Chapter 10: Money and Banking

Learning Objectives

1. Gain an understanding of definitions of the money supply and financial assets.

2. Recognise the sharp distinction between the MMT and orthodox representations of the process of credit creation by banks.

3. Be able to interpret a bank balance sheet and incorporate changes via flows of new transactions.

10.1 Introduction

In this Chapter we have a number of objectives. First we will introduce students to commonly used definitions of the **money supply**. Frequent reference has been made in earlier chapters to the purchase or sale of financial assets by both the government through the central bank and treasury, as well as by banks. Here we will provide students with a clear understanding of the generic characteristics of **financial assets**. We then devote space to the development of an understanding as to how banks behave in a modern monetary economy. In the process we will expose some long-standing myths about the role that banks play in the operation of the financial system. This analysis is complemented by the use of balance sheets in the following sub-section of the Chapter, which adds further clarity.

10.2 Some Definitions

Money supply

Economists and commentators try to draw inferences about the economy from trends over time in particular monetary aggregates. There are a number of measures of the so-called money supply, which have been devised over the years, but there is some variation across countries. For example, the Australian Bureau of Statistics (2012) defines the following:

The **monetary base** (HPM) comprises holdings of notes and coin by the private sector; deposits of banks with the Reserve Bank (that is, reserves), and other Central Bank liabilities to the private sector. In Australia and the UK, but not the USA, HPM is defined as 'narrow money' or 'M0' and is the most liquid measure of the money supply. On the other hand, the US definition of M0 excludes bank reserves.

M1 is defined as currency (that is, notes and coins) plus current bank deposits held by the private non-bank sector. This measure is used by economists trying to quantify the amount of money in circulation. The M1 is a very liquid measure of the money supply, as it contains cash and assets (bank deposits) that can quickly be converted to currency. Typically, central banks issue notes as currency while treasuries issue coins as currency - however, it was common in the past for treasuries to also issue notes.

M3 is defined as M1 plus all other Authorised Deposit-taking Institution (ADI) deposits from the private non-bank sector plus certificates of deposit issued by banks less ADI deposits held with each other. ADIs include banks, building societies and credit unions.

Broad money is the widest definition of money published by the Reserve Bank of Australia, the central bank. Broad money is defined as M3 plus borrowings from the private sector by non-bank financial intermediaries (including cash management trusts) less their holdings of currency and bank deposits. This measure is generally used to estimate the entire supply of money within an economy.

The US Federal Reserve defines M2 as M1 + most savings accounts, money market accounts, retail money market mutual funds, and small denomination time deposits (certificates of deposit of under $100,000). M2 has been typically used to forecast inflation.

10.3 Financial Assets

If a household engages in saving (a flow per period of time), over a number of months or years, then it will accumulate a growing stock of wealth over time. The household needs to make a decision about whether to continue to add its saving to its existing deposits at its bank or put together a portfolio of financial assets, which have different degrees of risk - for example, stocks (shares) or bonds (see below), which are also denominated in the money of account.

Treasuries in modern economies issue bonds (debt), which are financial assets bought and sold by the central bank, banks and the private sector. In Australia these bonds are also known as Commonwealth Government Securities (CGS).

These bonds acknowledge that the **issuer** is indebted (owes money) to the **bondholder** who buys the new bonds in the **primary** market. The bond is negotiable because ownership of the certificate can be transferred (sold) to another owner in the **secondary** market. Clearly secondary market trading has no impact at all on the volume of financial assets in the system since it just shuffles this wealth between wealth-holders.

The bond issuer must pay interest to the bondholder normally semi-annually and repay the principal later, when the bond matures. Bonds represent wealth for bondholders.

Thus a **bond** is a **formal contract** to repay a loan (IOU) with interest at fixed intervals. The bondholder is the lender (creditor). The borrower (debtor) issues the bond and the **coupon** is the interest rate, which is paid on the **face value** of the bond, which is printed on the bond. This means that semi-annual interest payments, say $R, are constant.

