The McGraw-Hill Companies

Tata McGraw-Hill Professional: Banking Fundamentals Series

An Introduction to Money

Tata McGraw-Hill Professional: Banking Fundamentals Series

The IT industry in India has a significant interest in the global banking industry, particularly the US banking industry, as many of its software development projects emanate from this sector of the economy. In order to cater to the training needs of software engineers in the BFSI space, the Series has been conceptualized. It offers a reasonably in-depth exposition on the topics in a concise and lucid manner, embellished with a lot of pertinent examples.

Each title in the series is a stand alone repository of material on the concerned topic. For issues that are quantitative in nature, appropriate numerical examples have been provided.

The series is a suitable source of knowledge for students of finance and marketing professionals in the BFSI space.

Titles in the series include:

- An Introduction to Money
- The Central Bank
- Risk and Risk Management
- Retail Lending
- Mortgage Lending
- Payment Systems

and many more…

The McGraw-Hill Companies

Tata McGraw-Hill Professional: Banking Fundamentals Series

An Introduction to Money

Sunil K. Parameswaran

Director & CEO

Tarheel Consultancy Services

Tata McGraw Hill Education Private Limited

NEW DELHI

McGraw-Hill Offices

New Delhi New York St Louis San Francisco Auckland Bogotá Caracas
Kuala Lumpur Lisbon London Madrid Mexico City Milan Montreal
San Juan Santiago Singapore Sydney Tokyo Toronto

Tata McGraw-Hill

Published by Tata McGraw Hill Education Private Limited,
7 West Patel Nagar, New Delhi 110 008.

ISBN (10): 0-07-070705-7
ISBN (13): 978-0-07-070705-4

Managing Director & Vice-Presidernt—Asia Pecific: *Ajay Shukla*
Executive Publisher—Professional: *R. Chandra Sekhar*
Production Executive: *Rita Sarkar*
Manager—Sales & Marketing: *S. Girish*
Sr. Product Specialist—BGR: *Priyanka Goel*
General Manager—Production: *Rajender P. Ghansela*
Asst. General Manager—Production: *B.L. Dogra*

Typeset at Script Makers,19, A1-B, DDA Market, Paschim Vihar, New Delhi 110 063, and printed at SDR Printers, A-28, West Jyoti Nagar, Loni Road, Shahdara, Delhi 110094

Cover Printer: SDR Printers

Cover Design: Kapil Gupta, New Delhi

RZDCRDRZRZCQR

To

My Parents
Savitri Parameswaran
and
Late A.S. Parameswaran

Preface

This is the first volume of the series on the banking industry. The book covers the economic role of money, which is a critical input for a modern economy, and the role played by commercial banks in the creation and circulation of money. Another focus area, from the perspective of controlling supply of money in an economy, is the function of a central bank– the regulator for the banking sector. Most of the examples have a U.S. flavor and focus, since this is intended to be a book on the global banking industry. However, wherever required, relevant data and illustrations from the Indian economy is presented, in order to facilitate the absorption and appreciation of the material by Indian readers. The theory however is universal and consequently should have appeal for readers irrespective of where they may be located.

The volume commences with an analysis of the economic roles of money in a modern society, and the way various forms of money have evolved historically. In Chapters 1 and 2 the various definitions of monetary aggregates are explained and economic statistics are presented for both the U.S., as well as, India. In this context the different types of deposit products offered by commercial banks are analyzed, and the process of the creation of coins and currency is studied, once again with reference to both the U.S., as well as, India. Chapter 3 covers the role played by the commercial banking industry in the creation and circulation of money. The process of deposit

multiplication, as well as, contraction and the consequent implications for money supply, are presented in detail with suitable illustrations. The role played by the central bank in this context is clearly brought out. Chapter 4 commences with the process of putting money in circulation and the implications of this process for Seigniorage, which is a form of tax revenue for modern governments. The chapter analyzes modern day payment modes like credit and debit cards, and clarifies the issue as to whether the spending limits on such cards should be considered as a part of the money supply. The book rounds off with a discussion of money and credit multipliers in a modern economy.

Each volume in this series is self contained and the series should serve as valuable study material for a course on the banking sector. The manuscripts have been used extensively at corporate training programs, and are a blend of academic rigor and practical insights. The objective of the author is to present a synthesis of modern finance and macroeconomic principles. Students of finance, and marketing professionals, in particular those in the BFSI, will find these volumes to be a lucid and concise resource, for developing a strong foundation about the subject.

Sunil K. Parameswaran

Acknowledgments

I wish to thank the various participants at the executive education programs on Global Banking that I have been conducting for my corporate clients over the years. Their suggestions and feedback has been invaluable in collating information for the manuscript and improving the expositional clarity.

Thanks are due in large measure to R. Chandra Sekhar and team at Tata McGraw-Hill for showing a keen interest in the project from the outset, and for giving the necessary inputs to ensure that I was able to complete the manuscript within an acceptable time frame.

Finally, I wish to thank my mother for all her help and moral support.

Sunil K. Parameswaran

Contents

CHAPTER 1

Introduction to Money

Introduction

What is money? Broadly speaking, any thing that people are willing to accept as payment for goods, services, or financial assets, may be termed as money. Lay people have a tendency to think of money in terms of coins and currency notes. However, such items constitute only a small percentage of what is accepted as the money in circulation, in a modern economy.

Money is sought after and held, because it performs four major functions. These may be stated as:

- It serves as a medium of exchange
- It serves as a store of value
- It serves as a unit of account
- It serves as a standard of deferred payment

Let us examine these functions in relatively more detail. It is obvious that money is a medium of exchange for economic transactions in a modern society. Historically

the growth of markets and the availability of a common unit of currency has gone hand in hand. Money, in its various forms, is the only item of value that anybody and everybody will accept in return for goods, services, or financial assets supplied by them. The method of commercial transactions, prior to the advent of money, was a system known as barter. Barter meant the exchange of goods and services for other goods and services. There are two problems with barter in practice. First, to sell the goods and services that we have, we should not only be able to locate people who are interested in acquiring what we have to offer, but who are also endowed with the goods and services that we are seeking to acquire. Second, the sale of a good or a service, must obviously be accompanied by the simultaneous acquisition of another good or service. In practice, most of the time these events will not coincide. The creation of a common unit of currency, made trade between individuals a lot simpler. It was no longer necessary to exchange goods or services for other goods or services, since it was possible to denominate everything in terms of the currency that was prevalent, which also served as the medium of exchange. Thus, every sale did not need to be accompanied by a simultaneous purchase.

Barter, which is technically known as *counter-trade* can still be occasionally observed in a modern economy. One of the reasons, why an acquirer of a good or a service may seek to make the payment in terms of another good or service could be because he has an insufficient amount of a freely convertible currency at his disposal. A freely convertible currency, like the U.S. dollar, British pound, or the euro, is a currency that is universally acceptable as a medium of payment. On the other hand, currencies like the Indian rupee are still not freely convertible and are consequently not acceptable as a mode of payment

globally. Here is an example from McInish (2000) on a modern day barter transaction.

'AT&T arranged a sale of switching equipment to Sevtelecom in Russia, who could pay only one-half of the price in convertible currencies. For the remainder, AT&T agreed to accept apatite concentrate and contracted with a German firm to sell it, pay a part of the proceeds to the apatite manufacturer, and the balance to AT&T.'

Clearly this was a win-win situation for everyone concerned. The Russians paid partly in cash and partly in kind, AT&T got paid fully in U.S. dollars, and the Germans, who were the middlemen in this case, also made some money in the process.

Money serves as a store of value, that is, it gives people the freedom to save, or put aside funds to satisfy their needs at a later point in time. Of course not all forms of money are good preservers of value, for erosion of the value of currency, a phenomenon that we term as inflation, is a constant fact of life.

Currency notes and coins, offer nil protection against inflation, since savings maintained in such forms do not earn any interest. Financial assets such as bonds and bank deposits are usually safer bets against inflation, although the former are subject to price risk or market risk, which is the risk that the value of the bond may decline due to increasing interest rates. If so, when an investor sells the bond prior to expiration, he will receive a lower price. Both bonds and bank deposits, except checking accounts* provide a periodic interest stream. Checking accounts are non-interest bearing deposits maintained with commercial banks. Obviously, such deposits do not provide any

* Cheques in America is spelt as 'check' and accounts for which holders can freely write cheques are called 'Checking accounts'.

protection against inflation. Other assets such as stocks, gold, and real estate generally provide a better hedge against inflation in the long run, although they are vulnerable to price declines in the short to medium term. These assets therefore raise the specter of what is known as a capital loss. That is, the price at the time of sale of such assets, may be lower than the price at which they were acquired at a prior instant of time. Stocks provide an income stream by way of dividends, and real estate held in the form of houses and apartments provide rental income. Gold, which is an eternal favorite as a hedge against inflation, does not provide any income. On the contrary it costs money to store and insure the metal.

One of the major advantages of having a form of currency is that it serves as a unit of account. That is, all types of goods, services and financial assets have a price in terms of money. Thus, the number of required prices in the economy is considerably reduced. In the absence of money a 1,000 good economy would require $\frac{1,000 \times 999}{2}$ or 499,500 prices.[1] However, if every good were to have its price expressed in terms of the unit of currency, we would require no more than 1,000 prices. Thus the information required in terms of the number of prices is reduced by 99.80%.

Finally, money serves as a standard of deferred payment. There are two categories of people in this world, those who have more than what they currently require and others who require more than what they currently have. People whose current wealth exceeds their current consumption needs, can lend their excess wealth to others. That is, money

[1] In general, if we have N goods in an economy, then in the absence of a unit of currency, we would require ${}^{N}C_{2}$ prices.

gives people the freedom to save. Such fund transfers can be made in various forms. Investors may acquire shares and bonds issued by companies, thereby enabling the borrowing firms to raise capital. Or they may deposit their money with banks, or acquire shares of mutual funds. In the latter cases, their money is indirectly channelized to parties in need of funds, by such financial intermediaries. Bank loans and bonds require the borrower to periodically pay interest. In the case of shares and units of mutual funds, the investors usually are periodically compensated by dividends. However, unlike the interest received from a debt security, the rate of dividends from shares of stock or those of a mutual fund, is not fixed, and nor is it contractually guaranteed.

Evolution of Money

In the early days, all trade was based on barter. The history of money began with a movement away from barter in favor of commodity money. What is commodity money? It is a physical good which is used for both monetary and non-monetary purposes. The next step was the development of a commodity standard. A commodity standard is a unit of currency, whose value is backed by the value of a monetary good, typically a precious metal like gold or silver. Finally, economies developed money as we know it today, known as fiat money. Such a form of money derives its value solely from the fact that it is universally acceptable as a medium of exchange in the market. These days money has gone a step further with the development of electronic money. E-money transfers obviate the need for standard forms of money like notes, coins or cheques.

Commodity Money

A commodity which is accepted as a unit of money usually has multiple economic uses, and not just as a currency medium. Primitive forms of money were items like shells and stones. Subsequently, precious metals like gold and silver emerged as the mediums of choice. The reasons were manifold. Firstly, currency units made of these metals were portable, durable, and easily recognizable. Secondly, they were considered to be universally valuable, because of their relative scarcity and their use as items of value such as jewelry.

If gold were to be used as a unit of currency, then the price of gold must be measurable in terms of other goods and services for which it is preferred and vice versa. The price of gold in terms of other goods and services represented the purchasing power of money in such an economy.

Commodity Standards

The use of precious metals as units of money had a problem in practice. Units of gold and silver invariably have different market values, based on their inherent purity and density. Thus, before a vendor could accept such money, he had to first verify the purity and weight of the metal being offered as payment. Quite obviously this was a costly and time consuming process. To circumvent this problem, people began to use standardized units of gold and silver as money. A monetary system in which the value of the medium of exchange depends on the value of gold is called a *gold standard.* Likewise, certain countries employed a silver standard. In some economies the value of money depended on the values of both gold as well as silver. Such a monetary system is referred to as a *bimetallic standard.*

In practice, citizens of countries using a metallic or a bimetallic standard, would take the metal(s) to a goldsmith, who would convert them into tokens of equal purity and weight. Typically he would also emboss the tokens to facilitate verification that this had been done. These metal pieces were the original coins that came to be used as money. Such coins rapidly caught on as units of currency. There were two principal reasons for this. First, many merchants would only accept coins validated by a goldsmith's stamp. Second, governments started playing a role in the minting of such money. These governments either regulated or owned the mints that produced such coins. There were two reasons why governments envisaged a role for themselves. The first was to ensure that the public had confidence in the nation's monetary system. Second, due to a process known as *seigniorage*, they could generate profits by minting such coins. This is because the coins issued by the mints were issued at a face value in excess of the value of the precious metals contained in them. The difference would obviously accrue to the Treasury as a profit. Seigniorage is essentially a form of tax, for it is a transfer of wealth from the citizens to the government.

