

GLOBAL
EDITION



Macroeconomics

SIXTH EDITION

Olivier Blanchard • David R. Johnson



ALWAYS LEARNING

PEARSON

320.120 VU Macroeconomics (C. Klamler)

time and location:

- see UniGrazOnline!!

contact:

- <http://www.uni-graz.at/fiwi/Klamler/home.html>
- office hours: Mon. 1.30 – 3.00 pm
(Institut für Finanzwissenschaft, E4)
- E-Mail: christian.klamler@uni-graz.at

grading:

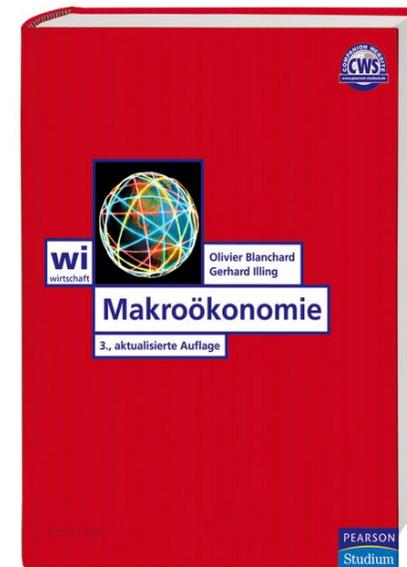
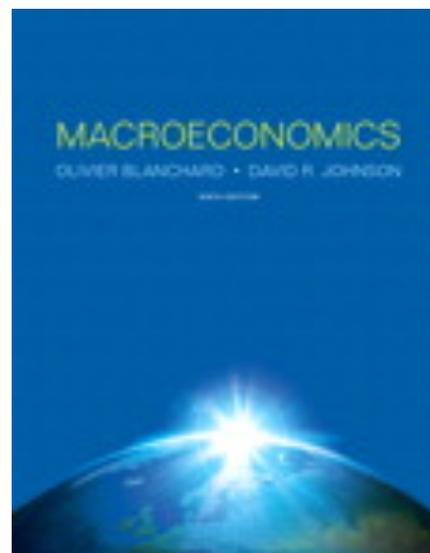
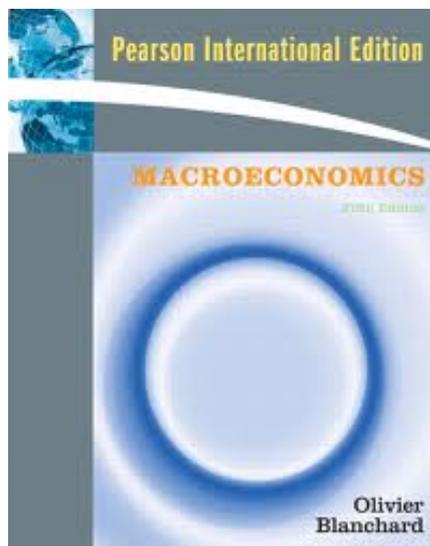
- 3 Tests
- in-class participation
- to pass the course you need more than 50 points

Tests (planned)

- 1st test: 4 April
 - max 15 points
- 2nd test: 9 May
 - max 40 points
- 3rd test: 20 June
 - max 45 points

Literature

- **Blanchard O.: Macroeconomics, Pearson Education, 5th ore more recent edition.**
- detailed online resources such as MC-test, data, question, etc. do you find on the Pearson webpage (link on my homepage)
- The german version of the textbook (Blanchard/Illing) is availabe in the library.



Topics

- **INTRODUCTION**
 - A Tour of the World (Chapter 1)
 - A Tour of the Book (Chapter 2)
- **THE SHORT RUN**
 - The Goods Market (Chapter 3)
 - Financial Markets (Chapter 4)
 - The IS-LM Model (Chapter 5)
- **THE MEDIUM RUN**
 - The Labor Market (Chapter 6)
 - The AS-AD Model (Chapter 7)
 - The Phillips-Curve (Chapter 8)
- **FURTHER TOPICS (if possible)**
 - The Facts of Growth (Chapter 10)
 - Policy Implications (Chapters 24-26)

Interesting Links

➤ **Statistik Austria**

- <http://www.statistik.at>

➤ **OECD**

- <http://www.oecd.org>

➤ **IMF World Economic Outlook**

- <http://www.imf.org/external/ns/cs.aspx?id=29>

➤ **ECB – Monthly Bulletin**

- <http://www.ecb.europa.eu/home/html/index.en.html>

➤ **NYT – Paul Krugman blog**

- <http://krugman.blogs.nytimes.com>

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A Tour of the World

Chapter 1

Introduction

What is Macroeconomics?

- describe economic developments (**empirical**)
- explain economic relationships (**theoretical**)
- provide suggestions for solutions (**political**)

Macroeconomists first look at three major variables

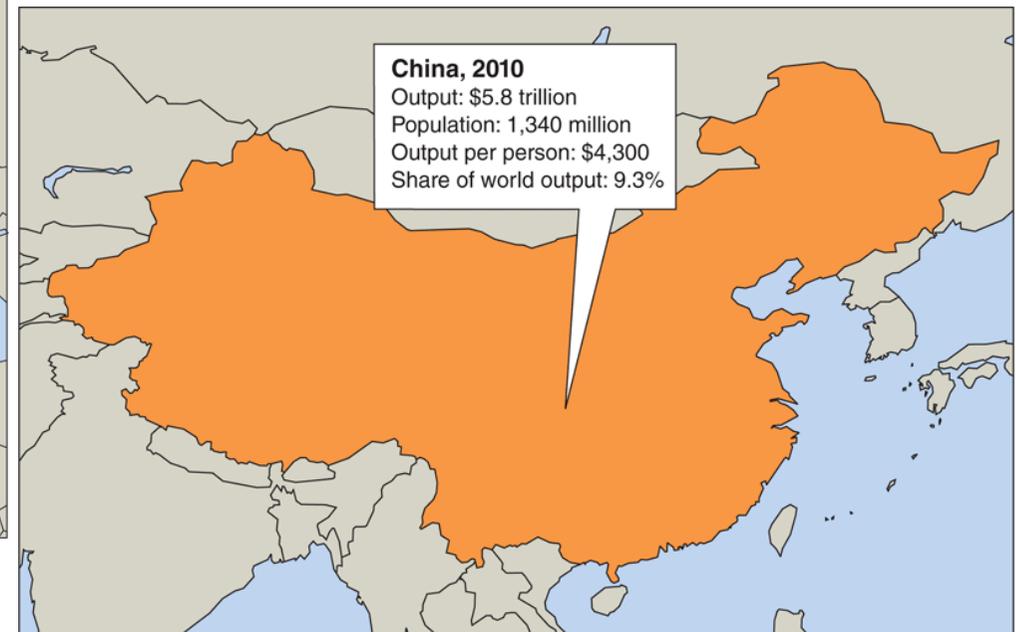
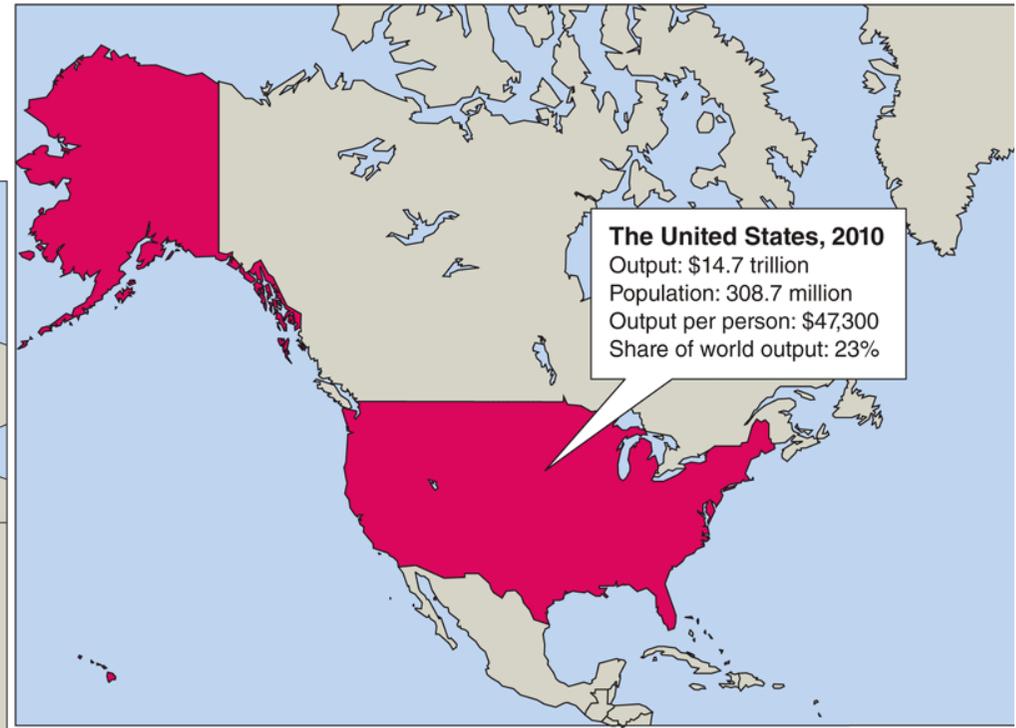
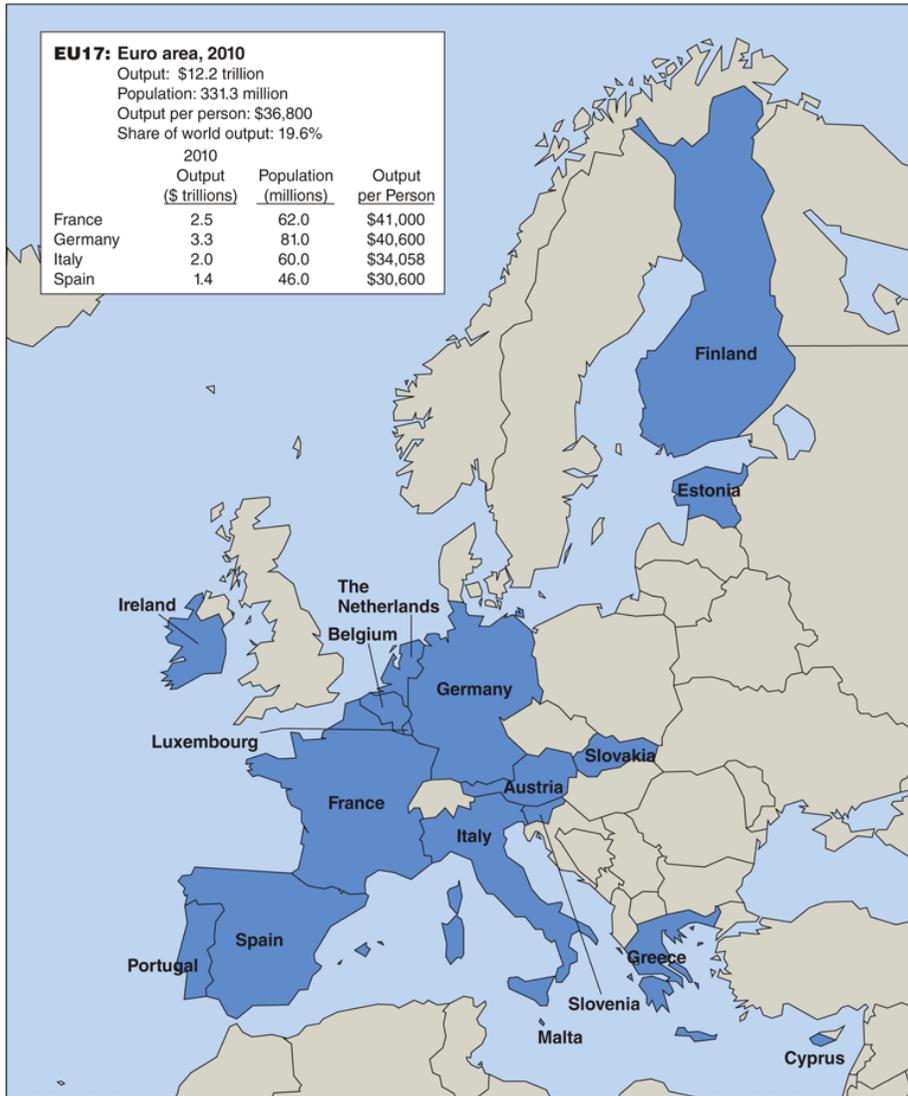
- **output**
- **unemployment rate**
- **inflation**

