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Department of Economics
Macroeconomics
Instructor: Mark Tomass, Ph.D.
Syllabus
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Course Objectives

This course is designed for those of you who have little or no background in macroeconomics. It introduces fundamental concepts of macroeconomic theory and outlines its relation to the behavior of economic variables that concern the business world. It explains how people's activities determine a country's level of output, employment, and prices. It examines the causes of the business cycle and the role government monetary and fiscal policies in determining the level business activities. It explains the behavior of the banking system and the active role of the financial system in determining the level of output. In analyzing economic activity, the course incorporates variables from the international sector, such as foreign exchange rates and international trade. Throughout the course, emphasize the role of the individual in determining output and prices within the context of rationality, beliefs, and values regarding the quality of life. A central feature of this course is the constant linking of the theory being developed with applications of current interest. Thus, we aim to cater adequately for those of you whose interest lie in applied economics, while not sacrificing theoretical standards appropriate for an undergraduate program. A successful completion of this course will enable you to comprehend and participate in current debates in the media on major economic issues facing your nation and the world. Furthermore, a correct understanding of the way in which the economy functions will aid you in making informed business decisions. Above all, the course will enable you to navigate with clear thinking in the complex economic and political relationships that shape our constantly changing world.

Required Readings:
1. **Text**: Paul Samuelson & William Nordhaus. *Principles of Economics*. Any edition. Available in the library.
2. **Summary of lecture notes and homeworks** can found in my folder (Tomass) on the drive Orion: Verejne (V) of the Faculty's computer system.

Outline of the Readings

I. Macroeconomic Concepts
    1. The concept of Gross Domestic Product (GDP) as a measure the level of economic activity.
    2. What is the difference between Gross Domestic Product (GDP) and Gross National Product (GNP)?
    3. The relationship between production, distribution, and consumption.
    4. The use of an Aggregate Demand and Aggregate Supply framework to determine output and price levels.
Readings: **Text**: chapter 23.

II. How Do We Measure the Level of Output?
    1. What is the difference between Real and Nominal GNP/GDP?
    2. What are the transactions that GDP does <u>not</u> include?
    3. Looking at the components of GDP as an aggregate of expenditures.
    4. Looking at the components of GDP as an aggregate of incomes.
    5. How do we acquire the magnitude of disposable income from GDP.
Readings: **Text**: chapter 24.

III. The Causes and Consequences of Unemployment
    1. Why does the volume of output fluctuate over time or why do we have business cycles?
    2. What are the different kinds of unemployment and their causes?
    3. Are their "social" costs to unemployment?
    4. What determines the rate of economic growth in a country?
Readings: **Text**: chapter 31.

IV. The Causes and Consequences of Inflation
    1. Defining inflation
    2. Measuring inflation: CPI vs. GDP Deflator
    3. What is the difference between a change in the price level and a change in relative prices?
    4. What are the causes of inflation?
    5. How does inflation affect the distribution of income?
    6. How does inflation affect the overall functioning of an economy?
Readings: **Text**: chapter 32.

V. The Multiplier Process
1. The construction of an income-expenditures model (cross diagram) of the determination of the level of real GDP.
2. The income-expenditures model and the multiplier effect
3. The international sector and the domestic level of output
Readings: **Text**: chapter 27.

VI. Aggregate Demand and Aggregate Supply Analysis
1. The Aggregate Demand/Aggregate Supply framework and the Classical explanation of the determinants of economic activity.
2. The Aggregate Demand/Aggregate Supply framework and the Keynesian explanation of the determinants of economic activity
3. The causes of stagflation
4. How do variations in exchange rates affect economic activity?
Readings: **Text**: chapter 26.

VII. Money and Central Banks
1. What is money?
2. Who creates money and who creates currency and how?
3. What is the role of central banks in controlling the supply of money?
Readings: **Text**: Chapters 28 & 29.

VIII. Issues in Monetary Theory and Policy
1. The demand for money.
2. How are interest rates determined?
3. The role monetary policy in combating economic instability.
4. The Equation of Exchange as a method of determining nominal GNP.
5. How are exchange rates determined?
Readings: **Text**: chapter 29.

IX. Issues in Fiscal Policy
1. The role fiscal policy in combating economic instability.
2. What are the implications of budget deficits?
Readings: **Text**: chapter 34.

Final Exam: First Attempt: May 17, You will get your grade via email
Second Attempt: May 31
You can see your first exam with an answer key on May 31

General Course Policies and Rules

Course Requirements
Final Exam[1]...........…………...100 points

Grading Scale

US Scale	ESF Scale		US Scale	ESF Scale	
95 - 100.......A	1	A	71 - 74.9.....C	2,5	D
91 - 94.9.....A-	1	A	67 - 70.9.....C-	2,5	D
87 - 90.9.....B+	1,5	B	64 - 66.9.....D+	3	E
83 - 86.9.....B	1,5	B	62 - 63.9.....D	3	E
79 - 82.9.....B-	2	C	60 - 61.9.....D-	3	E
75 - 78.9.....C+	2	C	0 - 59.9...…F	4	F

[1] The final exam is 90 minutes long. Depending on the class size, it is either in short questions form or in multiple choice form. The questions are based on material covered in the text, handouts, or lectures. They are based on these materials, but they are not identical to them. Exam questions do not ask you to reproduce the same information that you find in these materials. They ask you to analyze situations with a method derived from the material that you discussed in class or which are covered in the text. Therefore, do not be surprised if I ask you to respond to a question that is not illustrated in the text or in the handouts.

Class Discussion

Quality class participation is an important element of creating an enjoyable atmosphere in the class. The quality of your participation is reflected in your careful reading of the text, <u>thoughtful</u> reflection, and <u>constructive</u> comments. It is also important to build on each other's comments, which means attentive listening.

Make-up Exams

Make-up exams will be given <u>only</u> if a medical report is presented showing that you will not or were not capable of taking an exam. If you miss an exam you will receive a zero grade. For other rare emergencies, you must present a request in writing explaining the reason for an absence. I will review your note and let you know if your excuse is acceptable. Exams are given twice. If you are not satisfied with your performance in the first exam, then work harder for the second exam. If you take the secon exam, your new grade will be based on the average of the two exams. You may therefore risk a lower final grade if you perform badly on the second attempt.

Etiquette of Grade Disputing

You are encouraged to discuss your performance in any exam. This is done in my office during the designated office hours or by setting up an appointment with me if my office hours do not suit you. I will not discuss a dispute over a grade in class, especially in the same day after I handed you your exam. You ought to review your exam after you get home and consult the text first. Then if you still have a concern to debate with me, please do it in my office. You are also welcome to review your exam with me even if you have no desire to dispute your grade.

Attendance Policy

There is no formal policy regarding your class attendance; however, it is doubtful that you will perform well in the class with frequent absences. I may record attendance during each session in case an advisor inquires about you.

Tardiness or leaving the class early

Try to arrive in class five minutes before it starts in order to review your latest notes and get ready for the new material. Late arrivals are distracting to me and to your fellow students. If you have a good reason to leave the class before it ends, let me know before the class starts and sit next to the nearest exit so that you cause a minimum distraction.

