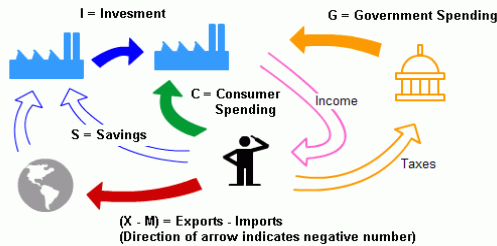


Chapter 2 Lecture - The Measurement and Structure of the National Economy

Chapter 2 - The Measurement and Structure of the National Economy



2-1

National Income Accounting

- National income accounts: an accounting framework used in measuring current economic activity
- Three alternative approaches give the same measurements
 - Product approach: the amount of output produced
 - Income approach: the incomes generated by production
 - Expenditure approach: the amount of spending by purchasers

2-2

National Income Accounting

- Why are the three approaches equivalent?
 - They must be, by definition
 - Any output produced (product approach) is purchased by someone (expenditure approach) and results in income to someone (income approach)
 - The fundamental identity of national income accounting:

Total production = total income = total expenditure

All methods should result give similar answers when adjusted for market prices versus factor costs.

2-3

Value added = value of output minus value of inputs purchased from other producers

Total spending on domestically produced final goods and services = \$21,500

	American Ore, Inc.	American Steel, Inc.	American Motors, Inc.	Total factor income
Value of sales	\$4,200 (ore)	\$9,000 (steel)	\$21,500 (car)	
Intermediate goods	0	4,200 (iron ore)	9,000 (steel)	
Wages	2,000	3,700	10,000	\$15,700
Interest payments	1,000	600	1,000	2,600
Rent	200	300	500	1,000
Profit	1,000	200	1,000	2,200
Total expenditure by firm	4,200	9,000	21,500	
Value added per firm	4,200	4,800	12,500	
Value of sales - cost of intermediate goods				

Total payments to factors = \$21,500

Sum of value added = \$21,500

Activity	Cost of Inputs	Price of Output	Value Added
Growing Oranges	\$0	\$1	\$1
Making Orange Juice	\$1	\$1.50	\$0.50
Distributing Juice to Stores (Wholesale)	\$1.50	\$2.25	\$0.75
Selling Juice to Consumer (Retail)	\$2.25	\$3.50	\$1.25

2-4

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Gross Domestic Product Once Again

- The product approach to measuring GDP
 - GDP (gross domestic product) is the market value of final goods and services newly produced within a nation during a fixed period of time
- Market value: allows adding together unlike items by valuing them at their market prices
 - Problem: misses nonmarket items such as homemaking, the value of environmental quality, and natural resource depletion
 - There is some adjustment to reflect the underground economy
 - Government services (that aren't sold in markets) are valued at their cost of production
 - Newly produced: counts only things produced in the given period; excludes things produced earlier

2-5

Gross Domestic Product

- Final goods and services
 - Don't count intermediate goods and services (those used up in the production of other goods and services in the same period that they themselves were produced)
 - Final goods & services are those that are not intermediate
 - Capital goods (goods used to produce other goods) are final goods since they aren't used up in the same period that they are produced

2-6

Gross Domestic Product

- GNP vs. GDP
 - GNP (gross national product) = output produced by domestically owned factors of production
 - GDP = output produced within a nation
 - $GDP = GNP - NFP$
 - NFP = net factor payments from abroad
 - = payments to domestically owned factors located abroad minus payments to foreign factors located domestically

2-7

Gross Domestic Product

- GNP vs. GDP
 - Example: Engineering revenues for a road built by a U.S. company in Saudi Arabia is part of U.S. GNP (built by a U.S. factor of production), not U.S. GDP, and is part of Saudi GDP (built in Saudi Arabia), not Saudi GNP
 - Difference between GNP and GDP is small for the United States, about 0.2%, but higher for countries that have many citizens working abroad

2-8

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Gross Domestic Product

- The expenditure approach to measuring GDP
 - Measures total spending on final goods and services produced within a nation during a specified period of time
 - Four main categories of spending: consumption (C), investment (I), government purchases of goods and services (G), and net exports (NX)
 - $Y = C + I + G + NX$ the income-expenditure identity

2-9

Gross Domestic Product

- The expenditure approach to measuring GDP
 - Consumption: spending by domestic households on final goods and services (including those produced abroad)
 - About 2/3 of U.S. GDP
 - Three categories
 - Consumer durables (examples: cars, TV sets, furniture, major appliances)
 - Nondurable goods (examples: food, clothing, fuel)
 - Services (examples: education, health care, financial services, transportation)

