MONEY, BANKS, AND THE FEDERAL RESERVE SYSTEM

Chapter 14

Monika Islam Khan

Chapter Outline

- **14.1** What Is Money, and Why Do We Need It?
- **14.2** How Is Money Measured in the United States Today?
- **14.3** How Do Banks Create Money?
- **14.4** The Federal Reserve System
- **14.5** The Quantity Theory of Money

Money

Money is one of mankind's most important inventions.

- Economists consider **money** to be any asset that people are generally willing to accept in exchange for goods and services or for payment of debts.
- **Asset**: Anything of value owned by a person or a firm.

We will begin by considering what role money serves, and what can be used as money.

- Then we will consider modern forms of money and the roles of banks and the government in creating and managing money.
- Finally, we will create a model relating prices to the amount of money.

14.1 What Is Money, and Why Do We Need It?

Suppose you were living before the invention of money.

- If you wanted to trade, you would have to exchange goods and services directly for other goods and services. This is called *barter.*
- Trades would require you to want to buy the exact same thing somebody else was selling, and you to sell the exact same thing someone was willing to buy. This is called a *double coincidence of wants*.

Eventually, societies started using **commodity money**—goods used as money that also have value independent of their use as money—like animal skins or precious metals.

- The existence of money makes trading much easier and allows specialization, an important step for developing an economy.

The Four Primary Functions of Money

- *Medium of exchange*

Money is acceptable to a wide variety of parties as a form of payment for goods and services.

- *Unit of account*

Money allows a way of measuring value in a standard manner. E.g. a candy bar is worth $2 or a book is worth $55.

- *Store of value*

Money allows people to defer consumption till a later date by storing value. e.g. saving in a bank. Other assets can do this too, but money does it particularly well because it is *liquid*- easily exchanged for goods.

- *Standard of deferred payment*

Money facilitates exchanges *across time* when we anticipate that its value in the future will be predictable.

Characteristics of Money as a Medium of Exchange

In order to serve as an acceptable medium of exchange (and hence a potential “money”), a good should have the following characteristics:

1. The good must be *acceptable* to most people.
2. It should be of *standardized quality* so any two units are alike.
3. It should be *durable* so that value is not lost by storage.
4. It should be *valuable* relative to its weight, so that it can easily be transported even in large quantities.
5. It should be *divisible* because different goods are valued differently.

Commodity Money

Commodity money has a value independent of its use as money.

In the past, many commodities have played the role of money as a medium of exchange:

- Cowrie shells in Asia (the classical Chinese character for money/currency, 貝, originated as a pictograph of a cowrie shell)
- Precious metals, such as gold or silver
- Beaver pelts in colonial North America
- Cigarettes in prisons and prisoner-of-war camps

Paper Money to Fiat Money

Beginning in China in the tenth century and spreading throughout the world, *paper money* was issued by banks and governments. The paper money was exchangeable for some commodity, typically gold, on demand.

- In modern economies, paper money is generally issued by a *central bank* run by the government.
- The *Federal Reserve* is the central bank of the United States. However, money issued by the Federal Reserve is no longer exchangeable for gold, nor is *any* current world currency. Instead, the Fed issues currency known as *fiat money*.

Fiat money refers to any money, such as paper currency, that is authorized by a central bank or governmental body and that does not have to be exchanged by the central bank for gold or some other commodity money.

Fiat Money—Advantages and Disadvantages

Fiat money has the advantage that governments do not have to be willing to exchange it for gold or some other commodity on demand.

- This makes central banks more flexible in creating money.

