

Reference Guide: Chapter 1 - The Science of Macroeconomics

1. Chapter Overview

This chapter introduces the field of macroeconomics, focusing on what macroeconomists study, such as the wealth of societies, economic growth, recessions, inflation, and trade relationships. It explains that economics is an evolving field where answers may be fuzzy, but economists are good at assessing sustainability. The chapter emphasizes how economists use simplified theoretical models and assumptions to understand complex economic phenomena, make forecasts, and explain the past. It highlights the importance of microeconomic foundations in macroeconomic models and discusses the use of multiple models for different issues. A key distinction is made between models with flexible prices (describing the long run) and sticky prices (describing the short run). The chapter uses a simple supply and demand model for cars to illustrate these concepts, including endogenous and exogenous variables and how changes in these variables affect market outcomes.

2. Key Concepts and Definitions

This section provides definitions for key terms and concepts discussed in Chapter 1.

- **Abbreviations:** Shortened forms of words or phrases used in economics to simplify models and communication.
- **Aggregate Income (Y):** The total income generated by a society as a whole; often used interchangeably with output or real GDP.
- **Assumptions:** Conditions or suppositions made to simplify economic models and make them tractable.
- **Boom (in the economy):** A period of rapid economic growth, often characterized by rising incomes.
- **Closed Systems:** Economic models where all relationships and variables are contained and interact within the model, similar to systems of equations.
- **Demand Curve:** A graphical representation showing the relationship between the price of a good and the quantity demanded, typically downward sloping.
- **Demand Equation/Function:** A mathematical expression showing the relationship between the quantity demanded of a good and the factors that influence it, such as price and income.
- **Depression:** A severe and prolonged downturn in economic activity. (Mentioned in Summary Document)

- **Economic Sustainability:** The ability of an economic system or process to continue functioning over the long term without depleting resources or causing irreversible damage.
- **Endogenous Variables:** Variables whose values are determined *within* an economic model; these are the outcomes the model seeks to explain or forecast. (Summary Document: Endogenous variables)
- **Equilibrium (Market):** A state where economic forces such as supply and demand are balanced; in the car model, this occurs where quantity supplied equals quantity demanded.
- **Exogenous Variables:** Variables whose values are determined *outside* an economic model and are taken as given; they act as inputs to the model. (Summary Document: Exogenous variables)
- **Flexible Prices:** Prices that adjust quickly to changes in supply and demand, leading to market clearing. Assumed to be more characteristic of the long run. (Summary Document: Flexible and sticky prices)
- **Forecasts:** Predictions about future economic outcomes made using economic models.
- **General Form (of an equation):** An equation that shows the relationship between variables without specifying exact numerical coefficients; often preferred in economics to understand directional changes.
- **Inflation:** A sustained increase in the general price level of goods and services in an economy. (Summary Document: Inflation and deflation)
- **Input Costs:** The expenses incurred in producing a good or service, such as the cost of materials (e.g., steel) or labor.
- **International Finance:** The study of financial interactions between countries, including capital flows and exchange rates.
- **Labor Contract:** An agreement between an employer and employee that specifies terms of employment, which can contribute to wage stickiness.
- **Macroeconomics:** The study of the economy as a whole, including topics like the wealth of societies, economic growth, inflation, unemployment, recessions, and international trade. (Summary Document: Macroeconomics)
- **Market Clearing:** A situation where prices adjust so that the quantity supplied equals the quantity demanded, leaving no excess supply or demand. (Summary Document: Market clearing)
- **Microeconomics:** The study of how individuals and firms make decisions and how they interact in markets. (Summary Document: Microeconomics)
- **Models (Economic):** Simplified representations of reality, often using mathematical equations and assumptions, to help understand economic behavior, explain events, and make forecasts. (Summary Document: Models)
- **Nomenclature:** The system of names or terms used in a particular field, like economics.

- **Real GDP (Gross Domestic Product):** A measure of the total value of all goods and services produced in an economy, adjusted for inflation; often used as a proxy for aggregate income or output (Y). (Summary Document: Real GDP)
- **Recession:** A period of temporary economic decline during which trade and industrial activity are reduced, generally identified by a fall in GDP in two successive quarters. (Summary Document: Recession)
- **Simplifications:** The process of making models less complex by omitting certain details or making specific assumptions, aiming to improve forecast accuracy or clarity.
- **Specific Form (of an equation):** An equation that includes specific numerical coefficients, allowing for precise calculations but potentially less general applicability.
- **Sticky Prices/Wages:** Prices or wages that do not adjust immediately to changes in economic conditions. Assumed to be more characteristic of the short run and can lead to phenomena like unemployment or unsold goods. (Summary Document: Flexible and sticky prices)
- **Supply Curve:** A graphical representation showing the relationship between the price of a good and the quantity supplied, typically upward sloping.
- **Supply Equation/Function:** A mathematical expression showing the relationship between the quantity supplied of a good and the factors that influence it, such as price and input costs.
- **Systems of Equations:** A set of multiple equations that are solved together; many economic models are systems of equations.
- **Trade Relationships:** The interactions between countries concerning the exchange of goods, services, and capital.
- **Unemployment:** A situation where individuals who are able and willing to work cannot find employment. Can result from sticky wages and an excess supply of labor. (Summary Document: Unemployment)
- **Wealth (of societies/countries):** The total value of assets, including financial and real assets, held by a nation or its members.

3. Core Principles and Models

3.1 What Macroeconomists Study

Macroeconomists examine the economy in its entirety. Key areas of study include:

- The wealth of societies and countries, including how it is created or destroyed (e.g., during recessions).
- The distribution of wealth within a society.
- Causes of rising inflation in various countries.

- Reasons for wealth disparities between countries and methods to promote growth in poorer nations.
- Trade relationships between countries and their impact on wealth creation, including identifying winners and losers from trade and international finance.
- Developing policies to improve overall economic performance.

3.2 How Economists Think

- **Theory as Model Building:** Economists use models, which are simplified theories of reality, to explain how exogenous variables influence endogenous variables.
 - Models involve assumptions to make them manageable and focus on key relationships.
 - Simpler models often yield better forecasts than more complicated ones, though they may not always explain the past perfectly.
 - The goal is to create better models that explain what is happening in the global economy.
- **The Use of Multiple Models:** No single model can answer all economic questions. Therefore, macroeconomists use different models to study different issues or phenomena. The choice of model depends on the specific question being addressed.
- **Prices: Flexible Versus Sticky:** This is a key feature distinguishing macroeconomic models.
 - **Flexible prices:** Adjust quickly to equate supply and demand, leading to market clearing. Models with flexible prices are generally used to describe the economy in the **long run**.
 - **Sticky prices (or wages):** Adjust slowly to changes in supply and demand. Examples include wages set by annual contracts or menu prices at restaurants.
 - In the **short run**, prices and wages may be sticky.
 - Sticky prices can result in excess supply (e.g., unsold goods, unemployment) or excess demand.
 - The distinction between short run and long run is that in the long run, "everything can change," while in the short run, "not everything can change" (like wages or prices).
- **Microeconomic Thinking and Macroeconomic Models:** Macroeconomic events arise from many microeconomic interactions (decisions of individuals and firms). Therefore, all macroeconomic models must be consistent with microeconomic foundations, even if these foundations are implicit.

3.3 Model Example: The Market for Cars

This is a simple model used to illustrate basic economic principles of supply, demand, and market equilibrium.

- **Objective:** To understand how the quantity and price of cars are determined and how various factors affect them.
- **Key Assumptions:**

- o Each buyer and seller is too small to affect the market price. (The instructor notes this is more accurate for buyers than large sellers like Toyota). This assumption simplifies the model.
- o The model considers an "average price for the average car," aggregating different car models into one representative good. This is another simplifying assumption.

- **Variables in the Model:**

Symbol	Description	Type	Source
QD	Quantity demanded of cars	Endogenous	
QS	Quantity supplied of cars	Endogenous	
P	Price of new cars (average)	Endogenous	
Y	Aggregate income (output, real GDP)	Exogenous	
Psteel	Price of steel (an input cost for car production)	Exogenous	

- **Equations (General Form):**

- o **Demand Function:** $QD = D(P, Y)$

- This states that the quantity of cars demanded is a function of the price of cars (P) and aggregate income (Y).
- Relationship:
 - If $P \uparrow$, then $QD \downarrow$ (higher prices reduce quantity demanded).
 - If $Y \uparrow$, then $QD \uparrow$ (higher income increases quantity demanded).

- o **Supply Function:** $QS = S(P, P_{steel})$

- This states that the quantity of cars supplied is a function of the price of cars (P) and the price of steel (P_{steel}) (an input cost).
- Relationship:
 - If $P \uparrow$, then $QS \uparrow$ (higher prices increase quantity supplied).
 - If $P_{steel} \uparrow$, then $QS \downarrow$ (higher input costs reduce quantity supplied).

- **Graphical Representation:**

- o **Demand Curve:** Plots QD against P. It is downward sloping because as price falls, quantity demanded rises.

- **Supply Curve:** Plots Q_S against P . It is upward sloping because as price rises, quantity supplied rises.
- **Equilibrium:** Occurs at the intersection of the demand and supply curves, where $Q_D = Q_S$. This point determines the equilibrium price (P^*) and equilibrium quantity (Q^*) of cars bought and sold.
- **Model Dynamics (Analyzing Changes/Shifts):**
 - **Effect of an Increase in Aggregate Income (Y):**
 - An increase in Y (e.g., an economic boom) shifts the **demand curve** to the right (outward).
 - Result: Both the equilibrium price (P^*) and equilibrium quantity (Q^*) of cars increase.
 - **Effect of an Increase in an Input Cost (e.g., P_{steel} or wages):**
 - An increase in the price of steel or other input costs (like labor wages) shifts the **supply curve** to the left (inward).
 - Result: The equilibrium price (P^*) of cars increases, and the equilibrium quantity (Q^*) of cars decreases.

4. Notation Glossary

This section provides a list of mathematical symbols and other notation used in Chapter 1, along with their definitions.

Symbol	Definition	Context	Source
Q_D	Quantity Demanded	Market for cars model	
Q_S	Quantity Supplied	Market for cars model	
P	Price (specifically, price of new cars in the model)	Market for cars model	
Y	Aggregate Income (also referred to as output, real GDP)	General macroeconomics, car model	
P_{steel}	Price of Steel	Input cost in car model supply function	
$D(\cdot)$	Demand Function	Represents the relationship $Q_D = D(P, Y)$	
$S(\cdot)$	Supply Function	Represents the relationship $Q_S = S(P, P_{\text{steel}})$	
$\uparrow$	Increase(s) / Goes up	General descriptive shorthand	
$\downarrow$	Decrease(s) / Goes down	General descriptive shorthand	
P^*	Equilibrium Price	General market analysis	
Q^*	Equilibrium Quantity	General market analysis	

5. Key Distinctions for Analysis

- **Endogenous vs. Exogenous Variables:**

- **Endogenous variables** are determined *within* the model. They are what the model seeks to explain or forecast. In the car market model, P (price of cars) and Q (quantity of cars) are endogenous.
 - **Exogenous variables** are determined *outside* the model and are taken as given inputs. Changes in exogenous variables cause changes in endogenous variables. In the car market model, Y (aggregate income) and P_{steel} (price of steel) are exogenous.
 - Think of exogenous variables as ingredients that go into the model (the cooking process), and endogenous variables as the meal (the forecast or output) that comes out.
- **Flexible vs. Sticky Prices (and implications for Short Run vs. Long Run):**
 - **Flexible Prices:** Adjust quickly to balance supply and demand, ensuring markets clear. This is typically assumed for the **long run**.
 - **Sticky Prices:** Adjust slowly to changes in economic conditions. This is often assumed for the **short run**.
 - In the short run, if prices are sticky, imbalances like excess supply (e.g., unsold goods, unemployment) or excess demand can persist. For example, sticky wages can lead to unemployment if the wage is above the market-clearing level.
 - The **long run** is a period where all prices and wages are assumed to be flexible and can adjust.
 - The **short run** is a period where some prices and wages are sticky and do not adjust fully.
 - Assuming prices/wages are sticky allows them to be treated as exogenous in some short-run models; if flexible, they are endogenous.
- **Macroeconomics vs. Microeconomics:**
 - **Macroeconomics** studies the economy as a whole, focusing on aggregate variables like national income (GDP), inflation, and unemployment.
 - **Microeconomics** studies the behavior of individual economic agents, such as households and firms, and their interactions in specific markets.
 - The two fields are related because macroeconomic phenomena are the result of many microeconomic decisions. All macroeconomic models must be consistent with microeconomic foundations.

Chapter 2: The Data of Macroeconomics - Reference Guide

This reference guide covers the key concepts, definitions, and formulas from Chapter 2, focusing on Gross Domestic Product (GDP), the Consumer Price Index (CPI), and measures of joblessness. It is designed for ease of reference.

2-1 Measuring the Value of Economic Activity: Gross Domestic Product (GDP)

Gross Domestic Product (GDP) measures two things simultaneously: the total income of everyone in the economy and the total expenditure on the economy's output of goods and services. For the economy as a whole, income must equal expenditure.

Income, Expenditure, and the Circular Flow

The **circular flow diagram** illustrates how income becomes expenditure. Households spend money on goods and services from firms. Firms use this money to pay for labor (income to households) and other factors of production. Thus, for the economy as a whole, total income and total expenditure must be (more or less) equal.

Rules for Computing GDP

1. **Value of Final Goods and Services:** GDP is the market value of all **final goods and services** produced within a country in a given period.

- **Intermediate goods** (goods used in the production of other goods, e.g., paper and glue for post-it notes) are not counted directly in GDP to avoid **double counting**. Their value is embodied in the final goods.
- **Value added** is the value of a firm's output minus the value of the intermediate goods the firm purchased. GDP can also be calculated as the sum of all value added in the economy.
- **Imputed value:** Some goods and services not sold in the marketplace are included in GDP, such as the estimated rental value of owner-occupied housing (owner's equivalent rent).

2. **Stocks and Flows:**

- A **stock** is a quantity measured at a specific point in time (e.g., the amount of capital in an economy).
- A **flow** is a quantity measured per unit of time (e.g., the amount of investment, which is new capital added). GDP is a flow variable.

Real GDP Versus Nominal GDP

- **Nominal GDP** values the production of goods and services at current prices. It can increase due to either an increase in output or an increase in prices.
 - Example: Paying \$18 for the same meal in San Francisco that costs \$10 elsewhere means the nominal value is higher, but the actual quantity (the meal) is the same.

- **Real GDP** values the production of goods and services at constant prices (prices from a base year). Real GDP changes only if the quantity of goods and services produced changes. It is a better measure of economic well-being and quantity produced than nominal GDP.

The GDP Deflator

The GDP deflator, also known as the implicit price deflator for GDP, measures the overall level of prices in the economy.

It is calculated as:

$$\text{GDP Deflator} = \frac{\text{Real GDP}}{\text{Nominal GDP}} \times 100$$

The GDP deflator can be used to calculate the inflation rate between years.

Chain-Weighted Measures of Real GDP

To account for changes in relative prices over time, chain-weighted measures of real GDP update the base year continuously. This provides a more accurate measure of real GDP growth than the traditional fixed-base-year method, especially when relative prices change significantly.

The Components of Expenditure (National Income Accounts Identity)

GDP (Y) is divided into four main components of expenditure:

$$Y = C + I + G + NX$$

This is known as the national income accounts identity.

1. **Consumption (C)**: Spending by households on goods and services.

- **Household**: A group of individuals sharing consumption decisions.
- Includes:
 - **Durable goods**: Goods that last for a long time (e.g., cars, appliances).
 - **Non-durable goods**: Goods that last a short time (e.g., food, clothing).
 - **Services**: Intangible items (e.g., haircuts, medical care, air travel, concerts).

2. **Investment (I)**: Spending on goods (called capital goods) that will be used in the future to produce more goods and services. It is about 15-20% of GDP in industrial economies but is a key driver of growth.

- **Business Fixed Investment (Capital Spending)**: Purchases of new plant, equipment, and intellectual property products by firms. **Physical capital** refers to the machinery and equipment businesses use.

- **Residential Fixed Investment:** Purchases of new housing by households and landlords. Sales of existing homes are not included as they were counted when new. This includes **owner's equivalent rent** for homeowners, who are treated as landlords renting to themselves.
- **Inventory Investment:** The change in firms' inventories of goods (goods produced but not yet sold). If inventories are accumulating, it's positive investment; if they are drawn down, it's negative investment. Even unsold goods are considered "purchased" by the firm that made them.
- Note: In the U.S., **Research and Development (R&D)** spending is included in investment.

3. **Government Purchases (G):** Spending on goods and services by local, state, and federal governments.

- Includes salaries of government workers and spending on public works.
- **Excludes transfer payments:** Payments for which no good or service is exchanged, such as Social Security, Medicare, and unemployment insurance benefits. These payments reallocate existing income rather than representing production.

4. **Net Exports (NX):** Spending on domestically produced goods by foreigners (exports) minus spending on foreign goods by domestic residents (imports).

- Formula: $NX = \text{Exports} - \text{Imports}$
- **Exports (X):** Goods and services sold to other countries.
- **Imports (M):** Goods and services purchased from other countries.
- Imports are subtracted because they are already included in C, I, or G, but represent foreign production. A trade deficit means NX is negative (imports > exports).