2-10

Personal Consumption

- Consumer Durables
 - Durable has a life of over 3 years: cars, furniture, etc
- Consumer Non-Durables
 - Goods with a life of less than three years: food, utilities, clothing
- Services
 - Housing, healthcare, recreation, education

2-11

Gross Domestic Product

- The expenditure approach to measuring GDP
 - Investment: spending for new capital goods (fixed investment) plus inventory investment
 - About 1/6 of U.S. GDP
 - Business (or nonresidential) fixed investment: spending by businesses on structures and equipment and software
 - Residential fixed investment: spending on the construction of houses and apartment buildings
 - Inventory investment: increases in firms' inventory holdings

2-12

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Investment: Adding to the Capital Stock

- Flows and Stocks
 - A stock is a quantity: capital, inventories and wealth are stock variables
 - A flow is an addition to or a subtraction from a stock: Investment and income are flow variables
- Investment in National Stocks
 - Residential Investment (homes)
 - Non-residential Investment (business investments in structures and equipment)
 - Changes in Inventories (changes get registered)

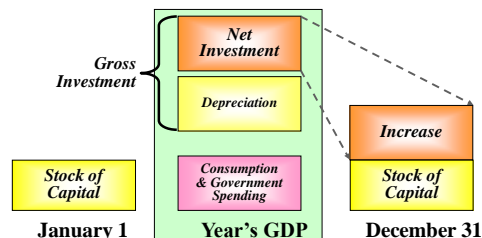
2-13

Net Investment

Gross Investment

– Depreciation or Capital Consumption Allowance

= Net Investment



2-14

Gross Domestic Product

- The expenditure approach to measuring GDP
 - Government purchases of goods and services: spending by the government on goods or services
 - About 1/5 of U.S. GDP
 - Most by state and local governments, not federal government
 - Government Expenditures reflect direct consumption, *not transfers*
 - Defense, Government investments in roads and other infrastructure, government services such as Department of Motor Vehicles. Police and Congress are all expenditures.

2-15

Government

- Transfer payments represent money redistributed from one group of citizens (taxpayers) to another (poor, unemployed, elderly).
 - While transfers are included in government budgets as outlays they are not purchases of currently produced goods and services.
 - Not result in production of new goods and services
 - Not included in government purchases or in GDP
- Examples: Social Security, Medicare and Medicaid and Interest payments on national debt

2-16

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Gross Domestic Product

- The expenditure approach to measuring GDP
 - Net exports: exports minus imports
 - Exports: goods produced in the country that are purchased by foreigners
 - Imports: goods produced abroad that are purchased by residents in the country
 - Imports are subtracted from GDP, as they represent goods produced abroad, and were included in consumption, investment, and government purchases

2-17

External Accounts

- Imports (M): Product Accounts: Goods and Services
- Exports (X): Product Accounts: Goods and Services
- Net Exports = $NX = X - M$
- If $NX = X - M > 0$ Trade Surplus
- If $NX = X - M < 0$ Trade Deficit
- Here are some examples of exports of services
 - Spending of foreign tourists in USA
 - transportation services
 - insurance / banking services
 - medical services
 - retail services (souvenirs)
 - hotel accommodation services

2-18

Table 2.1: Expenditure Approach to Measuring GDP in the United States, 2014

TABLE 2.1

Expenditure Approach to Measuring GDP in the United States, 2014

	Billions of dollars	Percent of GDP
Personal consumption expenditures (C)	11,830	68.5
Consumer durables	1303	7.5
Nondurable goods	2666	15.3
Services	7862	45.7
Gross private domestic investment (I)	2852	16.4
Business fixed investment	2211	12.7
Nonresidential structures	507	2.9
Equipment	1017	5.8
Intellectual property products	686	3.9
Residential investment	559	3.2
Inventory investment	82	0.5
Government purchases of goods and services (G)	3175	18.2
Federal	1219	7.0
National defense	752	4.4
Nondefense	468	2.6
State and local	1956	11.2
Net exports (NX)	-538	-3.1
Exports	2337	13.4
Imports	2875	16.5
Total (equals GDP) (Y)	17,419	100.0

Note: Numbers may not add to totals shown owing to rounding.
Source: Bureau of Economic Analysis web site, www.bea.gov, NIPA Table 1.1.5, May 29, 2015