However it also creates a potential problem: fiat money is only acceptable as long as *households and firms have confidence that if they accept paper dollars in exchange for goods and services, the dollars will not lose much value during the time they hold them.*

- If people stop "believing" in the fiat money, it will cease to be useful. E.g. during periods of high inflation

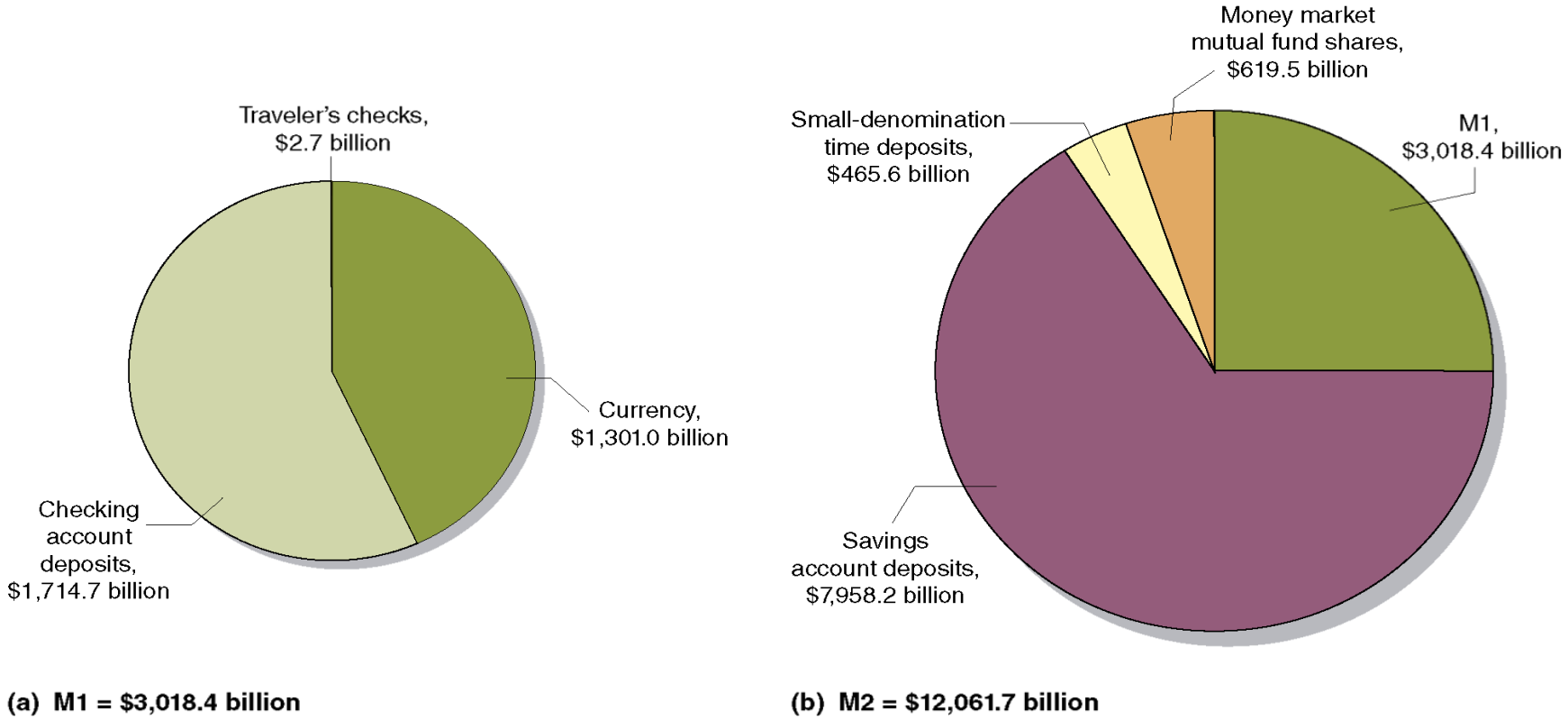
14.2 How Is Money Measured in the United States Today?

How much money is there in America? This is harder to answer than it first appears, because you have to decide what to count as "money."

Defining money:

- **M1** is the narrowest definition of the money supply: the sum of currency in circulation, checking account deposits in banks, and holdings of traveler's checks.
- **M2** is a broader definition of the money supply: it includes M1, plus savings account deposits, small-denomination time deposits, balances in money market deposit accounts, and non-institutional money market fund shares.

