ECON 160: Money and Banking

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Chapter 14

ANSWERS TO QUESTIONS

Unless otherwise noted, the following assumptions are made in all questions: the required reserve ratio on checkable deposits is 10%, banks do not hold any excess reserves, and the public's holdings of currency do not change.

1. *Classify each of these transactions as an asset, a liability, or neither for each of the "players" in the money supply process—the federal reserve, banks, and depositors.*

   a. *You get a $10,000 loan from the bank to buy an automobile.*

      Public: Assets rise by $10,000 due to automobile purchase, liabilities rise by $10,000 due to loan. Banks: Assets rise by $10,000 due to loan; this is offset by a decrease in reserves assets of $10,000.

   b. *You deposit $400 into your checking account at the local bank.*

      Public: Assets are unaffected ($400 increase in checking deposits is offset by a $400 decrease in currency holdings). Banks: Assets increase by $400 from reserves; liabilities increase by $400 due to checking account balance. Fed: Liabilities are unaffected (reserves increase by $400, currency decreases by $400).

   c. *The Fed provides an emergency loan to a bank for $1,000,000.*

      Banks: Assets increase by $1,000,000 in reserves; liabilities increase by the same amount due to borrowing from the Fed. Fed: Assets increase by the $1,000,000 from the loan; liabilities increase by $1,000,000 due to the increase in reserves.

   d. *A bank borrows $500,000 in overnight loans from another bank.*

      Assets and liabilities of the banking system as a whole are unaffected; however, individual banks' balance sheets will change due to the loan.

   e. *You use your debit card to purchase a meal at a restaurant for $100.*

      Public: Assets rise by the value of the meal of $100, and are offset by a fall in assets due to lower checking account balances of $100. Assets and liabilities of the banking system as a whole are unaffected; however, individual banks' balance sheets will change as funds are transferred from your bank account to the restaurant's bank account.

2. *The First National Bank receives an extra $100 of reserves but decides not to lend out any of these reserves. How much deposit creation takes place for the entire banking system?*

   None. Since there are no loans created from the new reserves, no additional deposit creation will occur.

3. *Suppose the Fed buys $1 million of bonds from the First National Bank. If the First National Bank and all other banks use the resulting increase in reserves to purchase securities only*

and not to make loans, what will happen to checkable deposits?

Checkable deposits will remain the same.

4. *If a bank depositor withdraws $1,000 of currency from an account, what happens to reserves, checkable deposits, and the monetary base?*

   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.

5. *If a bank sells $10 million of bonds to the Fed to pay back $10 million on the loan it owes, what is the effect on the level of checkable deposits?*

   None. The reduction of $10 million in discount loans and increase of $10 million of bonds held by the Fed leaves the level of reserves unchanged so that checkable deposits remain unchanged.

6. *If you decide to hold $100 less cash than usual and therefore deposit $100 more cash in the bank, what effect will this have on checkable deposits in the banking system if the rest of the public keeps its holdings of currency constant?*

   The deposit of $100 in the bank increases its reserves by $100. This starts the process of multiple deposit expansion, leading to an increase in the money supply.

7. *"The Fed can perfectly control the amount of borrowed reserves in the banking system" Is this statement true, false, or uncertain?*

   False. In general, The Fed will loan to banks when the need arises, and based on the desire to act as a lender of last resort. So in this sense, the Fed is at the mercy of banks' needs for borrowed reserves when it arises and therefore cannot perfectly control the amount of borrowed reserves in the banking system.

8. *"The Fed can perfectly control the amount of the monetary base, but has less control over the composition of the monetary base." Is this statement true, false, or uncertain? Explain.*

   False. Since the Fed cannot control the amount of discount lending to financial institutions, it does not have perfect control over the amount of reserves, and hence does not have perfect control over the monetary base.