How to maximize learning potentials in studying economics:

Some obvious notes for first-time students of economics

Economics is a social science that applies deductive logic to facts in order to deduce laws of efficient decision making. Its complexity arises from the syntheses of many simple laws that operate simultaneously. Your success in this course depends on your ability to synthesize these laws correctly and on your familiarity with the definitions of the terms used to describe the relevant facts. If this is your first course in economics, I suggest that you read the section below in order to maximize your learning experience:

First, read each assigned chapter before you come to class and highlight the concepts, phrases, and ideas that you had difficulties in comprehending. This is a very important part of your preparation for the course because attending class will not substitute for reading the textbook. You need to work on the material independently in order to become familiar with the logic of economic reasoning.

Second, participate in class discussion. Do not hesitate to ask about the definition of a term that is being used in the presentation. Key definitions are crucial to comprehending the lecture material. Be certain to identify any possible weaknesses you may have towards any topic.

Third, concentrate on my presentation while you are in the class. Referring back and forth to the textbook may be a confusing process. After class, get back to those issues which you highlighted and see if you now have a better understanding of them. If not, make sure that you ask me to clarify whatever you are unclear about in the next class. If you feel uncomfortable about asking questions in class, please feel free to consult me after the class is over, or during my office ours.

Fourth, the lectures are interdependent and will gradually become more complex. Therefore, if you do not deal with any difficulties promptly, you will fall behind the class and feel confused as the rest of the class progresses. Try to be in the forefront. Do not wait for the last class meeting to ask for help. It may then be too late. Always remember that my cooperation will improve your performance only if you are willing to work hard independently.

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Handout # 1

Defining and Measuring GDP

A. Defining Gross Domestic Product: GDP is the total market value of all the final goods and services produced within a country in a given period of time.

B. The items that GDP does not count:
1. Non-market goods and services: Whatever is produced but is not for sale.
2. Illegal goods and services.
3. Sale of used goods.
4. Change in ownership of assets.
5. Government transfer payments such as social security, welfare payments, and subsidies.
6. Leisure.
7. Externalities.

C. Measuring GDP by summing up the flow of expenditures:

We add up the following items:
1. Personal consumption expenditures = C
    a. Durable goods
    b. Non-durable goods
    c. Services
2. Gross private domestic investment expenditures= I
    a. Fixed investment
    b. Change in business inventories: goods produced but not sold.
3. Government expenditures = G
    a. Federal
    b. State and Local
4. Exports minus imports = X - M

Therefore **GDP = C + I + G + X - M**

D. Measuring GDP by summing up the flow of incomes:

We add up the following items:

1. Compensation of employees +
2. Proprietors' income +
3. Rental income of persons +
4. Corporate profits +
5. Interest income from private sources =

National Income +

Indirect business taxes (Sales tax, business property tax, license fees, and custom duties) =

Net National Income +

Depreciation (consumption of fixed capital) =

GDP

E. Acquiring the magnitude of disposable income from GDP:
GDP
+ Receipts of foreign income
- Payments of incomes to foreigners
= **GNP**
- Depreciation
= **Net National Product**
- Indirect business taxes
= **National Income**
- Social Security taxes
- Undistributed corporate profits
- Corporate income taxes
- Net interest paid to corporations
+ Government transfer payments
+ Personal interest, dividend, or government and business transfers received
= **Personal Income**
- Personal income taxes
= **Disposable Income**

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Handout # 2
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Macroeconomic targets and viewpoints on how to achieve them

Modern nation-states attempt to achieve the following three main targets

1. The full-employment target
   A. Defining unemployment: It is the ratio of those individuals who are actively seeking employment to the entire labor force (not population).

   B. The types of unemployment
      1. Frictional unemployment: It is also referred to as *search unemployment*. It represents the number of unemployed people who have the right skills to fill an equal number of existing vacancies in a given geographical region. Such unemployment, therefore, exists because the process of job search takes time for the lack of easily accessible information about existing vacancies. A remedy for frictional unemployment will be provided if a centralized source of information is established in a form of a computer billboard where one could post new information about vacancies and others can immediately access it.

      2. Structural unemployment: It represents the number of unemployed people who do <u>not</u> have the right skills to fill existing vacancies in a given geographical region. Structural unemployment takes place because of the changing nature of industries through time where new ones emerge and old ones disappear. The remedy to this type of unemployment can be provided by retraining people with new skills that pay comparable wages.

      3. Cyclical unemployment: It is also referred to as a general demand deficient unemployment. It represents the number of unemployed people who cannot find vacancies to fill. It is a situation where no vacancies exist

in many sectors of the economy. Cyclical unemployment is a by-product of the business cycle. It is remedied by increasing aggregate demand.

   C. The cost of unemployment to society

2. The price stability target

   A. Defining inflation: It is the rate of the increase in the price level.

   B. The cost of inflation to society

   C. The reasons for inflation
      1. Demand-pull inflation
      2. Cost-push inflation
         a. Monopoly power
         b. Supply-shock inflation
         c. Institutionalized cost of living adjustments

   D. Remedies for inflation
      1. Monetary policy: Reducing the growth rate of the money supply
      2. Fiscal policy: Decreasing spending or increasing taxes
      3. Price and wage controls

3. The economic growth target

   A. The sources for economic growth
      1. The availability of human and non human resources
      2. The productivity of labor
      3. The availability of entrepreneurial skills

   B. The institutional constraints on economic growth
      1. Political constraints
      2. Cultural constraints

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Handout # 3

Prices and Inflation

Below, we will distinguish between several categories that identify different measures of price indicators:

1. Relative Prices:

A relative price refers to the price of one commodity when compared with other commodities. When we say that the relative price of wine rose, we mean that the price of wine (or the prices of several brands of wine) increased while other prices did not increase or that the price of wine increased more than the increase in other prices. A change in relative prices therefore indicates a change in the prices of commodities in terms of each other.

2. The Price Level:

An indicator that refers to the relationship between an average of prices commodities in a given year compared to an average of prices in a base year. There are two indexes that measure the price level:

a. The Consumer Price Index: We take a market basket of commodities that represent what a typical urban consumer purchases (this basket includes imported commodities as well) and compare its cost to the cost of the same market basket in a base year. The individual prices are aggregated into an average price by weighting the price of each item according to how important the item is in the budget of the consumers   surveyed. Thus, the cost of the market basket is determined at different periods of time. The items and weights included are changed periodically on the basis of new survey information to maintain the relevancy of the market basket. To write the CPI in simple terms, it is:

$$CPI_{current} = (\text{Cost of basket at } P_{current} / \text{Cost of basket at at } P_{base}) \times 100$$

If the CPI for a current year equals to 125, then this would mean that average prices increased by 25% since the base year. Remember that the CPI for the base year equals to 100 because the numerator and the denominator in the ratio above are equal.

b. The Implicit GDP Deflator:

Contrary to the CPI, the deflator excludes imports and includes all goods that are produced in a country and measured by GDP. The proper formula to calculate the deflator is:

$$GDP \text{ Deflator} = (\Sigma P_{ci} \times Q_i / \Sigma P_{bi} \times Q_i) \times 100$$

where Σ = the sum of all items (i) included in GDP
  i = 1, 2, 3, ...etc., is the number of items included in GDP
  P_{ci} = The current price of each good
  P_{bi} = The base year price of each good (since 1988 the base year has been an average of the prices of 1982, 1983, and 1984)
  Q_i = The quantity of each good produced.