Figure 14.1 Measuring the Money Supply



- The charts show U.S. M1 and M2 as of July 2015.
- U.S. currency holdings are unusually high by world standards; people in other countries sometimes hold and use U.S. dollars.

M1 vs M2: Which One Should We Use?

When we want to talk about the money supply, which definition should we use?

Either one might be valid, but we are mostly interested in money's role as the medium of exchange, so this suggests using M1.

In our discussion of money, we will therefore:

1. Treat both currency and checking account balances as "money" but nothing else. (Traveler's checks are insignificant.)
2. Realize that banks play an important role in the money supply, since they control what happens to money when it is in a checking account.

What about Debit and Credit Cards?

- Debit cards directly access checking accounts, but the *card* is not money, the checking account balance is.
- Credit cards are a convenient way to obtain a short-term loan from the bank issuing the card. But transactions are not really complete until you pay the loan off—transferring money to pay off the credit card loan.

So credit cards do not represent money.

Making the Connection: Are Bitcoins Money?

Currency is only a small part of the money supply. Over the last decade or so, consumers have come to trust forms of e-money such as PayPal.

Bitcoins are a new form of e-money, owned not by a government or firm, but a product of a decentralized system of linked computers.

- Bitcoins can be traded for other currencies on web sites.
- Some web sites accept bitcoins as a form of payment.

Should bitcoins be included in a measure of the money supply?

- For now, they are not; if they grow popular, maybe they should be.

14.3 How Do Banks Create Money?

Banks play a critical role in the money supply.

- Recall that there is more money held in checking accounts than there is actual currency in the economy.
- So somehow money is being *created* by banks.

Further, banks are generally profit-making private firms: some small, but some among the largest corporations in the country.

- Their activities are designed to allow themselves to make a profit.

In order to understand the role that banks play, we will first try to understand how banks operate as a business.

Figure 14.5 The Balance Sheet of a Typical Large Bank (1 of 2)

Assets (in billions)		Liabilities and Stockholders' Equity in (billions)	
Reserves	$135	Deposits	$1,000
Loans	900	Short-term borrowing	400
Securities	700	Long-term debt	360
Buildings and equipment	15	Other liabilities	275
Other assets	550	Total liabilities	$2,035
		Stockholder's equity	265
Total assets	$2,300	Total liabilities and stockholders' equity	$2,300

On a balance sheet, a firm's assets are listed on the left, and its liabilities (and stockholders' equity, or *net worth*) are listed on the right. The left and right sides must add to the same amount.

- Banks use money deposited with them to make loans and buy securities (investments).
- Their largest liabilities are their deposit accounts: money they owe to their depositors.

Figure 14.5 The Balance Sheet of a Typical Large Bank (2 of 2)

Assets (in billions)		Liabilities and Stockholders' Equity in (billions)	
Reserves	$135	Deposits	$1,000
Loans	900	Short-term borrowing	400
Securities	700	Long-term debt	360
Buildings and equipment	15	Other liabilities	275
Other assets	550	Total liabilities	$2,035
		Stockholder's equity	265
Total assets	$2,300	Total liabilities and stockholders' equity	$2,300

Reserves are deposits that a bank keeps as cash in its vault or on deposit with the Federal Reserve.

- *Notice that the bank does not keep enough Reserves on hand to cover all of its deposits. This is how the bank makes a profit: lending out or investing money deposited with it.*

Required and Excess Reserves

The bank must keep *some* cash available for its depositors; it does this through a combination of *vault cash* and deposits with the Federal Reserve.

Banks in the U.S. are required to hold **required reserves**: reserves that a bank is legally required to hold, based on its checking account deposits.

- At least 10 percent of checking account deposits above some threshold level ($103.6 million in 2015).

10 percent is the **required reserve ratio (RR)**: the minimum fraction of deposits banks are required by law to keep as reserves.

- Banks might choose to hold **excess reserves**: reserves over the legal requirement.