Other Measures of Income

- **Gross National Product (GNP):** Measures the total income earned by a nation's permanent residents (nationals). $GNP = GDP + \text{Net Factor Income from Abroad}$ (income earned by domestic residents from overseas investments minus income earned by foreign residents from domestic investments).
 - Example: A U.S. company's factory in Indonesia counts towards Indonesia's GDP but U.S. GNP. BMW (German company) plant in South Carolina counts towards U.S. GDP but German GNP.
 - GDP is preferred as a better indicator of domestic economic activity and living standards.

Seasonal Adjustment

Many economic statistics, including GDP, are **seasonally adjusted** to remove the regular seasonal fluctuations (e.g., higher retail sales before Christmas). This makes it easier to see underlying trends.

2-2 Measuring the Cost of Living: The Consumer Price Index (CPI)

The **Consumer Price Index (CPI)** is a measure of the overall cost of a fixed basket of goods and services bought by a typical consumer, relative to the cost of the same basket in a base year. It is published by the Bureau of Labor Statistics (BLS).

The Price of a Basket of Goods

The calculation of CPI involves these steps:

1. **Fix the basket:** The BLS determines which goods and services are most important to the typical consumer and their relative importance (weights). The basket represents a typical household's expenditures. Example basket shares: Housing ~44%, Food & Beverages ~14%.
2. **Find the prices:** The BLS collects data on the prices of all the goods and services in the basket each month.
3. **Compute the basket's cost:** Use the price data to calculate the total cost of the basket at different times.
4. **Choose a base year and compute the index:**
$$\text{CPI} = \frac{\text{Cost of basket in base year}}{\text{Cost of basket of goods and services in current year}} \times 100$$
 The inflation rate is the percentage change in the CPI from one period to the next.

How the CPI Compares with the GDP and PCE Deflators

- **Scope of Goods:**
 - **GDP Deflator:** Reflects the prices of all goods and services produced domestically. This includes capital goods (e.g., machinery bought by firms) which are not bought by consumers and thus not in CPI.
 - **CPI:** Reflects the prices of goods and services bought by consumers, including imported consumer goods. Imported goods are not part of GDP and thus not in the GDP deflator (unless one considers their subtraction from NX).
- **Basket of Goods:**
 - **CPI:** Uses a fixed basket of goods and services. This doesn't allow for consumer substitution in response to price changes.
 - **GDP Deflator:** Uses a changing basket of goods and services, reflecting what is currently being produced in the economy.
- **Personal Consumption Expenditures (PCE) Deflator:**
 - Definition: Ratio of nominal consumer spending to real consumer spending.

- Preferred by the Federal Reserve for measuring inflation.
- Similarities to CPI: Based on consumer spending, includes imported consumer goods.
- Differences from CPI: Allows the basket of goods to change as consumer habits change (like the GDP deflator). This means it accounts for substitution and new goods more readily, often resulting in a lower measured inflation rate than the CPI.

Does the CPI Overstate Inflation?

The CPI may overstate increases in the cost of living due to several biases:

1. **Substitution Bias:** When prices of goods change, consumers substitute towards goods that have become relatively cheaper. The CPI, using a fixed basket, does not account for this substitution and thus overstates the increase in the cost of maintaining the same level of well-being.
2. **Introduction of New Goods:** New goods provide consumers with more choice and value. Over time, the fixed basket of the CPI becomes outdated as it does not immediately include new goods. This can lead to an overstatement of inflation because the increase in consumer welfare from new goods is not fully captured.
3. **Unmeasured Changes in Quality:** If the quality of a good improves while its price remains the same (or increases less than the quality improvement), the effective cost of living has fallen. The BLS tries to adjust for quality changes, but it's difficult to do so perfectly. If quality improvements are understated, inflation is overstated.
 - The overall bias is estimated to be around 0.5 to 1 percent per year, though the BLS works to reduce it.

Headline vs. Core Inflation

- **Headline Inflation:** Refers to the inflation rate calculated using the overall CPI, which includes all goods and services in the basket.
- **Core Inflation:** Excludes volatile food and energy prices from the CPI calculation. It is often considered a better measure of underlying, ongoing inflation trends.

2-3 Measuring Joblessness: The Unemployment Rate

The Household Survey

The Bureau of Labor Statistics (BLS) conducts a monthly household survey to classify the adult population (16 years and older) into three categories:

1. **Employed:** People who worked as paid employees, worked in their own business, or worked unpaid in a family member's business. Also includes those temporarily absent from their jobs (e.g., vacation, illness).

2. **Unemployed:** People who were not employed, were available for work, and had actively looked for work during the previous four weeks. Also includes those waiting to be recalled to a job from which they had been laid off.
3. **Not in the labor force:** People who fit neither of the first two categories, such as full-time students, homemakers, retirees, or those not actively looking for work.

From these categories, key labor market statistics are derived:

- **Labor Force:** The sum of the employed and the unemployed.
Labor Force=Number of Employed+Number of Unemployed
- **Unemployment Rate:** The percentage of the labor force that is unemployed. Unemployment Rate=
$$\frac{\text{Number of Unemployed}}{\text{Labor Force}} \times 100$$
- **Labor-Force Participation Rate:** The percentage of the adult population that is in the labor force. Labor-Force Participation Rate=
$$\frac{\text{Labor Force}}{\text{Adult Population}} \times 100$$

The Establishment Survey

The BLS also conducts an **Establishment Survey** (also known as the payroll survey) by surveying businesses. This survey asks firms about the number of workers they have on their payrolls.

- This survey provides a measure of employment that can differ from the household survey. Reasons for differences include:
 - People with multiple jobs are counted multiple times in the establishment survey but only once in the household survey.
 - The establishment survey doesn't count self-employed individuals, whereas the household survey does.
 - The surveys have different coverages and estimation methods.
- The establishment survey is often considered more accurate for tracking job creation trends.

Key Formulas Summary

- **Gross Domestic Product (Expenditure Approach):** $Y = C + I + G + NX$
- **Net Exports (NX):** $NX = \text{Exports} - \text{Imports}$
- **GDP Deflator:** $\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$
- **Consumer Price Index (CPI):** $\text{CPI} = \frac{\text{Cost of basket in current year}}{\text{Cost of basket in base year}} \times 100$
- **Labor Force:** Labor Force=Number of Employed+Number of Unemployed
- **Unemployment Rate:** Unemployment Rate=
$$\frac{\text{Number of Unemployed}}{\text{Labor Force}} \times 100$$
- **Labor-Force Participation Rate:** Labor-Force Participation Rate=
$$\frac{\text{Labor Force}}{\text{Adult Population}} \times 100$$

Glossary of Key Concepts

- **Business Fixed Investment:** Spending by firms on new structures (factories, offices), equipment, and intellectual property products.
- **Chain-Weighted Measures of Real GDP:** A method of calculating real GDP that updates the base year continuously, providing a more accurate measure of output growth.
- **Circular Flow Diagram:** A model that illustrates how expenditure by households becomes income for firms, and how income for factors of production (like labor provided by households) becomes household income.
- **Consumption (C):** Spending by households on goods (durable and non-durable) and services.
- **Consumer Price Index (CPI):** A measure of the overall cost of a fixed basket of goods and services bought by a typical consumer, relative to the same basket in a base year.
- **Core Inflation:** A measure of inflation that excludes volatile food and energy prices.
- **Durable Goods:** Goods that last for a long time, such as cars and appliances.
- **Employed:** Individuals who have jobs.
- **Establishment Survey:** A survey conducted by the BLS that asks businesses about the number of workers on their payrolls to measure employment.
- **Exports:** Goods and services produced domestically and sold to foreigners.
- **Final Goods and Services:** Goods and services purchased by the end user; they are not used as inputs for further production within the measurement period.
- **Flow:** A quantity measured per unit of time (e.g., income, investment).
- **GDP Deflator:** A measure of the overall level of prices, calculated as $(\text{Nominal GDP} / \text{Real GDP}) * 100$.
- **Government Purchases (G):** Spending by federal, state, and local governments on goods and services. Excludes transfer payments.
- **Gross Domestic Product (GDP):** The market value of all final goods and services produced within a country in a given period of time. Measures both total income and total expenditure.
- **Gross National Product (GNP):** The total income earned by a nation's permanent residents (nationals).
- **Headline Inflation:** The inflation rate calculated using the overall CPI, including all goods and services.
- **Household Survey:** A survey conducted by the BLS to classify individuals as employed, unemployed, or not in the labor force.
- **Imports:** Goods and services produced abroad and purchased by domestic residents.

- **Imputed Value:** An estimated value for goods and services that are not sold in the marketplace but are included in GDP, such as the owner's equivalent rent for owner-occupied housing.
- **Intermediate Goods:** Goods used as inputs in the production of other goods; not counted directly in GDP.
- **Inventory Investment:** The change in the value of firms' inventories of finished goods, goods-in-process, and materials.
- **Investment (I):** Spending on capital equipment, inventories, and structures, including household purchases of new housing.
- **Labor Force:** The total number of workers, including both the employed and the unemployed.
- **Labor-Force Participation Rate:** The percentage of the adult population that is in the labor force.
- **National Income Accounts Identity:** The equation $Y=C+I+G+NX$, showing that GDP is the sum of consumption, investment, government purchases, and net exports.
- **Net Exports (NX):** The value of a country's exports minus the value of its imports (also called the trade balance).
- **Nominal GDP:** The production of goods and services valued at current prices.
- **Non-Durable Goods:** Goods that last for a short time, such as food and clothing.
- **Not in the Labor Force:** Individuals who are not employed and not actively seeking work (e.g., students, retirees).
- **Owner's Equivalent Rent:** An imputed value in GDP representing the housing services owner-occupiers provide to themselves.
- **PCE Deflator (Personal Consumption Expenditures Deflator):** A measure of the price level for consumer goods and services, allowing the basket of goods to change over time; preferred by the Federal Reserve.
- **Physical Capital:** The stock of equipment and structures used to produce goods and services.
- **Real GDP:** The production of goods and services valued at constant prices (from a base year); adjusts for inflation.
- **Residential Fixed Investment:** Spending on new housing by households and landlords.
- **Seasonal Adjustment:** A statistical procedure used to remove predictable seasonal fluctuations from economic data.
- **Services:** Intangible items purchased by consumers, such as haircuts, medical care, and education.
- **Stock:** A quantity measured at a given point in time (e.g., wealth, capital).
- **Transfer Payments:** Payments made by the government for which no goods or services are received in return (e.g., Social Security, unemployment benefits); not included in GDP.

- **Unemployed:** Individuals who are not employed but are available for work and have actively looked for work in the recent past.
- **Unemployment Rate:** The percentage of the labor force that is unemployed.
- **Value Added:** The market value of a firm's output less the value of the intermediate goods the firm purchased.

Reference Guide: Chapter 3 - National Income: How It Is Earned

Overview

This chapter transitions from the demand side of the economy to the supply side, focusing on what determines the total production of goods and services (Gross Domestic Product - GDP) and how the income generated from that production is distributed to the factors of production. It explores the roles of capital, labor, and technology in determining an economy's output and examines the forces that determine wages and the return to capital. The chapter also delves into the Cobb-Douglas production function as a model for understanding these relationships and concludes with a discussion on the growing income inequality observed in many economies.

3-1 What Determines the Total Production of Goods and Services?

The economy's output of goods and services (GDP) is determined by two primary elements: the quantity of inputs, known as factors of production, and the economy's ability to transform these inputs into output, represented by the production function.

The Factors of Production

The primary factors of production used to create goods and services are:

- **Capital (K):** This refers to the tools, machinery, equipment, and structures used in production. It represents the physical assets businesses invest in to produce goods and services.
- **Labor (L):** This encompasses the physical and mental efforts of workers. It includes the time and skills people contribute to the production process, from manual labor to problem-solving and innovation.
- **Technology (A):** While not always explicitly listed as a separate factor in the basic production function $Y=F(K,L)$, technology plays a crucial role. It represents the society's understanding and know-how regarding the best ways

to produce goods and services. Technological advancements can make existing capital and labor more productive. It's the general knowledge available for making things, often accessible through patents (once expired) or other public means.

For initial analysis, we often assume a **closed economy**, meaning net exports (NX) are zero, simplifying the model by excluding foreign trade and investment.

The Production Function

The production function describes the relationship between the quantity of inputs used and the maximum quantity of output that can be produced. It is represented generally as:

$$Y=F(K,L)$$

Where:

- Y = Total output (Real GDP)
- K = Amount of capital
- L = Amount of labor

This function shows how much output (Y) is produced for given amounts of capital (K) and labor (L). Generally, increasing either capital or labor, or improving technology, will lead to an increase in output.

Returns to Scale:

This concept describes how output responds to a proportional increase in all factors of production.

- **Constant Returns to Scale (CRTS):** If all factors of production are increased by a certain percentage (e.g., z%), output increases by the same percentage (z%). Mathematically, $zY=F(zK,zL)$. For example, if capital and labor are both increased by 20%, output increases by 20%. Most macroeconomic models in this context assume CRTS for simplicity.
- **Increasing Returns to Scale:** If all factors are increased by z%, output increases by *more* than z%. Example: $Y=K^2L^2$. If K and L increase by 20% (multiplied by 1.2), Y increases by $(1.2)^2 \times (1.2)^2 = 1.44 \times 1.44 \approx 2.07$ times the original factors' effect, or more simply, if inputs are scaled by z, output is scaled by $z^2 \times F(K,L)$ using the professor's simplified lecture example $Y=(zK)(zL)=z^2KL$. With the example $Y=K^2L^2$, if K and L are increased by a factor z, then new output $Y'=(zK)^2(zL)^2=z^4K^2L^2=z^4Y$. (The transcript example was $Y=K^2L^2$ then zK^2zL^2 which leads to z^2Y if we consider z applied to the *product* K^2L^2 , but standardly it means $F(zK,zL)$ compared to $zF(K,L)$.) More accurately, for $Y=F(K,L)=K^2L^2$, if we scale inputs by z, $F(zK,zL)=(zK)^2(zL)^2=z^4K^2L^2=z^4Y$. If $z>1$, then $z^4>z$, indicating increasing returns to scale.
- **Decreasing Returns to Scale:** If all factors are increased by z%, output increases by *less* than z%. While individual businesses might experience various returns, for the economy as a whole, decreasing returns to scale are often considered more likely, though CRTS is a common simplifying assumption.

Example production function (constant returns): $Y=K \cdot L$ or $Y=K^{1/2}L^{1/2}$.

If we scale K and L by z: $F(zK,zL)=(zK)(zL)=z^2KL=zKL=zY$.

The Supply of Goods and Services

In the short run, for the purpose of analyzing factor price determination, we often assume that the economy's factors of production (capital and labor) and the level of technology are fixed.

$$Y = F(K, L)$$

Given fixed inputs and fixed technology, the total output supplied (Y) is also fixed.

3-2 How Is National Income Distributed to the Factors of Production?

National income is distributed among the factors of production based on their prices, which are determined by supply and demand in factor markets.

Factor Prices

Factor prices are the payments made to the factors of production:

- **Wage (W):** The price paid for labor.
- **Rental Rate (R):** The price paid for the use of capital.

We often analyze these in **real terms** to understand their purchasing power:

- **Real Wage (W/P):** The nominal wage (W) adjusted for the price level (P). It reflects the amount of goods and services a worker can buy.
- **Real Rental Rate (R/P):** The nominal rental rate (R) adjusted for the price level (P). It reflects the real return on capital.

For simplicity in initial models, we assume factor supplies (K and L) and technology are fixed. This fixes output (Y). The goal is to determine the equilibrium real wage and real rental rate.

The Decisions Facing a Competitive Firm

A competitive firm is small relative to the markets in which it operates. It takes the prices of its output and inputs as given by market conditions. The firm's objective is to maximize profit.

- **Profit = Revenue - Labor Costs - Capital Costs** $\text{Profit} = (P \times Y) - (W \times L) - (R \times K)$ Substituting the production function $Y = F(K, L)$: $\text{Profit} = P \times F(K, L) - W \times L - R \times K$ The firm chooses the amounts of labor (L) and capital (K) that maximize its profit.

The Firm's Demand for Factors

Marginal Product of Labor (MPL):

The MPL is the additional output a firm gets from one extra unit of labor, holding the amount of capital fixed.

$$MPL = F(K, L+1) - F(K, L)$$

Most production functions exhibit diminishing marginal product: holding other inputs constant, the marginal product of a factor decreases as more of that factor is used. For example, as more workers are hired with a fixed amount of capital, each additional worker contributes less to output than the previous one. This is because workers have less capital to work with, leading to crowding or inefficiencies. (Example: Cupcake production – adding only more flour to a recipe for 48 cupcakes to try and make 96 will result in worse cupcakes, showing diminishing returns to the single factor flour).

A profit-maximizing firm hires labor up to the point where the marginal product of labor (MPL) equals the real wage (W/P).

- The cost of an additional unit of labor is W . The benefit is $P \times MPL$.
- The firm hires labor until $P \times MPL = W$, or $MPL = W/P$. The MPL curve is downward sloping and represents the firm's demand curve for labor.