Percent	2000–2007 (average)	2008	2009	2010	2011*	2012*
World	3.2	1.5	-2.3	4.0	3.0	3.2
Advanced economies	2.6	0.1	-3.7	3.0	1.6	1.9
Emerging and developing economies	6.5	6.0	2.8	7.3	6.4	6.0

Output growth: Annual rate of growth of gross domestic product (GDP). *The numbers for 2011 and 2012 are forecasts, as of the fall of 2011.

Source: *World Economic Outlook* database, September 2011

The Key Areas



The Key Areas

Table 1-1 Growth, Unemployment, and Inflation in the United States Since 1970

	1970–2006 (average)	1996–2006 (average)	2006	2007	2008
US					
Output growth rate	3.1%	3.4%	3.3%	2.1%	2.5%
Unemployment rate	6.2%	5.0%	4.6%	4.6%	4.8%
Inflation rate	4.0%	2.0%	2.9%	2.6%	2.2%

Output growth rate: annual rate of growth of output (GDP). Unemployment rate: average over the year. Inflation rate: annual rate of change of the price level (GDP deflator).

Source: OECD Economic Outlook database, May 2007.

	1980–1999 (average)	2000–2007 (average)	2008	2009	2010	2011	2012
EU							
Output growth rate	2.2	2.2	0.4	-4.2	1.8	1.6	1.1
Unemployment rate	9.6	8.5	7.6	9.5	10.1	9.9	9.9
Inflation rate	5.2	2.3	3.2	0.3	1.6	2.5	1.5
China							
Output growth rate	9.8	10.5	9.6	9.2	10.3	9.5	9.0
Unemployment rate	2.7	3.9	4.2	4.3	4.1	4.0	4.0
Inflation rate	8.1	1.6	5.9	-0.6	3.3	5.5	3.3

Output growth rate: annual rate of growth of output (GDP). Inflation rate: annual rate of change of the price level (GDP deflator).

Source: World Economic Outlook database, September 2011

The Crisis

Worldwide recession starting in 2008 with a housing- and credit-bubble.