Money Creation at the Bank of America

- When you deposit $1,000 in currency at Bank of America, its reserves increase by $1,000 and so do its deposits.
- The currency component of M1 decreases by the $1,000, since that $1,000 is no longer in circulation, but the checking deposits component increases by $1,000. So there is no net change in the money supply—yet.
- However, Bank of America needs to make a profit, so it keeps 10 percent of the deposit as reserves and lends out the rest, creating a $900 checking account deposit.
- The $900 initially appears in a BoA checking account, but will soon be spent, and Bank of America will transfer $900 in currency to the bank at which the $900 check is deposited.
- And the cycle will continue, with PNC now making a loan.

When will this cycle end?

Bank	Increase in Checking Account Deposits
Bank of America	$1,000
PNC	+ 900 (= 0.9 : $1,000)
Third Bank	+ 810 (= 0.9 : $900)
Fourth Bank	+ 729 (= 0.9 : $810)
•	+ •
•	+ •
•	+ •
Total change in checking account deposits	= $10,000

Each round, the additional checking account deposits get smaller and smaller.

- Every round, 10 percent of the deposits are kept as reserves. This allows us to tell by how much the checking deposits will eventually increase: the $1,000 in currency will become the 10 percent required reserves for all of the checking deposits, so a total of $10,000 in checking deposits can be created.

Deposits Multiplying

- An alternative way to find out how much money the original $1,000 in currency will create is to add up all of the checking account deposits.

$$\$1{,}000 + [0.9 \times \$1{,}000] + [(0.9 \times 0.9) \times \$1{,}000] + \cdots$$

$$= \$1{,}000 + [0.9 \times \$1{,}000] + [0.9^2 \times \$1{,}000] + \cdots$$

$$= \$1{,}000(1 + 0.9 + 0.9^2 + \cdots)$$

$$= \$1{,}000\left(\frac{1}{1-0.9}\right)$$

$$= \$1{,}000\left(\frac{1}{0.10}\right)$$

$$= \$1{,}000(10) = \$10{,}000$$

Simple Deposit Multiplier

So the total increase in deposits is $1,000(10) = $10,000.

- The "10" here is the **simple deposit multiplier**: the ratio of the amount of deposits created by banks to the amount of new reserves.
- In general, we can write the simple deposit multiplier as:

Therefore, $\text{simple deposit multiplier} = \frac{1}{RR}$

- So with a 10 percent required reserve ratio (*RR*), the simple deposit multiplier is 10.

Therefore, with any "**r**" **percent** required reserve (RR) ratio, the money created is equal to the **initial deposit times "r"**. Or,

$$Change\ in\ checking\ account\ deposits = Initial\ deposit\ * \frac{1}{RR}$$

Check the example in the textbook! Change in bank reserves is the same as initial deposit.

Simple Deposit Multiplier vs. Real-World Deposit Multiplier

With a 10 percent required reserve ratio, the simple deposit multiplier tells us that a currency deposit will be multiplied 10 times. This is very mechanical!

- In reality, we do not observe this: currency deposits only end up being multiplied about 2.5 times, during “normal” periods.

Why this difference?

- Banks may not lend out as much as we predict, either because they want to keep *excess reserves*, or they cannot find credit-worthy borrowers.
- Consumers keep some currency out of the bank; that currency cannot be used as required reserves.

Note: during the recession of 2007-2009, research suggests that the real-world multiplier fell to close to 1.

Conclusions about Banks and the Money Supply

In general, we can assume that the real-world deposit multiplier is greater than 1. So we conclude that:

1. When banks gain reserves, they make new loans, and the money supply expands.
2. When banks lose reserves, they reduce their loans, and the money supply contracts.

This is enough to establish the important relationship between banks and the money supply.