2-19

Gross Domestic Product

- The income approach to measuring GDP
 - Adds up income generated by production (including profits and taxes paid to the government)
 - National income = compensation of employees (including benefits) + proprietors' income + rental income of persons + corporate profits + net interest + taxes on production and imports + business current transfer payments + current surplus of government enterprises
 - National income + statistical discrepancy = net national product
 - Net national product + depreciation (the value of capital that wears out in the period) = gross national product (GNP)
 - GNP - net factor payments (NFP) = GDP

2-20

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Gross Domestic Product

- The income approach to measuring GDP
 - Private sector and government sector income
 - Private disposable income = income of the private sector = private sector income earned at home (Y or GDP) and abroad (NFP) + payments from the government sector (transfers, TR , and interest on government debt, INT) – taxes paid to government (T)

$$= Y + NFP + TR + INT - T$$
 - Government's net income = taxes – transfers – interest payments = $T - TR - INT$
 - Private disposable income + government's net income = $GDP + NFP = GNP$

2-21

Table 2.2: Income Approach to Measuring GDP in the United States, 2014

TABLE 2.2

Income Approach to Measuring GDP in the United States, 2014

	Billions of dollars	Percent of GDP
Compensation of employees	9228	53.0
Proprietors' income	1380	7.9
Rental income of persons	640	3.7
Corporate profits	2090	12.0
Net interest	486	2.8
Taxes on production and imports	1146	6.6
Business current transfer payments	141	0.8
Current surplus of government enterprises	-34	-0.2
Total (equals National Income)	15,077	86.6
Plus Statistical discrepancy	-182	-1.0
Equals Net National Product	14,894	85.5
Plus Consumption of fixed capital	2796	15.7
Equals Gross National Product (GNP)	17,631	101.2
Less Factor income received from rest of world	928	4.8
Plus Payments of factor income to rest of world	616	3.5
Equals Gross Domestic Product (GDP)	17,419	100.0

Note: Numbers may not add to totals shown owing to rounding.
Source: Bureau of Economic Analysis web site, www.bea.gov, NIPA Tables 1.7.5 and 1.12, May 29, 2015

<https://www.bea.gov/national/index.htm#gdp>

2-22

Saving and Wealth

- Wealth
 - Household wealth = a household's assets minus its liabilities
 - National wealth = sum of all households', firms', and governments' wealth within the nation
 - Saving by individuals, businesses, and government determine wealth
- Measures of aggregate saving
 - Saving = current income – current spending
 - Saving rate = saving/current income
 - Private saving = private disposable income – consumption

$$S_{pvt} = (Y + NFP - T + TR + INT) - C$$

2-23

Saving and Wealth

- Measures of aggregate saving
 - Government saving = net government income – government purchases of goods and services

$$S_{govt} = (T - TR - INT) - G$$
 - Government saving = government budget surplus = government receipts – government outlays
 - Government receipts = tax revenue (T)
 - Government outlays = government purchases of goods and services (G) + transfers (TR) + interest payments on government debt (INT)
 - Government budget deficit = $-S_{govt}$
 - Simplification: count government investment as government purchases, not investment

2-24

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Saving and Wealth

- Measures of aggregate saving
 - National saving
 - National saving = private saving + government saving
 - $S = S_{pvt} + S_{govt}$

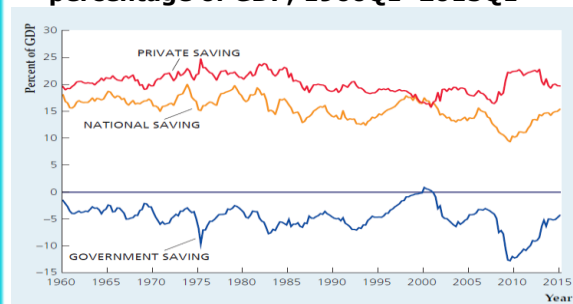
$$= [Y + NFP - T + TR + INT - C]$$

$$+ [T - TR - INT - G]$$

$$= Y + NFP - C - G = GNP - C - G$$
 - The next figure plots national saving, private saving, and government saving relative to GDP

2-25

Figure 2.1: U.S. saving measures as a percentage of GDP, 1960Q1–2015Q1



Sources: Bureau of Economic Analysis, National Income and Product Accounts, downloaded from Federal Reserve Bank of St. Louis, FRED database, research.stlouisfed.org/fred2/. Private saving: FRED series CPSAVE. Government saving: FRED data series CGSAVE (gross government saving, ignoring gross government investment as a component of outlays) minus A782RC1Q027SBEA (gross government investment). National saving: sum of private and government saving. GDP: FRED series GDP.