Marginal Product of Capital (MPK):

The MPK is the additional output a firm gets from one extra unit of capital, holding the amount of labor fixed.

$$MPK = F(K+1, L) - F(K, L)$$

Like labor, capital also exhibits diminishing marginal product.

A profit-maximizing firm rents capital up to the point where the marginal product of capital (MPK) equals the real rental price (R/P).

- The cost of an additional unit of capital is R . The benefit is $P \times MPK$.
- The firm rents capital until $P \times MPK = R$, or $MPK = R/P$. The MPK curve is downward sloping and represents the firm's demand curve for capital.

Equilibrium Factor Prices:

With fixed factor supplies, the real wage adjusts to equate labor demand (MPL) to the fixed labor supply. Similarly, the real rental rate adjusts to equate capital demand (MPK) to the fixed capital supply.

- At equilibrium, each factor of production is paid its marginal product.

The Distribution of National Income

If the production function has constant returns to scale, then national income (output Y) is divided between payments to labor and payments to capital, with no economic profit remaining (Euler's Theorem).

- **Total Real Wages paid to Labor:** $MPL \times L$
- **Total Real Rent paid to Capital:** $MPK \times K$
- **National Income:** $Y = (MPL \times L) + (MPK \times K)$
 - Economic profit = $Y - (MPL \times L) - (MPK \times K)$. If CRTS, economic profit is zero.
 - This differs from accounting profit, which may include the return to capital.

If we want labor to have a larger share of total income, the MPL needs to rise relative to MPK. If technology or other factors cause MPK to rise faster than MPL, capital's share of income will increase.

Case Study: The Black Death and Factor Prices

(Not detailed in the transcript beyond being listed as a topic in the textbook outline. This historical event significantly reduced the labor supply, which would be expected to increase real wages and decrease the real rental rate of land/capital according to the model.)

The Cobb–Douglas Production Function

A specific production function form that is widely used and has useful properties is the Cobb-Douglas production function:

$$Y = AK\alpha L^{1-\alpha}$$

Where:

- Y = Total output
- A = A parameter measuring the level of technology (total factor productivity).
- K = Capital stock
- L = Labor force
- α (alpha) = A parameter between 0 and 1 that measures capital's share of income. Consequently, $(1-\alpha)$ represents labor's share of income.

Properties of the Cobb-Douglas Function:

1. **Constant Returns to Scale:** If K and L are increased by the same proportion, Y increases by that proportion.

2. **Factor Shares:**

- Capital's share of income is αY .
- Labor's share of income is $(1-\alpha)Y$. These shares are constant, regardless of the levels of K and L or their prices.

3. **Marginal Products:**

- $MPL = (1-\alpha)A(K/L)^\alpha = (1-\alpha)(Y/L)$ (Average labor productivity)
- $MPK = \alpha A(L/K)^{1-\alpha} = \alpha(Y/K)$ (Average capital productivity) An increase in K raises MPL and lowers MPK . An increase in L lowers MPL and raises MPK . An increase in A (technology) raises both MPL and MPK .

If, for example, capital earns one-fourth of total income, then $\alpha=0.25$. The production function would be $Y=AK^{0.25}L^{0.75}$.

Case Study: Labor Productivity as the Key Determinant of Real Wages

(The transcript discusses the relationship between productivity (MPL) and real wages, noting that according to the Cobb-Douglas model, they should be highly related. However, it points out a divergence in recent decades where productivity has grown more than real wages, especially for unskilled labor.)

FYI: Pitfalls When Using Productivity and Wage Data

The transcript highlights that real-world data from 1980 to 2024 shows U.S. productivity up by about 28%, while average real wages rose by only about 16%. For unskilled labor, real wages have been largely flat over this period. This suggests that the simple Cobb-Douglas model where wages directly track average productivity might be missing some elements or that the parameters (like α) might be changing.

3-3 The Growing Gap Between Rich and Poor (Income Inequality)

There has been a substantial increase in income inequality in the U.S. and many other industrialized countries over the past half-century. The neoclassical theory of distribution (where factors are paid their marginal products) can be used to explore reasons for this. The **Gini coefficient**, ranging from 0 (perfect equality) to 1 (one person has all income), is a measure of income inequality. Rising inequality implies that this coefficient has been increasing.

A Falling Labor Share (or Rising Capital Share)

If the capital share (α) in the Cobb-Douglas function increases over time, it implies that a larger portion of national income is going to owners of capital, and a smaller share is going to labor. This could be due to technological changes that make capital relatively more productive or increase its importance in the production process.

The Race Between Education and Technology (Goldin and Katz Hypothesis)

This theory suggests that technological advancements often require a more skilled and educated workforce. If educational attainment doesn't keep pace with technological progress, the wages of highly educated workers (who can leverage new technology) will rise significantly, while those of less educated/skilled workers may stagnate or fall.

Technology enhances the productivity of skilled labor more than unskilled labor.

- Historically, to maintain a middle-class living, the required level of education has increased (e.g., from high school dropout to college degree, and now potentially graduate degrees for upper-middle-class).

Globalization

Increased international trade and the ability to outsource jobs can affect wages.

- Jobs that are easily outsourced to countries with lower labor costs may see downward pressure on domestic wages or job losses for those workers.
- Highly skilled jobs that are not easily outsourced, or jobs in sectors that benefit from global markets (e.g., specialized surgeons, local service providers like plumbers, HVAC technicians), may see their wages increase.
- While most economists believe international trade benefits the economy as a whole, there are winners and losers. Winners are often those whose skills are in high demand globally or are complementary to technology and

capital. Losers can be unskilled workers whose jobs are outsourced.

The Evolving Role of Marriage (Christine Schwartz - Assortative Mating)

Changes in marriage patterns can contribute to household income inequality:

- **Assortative Mating:** The tendency for people with similar income levels or educational attainment to marry each other. If high-income individuals marry other high-income individuals (forming "dual income, no kids" - DINKS - or high-income households with kids), their combined household income will be significantly higher than that of lower-income individuals who may also marry each other or form single-parent households.
- **Marriage and Divorce Rates:** Higher-income, higher-educated individuals tend to have higher marriage rates and lower divorce rates compared to lower-income, less-educated individuals. This can lead to more stable, high-income dual-earner households at the top end and more single-earner or unstable households at the lower end, widening the gap in household income. These trends have been observed from around 1970 to the present.

The Policy Questions

(The transcript doesn't explicitly list policy questions but discusses the underlying phenomena that policymakers might address, such as how to respond to rising inequality, the falling labor share, the impact of globalization, and the education-technology race.)

One observation mentioned is that U.S. income inequality is significantly driven by the very top earners (e.g., top 1%). If this segment were excluded, U.S. inequality levels might look more similar to those in some Nordic countries, suggesting that superstar effects or returns to top talent and entrepreneurship are particularly pronounced in the U.S.

3-4 Conclusion

The chapter establishes that an economy's output is determined by its factors of production (primarily capital and labor) and its production technology. In competitive markets, firms make hiring and investment decisions that lead to factors being paid their marginal products. The Cobb-Douglas production function provides a useful framework for analyzing how income is distributed between capital and labor. Various factors, including technological change biased towards capital or skilled labor, globalization, and societal trends like assortative mating, have been proposed to explain the observed rise in income inequality in recent decades.

Key Formulas

- **General Production Function:** $Y=F(K,L)$
 - Y: Total Output (Real GDP)
 - K: Capital
 - L: Labor
- **Constant Returns to Scale (CRTS) Property:** $zY=F(zK,zL)$ (where z is a positive scalar)
- **Profit Maximization for Labor:** Hire L until $MPL=W/P$

- MPL: Marginal Product of Labor
- W/P: Real Wage
- **Profit Maximization for Capital:** Rent K until $MPK=R/P$
 - MPK: Marginal Product of Capital
 - R/P: Real Rental Price of Capital
- **National Income Distribution (under CRTS):** $Y=(MPL \times L)+(MPK \times K)$
- **Cobb-Douglas Production Function:** $Y=AK\alpha L^{1-\alpha}$
 - A: Level of technology
 - α : Capital's share of income (constant, $0 < \alpha < 1$)
 - $1-\alpha$: Labor's share of income (constant)
- **Marginal Product of Labor (Cobb-Douglas):** $MPL=(1-\alpha)(Y/L)$
- **Marginal Product of Capital (Cobb-Douglas):** $MPK=\alpha(Y/K)$
- **Capital's Income:** $MPK \times K = \alpha Y$
- **Labor's Income:** $MPL \times L = (1-\alpha)Y$

Glossary of Key Concepts and Symbols

- **A (Technology):** A parameter in the production function (especially Cobb-Douglas) representing the level of technological advancement or total factor productivity.
- **Accounting Profit:** Total revenue minus explicit costs. May include the normal return to capital.
- **Alpha (α):** In the Cobb-Douglas production function ($Y=AK\alpha L^{1-\alpha}$), α is the exponent on capital and represents capital's share of total income. It is a constant between 0 and 1.
- **Assortative Mating:** The tendency for individuals to marry others with similar characteristics, such as income or education level.
- **Capital (K):** The stock of tools, equipment, buildings, and other man-made goods used to produce other goods and services.
- **Closed Economy:** An economy that does not engage in international trade or financial transactions (i.e., net exports are zero).
- **Cobb-Douglas Production Function:** A specific mathematical form of the production function, $Y=AK\alpha L^{1-\alpha}$, that exhibits constant factor shares and can have constant returns to scale.
- **Competitive Firm:** A firm that takes market prices for inputs and outputs as given, having no power to influence them.
- **Constant Returns to Scale (CRTS):** A property of a production function whereby a proportional increase in all inputs leads to an increase in output by the same proportion.
- **Decreasing Returns to Scale:** A property of a production function whereby a proportional increase in all inputs leads to an increase in output by a smaller proportion.
- **Diminishing Marginal Product:** The property whereby the marginal product of an input declines as the quantity of the input increases, holding other inputs constant.
- **Economic Profit:** Total revenue minus total costs, including both explicit and implicit costs (such as the opportunity cost of capital). Under constant returns to scale and perfect competition, long-run economic profit is zero.
- **Factor Prices:** The prices per unit that firms pay for the factors of production (e.g., the wage for labor, the rental rate for capital).

- **Factors of Production:** The inputs used to produce goods and services, primarily capital (K) and labor (L).
- **Gini Coefficient:** A statistical measure of income or wealth inequality within a population, ranging from 0 (perfect equality) to 1 (maximal inequality).
- **Globalization:** The increasing interconnectedness of economies around the world, particularly through trade, investment, and labor flows.
- **Increasing Returns to Scale:** A property of a production function whereby a proportional increase in all inputs leads to an increase in output by a larger proportion.
- **K (Capital):** Symbol for the quantity of capital.
- **L (Labor):** Symbol for the quantity of labor.
- **Labor:** The physical and mental effort of human beings used in the production of goods and services.
- **Marginal Product of Capital (MPK):** The additional output produced from one additional unit of capital, holding other inputs constant.
- **Marginal Product of Labor (MPL):** The additional output produced from one additional unit of labor, holding other inputs constant.
- **Neoclassical Theory of Distribution:** A theory stating that each factor of production is paid its marginal product.
- **P (Price Level):** The average level of prices in the economy.
- **Production Function:** A mathematical relationship showing the maximum amount of output that can be produced from any given combination of inputs, given the current state of technology. Generally $Y=F(K,L)$.
- **Profit:** A firm's total revenue minus its total costs.
- **R (Nominal Rental Price of Capital):** The nominal cost of renting one unit of capital for a given period.
- **R/P (Real Rental Price of Capital):** The nominal rental price of capital adjusted for the price level; the payment to capital measured in units of output.
- **Real Wage (W/P):** The nominal wage adjusted for the price level; the payment to labor measured in units of output. It reflects the purchasing power of wages.
- **Returns to Scale:** The rate at which output increases in response to a proportional increase in all inputs.
- **Technology (A):** The societal knowledge of how to produce goods and services. Improvements in technology shift the production function upwards, allowing more output from the same inputs.
- **W (Nominal Wage):** The nominal payment per unit of labor.
- **Y (Output/Income):** Symbol for the total quantity of goods and services produced in an economy, also representing the total income earned.
- **Z (Scaling Factor):** A variable used to represent a proportional change in inputs when discussing returns to scale.

Questions for Review (from Chapter Materials)

1. What determines the amount of output an economy produces?
2. Explain how a competitive, profit-maximizing firm decides how much of each factor of production to demand.
3. What is the role of constant returns to scale in the distribution of income?
4. Write a Cobb–Douglas production function describing an economy in which capital earns one-fourth of total income.
5. List three possible explanations for the increase in U.S. income inequality over the past several decades.

Chapter 4 Reference Guide: National Income – How It Is Spent and Financed (Loanable Funds Market)

This reference guide covers the core concepts related to the demand for goods and services, the components of aggregate demand in a closed economy, and the determination of equilibrium in the market for loanable funds.

1. Introduction and Key Models

The primary goal of this chapter is to develop the **market for loanable funds**, a crucial model for understanding how financial markets coordinate saving and investment in the economy. This market, along with the **real goods market** (aggregate supply and aggregate demand), forms a foundational part of macroeconomic analysis.

2. Demand for Goods and Services in a Closed Economy

In a closed economy (an economy that does not engage in international trade), the total demand for goods and services (Y) is the sum of consumption, investment, and government purchases.

$$Y = C + I + G$$

Where:

- Y = National Income / Output
- C = Consumption
- I = Investment
- G = Government Purchases

3. Consumption (C)

Consumption (C) refers to household spending on goods and services. Household income is allocated to three "buckets": taxation, consumption, and savings.

3.1. Disposable Income (Yd)

Consumption is primarily determined by disposable income, which is the income remaining after paying taxes (T).

$$Y_d = Y - T$$

Where:

- Y_d = Disposable Income
- Y = Total Income
- T = Taxes

3.2. The Consumption Function

The consumption function shows the relationship between consumption and disposable income.

$$C = C(Y_d) \text{ or } C = C(Y - T)$$

This function generally has two components:

- **Autonomous Consumption (C_a or C^*):** This is the portion of consumption expenditure that does not depend on the level of disposable income. It represents spending that occurs even if income is zero (e.g., rent, essential food purchases, utilities).
- **Induced Consumption:** This is the portion of consumption that varies with disposable income.

3.3. Marginal Propensity to Consume (MPC)

The Marginal Propensity to Consume (MPC) is the fraction of an additional dollar of disposable income that households spend on consumption.

$$MPC = \frac{\Delta Y_d}{\Delta C}$$

Where:

- ΔC = Change in Consumption
- ΔY_d = Change in Disposable Income

Conceptually, if an individual receives an extra \$100, and their MPC is 0.8, they will spend \$80 of that extra income. The MPC is the slope of the consumption function. For the U.S. economy as a whole, the MPC is estimated to be around 1/3.

This aggregate MPC is a dollar-weighted average; wealthier individuals (who have more "dollar votes") tend to have lower MPCs, pulling the average down.

3.4. Household Savings

Household savings (SH) is defined as any disposable income that is not spent on consumption.

$$SH = Y_d - C = Y - T - C$$

4. Investment (I)

Investment (I) refers to spending by businesses on new capital goods (equipment, machinery, structures) and spending by households on new housing.

4.1. The Investment Function

Investment is primarily determined by the real interest rate (r). The relationship is inverse: as the real interest rate rises, investment falls, and vice-versa.

$$I = I(r)$$

Where:

- r = Real Interest Rate

4.2. Real Interest Rate (r)

The real interest rate is the nominal interest rate adjusted for inflation. It represents the real cost of borrowing money and the real return to lending money.

$$r = \text{Nominal Interest Rate} - \text{Inflation Rate}$$

For example, if a mortgage rate is 5% (nominal) and inflation is 3%, the real interest rate is approximately 2%.

4.3. Relationship between Investment and Real Interest Rate

- **Higher Real Interest Rates (r):**
 - Increase the cost of borrowing for firms, making fewer investment projects profitable.
 - Increase the opportunity cost of investing for firms that have cash reserves (they could earn more by lending or buying bonds).
 - Result in lower investment.
- **Lower Real Interest Rates (r):**
 - Decrease the cost of borrowing, making more investment projects profitable.
 - Decrease the opportunity cost of investing for firms with cash reserves.
 - Result in higher investment. This applies to both business investment and residential real estate investment.

5. Government Purchases (G) and Taxes (T)

- **Government Purchases (G):** Spending by the government on goods and services (e.g., infrastructure, salaries of government employees).
 - G is generally assumed to be **exogenous**, meaning it is determined by political decisions outside the economic model.
 - **Transfer payments** (e.g., social security, unemployment benefits) are *not* included in G because they do not represent direct government purchases of goods or services, but rather a redistribution of income.
- **Taxes (T):** Revenue collected by the government.
 - T is also generally assumed to be **exogenous**.

5.1. Budget Balance

- **Budget Surplus:** Occurs when $T > G$. Public saving is positive.
- **Budget Deficit:** Occurs when $T < G$. Public saving is negative, and the government must borrow to finance its expenditures (e.g., by issuing Treasury bonds).
- **Balanced Budget:** Occurs when $T = G$.

6. National Savings (S) – The Supply of Loanable Funds

National Savings (S), also referred to simply as saving, is the total income in the economy that remains after paying for consumption and government purchases. It is the sum of private saving and public saving.