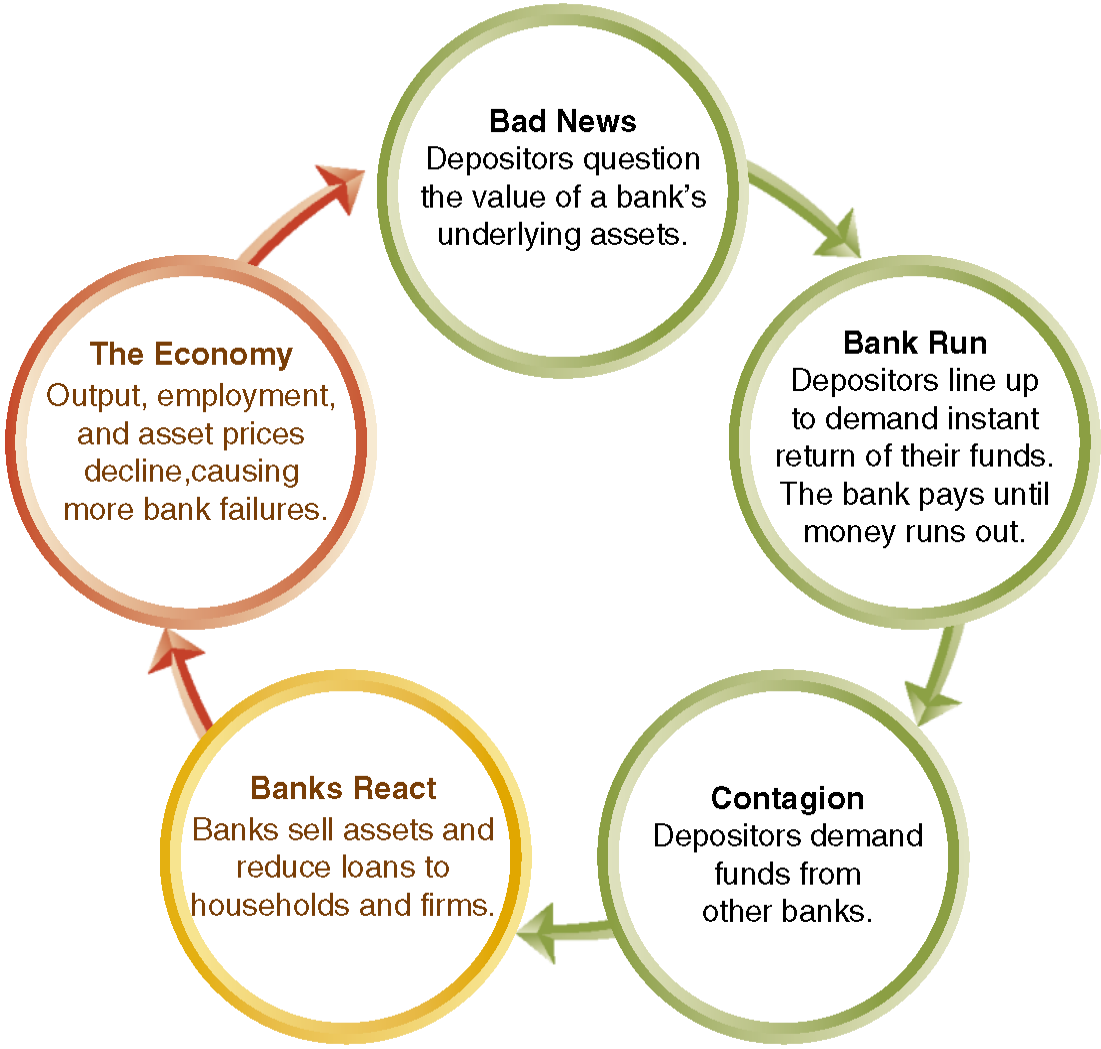
14.4 The Federal Reserve System

- We have described that, in the United States, banks keep less than 100 percent of deposits as reserves. This is known as a **fractional reserve banking system**, and is a system shared by nearly all countries.
- But what if depositors lost confidence in a bank and tried to withdraw their money all at once? This situation is known as a **bank run**; if many banks simultaneously experience bank runs, a **bank panic** occurs.

Figure 14.3 The Feedback Loop during a Bank Panic

The figure shows how a bank panic can take place.

- *Central banks*, like the Federal Reserve, can help to prevent bank runs and panics by acting as a *lender of last resort*, promising to make loans to banks in order to pay off depositors.
- This assurance can break the negative feedback loop.