The **issue price** is what investors pay for the bond when it is first issued, and is about equal to the face value on the bond. Later on, bonds may be traded: at a premium (above par, if good quality, so that there is minimal default risk by the issuer), or at a discount (price below par).

A **consol** is a perpetuity, so there is no maturity date. Interest is paid on this asset forever. Assume R is the annual interest payment, and r is the market rate of interest per annum, then the sale price, P, in the absence of risk, can be shown to be $P=R/r$. This is the present value of the stream of interest payments, R, forever.

A high sale price P means a low rate of return or yield $r=R/P$ (with R fixed) and conversely. So there is an inverse relationship between market (sale) price of a consol and its yield (rate of interest).

This inverse relationship applies to bonds of shorter maturity, as well, but the algebra is a little bit more complicated. This is a very important relationship.

A relatively safe bond, with a low risk of default by the borrower, will attract a high auction price and a low yield (interest rate) since **coupon R is fixed** and the implied rate of interest, $r\sim=R/P$.

A risky bond is less attractive to investors who would pay a lower price for it. They earn a higher yield, which incorporates a risk premium.

Treasury bonds (debt) are sold by auction, where banks and other institutions bid for them.

Ten-year treasury bonds issued in countries, such as Australia, USA, UK and Japan are very safe, and have attracted a relatively low yield (rate of interest) of under 5.5 per cent since 2008.

These countries issue their own currency. On the other hand, some of the Eurozone countries, including Greece, Portugal and Ireland, experienced ten-year bond rates in excess of 10 per cent over this period. These countries use a foreign currency, the Euro.

Bonds are also issued and sold in primary markets by state or provincial governments, multinational and local companies, credit institutions and other public bodies. Companies raise finance for new capital investment by: (i) issuing bonds; (ii) using retained profits, and (iii) undertaking a new share issue.

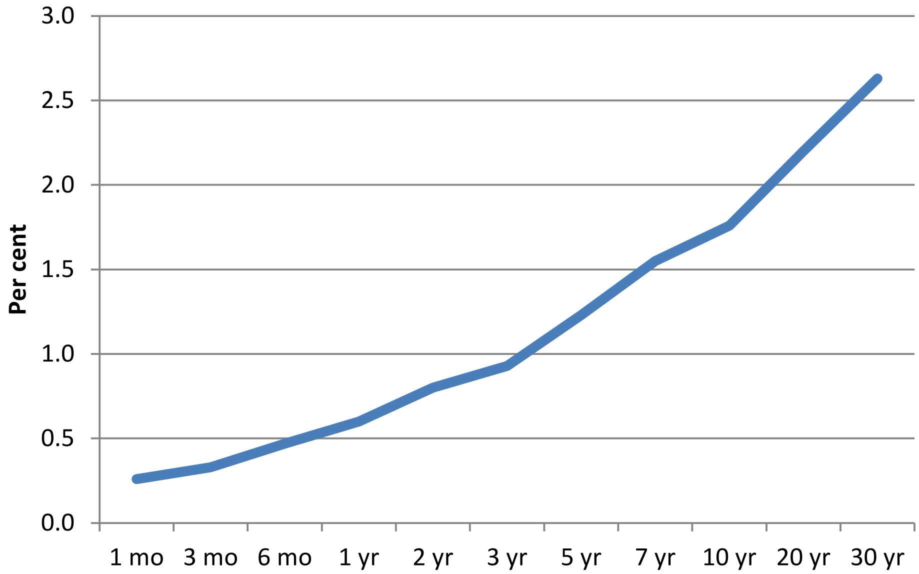
Treasuries and other institutions issue bond with different times to maturity. For example the US Department of the Treasury issues bonds of 1 month, 3 months, 6 months, 1 year, 2 year, 3 year, 5 year, 7 year, 10 year, 20 year and 30 year duration. We can use the term maturity and term interchangeably. So a 10-year treasury bond matures in 10 years.

