Measuring the Economy’s Health

I Output

The first measurement is the amount of goods produced in the economy, which measures if a country is rich or poor. The ultimate goal is to know why some countries are wealthy and others poor.

Definition 2 Nominal Gross Domestic Product (NGDP). Current market value of all finished goods and services produced domestically in a specified time.

- what? finished goods and services (not resold).
- where? Domestic production.
- when? A specified period (usually one year)

About $15.98 trillion as of the first quarter of 2013. Notes:

- This is a measure of the total output of the economy. By market value, we mean prices.
- The current market value of a beer at Titanic is say $5. If the Titanic economy made 1,000 beers the NGDP would be $5,000.

A Calculating NGDP: Value Added Approach

Definition 3 NGDP equals Value Added which equals revenue less cost of goods sold.

\[
\text{NGDP} = \text{revenue} - \text{cost of goods sold.}
\]

(1)

Remember from microeconomics: the price equals the value of a good. Consider an example, a Jeep:

<table>
<thead>
<tr>
<th>firm</th>
<th>Q</th>
<th>price</th>
<th>revenue</th>
<th>cost of goods</th>
<th>value added</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Steel</td>
<td>2 tons steel</td>
<td>$3,000 per ton</td>
<td>$6,000</td>
<td>0</td>
<td>$6,000</td>
</tr>
<tr>
<td>Chrysler</td>
<td>1 jeep</td>
<td>$26,000</td>
<td>$26,000</td>
<td>$6,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Dealer</td>
<td>1 jeep</td>
<td>$28,000</td>
<td>$28,000</td>
<td>$26,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>total mkt. value</td>
<td></td>
<td></td>
<td>$28,000</td>
<td></td>
<td>$28,000</td>
</tr>
</tbody>
</table>
Suppose US steel mines some iron and refines that iron into two tons of steel. US steel sells the steel to Chrysler, which uses the steel to make a jeep. Chrysler then sells the Jeep to a retailer, who in turn sells the Jeep to a consumer. Trick is to count only the “value added” to the product at each step. That is, don’t count the value of the product at each step, since that would be like assuming both Chrysler and US steel refined the iron into steel. Instead, US steel only converted the iron into steel, worth $6,000, Chrysler turned the steel into a Jeep, worth $26,000. To calculate the NGDP, we add only the additional cost added to the product at each step or count the product at the retail level only.

The value added approach gives NGDP from the production side.

B Income Approach

Definition 4 NGDP equals Total Income which equals wages plus profits.

\[
\text{NGDP} = \text{Total Income} = \text{wages} + \text{profits}. \tag{2}
\]

\[
\text{profits} = \text{revenues} - \text{wages} - \text{cost of goods}. \tag{3}
\]

Consider our example again:

<table>
<thead>
<tr>
<th>firm</th>
<th>Q</th>
<th>revenue - cost of goods = VA</th>
<th>wages paid</th>
<th>profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Steel</td>
<td>2 tons</td>
<td>$6,000</td>
<td>5*$1,000 = $5,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Chrysler</td>
<td>1 jeep</td>
<td>$20,000</td>
<td>10*$1,500 = $15,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Dealer</td>
<td>1 jeep</td>
<td>$2,000</td>
<td>1*$1,000 = $1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>$28,000</td>
<td>$21,000</td>
<td>$7,000</td>
</tr>
</tbody>
</table>

So the total income, consisting of both profits and wages, is $21,000 + $7,000 = $28,000. Notice that income equals NGDP. This is true in general (add the two equations above).

More generally, the income approach works like this (numbers are fourth quarter 2009):

1. Count all labor income: wages, salaries, and fringe benefits ($8.77 trillion, ‘compensation of employees, NIPA’). Wages are up about 3%, benefits 3%.

2. Count all capital income: profits, rental payments, interest payments. ($4.15 trillion).
3. Add depreciation. DEPRECIATION loss of value of investment goods. Also known as CAPITAL CONSUMPTION ALLOWANCE. Business do not count depreciation as part of profits. But we are looking at Gross domestic product, the product before depreciation. So we must put $2.06 trillion back in.

4. Add in indirect business taxes. Labor and capital income are given before income and profits taxes, but indirect taxes are not. Consider the purchase of of a final good. Some sales tax goes to the government. This sales tax is part of the value of the good, its just that the government gets it. These are now called “taxes on production and imports,” a change the book has not yet made ($1.15 Trillion). Also includes things similar to sales taxes such as import taxes and license fees.

5. Add income of foreigners that produce goods in the US. US labor income does not include foreigners working in the US. Subtract US income abroad. Americans earned $0.79 trillion abroad, foreigners earned $0.55 trillion here. Thus subtract $0.24 trillion.

The total is about 15.89 trillion, equal to the NGDP (plus rounding errors).

C The Spending Approach

The first method attacked the problem from the production side. Add up all firm production. The second approach was from the income side, add up everyone’s income. The third approach is to add up everyone’s spending. In the macro world spending equals income (you consume or save income, savings are loaned out and spent by someone). So we should be able to add up spending and get spending equal to NGDP. Spending is broken up into categories.

1. CONSUMPTION (C). Purchases of final goods and services by individuals. Does not include housing. About $11.35 trillion, roughly 71% of the economy. In other countries, consumption is much smaller (for example, Japan is only 58% and Germany is only 55%) and investment spending is higher.

2. INVESTMENT SPENDING (I). Purchases of final goods and services by firms (hammers, machines, and equipment, new espresso machines purchased by coffee houses, etc), plus new housing purchases. $2.14 trillion, or 13.4% of NGDP. Financial Assets are not part of investment, but spending from them is. Includes inventories of goods not sold. So an when a firm purchases an item to sell, it goes into inventory investment. When sold, it goes into consumption and inventory investment is lowered by the
amount of the good. In the recent recession, this part of GDP suffered by far the most, it fell by 23% in 9 months from 2008-III to 2009-II. During this period government spending was unchanged and consumption fell only by 3 percent).

