

Materials for ECON200: Introductory Macroeconomics

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Preface

This site will include supplemental material to our regular macroeconomics course readings. Mostly this will be used to show you how we can use publicly available data to create tables and figures to help us understand and analyze the economy. This material will accompany Taylor and Weerapana (2018) which will be the primary book for the course. We will also be using The CORE Team (2020b), and the other materials compiled by CORE including *Economy, Society, & Public Policy* (The CORE Team, 2020c) and *Doing Economics* (The CORE Team, 2020a) which act as useful comparisons to the more traditional material presented in Taylor and Weerapana (2018).

Chapter 1

Introduction

In Figure 1.1 below, you will see the unemployment rate for four countries averaged over each year. The unemployment rate measures the percent of people who cannot find a job in the group of those people either working or looking for work. It seems like a mouthful, but we are estimating the proportion of people who are technically in the *labor force*.

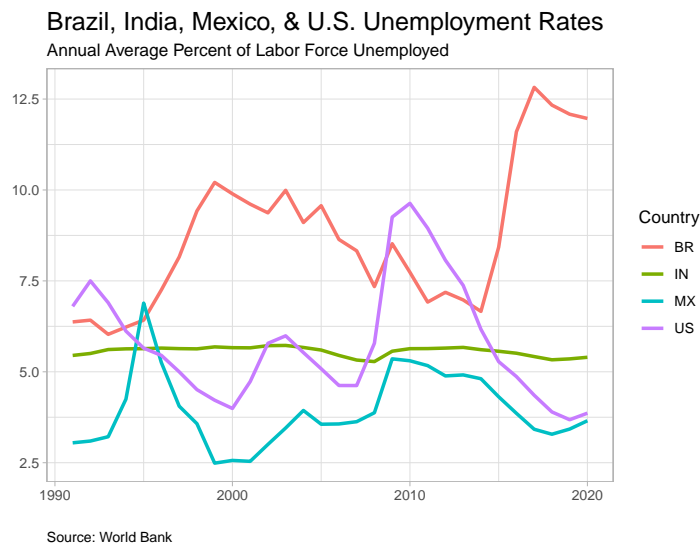


Figure 1.1: Unemployment Rates Around the World

Labor Force is the sum of those who are employed and those actively looking for work.

We measure the unemployment rate as:

$$\text{Unemployment Rate} = \frac{\text{Unemployed}}{\text{Unemployed} + \text{Employed}} \times 100$$

Something important about Figure 1.1 is that we can see in some countries the unemployment rate is much higher than in other countries. Partially this is because we do not all use the same measurements for those who are either technically unemployed or working. However, if we assume countries do a consistent job in measuring these rates, the changes are still somewhat accurate. For example, in the United States a monthly survey of about 60,000 households counts those considered unemployed not just as those people collecting unemployment payments, but also includes all those people who have actively sought work in the past four weeks (Bureau of Labor Statistics).

In recent months the COVID-19 crisis has gripped the world and put our global economy in a precarious position. As we can see from Figure 1.2 there has been a dramatic increase in the number of people who are newly jobless. Also, other metrics like vehicle miles travelled in the U.S. have crashed dramatically (Figure 1.3).

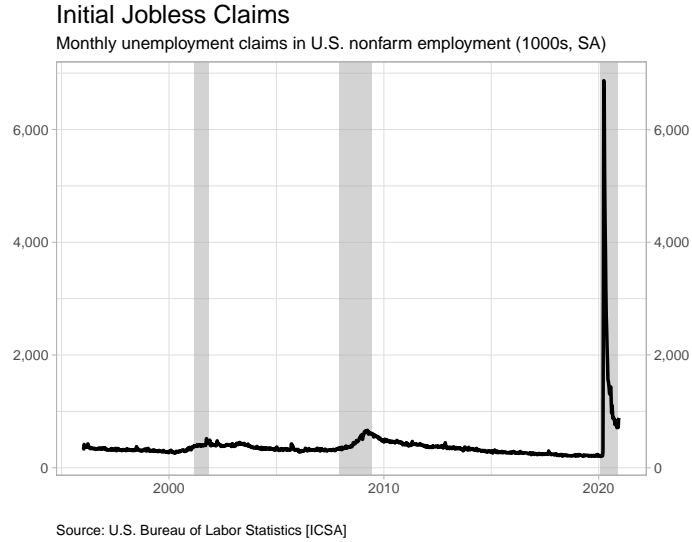


Figure 1.2: Jobless Claims Skyrocket in 2020

Table 1.1 shows the initial claims data for the past fifteen weeks, going back to the first weeks of the crisis in early March. Notice that the number of people filing for unemployment rose by a factor of more than ten! These unemployment claim numbers had literally never occurred in the U.S. before.

Table 1.1: Initial Unemployment Claims for Most Recent 50 Weeks (1000's)

Date	Claims
2020-01-04	212
2020-01-11	207
2020-01-18	220
2020-01-25	212
2020-02-01	201
2020-02-08	204
2020-02-15	215
2020-02-22	220
2020-02-29	217
2020-03-07	211
2020-03-14	282
2020-03-21	3,307
2020-03-28	6,867
2020-04-04	6,615
2020-04-11	5,237
2020-04-18	4,442
2020-04-25	3,867
2020-05-02	3,176
2020-05-09	2,687
2020-05-16	2,446
2020-05-23	2,123
2020-05-30	1,897
2020-06-06	1,566
2020-06-13	1,540
2020-06-20	1,482
2020-06-27	1,408
2020-07-04	1,310
2020-07-11	1,308
2020-07-18	1,422
2020-07-25	1,435
2020-08-01	1,191
2020-08-08	971
2020-08-15	1,104
2020-08-22	1,011
2020-08-29	884
2020-09-05	893
2020-09-12	866
2020-09-19	873
2020-09-26	849
2020-10-03	767
2020-10-10	842
2020-10-17	797
2020-10-24	758
2020-10-31	757
2020-11-07	711
2020-11-14	748
2020-11-21	787
2020-11-28	716

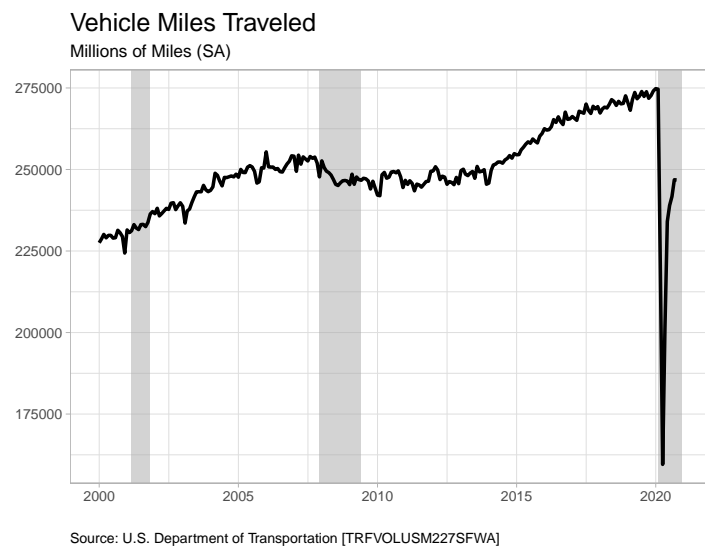


Figure 1.3: Travel Collapses in 2020

Chapter 2

Money & Banking

2.1 Money, Debt, & Credit

Money is an abstract concept, closely linked to the notions of wealth, income, credit, and debt. While most people closely associate money with paper currency issued by governments, it is a much broader social and political construct. As a social construct, money functions as it does—facilitating exchange, measuring value, and storing value—because people agree that it exists. As a political construct, states authorize their money for the payment of taxes and require it to be accepted in payment for debts. In this sense, nations can be considered as the protectors of the debts between occupants of politically delineated boundaries. Money serves several functions. It is a medium of exchange; a unit of account; and a store of value. Money is also a standard of deferred payment.

As a **medium of exchange** money is not the thing that is consumed in the process of trade but rather a *symbol* of agreed upon value. When a person sells their time to an employer, they are usually paid in money and not tangible consumption goods. The purpose of money in this instance is for the worker to ultimately use it in the future for their own consumption. Thus, there is an implicit agreement upon the value of the goods being exchanged (e.g., labor for time). Money also serves as a **unit of account**; in that it is how value is measured. In this way, money serves as standard of measurement. Thus, value of objects or actions can be measured and compared to one another. This is much the same as measuring height, weight, or speed. To serve as a **store of value**, money must retain most of its value over time. If one knew that money had no value at some point in the future, there would be no reason to accept it for exchange today. The store of value represents in some ways the trust that we place in one another when exchanging real things with each other over time.¹ Currency issuing nations mandate the terms of payment of taxes, as well

¹**Real** variables would include things that can be measured objectively, like hiring someone

as the repayment of debts between a state and its people. Money also serves as a **standard of deferred payment**. A deferred payment happens when the time of purchase occurs separately from the time of payment. Money serves as the standard with which we value these payments (or debts). Since money represents a standard in inter-temporal commitment (e.g., goods or services are consumed today, but paid for next year), it serves as the object through which our debts and credits are settled with a state or in private transaction.