There are two ways we can use data on yields for bonds of different maturities but of similar risk (see Mitchell, 2011b). First, we would see what is happening to the demand for bonds from investors. Rising yields signal falling demand. This could be a reflection of a strengthening economy with investors being prepared to acquire more risky assets and less very safe ones. This is also usually when the central bank pushes up the target interbank rate and bond yields more or less follow (see Chapter 15). Second, we will get an indication of what is happening to inflationary expectations and risk-assessments. We could graph a time series of yields for selected treasury bonds of different maturities say for the period of 1 January 2015 to 31 December 2015.

The second way of looking at the yields is to consider the **yield curve**. The yield curve is a graphical depiction of the **term-structure of risk-free interest rates** and plots the maturity of the government bond on the horizontal axis against the respective yields (rates of return) on the vertical axis. There are broadly three shapes that the curve will take:

- **Normal –** Under normal circumstances, short-term bond rates are lower than long-term rates. The central bank attempts to keep short rates down to keep levels of activity as high as possible and bond investors desire premiums in longer-term maturities to protect them against inflation. Thus, the yield curve is upward sloping.
- **Inverted –** Sometimes, short-term rates are higher than long-term rates and the yield curve is said to be inverted. Usually the economy starts to overheat and expectations of rising inflation lead to higher bond yields being demanded. The central bank responds to building inflationary pressures by raising short-term interest rates sharply. Although bond yields rise, the significant tightening of monetary policy causes short-term interest rates to rise faster, resulting in an inversion of the yield curve. The higher interest rates may then lead to slower economic growth.
- **Flat –** A flat yield curve is seen most frequently in the transition from positive to inverted, or vice versa. As the yield curve flattens the yield spreads drop considerably. A yield spread is the difference between, say, the yield on a one year and a 10-year bond. What does this signal about the future performance of the economy? A flat yield curve can reflect a tightening monetary policy (short-term rates rise). Alternatively, it might depict a monetary easing after a recession (easing short-term rates) so the inverted yield curve will flatten out (Mitchell, 2011b).

Figure 10.1 US Treasury yield curve (February 3, 2016)



Data Source: Daily Treasury Yield Curve Rates, Resource Center, US Department of the Treasury.

In Figure 10.1 we show the US Treasury Yield Curve for 3 February 2016, which conforms to the normal upward sloping form. This follows the Federal Open Market Committee's decision to raise the Federal Funds rate 25 basis points to a range of 25 to 50 basis points (0.25 percent to 0.50 percent) in December 2015. We will examine the impact of this decision on the yield curve in Chapter 15 Monetary Policy in Sovereign Nations.

We explore some factors that influence the shape of the Yield Curve in Advanced Material in the Appendix.

10.4 What do Banks Do?

The orthodox view: the money multiplier

In most textbooks, banks are presented as financial intermediaries that take in deposits, hold a small fraction of these in the form of reserves, and then lend out the remainder. If each bank follows these principles in making loans, aggregate lending expands through the 'deposit or money multiplier'. For the moment assume that all banks are required to hold reserves to deposit ratio of 10 per cent. This is designed to enable them to readily respond to a loss of reserves resulting from spending by customers on say goods and services, whose sellers bank elsewhere and also those customers who seek to hold additional cash. We now outline the operation of the money multiplier (see also Mitchell, 2011a):

i) Assume that a customer deposits say $100 in Bank A;

ii) Bank A retains $10 of reserves to conform to the required reserves to deposit ratio of 0.1. To expand its loan portfolio and increase profits, the remaining $90 is loaned to a customer whose deposits rise by $90;

iii) The customer spends these deposits and the recipient of the funds (seller) deposits $90 in their bank, which for generality we will assume is Bank B;

iv) Bank B then lends 0.9 times \$90 = \$81 (keeping 0.10 that is, \$9 as additional reserves as required) to a customer to finance their expenditure and so on.