6.1. Private Savings (SP)

Private savings is the disposable income ($Y - T$) that households have left after their consumption (C).

$$SP = Y - T - C$$

6.2. Public Savings (Spub)

Public savings is the amount of tax revenue (T) that the government has left after paying for its spending (G).

$$Spub = T - G$$

If $G > T$, public saving is negative (a budget deficit).

6.3. National Savings (S)

Combining private and public savings:

$$S = SP + Spub$$

$$(S = (Y - T - C) + (T - G) \text{ The taxes } (T) \text{ cancel out, so: } S = Y - C - G)$$

National savings represents the total pool of resources available from the economy's output after accounting for what is used by households and the government. This pool of savings is what is available to fund investment.

7. The Market for Loanable Funds

This market brings together savers (suppliers of loanable funds) and investors (demanders of loanable funds). The "price" in this market is the **real interest rate (r)**.

7.1. Demand for Loanable Funds

The demand for loanable funds comes from **investment (I)**. Firms and households borrow to finance investment projects. The investment function $I(r)$ is downward sloping because a lower real interest rate makes more investment projects profitable.

7.2. Supply of Loanable Funds

The supply of loanable funds comes from national savings (S).

$$S = Y - C - G$$

- **Initial Assumption (Theory of Liquidity Preferences implies fixed savings):** In the basic model, national savings is assumed not to depend on the real interest rate. This results in a vertical supply curve for loanable funds. This is because:
 - Output (Y) is fixed by the factors of production (capital and labor) and technology.
 - Consumption (C) depends on disposable income ($Y - T$), which is fixed if Y and T are fixed.
 - Government purchases (G) and Taxes (T) are assumed to be exogenous (fixed political decisions). Thus, $S = Y - C(Y - T) - G$, making S fixed.

7.3. Equilibrium

Equilibrium in the market for loanable funds occurs where the supply of loanable funds (National Savings) equals the demand for loanable funds (Investment).

$$S = I(r)$$

The real interest rate (r) adjusts to ensure that the amount of funds savers want to lend equals the amount investors want to borrow. In a closed economy, at equilibrium, savings equals investment ($S = I$).

8. Shifts in the Loanable Funds Market

8.1. Changes in Savings (Shifts in the Supply Curve, S)

Any factor that changes national savings will shift the supply curve for loanable funds.

- **Decrease in National Savings (Supply shifts left/inward):**

- **Causes:**

- **Increased Government Budget Deficit:** An increase in G or a decrease in T reduces public savings ($T-G$), thereby reducing national savings ($Y-C-G$).
 - **Changes in Private Savings Behavior:**
 - An increase in the Marginal Propensity to Consume (MPC) means households save less at any given level of disposable income.
 - An increase in autonomous consumption (e.g., due to rising housing costs) reduces household savings.
 - Changes in tax laws that discourage saving (e.g., eliminating tax advantages for 401ks, IRAs).

- **Effect:** The real interest rate (r) rises, and the equilibrium quantity of loanable funds (and thus investment) falls.

- **Increase in National Savings (Supply shifts right/outward):**

- **Causes:**

- **Decreased Government Budget Deficit:** A decrease in G or an increase in T increases public savings and national savings.
 - **Changes in Private Savings Behavior:**
 - A decrease in the MPC.
 - Tax incentives that encourage saving, such as:
 - **401(k)s and IRAs:** Tax-advantaged retirement savings accounts.
 - Traditional: Tax deduction now, pay taxes on withdrawal.
 - Roth: Pay taxes now, tax-free withdrawals.
 - **Health Savings Accounts (HSAs):** Triple tax advantage for those with high-deductible health plans.
 - **Consumption Taxes (e.g., sales tax, VAT) vs. Income Taxes:** Shifting from income taxes to consumption taxes can incentivize saving, as saving is not taxed until it is spent.

- **Effect:** The real interest rate (r) falls, and the equilibrium quantity of loanable funds (and thus investment) rises.

8.2. The Crowding Out Effect

When an increase in government spending (or a decrease in taxes) leads to a budget deficit, the government borrows more, reducing public savings and thus national savings. This decrease in the supply of loanable funds leads to a higher real interest rate, which in turn reduces (crowds out) private investment.

8.3. Changes in Investment Demand (Shifts in the Demand Curve, I)

Any factor that changes the profitability of investment at any given real interest rate will shift the demand curve for loanable funds.

- **Increase in Investment Demand (Demand shifts right/outward):**

- **Causes:**

- **Technological Innovation:** New technologies can create profitable investment opportunities, increasing the demand for funds to finance them.
 - **Tax Incentives for Investment:** Policies like investment tax credits or R&D tax credits can make investment more attractive. Favorable tax treatment for specific industries (e.g., oil and gas exploration, manufacturing) can also boost investment demand.
 - **Decreased Business Regulations:** Making it easier or cheaper to invest can increase demand.
 - **Effect (with vertical Savings curve):** The real interest rate (r) rises. The equilibrium quantity of savings and investment does *not* change because the supply of savings is fixed.
 - **Effect (with upward-sloping Savings curve - see Section 9):** The real interest rate (r) rises, and the equilibrium quantity of savings and investment also rises.

9. Relaxing the Theory of Liquidity Preferences: Upward Sloping Savings Curve

The assumption that national savings is perfectly inelastic (a vertical line) with respect to the real interest rate can be relaxed.

- **Rationale:** A higher real interest rate increases the reward for saving. Households may choose to save more and consume less when they can earn a higher return on their savings.
- **Implication:** The supply curve for loanable funds (S) becomes upward sloping, indicating that a higher real interest rate leads to a greater quantity of savings.
- **Effect of an Increase in Investment Demand (with upward sloping S):** When investment demand increases (shifts right), both the equilibrium real interest rate (r) and the equilibrium quantity of savings and investment will increase. The rise in the interest rate induces more saving, allowing for a higher level of investment.

10. Notation Glossary and Key Formulas Summary

Symbol Definition		First Mentioned Context & Formula(s)
Y	National Income / Output	$Y = C + I + G$
C	Consumption by households	$Y = C + I + G$; $C = C(Y - T)$
I	Investment by businesses and households	$Y = C + I + G$; $I = I(r)$

G	Government Purchases	$Y=C+I+G$
T	Taxes (net of transfers, effectively)	$Y_d=Y-T$
Y_d	Disposable Income	$Y_d=Y-T$
MPC	Marginal Propensity to Consume	$MPC=\Delta C/\Delta Y_d$
C_a / C⁻	Autonomous Consumption	Part of $C(Y-T)$
r	Real Interest Rate	$I=I(r)$; $r=\text{Nominal Rate}-\text{Inflation}$
SH / SP	Household (Private) Savings	$SP=Y-T-C$
Sp_{pub}	Public Savings	$Sp_{pub}=T-G$
S	National Savings (Supply of Loanable Funds)	$S=SP+Sp_{pub}=Y-C-G$; $S=I(r)$ at equilibrium
Δ	Change in a variable	$\Delta C/\Delta Y_d$

Key Formulas:

- Aggregate Demand (Closed Economy): $Y=C+I+G$
- Disposable Income: $Y_d=Y-T$
- Consumption Function: $C=C(Y-T)$ (can be $C=C^-+MPC \cdot (Y-T)$)
- Marginal Propensity to Consume: $MPC=\Delta C/\Delta Y_d$
- Investment Function: $I=I(r)$
- Real Interest Rate: $r=\text{Nominal Interest Rate}-\text{Inflation Rate}$
- Private Savings: $SP=Y-T-C$
- Public Savings: $Sp_{pub}=T-G$
- National Savings: $S=Y-C-G$
- Loanable Funds Market Equilibrium: $S=I(r)$ (or $Y-C-G=I(r)$)

11. Additional Concepts from Data Review (Brief Definitions)

- **Gini Coefficient:** A measure of statistical dispersion intended to represent the income or wealth inequality within a nation or any other group of people.¹ A Gini coefficient of 0 expresses perfect equality, while a Gini coefficient of 1 (or 100%) expresses maximal inequality.
- **U.S. National Debt:** The total amount of money that the U.S. federal government owes to creditors.
- **Debt-to-GDP Ratio:** The ratio of a country's government debt to its gross domestic product (GDP).
- **Personal Savings Rate:** The percentage of disposable personal income that households save.
- **3-Month Treasury Bill (T-bill) Rate:** Interest rate on short-term U.S. government debt, often considered a proxy for the risk-free rate on cash.
- **10-Year Treasury Bond Rate:** Interest rate on longer-term U.S. government debt, influential for consumer borrowing rates like mortgages.

Reference Guide: Chapter 5 - Money and the Monetary System

This reference guide provides a comprehensive overview of the concepts discussed in Chapter 5, focusing on the nature of money, its measurement, and the mechanisms by which its supply is controlled, primarily through the Federal Reserve.

It is designed for ease of reference and completeness.

1. Core Definitions

- **Money:** The stock of assets that can be readily used to make transactions. It is the total amount of assets available as a medium of exchange.
- **Store of Value:** An item that people can use to transfer purchasing power from the present to the future.
- **Unit of Account:** The yardstick people use to post prices and record debts.¹ It provides a common measure of value.
- **Medium of Exchange:** An item that buyers give to sellers when they want to purchase goods and services. People must be willing to accept it as payment.
- **Fiat Money:** Money without intrinsic value that is used as money because of government decree or by common acceptance that it has value. Its value relies on collective belief ("Tinkerbelle effect"). Examples include U.S. paper dollars.
- **Commodity Money:** Money that takes the form of a commodity with intrinsic value. Examples include gold, silver, or cigarettes in certain contexts (e.g., POW camps).
- **Gold Standard:** A monetary system where a country's currency or paper money has a value directly linked to gold. (This term is listed as a key concept; the provided transcripts primarily discuss gold as an early form of commodity money.)
- **Currency:** The paper bills and coins in the hands of the public.
- **Demand Deposits:** Balances in bank accounts that depositors can access on demand by writing a check or² using a debit card (e.g., checking accounts).
- **Liquidity:** The ease with which an asset can be converted into the economy's medium of exchange. Cash is the most liquid asset.
- **Money Supply:** The total quantity of money available in the economy.
- **Monetary Policy:** The set of actions taken by a central bank to manage the money supply and credit conditions to foster stable prices and sustainable economic growth.
- **Central Bank:** An institution designed to oversee the banking system and regulate the quantity of money in the economy.
 - **Federal³ Reserve (The Fed):** The central bank of the United States, established in 1913.

- **Open-Market Operations (OMO):** The purchase and sale of U.S. government bonds by the Fed to control the money supply.
- **Discount Rate:** The interest rate at which commercial banks can borrow money directly from the Federal Reserve.
- **Federal Funds Rate:** The interest rate at which banks make overnight loans to one another. The Fed targets this rate through its operations.
- **Federal Open Market Committee (FOMC):** The monetary policymaking body of the Federal Reserve System. It meets approximately every six weeks to assess economic conditions and determine monetary policy.

2. The Functions of Money

For an asset to be considered money, it must fulfill three critical functions:

1. Medium of Exchange:

- It must be widely accepted as a form of payment for goods and services.
- Example: U.S. dollars are accepted for transactions in the U.S., but might not be in another country, though some countries accept U.S. dollars alongside their own currency (e.g., the Bahamas).
- Yap stone discs were a medium of exchange on the Island of Yap.

2. Store of Value:

- It must allow purchasing power to be transferred from the present to the future.
- While inflation can erode the value of paper money over time, it generally retains value in the short term.
- Gold is a good store of value because it does not rust or tarnish.
- A \$20 bill today is expected to still be a \$20 bill next week, capable of purchasing goods.

3. Unit of Account:

- It provides a common measure for quoting prices and recording debts, allowing for comparison of the value of different goods and services.
- Prices are expressed in terms of dollars in the U.S.
- An unconventional example is how some zoos historically used "Gentoo penguins" as a unit of account for valuing animals for trade.

3. Types of Money

• Commodity Money:

- Has intrinsic value; the item would have value even if it were not used as money.
- Examples:
 - Gold and silver coins, where the metal itself is valuable.
 - Cigarettes in prisons or POW camps.
 - **Coinflation:** Some modern coins may have a metal content value that approaches or exceeds their face value (e.g., older U.S. pennies made primarily of copper, certain nickels). However, melting U.S. currency is illegal.

• Fiat Money:

- Has no intrinsic value; it is established as money by government decree or common acceptance.

- Its value derives from the collective belief that it is valuable and will be accepted by others. This is sometimes referred to as the "Tinkerbelle effect" – it exists because people believe in it.
- Examples: U.S. paper currency, Euros, Japanese Yen.
- Checks are not money themselves but are orders to transfer fiat money from a bank account.

Assets Not Considered Money (or less money-like):

- **Shares in Companies:** Not a medium of exchange.
- **Collectible Coins:** Valued for rarity, not primarily as a medium of exchange.
- **Certificates of Deposit (CDs or Time Deposits):**
 - Good store of value and unit of account.
 - Not a good medium of exchange due to restrictions and penalties for early withdrawal.
- **Credit Cards:**
 - Not money. They are a means of deferring payment, creating a short-term loan (an IOU) from the credit card company.
- **Bitcoin and Cryptocurrencies (as described in transcript):**
 - Neither fiat nor commodity money in the traditional sense.
 - Generally not a good unit of account due to price volatility.
 - Considered a volatile store of value.
 - Viewed more like speculative assets or collector's items (e.g., baseball cards, Magic: The Gathering cards) rather than functional money for daily transactions.

4. Measuring the Money Supply

The money supply is measured in different ways based on the liquidity of assets.

- **Liquidity:** Refers to how easily an asset can be converted into a medium of exchange.
 - **Highly Liquid:** Cash, demand deposits (checking accounts accessible by debit card).
 - **Less Liquid:** Savings accounts (may require transfer to checking or withdrawal).
 - **Illiquid:** Houses (take significant time and effort to convert to cash).

U.S. Money Supply Measures (Conceptualized as Russian Nesting Dolls):

- **M0:**
 - The narrowest definition of money.
 - Primarily consists of physical currency in circulation (cash).
- **M1:**
 - Includes all components of M0.
 - Adds:
 - Demand Deposits (funds in checking accounts).
 - Traveler's Checks (less common now).
 - Other Checkable Deposits (accounts on which checks can be written freely).
- **M2:**
 - Includes all components of M1.
 - Adds assets that are slightly less liquid than M1 components:

- Savings Deposits (savings accounts).
- Money Market Mutual Fund balances (some may have limited check-writing features).
- Small-denomination Time Deposits (Certificates of Deposit).
- (Note: The prevalence and features of savings accounts shifted when interest rates fell significantly around 2001-2002, reducing their attractiveness compared to checking accounts for some time.)

5. The Federal Reserve (The Fed) and Monetary Policy

The Federal Reserve is the central bank of the United States.

- **Establishment and Purpose:**

- Created in 1913.
- Designed to act as a **lender of last resort** to prevent bank failures and financial crises (inspired by events like the 1903 financial crisis, which was averted by J.P. Morgan personally intervening).
- It has wide latitude to make regulatory decisions with little direct political oversight in the U.S.

- **Structure:**

- **Federal Open Market Committee (FOMC):**

- The main policymaking body of the Fed.
- Meets approximately every six weeks (10 times a year) to discuss economic conditions and set monetary policy.
- Composed of:
 - The Board of Governors of the Federal Reserve System.
 - The President of the Federal Reserve Bank of New York.
 - Presidents of four other Federal Reserve Banks on a rotating basis.
- **Fed4 Chair:** Head of the FOMC, appointed by the U.S. President for a four-year term. Has significant influence on policy direction. (Jerome Powell was Chair as of December 2024 per the transcript; past chairs include Alan Greenspan and Ben Bernanke).

- **Dual Mandate (from Congress):**

1. **Stable Prices:** Typically interpreted as keeping inflation low and predictable (e.g., around a 2% target).
 2. **Sustainable Employment:** Fostering conditions for maximum employment.
- These two goals can present a tradeoff. For example, actions to lower unemployment rapidly might lead to higher inflation. During the COVID-19 pandemic, the Fed prioritized supporting employment and financial stability, even if actions were inflationary.

- **Functions and Tools of Monetary Policy:**

1. Regulating Banks and the Banking System:

- Ensures the health of the banking system.
- The **FDIC (Federal Deposit Insurance Corporation)**, part of the Fed's regulatory framework, insures deposits in member banks, increasing public confidence.

2. Controlling the Money Supply:

- **Open Market Operations (OMO):** The Fed's primary tool.
 - Conducted by the New York Fed branch.
 - **To Increase Money Supply (Expansionary Policy):** The Fed *buys* U.S. Treasury bonds from the public/banks. This injects cash (reserves) into the banking system, enabling banks to lend more.
 - **To Decrease Money Supply (Contractionary Policy):** The Fed *sells* U.S. Treasury bonds to the public/banks. This withdraws cash (reserves) from the banking system. More commonly, the Fed allows existing bonds it holds to mature without reinvesting the proceeds, which has a similar effect as the Treasury then issues new bonds to the public, draining cash from the system.
- **Setting Interest Rates (Influencing borrowing costs):**
 - **Discount Rate:** The interest rate at which the Fed lends directly to commercial banks.
 - A *lower* discount rate encourages banks to borrow reserves, potentially increasing lending and the money supply. It signals the Fed's willingness to provide liquidity.
 - A *higher* discount rate discourages banks from borrowing from the Fed, potentially reducing lending.
 - **Federal Funds Rate:** While not directly set, the Fed uses OMO to influence this target rate – the interest rate at which banks lend reserves to each other overnight. This rate, in turn, influences other interest rates in the economy.