The Establishment of the Federal Reserve System

In the late nineteenth and early twentieth centuries, the United States experienced several bank panics.

- In 1914, the Federal Reserve system started. “The Fed” makes loans to banks called **discount loans**, charging a rate of interest called the **discount rate**.

During the Great Depression of the 1930s, many banks were hit by bank runs. Afraid of encouraging bad banking practices, the Fed refused to make discount loans to many banks, and more than 5,000 banks failed.

- Today, many economists are critical of the Fed’s decisions in the early 1930s, believing they made the Great Depression worse.

Response to the Great Depression

In 1934, Congress established the Federal Deposit Insurance Corporation (FDIC).

- The FDIC insures deposits in many banks, up to a limit (currently $250,000). This government guarantee has helped to limit bank panics.

Bank runs are still possible; during the recession of 2007-2009, a few banks experienced runs from large depositors whose deposits exceeded the FDIC limit.

Main Fed Tool for Managing the Money Supply: Open Market Operations

Open market operations: the buying and selling of Treasury securities by the Federal Reserve in order to control the money supply.

- To increase the money supply, the Fed directs its *trading desk* in New York to *buy* U.S. Treasury securities—Treasury bills, notes, and bonds, which are short-term (1 year or less), medium-term (2-10 years), or long-term (30 years) tradable loans to the U.S. Treasury.
- To decrease the money supply, the Fed *sells* its securities.
- These open market operations can occur very quickly and are easily reversible.

Other Fed Tools for Managing the Money Supply

- *Discount policy*

The discount rate is the interest rate paid on money banks borrow from the Fed.

By lowering the discount rate, the Fed encourages banks to borrow (and hence lend out) more money, increasing the money supply. Raising the discount rate has the opposite effect.

- *Reserve requirements*

The Fed can alter the required reserve ratio. A decrease would result in more loans being made, increasing the money supply. An increase would result in fewer loans being made.

The Rise and Effects of the Shadow Banking System

The banks we have been discussing so far are *commercial banks*, whose primary role is to accept funds from depositors and make loans to borrowers.

In the last 20 years, two important developments have occurred in the financial system:

1. Banks have begun to resell many of their loans rather than keep them until they are paid off.
2. Financial firms other than commercial banks have become sources of credit to businesses.

Securitization Comes to Banking

A **security** is a financial asset—such as a stock or a bond—that can be bought and sold in a financial market.

Traditionally, when a bank made a loan like a *residential mortgage loan*, it would "keep" the loan and collect payments until the loan was paid off.

In the 1970s, *secondary markets* developed for *securitized* loans, allowing them to be traded, much like stocks and bonds.

Securitization: The process of transforming loans or other financial assets into securities.

- Check out Figure 14.5 to understand the process of securitization.

The Shadow Banking System

The 1990s and 2000s brought increasing important of non-bank financial firms, including:

- *Investment banks:* banks that do not typically accept deposits from or make loans to households; they provide investment advice and also engage in creating and trading securities such as *mortgage-backed securities*.
- *Money market mutual funds*: funds that sell shares to investors and use the money to buy short-term Treasury bills and commercial paper (loans to corporations).
- *Hedge funds*: funds that raise money from wealthy investors, and make "sophisticated" (often non-standard) investments.

By raising funds from investors and providing them directly or indirectly to firms and households, these firms have become a "shadow banking system."

14.5 The Quantity Theory of Money

Beginning in the sixteenth century, Spain sent gold and silver from Mexico and Peru back to Europe.

- These metals were minted into coins, increasing the money supply.

Prices in Europe rose steadily during those years.

- This helped people to make the connection between the amount of money in circulation and the price level.