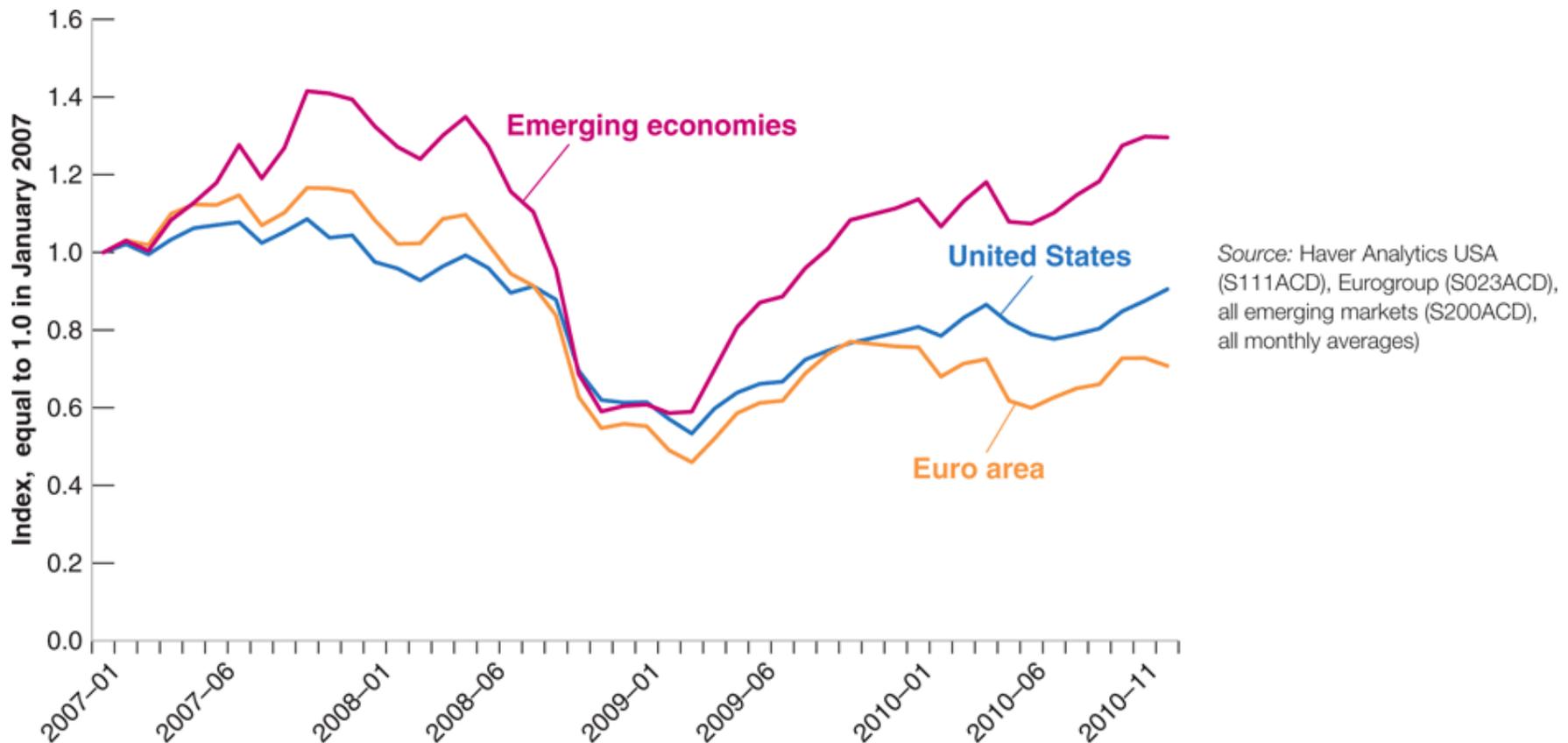
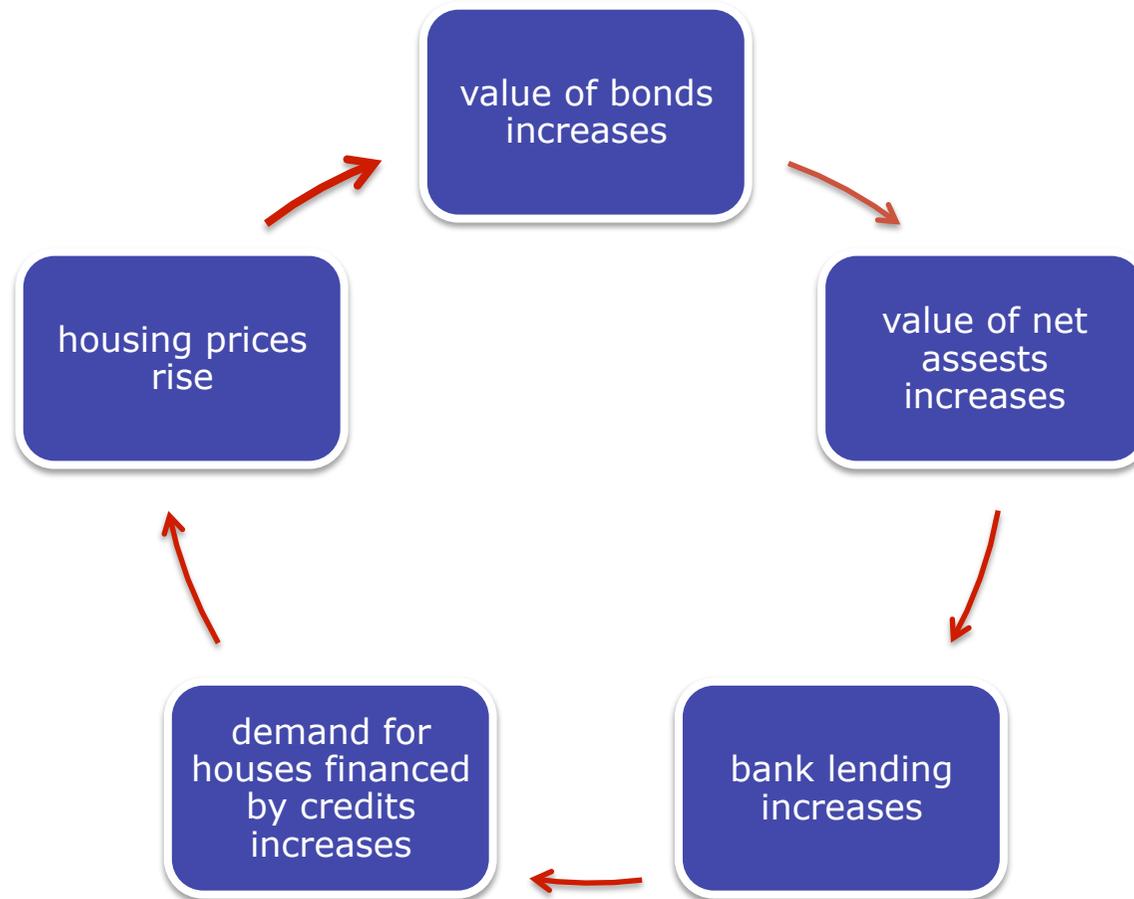


Figure: Stock prices in the United States, the Euro area, and emerging economies, 2007–2010

The Crisis

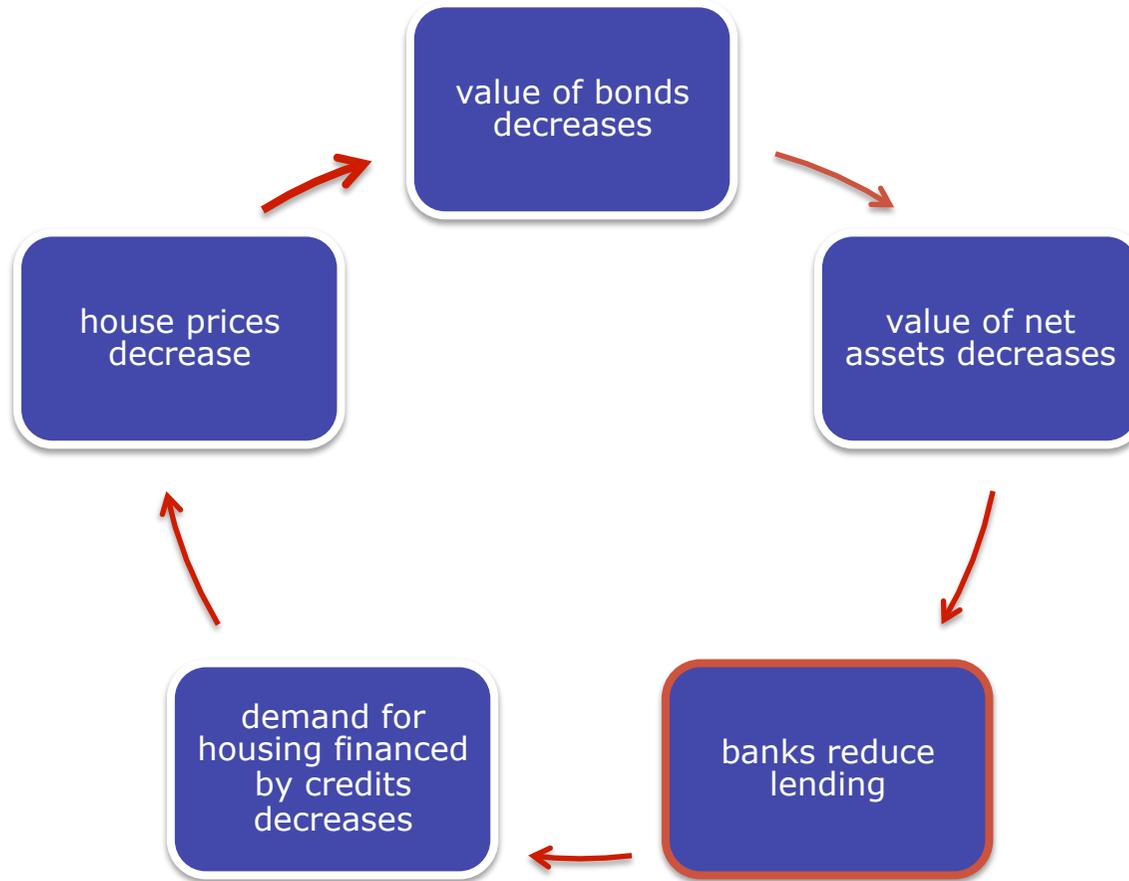
development of the financial crisis and its consequences **in the short run**



led to huge accumulation of debt by households measured relative to their income

The Crisis

as interest rates increased, troubles occurred



dangerous downward spiral started

- increased savings
- sharp decline in consumption demand

The Crisis

Consequences

- ✧ firms more pessimistic
- ✧ sharp decline in investment demand
- ✧ sharp decline in output and employment
- ✧ payment default
- ✧ banks and financial intermediaries in big trouble

first only certain sectors

- ✧ via **multipliers** shock for whole economy

from US to other continents via

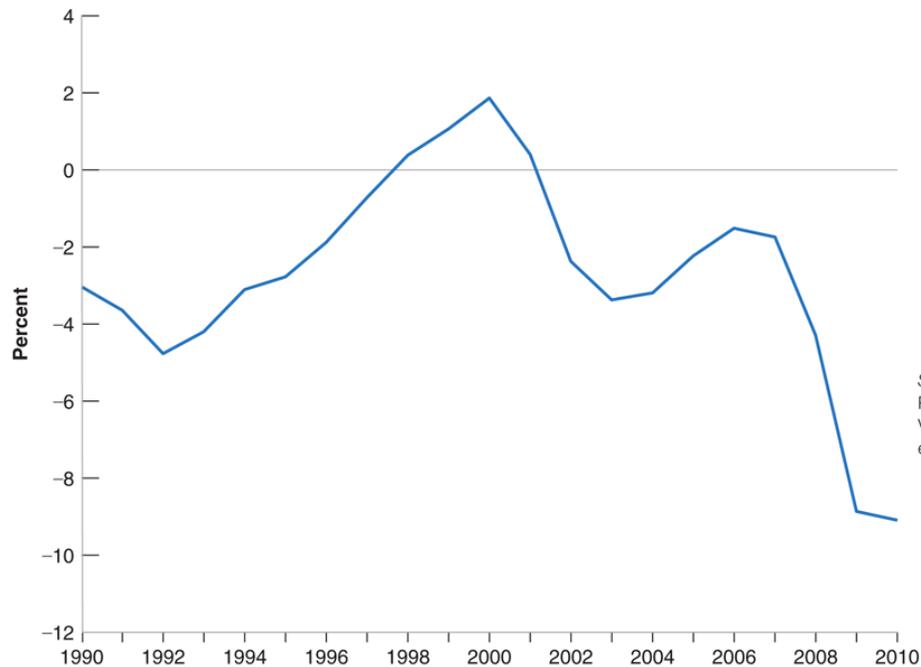
- ✧ **trade flows** (reduction of imports)
- ✧ **capital flows** (reduction in bank lending)