9. *If credit risk in the banking system increases, all else equal what effect, if at all, will this have on the money multiplier?*

   Holding market lending rates constant, if credit risk increases the risk-adjusted return on loans will decrease, and thus banks are more likely to loan out less excess reserves. This would lead to an increase in the excess reserves ratio, and hence decrease the money multiplier.

10. *If lending rates that banks can charge increase, all else equal what effect, if at all, will this have on the money multiplier?*

    If market lending rates increase relative to the interest rate paid on excess reserves, the opportunity cost of holding excess reserves increases, and thus banks are more likely to loan out more excess reserves. This would lead to a decrease in the excess reserves ratio, and hence increase the money multiplier.

11. *"The money multiplier is necessarily greater than 1." Is this statement true, false, or uncertain? Explain your answer.*

    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. *What effect might a financial panic have on the money multiplier and the money supply? Why?*

    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. *During the Great Depression years from 1930–1933, both the currency ratio c and the excess reserves ratio e rose dramatically. What effect did these factors have on the money multiplier?*

    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. *In October 2008, the Federal Reserve began paying interest on the amount of excess reserves held by banks. How, if at all, might this affect the multiplier process and the money supply?*

    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 money multiplier declined significantly during the period 1930–1933 and also during the recent financial crisis of 2008–2010. Yet the M1 money supply decreased by 25% in the Depression period but increased by more than 20% during the recent financial crisis. What explains the difference in outcomes?*

    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.

ANSWERS TO APPLIED PROBLEMS

Unless otherwise noted, the following assumptions are made in all of the applied problems: the required reserve ratio on checkable deposits is 10%, banks do not hold any excess reserves, and the public's holdings of currency do not change.

16. If the Fed sells $2 million of bonds to the First National Bank, what happens to reserves and the monetary base? Use T-accounts to explain your answer.

Reserves and the monetary base fall by $2 million, as the following T-accounts indicate:

First National Bank			
Assets		**Liabilities**	
Reserves	–$2 million		
Securities	+$2 million		

Federal Reserve System			
Assets		**Liabilities**	
Securities	–$2 million	Reserves	–$2 million

17. If the Fed sells $2 million of bonds to Irving the Investor, who pays for the bonds with a briefcase filled with currency, what happens to reserves and the monetary base? Use T-accounts to explain your answer.

Reserves are unchanged, but the monetary base decreases by $2 million due to the currency reduction, as the following T-accounts show:

Irving the Investor			
Assets		**Liabilities**	
Currency	–$2 million		
Securities	+$2 million		

Federal Reserve System			
Assets		**Liabilities**	
Securities	–$2 million	Currency	–$2 million

18. *If the Fed lends five banks a total of $100 million but depositors withdraw $50 million and hold it as currency, what happens to reserves and the monetary base? Use T-accounts to explain your answer.*

The initial effect of the loans on the banking system, Federal Reserve, and public are shown below.

Banking System (all five banks)			
Assets		**Liabilities**	
Reserves	+$100 million	Loans (borrowings from the Fed)	+$100 million

Federal Reserve System			
Assets		**Liabilities**	
Loans (borrowings from the Fed)	+$100 million	Reserves	+$100 million

Public	
Assets	**Liabilities**
No change	No change

After the public withdraws $50 million in deposits to hold as currency, the T-accounts look like this:

Banking System (all five banks)			
Assets		**Liabilities**	
Reserves	+$50 million	Loans (borrowings from the Fed)	+$100 million
		Checkable Deposits	–$50 million

Federal Reserve System			
Assets		**Liabilities**	
Loans (borrowings from the Fed)	+$100 million	Reserves	+$50 million
		Currency	+$50 million

Public		
Assets		**Liabilities**
Checkable Deposits	–$50 million	
Currency	+$50 million	

19. Using T-accounts, show what happens to checkable deposits in the banking system when the Fed lends $1 million to the First National Bank.