In each stage the amount lent and then spent diminishes. It can be readily shown that \$900 of additional loans are created, which, with the initial new deposit, means that deposits have risen by a total of \$1000, which are 'backed' by \$100 of reserves, thereby conforming to the required 10 per cent ratio.

This example is what the mainstream textbooks call a fractional-reserve banking system and it purports to explain how banks create money, which increases the money supply, such as M1, due to the increase in current deposits. The multiplier, in terms of the initial deposit of \$100, is 10, which is the inverse of the required reserves to deposit ratio of 0.1. A smaller money multiplier results if the non-Government sector chooses to hold more cash when credit is created.

The standard example is typically assumed as a 10 per cent ratio, so that students could readily calculate a money multiplier equal to 10! On 12 April 1992, the US Fed, for the first time, set the required reserve ratio on demand deposits at the magical 10 per cent, making theory appear to coincide with reality.

By way of summary, banks are considered to be financial intermediaries that maximise profits. They take in deposits to build up reserves so that they can then on-lend the deposits at a higher interest rate. However prudential regulations require that they maintain a minimum reserve to deposit ratio. The fractional reserve requirements mean that the resulting credit creation process is finite.

In addition, many economists still believe that High Powered Money (HPM), which consists of bank reserves and cash held by the non-government sector, is under the control of the central bank. Thus by controlling the size of the stock of HPM and setting the required reserve ratio, the central bank controls the size of the money supply or quantity of money.

Money is said to be 'exogenous' in the control sense, determined by the central bank. This has been called the 'verticalist' approach, because in most textbooks the money supply is presented as 'vertical' (perfectly inelastic with respect to interest rates), where the supply of money (horizontal axis) is plotted against the interest rate (vertical axis). As we will see in Chapter 11, the quantity of money is alleged to determine the rate of inflation, under the Quantity Theory of Money.

The implication of the operation of the money multiplier is that a bank would forego profitable loan opportunities, if it did not have sufficient reserves to enable additional credit creation. Some allowance is made for discretion: the deposit multiplier is claimed to be a function of interest rates and interest rate differentials, bank preferences regarding their holdings of excess reserves, and also public preferences regarding their holdings of cash, as noted, and time deposit and demand deposit ratios. However, as Brunner (1968) 'demonstrated', these factors are of only minor importance.

MMT representation of the credit creation process

We shall now argue that this characterisation of the credit creation process, which is driven by fractional reserve requirements, is not an accurate depiction of the way banks operate in a modern monetary economy characterised by a fiat currency and a flexible exchange rate.

In reality, the business of banking is complicated but is, in some respects, similar to that of other profit-seeking firms. Like non-bank firms, banks are seeking to earn profits and thereby generate returns for shareholders. Making loans secures profits as long as the banks are paying a lower rate of interest on funds that they borrow than they receive from their customers who take out loans.

First, a necessary condition for credit creation is that there are non-bank firms and/or households who are seeking loans to finance their planned spending on goods, services or assets. Second, some of these entities must be considered creditworthy by the banks, so that there is a high probability that the loan will be repaid in full. What constitutes credit-worthiness varies over the business cycle and lending standards tend to become more lax at boom times as banks chase market share. Third, the banks must assume that there is profit to be made by making these loans, as described above.

Banks make loans independently of their reserve positions (that is, their holdings of reserves, relative to their liabilities) and then borrow additional reserves if required. Bank managers generally neither know nor care, about the aggregate level of reserves in the banking system. Certainly, no loan officer ever checks the individual bank's reserve position before approving a loan. Bank lending decisions are affected by the price of reserves and expected returns, not by reserve positions. If the spread between the rate of return on an asset (loan) and the interbank rate is wide enough, even a bank that is already deficient in reserves will purchase the asset and cover the reserves needed by purchasing (borrowing) reserves in the interbank market.

The important point is that when a bank originates a loan to a firm or a household it is not lending reserves. Bank lending is not easier if there are more reserves, just as it is not harder if there are less. Bank reserves do not fund money creation in the way that is claimed in the money multiplier and fractional-reserve deposit story (Mitchell, 2011a).