The formula can be read as being the ratio of sum of current prices to base-year prices ($\Sigma P_{ci} \times Q_i / \Sigma P_{bi} \times Q_i$) of the same market basket multiplied by 100. The interpretation of each number for the deflator is similar to the CPI except that the indicator refers now to the average prices of the entire GDP and not a to selected market basket. That is, if the deflator for a current year equals to 125, then this would mean that average prices increased by 25% since the base year.

3. Inflation

It is the annual percentage change in the price level. Or, it is the rate of the change in any one of the above two indicators. The inflation rate therefore can be based on the CPI or on the deflator.

a. Inflation based on the Consumer Price Index =
$$\Pi\text{-CPI} = \{(CPI_{current} - CPI_{last\ year})/CPI_{last\ year}\} \times 100$$

b. Inflation based on the Implicit GDP Defaltor =
$$\Pi\text{-Deflator} = \{(Deflator_{current} - Deflator_{last\ year})/Deflator_{last\ year}\} \times 100$$

4. The Relationship Between Nominal GDP and Real GDP

We can acquire real GDP form nominal GDP by deflating nominal GDP using the GDP deflator.

$$Real\ GDP = (Nominal\ GDP/GDP\ Deflator) \times 100$$

5. The Relationship Between Nominal Income and Real Income

Since the purpose of acquiring real income is to assess the change in the purchasing power of consumers, it would therefore be more relevant to us to use the CPI in order to deflate nominal income because the CPI represents what consumers generally purchase. Therefore,

Real Income = (Nominal Income/$\text{CPI}_{current}$) x 100

If we divide any current value by the CPI as indicated above, we get the real purchasing power of that value.

6. Acquiring Real Interest Rates from Nominal Interest Rates

We have to distinguish between real interest earned in the past and current real interest that a lender would like to charge a borrower.

a. The Real Interest Rate Earned on a Past Loan =
The Nominal Interest Rate Received - The Rate of Inflation

b. The Real Interest Rate That Will Be Earned on a Present Loan =
The Nominal Interest Rate That Will Be Received - The Expected Rate of Inflation.

Causes of inflation

1. Cost-push factors

If costs determine prices and costs are historically determined, then the way to stop any rise in prices and costs is through income policies.

1. Administrative forces exerts autonomous upward pressure wage rates relative to the cost of living, interacted with administered-price markups applied to rising wage costs.
2. Monopolies.
3. Long-term relationships in product and labor markets.
4. Affects of weather on agricultural products and cost of energy.

A decrease in AS due to higher cost may cause inflation with consideration of lags. This would be true if we defined inflation as an increase in prices.

A. Characteristics of supply-side inflation:
1. They have a transitory influence on inflation.
2. They have their impact on the level of prices in selected periods.
3. Their influence is either *reversed* in following periods or ceases to be a cause of period-after-period changes in prices in the same direction.

B. How do they cause inflation:
1. Swings in the prices of *specific* goods or services sometimes coincide with fluctuations in the *general price index* of prices, specific items are frequently cited as the cause of the current inflation.
2. The *magnitude* and *timing* of price changes vary from item to item. The blame for inflation is often transferred, from period-to-period, from one item to another.

Conclusion:

Focusing attention on movements in the price of particular items or each wiggle in the general price indexes gives only a description of *where* and *when* the general inflationary pressures fall in the economy. The important issue is why prices, on average, continue to rise over an extended period of time.

2. Demand-pull factors

Inflation may occur due to an excess demand, because of an increase in MS or in V. In the classic inflation drama, government is a principal actor. It needs more goods and a larger work force, typically for war. The economy is already operating close to its normal capacity. If government is to buy more, private citizens will have to buy less. Higher taxes are straight-forward ways to achieve this shift, but government cannot or will not levy them, instead, it simply prints the money needed, or at least enough new money so that the rest can be borrowed cheaply. New government demand accumulates, in addition to diminished private demands. But, the economy cannot supply both. In terms of the equation of exchange, the higher growth of dollar spending induces little extra GDP and spills into higher inflation. The government gets what it wants. The price rise squeezes out private citizens caught by surprise, especially those dependent on fixed incomes and assets. Thus, inflation earns its reputation as the cruelest tax. It is worth noting here that short-run fluctuations in prices must be distinguished from persistent changes in prices. Monetary policy cannot prevent the quarter to quarter fluctuations in the price level that naturally result from the dynamics of economic activity. But the monetary actions of the government must be given a key position in any program to permanently reduce persistent inflation.

Other sources of demand-pull inflation are many, including persistent deficits that add to aggregate demand for goods and services but add little to the capacity to produce.

Those who think that inflation is exclusively demand-pull do not believe in an increase in prices before an increase in MS, and they justify observations that document an increase in prices before an increase in the money supply by saying that:

1. An increase in prices because of a previous increase in MS, which had a lagged effect on prices.
2. Expectations of future output at the level of full employment (Y_f), which leads to expectations of an increase in MS to satisfy an increase in transaction before an increase in prices takes place.

3. The measuring technique of change in prices does not include all items of goods. If prices of some inelastic goods rise, they will absorb a larger proportion of people's purchasing power and they will have less to spend on other goods. This implies a decrease in demand for those goods and a decrease in prices and thus the overall price level will stay the same. Therefore by assuming supply inelasticity in the sectors where prices decrease, and demand inelasticity in sectors where prices increase, a cost-push inflation may not occur.

3. Money and inflation

An explanation of the fundamental source of a continued pressure on prices requires a broader, long-run perspective that incorporates monetary developments.

When the money stock grows too rapidly relative to the rate of increase in the production of goods and services, individuals find themselves holding more money than they demand given existing incomes, prices, and yields (including interest rates) on other assets. In the process by which they attempt to pull their holdings of money in line with the quantity demanded, inflation results. Since output is not increased, the availability of credit will lead people to purchase goods, because if MS increases and nothing else happens, expenditures increase. Simply when too much money is chasing too few goods, there will be a persistent increase in prices. Therefore although prices can periodically rise or fall sharply due to non-monetary factors, inflation continues only if these non-monetary factors recur in succeeding periods, or if there is a continued excessive expansion of money. Consequently, analysis of persistent increases in the general level of prices requires consideration of the growth of the money stock.

Solutions:
1. Concentration on movements in individual prices or short-term movements in the general price index typically leads to limited monetary actions, and direct controls on prices of specific items.
2. Consideration of why prices continue to increase, pinpoints the rate of monetary contraction as the prime factors in the fight against inflation.

Conclusions:

Monetary policy cannot prevent the quarter to quarter fluctuations in the price level that naturally result from the dynamics of economic activity. But concentrating only on short-term fluctuations in the level of prices can result in falsely blaming non-monetary factors for a persistent rise in prices.

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Handout # 5

Aggregate Demand and Aggregate Supply Analysis

We will construct an AD/AS framework and use it as a tool to demonstrate why business cycles take place. We will construct each separately then integrate them into one framework.