3. Lender of Last Resort:

- The Fed provides short-term loans to banks facing liquidity crises when they cannot borrow elsewhere. This helps prevent bank runs and systemic financial instability.

The Federal Reserve has considerable latitude in its policy actions, particularly during economic crises, to ensure financial stability and support the economy.

Chapter 6: Inflation: Its Causes, Effects, and Social Costs – Reference Guide

6-1 The Quantity Theory of Money

Transactions and the Quantity Equation

The **velocity of money** refers to the rate at which money changes hands within an economy. It measures the number of times a unit of currency (e.g., a dollar bill) is used for transactions in a given period.

Example: If there are \$500 billion in transactions in a year and the money supply is \$100 billion, the average dollar was transacted 5 times. The velocity of money is 5.

The Quantity Equation is a mathematical identity:

$$M \times V = P \times T$$

Where:

- M = Money Supply
- V = Transactions Velocity of Money (the number of times money changes hands in transactions)
- P = Price Level (average price of a transaction)
- T = Total Number of Transactions in a period

This equation states that the total amount of money spent ($M \times V$) must equal the total value of transactions ($P \times T$).

From Transactions to Income

Because the total number of transactions (T) is difficult to measure precisely, economists often substitute total output or income (Y) for T. In this context, Y represents real GDP.

The Quantity Equation then becomes:

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

Where:

- M = Money Supply
- V = Income Velocity of Money (the number of times a dollar bill enters someone's income in a given period)
- P = Price Level (typically the GDP deflator, $P = \text{Nominal GDP} / \text{Real GDP}$)
- Y = Real GDP (total output/income)

Here, $P \times Y$ represents Nominal GDP. This equation remains an identity.

The Money Demand Function and the Quantity Equation

Real money balances (M/P) represent the purchasing power of the money supply.

The money demand function shows the determinants of the quantity of real money balances people wish to hold. A simple money demand function is:

$$(M/P)^d = kY$$

Where:1

- $(M/P)^d$ = Demand for real money balances
- k = A constant representing the proportion of income that people want to hold as cash. It is exogenous and reflects individuals' preferences for holding money.
- Y = Real income (Real GDP)

This equation implies that the demand for real money balances is proportional to real income.

If individuals desire to hold a lot of money for each dollar of income (k is large), then V is small (money changes hands infrequently). Conversely, if individuals desire to hold little money (k is small), V is large (money changes hands frequently).

The relationship between k and V is $k=1/V$.

The determination of k (and thus V) is influenced more by wealthier individuals, as every dollar "votes" in determining the average amount of money people hold relative to their income.

The Assumption of Constant Velocity

For simplicity in the Quantity Theory of Money, velocity (V) is often assumed to be constant and exogenous.

Historically, for certain periods (e.g., 1960-1990 in the U.S.), the velocity of money was relatively stable.

However, data since the late 1990s shows a declining trend in the velocity of money, influenced by factors like recessions (during which velocity tends to fall as people hold onto cash) and the prevalence of credit/debit card transactions (reducing the need to hold physical cash).

Money, Prices, and Inflation

If velocity (V) is assumed constant ($V=V^*$), the Quantity Equation $MV^*=PY$ implies:

1. A change in the quantity of money (M) must cause a proportionate change in nominal GDP (PY).
2. Real GDP (Y) is determined by the factors of production (capital, labor) and the production function. It is not affected by changes in the money supply in the long run (classical assumption).
3. Therefore, if Y is fixed by factor supplies and technology, and V is constant, any change in the money supply (M) must lead to a proportionate change in the price level (P).

In terms of growth rates:

The Quantity Equation can be expressed in percentage changes:

$$\% \Delta M + \% \Delta V = \% \Delta P + \% \Delta Y$$

Where:

- $\% \Delta M$ = Growth rate of the money supply
- $\% \Delta V$ = Growth rate of velocity

- $\% \Delta P$ = Inflation rate (denoted as π)
- $\% \Delta Y$ = Growth rate of real GDP

If V is constant, $\% \Delta V = 0$.

Then, $\pi = \% \Delta M - \% \Delta Y$.

This implies that the inflation rate is the growth rate of the money supply minus the growth rate of real GDP.

If real GDP growth is determined by factors other than money, then the primary determinant of inflation in the long run is the growth rate of the money supply.

- Countries with high money supply growth should experience high inflation.
- Countries with low money supply growth should experience low inflation.
- Empirical evidence over long time spans supports this relationship: higher money supply growth is associated with higher inflation, and also with more volatile and unpredictable inflation. Low money supply growth is associated with low and more predictable inflation.

Milton Friedman's Monetary Policy Rule:

Based on this theory, Milton Friedman proposed that the money supply should grow at a constant rate (e.g., 8%).

- If the economy booms (e.g., 5% growth), inflation would be 3%.
- If the economy stagnates (e.g., 0% growth), inflation would be 8%. The idea was that in downturns, higher inflation would inflate asset prices, potentially making it easier for debtors to pay off fixed-rate loans if their incomes rose with inflation.

6-2 Seigniorage: The Revenue from Creating Money

Seigniorage (pronounced "seignorage") is the revenue a government raises by printing money.

When the government prints money to finance expenditure, it increases the money supply, which can lead to inflation.

Inflation is like a tax on holding money: the real value of money held by the public decreases. This is often called the inflation tax.

- The inflation tax is paid by people who hold cash or non-interest-bearing assets, as the purchasing power of their money erodes.
- Approximately 20% of the U.S. population is "unbanked" (no bank account), holding their assets primarily in cash, making them particularly vulnerable to the inflation tax.

The Federal Reserve in the U.S. controls the money supply. It earns profit through seigniorage (e.g., interest on bonds it buys by printing money). By law, the Federal Reserve must turn over its profits to the U.S. Treasury Department.

6-3 Inflation and Interest Rates

Two Interest Rates: Real and Nominal

- **Nominal Interest Rate (i):** The interest rate as usually reported; it is not adjusted for inflation. It tells you how fast the number of dollars in your account will rise over time.
- **Real Interest Rate (r):** The nominal interest rate corrected for the effects of inflation. It tells you how fast the purchasing power of your savings will rise over time.

The relationship is:

$$r = i - \pi$$

Where:

- r = Real interest rate
- i = Nominal interest rate
- π = Inflation rate

This can be rearranged as: $i = r + \pi$

The Fisher Effect

The Fisher Effect states that there is a one-for-one adjustment of the nominal interest rate to the inflation rate.

If the real interest rate (r) is assumed to be determined by equilibrium in the market for goods and services (or more broadly, by factors exogenous to the monetary system, like the Federal Reserve's influence), then an increase in the inflation rate (π) by 1 percentage point will cause a 1 percentage point increase in the nominal interest rate (i).

$$i = r + E\pi$$

Where $E\pi$ is the expected inflation rate.

Empirical evidence shows that countries with higher inflation rates tend to have higher nominal interest rates, especially over longer periods.

Two Real Interest Rates: Ex Ante and Ex Post

- **Ex Ante Real Interest Rate:** The real interest rate that the borrower and lender expect when the loan is made. It is calculated as $i - E\pi$, where $E\pi$ is the expected future inflation.
- **Ex Post Real Interest Rate:** The real interest rate that is actually realized. It is calculated as $i - \pi$, where π is the actual future inflation.

Borrowers and lenders make decisions based on the ex ante real interest rate. However, the actual return depends on the ex post real interest rate.

6-4 The Nominal Interest Rate and the Demand for Money

The Cost of Holding Money

The nominal interest rate (i) is the opportunity cost of holding money (which earns no or low interest) instead of bonds or other interest-bearing assets.

- If i is high, people will want to hold less money because the forgone interest is high.
- If i is low, people will be more willing to hold money.

Therefore, the demand for real money balances depends negatively on the nominal interest rate and positively on the level of real income (Y).

A more general money demand function can be written as:

$$(M/P)^d = L(i, Y)$$

Where L denotes liquidity preference. The demand for liquidity (L) is negatively related to i and positively related to Y .

Using the Fisher effect ($i = r + E\pi$), the money demand function can be written as:

$$(M/P)^d = L(r + E\pi, Y)$$

Future Money and Current Prices

The price level (P) adjusts to equate the supply of real money balances (M/P) with the demand for real money balances ($L(r + E\pi, Y)$).

$$M/P = L(r + E\pi, Y)$$

Variables determination:

- M is set by the central bank (e.g., Federal Reserve).
- r adjusts to equilibrate savings and investment (or is set exogenously).
- Y is determined by factors of production and the production function.
- P adjusts to make the equation hold.

Changes in expected inflation ($E\pi$) can affect the current price level:

- If people expect higher inflation in the future ($E\pi$ rises), the nominal interest rate (i) rises (Fisher effect).
- A higher i reduces the demand for real money balances ($L(i, Y)$ falls).
- If M , r , and Y are unchanged, the current price level (P) must rise to reduce the supply of real money balances (M/P) and restore equilibrium.

Thus, expectations about future monetary policy and inflation can influence current economic variables. When inflation is high and volatile, expected inflation ($E\pi$) may differ significantly from actual inflation (π), impacting money demand and velocity.

- **Treasury Inflation-Protected Securities (TIPS):** These are bonds whose return is indexed to the inflation rate, protecting investors from unexpected inflation. Owning TIPS means giving up liquidity.

6-5 The Social Costs of Inflation

Inflation costs can be categorized based on whether inflation is expected or unexpected.

The Layperson's View and the Classical Response

Many laypeople believe inflation makes them poorer because it raises the cost of living. However, classical economics suggests that if all prices and nominal incomes rise proportionally (as implied by money neutrality in the long run), real income remains unchanged.

The Costs of Expected Inflation

Even when inflation is perfectly anticipated, it can impose costs:

1. Shoeleather Costs:

- The resources wasted when inflation encourages people to reduce their money holdings.
- With high inflation, money loses value quickly. People make more frequent trips to the bank to withdraw smaller amounts of cash to spend immediately, "wearing out their shoe leather."
- This includes the time and effort spent managing cash balances to avoid the inflation tax.
- Example: During periods of rapidly rising housing prices (e.g., 2021-2022), people rushed to buy houses, sometimes making hasty decisions to avoid anticipated future price increases, which can be seen as a form of shoeleather cost.

2. Menu Costs:

- The costs to firms of changing their prices.
- Examples include printing new menus, updating price tags, reprogramming vending machines, and advertising new prices.
- Higher inflation forces firms to change prices more frequently, increasing these costs.
- Menu costs also include the potential loss of business associated with raising prices if customers react negatively.

3. Relative Price Distortions (Variability):

- When firms change prices infrequently (due to menu costs), inflation causes relative prices to vary more than they would otherwise.
- If some firms adjust prices quickly while others lag, the price signals in the market become distorted.
- Example: If one ice cream shop raises its price due to inflation while another hasn't yet, customers may flock to the cheaper one, even if there's no quality difference. This misallocates resources because market decisions are based on temporarily skewed prices rather than efficiency or true value. This can lead to misallocation of financial capital and investment.

4. Tax Distortions:

- Inflation can alter individuals' tax liability, often in ways not intended by lawmakers, because many tax laws do not fully account for inflation.
- **Capital Gains Taxes:** In many countries (e.g., U.S.), capital gains are taxed without adjusting for inflation. If an asset's price rises due to inflation, the owner pays taxes on a nominal gain that may not represent a real gain in purchasing power.
 - Example: A house bought for \$800,000 sells for \$1.5 million. The nominal gain is \$700,000. Even if a portion of this is due to general inflation, capital gains tax (e.g., 15% federal + state taxes) is typically applied to the nominal gain (after deductions like the \$250,000/\$500,000 home sale exclusion in the U.S.). This can discourage transactions and lead to an illiquid housing market, potentially raising housing prices.

5. General Inconvenience (Confusion and Inconvenience):

- Living in a world with a changing price level is inconvenient. Money is the yardstick used to measure economic transactions. When inflation is high, the value of this yardstick is constantly changing.
- It makes long-term financial planning more difficult (e.g., planning for retirement, college expenses, or long-term care insurance). The uncertainty about future prices complicates calculations of how much to save.
- Example: Estimating retirement needs becomes harder if the future inflation rate is unknown or volatile. The real cost of a nursing home stay in 30 years is difficult to predict.

The Costs of Unexpected Inflation

Unexpected inflation has an additional, more pernicious effect: it arbitrarily redistributes wealth among individuals.

1. Arbitrary Redistribution of Purchasing Power (Wealth):

- Many long-term contracts (e.g., loans, mortgages) are not indexed to inflation but are specified in nominal terms.
- If inflation is unexpectedly high:
 - Debtors (borrowers) benefit because they repay loans with dollars that are worth less than expected.
 - Creditors (lenders) lose because the real value of the loan repayments they receive is lower than expected.
- If inflation is unexpectedly low:
 - Creditors benefit because the real value of repayments is higher than expected.
 - Debtors lose because they repay loans with dollars that are worth more than expected.
- Example: During the unexpectedly high inflation of 2020-2023 in the U.S., borrowers with fixed-rate mortgages benefited as their wages and home values rose with inflation while their mortgage payments remained fixed, effectively reducing the real burden of their debt. Banks and lenders received repayments with diminished purchasing power.

2. Increased Uncertainty:

- When inflation is high, it tends to be more volatile and unpredictable.
- This increased uncertainty makes it harder for individuals and businesses to make informed decisions and can discourage investment and long-term planning.

- o Risk-averse individuals (including banks) may react to high and volatile inflation by demanding higher nominal interest rates to compensate for the increased risk (a higher risk premium). This can lead to higher real interest rates.

Two Benefits of Inflation

While costly, mild and predictable inflation may offer some benefits:

1. Facilitating Real Wage Adjustments in Labor Markets:

- o Nominal wages are often "sticky" downwards; firms are reluctant to cut nominal wages, and workers resist such cuts.
- o Inflation allows real wages to fall even if nominal wages do not. If inflation is, say, 6%, a firm can give a 2% nominal wage increase, resulting in a 4% decrease in the real wage.
- o This can help labor markets reach equilibrium more efficiently, especially for struggling businesses that might otherwise have to lay off workers or go bankrupt if they had to maintain real wage levels or could not cut nominal wages.

2. Allowing for Negative Real Interest Rates:

- o Central banks can only lower the nominal interest rate to zero.
- o If the nominal rate is zero, the real interest rate is $0 - \pi = -\pi$.
- o A positive inflation rate allows the real interest rate to become negative. Negative real interest rates can be a useful policy tool to stimulate investment and consumption during severe economic downturns when nominal rates are at the zero lower bound.

6-6 Hyperinflation

Hyperinflation is defined as inflation exceeding 50% per month. This means prices are more than doubling every two months.

At such rates, the costs of inflation (shoeleather, menu, etc.) become extreme and insurmountable.

- Money ceases to function effectively as a store of value, a unit of account, or a medium of exchange.
- People rush to spend money as soon as they receive it.
- Barter or the use of foreign currencies (e.g., U.S. dollars) or alternative assets (e.g., crypto coins) may become common.

The Costs of Hyperinflation

Hyperinflation is one of the quickest ways to destroy an economy. All costs of moderate inflation become magnified:

- Shoeleather costs are severe as people go to great lengths to avoid holding rapidly devaluing domestic currency.
- Menu costs are extreme as prices must be changed constantly.
- Relative prices become highly distorted.
- Tax systems break down as real tax revenue plummets due to delays in collection (Tanzi effect).
- The economy effectively grinds to a halt as normal business transactions become impossible.

The Causes of Hyperinflation

Hyperinflations typically begin when governments face large budget deficits that they cannot finance by borrowing (e.g., if lenders are unwilling to lend). They then resort to printing money (seigniorage) to pay their bills.

Once hyperinflation starts, the problem often worsens:

- As prices rise, real tax revenue often falls because of collection delays (nominal collections don't keep up with soaring prices).
- The government's deficit may grow, forcing it to print even more money, fueling further inflation.

Hyperinflations end when the government implements fiscal reforms, such as reducing government spending and increasing taxes, to eliminate the need for seigniorage, and makes a credible commitment to sound monetary policy.

Case Study: Hyperinflation in Zimbabwe

Zimbabwe experienced a severe hyperinflation episode in the late 2000s.

- The government continuously printed money, adding more and more zeros to banknotes (e.g., \$10 billion, and even non-circulating \$10 trillion bills).
- The currency became virtually worthless.
- Transactions shifted to foreign currencies, primarily the U.S. dollar.
- This was driven by the government's desire for seigniorage revenue without relying on tax revenue.

6-7 Conclusion: The Classical Dichotomy

Real Variables: Variables measured in physical units or relative terms (e.g., quantities of goods and services produced (real GDP), hours of labor, productivity, real wage, real interest rate, capital stock). They reflect actual economic activity and purchasing power.

Nominal Variables: Variables measured in terms of money (e.g., nominal GDP, nominal wage, nominal interest rate, price level, money supply).