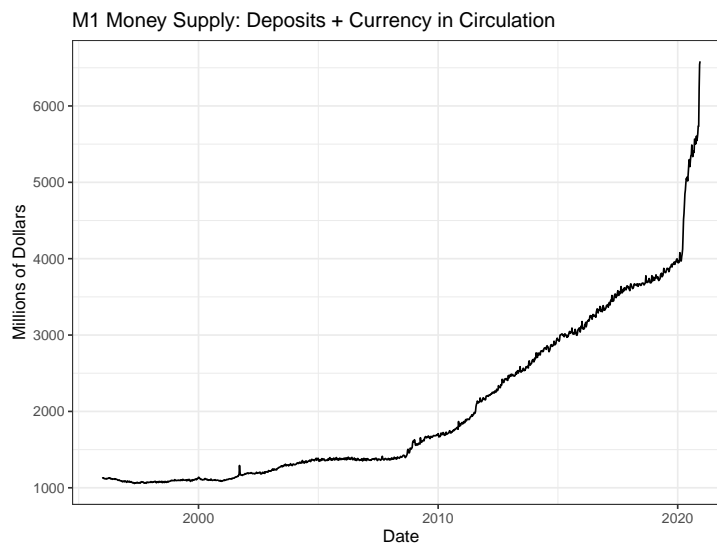


Figure 2.1: The Money Supply Has Grown Over Time

Money can be used to measure both stock and flow variables. **Stock variables**—like wealth—are measured at a given point in time. Below, **balance sheets** represent a typical way of measuring wealth (i.e., net worth) for individuals or capital (i.e., net equity) for companies. **Flow variables**—like income—are measured over a set length of time. Income might be paid as \$1,000 per week, or \$50,000 per year. Cash flow or income statements are common ways of measuring flow variables.

Debt is a stock concept, representing the sum of obligations owed to others at a given point in time. For example, you might have \$1,200 in accumulated debt at one point in time. **Deficits** or **surpluses** are flow concepts represented as the difference between income and expenditures over a set length of time. If you have \$500 a week in income, and \$600 in expenses, the result is a \$100 per-week deficit. In this example, after one week, debt would rise from \$1,200 to \$1,300 as the \$100 deficit is realized. Debts are the accumulated sum of all

to mow my lawn. The labor it takes to mow the lawn is *real*, as is the machine (i.e., physical capital) used to cut the lawn. The amount of a given currency paid to the worker or to buy the mower is a **nominal** variable since it is just representing relative value.

previous deficits and surpluses. It should be noted that debts do not need to be denominated in terms of an official state-issued currency. You could be in debt to a friend to “give a ride”, “move a couch” or “buy a drink” without resorting to dollars or contracts. However, in the U.S., debt is generally measured in dollars. Debt is often inappropriately vilified, when the true concern might be that a person or entity has taken on *too much* debt. It might be better to think of debts as symbolizing promises of future *real* activity. It is common that some person or entity takes on more future real obligations than they might be able to deliver. In this case, when the time comes to collect on an earlier promise which cannot be fulfilled, both the debtor and creditor might renegotiate the terms of repayment.² In most circumstances, debts are repaid. In this way, debt represents the social and community ties that take place over time. It is worth noting that whenever there is a delay in completing a transaction, debts are created. It is nearly impossible to think of a world in which debt does not exist or one where it is outlawed. Hence, debt and money represent a special kind of social contract.

As is explained below, people and banks can create money out of thin air. Today, when an obligation which spans time is entered into between two parties, this debt is measured using money. In this way, a \$10 bill represents future real activity that someone will do for you. Cash, somewhat counterintuitively, is a symbol of debt. If you read a U.S. Federal Reserve Note (U.S. paper money) it says on the front, that “This note is legal tender for all debts, public and private.” To the person holding physical or electronic cash, it means either you can repay your debts with it, or you can unlock real activity from someone else by getting them to do something for you. A wealthy individual—like Mark Zuckerberg—holds a great deal of influence over what other people will be doing in the future.

2.2 Wealth and Balance Sheets

With the concepts of money, debt, and credit introduced, an example can be developed. Imagine that Logan owns several assets. Let’s say he has \$1,000 in a checking account, \$60 in cash, a computer he values at \$800, a phone valued at \$500, and a bike worth \$300. These values are what he thinks he can sell these to someone else for. We measure the object’s **liquidity** as the *speed you can turn an asset into cash, without significant loss in value*. Cash and deposits are generally the most liquid assets, since there is minimal risk that it is not worth exactly what you think it is (e.g., \$100 can be sold for \$100). However, a computer, phone, or bike might not sell right away (or ever) at the values you estimate.

We then examine Logan’s **liabilities**, or obligations to others. If he owes \$1,000

²Social and political norms can help arbitrate the renegotiation under certain circumstances like death. Suppose a person owes their bank \$1,000, but passes away suddenly. The bank might try to recoup their losses by taking over ownership of the person’s house or car.

to his credit card company, and has \$3,000 in student loans, he has promised to repay those amounts—likely with interest—at some point in the future. We define **wealth** as the difference between your total asset value and total liabilities. This difference is called wealth or **net worth** for individuals and **capital** or **net equity** for firms and banks. A balance sheet equates total asset value (usually shown on the left-hand side) with total liabilities plus net worth (usually both shown on the right-hand side).

$$\text{Assets} = \text{Liabilities} + \text{Net Worth}$$

Using these values for the things Logan owns (\$2,660) and debts he owes to others (\$4,000), he would have a net worth of -\$1,340. We need to emphasize that net worth is the item on our balance sheet that *balances* the right-hand and left-hand side of Table 2.2.

Logan's Household Balance Sheet

Assets

Liabilities + Net Worth

Cash

\$60

Credit Card

\$1,000

Deposits

\$1,000

Student Loan

\$3,000

Computer

\$800

Phone

\$500

Bike

\$300

Net Worth

-\$1,340

Total

\$2,660

Total

\$2,660

Having negative wealth does not mean Logan is bankrupt, but it does mean he could not *liquidate* his assets and fully repay his debts. He might be in this situation because he is borrowing money to get an education, investing in his own human capital. He might do this because he expects this human capital investment will pay for itself through additional future earnings, earnings that exceed the amount being borrowed today. Recall, it is only when real promises are unfulfillable that borrowers are in danger of declaring bankruptcy. This arrangement—borrowing money to go to school—is usually a good deal for both the borrower and the lender.

To understand bankruptcy, Logan's cash flow must be considered, as it will show how his wealth is changing over time. Let's assume Logan has an income of \$2,000 per month, with rent of \$800 per month, interest payments of \$50 per month, and other expenses (electricity, cell phone, food, and interest costs on his debt) of \$1,000 per month.³ This leaves a surplus of \$150, which we will assume Logan uses \$50 to pay down his credit card debt, \$50 to pay down his student loan debt, and keeps \$50 to add to his checking account.⁴ We write out all the changes to the balance sheet in what is called a **T-account** which is used to keep track of all the transactions in Table 2.2.⁵ Notice that the entire \$150 set aside by Logan to repay debt and increase his checking account balance goes towards increasing his net worth. Some of this occurs through adding to his assets, and some occurs through reducing his liabilities.

Logan's Household T-Account for One Month

Assets

Liabilities + Net Worth

Deposits

\$50

Credit Card

-\$50

Student Loan

-\$50

Net Worth

³Note that each of these are flow variables and are comparable since they are measured over the same length of time.

⁴For the ease of exposition, interest payments have been combined with all other expenses, and the \$50 per month represents principal repayment.

⁵T-accounts are the flow counterpart of balance sheets, and themselves must balance. When combining a T-account with a starting balance sheet, the changes shown in a T-account will lead you to the updated balance sheet.

\$150

Total

\$50

Total

\$50

Our new balance sheet for Logan is visible in Table 2.2, where we can see the changes from our previous balance sheet as described in our T-account.

Logan's Updated Balance Sheet

Assets

Liabilities + Net Worth

Cash

\$60

Credit Card

\$950

Deposits

\$1,050

Student Loan

\$2,950

Computer

\$800

Phone

\$500

Bike

\$300

Net Worth

-\$1,190

Total

\$2,710

Total

\$2,710

2.3 Banks and Money Creation

Banks can be described using balance sheets and T-accounts in much the same way as we described Logan's personal finances before. Banks are different though in that they are profit-seeking institutions, looking to make money for their investors (i.e., equity holders or shareholders). Interest payments are one form of income for banks, which can lead to bank profits. Banks can also make other profitable investments, such as by buying assets that can be sold for more money than they were purchased for. Interest payments and interest rates are normally described in *nominal* terms. Nominal here just reflects how much more money needs to be repaid in the future and does not dictate how much in additional *real* goods and services are paid by the borrower. Above, we combined interest payments with all other expenses. A person like Logan who owes \$3,000 to a bank for his student loans, with an 11% annual interest rate, repaid over four years would have to make regular monthly payments of \$77.50, where at first the principal repayment is \$50 and the remaining \$27.50 is interest.⁶ Over the course of the loan, Logan pays \$3,722, which is \$722 in interest, on top of the \$3,000 of principal. At no point does Logan make a big \$3,000 payment, but he instead makes many smaller monthly payments. The same type of calculation would be used for his monthly credit card payments.

Businesses like banks start with capital (i.e., equity or net worth). We start with a group of investors who are opening Jupiter Bank. The owners want to pool some of their financial resources to incorporate as a bank and make a profit. Let's imagine a group of 50 investors who each contribute a \$1,000 cash investment, for a total of \$50,000 as in Table 2.3. The bank starts with a pool of \$50,000 cash.