The Crisis

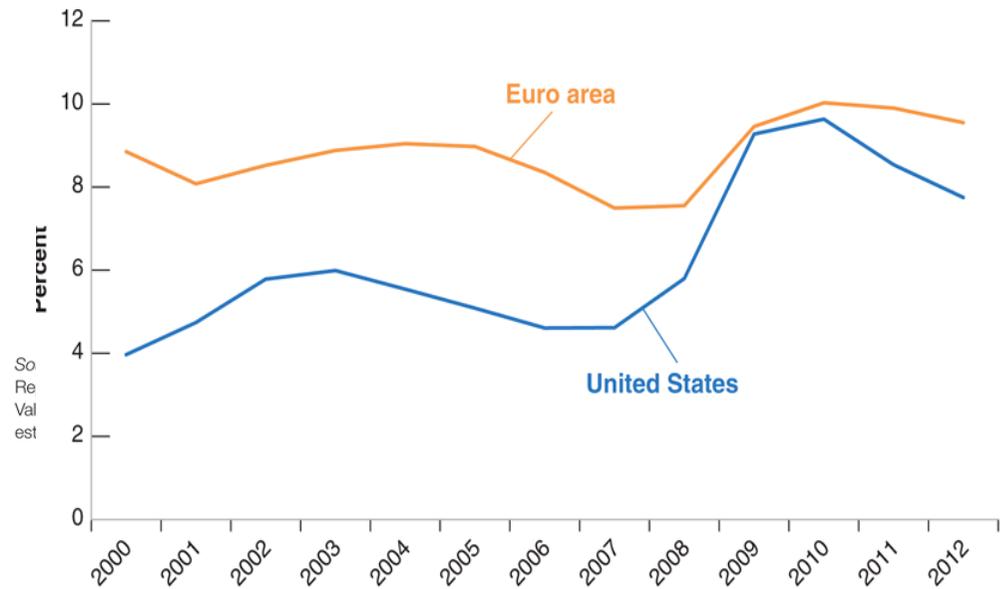
Percent	2000–2007 (average)	2008	2009	2010	2011*	2012*
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Source: World Economic Outlook database, September 2011



U.S. Federal Budget surpluses as a percent of GDP since

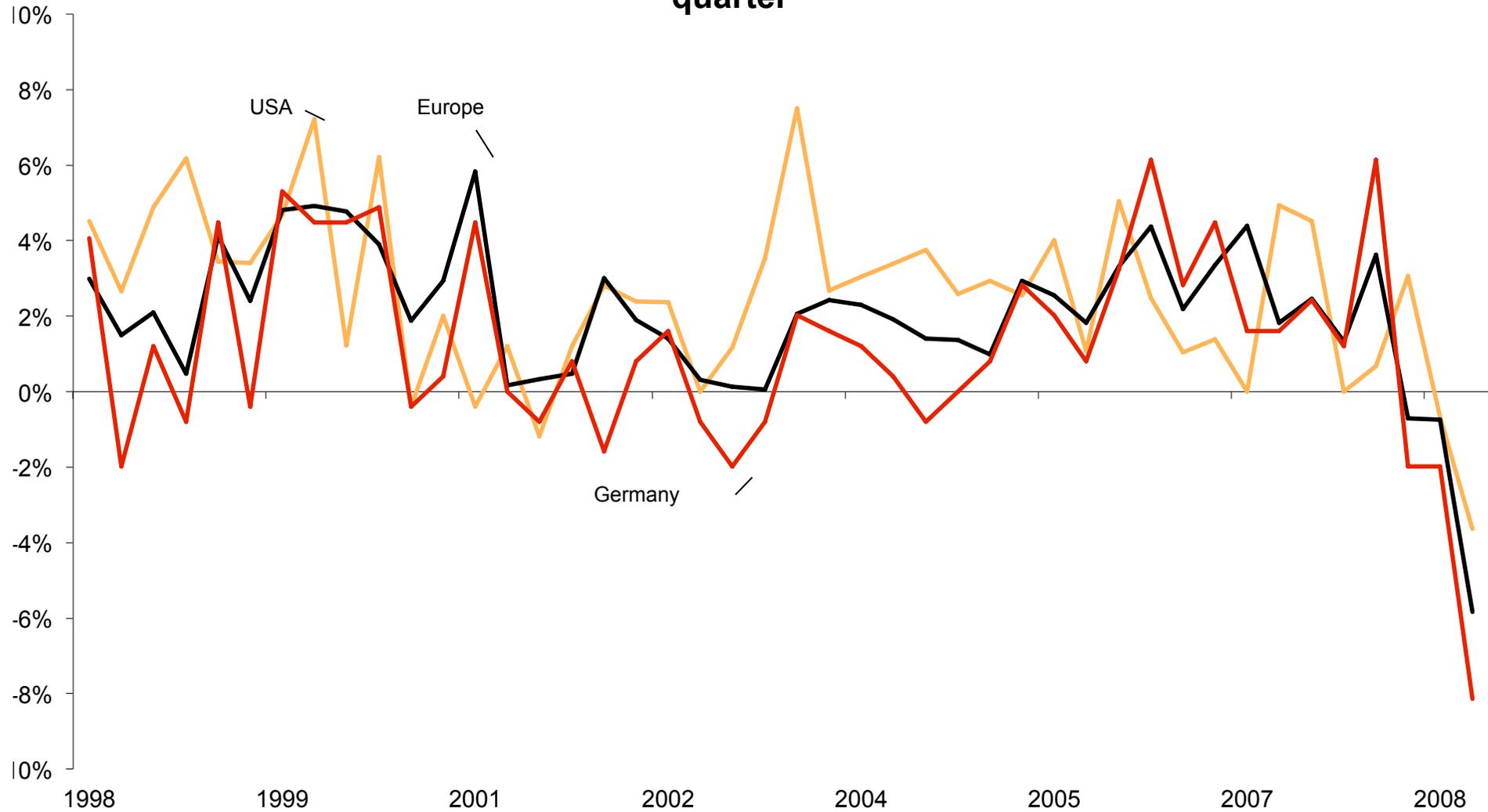


Unemployment rates in US and Euro area, 2000–2012

Source: World Economic Outlook database, September 2011

Worldwide Economic Slump

Growth Rates USA, Germany and Europe, 1998-2008, in % to previous quarter



The Medium Run

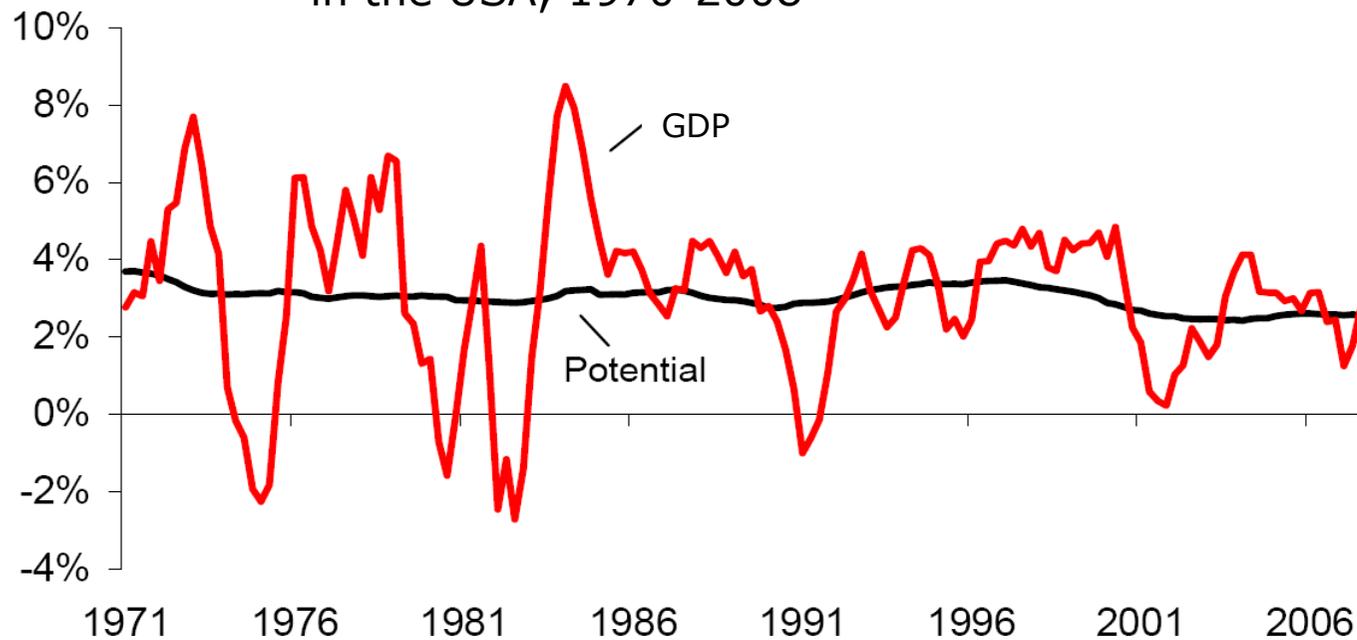
short run

- sharp decline in demand
- production under full employment level (full use of labor and capital) → (potential output)