The main difference between banks and other types of firms involves the nature of the liabilities. Banks 'make loans' by purchasing IOUs of 'borrowers'. This results in a bank liability, usually a demand deposit, at least initially, that shows up as an asset ('money') of the borrower. Thus a customer of a bank who secures a loan is simultaneously a 'creditor' of the bank, due to holding a demand deposit, but is also a 'debtor' to the bank. These creditors will almost immediately exercise their right to use the newly created demand deposits as a medium of exchange for purchases of goods and services. Bank liabilities (bank deposits) are the money used by households and non-bank firms for transactions in the form of cheques or transfers or are first redeemed at par ($ for $) against fiat money (which is guaranteed by the government) to enable cash to be used. The government will also accept some bank liabilities in payment of taxes.

In turn, bank reserves are the 'money' used as means of payment (or interbank settlement) among banks and for payments made to the central bank. Thus, when bank 'creditors' draw down their demand deposits, by either spending or choosing to hold more cash, this causes a corresponding loss of reserves for the individual bank. The bank may then either sell an asset, or increase its liabilities by borrowing additional reserves, in order to cover the loss of reserves. In the aggregate, however, such activities only shift reserves from bank to bank.

The interbank market (say the federal funds market in the US) functions to shuffle the reserve balances that the member (private) banks keep with the central bank to ensure that each of these banks can meet their reserve targets, which might be simply zero balances at the end of a period of time, which, for simplicity, we could assume is a day.

The bank expands its balance sheet by lending. Loans create deposits, which are then backed by reserves after the fact. The process of extending loans (credit), which creates new bank liabilities is unrelated to the reserve position of the bank. The major insight is that any balance sheet expansion, which leaves a bank short of the required reserves may affect the return it can expect on the loan as a consequence of the 'penalty' rate the central bank might exact through the discount window. But it will never impede the bank's capacity to effect the loan in the first place. So it is quite wrong to assume that the central bank can influence the capacity of banks to expand credit by adding more reserves into the system. We will address this proposition in more detail in Chapter 15.

Aggregate excesses or shortages of reserves across the banking system have to be rectified by the central bank. Ultimately then, the size of the stock of reserves is not discretionary in the short run. The central bank can determine the price of reserves, admittedly within some constraints, but then must provide reserves more or less on demand to hit its 'price' target, that is the target interbank rate (for example, the Fed funds rate in the USA and the Bank Rate in the UK), which we will describe in detail in Chapter 13.

The approach outlined in this section has been called the 'endogenous money' approach, in the sense that the supply of bank money is determined 'endogenously' by the demand for bank loans, plus the willingness of banks to lend, (which gives rise to the creation of deposits) rather than 'exogenously' (Moore, 1988). According to those who adopt this approach, any impact of monetary policy on the quantity of money is very indirect and operates primarily through interest rate effects.

The demand for loans, in turn, is determined by spending decisions of private economic agents (including decisions regarding asset purchases). These can be affected, but only very indirectly, by the loan rate of interest. The supply of loans is then never independent of the demand; banks supply loans only because someone is willing to 'borrow' bank money by issuing an IOU to banks. This means that the interest rate cannot be determined by the 'supply and demand' of loans since supply and demand are not independent. Rather, banks are price-setters in short-term retail loan markets. They then meet the demand for loans with some quantity rationing, at that price. Thus some requests for loans are refused, even though these aspiring borrowers claim to be willing (and able) to pay the going interest rate.

There can be several reasons for such quantity rationing of large segments of the population. Banks might worry about the default risk of borrowers, but might not be able to raise interest rates sufficiently to cover default risk, so that quantity rationing is superior to price rationing.