Jupiter Bank Initial Balance Sheet

Assets

Liabilities + Net Worth

Cash

\$50,000

Capital

\$50,000

Total

\$50,000

Total

\$50,000

⁶The \$3,000 is the principal on the loan, the 5% represents the interest rate, and the four years represents the term to maturity. The \$77.50 figure is found by using an amortization calculator like those found at <https://www.amortization-calc.com/loan-calculator/>.

As investors, we might think that a big pile of cash is not going to generate much of a return. We would be right. If prices rise over time due to inflation, the investors' money buys fewer real goods each year. Investors want their assets to grow over time so that they have greater wealth and can buy more real goods. Thus, the bank owners decide to hire managers who will take some calculated risks on their behalf. To operate as a bank, depositors are needed, and loans would be made. To attract business from people like Logan, the newly founded bank might offer higher interest rates on their deposits than other banks. Let's suppose they offer a 1% annual return on deposits to Logan, along with a host of other benefits like debit cards, and online banking.

Logan's deposit is a liability to Jupiter, as the bank now owes money to its depositor, Logan. The changes are reflected in a T-account (Table 2.3) and the new balance sheet (Table 2.3).

Jupiter Bank: T-Account After Logan's Deposit

Assets

Liabilities + Net Worth

Cash

\$1,050

Deposits

\$1,050

Total

\$1,050

Total

\$1,050

Jupiter Bank: Balance Sheet after Logan's Deposit

Assets

Liabilities + Net Worth

Cash

\$51,050

Deposits

\$1,050

Capital

\$50,000

Total

\$51,050

Total

\$50,000

2.4 Reserves

At this point, we will take a closer look at the assets held by Jupiter and give them a new name. What Jupiter had on hand as “cash” is called “reserves” in banking terminology. The cash is still there, it just has a different name. Banking regulators—like the Federal Reserve in the U.S.—set up reserve requirements which determine *a percentage of deposits that must be held at the bank in the form of cash or on their account with the Fed*. **Reserve requirements** apply only to deposit accounts, and in the U.S. system banks must maintain a percentage of deposits—on average—over a two-week maintenance period.

Banks can hold **excess reserves** which are just the amount greater than what they are required to hold. Both required and excess reserves are the primary source of liquidity in the banking system. When banks need to meet withdrawals or move money around to other banks, they do it with reserves. Banks generally hold some reserves in the form of **vault cash**, which is physical currency stored in the bank. Other reserve funds are held electronically on the bank’s **reserve account with the Fed**. The Fed acts as a “bank for banks” helping banks transfer money between each other, and they can create reserves out of thin air using a computer keystroke. As is shown below, reserves move with transactions and banks will often borrow them from each other for various reasons. The reserve requirement for this banking system is set at 10%. With this reserve requirement, the balance sheet can be rewritten, as in Table 2.4. Beginning in October 2008 U.S. banks have been paid interest on their reserve balances. In early 2020, the **interest rate on reserves** was set at 1.6% annually.⁷ So, with this interest earned on reserves Jupiter Bank is currently getting a positive monthly cash flow simply from offering deposit services to their customers and storing reserve balances. Note, if the Fed were to increase this interest rate, banks would likely want to increase the interest rate that they were charging all their customers who borrow money.

Jupiter Bank: Reclassifying Assets from Previous Balance Sheet

Assets

Liabilities + Net Worth

Required Reserves

\$105

⁷The Federal Reserve (Fed) pays banks interest on reserves. The Fed creates reserves—out of thin air—to pay to private banks for their reserve balances.

Deposits

\$1,050

Excess Reserves

\$50,945

Capital

\$50,000

Total

\$51,050

Total

\$50,000

At this point, Jupiter Bank's managers decide to purchase some U.S. government bonds (i.e., Treasuries). The return on U.S. Treasuries is low compared to other assets, reflecting the fact that there is very little risk that they will not be repaid. Typically, Treasuries pay a higher interest rate compared to the interest on reserve rate, so here we will assume a 3% annual return. This higher interest rate is appealing to the bank since it would create more profits for our shareholders. There is also a very liquid market for Treasuries, and it is easy to turn them into cash quickly. Treasuries are also a good source of **collateral**—an asset pledged by a borrower to a lender, which can be taken and sold if the borrower cannot repay their loan. Good collateral might come in handy if this bank needs to borrow cash. In Table 2.4, we show that Jupiter takes \$20,000 of its cash (i.e., reserves) and uses it to buy some government bonds. These changes are represented in the new balance sheet (Table 2.4).

Jupiter Bank: T-Account Due to Securities Purchase

Assets

Liabilities + Net Worth

Excess Reserves

-\$20,000

Securities

\$20,000

Total

\$0

Total

\$0

Jupiter Bank: Balance Sheet after Security Purchase

Assets
Liabilities + Net Worth
Required Reserves
\$105
Deposits
\$1,050
Excess Reserves
\$30,945
Securities
\$20,000
Capital
\$50,000
Total
\$51,050
Total
\$51,050

Starting from Table 2.4, Jupiter's managers want to make some loans. The interest and fees on the loans made will allow them to pay interest to depositors, finance their operations, and create a profit for the shareholders. Let's assume a potential customer named Olivia wants to borrow \$20,000 to finance a new climbing gym she plans to open. She is willing to borrow the money at an interest rate of 8%, meaning she would pay about \$1,600 in interest in the first year. When they make her this loan, the bank deposits the funds into an account for her at Jupiter bank so that she can use the money later, paying her the same 1% rate of return on her deposits that was paid to Logan. Jupiter creates a loan to Olivia, and this transaction is reflected in Table 2.4. Notice the process involves turning reserves into a loan. While somewhat unrealistic, we might imagine this is like Jupiter taking \$20,000 cash from the vault and giving it to Olivia, who promises to repay \$20,000 with interest. She then takes the cash to the teller who takes it and credits her deposit account. Now, think of the deposit as a new transaction. Of the \$20,000 that Olivia deposits, 10% or \$2,000 is considered required reserves and the remaining \$18,000 is excess reserves. A more realistic example would be to imagine *electronic claims* to money moving back and forth instead of paper money. In this case, Jupiter would never have even had the cash on hand.

Jupiter Bank: T-Account Due to New Loan to Olivia and Her Rede-posit

Assets
Liabilities + Net Worth
Excess Reserves
-\$20,000
Loan
\$20,000
Deposits
\$20,000
Required Reserves
\$2,000
Excess Reserves
\$18,000
Total
\$20,000
Total
\$20,000

Jupiter's new balance sheet in Table 2.4 has increased by \$20,000 on both sides, just as the T-account described. Note that the bank makes money and loans out of thin air. The loan is an asset to the bank, and while there is a risk that Olivia will not repay, the bankers are willing to take this risk in order to make a profit. On the opposite side of the balance sheet, the deposits Jupiter created are a liability to the bank. Earning a profit relies upon Olivia fulfilling her end of the deal and doing the real work in the future necessary to repay her loan and interest.

Now, imagine that Olivia takes \$1,000 and uses her debit card connected to her deposit account to buy materials for her gym. This moves money out of her deposit account, and a corresponding amount of reserves must go with it. Note, that of the \$1,000 being moved out of the bank, 10% (or \$100) is required reserves, and the remaining 90% (or \$900) is excess reserves. The required reserve rate (10% here) is always used to find the required reserves in a balance sheet or T-account.

Jupiter Bank: Balance Sheet after Olivia Loan & Deposit

Assets
Liabilities + Net Worth
Required Reserves

2.4. RESERVES

23

\$2,105

Deposits

\$21,050

Excess Reserves

\$28,945

Securities

\$20,000

Loans

\$20,000

Capital

\$50,000

Total

\$71,050

Total

\$71,050

Jupiter Bank: T-Account Due to Olivia's Debit Card Use

Assets

Liabilities + Net Worth

Deposits

-\$1,000

Required Reserves

-\$100

Excess Reserves

-\$900

Total

-\$1,000

Total

-\$1,000

Jupiter Bank: Balance Sheet after Olivia Uses Debit Card

Assets

Liabilities + Net Worth

Required Reserves

\$2,005

Deposits

\$20,050

Excess Reserves

\$28,045

Securities

\$20,000

Loans

\$20,000

Capital

\$50,000

Total

\$70,050

Total

\$70,050

2.5 Capital Requirements and Lending

Banks make loans to create profit and pay for the expenses of running their business. Below, we describe why regulators like the Federal Reserve in the U.S. want to ensure that banks have enough capital on hand if some of the banks risky investments do not pan out. The Federal Reserve does this using **capital requirements** which mandates banks to have a **capital ratio** that is at least a certain percentage of risky loans. Capital ratios are complicated in practice, but for illustrative purposes we set the capital requirement at 10% of loans. In Table 2.4, the total amount of loans is \$20,000, and 10% of this would be \$2,000. The bank, with \$50,000 in capital is well above the \$2,000 requirement. Jupiter's managers are free to make more loans if they wish. They are also meeting their reserve requirement in Table 2.4 with \$30,050 in reserves for \$20,050 in deposits. With deposits of \$20,050, they are required to have \$2,005 in reserves. Reserves above the required amount, \$28,045 in this case, are excess reserves.