3. GOVERNMENT PURCHASES (G). Purchases at all levels of government (military, roads, police). $3.03 trillion (18.9 percent). Has grown by one percent just since 2008. Note that the government does a lot of transfers, payments in cash of social security. TRANSFER PAYMENTS: All monetary payments such as social security, welfare, scholarships, NSF funding, NEA funding, etc. This we do not count. We count it instead when the recipient spends the money. Finally, most of the expenditures are at the state and local level, only about 37 percent is Federal.

4. NET EXPORTS (X-M). EXPORTS (X) are the purchases by other countries of domestically produced goods and services. IMPORTS (M) are the purchases of foreign produced goods and services by our country. Imports of foreign produced goods are counted as consumption and are therefore subtracted out here. Exports are $2.19 trillion, imports are $2.73 trillion leading to net exports of -$0.54 trillion. (About -3.4% of NGDP).

Thus by the expenditure method:

\[ NGDP = total \, expenditures = C + I + G + X - M \] (4)

NGDP = Income = value added = total value of finished goods = expenditures. (5)

D Direct Calculation

If we know all \( n \) finished goods in the economy, we can use direct calculation of the total value of all finished goods and services.

\[ NGDP = P_{1,t}Q_{1,t} + P_{2,t}Q_{2,t} + \ldots + P_{n,t}Q_{n,t} \] (6)

E Real GDP

One problem with NGDP is that it rises when prices rise. To solve this problem, we can measure production in constant prices:

**Definition 5** REAL GDP (GDP) is the total value of goods and services in constant dollars.
Increases in prices do not increase GDP. The direct method for GDP is:

\[ RGDP = P_{1,b}Q_{1,t} + P_{2,b}Q_{2,t} + \ldots + P_{n,b}Q_{n,t} \]  \hspace{1cm} (7)

Here \( b \) is a base year.

Note, since we are just changing units, all of the same calculations apply for GDP as NGDP. For example,

\[ NGDP = \text{Income} = \text{Expenditures} = \text{value added} \]  \hspace{1cm} (8)

\[ GDP = \text{real income} = \text{real expenditures} = \text{real value added} \]  \hspace{1cm} (9)

F GDP Growth and Cycle

Long run growth (\( Y^g \)) refers to the slow and steady average growth in GDP over many years. The business cycle is variation in GDP growth (\( Y^c \)). Therefore:

\[ GDP_t = Y^c_t + Y^g_t \]  \hspace{1cm} (10)

For example, long run average growth in the US is about 3% per year. In 2012-I, GDP was 107.0 (I am measuring using 2005=100). We would expect GDP to rise in 2013-I to 110.2, a 3% increase. Instead, GDP only rose to 108.7. So we have:

\[ 108.7 = Y^c_t + 110.2 \rightarrow Y^c_t = -1.5 \]  \hspace{1cm} (11)

The economy has a negative cycle component, since GDP growth was below average.

\[ \text{GDP Growth Rate} = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}} \]  \hspace{1cm} (12)

**Definition 6** A **BOOM** is a period of above average GDP growth.

**Definition 7** A **REcession** is two consecutive quarters of negative GDP growth.

**Definition 8** A **REcession** may also be defined as below average GDP growth (negative cycle component).

G GDP and Welfare

First, remember that the meaning of GDP depends on the size of the population. If the GDP or income is $100,000, then the meaning changes based on whether the population size
is two or 100,000. So to adjust we measure:

$$\text{GDP per capita} = \frac{GDP}{\text{population}}$$  \hspace{1cm} (13)$$

GDP per person will be our primary measure of welfare. That is, we will say that the higher the GDP per person, the better off society is.

Problems:

1. GDP per person is a very general measure. It is usually the case that some industries will be declining in GDP while others increase. For example, the energy sector is doing well, while energy users like airlines continue to struggle. Regionally, Nevada and Michigan are struggling more than most states.

2. GDP per capita makes no mention of the distribution of income. So for example, many Latin American countries large percentages of the GDP are held by very small percentages of the people.

3. Leisure is not an element of the GDP. By imposing an 80 work week the GDP level could be increased yet general welfare, at least in my opinion, would decline.

4. A significant portion of production is not traded in the market and is thus not recorded in the GDP. For example, consider home production, housework, cleaning, raising children, etc. Such production adds to our overall welfare, yet is not counted in the GDP. Example: washing machine breaks.

5. Some goods are not in the GDP, but spending on these goods are:

   (a) Environmental goods such as clean air and clean rivers.

   (b) Good health (high life expectancy, low child mortality) is not in the GDP.

   (c) Low crime is not in the GDP.

Another measure of production is gross national product (GNP), which measures all American owned production. Example: Disneyworld in France. The branch employs mostly French workers, and the product is sold to the French. This counts in GNP not GDP. Toyota’s built in the US and exported to Canada count in our GDP, but not our GNP. In the past, GNP and GDP were similar. Now they have diverged due to the increase in trade.

For all these caveats, GDP does a good job. Countries with higher GDP generally have better health and environment, and more leisure time (see charts).
II PRICES

**Definition 9** A *PRICE INDEX* is a ratio of the expenditure on a basket of goods and services in some given period to the expenditure in some base period.

EXAMPLE: So we might say that if dinner and a movie cost $10 in 1960 and $40 today, then the price index for movies would be $\frac{40}{10} \times 100 = 400$. Note that the base year is always 100. However, one might today instead get dinner and get a movie from Netflix for a total of $20$. How can this be included, since Netflix didn’t exist in 1960? Answer: Every so often the gov’t updates the basket of goods included.

A Price Indicies

The major price indices are:

- **GDP DEFLATOR.** Here every good in the GDP is included. The cost of different goods are weighted by the number sold. For example if 20% of the GDP is spent on beer then prices of beer makes up 20% of the GDP deflator. Formula:

  \[
  \text{GDP deflator} = \frac{P_{1,t}Q_{1,t} + P_{2,t}Q_{2,t} + \ldots + P_{n,t}Q_{n,t}}{P_{1,b}Q_{1,b} + P_{2,b}Q_{2,b} + \ldots + P_{n,b}Q_{n,b}} \times 100
  \]  

  (14)

  If 2005 = 100 (the base year), the GDP deflator is 116.5 a 1.7% increase over last year. It is important to think about price increases relative to the overall index. College tuition at UM increased by 4% from 2012 to 2013.