Aggregate Demand

The concept of aggregate demand represents quantities of output demanded at alternative price levels.

A. The Price Determinant of Aggregate Demand:
Price levels and quantities of output demanded are inversely related. This inverse relationship holds only if circumstances other than the price level do not change. The inverse relationship is reflected in a movement along the same AD curve and it exists for the following reasons:

1. The interest rate effect: Since AD assumes a fixed money supply, when the price level increases, the demand for money increases to conduct the same level of transactions. As a result, interest rates increase. The latter causes a decrease in investment spending. Thus, the quantity demanded of output decreases as we move to the left along the same AD curve.

2. The Wealth effect: An increase in the price level, reduces the purchasing power of existing financial assets, thus reducing the quantity demand of output as we move to the left along the same AD curve.

3. The foreign purchases effect: If the price level in the United States increases, Americans will buy more imported goods and foreigners will buy less American goods as well. This decreases the quantity demanded of domestically produced output as we move to the left along the same AD curve.

4. **The foreign exchange effect**: An increase in the price level, given a fixed supply of money, increases the rate of interest because of the higher demand for money to conduct the same level of transactions. The higher rate of interest increases the demand for the $U.S. because foreigners would like to deposit their savings in dollar denominated accounts or financial instruments. The higher exchange rate of the dollar decreases exports because they become more expensive to foreigners and reduces the quantity of output demanded as we move to the left along the same AD curve.

B. The Non-Price Determinants of Aggregate Demand:
If the price level does not change but other circumstances do change, the aggregate demand curve shifts to the left or to the right. If the change causes a higher demand then the AD curve shifts to the right indicating a new and higher level of output demanded at each alternative price level. The opposite will be true if the change causes a reduction in the level of aggregate demand. The following are possible changes in circumstances that will shift the AD curve:

1. Consumer spending: Consumption, in turn, is a function of
    a. Real wealth
    b. Expectations
    c. Consumer indebtedness
    d. Taxes

2. Investment Spending: Investment, in turn, is a function of
    a. Interest rates
    b. Profit expectations
    c. Business taxes
    d. New technologies that create new markets and spheres of
        investment opportunities
    e. Degree of excess capacity

3. Government Spending: An increase in government spending, given constant taxes and interest rates, increases aggregate demand.

4. Net Export Spending: An increase in foreign demand for domestic goods and an increase in domestic demand for domestic goods is caused by the combined effect of:
    a. an increase in national incomes abroad and
    b. a decrease in the vlaue of the dollar

5. Money Supply: Changes in the money supply cause changes in aggregate demand through changes in interest returns on financial

assets. For example, when the Federal Reserve System increases the money supply (as we will discuss later), it buys bonds in order to inject money reserves into the banking system. This increases the price of bonds and reduces the yield on bonds. As a result people switch to buying other assets including real assets, thus increasing aggregate demand.

Aggregate Supply

The concept of aggregate supply represents quantities of output produced and supplied at alternative price levels.

A. The Price Determinant of Aggregate Supply:

The relationship between the price level and the quantity of output supplied depends on how close to the level of full-employment the economy is operating. Price levels and quantities of output supplied are positively related when the prevailing level of output is near the level of full employment. This positive relationship holds only if circumstances other than the price level do not change. The positive relationship is reflected in a movement along the same AS curve and it exists for the following reasons:

1. The profit motive: Higher prices give producers an incentive to increase production and supply more to the market in order to generate more profits.

2. The cost of production: Higher levels of production implies higher cost for labor and raw materials because firms are competing to acquire more of limited resources.

However, when the economy achieves the level of full-employment, more output is not possible. Therefore, higher prices beyond the level of full-employment are not associated with higher quantities supplied. This makes the aggregate supply curve vertical. Conversely, at low levels of output where a high level of excess capacity and idle resources exist, an increase in the level of output is not associated with higher level of prices. This makes the aggregate supply curve at low levels of output horizontal.

B. The Non-Price Determinants of Aggregate Supply:

If the price level does not change but other circumstances do change, the aggregate supply curve shifts to the left or to the right. If the change causes a higher supply then the AS curve shifts to the right indicating a new and higher level of output supplied at each alternative price level. The opposite will be true if the change causes a reduction in the level of aggregate supply. The following are possible changes in circumstances that will shift the AS curve:

1. Input Prices:
   a. The availability of domestic resources
   b. Prices of imported resources (exchange rates)
   c. Market Power

2. Productivity: an improvement in productivity means that firms can produce more output given the same amount of inputs or that they can produce the same level of output with less inputs. In both cases the ratio of Output/Input increases at every alternative price level.

3. Business Taxes or Subsidies: Higher business taxes, other circumstances are equal, increase the cost of production at all alternative prices while the opposite is true for subsidies.

4. Legal and Institutional Constraints:
   a. Regulations: More regulations increase the cost of production.
   b. Unionism: A unionized labor force increases the cost of production.

5. The Expected Price Level:
   Expectations of higher prices decreases the supply of goods at all alternative prices and *vice versa*.

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> Handout 6

The Simple Income Multiplier

1. Non Income Factors Influencing Consumption and Savings:

1. Wealth of Stock of Assets
2. Price and Income Expectations
3. Credit and Interest Rates
4. Taxation
5. Population, Age Distribution and Geographic Location
6. Distribution of Income

2. Investment Expenditures:

1. Short-term Investment is Autonomous: Independent of the level
   of:
   a. Income
   b. Profit expectations
   c. Interest rates
   d. Other factors

   Instead any investment expenditures in any current period is
   affected by past investment decisions

2. Long-term Investment is affected by:

   a. Interest rates and Cost of Capital
   b. Current Sales and Expected Sales

3. The Multiplier: The ratio of the change in equilibrium output to the
independent initial change in investment, consumption, or government
spending that brings about that change. Assuming that MPC = 0.8 and the
change in I = 10
$Y/I = 1/(1-MPC)$
$Y = 1/(1-MPC) \times I = (1/1 - 0.8) \times 10 = 5 \times 10 = 50$

4. The Role of the Marginal Propensity to Consume:

The larger the MPC, the larger is the size of the multiplier, the steeper the
slope of the aggregate expenditure function, thus, the higher the change in
income as a result of the initial increase in autonomous investment.

5. The Process by Which Income Increases:

Round one:
Expenditure rise by I(10) where more investment goods
    are produced, and income of the factors producing them
    increase directly by I(10) since GNP = I + C = Y. This
    process takes the following course: Increase sales of
    investment goods = rise in production of investment
    goods, rise in wages or employment, rise Y.

Round two:
The additional income received is spend on consumption
    of food, clothing, books, etc. by the amount:

$$C = MPC \times Y$$
$$C = 0.8 \times 10$$

    where the remainder of income is saved, since
    Y = C + S. Therefore, the output and income of the
    grocers, the clothing industry, etc. go up by 8,
    thus adding another amount to the income increase
    in autonomous investment.

Round three:
Again, the recipients of this increment of spending
    will spend 6.4 (.8 x 8) of it, adding by that another
    amount to the increase in income.

Round four:
This process will go on with the increments becoming
    smaller and smaller until the impact of the initial
    increase in autonomous investment fades away, and
    income converges to a higher, new equilibrium level.