Both the reserve and capital ratio requirements are important in practice. The reserve requirement exists to ensure that banks have enough liquidity to meet withdrawals, and capital requirements exist to ensure that banks remain **solvent** in the event of losses. An **insolvent** bank would be one who could not liquidate all their assets and repay their liabilities.

Let's imagine that Jupiter makes a new \$30,000 loan to Emma who wants to start a cupcake shop. Emma plans to redeposit this loan in the bank, and like Olivia is also willing to pay an 8% interest rate on this loan. At the moment the loan is made, the bank does not have enough in excess reserves (since \$28,045 < \$30,000) and making the loan would leave them with only a portion of the reserves they are required to have. However, because Emma redeposits the money at Jupiter, there is no shortfall in required reserves. You should notice that in this situation, the total amount of reserves between Table 2.4 and 2.5 is unchanged. It is only the portion that is considered to be required that has changed. In the next section, we discuss what happens if Emma were to write a large check using the newly created deposits just placed in her account.

Jupiter Bank: T-Account Due to New Loan to Emma and Her Redeposit

Assets

Liabilities + Net Worth

Excess Reserves

-\$30,000

Loan

\$30,000

Deposits

\$30,000

Required Reserves

\$3,000

Excess Reserves

\$27,000

Total

\$30,000

Total

\$30,000

Jupiter Bank: Balance Sheet after Emma's Loan and Redeposit

Assets

Liabilities + Net Worth

Required Reserves

\$5,005

Deposits

\$50,050

Excess Reserves

\$25,045

Securities

\$20,000

Loans

\$50,000

Capital

\$50,000

Total

\$100,050

Total

\$100,050

2.6 Fed Funds Loans

Let's suppose that Emma wants to hire Cupcake Startup Inc. to help her get a cupcake shop up and running. Emma writes a check for \$30,000 on her account, paid to Cupcake Startup Inc., who has an account at a different bank (Europa Bank in Table 2.6). When Emma pays Cupcake Startup Inc., money is transferred from one bank to another. Europa Bank's reserves and deposits increase by the amount that they fall at Jupiter Bank.

Jupiter Bank: T-Account Due to Emma's Check Writing

Assets

Liabilities + Net Worth

Deposits

-\$30,000

Required Reserves

-\$3,000

Excess Reserves

-\$27,000

Total

-\$30,000

Total

-\$30,000

Now, a question is whether Jupiter is still meeting its reserve requirements. In Table 2.6, because of the changes described in Table 2.6, excess reserves are negative. Negative excess reserves indicate a shortfall in reserves. In this case, it can be viewed as total reserves being \$50, with a shortfall of reserves of \$1,955. What should the bank do, given that they are short of their liquidity requirement?

Europa Bank: T-Account (Cupcake Startup Inc.'s Bank)

Assets

Liabilities + Net Worth

Deposits

\$30,000

Required Reserves

\$3,000

Excess Reserves

\$27,000

Total

\$30,000

Total

\$30,000

Jupiter Bank: Balance Sheet after Emma's Check is Cashed

Assets

Liabilities + Net Worth

Required Reserves

\$2,005

Deposits

\$20,050

Excess Reserves

-\$1,995

Securities

\$20,000

Loans

\$50,000

Capital

\$50,000

Total

\$70,050

Total

\$70,050

Jupiter could choose to borrow the funds from another bank on the overnight market. Since Jupiter needs to pay for the funds that they borrow, we will assume that they borrow the smallest amount that they need, or \$1,955. Since they need 10% of \$20,050, or \$2,005, but already have \$50, they only need to borrow \$1,955. These loans between banks are for terms as short as one night, and banks like Jupiter who are borrowing pay the federal funds rate (or close to it) for this money. In early 2020, the federal funds rate was just below 1.6%, very near to the interest on reserves rate. This interbank loan shows up as a liability to Jupiter, and it is worth noting that it costs them more than deposits, which we have set at 1% here. Jupiter's borrowing can be seen in the new balance sheet in Table 2.6, which has grown by the amount of the interbank loan. One feature of the federal funds rate market is that the loans are not collateralized, meaning the bank is borrowing reserves from another bank on the promise that the loan will be repaid. If banks cannot get a federal funds market loan, they are often able to post assets (like government securities) as collateral and borrow money at similar rates.

A key feature of the interbank loan market is that banks do not have to hold reserves against these funds. Thus, it is a way banks can meet their requirements without having to maintain additional reserves.

Jupiter Bank: T-Account Due to Interbank Loan

Assets

Liabilities + Net Worth

Interbank Loan

\$1,995

Excess Reserves

\$1,995

Total

\$1,995

Total

\$1,995

Jupiter Bank: Balance Sheet after Interbank Loan

Assets

Liabilities + Net Worth

Required Reserves

\$2,005

Deposits

\$20,050

Excess Reserves

\$0

Interbank Loan

\$1,955

Securities

\$20,000

Loans

\$50,000

Capital

\$50,000

Total

\$72,005

Total

\$72,005

As long as there are excess reserves somewhere in the system, and other banks believe the borrowing bank is likely to repay, banks have access to necessary funds. If there is a shortfall in reserves—because many banks are trying to borrow—the Fed can “inject” liquidity into the system by creating reserves which they can use to temporarily purchase assets like Treasuries from a bank or the general public. They would do this **open-market purchase** when they observe the federal funds rate—the overnight cost of borrowing—is rising above their preferred **target federal funds rate**. The target federal funds rate along with the interest rate on reserves are the most important interest rates set by the **Federal Open Market Committee** during their meetings, which occur every

six weeks.⁸ The Federal Reserve Open Market Desk purchases securities from the banking system or general public, using reserves that it creates out of thin air. These reserves are usually electronic, but the Fed can direct the Treasury to print paper currency that could also be used as reserves. We assume here in Table 2.6 and 2.6 that the Fed buys \$10,000 of bonds directly from Jupiter—even if this is an unlikely real-world scenario.⁹

In this scenario the Fed is fulfilling its role as the *lender of last resort* and ultimate source of liquidity to the system. If the system is *illiquid* then the creation of credit for borrowers like Olivia might slow down more than anticipated. Credit plays a very important role in our economy, as it helps finance firm operations, and helps smooth consumption by households who otherwise receive lumpy payments.

Jupiter Bank: T-Account Due to Open Market Sale of Securities

Assets

Liabilities + Net Worth

Securities

-\$10,000

Excess Reserves

\$10,000

Total

\$0

Total

\$0

Jupiter Bank: Balance Sheet after Open Market Sale of Securities

Assets

Liabilities + Net Worth

Required Reserves

\$2,005

Deposits

⁸The FOMC can decide to change rates in between meetings, but this is rare and usually only in response to very severe shocks. The last time the FOMC changed interest rates in between meetings was in early 2008.

⁹Notice that the Fed is effectively using newly created money to bid up the price of bonds that are for sale on the open market. This would lead to an increase in the price, and a decline in the interest rate. In our example here, this is what the Fed is trying to accomplish. When interest rates are rising away from the Fed's target federal funds rate, they inject liquidity to ease the upward pressure. If interest rates are falling below their target, their goal is to extract liquidity, lowering prices and raising interest rates.

\$20,050
Excess Reserves
\$10,000
Interbank Loan
\$1,955
Securities
\$10,000
Loans
\$50,000
Capital
\$50,000
Total
\$72,005
Total
\$72,005

2.7 Binding Constraints and Bankruptcy

Following the Fed's purchase of bonds from Jupiter, we observe that Jupiter can make more loans and still meet its capital and reserve requirements. With \$50,000 in capital, they can make up to \$500,000 in loans, since \$50,000 is 10% of \$500,000 and 10% is our capital requirement. Also, with \$12,005 in reserves, they would be able to have \$120,050 in deposits—since \$12,005 is 10% of \$120,050 and 10% is our reserve requirement. The bank is not currently constrained by either requirement. Also note that since Jupiter has access to the overnight market for reserves that they could increase lending and borrow the reserves necessary to meet any requirement. It is worth reiterating that the job of the bank is to make a profit, and holding onto reserves only earns the interest on reserves rate of 1.6% paid by the Fed. Let's next presume that the managers of Jupiter target a level of \$150,000 in loans, which are made to customers who redeposit their money back into the bank. Jupiter's balance sheet is now shown in Table 2.7.

Jupiter Bank: Balance Sheet after Increasing Loan Portfolio

Assets
Liabilities + Net Worth
Required Reserves

\$12,005
Deposits
\$120,050
Excess Reserves
\$0
Interbank Loan
\$1,955
Securities
\$10,000
Loans
\$150,000
Capital
\$50,000
Total
\$172,005
Total
\$172,005

To reach the target level of loans of \$150,000, Jupiter would have had to have made \$100,000 in additional loans. This is 10-times the excess reserves in Table 2.6. With these additional loans, let's see if the bank is meeting its capital and reserve requirements. The bank has exactly 10% of its deposits held as reserves, so it is meeting that requirement. As for capital, the bank has \$150,000 in loans, and needs to have 10% (or \$15,000) in capital. The bank has \$50,000, well over \$15,000 in capital required, so the bank is also meeting its capital requirement.