The Economics of a Commodity Standard

For a long period of time, gold was the asset of reference of the international monetary system. Under the gold standard, the foundation of a nation's monetary system was the quantity of gold held by it. In practice, gold was used for monetary as well as non-monetary purposes. The quantity of gold that was devoted to monetary use was termed as *gold bullion*. Thus, gold bullion served as the monetary base for the economy, or the foundation of the monetary system.

In practice, people did not directly value goods and services in terms of gold, and nor did they use gold as a currency. The price of a good or a service was measured in terms of a currency unit, such as dollars per bushel of wheat. It was the currency, such as the dollar, which was used both in the form of coins as well as in paper form, that performed all the traditional roles of money, namely served as a medium of exchange, as a unit of account, as a store of value, and as a standard of deferred payment. The currency's value was however directly linked to gold, in the form of a rate of exchange. For instance, the rate may be expressed as $ X per ounce of gold. In most cases the monetary system was managed by the central bank, which stood ready to freely convert gold to dollars and dollars to gold at the specified rate of exchange. Since the central bank stood guarantee to do so, it ensured that nobody could buy gold for less or sell it for more than the rate fixed by the bank.

Once the bank fixed the exchange rate or the price of gold, it could influence the quantity of money by regulating the ratio of currency issued by private mints or banks relative to the amount of gold held by them. Thus the bank could set the *gold reserve ratio.*

For a long time coins were the sole item of currency, and the belief was that the coin's inherent metal content was the source of its value. Gradually however governments began to debase the coins, that is they reduced the gold base by mixing other metals like copper and bronze. Obviously this increased the earnings from seigniorage. Such debasement effectively broke the link between the value of the money unit, namely the coin, and the value of the base commodity, the precious metal in the coin.

The next step was paper money. The American colonists were the first to accept a paper based commodity standard.

In the early days following the discovery of America, precious metals were relatively scarce. Thus the colonial governments issued paper money backed by the value of European coins. By doing so, they established an indirect linkage to precious metals, for American currency was backed by European coins which in turn were backed by metals like gold and silver. This indirect approach was abandoned after some time, and the governments in the U.S. began issuing bills of credit that they promised to redeem at a future point in time. This paper money was used by the governments to acquire goods and services and spend on public works. The parties which acquired such money from the government could use them as a medium of exchange for other goods and services. The citizens' faith in such money was based on the belief that the governments could always raise adequate revenue by way of taxes to redeem the bills as promised.

The bills of credit were the first step towards the modern monetary system. Money in a modern economy is referred to as *fiat money*, as mentioned earlier. '*Fiat*' means a diktat or order. Such money by itself has no value and comes into existence solely because of legislation. The value of the money is based solely on the confidence of the people that the government will always honour the currency issued. In such a system, money derives its value solely from the fact that it is acceptable by everybody as a medium of exchange. In a modern economy, such money is issued by the central bank. The U.S. money supply is composed of notes issued by the Federal Reserve. In addition depository financial institutions also issue fiat money by allowing people to operate checking accounts.[2] Fiat money can in principle be created without any limits, although in real life the consequences of an increase in

[2] We will discuss this in detail later.

money supply on the rate of inflation will be a moderating factor. Thus, in real life, the availability of such money is constrained only be the fiscal discipline of the political system and the central bank.

Common Terms Associated with Money and Their Origin

- **Buck:** Early settlers in North America relied heavily on deer skin to finance their trades. Every skin was referred to as a buck.
- **Pecuniary:** The term means '*relating to money*'. It comes from the Latin word pecus, which means cattle.
- **Fee:** This is derived from the German word for cattle '*vieh*'.
- **Shell Out:** Native Americans and settlers in North America used shells as units of currency. This lead to the phrase shell out which means to pay.
- **Salary:** There was a time when soldiers in Rome were paid a part of their wages in the form of salt. The word '*Salarium*' in Latin, means of salt.
- **Dollar:** A count in Czechoslovakia started minting silver coins in 1519. These were known as 'talergroschen' which was eventually shortened to '*Talers*'. The word dollar is derived from the word taler.

Source: How Currency Works by Ed Grabianowski.

Macroeconomic Implications of Money

The quantum of money that is circulating in an economy has important implications for the level of prices, and other critical factors such as the level of employment. Too

much of money chasing too few goods, lead to an increase in the price level, a phenomenon that we term as inflation.

Inflation refers to the increase in the price level of an asset or service over a period of time. Here is a numerical example. At the beginning of 2008, a bottle of beer was priced at $ 2.50. At the end of the year, the same bottle was priced at $ 2.75. Thus, the rate of inflation as measured by the percentage change in the price level is:

$$\frac{2.75-2.50}{2.50}\times 100 = 10\%$$

In real life of course, we do not measure inflation by analyzing the change in price of a single good. In practice, economists track price indices, which measure the price of a representative basket of goods and/or services. There is however no unique index for tracking the change in the price level. Two of the commonly used indices are the *Consumer Price Index (CPI)*, and the *Producer Price Index (PPI)*.

In the U.S., the Department of Labor publishes the CPI every month, based on the prices in the previous month of the component goods and services. The index is based on the price changes of 80,000 items that represent a cross-section of goods and services purchased by urban households.[3] The CPI is released at 08:30 Eastern Time during the second or third week following the month being covered. The categories of goods and services on which the CPI is based, are divided into eight major groups. Each group is given a weight that signifies its importance. The weights are revised every two years to adjust for changing tastes and priorities. As of 2007 the weights were as shown in Table 1.1.

[3] Such consumers represent about 87% of the U.S. population.

To obtain the necessary data, the Bureau of Labor Studies (BLS) collects price related information from 23,000 retail and service businesses, which are frequented by a sample of 14,500 families. In practice, two measures of inflation are often reported — *Core* and *Non-core*. The core price index does not include the cost of food and energy, whereas the non-core index includes all the items listed in the table.

Table 1.1

Components of the CPI as of 2007

Shelter	32.30%
Fuel and Utilities	5.40%
Household Furnishings and Operations	4.70 %
Total Housing Related Items	42.40%
Food and Beverages	15.00%
Medical Care	6.20%
Apparel	3.80%
Recreation	5.60%
Education and Communication	6.00%
Other Goods and Services	3.50%
Private Transportation	16.30%
Public Transportation	1.10%
Total Transportation Items	17.40%

Source: The Secrets of Economic Indicators by Bernard Baumohl.

The CPI is important, for inflation has implications for all categories of people in an economy. First, it has implications for how much consumers have to pay for goods and services. Second, it is a key determinant of the cost of capital for a business. Third, it has implications for the wealth of people as measured by the value of their

investments. Finally, the rate of inflation has a significant impact on the lifestyle of retired people.

The second major tracking tool from the standpoint of measuring inflation is the Producer Price Index (PPI), which was formerly referred to as the *Wholesale Price Index (WPI)*. It measures the average changes in the prices received by domestic producers for their output. The BLS collects data by sampling producers in three industries — Manufacturing, Mining, and Service.

In India too we have a Wholesale Price Index. The index is used to measure the change in the average price level of goods which are traded in the wholesale market. In order to compute the index, the price of 435 commodities are used. The index is released on a weekly basis, and assesses price changes that occurred just two weeks prior. The Reserve Bank of India uses the PPI while formulating its monetary policies and strategies.

What are the causes of inflation? There are two major schools of thought. The monetarist school believes that inflation is caused by the excessive growth of money in the economy. The crux of their argument is that if the growth rate of money were to exceed the growth in the output of goods and services, it would amount to a situation where too much of money is chasing too little of available products. The consequence will obviously be a rise in the price level. The Keynesian school on the other hand, believes that inflation is primarily caused by an increase in the overall demand for goods and services. If the demand were to exceed the available supply, the imbalance will manifest itself as inflation.

The stage of the business cycle has implications for the rate of inflation. A surge in demand following a recession is usually not inflationary because there will be substantial production slack available in the economy. However

further up in the cycle, when the available resources are not adequate to satisfy the demand, rising demand can cause a sharp increase in price.

While too much of money in circulation poses problems, too little of money too has undesirable implications. If there is too little money available in circulation, the supply of goods and services will be high relatively to the level of demand. This will cause businesses to cut back on production and possibly reduce their work force. If the problem were to persist it could lead to an economic recession, or a reduction in the economy's level of output. A sustained recession will eventually lead to an increase in the level of unemployment, as companies cut back on their workforce in response to falling demand.

2

CHAPTER

Defining and Measuring Money in Circulation

Introduction

There is no unique definition of what constitutes money. One school of thought is that money should be measured as the aggregate of assets that can be deployed for making immediate payments. Obviously paper money, coins, checking accounts, and traveler's checks fall in this category. However, others say that this is too narrow a definition, for money is not only a medium of exchange, it is also a store of value. As per this view, assets such as balances in savings accounts, and other assets which can be easily converted to a medium of exchange, ought to be counted as well. The crux of the debate is the notion of liquidity. An asset is said to be liquid if it can be easily converted to cash and vice versa. The first school of thought believes that a liquid asset is not something that can be converted to cash, but rather is what constitutes cash itself, that is, it can be used as a

medium for acquiring goods and services. The second school believes that in practice other assets such as savings deposits can be easily converted to cash. Consequently their belief is that money is not just cash, but also cash-like assets.

Monetary Base

The monetary base also known as *high-powered money*, is the narrowest measure of money. The term refers to the amount of money produced directly by the actions of the government or the central bank of a country. The U.S. monetary base is the sum of currency with the public, that is outside the government, the Federal Reserve, and depository institutions, plus the reserves held by depository institutions. The reserves held by depository institutions includes deposits with the Fed and vault cash held by such institutions. The word *public* in this context, refers to all households, businesses, and governments, other than the U.S. Treasury, the Fed, and depository institutions in the U.S. Quite obviously the term includes both foreign individuals as well as foreign institutions.

M1

A broader definition of money is termed as M1. It views money purely as a medium of exchange. This measure of money has three components—currency, travelers cheques issued by non-banking institutions, and transactions deposits held by investors at depository institutions. The currency component of this measure of money is the same as what is included in high powered money. Why is it that only traveler's cheques issued by non-banking institutions such as American Express and Thomas Cook are included? The reason is that when conventional

depository institutions issue such cheques, they place the funds required to redeem such cheques in special transactions deposit accounts that are already included among transactions deposits.

Transactions deposits are checking accounts (referred to a current accounts in India), and checkable accounts such as NOW (Negotiable Order of Withdrawal) accounts and ATS (Automatic-Transfer-System) accounts.

Before we proceed further let us discuss the various types of accounts offered by U.S. banks.

Types of Bank Deposits

Deposits can be classified into four categories. These are:

- Demand deposits
- Savings deposits
- Time deposits
- Hybrid deposits

What is a demand deposit? 'A demand deposit is one where the bank is required to honor immediately, any withdrawals made by the account holder, either in person, or by designating a third party as a beneficiary.'

Such deposits are intended for day to day banking needs. Depositors can use such accounts for paying the bills of third parties from whom goods and services have been procured. Such accounts are referred to as checking accounts because they permit account holders to freely write cheques against their balances. Traditionally, such accounts in the U.S. have been non-interest bearing, and correspond to current accounts in India.

What is a savings account? 'It is an account that is designed to attract funds from customers who wish to set aside money in anticipation of planned as well as unanticipated future expenses.' In practice, the account holder can make

deposits and effect withdrawals as desired. Legally the bank can insist on receiving notice prior to a withdrawal, but this provision is rarely, if ever, invoked. Such accounts, unlike in India, do not offer cheque writing facilities. In the U.S. regulations limit the withdrawals, payments and transfers that an account holder may perform. The depositor is permitted to make up to six transfers or withdrawals per month or statement cycle (of at least four weeks duration). The bank may authorize up to three of these payments to be made by cheque, draft, debit card or similar order, by the depositor to third parties.