After the final round:
If we add up these increment increases in income, they amount to 50.

The Derivation of the Simple Multiplier

Fortunately, we do not have to go through all these processes in order to find out by how much would the level of income increase as a result of the initial increase in autonomous spending. For, we can find the change in the level of income by multiplying the initial amount of autonomous investment by the multiplier. To find the simple multiplier, we follow the steps below:

Assuming that we have a closed economy with no government sector:

Total spending GDP = C + I = total income Y = C + S

$Y = C + S$ where C = consumption, I = investment, Y = income, S = savings

$Y = C + I$ where $C = MPC \times Y$

$Y = (MPC \times Y) + I$

$Y - MPC \times Y = I$

$Y(1 - MPC) = I$ divide both sides by 1 - MPC

$Y = I \times [(1/(1-MPC)]$, where 1/(1-MPC) is the simple multiplier

You should also know that since:

$Y = C + S$, then if we divide by Y

$Y/Y = C/Y + S/Y$

$1 = MPC + MPS$

The Tax Multiplier

The aim of this lecture is to show what happens to the size of the income multiplier when we take taxes into account. In the following model we will assume closed economy, with no external trade. In equilibrium, aggregate output (Y) equals aggregate expenditure (AE). Then

$$Y = C + I + G \tag{1}$$

where Y is aggregate output, C consumption, I investment and G government spending. Let's assume that the household sector earns an income Y before paying taxes T, which are imposed in "lump sum" form – fixed, flat amount. Then the disposable income Y_d is

$$Y_d = Y - T \tag{2}$$

The amount which households spend is

$$C = a + mpc\, Y_d = a + mpc(Y - T) \tag{3}$$

Then equation (1) becomes

$$Y = a + mpc(Y - T) + I + G \tag{4}$$

$$Y = a + mpc(Y) - mpc(T) + I + G \tag{5}$$

$$Y - mpc(Y) = a - mpc(T) + I + G \tag{6}$$

$$Y(1 - mpc) = a - mpc(T) + I + G \tag{7}$$

Dividing by $(1 - mpc)$, the result is

$$Y = \big(1 / (1 - mpc)\big)\big(a - mpc(T) + I + G\big) \tag{8}$$

Equation (8) says that if taxes T increase by \$1, income decreases by the value of the tax multiplier:

$$- mpc / (1 - mpc) \tag{9}$$

The Balanced Budget Multiplier

Now, we will explore what will happen if the government increases spending and taxes by the same amount. We combine the Government spending multiplier with the Tax multiplier. Given that Δ stands for change, we have:

The government spending mutliplier: $\quad \Delta Y = \Delta G \left(1 / (1 - mpc) \right)$ (10)

and the tax multiplier: $\qquad\qquad\qquad \Delta Y = -\Delta T \left(mpc / (1 - mpc) \right)$ (11)

The change in output is then

$$\Delta Y = \Delta G \left(1 / (1 - mpc) \right) - \Delta T \left(mpc / (1 - mpc) \right)$$ (12)

and since $\Delta T = \Delta G$, therefore we substitute ΔG for ΔT and have

$$\Delta Y = \Delta G \left(1 / (1 - mpc) \right) - \Delta G \left(mpc / (1 - mpc) \right) =$$

$$= \Delta G / (1 - mpc) - (\Delta G \, mpc) / (1 - mpc) =$$

dividing by $(1 - mpc)$:

$$= \Delta G \left((1 - mpc) / (1 - mpc) \right) = \Delta G$$ (13)

This means that the change in government spending balanced by the same increase in taxes leads to the equal change in output, thus the balanced budget multiplier = 1.

Below, we will show what changes will take place after the initial change in taxes and government spending. We will assume that both G and T go up by \$1. Let $mpc(1 - t)$ be the induced increase in aggregate demand (AD) caused by \$1 increase in income in the presence of taxes, identified as c:

Change (D) in spending as a result of ΔG and ΔT

spending round	$\Delta G = 1$	$\Delta T = 1$	Net change	Total
1	1	$-c$	$1 - c$	$1 - c$
2	c	$-c^2$	$c - c^2$	$1 - c^2$
3	c^2	$-c^3$	$c^2 - c^3$	$1 - c^3$
.	.	.	.	.
.	.	.	.	.
n	c^{n-1}	$-c^n$	$c^{n-1} - c^n$	$1 - c^n$

ΔG = changes in spending resulting from the changes in G and its later changes in induced spending.

ΔT = the spending effect resulting from successive rounds of induced decreases in spending as a result of the initial increase in taxes.
Net change: is the change between two spending rounds.
Total changes: since $c < 1$ then c^n becomes very small and $\lim_{n \to \infty} c^n = 0$. The final change in aggregate spending is equal to $1 - \lim_{n \to \infty} c^n = 1 - 0 = 1$.

The basic question is: What is the difference between a dollar cut in taxes and a dollar increase in government purchases? A dollar cut in taxes leads only to a fraction of a dollar increase in consumption (because the other part is being saved), while government purchases increase aggregate demand a dollar for a dollar.

Incorporating the tax rate into the model

If T becomes a function of income, then as Y goes up, taxes go up as well. Then the disposable income will be smaller than is a case of the lump sum tax, thus the expenditures function would be flatter. Let's assume tax is a function of income:

$$T = t(Y) \tag{14}$$

Here t(Y) are the taxes as the function of income. Then the disposable income is

$$Y_d = Y - T = Y + TR - t(Y) \tag{15}$$

where TR are the total transfers, payments done by the government. They are not the function of the income. Consumption is still

$$C = a + mpc(Y_d) = a + mpc(Y + TR - t(Y)) \tag{16}$$

which means that the total output is equal to:

$$AD = C + I + G = a + mpc(Y + TR - t(Y)) + I + G$$

and we have

$$AD = a + I + G + mpc(TR) + mpc(1 - t)Y \tag{17}$$

The constant part of the income is $a + I + G + mpc(TR)$, it doesn't depend on the tax rate. Let's have $A = a + I + G + mpc(TR)$. Then, in equilibrium

$$Y = A + mpc(1 - t)Y$$

$$Y - mpc(1 - t)Y = A$$

$$Y_e = A / (1 - mpc(1 - t)) \tag{18}$$

where Y_e is equilibrium income.