The initial effect of the loans provided by the Fed is shown in the T-accounts below:

Federal Reserve System			
Assets		**Liabilities**	
Loans (borrowings from the Fed)	+$1 million	Reserves	+$1 million

Banking System			
Assets		**Liabilities**	
Reserves	+$1 million	Loans (borrowings from the Fed)	+$1 million

After the banks receive the reserves, those excess reserves are loaned out; through multiple deposit creation, the increase in reserves of the banking system will support $10 million in new loans and checkable deposits, increasing the money supply by $10 million. The final effect of the multiple deposit creation is shown in the T-accounts below:

Federal Reserve System			
Assets		**Liabilities**	
Loans (borrowings from the Fed)	+$1 million	Reserves	+$1 million

Banking System			
Assets		**Liabilities**	
Reserves	+$ 1 million	Loans (borrowings from the Fed)	+$1 million
Loans	+$10 million	Checkable Deposits	+$10 million

20. Using T-accounts, show what happens to checkable deposits in the banking system when the Fed sells $2 million of bonds to the First National Bank.

The Fed sale of bonds to the First National Bank reduces reserves by $2 million. The net result is that checkable deposits in the banking system decline by $20 million. The initial effect on the Fed and the banking system is shown below:

Federal Reserve System			
Assets		**Liabilities**	
Securities	–$2 million	Reserves	–$2 million

Banking System

Assets		Liabilities
Securities	+$2 million	
Reserves	–$2 million	

After the decline in bank reserves, the multiple deposit creation process works in reverse, so the final effect on the Fed and banking system balance sheets is shown below:

Federal Reserve System			
Assets		**Liabilities**	
Securities	–$2 million	Reserves	–$2 million

Banking System			
Assets		**Liabilities**	
Securities	+$ 2 million	Checkable Deposits	–$20 million
Reserves	–$ 2 million		
Loans	–$20 million		

21. *If the Fed buys $1 million of bonds from the First National Bank, but an additional 10% of any deposit is held as excess reserves, what is the total increase in checkable deposits? (Hint: Use T-accounts to show what happens at each step of the multiple expansion process.)*

The total increase in checkable deposits is only $5 million, substantially less than the $10 million that occurs when no excess reserves are held. The reason is that banks now end up holding 20% of deposits as reserves and only lend out 80%, so that the increase in deposits found in the T-accounts is $1,000,000 + $800,000 + $640,000 + $512,000 + $409,600 + . . . = $5 million. The T-accounts below show the effect of the securities purchase:

Federal Reserve System			
Assets		**Liabilities**	
Securities	+$1 million	Reserves	+$1 million

Banking System		
Assets		**Liabilities**
Securities	–$1 million	
Reserves	+$1 million	

After the increase in reserves and the multiple deposit creation process, the Fed and Banking system balance sheets are as follows:

Federal Reserve System			
Assets		**Liabilities**	
Securities	+$1 million	Reserves	+$1 million

Banking System			
Assets		**Liabilities**	
Securities	–$1 million	Checkable Deposits	+$5 million
Reserves	+$1 million		
Loans	+$5 million		

22. *If reserves in the banking system increase by $1 billion because the Fed lends $1 billion to financial institutions, and checkable deposits increase by $9 billion, why isn't the banking system in equilibrium? What will continue to happen in the banking system until equilibrium is reached? Show the T-account for the banking system in equilibrium.*

The banking system is still not in equilibrium because there continues to be $100 million of excess reserves (+$1 billion of reserves minus $900 million of required reserves, 10% of the $9 billion of deposits). The excess reserves will be lent out until equilibrium is reached with an additional $1 billion of checkable deposits. The T-account for the banking system when it is in equilibrium is as follows:

Banking System			
Assets		**Liabilities**	
Reserves	+$ 1 billion	Loans (borrowings from the Fed)	+$1 billion
Loans	+$10 billion	Checkable deposits	+$10 billion

23. If the Fed reduces reserves by selling $5 million worth of bonds to the banks, what will the T-account of the banking system look like when the banking system is in equilibrium? What will have happened to the level of checkable deposits?