What is a time deposit? It is a deposit with a fixed maturity date, corresponding to what we call a fixed deposit in India. It pays a higher rate of interest than a savings account, but there are penalties for premature withdrawals. By law such deposits must have a minimum maturity of seven days. In practice, such deposits have a duration of 30, 60, 90, or 180 days. In the U.S. such deposits are known as *Certificates of Deposit or CDs*. CDs are of two types– Negotiable and Non-negotiable. Non-negotiable CDs cannot be transferred from one party to another. In other words, they represent a customized contract between the bank and a specific individual. They are used mainly by retail investors, and tend to be of small denominations. Negotiable CDs on the other hand, can be freely transferred from one party to another. They therefore constitute marketable securities. They tend to be of large denominations, usually a multiple of one million dollars. They are used primarily by institutional investors, and represent a key component of the money market.

What is a hybrid account? Such accounts have features of more than one type of account. We will consider three types of hybrid accounts:

- NOW Accounts:

- Money Market Deposit Accounts
- Automatic Transfer Services

'*NOW*' stands for negotiable order of withdrawal. They can be used like checking accounts to pay for the purchase of goods or services. But unlike checking accounts, they pay interest. By law they can be held only by individuals or non-profit organizations. Legally a bank can insist on prior notice of a withdrawal. But such a provision is rarely invoked.

To understand a Money Market Deposit Account (MMDA), we need to first understand the concept of a money market mutual fund. A mutual fund, as you may know, is an entity that pools the investments made by its shareholders and invests the corpus in the securities markets. Money market mutual funds are specialized funds that invest exclusively in money market securities, where by money market securities, we mean debt securities with a maturity, at the time of issue, of one year or less. Such securities are:

- Short-term in nature
- Are highly liquid
- Carry a low risk of default

Over a period of time, such accounts began permitting their shareholders to write cheques against the balances in their accounts. Thus they began to directly compete with banks from the standpoint of attracting funds, and investments in these funds became no different from checking account deposits. Such funds offered market determined rates of interest, which were higher than what banks were offering, and began to wean away customers from banks. MMDAs were a response to such funds. After obtaining approval from the U.S. government, banks began to offer short-term deposits on which they could pay any interest that was deemed necessary to attract and

hold funds. These accounts permit up to six pre-authorized withdrawals per month to pay third parties. But only three of these withdrawals may be by way of issuing cheques to third parties. There is however no limit to the number of withdrawals that an account holder may make for personal use. Banks however reserve the right to set minimum limits for each withdrawal and to regulate the frequency of such withdrawals. Unlike NOW accounts, such accounts can be held by businesses.

What is an ATS? It is a combination of a checking and a savings account. Funds are primarily maintained as a savings deposit, and consequently balances earn interest. However cheques can be issued against balances in the checking account, with a proviso that in the event of an overdraft, funds will be automatically transferred from the savings to the checking account.

M2

Both M1 and high-powered money are definitions of '*cash money*', and include only highly liquid assets. High-powered money measures funds made directly available by the U.S. Treasury and the Federal Reserve, while M1 measures funds more broadly available to the public. The next definition of money, called M2, treats money not just as a medium of exchange, but also as a store of value. Consequently, M2 includes:

- M1
- Savings accounts
- Small denomination time deposits (of denomination less than $ 100,000), excluding retirement accounts
- Money market deposit accounts
- Shares of money market mutual funds other than those held by institutions

Investments in money market mutual funds are made by individuals, brokers, dealers, as well as financial institutions. The Fed is of the opinion that institutional investments at MMMFs are typically not very liquid. Thus only MMMF investments made by individuals and broker-dealers are included in M2.

M 3

An even broader definition of money is called M3. It includes:

- M2
- Time deposits with a denomination of $100,000 or more held at depository institutions
- Term Repos and Term Eurodollars
- Repos at depository institutions and Eurodollar deposits held by U.S. residents (other than depository institutions) at foreign branches of U.S. depository institutions
- Shares of money market funds held by institutions

Most of the terms in the definition of M3 are self explanatory. However, repurchase agreements and Eurodollars, merit an explanation.

What is a Repurchase Agreement?

A repurchase agreement, known as a Repo for short, is an arrangement by which a borrower acquires funds by selling securities in his possession to the lender, with an agreement to repurchase them on the following day at a higher price. Thus a Repo is nothing but a collateralized loan. The difference between the purchase price and the subsequent selling price, constitutes income for the lender. Most Repos

are done on an overnight basis. However such agreements may also be made for a longer period of time, in which case they are known as 'Term Repos'. From the standpoint of the borrower, these transactions are known as Repos, whereas from the point of view of the lender they are known as Reverse Repos. Thus every Repo must be matched by a Reverse Repo.

What are Eurodollars?

The development of the Eurocurrency market was one of the early factors in the growth of international investment.

A eurocurrency is a freely traded currency deposited in a bank outside its country of origin. For example, Eurodollars are dollars deposited outside the U.S. while Euroyen are yen deposited outside the Japan.

The rapid growth of the Eurodollar market was due to the following factors.

1. **Due to the high demand for the U.S. dollar as an international vehicle currency:** By the end of World War II, the U.S. was by far the most dominant country in the world. Consequently, the U.S. dollar became the most preferred currency for international trade, displacing the British pound which was the most sought after vehicle currency prior to the war.
2. **Due to the reluctance of the former Warsaw Pact countries (communist countries) to park their dollar holdings with U.S. banks**: Since the U.S. dollar was the major vehicle for trade, East European countries, required U.S. dollar balances in order to finance imports. They were however reluctant to maintain accounts with American banks, since there was always a fear that such deposits could be impounded by the U.S. government. Thus, they began depositing their dollars with European banks.

As trade grew, the European banks soon discovered that there was a ready demand for these dollars by parties based outside the U.S. As a consequence, an active Eurodollar market came into existence.

3. **Interest rate ceilings and reserve requirements in the U.S.:** In the 1960's, through a legislation called regulation Q, the U.S. government imposed low interest rate ceilings on U.S. banks, and simultaneously imposed significant reserve requirements.

   What is a reserve? When a unit of currency is deposited with a bank, only a fraction of it can be lent out. The balance has to be kept either in the form of approved securities or as cash. We, in India, have the requirements of the Statutory Liquidity Ratio (SLR) and the Cash Reserve Ratio (CRR). As per the SLR requirement, currently banks are required to maintain an amount equivalent to 24% of their demand and time liabilities in the following forms.

   - Cash
   - Gold valued at a price not exceeding the current market price
   - Unencumbered approved securities valued at a price as specified by the RBI from time to time

   The maximum limit of SLR is 40% and the minimum limit is 24%. The current requirement is therefore at the minimum. An additional reserve has to be maintained in the form of a deposit with the Reserve Bank of India. This is known as the Cash Reserve Ratio. The current requirement is 5%.

   The lower the reserve ratio, the more will be the money available with the bank for productive purposes. Consequently, the lower the reserve ratio,

the higher will be the rates paid on deposits, and the lower will be the lending rates. In other words, the greater the quantum of funds available with a bank, the smaller will be the spread or *net interest margin (NIM)* that it can afford to operate with. The net interest margin is the difference between the interest received by a bank on its loans and investments, and the interest paid by it on its deposits.

As a consequence of these two factors, depositors became reluctant to park their funds with American banks.

4. **Due to the lack of government regulations on Eurodollar deposits:** Eurodeposits were relatively unregulated and did not suffer from reserve requirements. It must be pointed out that even if there is no statutory reserve requirement, banks by themselves may maintain voluntary reserves as a measure of caution.
5. **Due to the large flow of Petrodollars into international banks from the Oil Producing Export Countries(OPEC):** After the 1973 war in the Middle East, rising crude oil prices ensured that Arab countries were flush with funds. The Euromarket, due to its lack of reserve requirements, and relatively low cost of operation due to economies of scale, was instrumental in recycling these so called Petrodollars by accepting deposits at relatively higher rates and simultaneously offering loans at competitive rates.

Current Statistics

The values of the monetary aggregates for the U.S. for the first seven months of the year 2009 are given below.

Table 2.1

Monetary Aggregates in billions of USD

Month	*M1*	*M2*
January	1,570.20	8,216.20
February	1,535.70	8,244.90
March	1,577.20	8,382.40
April	1,608.80	8,376.40
May	1,599.60	8,348.30
June	1,655.00	8,363.60
July	1,655.90	8,327.30

Source: Federal Reserve Statistical Release

Table 2.2

Components of M1 in billions of USD

Month	*Currency*	*Traveler's Cheques*	*Demand Deposits*	*Other Chequable Deposits*
January	825.80	5.50	426.30	312.60
February	838.60	5.50	377.40	314.10
March	846.20	5.40	396.50	329.10
April	849.00	5.30	408.20	346.30
May	850.80	5.20	405.50	338.00
June	852.40	5.20	441.70	355.60
July	854.60	5.20	440.40	355.70

Source: Federal Reserve Statistical Release

Table 2.3

Non-M1 Components of M2 in billions of USD

Month	*Savings Deposits*	*Small-denomination Time Deposits*	*MMMFs*
January	4,184.30	1,375.80	1,085.90
February	4,275.40	1,361.80	1,072.10
March	4,380.50	1,346.60	1,078.10
April	4,402.50	1,322.10	1,043.00
May	4,456.70	1,295.20	996.80
June	4,477.70	1,271.90	958.90
July	4,500.70	1,243.50	927.30

Source: Federal Reserve Statistical Release

Types of Bank Deposits in India

Banks in India generally offer four kinds of accounts. These are:

- Current accounts
- Savings accounts
- Recurring deposits
- Fixed deposits

Current accounts correspond to checking accounts in the U.S. There are no limit on the number of transactions or the amount of transactions on any given day. Such accounts are normally used by business entities and not individuals, except in exceptional cases where an individual has to make frequent payments to third parties by issuing cheques. Like in the U.S., depositors are not paid any interest by the banks.

Savings accounts in India are very popular with individuals. Unlike savings account in the U.S., such deposits which are maintained with banks in India, permit account holders to write cheques against their balances. Most banks have stipulated rules for the maximum number of withdrawals that an account holder may make in a specified period, as well as the maximum amount that can be withdrawn. However, in practice these are rarely, if ever enforced. But, if a bank were to perceive that an investor is enjoying the interest benefit of such an account, while simultaneously using the cheque writing facilities in a manner similar to a current account, it has the right to intervene and impose restrictions on withdrawals. The rate of interest on such accounts is fixed by the Reserve Bank of India (RBI).

Recurring deposits are intended for individuals seeking to set aside sums of money at periodic intervals in order to build a corpus. These accounts require the holder to deposit a fixed amount every month. The minimum deposit is usually Rs 100. Failure to deposit as scheduled will attract a penalty, as will early or premature withdrawal. A new innovation is what is known as FRD (Flexible Recurring Deposit). In the case of such accounts, the depositor has to choose a base amount, usually a minimum of Rs 500 and multiples of Rs 100 for amounts which are greater. This is the minimum that must be deposited every month. However, if he were to have surplus cash in a particular month, he can deposit an amount that is higher than the base amount, but with an upper limit, which is often set at 10 times the base amount.

Fixed deposits correspond to time deposits in the U.S. They pay higher interest than other deposit types, but require a commitment of funds for a fixed period, and

hence the name. Pre-mature encashment is possible, but usually a penalty in terms of a reduction in the percentage of interest paid is levied, although in a competitive market some banks are choosing to dispense with this provision. Unlike in the case of savings accounts, on which banks have to pay a rate of interest fixed by the RBI, banks can offer a rate of interest on such deposits, that they deem is necessary to attract and hold the funds.

Definition of Monetary Aggregates in India

The RBI defines five measures of the money supply. The most narrow is M0 and the broadest aggregate is M4. We will define each of them and give the statistics for their current levels.