The Classical Dichotomy is the theoretical separation of real and nominal variables in classical economic theory.

It suggests that changes in the money supply affect nominal variables but do not affect real variables in the long run.

Money Neutrality: The proposition that changes in the money supply do not affect real variables in the long run.

- If the central bank doubles the money supply, classical theory predicts that all nominal variables (prices, nominal wages, nominal GDP) will double, but all real variables (output, employment, real wages, real interest rates) will remain unchanged.

Implications:

- Central banks, by controlling the money supply, can influence nominal variables (like the price level and inflation rate) but have limited ability to affect real variables in the long run.

- To improve long-run economic performance (e.g., increase real GDP, productivity, labor supply), policymakers must look to factors other than monetary policy, such as policies that encourage capital formation, technological innovation, and improvements in labor force skills.

Critique related to the Financial Sector (from the lecture transcript):

The lecturer implies that if the classical dichotomy holds, then much of the activity in the financial sector (e.g., day trading stocks, crypto trading) might not contribute to long-run real economic growth.

- Such activities may increase nominal wealth for individuals but do not necessarily create new real goods and services for society as a whole.
- Long-run economic growth stems from producing actual goods and services that people want and need (e.g., housing, healthcare, infrastructure, manufactured goods).
- Labor and capital devoted to purely financial transactions might be seen as diverting resources from the production of real value.

Key Concepts Glossary

(Based on lecture content and provided chapter review)

- **Classical Dichotomy:** The theoretical separation of real and nominal variables; it implies that changes in the money supply do not affect real variables in the long run.
- **Ex Ante Real Interest Rate:** The real interest rate expected by borrowers and lenders when a loan is made ($i - E\pi$).
- **Ex Post Real Interest Rate:** The real interest rate actually realized after inflation occurs ($i - \pi$).
- **Expected Inflation ($E\pi$):** The rate of inflation that economic agents anticipate will occur in the future.
- **Fisher Effect:** The one-for-one adjustment of the nominal interest rate to the expected inflation rate ($i = r + E\pi$).
- **Fisher Equation:** The equation showing the relationship between nominal interest rate, real interest rate, and inflation: $i = r + \pi$.
- **Hyperinflation:** Extremely high inflation, typically defined as inflation exceeding 50% per month.
- **Income Velocity of Money (V):** The rate at which money circulates in the economy in relation to income; $V = (P \times Y) / M$.
- **Inflation (π):** A sustained increase in the general price level of goods and services in an economy over a period of time.
- **Inflation Tax:** The reduction in the real value of money held by the public caused by inflation when the government prints money to finance its spending.
- **Menu Costs:** The costs to firms of changing their prices.
- **Monetary Neutrality:** The proposition that changes in the money supply do not affect real variables in the long run.
- **Money Demand Function:** An equation showing the determinants of the quantity of real money balances people wish to hold, e.g., $(M/P)^d = L(i, Y)$.
- **Nominal Interest Rate (i):** The interest rate not adjusted for inflation; the stated interest rate.
- **Nominal Variables:** Variables measured in monetary units (e.g., nominal GDP, price level, nominal wage).

- **Price Level (P):** A measure of the average prices of goods and services in an economy (e.g., GDP deflator or CPI).
- **Quantity Equation:** The identity $M \times V = P \times Y$, which relates the money supply, velocity of money, price level, and real output.
- **Quantity Theory of Money:** The theory that assumes velocity is constant and concludes that the money supply determines nominal GDP, and in the long run, primarily affects the price level.
- **Real Interest Rate (r):** The nominal interest rate adjusted for inflation ($r = i - \pi$); measures the rate of return in terms of purchasing power.
- **Real Money Balances (M/P):** The quantity of money expressed in terms of the amount of goods and services it can buy; the money supply divided by the price level.
- **Real Variables:** Variables measured in physical units or relative terms, adjusted for inflation (e.g., real GDP, real wage, employment).
- **Relative Price Distortions:** Variations in the prices of goods relative to each other caused by inflation when firms adjust prices at different times or speeds.
- **Seigniorage:** The revenue raised by the government through the creation of money.
- **Shoeleather Costs:** The resources wasted when inflation encourages people to reduce their holdings of money (e.g., more frequent trips to the bank).
- **Transactions Velocity of Money (VT):** The rate at which money circulates in the economy in relation to total transactions; $VT = (P \times T) / M$.
- **Velocity of Money (V):** The rate at which money changes hands in the economy.

Chapter 7 Reference Guide:

The Open Economy

7-1 The International Flows of Capital and Goods

In an open economy, countries interact with other countries through trade in goods and services and through financial capital flows.

The Role of Net Exports

- **Net Exports (NX):** Defined as the value of a country's exports minus the value of its imports.
 - $NX = \text{Exports} - \text{Imports}$
- Net exports indicate the difference between what a country produces and what it consumes domestically.
 - The national income identity in an open economy is: $Y = C + I + G + NX$
 - This can be rearranged to show net exports as the difference between output (Y) and domestic spending ($C + I + G$): $NX = Y - (C + I + G)$

- **Trade Surplus:** Occurs when exports are greater than imports ($NX > 0$). The country produces more than it spends domestically.
- **Trade Deficit:** Occurs when imports are greater than exports ($NX < 0$). The country spends more than it produces domestically. The US typically runs a trade deficit.
- **Balanced Trade:** Occurs when exports equal imports ($NX = 0$). The country's spending equals its production.

International Capital Flows and the Trade Balance

- **Net Capital Outflow (S-I):** Represents the amount of money flowing out of a country for the purpose of acquiring foreign assets, minus the amount of foreign money flowing into the country to acquire domestic assets. It is also referred to as net foreign investment.
 - It is equal to the difference between domestic saving (S) and domestic investment (I):

$$\text{NetCapitalOutflow} = S - I$$
 - If $S > I$, the country is a net lender to the rest of the world, and net capital outflow is positive.
 - If $S < I$, the country is a net borrower from the rest of the world, and net capital outflow is negative. The US is a net borrower.
- **Relationship between Net Exports and Net Capital Outflow:**
 - A fundamental accounting identity states that net exports must equal net capital outflow: $NX = S - I$.
 - This means that the trade balance and net capital flows are two sides of the same coin.
 - A country with a trade deficit ($NX < 0$) must be a net borrower from abroad ($S < I$).
 - A country with a trade surplus ($NX > 0$) must be a net lender abroad ($S > I$).

7-2 Saving and Investment in a Small Open Economy

A small open economy is one that is too small to affect the world interest rate.

Capital Mobility and the World Interest Rate

- **Assumptions for a Small Open Economy Model:**
 1. **Perfect Capital Mobility:** Residents of the country have full access to world financial markets, and foreigners have full access to domestic financial markets. Capital can flow freely between countries.
 2. **Country is Small:** The domestic economy is too small to influence the world real interest rate (r^*). The country is a price-taker in world financial markets.
- **World Real Interest Rate (r^*):** The real interest rate prevailing in world financial markets. In a small open economy with perfect capital mobility, the domestic real interest rate (r) will be equal to the world real interest rate ($r = r^*$).
 - A **risk premium (θ)** might exist, causing $r = r^* + \theta$, due to factors like political risk or different legal structures. For simplicity, the basic model often assumes $\theta = 0$.
- **Production function:** Output (Y) is a function of fixed capital (K) and labor (L): $Y = F(\bar{K}, \bar{L}) = \bar{Y}$.
- **Consumption (C):** $C = C(Y - T)$, where T are taxes.
- **Investment (I):** Investment is a function of the real interest rate: $I = I(r)$. In a small open economy, $I = I(r^*)$.

- National Saving (S): $S = Y - C - G = \bar{Y} - C(\bar{Y} - T) - G = \bar{S}$. Savings is fixed given fixed Y, G, and T.

The Model for a Small Open Economy

- Given that $NX = S - I$:
 - $NX = \bar{S} - I(r^*)$
- The trade balance (NX) is determined by the difference between fixed national saving ($\bar{S}$) and investment, which depends on the world real interest rate ($I(r^*)$).
- If r^* is high, investment $I(r^*)$ is low, leading to a trade surplus ($S > I(r^*)$).
- If r^* is low, investment $I(r^*)$ is high, leading to a trade deficit ($S < I(r^*)$).

How Policies Influence the Trade Balance in a Small Open Economy

1. Domestic Fiscal Policy:

- An increase in government spending (G) or a decrease in taxes (T) reduces national saving ($S = Y - C - G$).
- This inward shift of the savings curve reduces $(S - I(r^*))$, leading to a decrease in net exports (or a larger trade deficit).
- The world interest rate (r^*) remains unchanged.
- Domestic fiscal expansion crowds out net exports in a small open economy.

2. Fiscal Policy Abroad (in a large foreign country that can affect r^*):

- If foreign countries (large enough to influence r^*) increase their government spending or cut taxes, their national saving decreases, leading to an increase in the world real interest rate (r^*).
- For the small open economy, a higher r^* leads to lower domestic investment $I(r^*)$.
- With saving ($\bar{S}$) unchanged, $(S - I(r^*))$ increases, leading to an increase in net exports (or a smaller trade deficit/larger trade surplus) for the small open economy.

3. Changes in Investment Demand:

- An outward shift in the investment demand curve (e.g., due to technological innovation or favorable government policies towards investment) means that at any given r^* , investment is higher.
- This increases $I(r^*)$.
- With saving ($\bar{S}$) unchanged, $(S - I(r^*))$ decreases, leading to a decrease in net exports (or a larger trade deficit).

7-3 Exchange Rates

Nominal and Real Exchange Rates

- **Nominal Exchange Rate (e)**: The relative price of the currency of two countries. It's the rate at which a person can trade the currency of one country for the currency of another.¹

- Example: If $e=120$ yen per U.S. dollar, then one U.S. dollar can be exchanged for 120 Japanese yen.
 - **Appreciation:** An increase in the value of a currency. If the dollar appreciates, e (yen per dollar) increases, meaning the dollar buys more foreign currency.
 - **Depreciation:** A decrease in the value of a currency. If the dollar depreciates, e (yen per dollar) decreases, meaning the dollar buys less foreign currency.
 - Nominal exchange rates are volatile and change frequently.
- **Real Exchange Rate (ϵ):** The relative price of the goods of two countries. It tells us the rate at which we can trade the goods of one country for the goods of another. It reflects the purchasing power of a currency for goods and services across borders.
 - Formula: $\epsilon = e \times \frac{P_d}{P_f}$
 - Where e is the nominal exchange rate (foreign currency per unit of domestic currency).
 - P_d is the price level of domestic goods (e.g., in U.S. dollars).
 - P_f is the price level of foreign goods (e.g., in Japanese yen).
 - Example: If a U.S. McDouble costs \$2.50 (P_d), a Japanese McDouble costs 200 yen (P_f), and the nominal exchange rate (e) is 120 yen/dollar.
 - The price of the U.S. McDouble in yen is $\$e \times P_d = 120 \text{ yen/dollar} \times 2.50 = 300 \text{ yen}$.
 - The real exchange rate $\epsilon = \frac{300 \text{ yen}}{200 \text{ yen}} = 1.5$.
 - This means one U.S. McDouble trades for 1.5 Japanese McDoubles. U.S. goods are relatively more expensive.
 - If ϵ is high, domestic goods are relatively expensive compared to foreign goods.
 - If ϵ is low, domestic goods are relatively cheap compared to foreign goods.

The Real Exchange Rate and the Trade Balance

- The net exports of a country depend on the real exchange rate: $NX = NX(\epsilon)$.
- **If the real exchange rate (ϵ) appreciates (rises):**
 - Domestic goods become more expensive relative to foreign goods.
 - Exports (X) will fall (foreigners buy fewer of our expensive goods).
 - Imports (M) will rise (domestic residents buy more of the cheaper foreign goods).
 - Therefore, net exports ($NX = X - M$) will fall.
- **If the real exchange rate (ϵ) depreciates (falls):**
 - Domestic goods become cheaper relative to foreign goods.
 - Exports (X) will rise.
 - Imports (M) will fall.
 - Therefore, net exports (NX) will rise.
- The $NX(\epsilon)$ curve is downward sloping: a higher ϵ leads to lower NX .

The Determinants of the Real Exchange Rate

- In equilibrium, the supply of domestic currency for net capital outflow ($S-I$) must equal the demand for domestic currency by foreigners wanting to buy net exports ($NX(\epsilon)$).
 - $S-I = NX(\epsilon)$

- The S-I curve is vertical because saving (S) is fixed (dependent on $\bar{Y}, G, T$) and investment (I) depends on the world real interest rate (r^*) (in a small open economy) or the domestic r (in a large open economy, which is determined by domestic S and I). It does not depend on ϵ .
- The real exchange rate (ϵ) adjusts to ensure that net exports equal the level of net capital outflow.

How Policies Influence the Real Exchange Rate (in a Large Open Economy context, which sets its own r)

1. Domestic Fiscal Policy (Expansionary - $G \uparrow$ or $T \downarrow$):

- Reduces national saving ($S \downarrow$).
- The S-I curve shifts to the left.
- This reduces the supply of domestic currency to be invested abroad.
- The real exchange rate (ϵ) appreciates (rises).
- Net exports (NX) fall (due to both the direct shift in S-I and the appreciation of ϵ). This is consistent with the "twin deficits" argument (government budget deficit leading to a trade deficit).

2. Fiscal Policy Abroad (Expansionary - Foreign $G \uparrow$ or $T \downarrow$):

- If this increases the world interest rate (r^*), it reduces domestic investment ($I \downarrow$) in a country whose r is tied to r^* .
- This increases S-I, shifting the S-I curve to the right.
- The real exchange rate (ϵ) depreciates (falls).
- Net exports (NX) rise.
- Alternatively, if fiscal expansion abroad directly increases demand for our goods (shifting $NX(\epsilon)$ curve out), this would cause appreciation. The transcript's example (source 293-300) focuses on how foreign fiscal expansion might reduce capital inflow to the US (or increase US investment abroad if (r^*) rises globally, making US assets relatively less attractive or foreign more), thus decreasing US I or increasing S-I. This increases the supply of dollars, leading to a depreciation of ϵ and higher NX.

3. Increase in Domestic Investment Demand (e.g., due to deregulation):

- Shifts the I curve to the right (or S-I to the left as I increases).
- The S-I curve shifts to the left.
- The real exchange rate (ϵ) appreciates (rises).
- Net exports (NX) fall.

4. Trade Policies (e.g., Tariffs or Quotas to restrict imports):

- For a given real exchange rate ϵ , restricting imports initially increases net exports ($NX = X - M$, as M falls). The $NX(\epsilon)$ curve shifts to the right.
- However, S-I (the supply of currency) has not changed.
- The real exchange rate (ϵ) must appreciate (rise) until NX returns to its original level determined by S-I.
- The result: ϵ is higher, imports are lower (due to policy), and exports are also lower (due to higher ϵ). The overall trade balance (NX) is unchanged.

- Trade policies do not affect S or I , so they cannot alter the trade balance ($S-I$). They mainly affect the volume of trade and the composition of GDP.

The Determinants of the Nominal Exchange Rate (e)

- Recall the formula for the real exchange rate: $\epsilon = \frac{P_d}{P_f}$.
- Rearranging for the nominal exchange rate: $e = \epsilon \frac{P_f}{P_d}$.
- The nominal exchange rate (e) depends on the real exchange rate (ϵ) and the price levels in the two countries (P_f and P_d).
- **Changes in Percentage Terms (Log-linearized form):**
 - - Where π_f is the foreign inflation rate and π_d is the domestic inflation rate.
- **Implications:**
 - If a country has high domestic inflation (π_d) relative to other countries (π_f), its nominal exchange rate (e) will tend to depreciate (assuming ϵ is relatively stable). This is because $\pi_f - \pi_d$ becomes negative.
 - If a country has low domestic inflation, its currency will tend to appreciate.
 - Empirical evidence suggests this relationship holds over long periods (decades) but not necessarily in the short run.

The Special Case of Purchasing-Power Parity (PPP)

- **Purchasing-Power Parity (PPP):** A theory stating that a unit of any given currency should be able to buy the same quantity of goods in all countries. It implies that the "law of one price" holds for all goods.
 - If PPP holds, the real exchange rate (ϵ) must be equal to 1.
 - $\epsilon = \frac{P_d}{P_f} = 1$
 - This implies that the nominal exchange rate $e = \frac{P_f}{P_d}$.
 - Under PPP, the nominal exchange rate adjusts to equalize the price of a basket of goods across countries. Any changes in P_d or P_f must be offset by changes in e .
 - Therefore, if PPP holds, (since $\epsilon = 1$).
- **Implications of PPP:**
 - If $\epsilon = 1$, the $NX(\epsilon)$ curve is horizontal (perfectly elastic). Net exports are highly sensitive to any deviation from $\epsilon = 1$.
 - In this case, $S-I$ determines net capital outflow, but it does *not* influence the real or nominal exchange rate in the same way. The nominal exchange rate is solely determined by relative price levels.
- **Why PPP Does Not Always Hold in Reality:**
 1. **Not all goods are tradable:** Some goods and services (e.g., haircuts, housing) are difficult to trade internationally. Arbitrage cannot equalize their prices.
 2. **Tradable goods are not always perfect substitutes:** A Toyota made in Japan may not be a perfect substitute for a Ford made in the U.S. Consumer preferences vary.
 3. **Transportation costs:** Shipping goods between countries costs money, creating price wedges.