Now, assume a change in the tax rate (t). Let's have a case when the initial tax rate t is reduced to t'. Then the change in spending of the initial level of income is equal to

$$-mpc\ Y_e\ \Delta t \tag{19}$$

Remember, $\Delta t = t' - t < 0$, so the whole formula is positive. Therefore, induced spending due to higher income equals to

$$mpc\ (1 - t')\ \Delta Y_e \tag{20}$$

Putting equations 19 and 20 together we get

$$\Delta Y_e = -mpc\ Y_e\ \Delta t + mpc\ (1 - t')\ \Delta Y_e \tag{21}$$

From 21, in turn, we get

$$\Delta Y_e - mpc\ (1 - t')\ \Delta Y_e = -mpc\ Y_e\ \Delta t$$

$$\Delta Y_e\ (1 - mpc\ (1 - t')) = -mpc\ Y_e\ \Delta t$$

$$\Delta Y_e = -(1 / (1 - mpc\ (1 - t')))\ (mpc\ Y_e\ \Delta t) \tag{22}$$

Incorporating the international sector

Until now we assumed a closed economy with no external trade. Now we will add imports and exports into the model. Since in equilibrium, AD = Y, then

$$AD = Y = C + I + G + X - M^2$$

Given that

$$C = a + mpc\ (Y + TR - T)$$

and

$$M = mpm\ (Y + TR - T)$$

then

$$Y = a + mpc\ (Y + TR - T) + I + G + [X - mpm\ (Y + TR - T)]$$

Notice that while export is a function of foreign incomes and the domestic price level, import is a function of disposable income, because these are the goods and services consumed by domestic people. If taxes (T) become a function of income,

$$Y = a + mpc\ [(Y + TR - t(Y)] + I + G + \{X - mpm\ [Y + TR - t(Y)]\}$$

By moving the autonomous part of income to the right side of the above equation, we get

$$Y - mpc\ [(Y - t(Y)] + mpm\ [Y - t(Y)] = a + mpc\ TR - mpm\ TR + I + G + X$$

$$Y - mpc\ (1 - t)\ Y + mpm\ (1 - t)\ Y = a + (mpc\ -mpm\ )TR + I + G + X$$

$$Y\ [1 - mpc\ (1 - t) + mpm\ (1 - t)] = a + (mpc\ -mpm\ )TR + I + G + X$$

Then from the above, we get

$$Y = \{1 / [1 - mpc\ (1 - t) + mpm\ (1 - t)]\}\ [a + (mpc\ -mpm\ )\ TR + I + G + X]\quad (1)$$

Notice that *mpm* decreases the size of the multiplier. The higher the *mpm*, the lower is the multiplier.

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2   (Y) is the level of income. Note that this model assumes prices to be constant. This means that it makes no difference whether Y is real or nominal.
(C) is consumption.   (I) is investment.   (G) is government spending.
(X - M) is net export, which is export minus import.
(a) is a constant which represents the level of consumption at zero income.
(*mpc*) is the marginal propensity to consume.   (TR) is transfers.   (T) is taxes.
(*mpm*) is the marginal propensity to import.

Defining Money

A. What is money? It is the stock of assets used for transactions.

B. The functions of money:
   1. A store of value: Money is a way to transfer purchasing power from the present to the future.
   2. A unit of account: Money provides the terms in which prices are quoted and debts are recorded.
   3. A medium of exchange: Money is what we use to buy goods and services.

C. Kinds of money:
   1. Fiat or token money: Items designated as money that have no other intrinsic value such as cash.
   2. Commodity money: Items used as money that also have intrinsic value on their own such as gold, cigarettes, or cattle.

D. Money aggregates:
   1. Transactions money = M1 = currency + demand deposits + traveler's checks + other checkable deposits. This kind of money is perfectly liquid.
   2. Broad money = M2 = M1 + overnight repurchase agreements + overnight Eurodollars + money market mutual fund shares + money market deposit accounts + saving deposits + small time deposits. This kind of money can be easily converted into cash. Its degree of liquidity therefore is lower than M1.

   3. M3 = M2 + large denomination time deposits + term repurchase agreements.

4. L = M3 + other Eurodollar deposits + saving bonds + banker's acceptances + commercial paper + short-term Treasury securities. Its liquidity is the lowest because of the transaction cost involved in converting it into money.

E. A simplified version of the determinants of the money supply.
The monetary base (B) = currency (C) + reserves (R).
The required-reserve ratio (rrr) is the fraction of deposits that banks hold in reserve.
The currency-deposit ratio (cr) expresses the preferences of the public about how much money to hold in the form of currency C and how much to hold in the form of demand deposits D.

We begin with the definition of the money supply:

$$M = C + D \qquad (1)$$

where

$$C = cr \times D \qquad (2)$$

We substitute (2) in (1) and get

$$M = (cr \times D) + D = (1 + cr)D \qquad (3)$$

By rearranging terms, we get:

$$D = M/(1 + cr) \qquad (4)$$

Next, the monetary base is defined as:

$$B = C + R \qquad (5)$$

where

$$R = rrr \times D \qquad (6)$$

We substitute (2) and (6) into (5) and get:

$$B = (cr \times D) + (rrr \times D) = (cr + rrr)D \qquad (7)$$

By rearranging, we get:

$$D = B/(cr + rrr) \qquad (8)$$

We equate (4) and (8):

$$M/(1 + cr) = D = B/(cr + rrr) \qquad (9)$$

Equation (9) can be written as:

$$M \times [1 / (1 + cr)] = B / (cr + rrr)$$

$$M = [B / (cr + rrr)] / [1/ (1 + cr)]$$

$$M = [(1 + cr) / (cr + rrr)] \times B \qquad (10)$$

Equation (10) shows that the money supply depends on three exogenous variables. The factor of proportionality of the money supply to the monetary base, $(cr + 1)/(cr + rrr)$, is called the money multiplier m.

$$M = m \times B.$$

F. How is the quantity of money controlled.
The control of the money supply is delegated to an institution called the Central Bank (CB). The CB controls the money supply indirectly by altering either the monetary base or the reserve-deposit ratio. To do this, the CB has at its disposal three instruments of monetary policy:

1. Open-market operations. They represent the purchases and sales of government bonds by the CB. When the CB buys bonds from the public, it pays them for the bonds , thus increases the monetary base and thereby potentially increases the money supply.

2. Reserve requirements. They represent the CB's regulations that impose on banks a minimum required reserve ratio. An increase in reserve requirements raises the reserve-deposit ratio and thus lowers the money multiplier and the potential money supply.

3. The discount rate. It is the interest rate that the CB charges when it makes loans to banks. The lower the discount rate, the cheaper are borrowed reserves, and the more banks borrow at the CB's discount window. This raises the monetary base and the potential money supply. However, it should be noted that commercial banks cannot borrow whenever they please in order to lend money and make a profit. The CB lends only when the bank demonstrates a short-term liquidity problem.

Macroeconomics
Instructor: Mark Tomass
Handout # 9

The Multiple Deposit Expansion and the Simple Multiplier
A MONOPOLY BANK
BALANCE SHEET

Assets		Liabilities	
Reserves	100 (cash)	DD	100
Loans (1)	100	borrowed (1) DD	100
Loans (2)	100	borrowed (2) DD	100

1. When I deposit 100 Cash MS=0. Only the components of MS have changed because money has been converted into DD.

2. The monopoly bank can lend as much as it wants as long as I do not convert my deposit into cash, and as long as no borrowers demand cash.