- **M0:** This is known as *reserve money*. Consists of the currency in circulation + Bankers' deposits with the RBI + 'Other' deposits with the RBI
- **M1:** This is equal to currency with the public + Demand deposits with the banking system + 'Other' deposits with the RBI
- **M2:** This is defined as the level of M1 + savings deposits with Post Office Savings Banks
- **M3:** This is equal to M2 + Time deposits with the banking system
- **M4:** This is the broadest monetary aggregate. It is equal to M3 + all deposits with Post Office Savings Banks

Statistics

Table 2.4

Currency Related Statistics in Rupees Crore

Year	*Cash with Banks*	*Currency with the Public*
2000-01	8,654	209,550
2001-02	10,179	240,794
2002-03	10,892	271,581
2003-04	12,057	314,971
2004-05	12,347	356,314
2005-06	17,454	412,124
2006-07	21,244	482,854
2007-08	22,390	568,410
2008-09	24,790	666,364

Source: www.rbi.org.in

Table 2.5

Deposit Related Statistics in Rupees Crore

Year	*Other Deposits with the RBI*	*Bankers' Deposits with the RBI*	*Demand Deposits*	*Time Deposits*
2000-01	3,630	81,477	166,270	933,771
2001-02	2,850	84,147	179,199	1,075,512
2002-03	3,242	83,346	198,757	1,244,379
2003-04	5,119	104,365	258,626	1,426,960
2004-05	6,478	113,996	286,998	1,595,997
2005-06	6,869	135,511	407,423	1,893,104
2006-07	7,496	197,295	477,604	2,342,113
2007-08	9,054	328,447	578,372	2,862,046
2008-09	5,573	291,275	581,247	3,510,835

Source: www.rbi.org.in

Table 2.6

Monetary Aggregates in Rupees Crore

Year	*Reserve Money (M0)*	*Narrow Money (M1)*	*Broad Money M1 + Time Deposits*
2000-01	303,311	379,450	1,313,220
2001-02	337,970	422,843	1,498,355
2002-03	369,061	473,581	1,717,960
2003-04	436,512	578,716	2,005,676
2004-05	489,135	649,790	2,245,677
2005-06	571,958	826,415	2,719,519
2006-07	708,890	967,955	3,310,068
2007-08	928,302	1,155,837	4,017,882
2008-09	988,001	1,253,184	4,764,019

Source: www.rbi.org.in

Creation of Coins and Currency

The U.S. Mint which produces coins, and the U.S. Bureau of Engraving and Printing (BEP), which prints paper currency, are both operated by the U.S. Treasury. The Mint is headquartered in Washington DC and has facilities in Denver, Colarado, Philadelphia, San Francisco, and West Point in New York. The BEP has production facilities in Washington DC and Fort Worth, Texas. The coins and currency created are sold to the 12 Federal Reserve banks.

Coin and Currency Creation Facilities in India

Production of coins and currency in India is undertaken by Security Printing & Minting Corporation of India Ltd.

(SPMCIL), which is wholly owned by the Government of India. The corporation controls four mints, two note printing presses, two security printing presses, and one security paper mill.

The four mints are located in:

- Hyderabad
- Kolkata
- Mumbai
- Noida

The currency note presses are in Nashik Road and Dewas. The two units have a combined capacity of printing in excess of 5.5 billion pieces of currency of different sizes and denominations.

CHAPTER 3

Money and The Banking System

Reserve Requirements in the U.S.

As we have seen, a reserve is that portion of a bank's assets that has not been lent out or invested, but is held in a form readily available for use. Legal reserves in the U.S. take two forms:

- Currency held in the vaults of the bank (Vault Cash)
- Deposits held by the bank with the Federal Reserve

Reserve requirements have implications for the ability of a bank to create money, for a bank can only lend out the funds that remain after accounting for the required reserves. As per law, the Fed can impose a reserve requirement ranging from 8–14% on transactions deposits, and up to 9% on non-personal time deposits. Transactions deposits are checking and other accounts from which payments can be made to third parties. Non-personal time deposits are fixed deposits held by entities other than individuals and sole proprietorships. The Fed can also impose any reserve that it deems appropriate on the amount that U.S.

depository institutions owe on a net basis to their foreign affiliates or other foreign banks.

In order to reduce the reserve burden, the law provided that reserves would be only 3% on the first 25MM of transactions accounts, and it stipulated that this figure would be adjusted annually by a factor equal to 80% of the percentage change in total transactions accounts in the U.S. Subsequent legislation stipulated that the first two million dollars of a bank's deposits would attract nil reserves, and that this level would be adjusted upward if the quantum of deposits held by the U.S. banks were to increase. However, it was specified that no downward adjustments would be made for any decline in the deposit base.

Current Reserve Requirements

For transactions deposits, the requirements as of 31 December 2009 were:

Table 3.1

Current Reserve Requirements

Deposit Amount	*Reserve Percentage*
0-10.70MM	Nil
10.70MM < X < 55.20MM	3%
X > 55.20MM	10%

Non-personal time deposits are currently exempt from reserve requirements. The requirement is applied to deposits over a two-week period.

Reserve Maintenance

The reserve requirement is calculated on a daily average basis over a two-week period known as the *Reserve Computation Period*. This stretches from a Tuesday to a Monday, two weeks later. In order to determine the required legal reserves, the Fed calculates the daily average of transactions deposits held by a bank over this period, and multiplies it by the required percentage.

The reserves held by a bank must equal the required amount over a two-week period known as the *Reserve Maintenance Period*. This starts on a Thursday, 17 days after the computation period gets over, and ends on a Wednesday two-weeks later. While computing the quantum of required reserves the vault cash held by a bank is adjusted. In practice, the process involves three 14-day periods, as we illustrate below.

Illustration

Assume that today is Tuesday, the 13th of October 2009. A new computation period will commence today and will end on Monday, the 26th of October. Assume that the average checking account balance during this period is $ 900 million. Assuming a reserve ratio of 10%, the required reserve is $ 90 million. The corresponding vault cash computation period will commence on Tuesday, the 27th of October, and will end on Monday, the 9th of November. For this period the bank will have to compute its average vault cash holdings. Let us assume that it is $12 million. Therefore the reserve deposit requirement is 90 – 12 = $ 78 million. The reserve maintenance period will commence on Thursday, the 12th of November and will end on Wednesday, the 25th of November. The average

balance in the bank's reserve account at the FED during this period must be greater than or equal to $ 78 million.

The next reserve computation period will commence on Tuesday, the 27th of October. Thus the computation calendars overlap, which means that depository institutions are satisfying reserve requirements on a continuous basis, but with a consistent lag of one month.

The Use of Sweep Accounts

Excess reserves are non-remunerative for the bank, for both vault cash as well as reserve deposits at the Fed are non-interest bearing. So while excess reserves undoubtedly have a utility from the standpoint of satisfying a sudden loan or withdrawal request, there is an opportunity cost. One way of reducing the cost is by using a sweep operation. What happens in practice may be described as follows.

At the close of business on Fridays, the bank will classify its checking deposits as MMDA accounts which currently attract nil reserves. The funds will be re-classified as checking deposits at the opening of business on the following Monday. Obviously the bank does not face the specter of a sudden withdrawal or loan request over the weekend. This reduces the bank's reserve requirement because the 14-day balance averaging period includes two weekends. A complete classification of checking balances can reduce the transactions deposits balance to zero on four out of fourteen days. However the sweep operation carries a price tag. MMDA accounts require the bank to pay interest. This outflow will partially offset the opportunity cost savings achieved by reducing the required reserves.

Creation of Money by Banks

How do reserve requirements impact the deposit base of financial institutions, and lead to the creation of money? Consider a simple economy where there are five citizens Alfred, Brad, Charlie, Doug and Eric. Assume that Brad has 75 bushels of wheat, while Charlie has 60 bushels of corn. Let the price of wheat be $ 5 per bushel, and that of corn $ 4 per bushel.

Assume that Alfred is a Federal government employee, who has to be paid a monthly salary of $ 100. The Federal Reserve, will create this currency. What will happen is that the U.S. government will issue bonds worth $ 100, and in return will get $ 100 in currency from the Fed. The FED's balance sheet at this point, in time, will be as depicted below.

The Fed's Balance Sheet

Liabilities	Assets
Federal Reserve Notes $ 100	U.S. Government Securities $ 100

Figure 3.1

At this point in time, the money in circulation is $ 100, which is with Alfred. The monetary base or high powered money is $ 100, as are M1 and M2.

If there is no bank in the economy, Alfred can buy 20 bushels of wheat from Brad. Brad in turn can buy 25 bushels of corn from Charlie. The amount of money in circulation in this scenario is $100.

Now let us introduce a bank, called First National. Assume that Alfred buys 20 bushels of wheat from Brad, who deposits the money received in the bank. Let us assume that the required reserve ratio imposed by the Fed is 10%. If so, First National will have to keep $ 10 as reserves, but is free to make loans to the extent of $ 90. Assume that it lends $ 90 to Doug, who uses it to buy another 18 bushels from Brad, who deposits it once again with First National. First National will have to keep a statutory reserve of $ 9, and can lend out $ 81. Assume that it makes a loan of $ 81 to Eric, who uses it to buy 20.25 bushels[1] from Charlie, who deposits it with the bank. After these transactions, Brad has a bank balance of $190, while Charlie has a bank balance of $ 81. Thus the amount of money, as measured by the ability of the people to pay for goods and services is $ 190 + $ 81, or $ 271.

Now let us extend the analysis to include more people. If so, each time a person makes a deposit with the bank, it can loan out 90% of it to someone. Thus the creation of money due to the initial deposit of $ 100 follows the following sequence:

$$100 + 0.9 \times 100 + 0.9 \times 90 + 0.9 \times 81.....$$

In general if the amount of currency deposited is $ D, and the reserve ratio is r, the sequence may be stated as:

$$D + (1 - r) \times D + (1 - r)^2 \times D + (1 - r)^3 \times D + ...$$

[1] Assume that assets are infinitely divisible.

Since r is less than one, the series will converge to $\frac{D}{r}$. In our case, since the required reserve is 10%, and the amount of currency deposited is $ 100, the money in circulation can increase to a maximum of $\frac{100}{0.10}$ or $ 1,000.

Thus the extension of loans by commercial banks has an impact on their deposit base, since borrowers for the most part prefer to keep the proceeds as bank deposits, rather than in the form of cash. In practice, a bank cannot enlarge its deposit base without limit by making more and more loans. It must be remembered that every time a bank accepts a deposit, it is undertaking an obligation to clear cheques issued by the borrower. Consequently, some kind of a contingency fund is required. This is precisely the rationale behind the concept of a reserve.

Thus an original deposit of $ 100 by a customer can create a deposit base of $ 1,000 by a process of expansion. The deposit multiplier in this case is 10, which is nothing but the reciprocal of the reserve ratio.

In practice, it is not necessary that a deposit of $ 100 by Brad will lead to an increase of $ 1,000 in the deposit base. For instance, what if Charlie withdraws and keeps $ 11 as cash with himself, an amount that does not subsequently re-enter into the banking system, and deposits only $ 70 with the bank. The deposit of $ 70 if allowed to expand to its limit will lead to an aggregate deposit of $ 700. Taking the $ 190 that Brad has in his bank account, and the $ 11 held by Charlie, the total amount of money available in the economy is only:

$$100 + 90 + 11 + 700 = \$\ 901$$

The withdrawal of funds without their subsequent deposit into the banking system is called a *leakage*. Obviously,

the greater the leakage, the smaller will be the money multiplier. In practice, there could be another reason why the deposit expansion is not taken to its conclusion. What if the bank is not able to find new borrowers after a point? In our illustration, assume that after Charlie deposits $ 81 with the bank, there are no further demands for loans. If so, the deposit base will only be:

$$100 + 90 + 81 = \$\ 271$$

Accounting for the Above Transactions

When Brad deposits $ 100 with the bank, its balance sheet will look as follows.

Balance Sheet of First National Bank

Liabilities	Assets
Deposit from Brad $ 100	Vault Cash $ 100

Figure 3.2

When Doug is granted a loan by the bank, which is subsequently used to pay Brad, the corresponding bank balance sheet will look as follows.

Balance Sheet of First National Bank

Liabilities	Assets
Deposit from Brad $ 190	Vault Cash $ 100
	Loan to Doug $ 90

Figure 3.3

The next transaction entails the making of a loan of $ 81 by the bank to Eric, who uses it to procure goods from Charlie. The balance sheet of the bank after these transactions will look as follows.