Checkable deposits will decrease by $50 million when the banking system is in equilibrium (as a result of the $5 million decrease in reserves supporting the money supply). The T-account is shown below:

Banking System			
Assets		**Liabilities**	
Reserves	–$ 5 million	Checkable deposits	–$50 million
Securities	+$ 5 million		
Loans	–$50 million		

24. If the Fed sells $1 million of bonds and banks reduce their borrowings from the Fed by $1 million, predict what will happen to the money supply.

The Fed's sale of $1 million of bonds shrinks the monetary base by $1 million, and the reduction of borrowing from the Federal Reserve lowers the monetary base by another $1 million. The resulting $2 million decline in the monetary base leads to a decline in the money supply.

25. Suppose that currency in circulation is $600 billion, the amount of checkable deposits is $900 billion, and excess reserves are $15 billion.

a. Calculate the money supply, the currency deposit ratio, the excess reserve ratio, and the money multiplier.

The money supply is given as $M = C + D$ = $600 billion + $900 billion = $1500 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. Suppose the central bank conducts an unusually large open market purchase of bonds held by banks of $1400 billion due to a sharp contraction in the economy. Assuming the ratios you calculated in part (a) remain the same, predict the effect on the money supply.

The monetary base will increase to $600 + $90 + $15 + $1400 = $2105 billion; given the money multiplier calculated in part (a), this implies the money supply should increase to $2105 × 2.13 = $4483.65 billion

c. Suppose the central bank conducts the same open market purchase as in part (b), except that banks choose to hold all of these proceeds as excess reserves rather than loan them out, due to fear of a financial crisis. Assuming that currency and deposits remain the same, what happens to the amount of excess reserves, the excess reserve ratio, the money supply, and the money multiplier?

ER = $1415 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. *During the financial crisis in 2008, the Federal Reserve began injecting the banking system with massive amounts of liquidity, and at the same time, very little lending occurred. As a result, the M1 money multiplier was below 1 for most of the time from October 2008 through 2011. How does this scenario relate to your answer to part (c)?*

   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.

ANSWERS TO DATA ANALYSIS PROBLEMS

1. *Go to the St. Louis Federal Reserve FRED database, and find the most current data available on Currency (CURRNS), Total Checkable Deposits (TCDNS), Total Reserves (RESBALNS), and Required Reserves (RESBALREQ).*

   a. *Calculate the value of the currency deposit ratio c.*

      c = CURRNS/TCDNS = 1473.7/2020.0 = 0.73 as of May 2017.

   b. *Use RESBALNS and RESBALREQ to calculate the amount of excess reserves, and then calculate the value of the excess reserve ratio e. Be sure the units of total and required reserves are the same when you do the calculations.*

      Excess Reserves is calculated as RESBALNS – RESBALREQ = 2225.769 – 115.464 billion = 2110.305 billion as of May 2017. Thus, e = [RESBALNS – RESBALREQ]/TCDNS = 2110.305/2020.0 = 1.044.

   c. *Assuming a required reserve ratio rr of 11%, calculate the value of the money multiplier m.*

      Given the data above, m = 1.73/[0.73 + 1.044 + 0.11] = 0.92.

2. *Go to the St. Louis Federal Reserve FRED database and find data on the M1 Money Stock (M1SL) and the Monetary Base (AMBSL).*

   a. *Calculate the value of the money multiplier using the most recent data available and the data from five years prior.*

      The money multiplier for May 2017 is 3505.4/3796.5 = 0.92; for May 2012 the multiplier is 2257.6/2635.1 = 0.86.

   b. *Based on your answer to part (a), how much would a $100 million open market purchase of securities affect the M1 money supply today and five years ago?*

      The $100 million open market purchase of securities will increase the monetary base by $100 million, and would hypothetically increase the M1 money supply by 0.92 × $100 million = $92 million in May 2017, and the same open market operation would result in 0.68 × $100 million = $68 million increase in M1 in May 2012.