Recall that the act of a bank lending comes with a degree of risk, the risk being that the borrower will not repay the loan. Thus, when banks lend people money to buy homes, they usually require the purchaser to post the house as collateral to the loan as well as put a cash "down payment" towards the purchase price. Historically, this down payment was 20% of the purchase price, so a \$100,000 apartment would require the buyer pay \$20,000 in cash up front. The bank would provide the other \$80,000 in the form of a mortgage. If the borrower loses their job or cannot come up with their mortgage payments, they are **foreclosed** on by the bank. In foreclosure, the bank seizes the apartment and can resell it to recoup their losses. Since banks do not typically like to own homes, they will often try to sell these homes as fast as possible, likely selling it for less than it might otherwise be worth. In this situation, the bank would face losses on the

value of their assets, since they **write-down** or reduce the value of their loan portfolio.

In Table 2.7, we presume that Jupiter faces losses of \$10,000 on its loans. This might be because the bank lent a client money who ran up a balance on a credit card which they were unable repay and went into bankruptcy. In our balance sheet in Table 2.7, Jupiter's loans and capital decline together. The bank still owes its depositors their money back, and their reserves are not available to reflect losses. The owners of the bank suffer these losses, and the bank's overall balance sheet shrinks.

T-Account Due to \$10,000 Write-down on Loan Portfolio

Assets

Liabilities + Net Worth

Loans

-\$10,000

Capital

-\$10,000

Total

-\$10,000

Total

-\$10,000

Balance Sheet after \$10,000 Write-down on Loan Portfolio

Assets

Liabilities + Net Worth

Required Reserves

\$12,005

Deposits

\$120,050

Excess Reserves

\$0

Interbank Loan

\$1,955

Securities

\$10,000

Loans
\$140,000
Capital
\$40,000
Total
\$162,005
Total
\$162,005

Taking this a step further, now assume that Jupiter has made a lot of bad loans, so many in fact that they lose another \$45,000 in value (Table 2.7). The new balance sheet would show a negative value for net worth in Table 2.7. At this point, Jupiter is **insolvent**, meaning it cannot liquidate its assets and repay its creditors. The **Federal Deposit Insurance Corporation** (FDIC) exists to intervene in these circumstances. The FDIC makes depositors whole and makes up for the shortfall in capital at a loss to the FDIC insurance fund. Banks like Jupiter are members of the FDIC and pay periodic insurance premiums to help ensure the solvency of the banking system.

The FDIC usually tries to intervene well before the bank is insolvent, and usually tries to help arrange for another firm to buy the failing firm. Another bank might want to buy access to Jupiter's depositors, their remaining loan portfolio, or the physical locations and employees.

T-Account Due to \$45,000 Write-down on Loan Portfolio

Assets
Liabilities + Net Worth
Loans
-\$45,000
Capital
-\$45,000
Total
-\$45,000
Total
-\$45,000

Jupiter Bank: Balance Sheet after \$45,000 Write-down on Loan Portfolio

Assets

Liabilities + Net Worth

Required Reserves

\$12,005

Deposits

\$120,050

Excess Reserves

\$0

Interbank Loan

\$1,955

Securities

\$10,000

Loans

\$95,000

Capital

-\$5,000

Total

\$117,005

Total

\$117,005

2.8 Capital v. Reserve Constrained Banking

Regulation of both capital and liquidity play an important role in banking. Here we examine another fictional bank—Callisto Bank—to discuss the role for regulation. First, we examine the **debt-to-equity ratio**, which is calculated as the total amount of liabilities—or debt—to the total amount of capital. In Table 2.8, Callisto Bank has a debt-to-equity ratio of \$210,000 to \$15,000, which is 14-to-1. This is also sometimes referred to as the banks' **leverage ratio**, since it represents the amount of borrowed money that the bank is using relative to their own capital. Highly leveraged banks are taking more risk, since if the bank's assets decline in value, the losses are amplified by this amount. Next, a **capital ratio** is found by taking the total of all risky loans, \$120,000, and comparing that to total capital of \$15,000, yielding an 8-to-1 ratio.¹⁰ This is the same thing as having 12.5% of loans held as capital. If we continue using the

¹⁰We are assuming here that the debt issued by the bank only takes the form of loans, and equity only comes in the form of capital.

10% requirement from earlier, then this bank is meeting its capital requirement. With \$200,000 in deposits, and \$30,000 in total reserves, the bank is also well above its reserve requirement with a 15% ratio.

Callisto Bank: Balance Sheet

Assets

Liabilities + Net Worth

Required Reserves

\$20,000

Deposits

\$200,000

Excess Reserves

\$10,000

Interbank Loan

\$10,000

Securities

\$75,000

Loans

\$120,000

Capital

\$15,000

Total

\$225,000

Total

\$225,000

So, our question is to see how much lending this bank could do and still meet both statutory requirements. With existing reserves, the bank could support deposits of up to \$300,000, since \$30,000 of reserves divided by the reserve requirement of 10% (or 0.10) would be \$300,000 (Table 2.8). The new balance sheet would have an increase of \$100,000 on each side since the \$10,000 of excess reserves would be categorized as required reserves after the increase in deposits.¹¹

If we check the capital requirement, we will see that the bank is holding loans that place it at more risk than regulators would prefer. Callisto's capital ratio is

¹¹Note again, we are assuming all loans created are immediately held as deposits.

only at 6.8% (\$15,000/\$220,000), below its 10% requirement of \$22,000. Callisto should not be making loans in this amount. In this case, we say they are **capital constrained** but not **liquidity constrained**. If Callisto wanted to increase lending while still meeting their capital requirement, they could increase lending from \$120,000 in Table 2.8 to \$150,000 (which is \$15,000 divided by the capital requirement of 10%). The balance sheet would grow by \$30,000. Banks like Callisto might be able to borrow more reserves on the overnight market and increase their lending by much more than the amounts mentioned here. Banks face other regulations, but the role played by capital is very important to understanding the financial crisis in the late 2000s.

Callisto Bank: Balance Sheet with Proposed Loan Expansion Based on Reserve Requirement

Assets

Liabilities + Net Worth

Required Reserves

\$30,000

Deposits

\$300,000

Excess Reserves

\$0

Interbank Loan

\$10,000

Securities

\$75,000

Loans

\$220,000

Capital

\$15,000

Total

\$325,000

Total

\$325,000

Table 2.8 is more representative of the modern system, where banking operations are more constrained by access to capital and capital requirements than reserve or liquidity requirements. After the 2008 Financial Crisis, the Federal Reserve

increased reserves in the system by nearly \$4 trillion. This increase spurred fears of an overwhelming increase in lending, but those predictions failed to understand that banks were already constrained by capital requirements and a lack of demand for new lending. Following the housing crisis which started in 2006, bank capital had been decimated. Banks were not necessarily eager to go out and make lots of new loans just because they were given the reserves to do so. Instead, they faced much tighter oversight of their capital when many banks were facing a crisis of solvency. The Fed can only do so much when banks face solvency issues, since that is left to the FDIC who does not typically help recapitalize banks. Banks were left to raise capital on their own and were under pressure to find investors who would be willing to give banks money in exchange for ownership stakes in now undercapitalized banks. In 2008, the Troubled Asset Relief Program or TARP authorized the government purchase of an ownership stake in financial institutions that were deemed systemically important. These institutions were effectively nationalized as the government took a large controlling stake in the banks. The government did not overwhelmingly restrict the banking operations of these institutions, although TARP did come with some additional oversight responsibility.

Callisto Bank: Balance Sheet with Proposed Loan Expansion Based on Capital Requirement

Assets

Liabilities + Net Worth

Required Reserves

\$23,000

Deposits

\$230,000

Excess Reserves

\$7,000

Interbank Loan

\$10,000

Securities

\$75,000

Loans

\$150,000

Capital

\$15,000

Total

\$255,000

Total

\$255,000

2.9 Federal Reserve Tools/Instruments, Targets, and Goals

There is a distinction between the Federal Reserve's tools (or instruments), targets, and goals. The main tools used by the Federal Reserve are the:

- **Open Market Operations:** The Fed's purchase (sale) of bonds intended to decrease (increase) the federal funds rate. These operations are done multiple times per day with the intention of trying to maintain the Fed's target federal funds rate.
- **Interest on Reserves:** Starting in October 2008, the Fed began paying banks for holding reserves. There are separate rates paid for required and excess reserves (although they have been set equal to each other since the program's inception). Since 2008, this rate has been used to help guide the federal funds target rate.
- **Reserve Requirements:** The percentage of deposits that must be held in the form of the bank's reserves.
- **Balance Sheet Operations:** When the Fed increases the size (quantitative) or quality (qualitative) of its own balance sheet. This can be used to try and influence interest rates other than the federal funds rate.
- **Discount Rate:** The cost of borrowing reserves directly from the Federal Reserve. This is nearly identical to how the interbank loans work, except the reserves are coming from outside the private sector and the loans are collateralized. There is also an increase in reserves through a discount rate loan.

The Fed's targets are the intermediate things the Fed is trying to change which might influence economic activity like consumption or investment. Some examples of targets are the:

- **Federal Funds Rate:** The Fed sets a target rate in this market by providing sufficient liquidity to push lending conditions towards their preferable state. This interest rate is now guided by the interest on reserves rate which is set to be close to the target fed funds rate. Increases (decreases) to these interest rates are expected to indirectly cause other interest rates to rise throughout the economy, including Treasury and riskier assets.
- **Long-term Interest Rates:** The Fed might choose to also try to manipulate longer-term interest rates to affect behavior in other markets.
- **Money Supply:** The Fed could try to target the total supply of money, in the form of deposits and currency (i.e., M1) or the broader M2 money

supply (M1+MMMF+Savings+Time deposits).¹²

Ultimately, the Federal Reserve is trying to reach its goals of:

- **Full Employment:** interpreted as unemployment at or near the natural rate of unemployment
- **Stable Prices:** interpreted as a stable and low rate of inflation at or near 2%.