Balance Sheet of First National Bank

Liabilities	Assets
Deposit from Brad $ 190	Vault Cash $ 100
Deposit from Charlie $ 81	Loan to Doug $ 90
	Loan to Eric $ 81

Figure 3.4

Since vault cash is counted as reserves, the bank has $ 100 of reserves. Of this 10% of the total deposits held, which

in this case is $ 271, constitutes the required reserves. Thus the balance of $ 72.90 is excess reserves. The bank can use this excess to either make additional loans, or else to acquire securities.

It is not necessary that all reserves should be held in the form of vault cash. In practice, most reserves are maintained in the form of deposits with the Federal Reserve. For instance, let us assume that First National Bank retains $ 15 in the form of vault cash and transfers $ 85 to the Fed. The Fed will then withdraw this amount of money from circulation, and its balance sheet at this point in time will be as depicted below.

The Fed's Balance Sheet

Liabilities	Assets
Federal Reserve Notes $ 15	U.S. Government Securities $ 100
Reserves of First National Bank $ 85	

Figure 3.5

Now let us introduce a second bank, First Global. Assume that when Brad gets $ 100, he deposits it with First National Bank. The same happens after the second transaction wherein he receives $ 90. At this point in time, the bank has $ 100 with it, whereas the required reserve corresponding to $ 190 of deposits is only $19. So it has

excess reserves of $81. What if Charlie, who borrows $ 81, decides to deposit it with First Global Bank? If so, $ 81 will be transferred from First National to First Global. What will happen is that the Fed will debit the reserve account of the first bank, and credit the account of the second bank. The FED's balance sheet will look as shown in Figure 3.6.

Considering that First Global has $ 81 deposited with it, it has excess reserves of $ 72.9. The total reserves in the banking system continues to be $ 100, of which $ 15 is in the form of vault cash at First National, $ 4 is in the form of a reserve deposit held by First National at the Fed, and $ 81 is in the form of a reserve deposit held by First Global at the Fed. What if First Global were to desire to hold $ 6 in the form of vault cash? The Fed will issue notes equivalent to this amount and will debit the reserve account held by the bank with it. In a T-account format, it will look as shown in Figure 3.7.

The Fed's Balance Sheet

Liabilities	Assets
Federal Reserve Notes $ 15	U.S. Government Securities $ 100
Reserves of First National Bank $ 4	
Reserves of First Global Bank $ 81	

Figure 3.6

The Fed's Balance Sheet

Liabilities	Assets
Federal Reserve Notes $ 21	U.S. Government Securities $ 100
Reserves of First National Bank $ 4	
Reserves of First Global Bank $ 75	

Figure 3.7

Thus the total reserves held by the banking system as a whole is independent of the number of banks in the system. Since First Global too is empowered to make loans after maintaining the required reserves, the two banks taken together can in principle cause the total deposit base in the economy to reach $ 1,000.

Deposits and Withdrawals and The Impact on Reserves

Thus the reserves held by a bank, will go up whenever a customer makes a deposit. Deposits may be in the form of cash or as a cheque. In the case of a cash deposit, vault cash will increase by the amount deposited. The bank may choose to keep all or a part of the amount as vault cash. If it were to choose not to retain the entire amount as cash, it would transfer the excess cash to the Fed, which will credit its reserve account by the same amount. Thus, the sum of vault cash and the reserve balance at the Fed, will increase by the amount deposited by the customer. What about the case where a customer deposits a cheque drawn on another bank? If so, fund's will be transferred from the reserve account that is held by the drawer's bank at the Fed, to the reserve account that is being maintained

by the drawee's bank at the Fed. Consequently, the drawee's bank will witness an increase in its reserves, while the drawer's bank will lose an equivalent amount in reserves.

We will give an illustration of how a payment is effected when a party deposits a cheque drawn on another bank.

Illustration

An IT firm in Chicago has sold software worth $ 100,000 to a party in Boston and has received a cheque for the amount, drawn on a Boston based bank. The firm will deposit the cheque with its bank in Chicago. The bank will send the cheque to the Federal Reserve Bank of Chicago, which will in turn send the cheque to the Federal Reserve Bank of Boston. The Federal Reserve Bank of Boston will send the cheque to the local bank on which the cheque was drawn. This bank will debit the account of the drawer and will either remit the amount to the Federal Reserve Bank of Boston, or else will authorize it to debit its reserve account. The funds will then be transferred from the Federal Reserve Bank of Boston to the Federal Reserve Bank of Chicago, which will credit the reserve account of the drawee's bank. The drawee's bank will finally credit the drawee's account. The net result is the transfer of an amount of $ 100,000 from a party in Boston to a party in Chicago. Cheques which are collected and cleared by the Federal Reserve system must be paid in full by the banks on which they are drawn, without deduction of any fees, that is, they should be *paid at par.* Of course the drawee's bank may recover collection charges from the drawee.

How do the funds get transferred from one Federal Reserve Bank to another? In order to facilitate transfers between two district Federal Reserve banks, the 12 banks as a whole maintain a fund in Washington D.C. called the *Inter-district*

Settlement Fund, in which each district bank has a share. By way of this fund, money is regularly transferred from one Reserve Bank to another.

Even banks that are not members of the Federal Reserve system, may arrange to maintain what is called a *Clearing Balance* with a district Federal Reserve Bank. When cheques drawn on other banks are deposited with the bank in question, its clearing account will be credited. On the other hand, when cheques drawn against it by its customers are deposited with other banks, its clearing account will be debited.

Impact on Monetary Aggregates

When the Fed issues currency equivalent to $ 100, it adds $ 100 to the monetary base or to high powered money. The monetary base remains at this figure, irrespective of whether the amount is subsequently held by the public, or by commercial banks, or by a combination of the two. However, when checking accounts are opened with commercial banks, M1 and obviously M2 will increase.

When Alfred receives $ 100 from the government, the currency in circulation is $ 100. The monetary base is also $ 100. When Brad receives $ 100 from Alfred and deposits it with the bank, currency with the public stands reduced by $ 100. However the magnitude of checking deposits (M1)is $ 100, as is the level of bank reserves held in the form of vault cash. When Brad deposits the amount received by him from Doug in a checking account, M1 increases to $ 190. However the monetary base remains at $ 100. Finally when Charlie deposits the amount received by him from Eric in a checking account, M1 increases to $ 271, while high powered money continues to remain at $ 100.

Investments: An Alternative

It is not necessary that a bank with excess reserves should make loans. It also has the option of buying securities. For instance, let us take the situation where Charlie deposits a cheque for $ 81 with First Global Bank. The bank will have reserves of an equivalent amount but the required reserves would only be $ 8.1, or 10% of the deposit. It can therefore use the excess reserves, amounting to $ 72.90 in this case, to acquire securities worth $ 60 from a dealer. Let us assume that the dealer also has an account with the same bank.

If so, on the assets side, investments will rise by $ 60, while on the liabilities side, deposits (by the dealer) will increase by the same amount. In a T-account format, the position after the transaction will look as follows.

Balance Sheet of First National Bank

Liabilities	Assets
Deposit from Charlie $ 81	Reserves at the Fed $ 75
Deposit from Dealer $ 60	Vault Cash $ 6
	Investments $ 60

Figure 3.8

The Treasury's Accounts

The U.S. Treasury holds a part of its operating cash balance with the Fed. The rest is held with depository institutions across the U.S., in what are called *Treasury Tax & Loan (TT&L)* note accounts. All disbursements made by the Treasury are by debits to its account at the Fed. Consequently, when the Treasury requires additional funds

to cover the cheques issued by it, it does so by transferring funds from its account at a depository institution or institutions, to its account at the Fed. Such transfers are referred to as '*calls*' on TT&L account balances.

The credit balances in the TT&L accounts arise from receipt of tax payments by residents, as well as on account of payments from buyers for securities issued by the Treasury.

Impact of an Increase in the Treasury's Deposits

When the Treasury makes a call on a TT&L account, the funds are transferred from the bank in which the account is held to the Treasury's account at the Fed. What happens in practice is that the Fed will debit the reserve account of the depository institution from which funds are being transferred, and credit the Treasury's account held with it. Consequently there will be a reduction in bank reserves equivalent the full amount of the transaction. However, since depository institutions are not required to maintain reserves against TT&L accounts, there is no reduction in the required reserves.

Illustration

Consider the following position at the Fed.

The Fed's Balance Sheet

Liabilities	Assets
Federal Reserve Notes $ 21	U.S. Government Securities $ 100
Reserves of First National Bank $ 4	
Reserves of First Global Bank $ 75	

Figure 3.9

Charlie, who has $ 81 on deposit with First Global, is required to pay a tax of $ 25 to the Treasury. Assume that the Treasury has a TT&L account at First Global. If so, the bank will debit Charlie's account and credit the Treasury's account. First Global's financial position will be as follows.

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's A/c $ 56	Vault Cash $ 6
Treasury's TT&L A/c $ 25	Reserves at the Fed $ 75

Figure 3.10

This transaction will leave the reserve position unchanged, but will cause the money supply to decline by $ 25.

If the Treasury were to transfer an amount of $ 25 from its account at First Global to the Fed, the steps would be as follows. First Global will debit the Treasury's account with $ 25. On the assets side, it will amount to a reduction of $ 25 in its reserve account at the Fed. Consequently after the transaction, First Global's position will be as shown in Figure 3.11.

The Fed will debit First Global's reserve account with $ 25, and will credit The Treasury's account with an equivalent amount. As a consequence, the reserve balance held by the banks has declined by $ 25. In a T-account format, we can depict the position as shown in Figure 3.12.

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's A/c $ 56	Vault Cash $ 6
	Reserves at the Fed $ 50

Figure 3.11

The Fed's Balance Sheet

Liabilities	Assets
Federal Reserve Notes $ 21	U.S. Government Securities $ 100
Reserves of First National Bank $ 4	
Reserves of First Global Bank $ 50	
Treasury's A/c $ 25	

Figure 3.12

Typically the Treasury will spend this income by giving a cheque to another party say Larry. Let us say that it gives a cheque for $ 20 to Larry. If Larry was to deposit the

cheque with First Global, the sequence of events would be as follows.

First Global would credit Larry's account with $ 20. On the asset side it would gain $ 20 in reserves. At the Fed, the Treasury's account will be debited with $ 20 while the reserve account of First Global will be credited with $ 20. In a T-account format, the positions will look as follows.

The Fed's Balance Sheet

Liabilities	Assets
Federal Reserve Notes $ 21	U.S. Government Securities $ 100
Reserves of First National Bank $ 4	
Reserves of First Global Bank $ 70	
Treasury's A/c $ 5	

Figure 3.13

As a consequence of this transaction the reserves in the banking system increase by $ 20 as does the money supply or M1.

The Treasury keeps its funds in TT&L accounts until needed, and transfers the required amounts to its checking accounts at the Fed only when the funds are required to be disbursed. The reason is the following. The income for the Treasury particularly in the form of taxes is lumpy and is received periodically. Similarly income from the sale of securities is also received in accordance with the scheduled sale of such assets. On the other hand,

disbursements have to be made throughout the year in the form of salaries, wages, pensions, and other expenses like fuel bills. We have seen that whenever a call is made on a TT&L account, there is a reduction in the reserves of commercial banks. These reserves are restored, partially or fully, when the Treasury makes subsequent payments from its account at the Fed. If the Treasury were to make calls on the TT&L account as and when revenue is received, it will lead to a significant and sharp decline in bank reserves. However, since the disbursements made by the Treasury are more uniform, restoration of reserves will not be at the same pace. Consequently the banking system will experience a substantial reduction in reserves if and when a large call is made on a TT&L account, which will have implications for the ability of member banks to make loans to fund economic activities. This has the potential to be recessionary and can lead to an economic slowdown. Consequently the Treasury draws on its TT&L balances only on a *just-in-time (JIT)* basis.