medium run

- as economy recovers production returns to full capacity

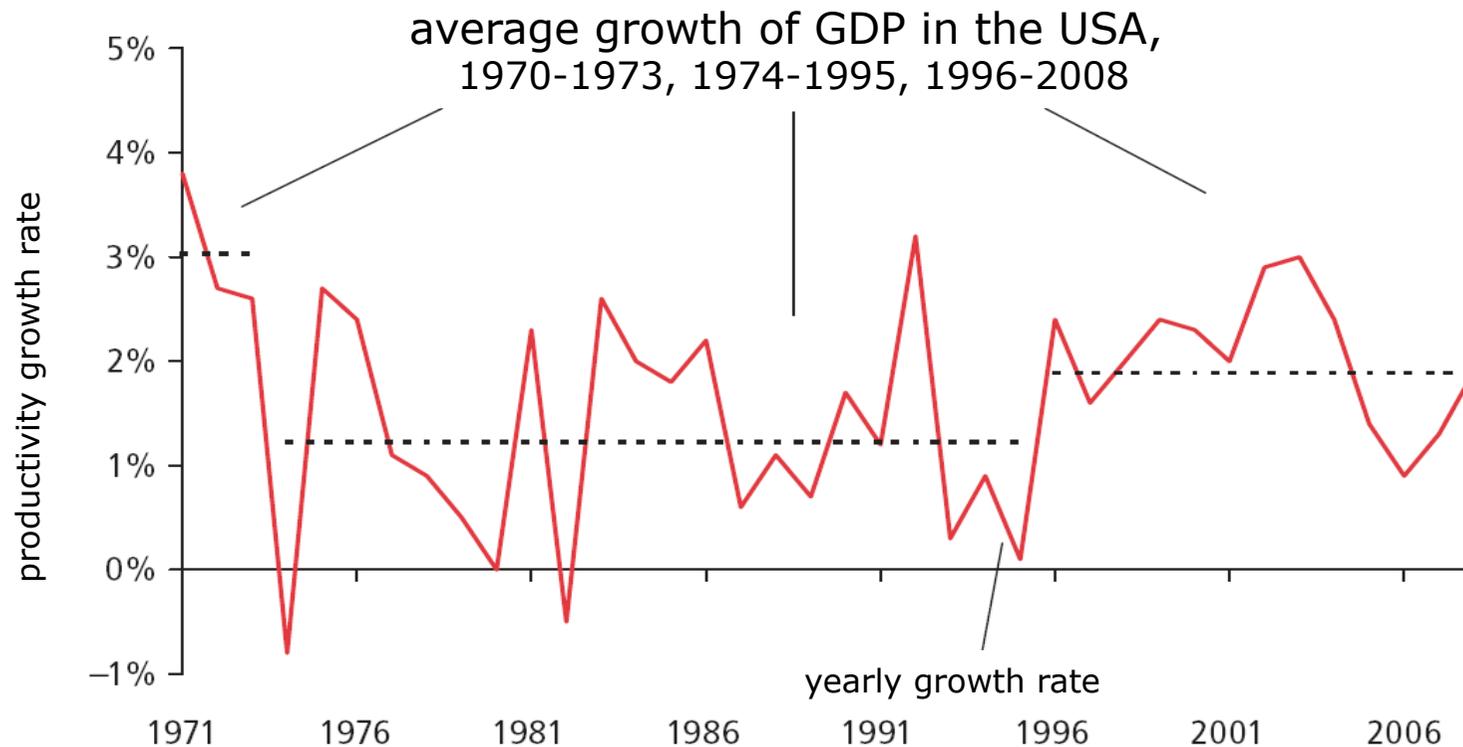
growth of GDP and potential output
in the USA, 1970-2008



- danger:
 - political interventions
 - disturbance of financial marketsmight decrease the chance of medium run recovery

The Long Run

- main question how housing prices will – **in the long run** – be made consistent with supply and demand again
- as production and prices decrease in recession, debt burden increases
 - will there be high growth again to be able to service the debt?

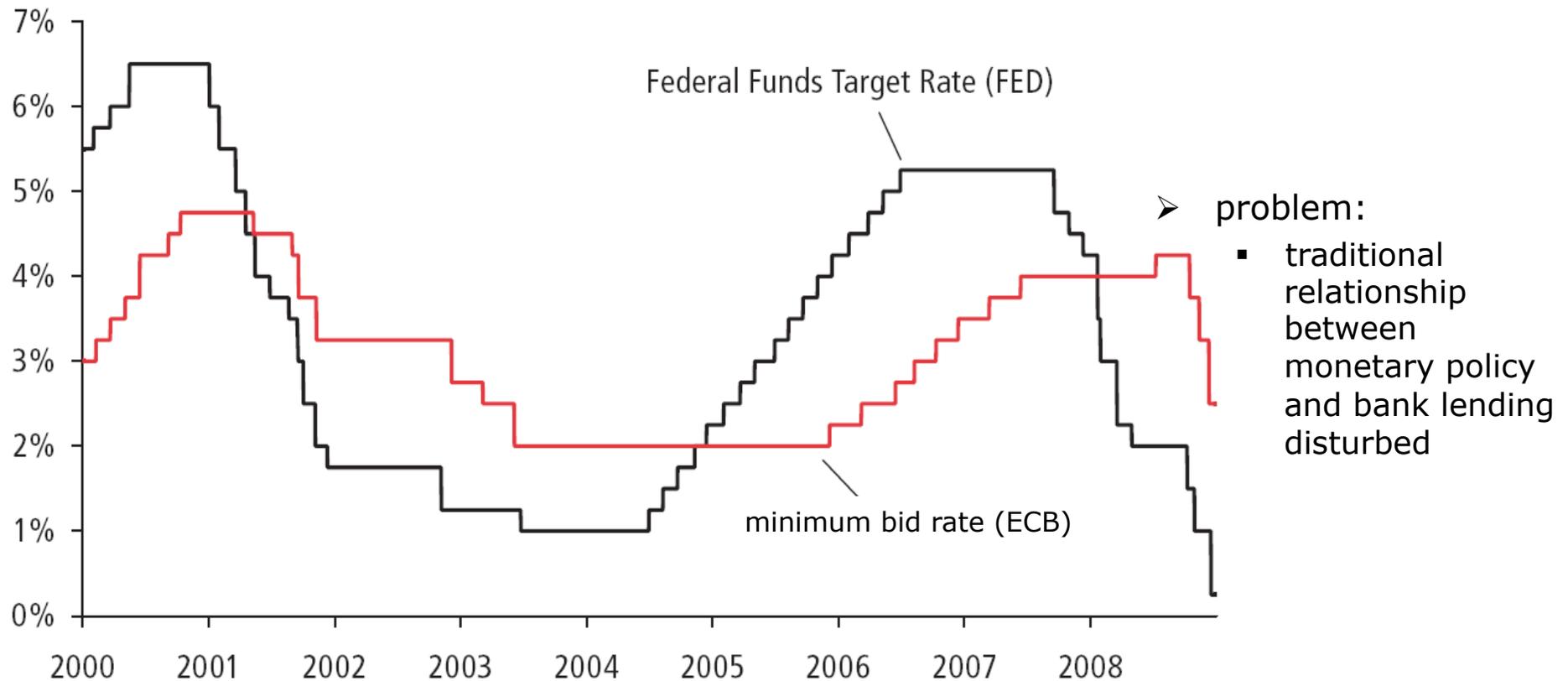


Challenges for Economic Policy

- active (expansive) economic policy against demand slump
- without short-run stabilizing activities, severe long-run damage possible
- usually, in the medium run, economy will adapt to demand changes
 - process can be enduring
 - short-run stabilizing activities necessary
- major challenge in stabilizing the financial system and stimulate demand through monetary- and fiscal policy
- another important aspect is the reformation of the financial sector
 - state guarantees for banks
 - Euro rescue fund

Challenges for Economic Policy

- the role of **monetary- and fiscal policy**
 - during the crisis, central banks provided huge amounts of liquidity
 - to stabilize production, interest rates have been decreased



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A Tour of the Book



Chapter 2

Measuring economic activity

National income and product accounts are an accounting system used to measure aggregate economic activity.