Often, banks probably have better information than do borrowers about such risks. For example, the borrower who wishes to open a new restaurant might not have good access to information about bankruptcy rates in the industry or might simply be overly optimistic. On the other hand, banks can never know the future, so must operate on the basis of rules of thumb (for example, informal rules that restrict loan size). Some quantity rationing can even be irrational, perhaps discriminatory, because banks have traditionally forgone certain kinds of loans or are reluctant to lend to certain groups in the community. The key point is that the supply of loans does not simply adjust to the demand for loans at some interest rate.

The short-term retail interest rates can be taken as a mark-up over short-term wholesale interest rates. Exactly what determines the mark-up (and whether it is variable) is controversial, but not important to our analysis here (see Moore, 1988). Wholesale interest rates, finally, are under the influence of central bank policy. Individual banks use wholesale markets to rectify a mismatch between retail loans and deposits. Most banks will not be able to match exactly their retail loans and deposits. Some banks will be able to make more retail loans than they can retain in deposits and thus suffer a loss of reserves, while others will find fewer loan customers than depositors, so they will have a surplus of reserves. Banks then use wholesale markets to either 'purchase' reserves by issuing wholesale liabilities (for example, negotiable, large denomination certificate of deposits (CDs) or by borrowing central bank funds), while surplus banks will sell their excess reserves.

As discussed above, the central bank sets the overnight interbank rate. This rate then determines other short-term wholesale rates (mainly as a mark-up, but also as a mark-down) through arbitrage. In conclusion, the supply of money is determined endogenously while the price of money short-term interest rate is determined exogenously as a result of central bank policy.

Summary

The orthodox position is that banks leverage (create credit) when provided with new deposits, but are constrained by fractional reserve requirements. Since the central bank is claimed to be able to control the stock of HPM or monetary base, the central bank is able to control the supply of money according to this deterministic theory of credit creation.

MMT would first deny that the central bank can control the stock of HPM, because monetary policy is conducted by the central bank setting a target interbank rate and providing the right level of reserves to the banking system so that banks lend to and borrow from each other at this target rate (for more details, see Chapters 13 and 15). Second, a bank is not constrained by its reserve position in deciding whether to make a loan to a particular customer. As long as the customer appears creditworthy and the loan is profitable to the bank, it will make the loan and then acquire sufficient reserves by borrowing from other banks or the central bank. Thus in contrast to the orthodox position of deposits driving loans, MMT argues that loans drive deposits. Further the experience of the 1980s cast considerable doubt on the relation between total reserves (HPM) and monetary aggregates, because the 'money multiplier' became unstable.

A bank's credit creation: A balance sheet analysis

The balance sheet of a typical bank looks like this:

Figure 10.2 A typical bank balance sheet

Assets	**Liabilities**
Advances (Loans)	Checking accounts
Securities	Savings accounts
Reserves	Other liabilities
Other Assets	Net Worth

The money entries are the cheque and savings accounts on the balance sheet. Note that they are the IOUs of banks, and hence appear as liabilities on the balance sheet. The bank promises to convert deposits in a cheque account (and deposits in most savings accounts) into cash on demand. Banks hold financial assets in the form of loans to customers and securities, that is Treasury debt and other assets.

Firms in general and banks in particular, should have positive Net Worth that is the difference between Assets and Liabilities. Total assets in the left hand column will balance with the items in the Liability column, because the latter includes Net Worth.

The following simplified series of balance sheets will clarify the process of credit creation by Bank A. Let us assume that Bank A starts with the following very simple balance sheet.

Figure 10.3 Bank A balance sheet

Assets	**Liabilities**
Building = $200	Net Worth = $200

Its owners have raised capital and bought the building. The owner's equity or net worth is equal to the value of the building they have purchased. Bank A has not engaged in any banking activity yet. Now a customer comes into the bank and says that they would like to borrow $200 to finance the purchase of a car. The bank checks their creditworthiness (asks for income tax returns, proof of assets, credit history, etc.). If the customer is approved then the following occurs on the bank's balance sheet.