A MULTI-BANKING SYSTEM
MUMBO BANK

	Assets		Liabilities	
①	Total Reserves 100 (cash)		DD (Mark)	100
	RR	10		
	ER	90		
②	(100 x .10) + (90 x .10)	19	DD (Mark)	100
	RR		DD (Joe's)	90
	ER	81		190
	Loans	90		
		190		
③a	RR	10	DD (Mark)	100
	ER	0	DD (Joe's)	0
	Loans	90		100
		100		

1. I deposit 100, RRR = .10 --> the bank keeps $10 in RR and $90 in ER.

2. Mumbo Bank can now make a loan to Joe Six Pack by $90, and must hold additional RR for the $90 transaction deposit that it created. Therefore, RR for the loan: 90 x .10 = $9

3a. Joe spends the money by buying few cases of beer from Drunk Inc. Therefore, DD (Joe's) decreases to zero and the bank's RR declines by 9 and ER declines by

JUMBO BANK

	Assets		Liabilities	
③b	RR	9	DD (Drunk Inc.)	90
	ER	81		
		90		90
④	RR	17.1	DD (Drunk Inc.)	90
	ER	72.9	DD (Joe's)	81
	Loans	81.0		
		171		171
⑤	RR	9	DD (Joe's)	0
	ER	0	DD (Drunk Inc.)	90
	Loans	81		
		90		90

81.

3b. Drunk Inc. deposits the check of $90 at Jumbo Bank. The increase in Drunk Inc's DD is matched by the decline in Joe's DD. MS therefore has not changed in step 3.

4. Jumbo bank makes a loan to Joe Six Pack because Mumbo has told him to go elsewhere (RR for loan = (81 x .10)+9 = 17.1. Therefore, MS increases by 81.
The Total increase in MS = 90 + 81 = 171
The money supply continues to increase until ER is reduced to zero.
The MS therefore increases whenever a loan is made.

5. Joe spends the money again by buying beer from Winos, Inc.

BIMBO

	Assets		Liabilities	
⑥	RR	8.1	DD (Winos Inc.)	81
	ER	72.9		
		81		81
⑦	RR	15.39	DD (Winos Inc.)	81
	ER	65.61	DD (Joe's)	72.91
	Loans	72.90		
		153.90		153.90

6. The same process continues when Winos Inc. deposits the $81 check at Bimbo Bank.

7. Bimbo Bank then makes a loan of $72.9 to Joe.

The simple deposit Multiplier:

We can find out the potential increase in the amount of deposits in the banking system as a result of my $100 deposit in Mumbo bank by multiplying the initial increase in reserves by the inverse of the required reserve ratio. 100 x (1/0.1) = 1000.

The Demand for Money

The Determinants of the Demand for Money: People have two motives for holding money:

1. **The <u>Transactions</u> and <u>Precautionary</u> Demand for Money:** The amount of money that individuals and businesses desire in order to purchase goods and services on regular basis in addition to money which they keep aside for unforeseen emergencies.

The main determinants of transactions and precautionary demand for money is income: the higher the level of <u>income</u>, the higher the transactions and precautionary demand for money. A determinant of secondary importance is the opportunity cost of holding money as represented by the rate of interest on financial assets.

People are usually paid by their employer once a month. Let us assume that they receive their pay at the beginning of the month and spend it during the month. Therefore, at the end of the month, they have nothing left. If their salary is $6,000, they have 6,000 the first day, 5,800 the second day, and zero at the end of the month. The average transactions balance is then the average of money holding during the month, which in our case $3,000.

If they were paid twice a month, half of their salary at the beginning of the month and the second half in the middle of the month, the average balance would be only half of the previous one, $1,500. People have to hold money before they can spend them. Therefore, the higher the expenditures, the higher is the desire to hold money.

It is not always wise to hold a large amount of money because the opportunity cost of holding money has to be taken into account. Money held at home not only doesn't grow, but losses value by the rate of infltion, while deposits at the bank earn interest. Therefore, even if a person is paid once a month, it might be good for him or her to deposit half of the sum for half of the month at a bank and withdraw it in the middle of the month. Thus, lowering the average transactions balance. The higher the opportunity cost of holding money, the lower is the desire to hold money. The demand function for transactions balances is therefore a positive function of expenditures and a negative function of the opportunity cost.

2. **The <u>Asset</u> Demand for Money:** The amount of money that people desire to hold as an alternative to purchasing bonds.

The asset motive induces people to hold the money as a store of value. Two factors need to be considered when deciding how much money to hold as an asset:

1. the liquidity of the asset: how quickly it can be changed into notes, and
2. its yield: how much interest it brings.

Furthermore, with high bond prices and low interest rates, people generally prefer to hold more money and fewer bonds, and vice versa. When bond prices are low, people purchase them in order to sell them at higher expected prices and experience capital gain.

When saving for holidays or for buying a new car, liquidity is less important than yield because the purchase is planned for a longer time.

The amount of money people hold as an asset is called asset balance. As with the transactions, we can express the demand for asset balances as a positive function of desired wealth and a negative function of the opportunity cost. The total average money balance is the sum of the transaction (including precautionary) and asset balance:

average money balance = average transactions balance + asset balance.

The total quantity of money demanded is shown by the demand function for money, which is the plain sum of the demand function for transactions balances and the demand function for asset balances:

$$M^d = f_t(E, -oc) + f_a(W, -oc)$$

where E is expenditure, W is wealth, oc is opportunity cost and f_t and f_a are the demand sub-functions.

But, there is a limit on the total demand for money balances for the whole economy: it can not exceed the total stock of money available in the economy. Therefore, if M is the total stock of money, the demand for money must equal to the stock of money:

$$M^d = M$$

The Velocity of Money

One can also look at the speed at which money flow through the economy to determine the demand for money. Velocity is the ratio between the total expenditures (spending, nominal GDP, or nominal income) and the quantity of money existing:

$$V = \frac{E}{M} \Rightarrow E = M \times V$$

Given that in efficient markets, the demand for money must equal to the stock of money, with the stock of money held constant, if people decide to hold more money, the speed of circulation of money through the economy (velocity) will decrease, and vice versa. Therefore, there is a strong relationship between the demand for money and velocity. An decrease in velocity requires a decrease in expenditures, thus it is accompanied by equivalent increase in the demand for money and vice versa.

Money, prices, and interest rates in the long-run:

The Quantity Theory of Money is an economic theory that depicts the relationship between the money supply and the price level, taking into account the level of real output and velocity. It hypothesizes the following relationship:

$$MV = PQ$$

where: M = the Money Supply (Currency + Demand Deposits)
V = Velocity: the number of times in a year that a dollar is
          used to purchase goods and services in a period of time
P = the Price Level
Q = Real output produced in a year
PQ = Total spending (which is financed by MV)

If we assume V and Q to be <u>constant</u>, then an increase in the money supply will lead to an increase in the price level. This is, therefore, a theory of inflation, whereby variations of Nominal GNP (PQ) are explained by variations in M. Indeed, the total purchase of goods and services in an economy is equal to the total sum of money, multiplied by the number of times on average unit of currency buys a commodity during that period of time. We also know that total expenditures are equal to the quantity purchased, multiplied by the price level ($P * Q = E$).

If the quantity of money increases, what will change in the economy in the long run? To answer this question, we have to examine the behavior of each individual: if prices increase by 100 % and the individual's salary increases by the same amount, the individual has no reason to stop buying one good versus another, or to buy less. Nothing will change, except prices will be doubled. We call this process **inflation**. During an inflationary period, nominal prices increase but real price (what the money buys) stays the same.

Thus we assume, that if the quantity of money in the economy increases, P will increase proportionally, but not Q or V.