Different concepts developed to measure economic activity:

- ❖ **growth**: Gross domestic product (**GDP**), **GNP**, etc.
- ❖ **inflation rates**: consumer price index (**CPI**), **GDP-deflator**
- ❖ **interest rates**: short-run vs. long-run interest rates
- ❖ **exchange rates**: market rates vs. purchasing power parity

What concepts we use depends on the question to be answered!

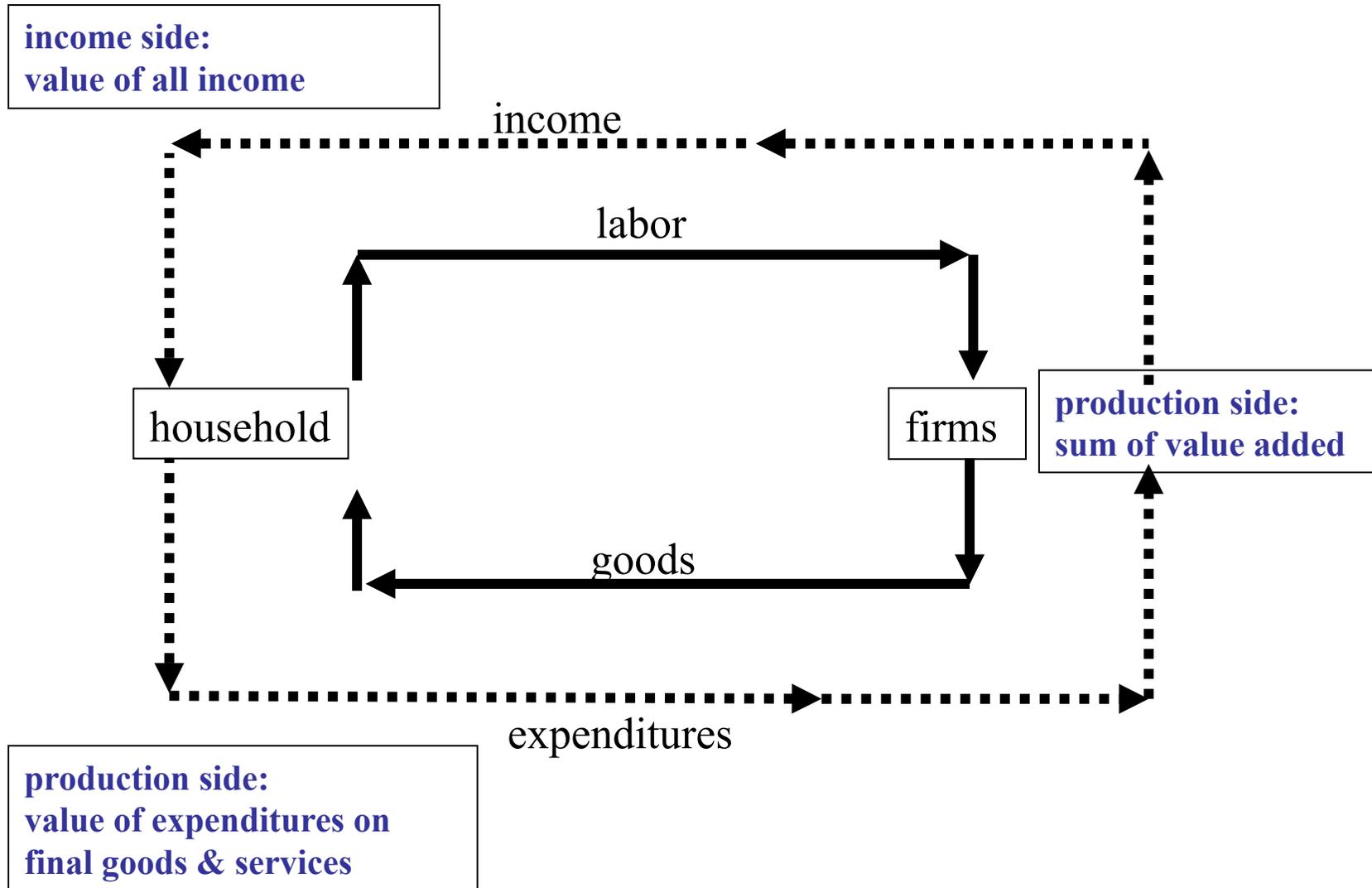
Aggregate Output

The measure of aggregate output in the national income accounts is **gross domestic product (GDP)**.

There are three ways of defining GDP:

1. GDP as the **value** of the **final goods and services** produced in the economy during a **given period**
2. GDP as **sum of value added** in the economy during a **given period**
3. GDP as **sum of incomes** in the economy during a **given period**

Aggregate Output



Aggregate Output

Example: 2 firms

Steel Company (Firm 1)		Car Company (Firm 2)	
Revenues from sales	\$100	Revenues from sales	\$200
Expenses	\$ 80	Expenses	\$170
Wages	\$80	Wages	\$70
		Steel purchases	\$100
Profit	\$ 20	Profit	\$ 30

- calculate GDP
- what if the firms merge?

Table 2-1 The Composition of GDP by Type of Income, 1960 and 2006

	1960	2006
Labor income	66%	64%
Capital income	26%	29%
Indirect taxes	8%	7%

Nominal vs. Real GDP

Nominal GDP is the sum of the quantities of final goods produced multiplied by their current price.

❖ how can it increase?

Real GDP is constructed as the sum of the quantities of final goods multiplied by constant (rather than current) prices.

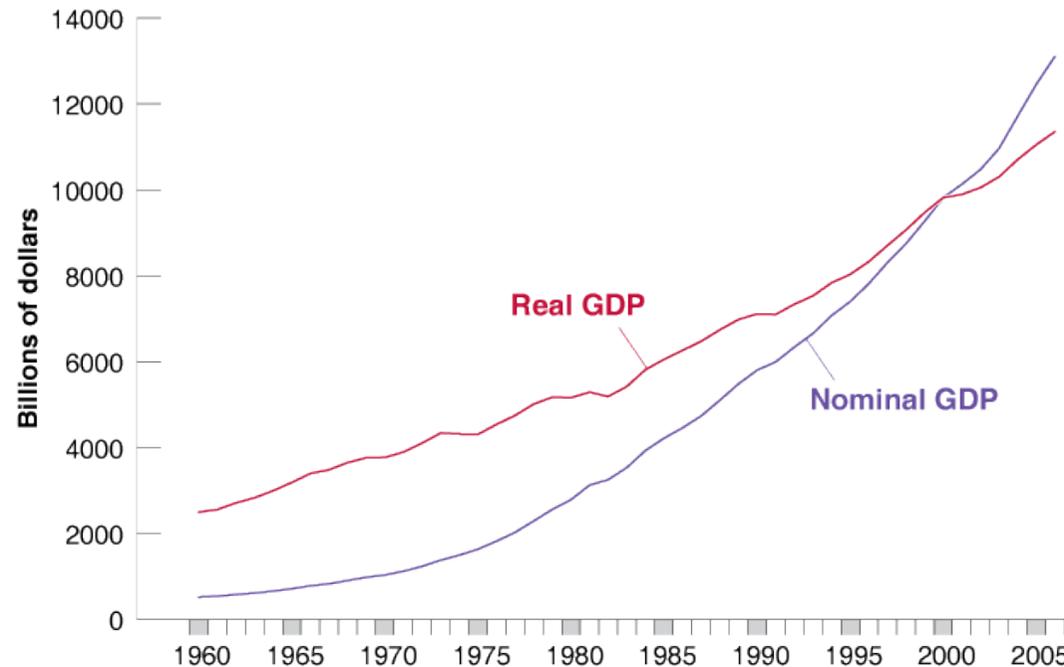
Year	Quantity of Cars	Price of cars	Nominal GDP	Real GDP (in 2000 dollars)
1999	10	\$20,000	\$200,000	\$240,000
2000	12	\$24,000	\$288,000	\$288,000
2001	13	\$26,000	\$338,000	\$312,000

Nominal vs. Real GDP

■ Figure 2 - 1

Nominal and Real U.S. GDP, Since 1960

From 1960 to 2006, nominal GDP increased by a factor of 25. Real GDP increased by a factor of about 4.5.



- Nominal GDP is also called **dollar GDP** or **GDP in current dollars**.
- Real GDP is also called **GDP in terms of goods**, **GDP in constant dollars**, **GDP adjusted for inflation**, or **GDP in 2000 dollars**.
- GDP will refer to *real GDP*, and Y_t will denote *real GDP in year t* .
- Nominal GDP and variables measured in current dollars will be denoted by a dollar sign in front of them—for example, $\$Y_t$ for nominal GDP in year t .