- **CONSUMER PRICE INDEX (CPI).** Basket is only goods purchased by a “typical urban family”. Prices are done by surveying stores.

  \[
  \text{CPI} = \frac{P_{1,t}Q_{1,b} + P_{2,t}Q_{2,b} + \ldots + P_{n,t}Q_{n,b}}{P_{1,b}Q_{1,b} + P_{2,b}Q_{2,b} + \ldots + P_{n,b}Q_{n,b}} \times 100
  \]  

  (15)

  The May 2013 CPI (using a base year of 1983) is 231.8.

- **INFLATION RATE:** Percent change in price index from the previous period.

  \[
  \text{CPI Inflation} = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100\%
  \]  

  (16)

  So the CPI increased by 100 \cdot \frac{(231.8 - 228.65)}{228.65} = 1.4\%.
Comparisons across time: Bill Gates is the richest man in history. Titanic is the top selling movie of all time. Such statements are misleading, comparing apples and oranges. Why? Because dollars in each year buy different things. We care only about what Bill Gates can buy with his money, not how much money Bill Gates makes.

Here is how to make an exact comparison: President Hoover in 1931 made $75K. This is 1931 dollars. Obama in 2013 makes $400K, these are 2013 dollars. Now the CPI in 1931 is 15.9 (the base year of 1983=100). Hence $15.9 in 1931 bought about the same amount of goods as $100 bought in 1983. The CPI in 2012 is 228.5. Hence $100 in 1983 buys the same as $231.8 today. Hence $15.9 in 1931 buys the same amount of goods as $231.8 today. To convert:

$$75,000 \text{ 1931 dollars} \times \frac{231.8 \text{ 2013 dollars}}{15.9 \text{ 1931 dollars}} = 1,093,396 \text{ 2013 dollars}$$

(17)

So we see that Hoover made more than twice as much as Obama! Presidential salaries have gone down, not up, over time (note I am ignoring fringe benefits such as room and board).

Another example, in 2000 reporters called asking for a comment about the “record gas prices.” I replied that the record for gas prices was in the early 80’s and that gas prices were currently quite reasonable, although certainly higher than the previous year. Gas prices were $1.37 per gallon in 1981 and $1.63 in 2000.

$$1.37 \text{ 1981 dollars} \times \frac{174.5 \text{ 2000 dollars}}{94 \text{ 1981 dollars}} = 2.54 \text{ 2000 dollars}$$

(18)

Much higher in 1981 than 2000 (and incomes in 1981 were less than half of incomes in 2000).

C Notes

- The CPI is best when thinking about household problems, such as how much of a raise must I give an employee so that he is able to buy the same amount of goods?

- The GDP deflator is best used in adjusting other variables for the effects of price changes. Such as how much did the GDP increase apart from the effects of price changes.

- CPI overstates inflation because

1. Fails to take into account improvements in technology. In the past air bags were optional: say the car costs $20K plus $500 for the airbag. Then the airbag is
made standard, and the price of the car is $20,500. This appears to be inflation but is not.

2. The CPI uses base goods. Thus the CPI does not allow for substitution to cheaper goods that may have occurred.

The CPI is now adjusted to account for these factors. But it is controversial whether or not the index was over adjusted (if so the CPI would be understating inflation).

- The CPI heavily weights goods such as food and energy which are subject to big price changes, while GDP deflator weighs these very little. Thus the CPI is more volatile. For example, in the past few months, big increases in energy prices drove up the CPI.

D REAL GDP and price indices

Recall,

\[ \text{RGDP} = P_{1,b}Q_{1,t} + P_{2,b}Q_{2,t} + \ldots + P_{n,b}Q_{n,t} \] (19)

Thus:

\[ \text{RGDP} = \frac{\text{NGDP}}{\text{GDP deflator}} \] (20)

III Input Market number 1: measuring labor activity

Labor market activity also gives some information as to how well the economy is doing. Also, labor input is the largest component of production. Wages and salaries compose 60% of the income, while profits and interest are only 40%.

A Who is working?

In order to measure how many people are not working, we need to classify people. A five year old is not working, but we don’t want to count her as unemployed.

We start by ruling out people physically unable to work.

Definition 10 WORKING AGE POPULATION: All non-institutionalized persons over 16. (i.e. not in jail, in a hospital, or not able to work).

Within the working age population, we have:
Definition 11 LABOR FORCE: All those working or looking for a job.

Those not looking for a job are designated as NOT PARTICIPATING. You are not participating if you are:

- a student, unpaid homemaker, or retired.
- Armed forces are not participating, even though they are working and earning a wage.
- not willing to work because the wage is too low.
- Not looking because you think there is no chance you would find a good job. (a DISCOURAGED WORKER).
- Not looking but are willing to work (MARGINALLY ATTACHED).
- an unpaid volunteer.
- have a job which starts in more than 30 days and are not looking for something which starts sooner.

Within the labor force, you are either employed or unemployed.

Definition 12 EMPLOYED: In the labor force and working (being paid).

- Paid volunteers are employed.
- Part time work counts.

Definition 13 UNEMPLOYED: In the labor force but not employed.

If you have a job which starts in less than 30 days, you are unemployed.
Figure 1: Population Categories.

EXAMPLES:

- Minister at a local church, paid non-profit. (employed)
- student. (not participating)
- student working at front desk of dorm. (employed)
- student given a government stipend. (employed) Under what category does his income go in the GDP (wages)?
- Army volunteer. (not participating)
- retiree. (not participating)

These statistics are among the most commonly used labor market indicators.

Definition 14 \textit{PARTICIPATION RATE: Percentage of working-age population in the labor force}.