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's A/c $ 56	Vault Cash $ 6
Larry's A/c $ 20	Reserves at the Fed $ 70

Figure 3.14

Deposit Contraction

Assume that Brad has $ 190 on deposit with First National while Charlie has $ 81 on deposit with First Global. First National has reserves of $ 19, which is required by law, while First Global has reserves of $ 81, of which $ 8.1 is required. Consequently it has $ 72.9 of excess reserves. First National has also made a loan of $ 90 to Doug and $ 81 to Eric. The positions of the two banks are as depicted below, in Figure 3.15 and 3.16.

Balance Sheet of First National Bank

Liabilities	Assets
Brad's Deposit $ 190	Vault Cash $ 15
	Reserves at the Fed $ 4
	Loan to Doug $ 90
	Loan to Eric $ 81

Figure 3.15

Let us consider various scenarios. We will first look at a situation where Charlie withdraws $ 40 in cash from his account at First Global. The bank will ask the Fed to issue $ 40 to it in the form of currency bills. If so its position will look as shown in Figure 3.17.

The transaction will lead to the following situation in the books of the Fed, is depicted in Figure 3.18.

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's Deposit $ 81	Vault Cash $ 6
	Reserves at the Fed $ 75

Figure 3.16

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's Deposit $ 41	Vault Cash $ 6
	Reserves at the Fed $ 35

Figure 3.17

The net result is that the aggregate reserves held by the two banks (including vault cash) is now:

$$15 + 4 + 6 + 35 = \$\ 60$$

Thus the reserves have contracted by $ 40. There is no corresponding change in the monetary base since the aggregate reserves plus the currency in circulation continues to be:

$$60 + 40 = \$\ 100$$

The Fed's Balance Sheet

Liabilities	Assets
Federal Reserve Notes $ 61	U.S. Government Securities $ 100
Reserves of First National Bank $ 4	
Reserves of First Global Bank $ 35	

Figure 3.18

On the other hand, what if Brad were to withdraw $ 40 from his account at First National Bank. The bank has no excess reserves. Consequently it will have to borrow. If we assume that First Global is the only other bank in the economy, then it would obviously have to borrow from it. What will happen is that the Fed will debit First Global's reserve account and credit First National's reserve account. It will then issue $ 40 in currency to facilitate the withdrawal by Brad, and in the process will debit First National's reserve account by an equal amount. In a T-account format the FED's position will look as shown in Figure 3.18.

The positions of the two banks will be as shown in Figure 3.19 and Figure 3.20.

Balance Sheet of First National Bank

Liabilities	Assets
Brad's Deposit $ 150	Vault Cash $ 15
Loan from First Global $ 40	Reserves at the Fed $ 4
	Loan to Doug $ 90
	Loan to Eric $ 81

Figure 3.19

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's Deposit $ 81	Vault Cash $ 6
	Reserves at the Fed $ 35
	Loan to First National $ 40

Figure 3.20

Once again the sum of vault cash and reserve balances held by the two banks, stands reduced from $ 100 to $ 60.

Now let us consider a situation where Charlie deposits $ 81 with First Global, which invests $ 22.90 in Government securities, makes loans worth $ 500, and keeps the balance at the Fed. We will assume that the securities were bought from the Treasury. The bank would obviously credit the Treasury's TT&L account with $ 22.90. The bank's balance sheet will look as depicted below.

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's Deposit $ 81	Securities $ 22.90
Deposits by Others $ 500	Loans $ 500
Treasury's TT&L A/c $ 22.90	Reserves at the Fed $ 75
	Vault Cash $ 6

Figure 3.21

The bank is required to maintain reserves worth $0.10 \times 581 = \$ 58.10$. Thus it has excess reserves of $\$ 22.90$. What would happen if Charlie was to now withdraw $ 40 as cash? Since the excess reserves are not adequate, the bank would either have to sell securities or else recall loans. Remember the only other bank in the system, First National, has no excess reserves. Consequently borrowing of reserves from it is ruled out.

Let us first consider the case where it sells securities equivalent to $ X, to the Fed. The amount that is required to be sold may be computed as follows. If $ X worth of securities were to be sold, then from the balance sheet equation:

$$41 + 500 + 22.90 = (22.90 - X) + 500 + 0.10 \times (41 + 500)$$

$$\Rightarrow \qquad X = \$ 13.10$$

Consequently, if the bank was to sell securities, its balance sheet will look as follows.

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's Deposit $ 41	Securities $ 9.80
Deposits by Others $ 500	Loans $ 500
Treasury's TT&L A/c $ 22.90	Vault Cash $ 6
	Reserves at the Fed $ 48.10

Figure 3.22

Let us analyze the cash flows involved. The bank had $ 22.90 of excess reserves. A withdrawal of $ 40 reduced the required reserves by $ 4. Consequently to fund the

withdrawal of $ 40, the bank could rely on its excess reserves of $ 26.90. The balance of $ 13.10 was obtained by selling securities. The reserve balance at the Fed after the transaction, assuming that $ 6 continues to be held as vault cash is $ 48.10, which is nothing but $ 75 – $ 26.9. The sum of the vault cash plus the reserve deposit is $ 54.10, which is 10% of the total deposits held by the bank[2].

The other option is to recall loans. The amount of loans to be recalled may be calculated as follows. If the bank were to recall $ X of loans to meet its reserve requirements, then from the balance sheet equation:

$41 + (500 - X) + 22.90 = 22.90 + (500 - X) + 0.10\ (41 + 500 - X)$

$\Rightarrow \qquad X = \$\ 131$

If the bank was to do so, its balance sheet would appear as shown below.

Balance Sheet of First Global Bank

Liabilities	Assets
Charlie's Deposit $ 41	Securities $ 22.90
Deposits by Others $ 369	Loans $ 369
Treasury's TT&L A/c $ 22.90	Vault Cash $ 6
	Reserves at the Fed $ 35

Figure 3.23

The cash flows may be analyzed as follows. A withdrawal of $ 40 lead to a situation where the bank had excess reserves of only $ 26.90. It had to recall loans to obtain

[2] Remember banks do not have to maintain reserves against TT&L accounts.

the remaining $ 13.1. Since the reserve ratio is 10%, it had to recall 10 times the amount required, which in this case is $ 131. As far as the reserves are concerned, the excess reserves of $ 26.90 were completely used up, as was the amount of $ 13.1 which was freed up on account of the loan recall. Consequently the amount with the Fed, assuming that $ 6 continues to be held as vault cash is $ 35, which is nothing but $ 75 – $ 40. The sum of vault cash and the reserve deposit is $ 41, which is exactly 10% of the total deposits held by the bank.

A deposit of currency into the banking system obviously has a multiplier effect. As we have seen an issue of currency equivalent to $ 100 has the capacity to lead to total deposits of $ 1,000, assuming that the required reserve ratio is 10%. The withdrawal of funds on the other hand will result in a contraction of money supply by a multiple amount. Thus the withdrawal of $ 40 from the banking system will preclude the deposit base from increasing to $ 1,000.

In the first case, after Charlie's withdrawal, the total reserves held by the banking system was $ 19 + $ 6 + $ 48.10 = $ 73.10. Prior to the withdrawal it was $ 100. To meet the drain of cash the bank needed to release $ 40 in reserves. In this case, the Fed injected extra reserves of $ 13.10 into the banking system by acquiring securities worth an equivalent amount. Consequently the reserve balance after this transaction was $ 100 + $ 13.10 – $ 40 = $ 73.10. These reserves were just adequate to support a deposit base of $ 731.

In the second case, after loans worth $ 131 were recalled to meet the withdrawal, the reserves available were $ 100 – $ 40 = $ 60. Consequently the banking system could only support a deposit base of $ 600.

In both cases, theory predicted that a withdrawal of $ 40 would lead to a reduction of $ 400 in the deposit base. In the first case, this was precluded by the injection of

$ 13.10 in reserves by the Fed, as a consequence of which total deposits contracted to $ 731. In the second case however, where there was no injection of additional reserves, the deposit base shrank to $ 600, as was to be expected.

Thus there is a critical difference between deposit expansion and deposit contraction. Leakages or slack loan demand may lead to a deposit expansion that is less than what theory would predict. However, unless a withdrawal of cash from the banking system is accompanied by a simultaneous injection of cash, deposit contraction must take place to the extent predicted by theory.

How Does The Treasury Borrow?

In our first illustration, we assumed that the Fed would create $ 100 in currency by buying a bond with the same face value from the Treasury. While in principle it is possible for the central or federal government of a country to borrow directly from its central bank, this is not the practice in the U.S. In the U.S., the Treasury borrows to a limited extent by issuing debt securities directly to depository institutions, and largely by issuing such securities to the public.

The Fed's Balance Sheet

Liabilities	Assets
Treasury's A/c $ 100	U.S. Government Securities $ 100

Figure 3.24

Let us first consider a case where the U.S. Treasury borrows directly from the Fed, by issuing government securities worth $ 100. The Fed's balance sheet will look as shown in Figure 3.24, after the transaction.

Now assume that the Treasury spends the funds available by giving a check of $ 100 to Larry, who deposits it with First National Bank. The Fed will debit the Treasury's checking account and will credit the reserve account of First National. Consequently the Fed's balance sheet would appear as shown below.

The Fed's Balance Sheet

Liabilities	Assets
Reserves of First National $ 100	U.S. Government Securities $ 100

Figure 3.25

First National's balance sheet, as a consequence of this transaction will look as shown below in Figure 3.26.

The net result is that high powered money has gone up by $ 100, since the total reserves of the banking system has increased by a corresponding amount. M1 has also increased by the same amount since transactions deposits have also gone up by $ 100. Thus if the Treasury were to spend the proceeds of an issue of $ X worth of securities to the central bank, then both high powered money as well as M1 will increase by $ X.

Balance Sheet of First National Bank

Liabilities	Assets
Deposit from Larry $ 100	Reserves at the Fed $ 100

Figure 3.26

If however the Treasury were to directly issue securities worth $ X to the bank, then as we have seen earlier, its TT&L A/c balance will increase by $ X. If it was to subsequently spend the money by issuing a cheque to Larry, then the transactions deposit base of the banking system will stand increased by $ X. However there will be no increase in high powered money.

Finally, let us consider a situation where the Treasury directly issues securities worth $ X to a dealer called Joe. Let us assume that he makes a payment by issuing a cheque drawn on his account at First National Bank, where he has a deposit of the same amount. The bank will credit the Treasury's TT&L account after debiting Joe's account. Thus M1 will stand reduced by $ X. The Treasury will at some point in time transfer the funds to its account at the Fed prior to making a payment. This, as we have seen earlier will cause the Fed to debit First National's reserve account by $ X and credit the Treasury's account by the same amount. As a consequence, high powered money will stand reduced by $ X. Now assume that the Treasury makes a payment of $ X to Larry by drawing on its account at the Fed. The Fed will credit the reserve account of Larry's bank by $ X, after debiting the Treasury's account. This will restore high powered money to its former level.

Larry's bank will credit his checking account with $ X, which will restore M1 to its former level.

Thus the expending of $ X by the Treasury, after obtaining funds by directly issuing bonds to the Federal Reserve, will lead to an increase of an equivalent amount in both the monetary base as well as M1. However, if it were to obtain the funds by issuing the bonds to a commercial bank, then the expending of such money will cause M1 to increase by $ X, without any impact on the monetary base. Finally, if the Treasury were to obtain the resources by issuing bonds directly to the public, the expending of such funds by it will have no impact on either the monetary base or the level of M1.

4

CHAPTER

Seigniorage, Money Multipliers and Plastic Money

Putting Money in Circulation

Whenever coins and currency are produced by the Mint or the BEP, they are sold by the Treasury to the Federal Reserve Banks. Coins are sold for their face value. However, currency notes are sold for their cost of production. Each of the 12 Federal Reserve Banks will keep this newly minted coins and currency notes in its storage vault. However this currency does not immediately become a part of M1. For coins and notes to be counted as M1 they must pass into the hands of the public. In other words they must leave the possession of the Fed as well as the banking system.

So how does newly generated cash enter into circulation. To start with, there must be a demand for cash from the customers of commercial banks. If the banks do not have

adequate vault cash to meet this demand, they will ask the Fed for additional supplies. The Fed will debit the reserve account of the bank which is seeking funds, and transfer the cash to it. The bank will debit the account of the depositor who is seeking to withdraw, and in this manner newly minted currency commences its circulation amongst the public. There is however no impact on the money supply, for although checking account balances stand reduced, there is an equal amount of additional money in circulation with the public. Consequently M1 is not impacted, nor is the monetary base.