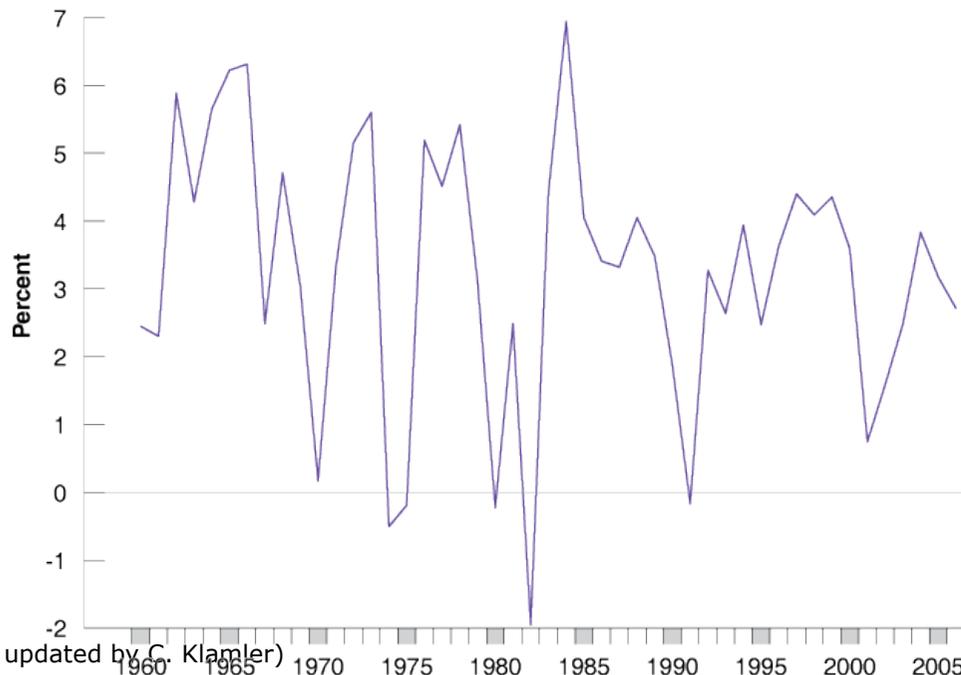
Level vs. Growth rate

➤ **Real GDP per capita** is the ratio of real GDP to the population of the country.

➤ **GDP growth** equals:
$$\frac{(Y_t - Y_{t-1})}{Y_{t-1}}$$

- Periods of positive GDP growth are called **expansions**.
- Periods of negative GDP growth are called **recessions**.

■ **Figure 2 - 2**
Growth Rate of U.S. GDP Since 1960
Since 1960, the U.S. economy has gone through a series of expansions, interrupted by short recessions.



Real GDP, Technological Progress, and the Price of Computers



FOCUS

- how to deal with changes in quality of existing goods? One of the most difficult cases is computers.
- adjust for improvements by looking at the market for computers and how it values computers with **different characteristics** in a given year.
- This approach, which treats goods as providing a collection of characteristics— here speed, memory, and so on—each with an implicit price, is called **hedonic pricing** (*hedone* means “pleasure” in Greek).
- what to do with other services like police, education, etc.?
- what to do with houses and rents?

Unemployment Rate

- ◆ **Employment** (N) is the number of people who have a job.
- ◆ **Unemployment** (U) is the number of people who do not have a job but are looking for one.
- ◆ **The labor force** (L) is the sum of employment and unemployment:

$$L = N + U$$

- ◆ **unemployment rate**

$$u = \frac{U}{L}$$

- ◆ **participation rate** = $\frac{\text{labor force}}{\text{population of working age}}$

Unemployment Rate - Austria

Unemployed people and rate in Austria (international definition)

Arbeitslose und Arbeitslosenquoten nach ILO-Konzept nach Alter und Geschlecht

Jahre	Arbeitslose					Arbeitslosenquoten				
	insgesamt	15-24 Jahre	25-44 Jahre	45-54 Jahre	55-64 Jahre	insgesamt ¹⁾	15-24 Jahre	25-44 Jahre	45-54 Jahre	55-64 Jahre
	in 1.000					in %				
					Insgesamt					
1995	139,3	30,6	69,3	30,0	9,4	3,7	5,2	3,2	3,8	3,8
1996	155,4	36,0	76,7	31,3	11,3	4,1	6,3	3,6	4,1	4,5
1997	158,9	34,8	82,1	31,3	10,6	4,2	6,3	3,8	4,1	4,2
1998	159,6	30,6	82,6	34,0	12,3	4,2	5,8	3,8	4,4	4,7
1999	141,6	26,7	69,8	31,7	13,5	3,7	5,1	3,2	4,0	4,9
2000	133,8	26,3	64,8	28,8	13,9	3,5	5,1	2,9	3,6	5,2
2001	137,1	28,6	67,8	27,5	13,1	3,6	5,6	3,1	3,3	4,9
2002	156,2	31,8	75,3	33,5	15,6	4,0	6,2	3,4	3,8	5,4
2003	169,6	36,5	81,6	35,2	16,4	4,3	7,0	3,7	3,9	5,3
2004	213,5	57,3	107,6	36,7	11,7	5,5	10,5	5,0	4,2	4,3
2005	223,5	62,6	110,3	38,6	11,7	5,6	11,0	5,1	4,2	4,0
2006	211,7	55,7	103,9	39,0	12,8	5,3	9,8	4,8	4,1	4,0
2007	200,3	55,2	94,8	38,3	11,8	4,9	9,4	4,4	3,9	3,4
2008	172,0	50,1	79,7	33,8	8,2	4,1	8,5	3,8	3,3	2,2
2009	222,9	62,7	105,2	44,5	10,2	5,3	10,7	5,0	4,2	2,7
2010	203,4	54,3	97,4	41,6	9,9	4,8	9,5	4,7	3,8	2,5
2011	193,8	51,9	89,4	37,6	14,6	4,6	8,9	4,3	3,3	3,6
2012	208,9	54,7	96,2	43,0	14,8	4,9	9,4	4,7	3,7	3,4
2013	231,3	55,8	110,0	48,0	17,3	5,4	9,7	5,4	4,0	3,8
2014	244,9	58,2	116,7	50,9	18,4	5,6	10,3	5,8	4,2	3,8
2015	251,8	59,2	115,0	53,0	24,3	5,7	10,6	5,7	4,4	4,7

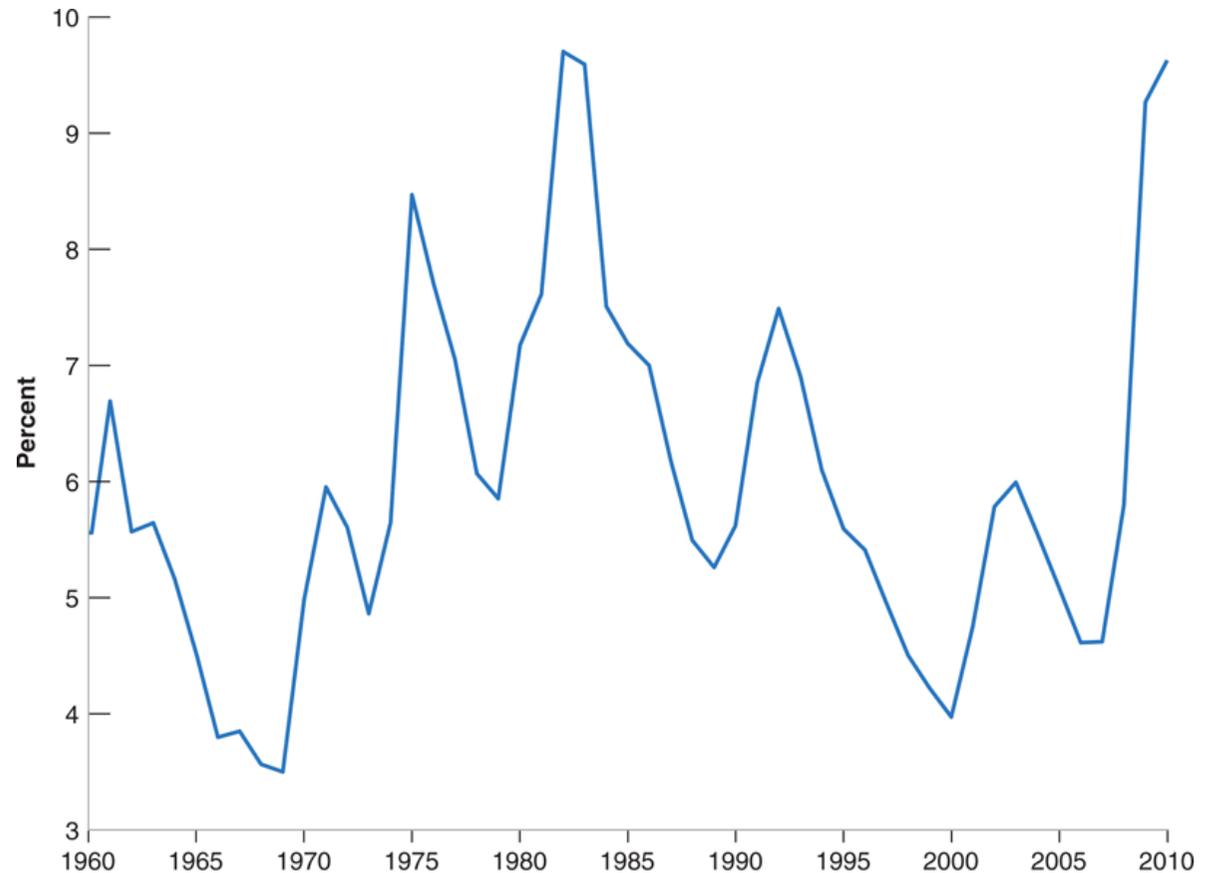
source: Statistik Austria

Unemployment Rate - USA

■ Figure 2 - 3

U.S. Unemployment Rate Since 1960

Since 1960, the U.S. unemployment rate has fluctuated between 3% and 10%, going down during expansions and going up during recessions.