Figure 10.4 Bank A balance sheet

Assets	**Liabilities**
Loan to Customer = $200	Cheque Account of Customer = $200
Building = $200	Net Worth = $200

The bank just created $200 of money entries (deposits in the cheque account of the customer in return for the customer's IOU, or promise to pay $200). The bank's total assets, which equal liabilities plus Net Worth, are now $400.

Before we move on to the customer's spending of their deposit, let us examine this balance sheet carefully.

Where did the bank get the money entry it created?

- A cheque account was created ex-nihilo, that is, from nothing, by entering a number (200) in a computer. In the past banks could also issue their own banknotes - but generally only central banks can do that now.
- The bank did not need any prior deposits, or any cash in its vault. In fact the bank did not have any cash in its vault, nor any deposits in its account at the central bank in this simplified example.
- The bank is not lending anything it has, it just creates money entries, (bank deposits), at will.
- Those money deposits or entries are its liabilities/IOUs.
- By creating those bank IOUs, the bank promises to:

- Convert deposits into cash on demand;
- Accept any of those IOUs in payment of debts owed to the bank.

The cheque account is just a legal promise to convert to cash on demand, and to accept payment in the form of the bank's own IOUs. The bank does not have to have any cash now.

The success of the banking operation (lending by accepting an IOU, and the creation of a demand deposit) depends on:

- The capacity of the customer to repay that is creditworthiness. If they have problems in making timely payments on their debts, this affects the value of the bank's assets and its own income inflows and ultimately affects the net worth of the bank, the bank's capital ratio, and the shareholders' return on equity.
- The bank's capacity to acquire reserves at low cost if:
    - The customer wants to withdraw cash;
    - The bank needs to pay debts to other banks through an interbank settlement following the customer's spending (see below);
    - The bank needs to settle tax payments made by the customer to the government.

If these conditions are not satisfied the bank gets in trouble; it can become insolvent or illiquid. The first means its net worth falls to or below zero; the second means it cannot meet cash withdrawals or clearing. Thus, even though banks can create unlimited amounts of money deposits, they have no incentive to do so because they may be unprofitable.

So what happens if now the customer pays $200 to a car dealer who happens to have a bank account at another bank called Bank B? The balance sheet of Bank A looks like this:

Figure 10.5 Bank A balance sheet

Change in Assets	Change in Liabilities
	Cheque Account of the customer = -$200 Reserves due to Bank B = +$200

Figure 10.6 Bank B balance sheet

Change in Assets	Change in Liabilities
Claim on Bank A Reserves: +$200	Cheque Account of Car Dealer +$200

Bank A's liabilities in the form of the customer's cheque account have dropped by $200 through the purchase of a car, but the transaction is not confined to the reduced balances in the customer's account at Bank A and the increased balances of the Car Dealer at Bank B. Bank A now owes Bank B $200 and needs reserves to settle this debt, but does not have reserves. Where does it get the reserves?

The banks are required to keep reserve accounts at the central bank. These reserves are liabilities of the central bank and assets of the banks. These reserves function to ensure the payments (or settlements) system functions smoothly. That system relates to the millions of transactions that occur daily between banks as cheques are tendered by citizens and firms and more. Without a coherent system of reserves, Bank A could easily find itself unable to fund Bank B's demands based on the cheque drawn on the customer's account and presented at Bank B by the Car Dealer.

Bank A will get the reserves from the source that is the least costly. It may sell assets, but, in our example, Bank A only has a building so it would be very costly to get reserves that way. Bank A could sell bonds, if it had any, or it may borrow reserves from other banks (domestic or foreign) or the central bank. A common way to get the reserves is to borrow from the central bank, which is the monopoly supplier of reserves. Figure 10.7 documents the latest change to Bank A's balance sheet, associated with obtaining these reserves:

Figure 10.7 Bank A balance sheet

Change in Assets	**Change in Liabilities**
Reserve: +$200	Debt to Central Bank: +$200

Figure 10.8 Central bank balance sheet

Change in Assets	**Change in Liabilities**
Reserve Loan to Bank A: +$200	Reserve: +$200

Now that Bank A has the reserves it can settle its debt with Bank B.