Definition 15 \textit{UNEMPLOYMENT RATE: Number of people unemployed as a percentage of the total labor force}.

\[
\text{PARTICIPATION RATE} = \frac{\text{LABOR FORCE}}{\text{WORKING-AGE POPULATION}} \cdot 100\% \tag{21}
\]

\[
\text{UNEMPLOYMENT RATE} = \frac{\text{UNEMPLOYED}}{\text{LABOR FORCE}} \cdot 100\% \tag{22}
\]
Unemployment is 7.6% in May 2013, still very high. The participation rate is 63.4%, lower than at any time since the 1970s.

Recently, the Bureau of Labor Statistics (BLS) began keeping track of under-employed (I’m just going to use the most comprehensive measure):

**Definition 16** UNDER-EMPLOYED (U6): unemployed, plus marginally attached, plus part-time workers who took a part time job for economic reasons.

**Definition 17** UNDER-EMPLOYMENT RATE: U6 workers divided by the labor force plus U6 workers.

Marginally attached workers are workers who are not currently working but have looked in the past 12 months, plus discouraged workers. Discouraged workers are not currently looking for work for economic reasons (e.g. they believe they have no chance of finding a job and have given up trying). The u6 underemployment rate is currently 13.8%.

**B Labor market statistics**

The market for labor is one of the most important macroeconomic markets. Here we will develop statistics to measure the price and quantity of labor.

**Definition 18** TOTAL HOURS WORKED (N): all hours worked by all individuals in the labor force.

It is usually easier to discuss average hours per week, which for May 2013 were 34.3 hours per week, a substantial decline from 39 hours per week in the mid 1960’s. Total hours generally rise due to population growth.

**Definition 19** REAL WAGE: \( \frac{W}{P} \) Total earnings of individuals and proprietorships not including fringe benefits divided by the CPI.

**Definition 20** LABOR PRODUCTIVITY: Output per work hour.

\[
\text{LABOR PRODUCTIVITY} = \frac{GDP}{N} \tag{23}
\]

This statistic has become important of late, due to it’s dramatic rise. With 2005=100, we have 111.4 as of March 2013, after rising quickly in the initial recovery 2009-2010, productivity growth has leveled off, growing only 0.6% in 2012. Do we mis-measure output? Airlines example: 14 percent fewer workers, but is productivity up 14 percent? Productivity in France rose following a switch to a 35 hour work week.
C The Labor Market

Who supplies labor? Households. The higher the wage, the more households want to work and forego leisure. For low wages, many hang at the beach. Similarly, firms demand labor. If an employee contributes more to profits than she costs in terms of wages, the firm hires. As wages rise, only firms with very productive job openings hire.

![Diagram of the labor market]

Figure 2: The Labor Market.

The above graph shows that there is no unemployment. Everyone is either working or not participating.

D Why is there unemployment?

1 Job Rationing: Theory

The first theory looks at price floors in the labor market. Suppose a price floor, a minimum wage that is above the equilibrium wage:
Figure 3: The effect of a minimum wage.

Why might a minimum wage exist?

1. Minimum wage laws.

2. Insider laws. Laws preventing or restricting firing prevents firms from hiring unemployed at a lower wage. See for example Spain.

3. Efficiency Wages. Extra pay above market pay to induce harder work.

2 Job Rationing: Business Cycle Effects

Definition 21 The natural rate of unemployment is the long run average rate of unemployment, when the economy is neither in a boom nor recession.

Definition 22 Cyclical unemployment is the increase in unemployment due to recessions.

Notice that the model predicts that unemployment falls in a boom. Suppose the economy improves, so that firms demand more workers (either to sell more goods, or because workers are more productive). Then:
3 Evidence for effects of minimum wages and other policies

At least five policies affect unemployment:

1. Minimum wage laws.
2. Taxes on wages, paid by both households and firms.
3. Unemployment benefits.
4. Insider laws.
5. Job Training.

These policies vary across countries and over time in the US. We can use such variation to identify how government policies affect unemployment.

Consider 4 countries, Spain and France, which have consistently high unemployment, and the US and Australia, which do not.

1. The evidence shows that the minimum wage is not the main problem, since Australia has a high minimum wage and Spain a low minimum wage (see graph).
2. The evidence shows that France and Spain have the highest tax rates on wages (see graph). Suppose the firm must pay a minimum wage of $10 per hour plus a 10% tax. Then effectively the minimum wage is $11 per hour, creating additional unemployment.
3. Unemployment benefits are much greater for Spain and Australia than the US. So high tax rates and unemployment benefits work well in our sample of four countries. For a larger sample, the biggest factors are insider laws and tax differences (see chart).

A similar result obtains from looking at US time series data. Until recently our average unemployment has fallen substantially since the 1970s. What is different?

1. The real minimum wage has fallen, since prices have risen by more than the minimum wage.

2. Insider laws have relaxed as the influence of unions has declined.

3. Real unemployment benefits have fallen a little (but are now sharply up).

4. Tax rates on wages have fallen.

This indicates again that taxes and insider laws are the biggest factors (see chart).

IV Input Market number 2: Capital Market

A Investment and Capital

Definition 23 Investment Spending (I) is the purchase of final goods and services by firms (including real estate).

Note that investment here is gross investment. Some investment replaces old worn out equipment.

\[
\text{net investment Spending} = \text{gross investment Spending (I)} - \text{depreciation} \quad (24)
\]

Real Estate is included because it is a durable good. One buys a house factory that produces housing services for years to come. Technically cars and washers and other durable goods should be included but are not.

Definition 24 The CAPITAL STOCK is the total of all net investments for all years.

\[
\text{Capital next year} = \text{net investment spending} + \text{existing capital} \quad (25)
\]

Recall that depreciation was $2.06 trillion in 2013, and gross investment spending was $2.14 trillion. Thus net investment spending was $0.08, almost zero. The existing capital in 2011 was about $51 trillion. The capital is used together with the labor to produce GDP.
B Savings

1 National Savings

Definition 25 NATIONAL SAVINGS is that part of income which is not consumed by either consumers or government.

\[ S = Y - C - G \]  \hspace{1cm} (26)

\[ S = I + X - M \]  \hspace{1cm} (27)

Foreigners can invest in the US, thus adding to our savings, or the reverse. Savings equals investment here and net investment abroad.