2-26

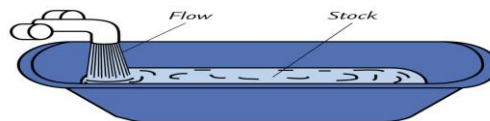
Saving and Wealth

- The uses of private saving
 - $S = I + (NX + NFP)$
 - $S = I + CA$
 - Derived from $S = Y + NFP - C - G$ and
 - $Y = C + I + G + NX$
 - $CA = NX + NFP =$ current account balance
- The uses of private saving
 - $S_{pvt} = I + (-S_{govt}) + CA$
 - (using $S = S_{pvt} + S_{govt}$)
 - The uses-of-saving identity—saving is used in three ways:
 - investment (I)
 - government budget deficit ($-S_{govt}$)
 - current account balance (CA)

2-27

Saving and Wealth

- Relating saving and wealth
 - Stocks and flows
 - Flow variables: measured per unit of time (GDP, income, saving, investment)
 - Stock variables: measured at a point in time (quantity of money, value of houses, capital stock)
 - Flow variables often equal rates of change of stock variables
 - Wealth and saving as stock and flow (wealth is a stock, saving is a flow)



2-28

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Saving and Wealth

- Relating saving and wealth
 - National wealth: domestic physical assets + net foreign assets
 - Country's domestic physical assets (capital goods and land)
 - Country's net foreign assets = foreign assets (foreign stocks, bonds, and capital goods owned by domestic residents) minus foreign liabilities (domestic stocks, bonds, and capital goods owned by foreigners)
 - Wealth matters because the economic well-being of a country depends on it

2-29

Saving and Wealth

- Relating saving and wealth
 - National wealth: domestic physical assets + net foreign assets
 - Changes in national wealth
 - Change in value of existing assets and liabilities (change in price of financial assets, or depreciation of capital goods)
 - National saving ($S = I + CA$) raises wealth
 - Comparison of U.S. saving and investment with other countries
 - The United States is a low-saving country; Japan is a high-saving country
 - U.S. investment exceeds U.S. saving, so we have a negative current-account balance

2-30

Summary - Measures of the Aggregate Savings

Measures of Aggregate Saving	
Saving measure	Definition and formula
Private saving	Private disposable income less consumption $S_{pvt} = (Y + NFP - T + TR + INT) - C$
Government saving	Government receipts less government outlays $S_{govt} = (T - TR - INT) - G$
National saving	Private saving plus government saving; also GNP ($Y + NFP$) less consumption and government purchases $S = S_{pvt} + S_{govt}$ $= Y + NFP - C - G$

2-31

Real GDP, Price Indexes, and Inflation

- Real GDP
 - Nominal variables are those in dollar terms
 - Problem: Do changes in nominal values reflect changes in prices or quantities?
 - Real variables: adjust for price changes; reflect only quantity changes
 - Nominal GDP is the dollar value of an economy's final output measured at current market prices
 - Real GDP is an estimate of the value of an economy's final output, adjusting for changes in the overall price level**

2-32

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Real GDP, Price Indexes, and Inflation

- Price Indexes
 - A price index measures the average level of prices for some specified set of goods and services, relative to the prices in a specified base year
- GDP deflator = $100 \times \text{nominal GDP} / \text{real GDP}$
 - Note that base year $P = 100$
- Consumer Price Index (CPI)
 - Monthly index of consumer prices; index averages 100 in reference base period (1982 to 1984)
 - Based on basket of goods in expenditure base period (updated periodically)

2-33

GDP Deflator

- The GDP deflator is the ratio of nominal GDP to Real GDP (multiplied by 100).