One price in the economy is however very important — the price of money. Assume a bank issues a loan for a year, and during the year the quantity of money doubles and prices in the economy increase by 100 %. The real value of the money, that the bank lent a year ago, is only 50 % of its former value. The real value of money decreases at the same rate at which prices increase, by the inflation rate.

To express it mathematically: the nominal yield on a loan l at an interest rate i is $1 + i$. If the inflation rate is f, the real value of money goes down at $1 / (1 + f)$. Thus the real yield on a loan is given by

$$I_r = \frac{1 + i}{1 + f}$$

How Are Exchange Rates Determined?

The exchange rate is the price of a country's currency in terms of another's currency. It tells you how much one unit of a currency is worth, if expressed in the currency of the other country. For example, when you look at the currency trading section of the Wall Street Journal, you will find two prices given for each national currency in dollars. The column headed by "U.S. $ equivalent" gives you the amount of dollars (or fraction of a dollar) that you will get for one unit of foreign currency, whereas the column headed by "currency per U.S. $" gives you the amount of foreign currency you get for one dollar. We call this the **nominal exchange rate**. This rate can be a spot rate or a forward rate. The **spot rate** tells you that the specified amounts will be delivered to you on the spot; the **forward rate** tells you that the specified amount will be delivered to you at a specified time in the future (30, 90, or 180 days).

The exchange rate is important not only for measuring prices of currencies, it also shows the price of goods and services in different currencies. For example, if the exchange rate between the dollar and the Czech crown is 28 Kc, then not only the price of $1 is 28 Kc, but also the price of a one-dollar tooth paste is 28 Kc. Thus, a change in exchange rates affects the prices of foreign goods. If the price of one unit of tooth paste in the U. S. stays the same ($1), but the exchange rate changes to 45 Kc per one dollar, the price of this imported tooth paste in the Czech Republic (CR), expressed in Kc, will rise as well. When a price of a currency increases, we say that the currency appreciates. In our example, the dollar appreciated against the Czech crown because it is more expensive now than before (45 Kc instead of 28 Kc). Moreover, one dollar will buy now more goods in the CR once exchanged for Czech crowns. On the other hand, the Czech crown depreciated. Before the change,100 Kc used to buy 100 Kc ÷ 28 Kc per dollar = $3.57; after the exchange rate changed, it buys less than $2.3 (100 Kc ÷ 45 Kc per dollar). Therefore, we conclude that the price of a foreign good for us is determined by the price of the good expressed in foreign currency (or foreign-currency price) and by the exchange rate (or the price of that foreign currency).

However, the nominal exchange rate is not sufficient to express the real purchasing power of the currency. For, if you exchange your U. S. dollar for 28 Czech crowns, it doesn't mean that you are now 28 times richer. You also have to consider how much these 28 Kc will buy in the CR. We will need to know the nominal rate ER_n, the price of a good in the foreign country expressed in the currency of that country P_f, and the price of the same good in the local country in terms of the domestic currency P_d. Then you will get the **real exchange rate** ER_r defined as

$$ER_r = ER_n \times \frac{P_d}{P_f}$$

For example, one gallon of gasoline costs about $1.20 in the U. S. Therefore, the price of one liter is about $.30. The price of one liter of gasoline in the CR is about 20 Kc. The nominal exchange rate is 28 Kc per one dollar. Using the equation above, we get the real exchange rate:

$$ER_r = ER_n \times \frac{P_d}{P_f} = 28 \times \frac{0.3}{20} = 0.42$$

$ER_r = 0.42$ means that the $.30 which will buy one liter of gasoline in the U. S. will buy less than half a liter (0.42) in the CR. Alternatively, those 20 Kc with which you buy one liter of gasoline in the CR will buy $1 \div ER_r = 2.38$ liters of gasoline in the U. S.

In the real world, you cannot find data for the real exchange rate for each good. Instead, price indexes are computed, using groups of products in one country and their substitutes in the foreign country.

Since the real exchange rate is determined by the nominal exchange rate, domestic prices and foreign prices, a change in any of these three can affect the real rate. If the nominal exchange rate increases, the real exchange rate increases as well. If inflation in the foreign country is higher compared to that in the domestic country, the real exchange rate decreases. An American can still get 28 Kc for his dollar, but if prices in the CR increased, it will now buy less in the CR than before.

To relate the real exchange rate with the nominal exchange rate, the % change in the real exchange rate can be calculated as the change in the nominal exchange rate plus the % change in domestic prices (domestic inflation rate) minus the % change in foreign prices (foreign inflation rate):

$$\frac{\Delta ER_r}{ER_r} = \frac{\Delta ER_n}{ER_n} + \frac{\Delta P_d}{P_d} - \frac{\Delta P_f}{P_f} \,.$$

This formula can also be rewritten to show the change in the nominal exchange rate:

$$\frac{\Delta ER_n}{ER_n} = \frac{\Delta ER_r}{ER_r} + \frac{\Delta P_f}{P_f} - \frac{\Delta P_d}{P_d} \,.$$

Long run determinants of Exchange rates

1. **Relative Price Levels:** Given a constant real exchange rate between countries, the **purchasing power parity theory** (PPP) predicts that the nominal exchange rate reflects the relative inflation in the countries in question. Assuming the real exchange rate is constant, we can rewrite the formula above:

$$\frac{\Delta ER_n}{ER_n} = \frac{DP_f}{P_f} - \frac{DP_d}{P_d} \,.$$

Thus, the PPP theory predicts that if an increase in the domestic inflation rate is greater than an increase in the foreign country's inflation rate, the domestic currency will depreciate relative to the other. Alternatively, whenever domestic inflation rises less than inflation in the foreign country (which means that it would fall relatively to the foreign one), the domestic currency should appreciate. The PPP theory is simple but it makes too many unrealistic assumptions. Realistically, we must add the next three elements to the long run determinants of exchange rates:

2. Relative Productivities: Different countries have different productivities. Some countries can increase output with small increases in inputs relative to other countries. Thus, their goods can be cheaper, the fact which increases foreign demand for their goods and for their currencies leading to the appreciation of its currency in real and nominal terms. The opposite will also be true if the country's relative productivity rate declines.

3. Trade Barriers: Trade between countries is not always free. Quotas and tariffs are the most common tools used to prevent free trade and protect domestic firms. The nominal exchange rate of the country that imposes barriers to trade appreciates because lower imports leads to a decrease in the supply of its currency.

4. Consumer Preferences: A change in consumers preferences can also affect the demand for foreign and domestic goods. Given constant inflation rates, if consumers prefer a foreign good over a similar equally priced domestic good, then its currency's real and nominal exchange rates depreciates, and vice versa.

Short-Run Determinants of Exchange Rates

By thinking about the exchange rate in the short run as being the price of a domestic financial asset (unit of currency) relative to similar foreign financial asset, then short run exchange rates will be determined by the supply and demand of these assets, which, in turn, are determined by their relative expected rates of return. By the term **similar**, it is implied that the financial assets in question are perfect substitutes with regard to their risk, liquidity, and information characteristics. A portfolio investor (or saver), who wants to know if it is better to buy a domestic or a foreign bond, compares the interest rates on similar financial assets of several countries to decide which one to purchase.