- 4. **Trade barriers:** Tariffs, quotas, and regulations can prevent prices from equalizing.
 - **Usefulness of PPP:**
 - While not perfectly accurate in the short run, PPP provides a good explanation for long-run trends in exchange rates, especially between countries with significantly different inflation rates.
 - The correlation between relative inflation and nominal exchange rate depreciation is strong over decades.
-

7-4 Conclusion: The United States as a Large Open Economy

- The models of a closed economy and a small open economy represent extremes.
 - **Large Open Economies (LOE)**, like the United States, share characteristics of both:
 - They are open to international trade and capital flows.
 - Due to their size, their domestic policies (fiscal, monetary) can influence world variables, including their own interest rates and potentially the world interest rate. They are not pure "price takers" for interest rates.
 - Their savings and investment behavior significantly impacts their own trade balance and exchange rates, and also has repercussions for other economies.
 - **Fiscal Expansion in a Large Open Economy:**
 - **Closed Economy Effect:** Raises interest rates, crowds out domestic investment. No change in NX (as $NX=0$).
 - **Small Open Economy Effect:** No change in interest rates (set by r^*), no change in investment. Reduces NX (causes trade deficit).
 - **Large Open Economy Effect (Mixture):** Interest rates likely rise (but perhaps by less than in a closed economy due to capital inflows). Investment falls somewhat. Net exports fall (trade deficit worsens) as the currency appreciates. The impact is a blend of the closed and small open economy outcomes.
 - The U.S. runs a persistent trade deficit, meaning $S < I$. It relies on net capital inflows from the rest of the world to finance its domestic investment.
-

Glossary of Key Notation and Terms2

- **C:** Consumption expenditure.
- **e:** Nominal Exchange Rate (units of foreign currency per unit of domestic currency, e.g., yen per dollar).
- **epsilon (Epsilon):** Real Exchange Rate (relative price of domestic goods in terms of foreign goods; $\epsilon = P_d/P_f$).
- **G:** Government purchases.
- **I:** Investment expenditure. $I(r)$ indicates investment is a function of the real interest rate.
- **Net Capital Outflow:** The net flow of funds being invested abroad by domestic residents ($S-I$). Equal to the Trade Balance (NX).
- **Net Exports (NX):** Exports minus imports. $NX=Y-(C+I+G)$. $NX=S-I$. $NX(\epsilon)$ indicates net exports are a function of the real exchange rate.
- **P_d:** Price level of domestic goods.

- **P_f**: Price level of foreign goods.
- **PPP (Purchasing-Power Parity)**: Theory that states exchange rates between currencies are in equilibrium when their purchasing power is the same in each of the two countries, meaning $\epsilon=1$.
- **r**: Real interest rate.
- **r^*** : World real interest rate.
- **S**: National Saving ($S=Y-C-G$).
- **Trade Balance**: Another term for net exports (NX).
- **Trade Deficit**: $(NX < 0)$ (Imports > Exports).
- **Trade Surplus**: $NX > 0$ (Exports > Imports).
- **T**: Taxes net of transfer payments.
- **theta (Theta)**: Risk premium associated with investing in a particular country.
- **π_d (Pi, domestic)**: Inflation rate in the domestic country (π).
- **π_f (Pi, foreign)**: Inflation rate in the foreign country (π).
- **Y**: Real GDP or Output. $\bar{Y}$ indicates fixed output.
- **Appreciation (Currency)**: An increase in the value of a currency relative to foreign currencies (nominal exchange rate e rises if defined as foreign/domestic). Results in real appreciation (ϵ rises) if price levels are constant.
- **Depreciation (Currency)**: A decrease in the value of a currency relative to foreign currencies (nominal exchange rate e falls if defined as foreign/domestic). Results in real depreciation (ϵ falls) if price levels are constant.
- **Small Open Economy**: An economy that participates in international trade and finance but is small enough that its policies do not affect the world interest rate.
- **Large Open Economy**: An economy that participates in international trade and finance and is large enough that its policies can affect world variables like interest rates and its own exchange rate significantly.

Chapter 12: Exhaustive Reference Guide - Introduction to Economic Fluctuations

This guide provides a comprehensive overview of the concepts discussed in the lecture on Aggregate Demand (AD) and Aggregate Supply (AS), designed for completeness and ease of reference.

1. Overview of the AD-AS Model

- The Aggregate Demand and Aggregate Supply model is one of the most fundamental models in all of economics.
- It is used to analyze economic fluctuations, including the price level (i.e. inflation) and Y real GDP aggregate output.

- The model helps predict the fundamental effects of different shocks on the economy and how that might change from short run versus the long run.
- It has been a highly effective workhorse model in economics for approximately 80 years, more or less in the same form.

2. The Business Cycle

Definition and Characteristics

- The **Business Cycle** refers to the booms and busts in the economy.
- A variable is considered **cyclical** if it goes up when the economy is growing quickly and it goes down when the economy is stagnant or in decline in a recession.

GDP Growth Patterns

- Over long periods of time, GDP growth in the United States averages about 3% a year.
- **International Comparisons:**
 - Smaller countries tend to have slightly higher average growth rates, but more volatile growth.
 - Countries in Europe and Japan tend to have lower average growth rates, closer to 1% to 2%, but less volatile.
 - The higher your growth rate gets, the more volatile your growth rate will be, which is what you see in emerging markets and developing countries.
 - In rich countries around the world, average growth rates are lower but not as volatile.

Components' Behavior with GDP

- **Consumption (C):**
 - Fluctuates with GDP.
 - Generally speaking, goes up by about 2%, 2.5% a year in the United States.
 - When there's a recession, that growth rate is lower. When the economy is booming, consumption grows a little bit higher.
- **Investment (I):**
 - Particularly fluctuates with GDP.
 - Generally speaking, increases in investment mean the economy is probably going to grow.
 - When investment is in decline, you're probably in a recession.

Unemployment and Okun's Law

- Unemployment tends to rise during a recession and it falls when an economy is in an expansion.
- **Okun's Law** describes the negative relationship between the change in real GDP and the change in the unemployment rate.
 - When the change in real GDP is very high, the unemployment rate tends to decline.
 - When the change in GDP is really low, the unemployment rate tends to increase.

- A GDP growth rate of approximately three percent a year means unemployment isn't changing (this is kind of par or average).
- The law is more likely to hold over the course of many decades, even though it might not hold true month over month.
- Outliers can occur, such as in 1971 when the unemployment rate went up while there was still growth in GDP due to a supply shock (Arab oil embargo). Another example is 2021, where the economy bounced back quickly and the unemployment rate didn't necessarily hold up to the fitted line.

3. Leading Economic Indicators

Purpose and Nature

- **Leading Economic Indicators** are used to get an idea of how the economy is going before actual GDP numbers are available.
- The Conference Board publishes an index of these indicators.
- Interpreting these indicators is where the science of economics becomes more of an art form; not every indicator is relevant at every point in time, and there are multiple ways to make forecasts. (Analogy: many different recipes to make chocolate chip cookies, but all are identifiable as chocolate chip cookies).

Key Indicators

The following are ingredients often included in indexes of leading economic indicators, though proportions might differ based on what's considered most important at a given time:

- **Weekly hours of work in manufacturing:** An increase in hours, especially overtime (which is expensive for businesses), suggests the economy is doing well and business is booming.
- **Weekly initial claims for unemployment insurance:** Economists watch this very closely. An increase in claims is generally not great for the economy. A **four-week moving average** is often used to smooth out bumps caused by large, firm-specific layoffs in a single week.
- **Manufacturer new orders for consumer goods and materials:**
 - Orders for non-durable goods (e.g., food, clothing) are not watched as closely because people tend to buy these items regardless of the economic situation.
 - Orders for **durable goods** (items supposed to last two years or more, like sofas, refrigerators, appliances, furniture) are watched more closely. When consumers buy more durable goods, it suggests the economy is doing well.
- **New orders for non-defense capital goods:** This indicates business investment and is highly correlated with GDP growth. Increased orders for capital equipment and machinery are good for the economy.
 - **Excludes aircraft:** Aircraft orders are extremely volatile and can be skewed by large, infrequent orders from airlines (e.g., an order with Boeing).
 - **Excludes defense goods:** Government spending (including defense) is impacted by political factors, not necessarily economic ones.
- **ISM New Orders Index:** This is from the Institute of Supply Management, another manufacturing index that is followed.

- **Building permits for new private housing units:** Watched very closely because private housing is part of investment. When people buy new houses, they also buy other goods like sofas and appliances, indicating economic strength.
- **Stock prices:** Viewed with caution and skepticism ("fuzzy"). John Maynard Keynes said stocks were determined by "animal spirits," meaning emotions and sentiment play a significant role. Regulatory effects (e.g., Sarbanes-Oxley after Enron) can also impact the number of publicly traded companies, making some stock market indices (like the Wilshire 5000, which used to track 5000-6000 companies but now there are fewer than 5000 publicly traded) less representative. Not given much credence as a leading indicator by the lecturer.
- **Lending credit index:** Relevant, especially watching commercial lending by small and regional banks.
- **Interest rate spread (Yield Curve):** Commonly the 10-year Treasury rate minus a shorter-term rate like the federal funds rate, the 2-year Treasury, or the 3-month Treasury.
 - This spread should normally be positive because longer-term bonds carry more risk and should offer higher interest rates.
 - An **inverted yield curve** occurs when this spread is negative.
 - An inverted yield curve has always happened before every U.S. recession.
 - However, it is a necessary but not a sufficient condition for a recession; the yield curve often inverts without a subsequent recession (the joke is it has "successfully predicted 17 of the last five recessions").
- **Average consumer expectations for business and economic conditions (Consumer Sentiment):** This is included but is highly volatile and can be impacted by things outside the economy, again reflecting "animal spirits". "Animal spirits" is an economist's way of acknowledging psychology that isn't fully understood in economic models.

4. Time Horizons in Macroeconomics

Short Run vs. Long Run Distinction

The economy behaves differently depending on the flexibility of prices:

- **Short Run:**
 - Prices are **sticky**; they can't change very much.
 - Firms cannot easily change their capital equipment and machinery; very little can change.
- **Long Run:**
 - All prices are **flexible** and can change.
 - Firms can change capital equipment, machinery, build new factories, or buy out competitors.

5. Aggregate Demand (AD)

Definition

- The **Aggregate Demand (AD) curve** shows the relationship between prices (the price level) and output (aggregate quantity of goods and services demanded).

The Quantity Equation as Aggregate Demand

- The AD curve is derived from the **Quantity Theory of Money** being built into the model.
- Equation: $MV=PY$
 - M = Money Supply
 - V = Velocity of Money
 - P = Price Level
 - Y = Real GDP (Aggregate Output)
- This equation shows an inverse relationship between the price level (P) and output (Y).

Why the AD Curve Slopes Downward

- **Real Money Balances Effect (Wealth Effect):**
 - If the price level (P) increases, real money balances (M/P) decline.
 - This means the wealth you have (cash) will buy less stuff; your money doesn't go as far.
 - As a result, there will be a decline in the amount of stuff purchased (Y).
 - Conversely, if P decreases (e.g., price of gas and food fall), paychecks go farther, people feel wealthier, and spend more money.
- Other effects built into the AD model (mentioned but not detailed): interest rate effect, exchange rate effect.

Shifts in the AD Curve

The AD curve shifts if components of $Y=C+I+G+NX$ change, or if the money supply changes.

- **Factors causing an inward (leftward) shift of AD (less demand for goods):**
 - Reduction in Money Supply (M): This leads to higher interest rates, causing consumers to borrow and spend less, and businesses to invest less.
 - Decrease in Consumption (C): e.g., consumers become less willing to spend.
 - Decrease in Investment (I): e.g., businesses become less willing to invest.
 - Decrease in Government Spending (G): e.g., government austerity.
 - Decrease in Net Exports (NX): e.g., foreigners become less willing to buy domestic goods (e.g., agricultural products if deemed unsafe).
- **Factors causing an outward (rightward) shift of AD (more demand for goods):**
 - Increase in Money Supply (M) or if interest rates go down.
 - Increase in C, I, G, or NX (e.g., a new technology businesses want to invest in causes I to rise and AD to shift out).

6. Aggregate Supply (AS)

There are two aggregate supply curves based on whether prices are flexible.

The Long Run: Vertical Aggregate Supply Curve (LRAS)

- In the long run, output (Y) is fixed by the amounts of capital (K) and labor (L), technology, and human capital. This is derived from the production function.
- To grow output in the long run, one must increase capital, labor, technology, or human capital (effectiveness of capital/labor through education, training, experience).
- The LRAS curve is **vertical** at the **natural rate of output** (Y^*), which is also considered **full employment** output.
- **Natural Rate of Output / Full Employment:**
 - Output level where the unemployment rate equals the natural rate.
 - This doesn't mean zero unemployment.
 - It means the unemployment rate has no reason to either increase or decrease; it's stable. Based on Okun's law, this corresponds to a GDP growth rate of about 3% in the U.S. historically, though likely lower now.
- **Shifts in LRAS:** The LRAS curve shifts if there's a change in the production function inputs:
 - Changes in Capital Stock (K).
 - Changes in Labor Supply (L) (e.g., a ton of immigration increases L and shifts LRAS out).
 - Changes in Technology (e.g., a brand new technology that dramatically improves productivity shifts LRAS out).
 - Changes in Human Capital (e.g., a more effective education system makes labor more productive, shifting LRAS out).

The Short Run: Horizontal Aggregate Supply Curve (SRAS)

- In the very short run, it's assumed that all prices are **sticky**, and firms won't be changing their prices at all. (Except commodity prices like gasoline, which can change dramatically).
- The SRAS curve is **horizontal** at a fixed price level (P_{sticky}).
- At this fixed price level, firms can increase output. This can be done by:
 - Bringing on workers to do overtime.
 - Opening up a second shift or a third shift (overnight). Most businesses shut down overnight (Waffle House is an exception and appreciated for it, though being there at 3 AM implies life mistakes), but they can increase operations.

From the Short Run to the Long Run (Price Adjustment Mechanism)

The movement from the short run to the long run occurs as prices adjust:

- **If Output > Natural Rate ($Y > Y^*$)** (economy growing like gangbusters):
 - Prices are probably going to go up; this is inflationary. SRAS shifts upward.
- **If Output < Natural Rate ($Y < Y^*$)** (economy in recession):
 - Prices will probably fall over time. SRAS shifts downward.
- **If Output = Natural Rate ($Y = Y^*$):**
 - The price level will stay more or less constant; the inflation rate will be relatively low, slow, and predictable.
- The more ability prices have to adjust, the more the economy moves from the horizontal SRAS to the vertical LRAS.

7. Economic Shocks

Shocks are events that impact aggregate demand or aggregate supply.

Shocks to Aggregate Demand (Demand Shocks)

- These affect the AD curve.
- Example: An exogenous decrease in velocity (V).
 - If people aren't spending their money (holding onto cash), velocity decreases.
 - This means they are not buying goods and services, reducing aggregate demand.

Shocks to Aggregate Supply (Supply Shocks)

- These impact the supply curve (SRAS or LRAS).
- **Adverse Supply Shocks** (shift SRAS upward/leftward):
 - Bad weather destroying crops, pushing up food prices. This shifts SRAS up.
 - An oil cartel raising the price of oil by decreasing oil production. This also shifts SRAS up. This leads to stagflation (higher prices, lower output).
- **Favorable Supply Shocks** (shift SRAS downward/rightward):
 - Example: If the price of oil were cut in half overnight, it might be good for the economy, providing a shot in the arm.
- **Shocks to Long-Run Aggregate Supply (LRAS)**: These affect the production function inputs.
 - A brand new technology dramatically improving productivity shifts LRAS outward.
 - A more effective education system making labor more productive shifts LRAS outward.
 - A ton of immigration increasing labor supply shifts LRAS outward.
 - Events reducing productive capacity shift LRAS inward. Example: The lockdowns of 2020 reduced the amount of labor in the economy. This adverse supply shock to labor led to lower LRAS. The result was higher prices and the economy going into a recession, showing the model works well.

Key Equations Mentioned

- **Quantity Equation of Money (basis for AD):** $MV=PY$
- **Real Money Balances:** M/P
- **Expenditure Approach to GDP (basis for AD components):** $Y=C+I+G+NX$
- **Production Function (basis for LRAS):** Conceptually,
 $Y=\text{Function of (Capital, Labor, Technology, Human Capital)}$

Chapter 21: The Financial System: Opportunities and Dangers - Reference Guide

This reference guide covers the key concepts, mechanisms, and issues related to the financial system, including its functions, the anatomy of financial crises, policy responses, and preventative measures, as discussed in the course material.

21-1 What Does the Financial System Do?

The financial system plays a crucial role in the functioning of a modern economy. Its primary functions include channeling funds, managing risk, mitigating information asymmetries, and fostering economic growth.