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

$$P = \frac{\text{GDP}}{Y} \times 100$$

2-34

Consumer Price Index

- The CPI is the price of a representative market basket of goods relative to the price of that same basket during a benchmark/base year (multiplied by 100).

$$CPI_t = \frac{\text{Cost of Market Basket in year } t}{\text{Cost of Market Basket in Base year}} \times 100$$

2-35

Table 2.3: Production and Price Data

TABLE 2.3

Production and Price Data

	Year 1	Year 2	Percent change from year 1 to year 2
Product (quantity)			
Computers	5	10	+100%
Bicycles	200	250	+25%
Price			
Computers	\$1200/computer	\$600/computer	-50%
Bicycles	\$200/bicycle	\$240/bicycle	+20%
Value			
Computers	\$6000	\$6000	0
Bicycles	\$40,000	\$60,000	+50%
Total	\$46,000	\$66,000	+43.5%

2-36

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Table 2.4: Calculation of Real Output with Alternative Base Years

TABLE 2.4
Calculation of Real Output with Alternative Base Years

Calculation of real output with base year = Year 1					
	Current quantities		Base-year prices		
Year 1					
Computers	5	×	\$1200	=	\$6000
Bicycles	200	×	\$200	=	\$40,000
				Total =	\$46,000
Year 2					
Computers	10	×	\$1200	=	\$12,000
Bicycles	250	×	\$200	=	\$50,000
				Total =	\$62,000
Percentage growth of real GDP = $(\$62,000 - \$46,000) / \$46,000 = 34.8\%$					
Calculation of real output with base year = Year 2					
	Current quantities		Base-year prices		
Year 1					
Computers	5	×	\$600	=	\$3000
Bicycles	200	×	\$240	=	\$48,000
				Total =	\$51,000
Year 2					
Computers	10	×	\$600	=	\$6000
Bicycles	250	×	\$240	=	\$60,000
				Total =	\$66,000
Percentage growth of real GDP = $(\$66,000 - \$51,000) / \$51,000 = 29.4\%$					

2-37

Real GDP, Price Indexes, and Inflation

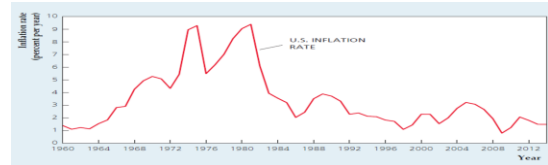
• Price Indexes

– Inflation

- Calculate inflation rate:

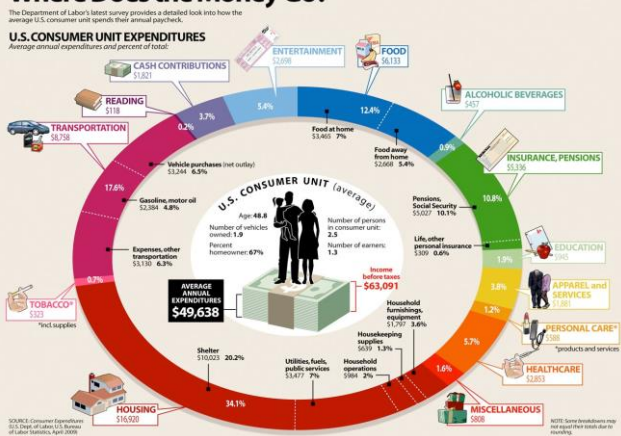
$$\pi_{t+1} = (P_{t+1} - P_t) / P_t = \Delta P_{t+1} / P_t$$

- The figure shows the U.S. inflation rate since 1960 for the GDP deflator



Source: Implicit price deflator for GDP, from FRED database, Federal Reserve Bank of St. Louis, research.stlouisfed.org/fred2/series/GDPCTPI. 2-38

Where Does the Money Go?



Factors That May Bias CPI

New Goods Bias

- New goods that were not available in the base year appear and, if they are more expensive than the goods they replace, they put an upward bias into the CPI.

Quality Change Bias

- Quality improvements occur every year. Part of the rise in the price is payment for improved quality and is not inflation.
- The CPI counts all the price rise as inflation.

Commodity Substitution Bias

- The market basket of goods used in calculating the CPI is fixed and does not take into account consumers' substitutions away from goods whose relative prices increase.

Outlet Substitution Bias

- As the structure of retailing changes, people switch to buying from cheaper sources, but the CPI, as measured, does not take account of this outlet substitution.