2 Public and Private Savings

We can divide Savings into public savings \( T - G \) where \( T \) is taxes and private savings \( Y - C - T \) since:

\[ S = (Y - C - T) + (T - G) \]  \hspace{1cm} (28)

This brings up an important point. Savings and debt are opposite sides of the same coin. If the Government is running a deficit \( G > T \), then the deficit reduces savings. Similarly, when I pay back school loans, that is savings.

C The market for capital: Loanable Funds Market

We need a price of investment and a quantity of investment. For the price, we can use the interest rate.

1 Quantity of Loanable Funds

Many types of loans exist: stocks, bonds, mutual funds, bank loans, etc. All of these link lenders and borrowers through intermediaries.

Definition 26 Intermediaries: Institutions through which savers indirectly provide funds to borrowers.
In macro we are concerned only with the overall quantity of loans. But we do know that the total pool of loanable funds is equal to the national savings. This is the supply of loans. The demand for loans is therefore investment spending plus net exports.

2 The price of Loanable Funds

As the price of labor is the real wage so the real interest rate is the price of loanable funds. The real interest rate compensates lenders for delaying consumption.

Definition 27 INTEREST RATE: \((r)\) Charge per dollar per period that borrowers pay or lenders receive.

What affects the interest rate:

- risk
- inflation
- taxes

Riskier assets receive a higher interest rate. There is some probability of default, the borrower will not repay. Thus the lender demands an extra premium to account for this.

Examples:

- PRIME RATE: the overnight interest rate charged by banks to their largest most dependable businesses, such as fortune 500 companies. The prime rate is currently 3.25%.

- Student’s credit card rate: the average credit card rate is 15.25%, and is often 20% or more.

Why are these rates different? Remember that the bank expects to make the same amount of money from these two loans. On average more than three times the number of credit cards default as do Fortune 500 companies.

Inflation means that tomorrow’s dollars are not worth as much as today’s dollars. Thus the nominal interest rate is higher in periods of high inflation. The lender must be compensated for being payed back in dollars which are worth less. The real interest rate only compensates lenders for delaying consumption. Suppose that IBM took out a loan at the prime rate. CPI Inflation is 1.4%. What is the real interest rate? Ie, how much extra goods can we buy after the payment of the loan?
\[ \text{real } r = \text{nominal } r - \text{inflation rate} \quad (29) \]

\[ = 3.25\% - 1.4\% = 1.85\% \quad (30) \]

Here if we make a $100 loan at the prime rate, we get $3.25 extra at the end of the year, but it only buys $1.85 worth of goods because prices have risen. Inflation increases nominal interest rates.

Investments which are not taxed have a lower interest rate. Investors care only about the interest rate after taxes are paid. Therefore an untaxed investment, such as a municipal bond, and a taxable investment, such as a corporate bond, have different interest rates before taxes, but the same interest rate after taxes. Carnegie Mellon story. If \( t \) is the tax rate:

\[ \text{after tax rate} = r (1 - t) \quad (31) \]

<table>
<thead>
<tr>
<th>Rate</th>
<th>Risk</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime Rate (banks to firms)</td>
<td>low</td>
<td>3.25%</td>
</tr>
<tr>
<td>Discount Rate (Federal Reserve to banks)</td>
<td>lower</td>
<td>0.75%</td>
</tr>
<tr>
<td>Federal Funds (banks to banks)</td>
<td>lower</td>
<td>0.11%</td>
</tr>
<tr>
<td>4-week Treasury Bill (households to government)</td>
<td>lowest</td>
<td>0.03%</td>
</tr>
</tbody>
</table>

3 The market for loans

Putting everything together gives us:
Here we see that if the interest rate is above the market interest rate, more money is being saved than is demanded for loans. Investors then offer smaller interest rates to entice more businesses to borrow. Similarly, if the interest rate is below the equilibrium, then there is not enough savings to meet the demand for loans by businesses. Therefore, businesses bid up the interest rate trying to attract loans.

Consider an example. A common claim is that government budget deficits increase interest rates. If we increase the deficit by reducing taxes what happens?

Apparently, savings and interest rates are unchanged: what has happened is that public savings went down but private savings went up, so overall savings is unchanged. Of course the cut in taxes could affect consumption, but as we saw earlier this is not likely to be significant as people prefer smooth consumption.

Suppose now we increase government spending.
Figure 7: The market for loans, after an increase in spending.

Apparently, public savings falls and interest rates rise. Here the government moves money from government savings to government consumption so savings falls. Thus, claims that deficits will raise rates are only partly right.

V The market for money

A What is money?

Definition 28 MONEY is anything that fulfills 3 purposes:

- MEDIUM OF EXCHANGE: Members of the economy will accept money in exchange for goods and services.

- STORAGE OF VALUE: Can store wealth with money.

- UNIT OF ACCOUNT: Can use money as a numeraire good. Can give a price for all goods and services in terms of money.

Examples of money: paper money, gold (commodity money), pieces of paper that can be converted to gold (gold standard), cigarettes (in jails, among soldiers, in pow camps), wheels of stone (on the island of yap in the south pacific), cowrie shells (in west africa). Show pictures.

The student should try to think of money in terms of a medium of exchange rather than a store of value. The alternative to using money is barter:

Definition 29 BARTER: The exchange of goods for other goods.
Bartering is painful in a large economy because of the

Definition 30 DOUBLE COINCIDENCE OF WANTS: a seller must find a buyer who wants the goods being sold, and at the same time has goods to exchange which the seller wants.

Money eliminates the double coincidence of wants. One can exchange each good for money.

Money also provides liquidity services:

Definition 31 LIQUIDITY SERVICES: money allows a person to buy or sell on short notice.

Perhaps you own other assets such as stocks, bonds, businesses, etc. Money is more liquid. Liquidity is thus the ability to buy and sell on short notice, without penalty. One can sell anything if the price is low enough. Some items like houses require search to find a buyer. To sell quickly, one pays a liquidity penalty by lowering the price. Money has no such penalty.