Figure 10.9 Bank A balance sheet

Change in Assets	**Change in Liabilities**
Reserves: -$200	Reserves due to Bank B = -$200

Figure 10.10 Bank B balance sheet

Change in Assets	**Change in Assets Liabilities**
Claim on Bank A: -$200 Reserves: +$200	

The debt between the two banks has been settled. The final balance sheets of Bank A, Bank B and the central bank look like this:

Figure 10.11 Bank A balance sheet

Assets	**Liabilities**
Funds Advance to Customer= $200 Building = 200	Debt to Central Bank = $200 Net Worth = 200

Bank A makes money as long as the interest it receives on the loan to the customer is higher than the interest it pays to the central bank on the reserves. The balance sheet of Bank B is shown below, where we assume Bank B had reserves prior to the checking account of the Car Dealer being increased by the sale of the car to the customer.

Figure 10.12 Bank B balance sheet

Assets	**Liabilities**
Reserves + $200	Checking Account of Car Dealer + $200

Finally the balance sheet of the central bank is shown in Figure 10.13.

Figure 10.13 Central bank balance sheet

Assets	**Liabilities**
Reserve Loan to Bank A= $200	Reserves: +$200

Note that none of these operations involved any transfer of physical cash. It was all bookkeeping entries through keystrokes to computers. Also note we only show the assets and liabilities directly related to our examples. Of course, private banks and the central bank have many other assets and liabilities, as well as net worth on their balance sheets.

In practice, the central bank will usually not advance reserves to the bank directly in the form of an unsecured advance; instead it will ask for collateral (usually a treasury security) in exchange and will provide funds for less than the value of the collateral. So, if Bank A has a $300 bond, it surrenders it to the central bank in exchange for reserves. The Fed will give only say $285 if the discount rate is 5 per cent.

Appendix: Advanced Material

Theories of the yield curve and its dynamics

Mitchell (2011b) notes that there are various theories about the yield curve and its dynamics. All share some common notions – in particular that the higher is expected inflation the steeper the yield curve will be other things equal.

The basic principle linking the shape of the yield curve to the economy's prospects is explained as follows. The short end of the yield curve reflects the interest rate set by the central bank. The steepness of the yield curve then depends on the yield of the longer-term bonds, which are set by the market. But the short end of the curve is the primary determinant of its slope. In other words, the curve steepens mainly because the central bank is lowering the official cash rate, and it flattens mainly because the central bank is raising the official cash rate.

Bond traders link the dynamics of the yield curve to their expectations of the future economic prospects. When the yield curve flattens it is usually accompanied by deflation or steady and low inflation and vice versa.

One of the risks in holding a fixed coupon bond with a fixed redemption value is purchasing power risk. Economists believe that most people would prefer to consume now rather than later if there was to be a trade-off. To encourage foregone consumption now, a yield on savings must be provided by markets. The yield is intended to allow a person to consume more in the future than has been sacrificed now. But if the prices of real goods and services increase in the meantime, then inflation could completely wipe out any gain in real consumption, so that the real interest rate is zero.

Consider a person who invests in a one-year $1,000 coupon treasury bond with a single coupon payment expected of $100. The individual will expect to get $1,100 on the redemption date. Assume that over the holding period, prices rise by 10 per cent. At the end of the year, a basket of goods that previously cost $1,000 would now cost $1,100. In other words, the investor is no better off at the end of the year as a result of the investment. The nominal yield has been offset by the price inflation.

Purchasing power risk is more threatening the longer is the maturity. This is one reason why longer maturity rates will be higher. The market yield is equal to the real rate of return required plus compensation for the expected rate of inflation. If the inflation rate is expected to rise, then market rates will rise to compensate. In this case, we would expect the yield curve to steepen, given that this effect will impact more significantly on longer maturity bonds than at the short end of the yield curve.

References

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