Connecting Money and Prices: The Quantity Equation

In the early twentieth century, Irving Fisher formalized the relationship between money and prices as *the quantity equation*:

$$M \times V = P \times Y$$

- *M*: Money supply
- *V*: **Velocity of money**: the average number of times each dollar in the money supply is used to purchase goods and services included in GDP.
- *P*: Price level
- *Y*: Real output

Rewriting this equation by dividing through by *M*, we obtain:

$$V = \frac{P \times Y}{M}$$

Calculating the Velocity of Money

Measuring:

- The money supply (*M*) with M1,
- The price level (*P*) with the GDP deflator, and
- The level of real output (*Y*) with real GDP,

We obtain the following value for velocity (*V*):

$$V = \frac{1.09 \times \$16.0 \text{ trillion}}{\$2.8 \text{ trillion}} = 6.2$$

- We can always calculate *V*. But will we always get the same answer? The *quantity theory of money* asserts that, subject to measurement error, we will:

Quantity theory of money: A theory about the connection between money and prices that assumes that the velocity of money is constant.

The Quantity Theory Explanation of Inflation

When variables are multiplied together in an equation, we can form the same equation with their *growth rates added together*.

So the quantity equation:

$$M \times V = P \times Y$$

generates:

- Growth rate of the money supply + Growth rate of velocity = Growth rate of the price level (or the inflation rate) + Growth rate of real output

Constant velocity of money means growth rate of velocity is zero!

Rearranging this to make the inflation rate the subject, and assuming that the velocity of money is constant, we obtain:

Inflation rate = Growth rate of the money supply − Growth rate of real output

The Inflation Rate According to the Quantity Theory

- $\text{Inflation rate} = \text{Growth rate of the money supply} - \text{Growth rate of real output}$

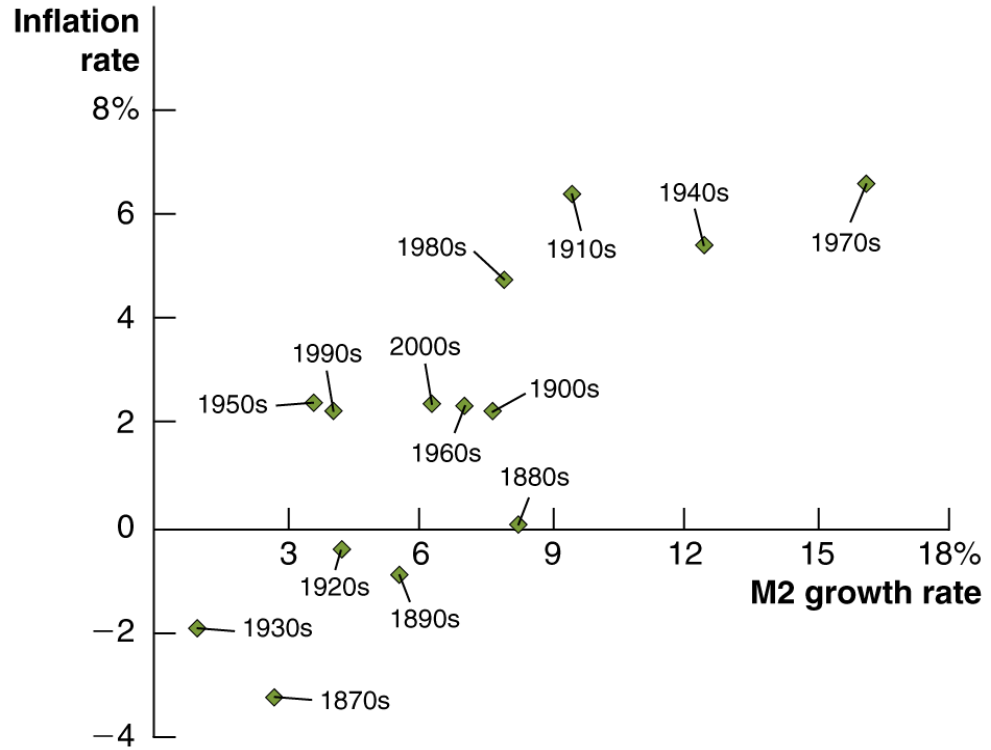
This equation provides the following predictions:

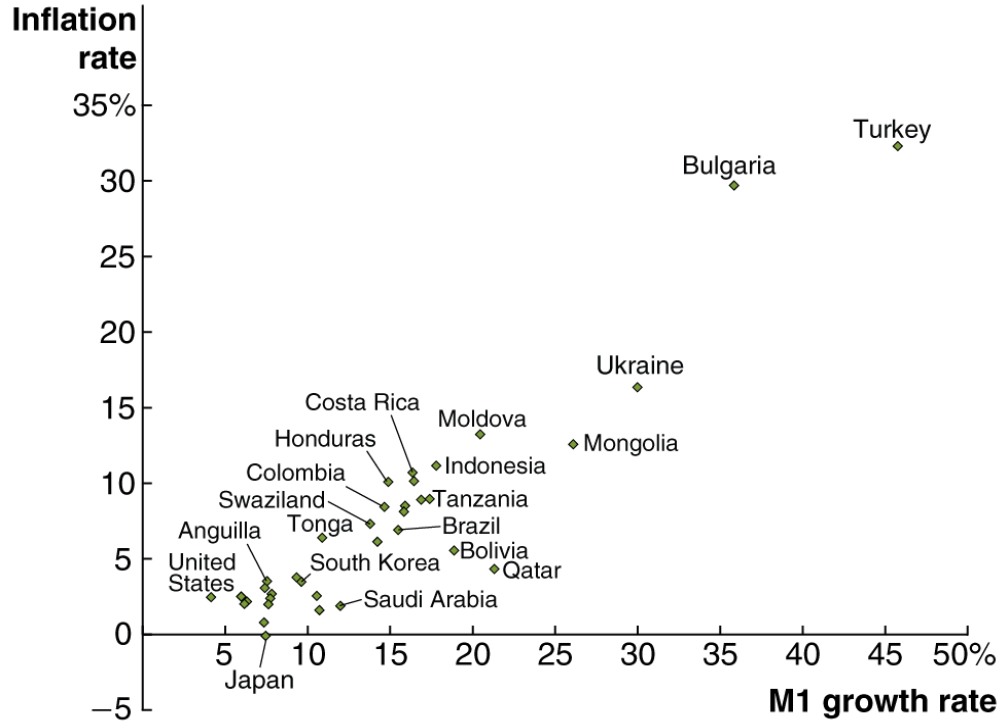
1. If the money supply grows faster than real GDP, there will be inflation.
2. If the money supply grows slower than real GDP, there will be *deflation* (a decline in the price level).
3. If the money supply grows at the same rate as real GDP, there will be neither inflation nor deflation: the price level will be stable.

Is velocity truly constant from year to year? The answer is *no*. However, the quantity theory of money can still provide insight:

- **In the long run, inflation results from the money supply growing at a faster rate than real GDP.**

Figure 14.6 The Relationship between Money Growth and Inflation over Time and around the World – Based on the Quantity Theory of Money





There *is* a positive relationship, but not the consistent relationship implied by a constant velocity of money.

Although the relationship is not entirely predictable, countries with higher growth in the money supply do have higher rates of inflation.

Hyperinflation

Very high rates of inflation—in excess of 100 percent per year—are known as *hyperinflation*.

- Hyperinflation results when central banks increase the money supply at a rate far in excess of the growth rate of real GDP.
- This might happen when governments want to spend much more than they raise through taxes, so they force their central bank to "buy" government bonds.

Recently, hyperinflation has occurred in Zimbabwe. During the 2000s, prices increased by (on average) 7500 percent per year.

- At that rate, a can of soda costing $1 this year would cost $75 next year and over $5,600 the year after that.

Hyperinflation tends to be associated with slow growth, if not severe recession.

THE END

“Monetary policy is like juggling six balls... it is not 'interest rate up, interest rate down.' There is the exchange rate, there are long term yields, there are short term yields, there is credit growth.”

– Raghuram Rajan

“When they so called ‘target the interest rate’, what they are doing is controlling the money supply via the interest rate. The interest rate is only an intermediary instrument.”

- Milton Friedman