B Types of Money

Definition 32 FIAT MONEY has no value other than as money.

Most monetary systems are of this type. Example is paper money.

Definition 33 COMMODITY MONEY has other uses.

Examples are gold (commodity money) and cigarettes (in jails, among soldiers, in pow camps).

Definition 34 IMPURE COMMODITY MONEY. Money that can be converted into something of value at a fixed price.

Examples are currency boards and gold standard.

C Measuring the amount of money

What assets are money?

- cash and currency
- checking and savings accounts, money market accounts.
Contrary to intuition, credit cards are not money. Add up the total units of currency available for purchases. Then we can see that credit cards add no units of currency but checking accounts do. Credit cards are merely the right to spend someone else’s money.

Suppose there are $100 floating around the economy. There is then $100 of cash and currency which can be spent. Thus cash and currency add to the total amount of money available. Now suppose $10 is deposited in a checking account in a bank. Then the depositor has $10 to write checks with, so no addition to the supply of money right? Wrong. The bank does not hold all of the $10, but instead loans out some of it. Thus the cash returns to the economy, and the checking account adds to the money supply.

Now consider credit cards. If you buy something with a credit cards, the bank pays the merchant with cash. No addition to the money supply. This is illustrated below:

Figure 8: Credit cards and the money supply.

There are four ways to measure the amount of money in the economy. We will look at two:

**Definition 35** $M_1$ is the sum of all currency, travelers checks, and checkmaking accounts held by the non bank public.
Definition 36  *M2 is the sum of M1, savings deposits, money market accounts, and small time deposits.*

Small time deposits are short duration certificates of deposit (CDs), which can be converted into cash at a penalty. What is the difference? M1 is more liquid, the penalties are lower or zero.

D  The banking system and the creation of money

Definition 37  *The monetary base or high powered money is the sum of currency held by the non bank public plus bank reserves.*

The economy creates more money from high powered money using the banking system. Here’s how.

First we need to know how much money the banks may loan out of deposits. Banks are required by law to hold some of deposits in reserve at the Federal Reserve Bank.

Definition 38  *The REQUIRED RESERVE RATIO (rrr) is the percentage of deposits banks are required to hold by law at the Federal Reserve Bank.*

The required reserve ratio is currently 8% on checking accounts (many countries have lower rrr’s: Mexico’s is 0-2%).

Now that we know how much a bank may loan out, let us count the total amount available. Here’s how it works:

![Diagram of the banking system](image)

Figure 9: Credit cards and the money supply.

What is the money supply? Here is how we figure it out. We know that $M1$ equals currency plus deposits. Let $M$ be $M1$, $CU$ be currency, and $D$ be deposits. Then:

\[ M = CU + D \]  (32)
In the above example, $CU = 0$, but in reality households hold a mix of currency and deposits. Let $k$ be the ratio of currency to deposits:

$$CU = kD$$

(33)

We also know two more things. First we know that bank reserves $BR$ equals deposits times the required reserve ratio $rrr$. So:

$$BR = rrrD$$

(34)

Finally we know that the monetary base, $MB$ is defined as currency held by the public plus bank reserves:

$$MB = CU + BR$$

(35)

Now let's combine these formulas. Combining (32) and (33) gives:

$$M = (k + 1)D$$

(36)

Combining (34), (33), and (35) gives:

$$MB = (k + rrr)D$$

(37)

Dividing these last two equations results in:

$$\frac{M}{MB} = \frac{k + 1}{k + rrr}$$

(38)

The right hand side is the money multiplier:

$$\text{money multiplier} = \frac{k + 1}{k + rrr}$$

(39)

**Definition 39** The money multiplier is the ratio of the total change in the money supply to a $1$ change in the monetary base.

This number tells us how much money is created when we change the monetary base. If the money multiplier is 2, then for each dollar that enters the economy, two dollars of currency held by the public plus checking accounts is created:

$$\Delta M = \Delta MB \cdot \text{money multiplier}$$

(40)
Example: Suppose the money supply is $600 billion and the required reserve ratio is $\frac{1}{3}$. Suppose the currency to deposit ratio is $\frac{1}{3}$. Calculate the money multiplier (1.5), the monetary base ($400$ Billion), the FED sells $100$ in tbills, what happens to money supply? (MS falls $150$ Billion).

E The Federal Reserve System

The Federal Reserve Bank: The central bank of the United States, which oversees the creation of money and regulates banks.

The FED changes the amount of money in circulation in 3 ways:

- Required Reserve Ratio
- Discount Rate
- Open Market Operations

1 CREATING MONEY BY CHANGING THE REQUIRED RESERVE RATIO

By lowering the rrr, banks may loan out more money, which increases the money supply. Banks always loan out every dollar they can.

![Diagram of money creation process](image)

Figure 10: Increasing the money supply by reducing the required reserve ratio.

The required reserve ratio is rarely changed (changed for Y2K, lowered for some types of deposits recently) and is not used to control the money supply. The reason is that the FED likes to make small changes on a day to day basis. The required reserve ratio tends to make large changes. Also banks do not like regulatory changes on a daily basis.
2 CREATING MONEY BY CHANGING THE DISCOUNT RATE

Definition 40 The discount rate is the interest rate paid by banks for overnight loans from the FED.

A bank that is low on reserves might borrow from another bank (at the fed funds rate, currently 0.18%) to maintain its required reserves. Or it could borrow from the FED. When a bank borrows from the FED, new money is added to the economy. Or the bank may need money to make loans. The discount rate is currently 0.75%.

Figure 11: Increasing the money supply by reducing the Discount Rate.

So the FED is a lender to banks, but is known as a lender of last resort since the Fed monitors banks it lends to very closely and will not let banks make risky loans. In addition, the FED has recently changed its policy to make the Discount rate higher than the Fed Funds rate. For these reasons, banks prefer to borrow from other banks.

The discount rate is not used for control of the money supply since it is imprecise. Who knows how many banks will borrow from the fed if it lowers the discount rate? The discount rate is used instead by the fed as a signal of future and current monetary policies.