The Fed's Balance Sheet

Liabilities	Assets
Reserves of First National Bank $ 200	U.S. Government Securities $ 200

Figure 4.1

The reduction in the reserve account of the bank will have implications for its ability to make additional loans. Consequently a bank will seek to restore its reserve base. One option for it is to sell Treasury securities to the Fed. The acquisition and sale of Treasury securities by the Fed is referred to as *open market operations*. In this case, since the Fed is acquiring securities from the bank, it will credit its reserve account by an equivalent amount. This issue of

high powered money in the form of an increase in the reserve deposits that the banks have at the Fed, is important from the perspective of analyzing the seigniorage gains.

Consider the balance sheet of the Fed, shown in Figure 4.1.

Let us assume that First National is holding securities worth $ 50. Its balance sheet is as shown below.

Balance Sheet of First National Bank

Liabilities	Assets
Deposits $ 250	Reserves at the Fed $ 200
	U.S. Government Securities $ 50

Figure 4.2

If we assume that there is no currency in circulation with the public, high powered money is $ 200, while M1 is $ 250.

Assume that a customer named Brad comes to the bank seeking to withdraw $ 25 in cash. The Fed will issue currency equal to $ 25 to the bank to facilitate the withdrawal. As a consequence of this transaction, the balance sheet of the two institutions will be as depicted in Figure 4.3 and Figure 4.4.

The Fed's Balance Sheet

Liabilities		Assets	
Reserves of First National Bank	$ 175	U.S. Government Securities	$ 200
Federal Reserve Notes	$ 25		

Figure 4.3

Balance Sheet of First National Bank

Liabilities		Assets	
Deposits	$ 225	Reserves at the Fed	$ 175
		U.S. Government Securities	$ 50

Figure 4.4

High powered money is now $ 175 + $ 25 = $ 200. M1 = $ 225 + $ 25 = $ 250. Hence the transaction has had no impact on either the monetary base or M1. However the reserves held by the bank has declined by $ 25, which has implications for its ability to make

additional loans. One way for the bank to restore its reserve base is by selling securities worth $ 25 to the Fed. If so, the respective financial positions of the two institutions will be as depicted below.

The Fed's Balance Sheet

Liabilities	Assets
Reserves of First National Bank $ 200	U.S. Government Securities $ 225
Federal Reserve Notes $ 25	

Figure 4.5

Balance Sheet of First National Bank

Liabilities	Assets
Deposits $ 225	Reserves at the Fed $ 200
	U.S. Government Securities $ 25

Figure 4.6

The level of high powered money after this transaction is $ 200 + $ 25 = $ 225. M1 is $ 225 + $ 25 = $ 250. Thus while M1 is unaffected by the transaction, the monetary base has increased by $ 25.

Thus the injection of $ 25 into the public domain has lead to the acquisition of $ 25 worth of Treasury securities by the Fed. The Treasury has to pay interest on all outstanding securities, including those held by the Fed. However, the Fed, unlike private parties, will return the income received from such securities to the Treasury, at the end of the year. Consequently, an injection of new money into the economy leads to the retirement of an equivalent amount of securities. The income from the issue of such currency is therefore the interest saved by the Treasury, which would have otherwise have had to be paid to the security holders. This then is the context in which we should analyze the seigniorage from the issue of currency notes.

Seigniorage

Seigniorage may be defined as the net revenue that is derived by issuing coins or bank notes. This is because, in practice, there is always a difference between the face value of a coin or note, and the costs entailed in their production and distribution. Let us first discuss seigniorage with an example from the Canada.

The Canadian Evidence

It costs the Royal Canadian Mint about 12 cents to produce and distribute a one dollar coin. Thus the Canadian government makes a profit of approximately 88 cents for every coin that is sold to an institution at face value. Coins,

unlike bank notes are not redeemed by the government. Thus the seigniorage is generated at the time of sale and accrues to the credit of the Government.

The Bank of Canada issues bank notes in the country. Their lifespan is relatively short — in practice, it ranges from about two years for $ 5 and $ 10 notes to about seven years for $ 100 notes. Financial institutions can redeem their surplus notes to the central bank for payment. Thus these notes represent a payable liability for the central bank. As we have just deduced, the accounting process for the revenue and costs associated with the issuance of notes differs from that for coins.

When the central bank issues a bank note, which represents a liability for it, it subsequently acquires interest bearing securities via open market operations. These securities may be short-term in nature (lifespan of a year or less) in which case they are known as bills, or long-term (lifespan in excess of a year) in which case they are referred to as notes or bonds. In the case of notes therefore, seigniorage is the difference between the interest earned on the government securities, and the cost of producing and distributing bank notes. Since these securities are held over a period of time, note related seigniorage is collected in installments over a period of years.

Let us take the Canadian $ 20 bill. At an average interest rate of 5%, a note generates a revenue of a dollar per year that it is in circulation, which we will assume is about three years. The production costs of such notes is about six cents, which works out to about two cents per year. The average annual distribution costs of such notes is approximately two cents. Thus the average annual production and distribution cost is about four cents. Therefore, the annual net revenue for the central bank for every such note that is in circulation is about 96 cents.

The interest revenue for the Bank of Canada has ranged between $ 1.7 billion to $ 2.2 billion. About $ 130 MM has been used by the bank to finance its general operating expenses. The remainder is paid to the government. Thus seigniorage allows the federal government to finance a part of its expenditure without having to levy taxes.

The U.S. Evidence

The currency bills issued by the Fed have a finite life span. It has been estimated that the life of dollar bills in the U.S. is as shown in the table below.

Table 4.1

Life Span of a Typical US dollar Bill

Denomination	*Life Span*
$1	21 months
$5	15.90 months
$10	18.30 months
$20	24.30 months
$50	55.40 months
$100	88.80 months

Source: www.richmondfed.org

Consider the 20 dollar bill. Assume that it stays in circulation for exactly two years. At the end of two years, a depositor will return it to a commercial bank. The bank will return it to the Fed and have its reserve account credited. The Fed will retire the notes from circulation. To offset the increase in bank reserves, the Fed will sell securities to the bank. It will then debit the reserve account

of the bank. Thus for a period of two years, the Fed has earned interest on $ 20. If we assume that the rate is 6% per annum, the annual income is $ 1.20. The Fed pays 5 cents to acquire the note from the Treasury. If we assume that this is the only cost, then the income from the bill over a period of two years is $ 2.35. This is the seigniorage income from the bill. Since the Fed transfers the profit accrued in this manner to the Treasury, the ultimate beneficiary of seigniorage is the Treasury.

Federal Reserve notes in circulation, which are recorded as liabilities of the issuing bank, are the largest liabilities of the Federal Reserve system. On the other hand, Treasury securities are the biggest assets of the Federal Reserve banks. In practice, the Fed arrives at a forecast of the amount of currency that is required to meet the demand in a year, and submits an order to the BEP. The BEP establishes a billing rate for the cost of manufacturing the currency notes, which has to be borne by the Fed. Unlike currency notes, coins are not liabilities of the Fed. The annual output of coins is determined by the Mint, which monitors the stock held by the Fed to identify trends in the demand.

In 2002, the Mint sold about 15 billion coins with a face value of $ 1.4 billion. The production cost of the coins was $ 436 million. The BEP produced 7 billion notes with a face value of $ 103.50 billion. The production cost was 384 million. In the same year, the Fed spent about $ 30 million to process the coins and $ 342 million to process the currency notes.[1]

In 2002, the Mint transferred $ 1 billion in seigniorage from coins and the Fed transferred about $ 24.50 billion in excess earnings, which arise mainly from the holding

[1] See GAO-04-283 Coins and Currency.

of U.S. government securities and are attributable in part to the value of currency in circulation.

Credit and Debit Cards

Are credit and debit cards money? Let us first consider credit cards. These instruments represent a revolving line of credit that is offered by the issuing financial institution to the card holder. That is, the holder can use the card to acquire goods and services up to a pre-defined limit. Each time he repays, in part or in full, his ability to make further transactions on credit will be restored by the extent of payment made.

Credit cards are commonly referred to as *plastic money*. However there is a critical difference between money and such cards. When you use money, in the form of currency or as a checking account balance, to acquire a good or a service, you are exchanging one asset for another. However, if you were to execute the same transaction using a credit card, you would be creating a liability. When you make a card based payment, the institution that issued the card will make a transfer of funds to the merchant's bank account. This is a monetary transaction. The issuing institution will then bill you for the transaction, to which you will respond either in the form of installments or as a bullet payment. Such payments are normally made by issuing cheques. This too entails the use of money. However the credit card transaction that created the liability is not money. It merely represents an extension of credit on the part of the card issuer.

One may argue that most checking account balances arise on account of loans availed from a depository institution. However, it must be remembered that the loan extended by such an institution is not money. Money is created

when the borrower deposits the amount in a checking account, thereby creating an asset for himself.

Illustration

Consider the following T-account.

Balance Sheet of First National Bank

Liabilities	Assets
Deposit from Brad $ 200	Reserves at the Fed $ 200

Figure 4.7

Now assume that the bank makes a loan of $ 100 to Mark who deposits it with First Global Bank. When the check clears, the balance sheet of the two banks will be as depicted below.

Balance Sheet of First National Bank

Liabilities	Assets
Deposit from Brad $ 200	Reserves at the Fed $ 100
	Loan to Mark $ 100

Figure 4.8

Balance Sheet of First Global Bank

Liabilities	Assets
Deposit from Mark $ 100	Reserves at the Fed $ 100

Figure 4.9

M1 is obviously $ 300. Now assume that First Global gives Mark a revolving line of credit of $ 50 in the form of a credit card. Obviously he will use it only when he wishes to procure a good or a service. Let us assume that he buys goods worth $ 50 from Brad by using his card. When First Global pays Brad, the Fed will debit its reserve account by $ 50 and credit First National's reserve account with an equal amount. Consequently, the balance sheets of the two institutions will look as follows.

Balance Sheet of First National Bank

Liabilities	Assets
Deposit from Brad $ 250	Reserves at the Fed $ 150
	Loan to Mark $ 100

Figure 4.10

Balance Sheet of First Global Bank

Liabilities	Assets
Deposit from Mark $ 100	Reserves at the Fed $ 50
	Loan to Mark $ 50

Figure 4.11

M1 has obviously increased to $ 350. What if Mark now repays the amount outstanding on his credit card. If so, First Global's position will look as depicted below.

Balance Sheet of First Global Bank

Liabilities	Assets
Deposit from Mark $ 50	Reserves at the Fed $ 50

Figure 4.12

M1 is back to $ 300. Thus a card based transaction has monetary implications on two occasions. The first is when

the issuing bank pays the merchant. The second is when the card holder repays the issuer. The card based transaction by itself just creates a liability.

What about debit cards? Such cards are an alternative to cheque. That is, when you use such cards, funds are immediately transferred by a debit to your bank account and a credit to the merchant's. However, remember that in a cheque based transaction, it is not the cheque per se which represents money. It is the balance in the checking account which backs the cheque, that is construed as money. These balances are a part of the monetary aggregates M1 and M2. Thus, withdrawal limits on debit cards do not represent any additions to the amount of money in circulation.

The Money Multiplier

We have seen that the deposit multiplier is the reciprocal of the required reserve ratio. We will now go on to derive the money multiplier. The monetary base, or the high powered money in the economy, is equal to the currency held by the public, and the total reserves in the banking system. If we denote high powered money by H, the amount of currency held by C, and the total reserves by TR, we can write:

$$H = C + TR$$

If we denote the level of transactions deposits in the banking system by D then, assuming that there are no excess reserves in the system

$$D = \frac{TR}{r} \Rightarrow TR = rD$$

where r is the required reserve ratio. We will further assume that the level of currency held by the public may be

expressed as $c \times D$, where c is the desired currency ratio. If so

$$H = C + TR = cD + rD = (c + r) \times D$$

Therefore the level of high powered money is equal to the sum of the required reserve ratio and the desired currency ratio, multiplied by the amount of transactions deposits in the banking system.