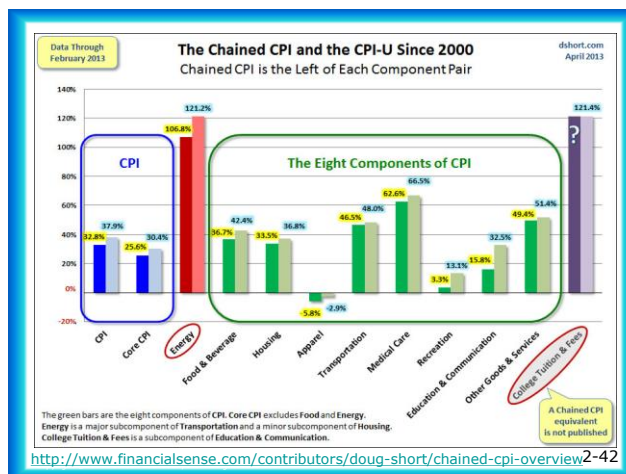
2-40

Chapter 2 Lecture - The Measurement and Structure of the National Economy

Problems with Inflation

- Redistributive Effects
 - Nominal and real income
 - Growth in nominal income vs. inflation rate
 - Anticipated vs. unanticipated inflation
- Who is hurt by inflation?
 - Fixed-income receivers
 - Savers
 - Creditors
- Who is unaffected or not hurt by inflation?
 - Flexible-income receivers
 - Cost-of-living adjustments (COLAs)
 - Debtors

2-41



Real GDP, Price Indexes, and Inflation

- Application: The Fed's preferred inflation measures
 - The Federal Reserve focuses its attention on the personal consumption expenditures (PCE) price index
 - The Fed forecasts both the overall PCE price index and the core PCE price index
 - The PCE price index is superior to the CPI because it avoids substitution bias and is revised when better data are available
 - Differences between the PCE price index and the CPI include formulas used in their calculation, coverage of different items, and weights given to different items
 - The Fed uses the core PCE price index to measure the underlying trend in inflation
 - But the Fed forecasts both the core and overall PCE price index because the Fed needs to keep its eye on both underlying trends but also the actual inflation rate faced by households

2-43

- The core inflation rate is the CPI inflation rate excluding the volatile elements (of food and fuel).
- The core inflation rate attempts to reveal the underlying inflation trend.



2-44

Chapter 2 Lecture - The Measurement and Structure of the National Economy

The Uses and Limitations of Real GDP

- Limitations of Real GDP
 - Real GDP measures the value of goods and services that are bought in markets.
 - Some of the factors that influence the standard of living and that are not part of GDP are
 - Household production
 - Underground economic activity
 - Health and life expectancy
 - Leisure time
 - Environmental quality
 - Political freedom and social justice

2-45

Interest Rates

- Real vs. nominal interest rates
 - Interest rate: a rate of return promised by a borrower to a lender
 - r = Real interest rate: rate at which the real value of an asset increases over time
 - i = Nominal interest rate: rate at which the nominal value of an asset increases over time
 - Real interest rate = $i - \pi$ π = inflation rate

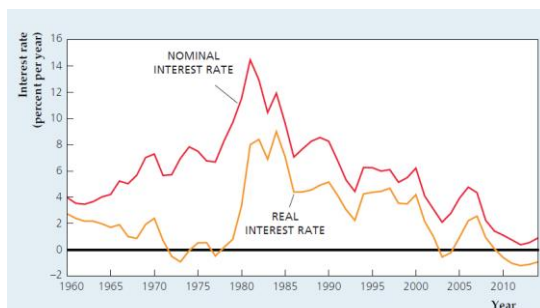
The expected real interest rate

$$r = i - \pi^e \quad \text{If } \pi = \pi^e, \text{ inflation rate} = \text{expected inflation rate}$$

The Fisher equation $i = r + \pi^e$

Exactly: $(1 + r) = \frac{(1 + i)}{1 + \pi}$ $(1 + i) = (1 + r)(1 + \pi)$ 2-46

Figure 2.5: Nominal and real interest rates in the United States, 1960–2014



Source: The implicit price deflator for GDP is the same as for Fig. 2.3. Inflation rates for 2015 and 2016 are assumed to be 2%. The nominal interest rate on three-year Treasury securities is from the Board of Governors of the Federal Reserve System, Statistical Release H15, www.federalreserve.gov/releases. 2-47

Real versus Nominal Rates (Finance)

- r^* = Real risk-free rate. T-bond rate if no inflation; 1% to 4%.
- r or i = Any nominal rate.
- r_{RF} = Rate on Treasury securities.

$$r = r^* + IP + DRP + LP + MRP$$

Here:

- r = Required rate of return on a debt security.
- r^* = Real risk-free rate.
- IP = Inflation premium.
- DRP = Default risk premium.
- LP = Liquidity premium.
- MRP = Maturity risk premium.

2-48