Financing Investment

- **Primary Goal:** To move money from savers to borrowers.
 - Borrowers are typically investors in the business world, seeking funds for capital, equipment, and machinery.
 - A well-functioning financial system efficiently converts savings into investment.
- **Sources of Savings:**
 - Bank savings accounts.
 - Purchasing bonds.
 - Buying stocks.
- **Mechanisms for Transferring Funds:**
 - **Direct Finance:** Savers provide funds directly to borrowers through financial markets.
 - Examples: Buying a share of a company or a bond issued by a company or government.
 - **Indirect Finance:** Savers deposit money with financial intermediaries, which then lend these funds to borrowers.
 - Examples: Putting money in a bank, buying a mutual fund, or contributing to a 401k.
- **Ways Businesses Raise Funds:**
 - **Debt Finance (Bonds):** Selling bonds, which are essentially IOUs.
 - Typically used by well-known companies.
 - **Junk Bonds:** Bonds sold by less trustworthy or riskier companies.
 - **Equity Finance (Stocks):** Selling a percentage of ownership (shares) in the company to the stock market. This provides the company with capital for its activities.
- **Financial Intermediaries:** Institutions that stand between savers and borrowers.
 - **Banks:** Accept deposits and make loans. Small and medium-sized banks often focus on commercial real estate.
 - **Mutual Funds:** Pools money from many investors to purchase a diversified portfolio of stocks, bonds, or other assets.
 - **Pension Funds:** (Mostly public nowadays) Manage retirement savings for employees.

- **Insurance Companies:** Collect premiums and invest these funds (often in bonds or stocks) to cover future claims. They hold significant assets.

Sharing Risk

- **Risk Aversion:** Most individuals are risk-averse, meaning they dislike uncertainty and prefer a certain outcome over a risky one with the same expected payoff.
 - The willingness to take risk decreases as the potential loss increases (e.g., an \$80,000 bet vs. a \$1 bet).
- **Role of the Financial System:** Allows for the spreading of risk among many individuals.
 - Instead of one person bearing all the risk of a large investment, many people can invest smaller amounts, reducing individual exposure.
 - Example: 80,000 people investing \$1 each in a project, rather than one person investing \$80,000.
- **Diversification:** A key strategy for risk management, involving holding a variety of assets.
 - **Idiosyncratic Risk:** Risk specific to a single company or asset (e.g., bad management at one firm). Diversification can significantly reduce this type of risk. Owning an S&P 500 index fund means owning shares in roughly 500 different companies.
 - **Systematic Risk (Systemic Risk):** Risk that affects the entire market or economy (e.g., a financial crisis, a pandemic-induced lockdown). Diversification cannot eliminate this risk, as all entities are subject to the broader system's performance.

Dealing with Asymmetric Information

- **Asymmetric Information:** A situation where one party in a transaction has more or better information than the other party.¹
 - Example: When depositing money in a bank, the saver doesn't know exactly how the bank is lending out that money.
- **FDIC Insurance:** Helps reduce problems associated with asymmetric information in banking by insuring deposits up to a certain limit (e.g., \$250,000).
- **Problems Arising from Asymmetric Information in Business Financing:**
 - **Adverse Selection (Before the Transaction):** Borrowers may know more about the risks or potential downsides of their projects than lenders.
 - Example: A biotech company seeking a loan might not disclose the full extent of negative side effects of a new treatment to the bank.
 - **Moral Hazard (After the Transaction):** After receiving a loan, borrowers may engage in irresponsible or overly risky behavior with the funds, knowing the lender bears some of the risk.
 - Example: A biotech company using a \$100 million loan to build a corporate bowling alley instead of for research and development.
- **How Banks Mitigate Asymmetric Information:**
 - **Screening Borrowers:** Assessing creditworthiness and requiring collateral to reduce adverse selection. The joke is that to get a \$100,000 loan, you first deposit \$100,000.
 - **Restricting Loan Use:** Loan contracts may specify how funds can be spent to address moral hazard.
 - **Monitoring (more common with Angel Investors and Venture Capital):** Closely overseeing the operations of the business to ensure funds are used as intended.

Fostering Economic Growth

- **Financial Capital vs. Physical Capital:**
 - **Physical Capital:** Equipment and machinery (as in the Solow model).
 - **Financial Capital:** Money available for businesses to borrow and invest.
- **Risk and Reward:** Generally, projects with higher potential rewards also entail higher risks.
- **Role of a Good Financial System:**
 - Improves the risk-reward ratio by financing the best possible opportunities given their risk.
 - Provides financing for projects with some risk but also potential for profitability, leading to economic growth.
- **Government's Role in Supporting the Financial System:**
 - **Legal Framework:** Establishing and enforcing laws against financial fraud.
 - **Disclosure Requirements:** Mandating transparency to provide more information to all parties.
 - Example: The **Sarbanes-Oxley Act (SOX)**, enacted after the Enron scandal, forced companies to engage in more detailed financial disclosure, making accounting shenanigans harder to hide. Violations can lead to severe penalties.

21-2 Financial Crises

Financial crises occur when the financial system malfunctions, leading to severe economic downturns.

The Anatomy of a Crisis

- **Speculative Asset Bubbles:** Occur when people buy assets (e.g., houses in 2004-2005, dot-com stocks in the late 1990s, Bitcoin) primarily because they expect the price to rise in the future, rather than based on the asset's intrinsic value or utility.
 - **Greater Fool Theory:** The idea that one can profit from buying an overvalued asset by selling it to an even "greater fool" at a higher price. This continues until there are no more buyers at inflated prices.
- **Asset Price Declines and Defaults:** When speculative bubbles burst, asset prices fall sharply.
 - This leads to **defaults**, where borrowers cannot repay their loans.
 - These defaults are particularly problematic for highly **leveraged** banks (banks that have borrowed heavily to finance their assets).
- **Impact on Banks and the Economy (Vicious Circle):**
 - Example: 2008-2009 Global Financial Crisis. Layoffs led to mortgage defaults.
 - Mortgage defaults harmed banks, leading to more layoffs and further defaults.
 - **Jingle Mail:** Homeowners mailing their house keys back to lenders, abandoning their mortgages.
 - Banks became hesitant to recognize losses from **non-performing loans** on their books to avoid appearing insolvent. This could lead to the bank itself being considered insolvent.
- **Falling Confidence and Bank Runs:**
 - Lack of confidence can trigger **bank runs**, especially with uninsured deposits.
 - Example: **Silicon Valley Bank (SVB)** in 2023. Depositors with amounts exceeding the \$250,000 FDIC insurance limit rushed to withdraw funds, leading to the bank's collapse and FDIC receivership.
- **Fire Sales:** When banks in distress are forced to sell assets quickly at deeply discounted prices to meet withdrawal demands or cover losses. This can further depress asset prices and exacerbate the crisis.
 - Generally avoided in the U.S. through FDIC insurance and Federal Reserve actions. Banks usually go into **receivership**.

- **Credit Crunch:** In a volatile financial system with widespread defaults, lenders become very cautious.
 - Interest rates rise for everyone due to increased perceived risk, especially **systemic risk** (unavoidable market-wide risk).
 - Even businesses with good ideas may be unable to get loans, stifling investment and economic activity.
 - This lack of credit and financing opportunities affects many industries (e.g., home improvement, oil industry during the 2008 crisis).
- **Broader Economic Impact:**
 - Recession, high unemployment (e.g., around 10% in 2009).
 - Dramatic drop in consumer spending.
 - Increased government spending (often debt-financed) to try and offset the decline, leading to higher debt-to-GDP ratios.

Policy Responses to a Crisis

Governments and central banks intervene to try and break the vicious circle between the financial system and the real economy.

- **Conventional Monetary Policy:**
 - Central banks lower interest rates (e.g., to zero).
 - Effectiveness can be limited if banks are still unwilling to lend due to uncertainty about their own solvency or the value of their assets (especially if there's no market for those assets, like certain mortgage-backed securities in 2008).
- **Conventional Fiscal Policy:**
 - Government increases spending and/or cuts taxes.
 - Examples: Stimulus packages in 2008-2009 and 2020-2022.
 - These measures typically lead to increased government debt.
 - Effectiveness of specific programs can be debated:
 - **Green energy stimulus (2009):** Questionable value.
 - **Cash for Clunkers (2009):** Widely criticized by economists. People traded in functioning vehicles (often Ford F-150s) for new, slightly more efficient ones (often new Ford F-150s). This destroyed a segment of the used car market, contributing to higher used car prices later.
- **Lender of Last Resort:**
 - The central bank (e.g., the Federal Reserve) provides liquidity to solvent but illiquid financial institutions to prevent bank runs and fire sales.
 - The FDIC also plays a role in backing up deposits.
 - The Federal Reserve can take control of failing banks (**receivership**) and try to sell them to healthier banks.
 - Banks may be reluctant to borrow from the lender of last resort due to the negative signal it sends about their financial health.
- **Propping Up the Financial System (Bailouts):**
 - Using public funds to inject capital into financial institutions.
 - Example: **Troubled Asset Relief Program (TARP) in 2008.**
 - Initially intended for the government to buy \$800 billion in bad mortgage-bond securities from banks.
 - It was deemed too difficult, so instead, cash was directly given to banks.

- The Federal Reserve provided zero-percent loans to banks to encourage lending.
- Aid can also be extended to **shadow banks** (e.g., title loan, paycheck advance places) to prevent their collapse, as they serve the unbanked population (around 20% of the U.S. adult population in late 2024).
- In 2020, publicly traded companies could borrow money from the Federal Reserve.
- **Moral Hazard Problem with Bailouts:**
 - If financial institutions believe they will be rescued by the government ("too big to fail"), they may be incentivized to take on excessive risk.
 - Traders: Bonuses for successful risky bets, but limited downside (job loss) if bets fail.
 - **"Too Big to Fail":** An institution so ingrained in the financial system that its failure would have catastrophic consequences, compelling government intervention.

Policies to Prevent Crises

Efforts to make the financial system more resilient and less prone to crises.

- **Regulating Shadow Banks and Other Financial Institutions:**
 - **Shadow Banks:** Financial institutions that perform bank-like functions but are not regulated as banks (e.g., title loan places, paycheck advance companies).
 - Private investment banks, hedge funds, private equity companies, non-publicly traded insurance companies often face less stringent regulation than publicly traded, traditional banks.
- **Restricting Size of Financial Firms / Breaking Up "Too Big to Fail" Institutions:**
 - The idea is to reduce systemic risk.
 - This has not largely happened; in some cases, "too big to fail" banks have gotten larger when acquiring failing smaller banks.
- **Limiting Excessive Risk-Taking:**
 - Defining "excessive" risk is challenging.
 - **Volcker Rule (part of Dodd-Frank):** Restricts commercial banks from engaging in certain types of speculative investments (e.g., proprietary trading, taking large positions in assets like Bitcoin).
- **Reforming Regulatory Agencies:**
 - Example: **Consumer Financial Protection Bureau (CFPB).** Created by the Dodd-Frank Act. A private entity funded outside government appropriation, with wide latitude to create new regulations on businesses impacting consumer finances.
- **Microprudential vs. Macroprudential Regulation:**
 - **Microprudential:** Focuses on the safety and soundness of individual financial institutions.
 - **Macroprudential:** Focuses on the stability of the financial system as a whole, aiming to mitigate system-wide risks. (Mankiw's view: aim at the environment/industry itself, not just individual firms). The effectiveness of both is debated.
- **Challenges and Consequences of Regulation:**
 - **Dodd-Frank Act (post-2008/2009):** A comprehensive set of financial regulations.
 - Regulation can push financial activity into less regulated or unregulated corners of the market (e.g., shadow banks).
 - **Sarbanes-Oxley Act (SOX):** Increased regulatory hurdles for publicly traded companies.
 - Led to a decrease in the number of publicly traded firms (from over 6,000 to less than 5,000), as many firms prefer to stay private to avoid compliance costs.
 - **The "Gulliver's Travels" Analogy for Regulation:**

- Individual regulations, like individual Lilliputian ropes, may not stop a business (Gulliver).
- However, the cumulative effect of many regulations can stifle business operations and profitability.
- There is a lack of holistic examination of the overall regulatory environment.

Case Study: The European Sovereign Debt Crisis (Post-2009)

- Triggered by concerns over high government debt levels in some Eurozone countries, particularly Greece.
- Interest rates on Greek debt soared due to fears of default.
- Contagion: Bond yields in other countries like Portugal, Italy, and Spain (collectively referred to by some bond traders as **PIGS**) were also affected.
- **Responses and Consequences:**
 - **Bailouts and Partial Default:** A negotiated partial default on Greek bonds involving the European Central Bank (ECB) and the International Monetary Fund (IMF).
 - Greek banks holding Greek government bonds were largely spared from the default to prevent the collapse of the Greek banking industry. International banks outside Greece took the hit.
 - **Austerity Measures:** Greece had to implement spending cuts and tax increases as part of the bailout conditions.
 - Example: A 10% pay cut for all government workers, leading to financial hardship for many citizens and further negative impacts on the Greek economy.
 - **Bank Jog:** Fears that Greece might leave the Eurozone and reintroduce the drachma led citizens to withdraw euros from ATMs. ATM withdrawal limits were imposed to prevent a full-scale bank run.
 - **Political Tensions:** Countries like Germany, with stronger economies, were unhappy about financing bailouts for countries perceived as having mismanaged their finances.
- **Current Status:** Structural issues in some Eurozone economies (high government spending, low taxes, high debt) may remain, with "band-aid" solutions masking deeper problems.

Key Concepts Glossary (from provided materials)

- **Adverse Selection:** A problem of asymmetric information that occurs *before* a transaction, where the party with more information about the risks of a project (e.g., a borrower) is more likely to seek a loan, to the detriment of the lender.
- **Asymmetric Information:** A situation in which one party in a transaction has more or superior information compared to another2 party.
- **Bonds:** A form of debt finance where an investor loans money to an entity (corporate or governmental) which borrows the funds for a defined period at a variable or fixed interest rate.3
- **Debt Finance:** Raising funds by borrowing, such as through issuing bonds.
- **Diversification:** Spreading investments across various financial instruments, industries, or other categories to reduce idiosyncratic risk.
- **Equity Finance:** Raising funds by selling shares of ownership in a company (stocks).
- **Financial Crisis:** A situation in which the value of financial institutions or assets drops rapidly, often leading to a credit crunch and a broader economic recession.
- **Financial Intermediaries:** Institutions like banks, mutual funds, and insurance companies that channel funds from savers to borrowers.
- **Financial Markets:** Markets where financial securities, such as stocks and bonds, are bought and sold.

- **Financial System:** The set⁴ of institutions, such as banks, insurance companies, and stock exchanges, that permit the exchange⁵ of funds.
- **Fire Sale:** The urgent sale of assets at heavily discounted prices, often occurring when institutions are in financial distress and need to raise cash quickly.
- **Greater Fool Theory:** The idea that it's possible to make money by buying overvalued assets if there's someone else (a "greater fool") willing to buy them at an even higher price.
- **Jingle Mail:** When a homeowner sends their house keys back to the mortgage lender because they cannot make payments and are abandoning the property.
- **Lender of Last Resort:** An institution, usually a central bank, that offers loans to banks or other eligible institutions that are experiencing financial difficulty⁶ or are considered highly risky or near collapse.⁷
- **Leverage:** The use of borrowed capital for an investment, with the expectation that the after-tax profit to the equity holder from the transaction will exceed the borrowing cost. High leverage magnifies both gains and losses.
- **Macroprudential Regulation:** Regulation that focuses on the stability of the financial system as a whole to mitigate system-wide risks.
- **Microprudential Regulation:** Regulation that focuses on the safety and soundness of individual financial institutions.
- **Moral Hazard:** A problem of asymmetric information that occurs *after* a transaction, where one party gets involved in a risky event knowing that it is protected against the risk and the other party will incur the cost.
- **Mutual Funds:** An investment vehicle made up of a pool of moneys collected from many investors for the purpose of investing in securities such as stocks, bonds, money market instruments,⁸ and other assets.
- **Non-Performing Loans:** Loans on which the borrower is not making interest payments or principal repayments as stipulated in the loan agreement.
- **Risk Averse:** A characteristic of investors who prefer lower returns with known risks rather than higher returns with unknown risks.
- **Sarbanes-Oxley Act (SOX):** U.S. federal law that mandated certain practices in financial record keeping and reporting for public companies to increase transparency and reduce corporate fraud.
- **Shadow Banks:** Financial intermediaries that conduct credit creation and other financial services similar to traditional banks but are not subject to the same regulatory oversight.
- **Speculative Bubble:** A situation in which asset prices appear to be based on implausible or inconsistent views about the future. Prices rise rapidly, driven by expectations of further price increases.
- **Stocks:** A type of security that signifies ownership in a corporation and represents a claim on part of the corporation's⁹ assets and earnings.
- **Systemic Risk (Systematic Risk):** The risk inherent to the entire market or market segment, also known as undiversifiable risk or market risk.
- **Too Big to Fail:** A concept where a financial institution is so large and interconnected that its failure would be disastrous to the greater economic system, and therefore must be supported by government in a crisis.
- **Troubled Asset Relief Program (TARP):** A U.S. government program created in 2008 to purchase toxic assets and equity from financial institutions to strengthen its financial sector.
- **Volcker Rule:** A U.S. federal regulation that prohibits banks from conducting certain investment activities with their own accounts and limits¹⁰ their dealings with hedge funds and private¹¹ equity funds, also called proprietary trading.