The Fed is free to change its instruments, and form its own targets, but the goals are more rigid since they are mandated by Congress. By law, the Fed's job is to maintain full employment and stable prices, but they are free to interpret what this means. So, there is some flexibility here, where rather than focus on keeping prices constant they have chosen to instead try to keep inflation steady (which is the rate of change in prices).

2.10 An Aside on Sweeps

There is one other regulatory complication which has made the U.S. banking system less reserve constrained and more subject to capital constraints. Take the example of Callisto Bank again, who now instead of having interbank loans, has savings deposits from its customers in the amount of \$10,000. This bank could make loans under its capital requirement (up to \$150,000 as seen in Table 2.10), but they do not have any reserves to make the—say \$5,000—loan they would like to. What the bank can do is reclassify some of its deposits as savings. They do this, because savings accounts are not subject to reserve requirements.

Callisto Bank: Balance Sheet with Savings Accounts

Assets

Liabilities + Net Worth

Required Reserves

\$20,000

Deposits

\$200,000

Excess Reserves

\$0

Interbank Loan

\$10,000

¹²Savings accounts or money-market deposit accounts (MMDA) are less liquid than checking. Money market mutual funds (MMMF) are another less-liquid alternative to deposits. Finally, small-denominated time deposits-or certificate of deposit (CDs)-are investments that can be liquidated with a small penalty.

Securities

\$75,000

Loans

\$130,000

Capital

\$15,000

Total

\$225,000

Total

\$225,000

The changes to the balance sheet must lead to an increase in excess reserves of \$5,000, which we can get by switching \$50,000 out of their deposits and into savings as in Tables 2.10 and 2.10.

Callisto Bank: T-Account Due to Sweeps

Assets

Liabilities + Net Worth

Deposits

-\$50,000

Savings

\$50,000

Required Reserves

-\$5,000

Excess Reserves

\$5,000

Total

\$0

Total

\$0

Callisto Bank: Balance Sheet After Sweeps

Assets

Liabilities + Net Worth

Required Reserves

\$15,000

Deposits

\$150,000

Excess Reserves

\$5,000

Interbank Loan

\$60,000

Securities

\$75,000

Loans

\$130,000

Capital

\$15,000

Total

\$225,000

Total

\$225,000

The size of the balance sheet does not change, and total reserves do not change, just how their money is categorized. The loan gets created in Table 2.10, and the final balance sheet is shown below in Table 2.10.

Callisto Bank: T-Account Due to New \$5,000 Loan and Redeposit

Assets

Liabilities + Net Worth

Excess Reserves

-\$5,000

Loans

\$5,000

Deposits

\$5,000

Required Reserves

\$500

Excess Reserves

\$4,500

Total

\$5,000

Total

\$0

Callisto Bank: Balance Sheet After \$5,000 Loan and Redeposit

Assets

Liabilities + Net Worth

Required Reserves

\$15,500

Deposits

\$155,000

Excess Reserves

\$4,500

Interbank Loan

\$60,000

Securities

\$75,000

Loans

\$135,000

Capital

\$15,000

Total

\$230,000

Total

\$230,000

Banks can sweep deposits into non-reserve-requiring savings accounts for the purpose of reducing their need to hold reserves, and so that the bank can purchase assets that offer depositors a higher rate of return. In the years after banks could do this in the early 1980s, bank reserves fell to approximately 7% of total

deposits prior to the financial crisis in 2008. Prior to 2008, there were only about \$45 billion in reserves in the entire banking system, and about \$30 billion being vault cash. This meant there were only about \$15 billion in reserve balances with the Fed, and \$2 billion in excess reserves. These reserves supported checkable deposits of approximately \$600 billion in checkable deposits in 2008.

Chapter 3

Labor Market Measures

3.1 Labor Force Participation

The labor market is one of the most important and relevant macroeconomic measures of health.¹ There are several different measures of labor market health. First, we might like to know what portion of eligible workers are engaged in either working or job search. We measure this using the **labor force participation rate** (LFP). The LFP tends to rise and fall with long-term economic trends, like women entering the workforce or the reduction in manpower necessary for manufacturing. We calculate the LFP as:

$$\text{LFP} = \frac{\text{Unemployed} + \text{Employed}}{\text{Eligible Population}} \times 100$$

We can see that structural forces shift labor force participation (Figure 3.1). However, LFP does change with cyclical events, such as the case with the recent COVID-19 pandemic.

3.2 Job Growth

Another way to look at the health of the labor market is to look at job growth. Job growth in the U.S. had been going very strong until the COVID-19 pandemic in early 2020. Note that in Figure 3.2 there had been positive gains in growth for over ten years! Prior to the COVID-19 pandemic, healthy job growth was considered to be about 200,000 jobs per month.

The COVID-19 pandemic is unlike anything we have ever experienced in the U.S., so much so that the scale of all previous changes appear nearly irrelevant.

¹Many of the graphs here are adapted from code available from Len Kiefer's blog post <http://lenkiefer.com/2018/03/11/charting-jobs-friday-with-r/>.

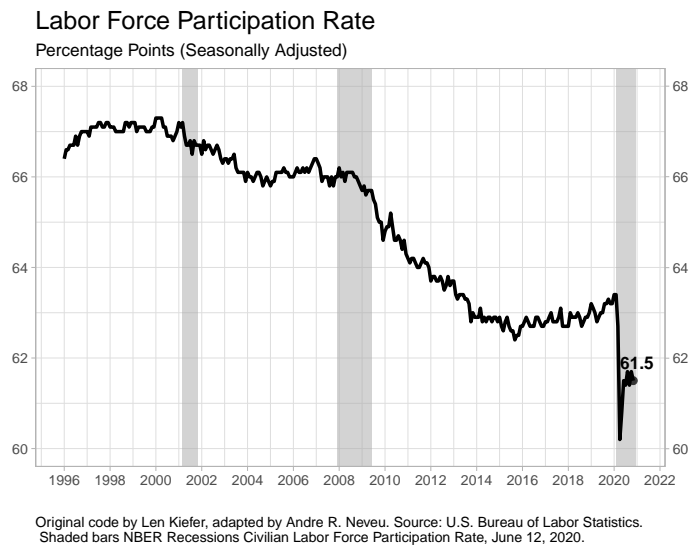


Figure 3.1: The Workforce Shows Structural and Cultural Changes

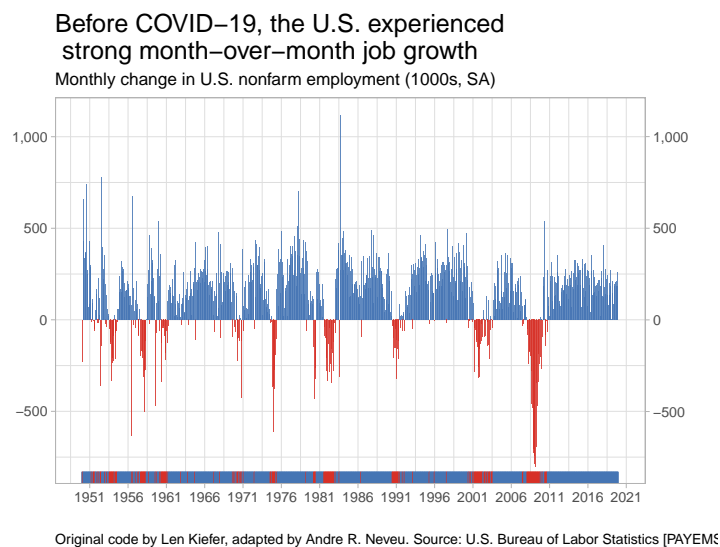


Figure 3.2: Job Gains Had Persisted for a Historically Long Stretch

Note that Figure 3.3 is the same as Figure 3.2 but focuses on the periods since the start of the Great Recession in late 2007.

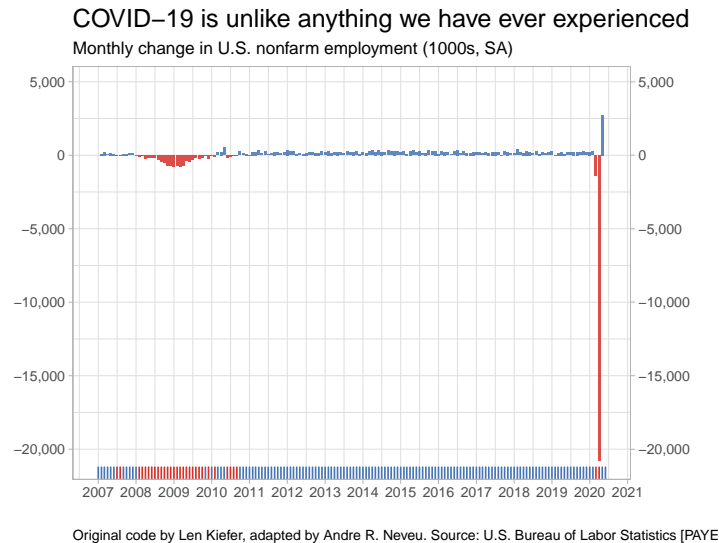


Figure 3.3: The COVID-19 Job Losses Are Stunning

3.3 Unemployment Rates

The unemployment rate is a different measurement than labor-force participation. Unemployment rates only look at the percentage of the labor force that cannot find work. The labor force is the numerator in the calculation of the LFP, and sometimes when people lose a job they leave the labor force entirely. This complicates our perception of the health of the labor market when some people are both losing jobs—leaving the numerator of the unemployment rate—and also leaving the labor force. In mid-2020, people are both filing for unemployment—which means they stay in the labor force—and dropping out of the labor force.

$$\text{Unemployment Rate} = \frac{\text{Unemployed}}{\text{Unemployed} + \text{Employed}} \times 100$$

The unemployment rate is often compared to a conceptual measure known as the **natural rate of unemployment**. This natural rate is what economists estimate the unemployment rate would have to be in order to keep the economy producing at its potential. **Potential output** is somewhat confusing, as it really means the country is producing goods and services at a *sustainable* level and not the *absolute maximum*. You might think of potential output more like a pace you could sustain while jogging, but not an all-out sprint! The

estimated natural rate of unemployment considers what we have talked about so far. Strong participation, healthy job growth, and availability of jobs making for a *healthy* labor market.