3 CREATING MONEY BY CONDUCTING OPEN MARKET OPERATIONS

There are trillions of dollars worth of government bonds known as treasury bills. These are sold in the open market on Wall Street. Suppose the FED wanted to increase the money supply. Then the FED could go down into the basement, print some money, and then go to Wall street and buy some tbills. Money enters the economy and the tbills are kept in a vault or destroyed.
This is the easiest and most common method of adjusting the money supply. It is open market operations. The FED uses the discount rate typically to signal what it will do in the open market. The FED rarely lowers the required reserve ratio, even a small change creates huge adjustments in the money supply. Further, banks don’t like the rules of the game to change all of the time.

4 MORE INFORMATION ON THE FED

- Designed solely to better the economy. It is somewhat politically independent, members are appointed by the president for 7 year terms. This is so the FED can look out for the long term interest of the economy instead of the short term election interest.

- The FED’s goals for the supply of money and interest rates is called monetary policy. For example, a “loose monetary policy” involves expanding the MS, while a “tight monetary policy” involves a slowly growing or contracting MS.

- The FED can conduct its monetary policy by pegging interest rates or by pegging MS. Right now, the FED tries to peg an interest rate.

F Velocity and Quantity Theory

1 Velocity

Definition 41 Velocity \( V \) is the number of times a dollar is spent in a given period.

The velocity is computed via the Quantity Theory of Money:

\[ MV = PY \]  \hspace*{1cm} (41)
The above equation states that the number of dollars spent must equal the number of goods purchased. So we can compute velocity as:

\[ V = \frac{PY}{M} \]  \hspace{1cm} (42)

2 Money and Inflation in high inflation countries

Notice that an increase in \( M \) results in some combination of an increase in \( P \), an increase in \( Y \), or a decrease in \( V \).

In high inflation countries, money supply increases at a rate far in excess of \( Y \) and \( V \). (50% to less than 5%). Thus we can expect money and prices to be roughly proportional in high inflation countries.

Printing money is the primary cause of inflation. As more money is printed (increase in supply), the value of money falls. Equivalently, the price of money falls or equivalently more money is required to purchase goods. Thus prices are higher, or we have inflation.

Money becomes a ‘hot potato’ in high inflation countries. Money loses value so quickly that people spend it as soon as possible rather than hold money and watch it lose value. Thus velocity often rises in high inflation countries, meaning that price increases often exceed money growth rates.

Why do countries print large amounts of currency? Largely the reason is to finance expenditures. Here is how:

![Figure 13: Financing through seniorage.](image)

So the net of things is that the government has purchased goods and services with printed money. This is tempting for countries that face a shortfall of tax revenue. But no free lunch
exists. The decrease in value of money imposes costs:

- menu costs.
- monetary confusion.
- increased batering and costly credit arrangements.
- Money holders have “paid” the tax.

VI Foreign Money: Foreign Exchange Market

A growing part of the US macro economy is foreign exchange and foreign trade. These are the exchange of goods, assets, and money across countries. We hope to learn about some important issues.

- How does the macro economy affect trade? Do we purchase more imports in booms or recessions, for example.
- How does trade affect the macroeconomy? How does trade affect our GDP and national savings, for example.
- What about our recent trade deficit? Is this bad for the economy? Why is there a trade deficit?
- What about all of the recent proposals to reduce trade barriers? How does reducing trade barriers affect the economy?

A Trade: The exchange of goods across countries

I’ll do this by two examples. Example 1 involves the trade of the US versus Costa Rica.

So we see that Costa Rican coffee is “exchanged” for US cars. In reality of course, Starbucks accepts dollars and does the exchange for the US consumer, but the outcome is the same. All dollars end up in the US and all Colons end up back in Costa Rica. Notice that since the cost of the coffee equals the cost of the Jeeps, we have \( X = M \). Another way to think about it: Chrysler has “produced” coffee for the US consumer with “inputs” like steel!

The second example involves US trade with Japan.
US: Wants coffee, has dollars.

Costa Rica: Has coffee, wants colons.

Figure 14: Trade: the exchange of goods for goods.

US has jeeps, wants dollars.

Costa Rica: Wants jeeps, has colons.

Figure 15: Trade: the purchase of foreign goods with US assets.

Here US treasury bills were exchanged for Japanese Hondas. Let’s look at the trade picture. For the US we have:

\[ \text{net exports} = X - M = 0 - \text{Value of Hondas} < 0 \]  \hspace{1cm} \text{(43)}

The US is running a trade deficit. For Japan, we have:

\[ \text{net exports} = X - M = \text{Value of Hondas} - 0 > 0 \]  \hspace{1cm} \text{(44)}
Japan is running a trade surplus.

Here are some definitions:

\[
\text{Net Exports} = X - M \quad (45)
\]

A Trade Deficit is when \( X < M \). A Trade Surplus is when \( X > M \).

Does Costa Rica have to spend the US dollars on either a US good or asset? No it could sell them to another country who buys a US good or asset, giving the same result. Or it could hold onto the dollars. This means that the dollars lose value over time, so the only reason to do that is if dollars can be used as a medium of exchange. But the dollar’s value as a medium of exchange is derived from its ability to buy US goods. Eventually, the dollars are spent in the US.

B Savings, Investment, and trade

The US essentially borrows from the Japanese lenders, purchasing the Honda’s on credit. The Japanese have added to the pool of savings that the US may borrow from. Recall that savings are income less consumption less government purchases:

\[
S = Y - C - G = I + (X - M) \quad (46)
\]

\[
S + (M - X) = I \quad (47)
\]

So we see that the trade deficit adds to our savings pool. See graph.

Definition 42 CAPITAL INFLOWS: purchase of domestic assets by foreigners.

Definition 43 CAPITAL OUTFLOWS: purchase of foreign assets by domestic investors.

