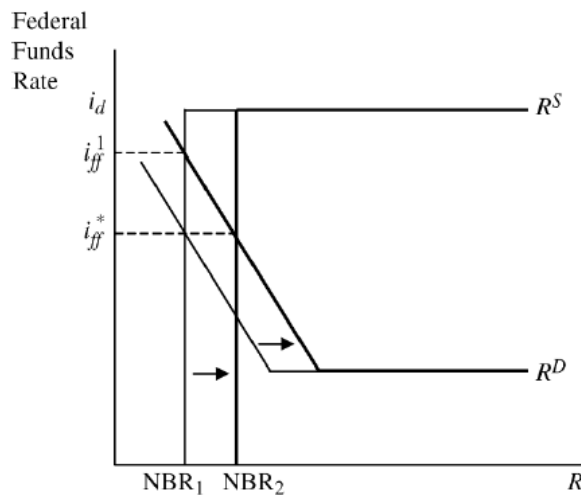
- (f) With the decrease in required reserves, this reduces reserve demand as shown in part (e) above. This will decrease the equilibrium fed funds rate. In order to sterilize the effects and keep the fed funds rate unchanged, the Fed will conduct an open market sale of securities, shifting the reserve supply line to the left. The end result is that the fed funds rate and borrowed reserves will be unchanged, and non-borrowed reserves will decrease.



Chapter 17: Questions 1, 2, 7, 17, 23, 24, 25

1. A nominal anchor helps promote price stability by tying inflation expectations to low levels directly through its constraint on the value of money. It can also limit the time-inconsistency problem by providing an expected constraint on monetary policy.
2. Central bankers might think they can boost output or lower unemployment by pursuing overly expansionary monetary policy even though in the long run this just leads to higher inflation with no gains to increasing output or lowering unemployment. Alternatively, politicians may pressure the central bank to pursue overly expansionary policies.
7. Inflation targeting increases the accountability of monetary policymakers, and is a mechanism of self-discipline which effectively ties the hands of policymakers to commit to a policy path. Because of the transparency of an inflation targeting framework, it is very easy to verify whether policymakers are faithful to a committed policy path. As a result, there is much less ability and incentive for policymakers to deviate to a discretionary policy which could increase output or raise the inflation rate, therefore mitigating the time-inconsistency problem.
17. (a) The ten-year bond is an intermediate target because it is not directly affected by the tools of the Fed, but is linked to economic activity. (b) The monetary base is a policy instrument because it can be directly affected by the tools of the Fed and is only linked to economic activity through its effect on the money supply. (c) M1 is an intermediate target because it is not directly affected by the tools of the Fed and has some direct effect on economic activity. (d) The fed funds rate is a policy instrument because it can be directly affected by the tools of the Fed.

23. (a) If unemployment rises, this would lower the output gap, and trigger a lower fed funds rate according to the Taylor rule. (b) If inflation rises by 1%, this alone would prompt the fed funds rate to rise by 1.5 percentage points. The decrease in the output gap alone would imply the fed funds rate would fall by 0.5 percentage points. Thus, the two factors together imply a net effect of increasing the fed funds rate by one percentage point according to the Taylor rule. (c) Prolonged increases in productivity growth would increase potential output, and with the same rate of actual output growth this would cause the output gap to decline, resulting in a decline in the fed funds rate according to the Taylor rule. (d) If potential output declines, this is the opposite of (c) above, so the fed funds rate would rise according to the Taylor rule. (e) If the inflation target is revised downward, this would increase the inflation gap at any given inflation rate. This would result in a higher fed funds rate according to the Taylor rule.
24. An increase in the demand for reserves will raise the federal funds rate. In order to maintain the interest rate target, the Fed will buy bonds, thereby increasing the amount of nonborrowed reserves, which shifts the supply curve for reserves to the right, thereby keeping the fed funds rate from rising, as shown below. The open market purchase will then cause the monetary base and the money supply to rise.



25. (a) Assuming the output gap and all other parameters remain constant, the Taylor Rule is $\bar{r} = \pi^e + 2 + 0.5(\pi^e - 2) + 0.5(1)$, where π^e is expected inflation. Thus, if $\pi^e = 4\%$, then the fed funds rate should be set to $4 + 2 + 0.5(2) + 0.5 = 7.5\%$. (b) If the measure of expected inflation is the average of the two forecasts, then $\pi^e = 0.5(3\% + 5\%) = 4\%$. In this case, again the Taylor rule would imply a setting of the fed funds rate of 7.5%. (c) If the measure of expected inflation is the average of the two forecasts, then $\pi^e = 0.5(0\% + 8\%) = 4\%$. In this case, again the Taylor rule would imply a setting of the fed funds

rate of 7.5%. (d) Probably not. In the situation in part (a), it is assumed that there is very little uncertainty about what inflation will be, thus a Taylor rule approach to policy may work fine. However, in (b) and (c), there is clearly more uncertainty about the state of the economy, and therefore having a mechanical rule to dictate policy without accounting for this uncertainty could be problematic. For instance, in part (c), if future inflation actually turned out to be closer to 0%, the Taylor rule policy may prove to be too tight, and could push the economy into a deflationary situation. This example highlights why judgment and discretion in interpreting data are important parts of the monetary policy process.