We can see in Figure 3.4 that the unemployment rate in early 2020 was at an historic low, and was well below what economists considered *natural*. When the economy is not doing so well, the labor market tends to be one of the most important signals. Thus, the unemployment rate usually rises rapidly during **recessions** when the economy and output is contracting.

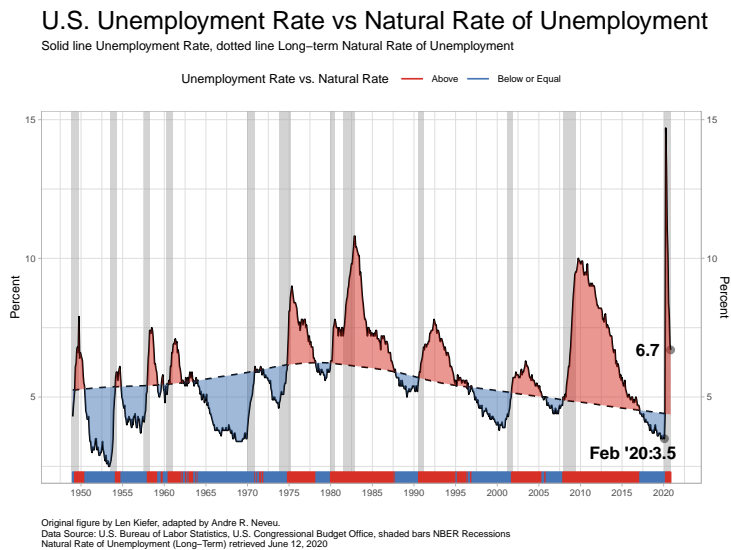


Figure 3.4: Unemployment Rates Had Been Historically Low

3.4 Long-Run Trends v. Short-Run Changes

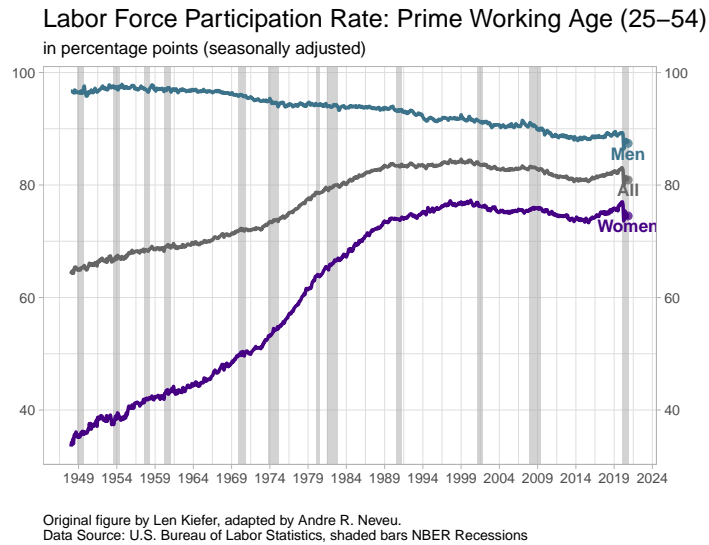


Figure 3.5: Labor Force Participation Has Plummetted

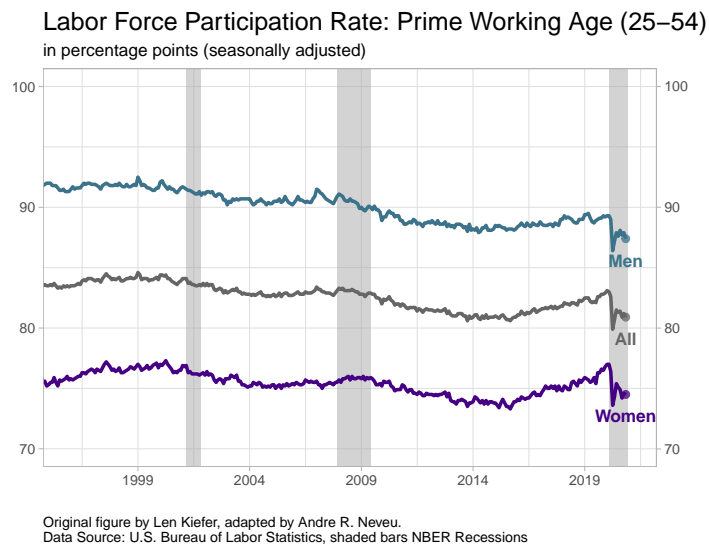


Figure 3.6: The Change is Similar Across Gender

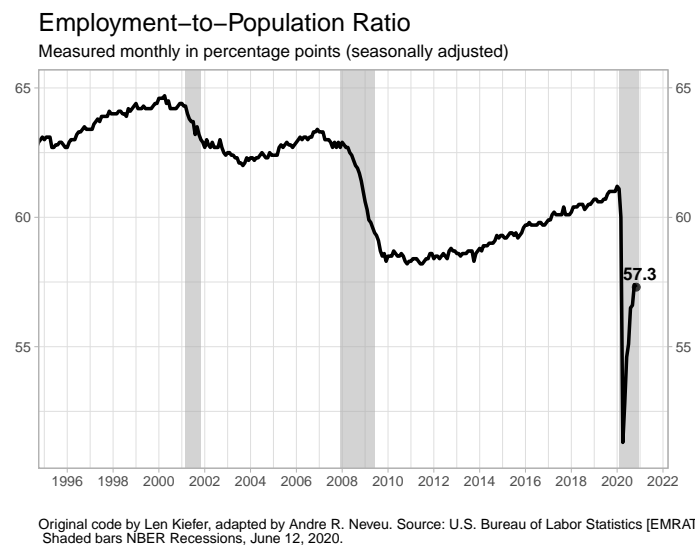


Figure 3.7: Expectedly, the Percentage of All People Employed Has Fallen

Chapter 4

Inflation

Prices for the goods and services we consume change over time. Recall that a price that you pay for a good is simply a *nominal* value, and does not directly take into account the amount of *real* work that would be performed to purchase a good. For example, if you were living in the fictional country of Titan, and a bag of chips there cost 30 units, that information is not particularly informative by itself. First, you want to know if “30 units” is a lot. If a typical wage for an hour of work was “3 units” then chips seem expensive costing you about 10 hours of work! However, if a typical wage was “300 units” for an hour of work, then chips are cheap, earned with about six minutes of work! Thus, what is most important to you is the real value.

For many goods—like tuition—the price level just seems to rise over time. Here, we see the average price **level** for the U.S. as measured by the **Consumer Price Index** (CPI). By itself, the CPI in Figure 4.1 is not particularly informative. In April 2020, the CPI measured 255.902. What we might be more interested in is the change in the CPI, or inflation seen in Figure 4.2. So if we look at the CPI from April 2019 when it measured 254.943, we could see that it increased by:

$$\left(\frac{255.902}{254.943} - 1 \right) \times 100 = 0.4\%$$

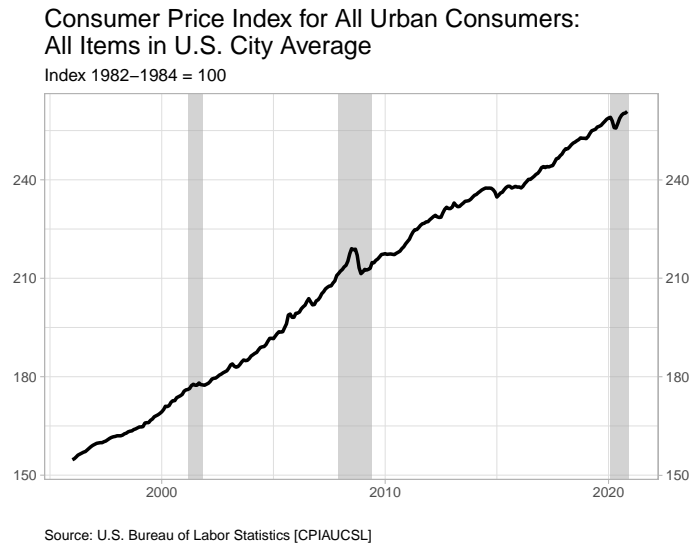


Figure 4.1: Price Levels Generally Rise Over Time

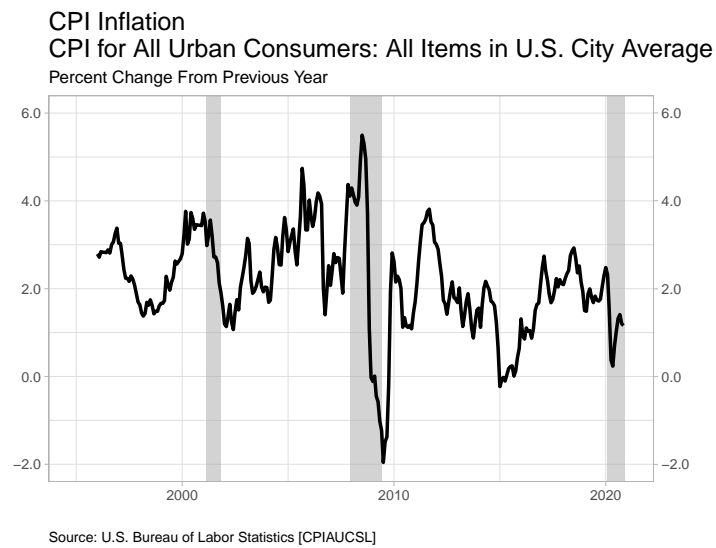


Figure 4.2: Inflation Rates Are Measuring the Change in the Price Level

Chapter 5

Output and Production

Measures of output and production

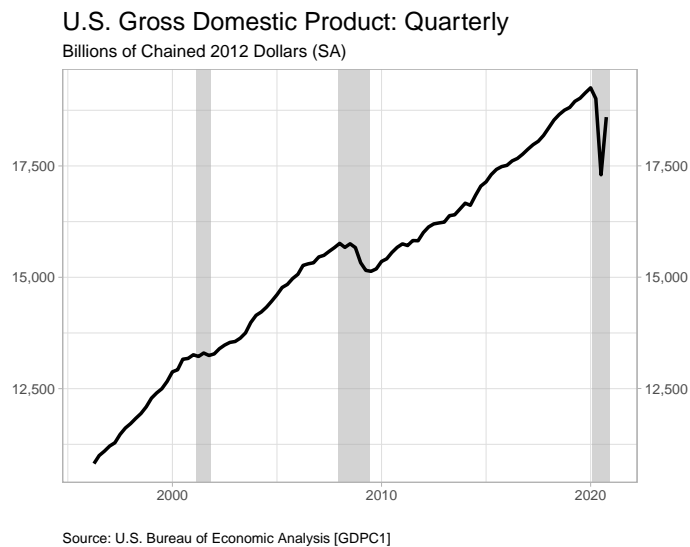


Figure 5.1: Output Exhibits Both Growth and Cycles

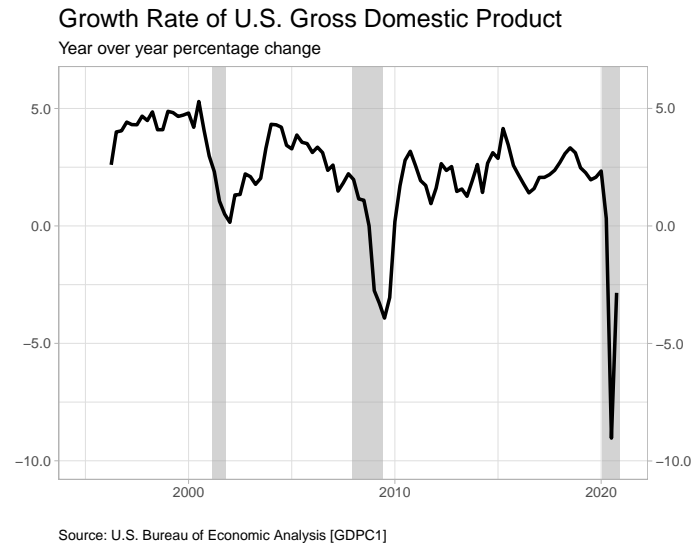


Figure 5.2: Output Exhibits Both Growth and Cycles

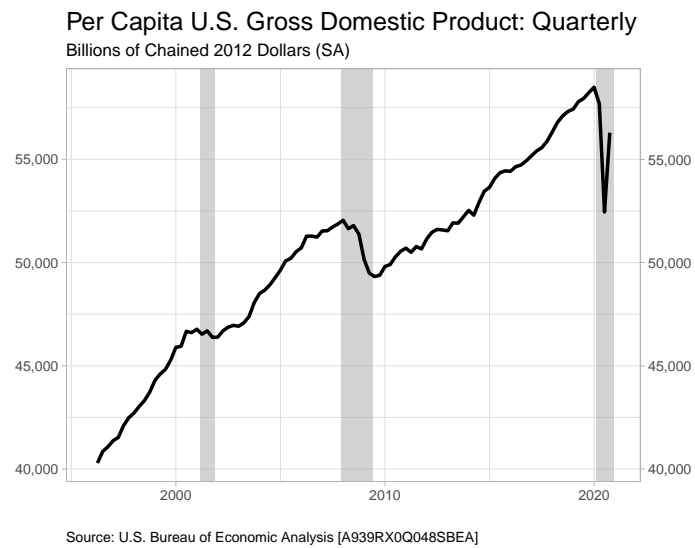


Figure 5.3: Per Capita GDP Might be More Important

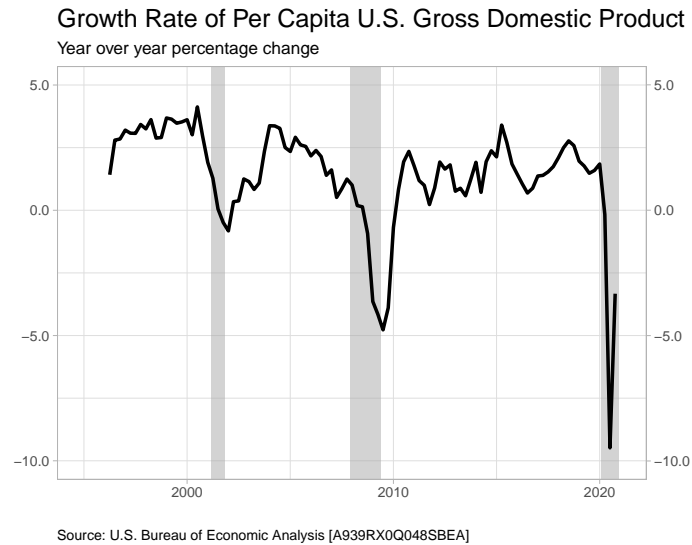


Figure 5.4: Per Capita Also Exhibits Cycles

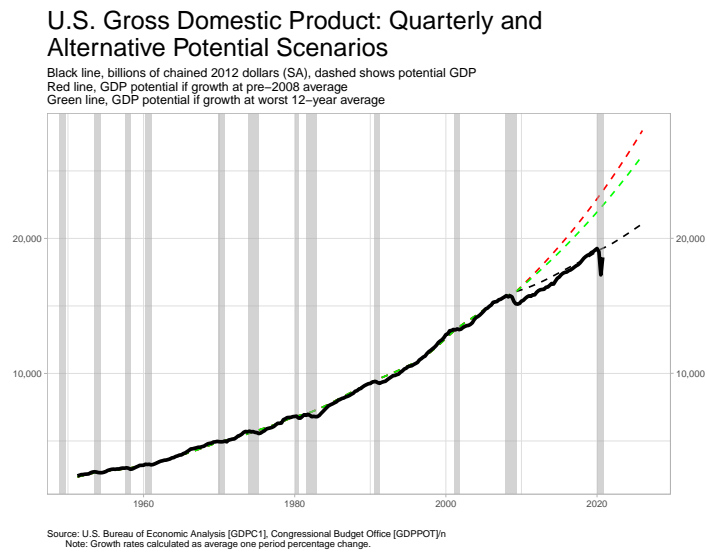


Figure 5.5: Per Capita Also Exhibits Cycles

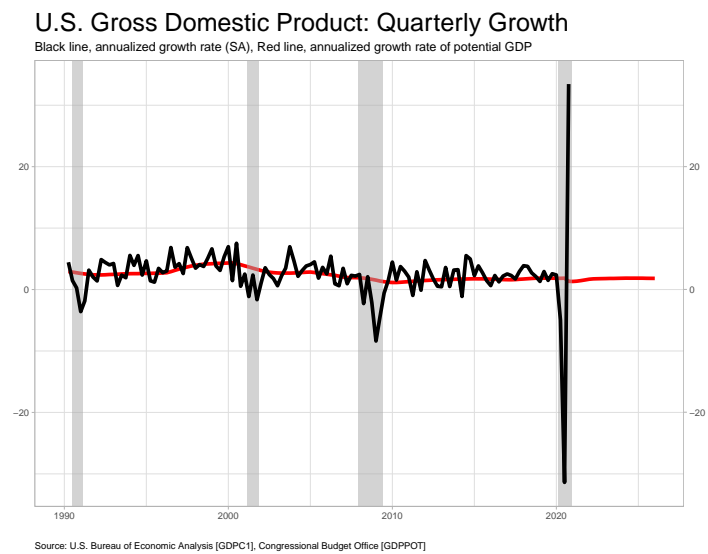


Figure 5.6: Per Capita Also Exhibits Cycles

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