We know that $M1 = C + D$. Thus,

$$M1 = cD + D = (1 + c) \times D$$

That is, the quantum of money in the economy as defined by the aggregate M1, is equal to one plus the desired currency ratio multiplied by the amount of transactions deposits. Therefore,

$$M1 = (1 + c) \times D = (1 + c) \times \frac{H}{(r + c)}$$

$$\Rightarrow \qquad M1 = \frac{(1+c)}{(r+c)} \times H$$

Thus for a given level of high powered money, the amount of money in the economy, as measured by the aggregate M1, is a function of the required reserve ratio and the desired currency ratio. If we assume that the two ratios are constant then,

$$\Delta M1 = \frac{(1+c)}{(r+c)} \times \Delta H$$

Thus an increase of one dollar in high powered money will lead to an increase of $\frac{(1+c)}{(r+c)}$ in M1. Since r is less than one, $1 + c > r + c$. Therefore the factor $\frac{(1+c)}{(r+c)}$ will always be greater than one. This factor is known as the *money multiplier*.

Obviously if the desired currency ratio is greater than zero, then the money multiplier will be less than the required reserve ratio or the deposit multiplier. This is because if the public were to desire to hold some currency, then each time the bank makes a loan to a borrower, or acquires securities from a dealer, there will be a leakage in the sense that some money will exit the banking system. Consequently, the ability of institutions to expand the money supply by making additional loans or investments will stand reduced.

The Impact of Excess Reserves

In our arguments, thus far we have assumed that there are no excess reserves in the banking system. That is, total reserves are assumed to equal the required reserves, or in other words, the banking system is fully loaned up. However, in practice most banks will keep excess reserves. One reason could be that such reserves can be used if there were to be a larger than anticipated withdrawal by depositors. In the absence of such resources, a bank would typically have to borrow reserve funds, either from other banks in what is known as the *Fed Funds* market, or directly from the Fed at its discount window. The other alternatives would be to recall loans made to borrowers, or to sell securities from its investment portfolio. An unanticipated withdrawal may not be the only motivation for a bank to hold excess reserves. Such assets also help depository institutions to deal with the specter of a sudden loan request.

We know that total reserves TR are equal to the sum of the required reserves RR, and the excess reserves ER. Thus,

$$TR = RR + ER$$

$$\Rightarrow \qquad H = C + TR = C + RR + ER$$

We will assume that the banks desire to hold a fraction e of their deposit liabilities as excess reserves. The required reserves are given by $RR = r \times D$. Since $C = c \times D$ and $ER = e \times D$, we can state that

$$H = c \times D + r \times D + e \times D = (c + r + e) \times D$$

$$M1 = c \times D + D = (1 + c) \times D$$

$$\Rightarrow \qquad M1 = \frac{(1+c)}{(r+e+c)} \times H$$

Therefore, the money multiplier if there are excess reserves in the banking system is $\frac{(1+c)}{(r+e+c)}$. The higher the level of desired excess reserves, the smaller will be the money multiplier.

Illustration

Assume that a person named Alfred receives a $ 100 bill which he deposits in a bank. The required reserve ratio is 10%. Bob receives a loan of $ 90 from the bank. He withdraws $ 25 in cash and deposits $ 65 with the bank. The bank lends the money deposited by Bob to other parties till it has no excess reserves. That is the deposit base multiplies till it reaches its limit.

The quantum of deposits in the banking system will be:

$$100 + \frac{65}{0.10} = \$\,750$$

The amount of cash with the public is $ 25. The reserves held by the banking system is $ 75. Thus the high powered money in the economy is $ 100, while M1 is

$$\$\,25 + \$\,750 = \$\,775$$

The cash to deposit ratio is

$$\frac{25}{750} = \frac{1}{30}$$

The money multiplier is

$$\frac{\left(1+\frac{1}{30}\right)}{\left(\frac{1}{10}+\frac{1}{30}\right)} = \frac{31}{4} = 7.75$$

Thus $M1 = 775 = 7.75 \times 100 = m \times H$.

Now assume that when Bob deposits \$ 65 with the bank, the bank decides to hold \$ 15 as excess reserves. Consequently only \$ 43.50 is lent to the next borrower. If we assume no further leakages, the deposit of \$ 65 will get multiplied to \$ 500. The high powered money in the economy continues to be \$ 100. However M1 is

$$\$\,25 + \$\,100 + \$\,65 + \$\,435 = \$\,625$$

The cash to deposit ratio is

$$\frac{25}{600} = \frac{1}{24}$$

The excess reserves to deposit ratio is

$$\frac{15}{600} = \frac{1}{40}$$

The money multiplier is

$$\frac{\left(1+\frac{1}{24}\right)}{\left(\frac{4}{40}+\frac{1}{40}+\frac{1}{24}\right)} = \frac{\frac{25}{24}}{\frac{4}{24}} = \frac{25}{4} = 6.25$$

Thus $M1 = 625 = 6.25 \times 100 = m \times H$.

The Credit Multiplier

What does a bank do with money that is deposited with it? It will maintain a portion of the amount as reserves, perhaps a combination of required and excess reserves, and will utilize the balance to make loans and investments. Thus the magnitude of loans and investments, or the level of credit offered by the bank is equal to

$$D - RR - ER = (1 - r - e) \times D$$

Since

$$D = \frac{H}{(c + r + e)}$$

The credit multiplier is $\frac{(1 - r - e)}{(c + r + e)} \times H$

Illustration

Let us consider the data used earlier. The monetary base is $ 100, the required reserve ratio is 0.10, the desired cash to deposit ratio is $\frac{1}{24}$, and the excess reserves to deposit ratio is $\frac{1}{40}$. In such a situation the credit multiplier is $\frac{\left(1 - \frac{1}{10} - \frac{1}{40}\right)}{\left(\frac{1}{10} + \frac{1}{24} + \frac{1}{40}\right)}$, which in this case is

$$\frac{\frac{(120 - 12 - 3)}{120}}{\frac{(12 + 5 + 3)}{120}} = \frac{105}{20} = 5.25$$

Thus the amount of credit offered by the banking system is $5.25 \times 100 = \$\ 525$.

1

APPENDIX

Sources and References

1. Ashby, D.B., *Money Mechanics.* E-Book.
2. Ask Dr. Econ. FRB of San Francisco, 2005.
3. Baumohl B., *The Secrets of Economic Indicators.* Wharton School Publishing, 2004.
4. Credit and Liquidity Programs and the Balance Sheet. www.federalreserve.gov
5. Federal Reserve Bank of Chicago *Modern Money Mechanics.*
6. Federal Reserve Statistical Release. September 17, 2009.
7. Grabianowski, E., *How Currency Works.*
8. Humphrey, T.M., *The Theory of Multiple Expansion of Deposits: What it is and Whence it Came.* FRB of Richmond, March/April 1987.
9. Lang, R.W., *TTL Note Accounts and the Money Supply Process.* FRB of St. Louis, October 1979.
10. Measuring Profits from Currency Issue. Reserve Bank of Australia Bulletin, July 1997.
11. Miller R.L. and D. VanHoose, *Money, Banking, and Financial Markets.* South-Western, 2001.

12. Money Facts #18- Seigniorage Revenue. www.bailey capitalfund.com.
13. Neumann M.J.M., *Seigniorage in the United States: How Much Does the U.S. Government Make from Money Production?*
14. Obringer, L.A., *How The Fed Works.*
15. Rose, P.S., *Commercial Bank Management.* McGraw-Hill, 2002.
16. Rose, P.S., *Money and Capital Markets.* Irwin McGraw-Hill, 2000.
17. Walter, J.R., *Monetary Aggregates: A User's Guide.* Economic Review, January/February 1989.
18. www.bankofcanada.ca

2

APPENDIX

Test Your Concepts

Tick or circle the closest response to each question

1. In a 500 good economy, in the absence of money we would require:
   (a) 500 prices
   (b) 249,500 prices
   (c) 124,750 prices
   (d) None of the above
2. Which of these is a component of M1:
   (a) Currency with the public
   (b) Checking accounts at commercial banks
   (c) Travelers' cheques issued by non-bank institutions
   (d) All of the above
3. Which of these is a component of M2
   (a) Currency with the public
   (b) Checking accounts at commercial banks
   (c) Travelers' cheques issued by non-bank institutions
   (d) All of the above

4. The term non-banking public, in the context of holding of U.S. dollars, includes:
   (a) Foreign banks
   (b) Foreign governments
   (c) Foreign businesses
   (d) All of the above
5. The term non-banking public, in the context of holding U.S. dollars, excludes:
   (a) Banks operating in the U.S.
   (b) The U.S. Treasury
   (c) The Federal Reserve
   (d) All of the above
6. Which of these statements is true about checking accounts:
   (a) They do not pay interest
   (b) Depositors can write cheques without any restrictions
   (c) They are a part of the monetary base
   (d) (a) and (b)
7. Which of these statements is true:
   (a) M2 includes M1
   (b) M3 includes M1
   (c) M3 includes M2
   (d) All of the above
8. The central bank of the U.S. is known as:
   (a) Bank of America
   (b) Central Bank of America
   (c) American Central Bank
   (d) None of the above

9. SLR includes:
   (a) Vault cash
   (b) Gold
   (c) Unencumbered government securities
   (d) All of the above
10. Which of these statements is true about 'Sweep' programs:
   (a) They reduce the level of required reserves
   (b) They reduce the opportunity cost of holding reserves
   (c) They increase the interest burden for the bank
   (d) All of the above
11. Consider an economy where $ 75 is in circulation with the public, and $ 25 is being held as vault cash by Bank of U.S., which is the only bank in the system. The bank has made loans worth $ 250 to people who have chosen to deposit the amounts borrowed with the bank in checking accounts. Bank of U.S. has reserves of $ 75 with the central bank. Which of these statements is true:
   (a) High powered money is $ 75
   (b) High powered money is $ 100
   (c) High powered money is $ 175
   (d) None of the above
12. Consider the data given in Question-11. Which of these statements is true:
   (a) M1 is $ 75
   (b) M1 is $ 100
   (c) M1 is $ 175
   (d) None of the above

13. Consider an economy where there is an initial deposit of $ 500 into a bank. The bank makes a loan of $ 450 to another party, who withdraws $ 50 as cash and deposits the balance of $ 400 with the bank. The bank lends out this money repeatedly till the deposit base reaches its logical limit. The reserve ratio is obviously 10%.

    At the end of the deposit expansion process the quantum of deposits in the banking system will be:

    (a) $ 5,000

    (b) $ 4,500

    (c) $ 4,100

    (d) $ 4,550

14. Consider the data given in Question-13. At the end of the deposit expansion process, which of these statements is true:

    (a) The monetary base is $ 500

    (b) The monetary base is $ 550

    (c) The monetary base is $ 450

    (d) None of the above

15. Consider the data given in Question-13. At the end of the deposit expansion process, which of these statements is true:

    (a) M1 is $ 50

    (b) M1 is $ 5,000

    (c) M1 is $ 4,500

    (d) M1 is $ 4,550

16. Assume that the desired currency ratio is 5%, while the required reserve ratio is 15%. Assume that there are no excess reserves in the banking system. The money multiplier is:

(a) 6.67
(b) 5.00
(c) 5.25
(d) 5.75

17. Which of these statements is true about money market CDs:
    (a) They are negotiable
    (b) They are used primarily by individual investors
    (c) They permit cheques to be written against them
    (d) All of the above
18. Which of these statements is true about TT&L accounts:
    (a) They are maintained with commercial banks
    (b) They are drawn on only on a just-in-time basis
    (c) A call on a TT&L account leads to a reduction in the reserves of commercial banks
    (d) All of the above
19. Which of these is true about Seigniorage:
    (a) It is a form of tax levied by the Government
    (b) The gains from it ultimately accrue to the central bank
    (c) The income from seigniorage due to coins is accounted in the same way as the income from currency
    (d) All of the above
20. Which of these is money:
    (a) A Citibank debit card
    (b) An AMEX credit card
    (c) Both (a) and (b)
    (d) None of the above

Solutions to Test Your Concepts

Q. No.	*Answer*	*Q. No.*	*Answer*
1	c	11	c
2	d	12	d
3	d	13	b
4	d	14	a
5	d	15	d
6	d	16	c
7	d	17	a
8	d	18	d
9	d	19	a
10	d	20	d