Definition 44 NET FOREIGN INVESTMENT: purchase of foreign assets domestically less purchase of domestic assets by foreigners.

\[
NFI = \text{outflows} - \text{inflows} \quad (48)
\]

\[
NFI = X - M \quad (49)
\]
\[ S - NFI = I \] (50)

In our example, suppose the value of the Honda is $5,000. We have inflows of $5,000, outflows of $0, NFI of -$5,000. So $5,000 is added to the domestic savings pool.

Even in the case where we run a trade deficit, we get an addition to the savings pool that fuels our investment spending.

C The market for foreign exchange

The price in the foreign exchange market is the exchange rate (E).

**EXCHANGE RATE:** Price of domestic currency in terms of foreign currency.

\[ E = \frac{\text{units of foreign currency}}{1 \text{ dollar}} \] (51)

Examples are:

<table>
<thead>
<tr>
<th>exchange rate</th>
<th>explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E=0.77</td>
<td>0.77 Euros/ $1</td>
</tr>
<tr>
<td>E = 97.7</td>
<td>97.7 Japanese yen/ $1</td>
</tr>
<tr>
<td>E = 491</td>
<td>491 Costa Rican Colons/ $1</td>
</tr>
<tr>
<td>E= 31.1</td>
<td>31.1 Thai Baht/ $1</td>
</tr>
<tr>
<td>E= 0.65</td>
<td>0.65 British Pounds/ $1</td>
</tr>
<tr>
<td>E= 5.4</td>
<td>5.4 Argentinian Pesos/ $1</td>
</tr>
</tbody>
</table>

1 Strong versus weak currency

**Definition 45** *CURRENCY APPRECIATION occurs when the value of the currency increases in the sense that the currency buys more units of foreign currency.*

**Definition 46** *CURRENCY DEPRECIATION is a decrease in the value of the currency.*

Notice that the currency appreciates when \( E \) rises. As the dollar strengthens, the dollar buys more foreign currency and therefore more foreign goods. Thus \( M \) rises. Foreign currency also buys less US dollars and hence less US goods. Hence \( X \) falls. Net exports thus falls or the trade deficit rises.
A strong currency is bad for exporters and good for importers, but the increased savings in the US market helps keep interest rates down. Also low import prices help keep overall inflation down, especially in developing countries with big import sectors.

Conversely, a weak currency is good for exporters, but bad for importers, savings, interest rates, and inflation.

2 The Real Exchange Rate

Definition 47 The real exchange rate \( e \) is the rate at which domestic goods are exchanged for foreign goods.

Remember we care about real things (goods) not nominal things (dollars).

To get the real exchange rate rate, start with 1 basket of US goods. The cost of that basket is \$P\. Exchange \$P for yen. Remember 1 dollar buys \( E \) yen, so we can buy a total of \( P \cdot E \) yen. Now buy Japanese goods. We can buy \( \frac{1}{P} \) Japanese goods per yen. Thus we can buy a total of \( \frac{P \cdot E}{P} \) Japanese goods with on American good. So the real exchange rate is:

\[
e = \frac{P \cdot E}{P} = \frac{\$}{\text{US basket}} \cdot \frac{\text{Yen}}{\text{yen}} \cdot \frac{\text{Japanese baskets}}{\text{US basket}} = \frac{\text{Japanese baskets}}{\text{US basket}}
\]

The real exchange rate is the value or price of US goods. What you can get in exchange for the good.

Definition 48 Purchasing Power Parity: The theory that prices of identical goods in different countries are the same when measured in the same currency.

Purchasing power parity (PPP) says that \( e = 1 \), a basket of US goods can be exchanged for an identical basket of Japanese goods. Example: The cost of McDonalds Big Macs in Great Britian. PPP says the cost of a Big Mac should be the same in the two countries. Is it?

\[
P_f = \frac{2.49 \text{£}}{1 \text{ GB Mac}} \quad P = \frac{4.20 \text{\$}}{1 \text{ US MAC}} \quad E = \frac{0.65 \text{£}}{\text{\$1}}
\]

\[
e = \frac{PE}{P_f} = \frac{4.20 \cdot 0.65}{2.49} = 1.10 \frac{\text{GB Macs}}{\text{US Mac}}
\]
If the goods were truly identical, we would expect \( e = 1 \). Thus we might expect \( E \) to rise until \( e = 1 \). Hence we can say that \( E \) is too large or that one dollar purchases too many pounds or that the dollar is overvalued.

3 Inflation and Exchange Rates

We are now ready to graph the market for foreign exchange:

![Figure 16: The real foreign exchange market.](image)

Note that the exchange rate adjusts to maintain equilibrium. How does the real rate appreciate?

1. Increased demand for dollars: US investments are more attractive, or US exports are more attractive.

2. Decreased supply of dollars: Imports are less attractive, Foreign investments are less attractive.

These are real effects, and so change the real exchange rate as well as the nominal rate.

The nominal rate may change independent of the real rate. Suppose US price level rises (inflation). Then the nominal exchange rate must adjust upward to maintain PPP.
So inflation causes a fall in the nominal exchange rate. That is inflation which causes a fall in the value of the currency, as one might expect. If inflation causes the currency to buy less goods, it should buy less foreign currency as well. Initially a rise in US prices implies US goods are more expensive. Demand for dollars falls. In addition, foreign goods are relatively cheaper, supply of dollars to get foreign dollars and thus foreign goods rises. This creates an excess supply of dollars. The nominal rate or value of the dollar falls.

D Trade and unemployment

Does increased trade imply increased unemployment? Are jobs lost to outsourcing and foreign competition? It is not clear.

1. Import/Export gains. Importers and exporters may gain more jobs than are lost to foreign competition.

2. Increased competitiveness. Domestic industries may become more competitive in the face of foreign competition.

3. Technological change. Technology may advance as businesses are exposed to foreign practices.

4. Intermediate goods effect. A tariff on intermediate goods may cause finished goods producers to move overseas. Examples include Steel tariffs, which are estimated to have cost 300,000 jobs in the auto industry. A recent study of sugar tariffs find they cost 3 times as many jobs as they save in the candy industry.
• US evidence: increased trade has resulted in lower unemployment.

• Developing countries: liberalization is associated with lower unemployment.