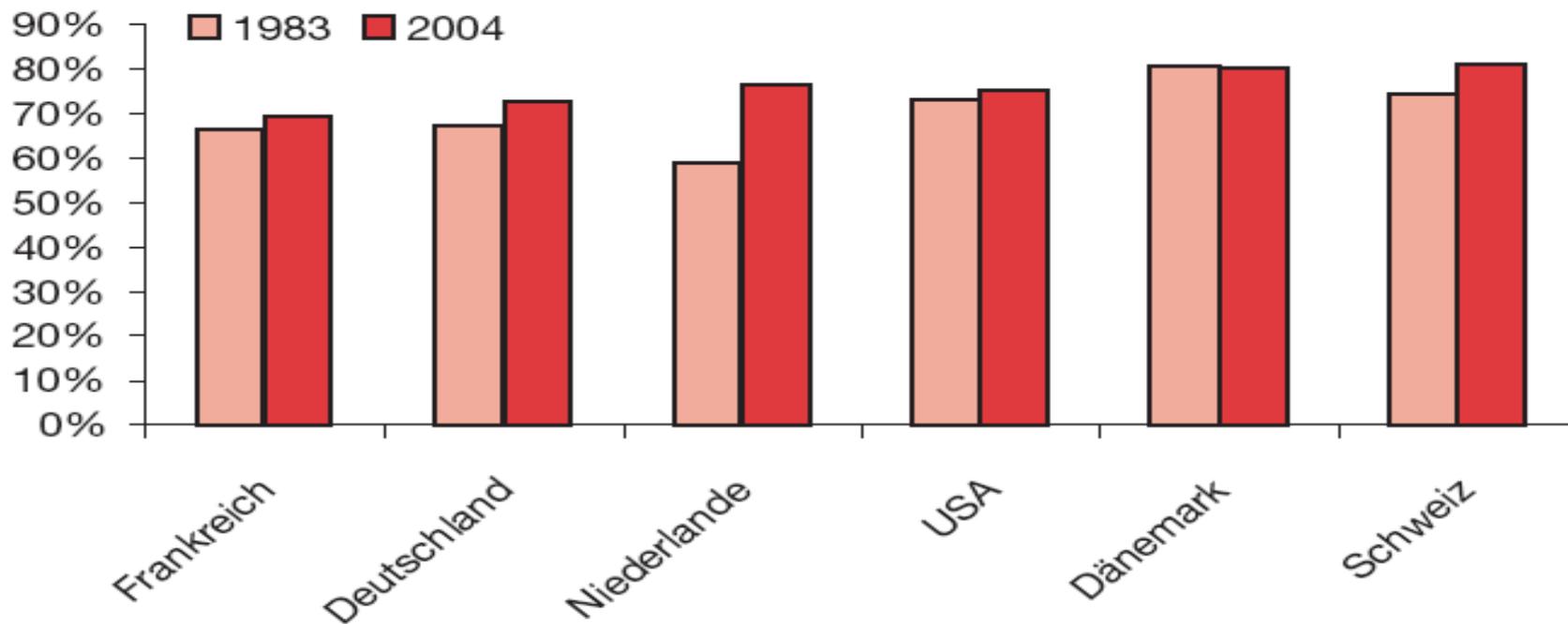


Source: Series UNRATE: Federal Reserve Economic Data (FRED) <http://research.stlouisfed.org/fred2/>

Unemployment Rate

Why Do Economists Care About Unemployment?

- Economists care about unemployment for two reasons:
 - Because of its direct effects on the welfare of the unemployed.
 - Because it provides a signal that the economy may not be using some of its resources efficiently.



participation rates

Did Spain Really Have a 24% Unemployment Rate in 1994?



S
D
C
O
F

- Spain in 1994 looked nothing like the United States in 1933: There were few homeless people, and most cities looked prosperous.
- The size of the underground economy—the part of economic activity which is not measured in official statistics, either because the activity is illegal or because firms and workers would rather not report it and thus not pay taxes—is an old issue in Spain.
- The Spanish underground economy was significant, but it just was not the case that most of the Spanish unemployed worked in the underground economy.
- A key to the answer of how the unemployed survived lies with the Spanish family structure.

Inflation Rate

- **Inflation** is a sustained rise in the general level of prices—the price level.
- The **inflation rate** is the rate at which the price level increases.
- And what is **deflation**?

How can we measure inflation?

- **GDP-deflator** in year t , P_t , is defined as the ratio of nominal GDP to real GDP in year t :

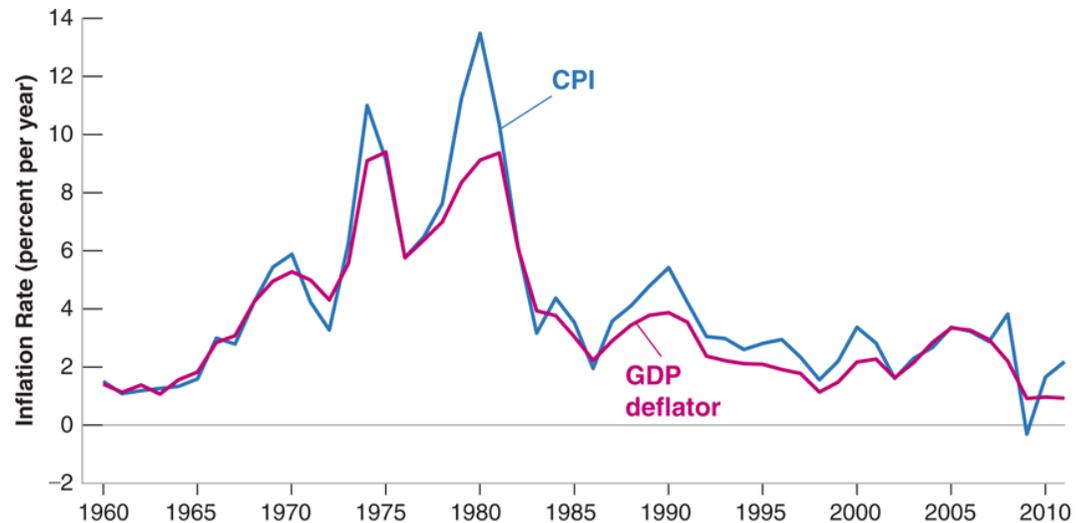
$$P_t = \frac{\text{Nominal GDP}_t}{\text{Real GDP}_t} = \frac{\$Y_t}{Y_t}$$

- is an index number, i.e., set equal to 100 in base year.
- rate of change in GDP-deflator equals the rate of inflation

$$\frac{(P_t - P_{t-1})}{P_{t-1}} \quad \xrightarrow{\text{hence}} \quad \$Y_t = P_t Y_t$$

Inflation Rate

- **Consumer Price Index (CPI)** measures the average price of consumption, i.e., the cost of living.
 - cost in dollars of a specific list of goods and services over time, trying to represent the **consumption basket**
- what is the difference between CPI and GDP-deflator?
 - set of goods produced in the economy is not the same as the set of goods purchased by consumers



Source: Calculated using series GDPDEF, CPI-AUSCL Federal Reserve Economic Data (FRED) <http://research.stlouisfed.org/fred2/>

Inflation Rate – Consumption Basket

Waren-			Warenkorb 2010		Gewicht VPI		% Anteil		Gewicht	
CC1	CC2	CC3	code		2011	VPI	an der		HVPI 2011	HVPI
							Gruppe			
00			Gesamtverbrauchsausgaben		100,0000	791			100,0000	780
01			NAHRUNGSMITTEL UND ALKOHOLFREIE GETRÄNKE		12,0087	128			12,0477	128
01	01			Nahrungsmittel	10,7038	117			10,7222	117
01	01	01	Brot und Getreideerzeugnisse		2,3153	22	100,00	2,3506		22
01	01	01	42	Pizza, tiefgekühlt	0,1026		4,43	0,1044		
01	01	01	43	Germknödel, tiefgekühlt	0,0084		0,36	0,0085		
01	01	01	45	Fertiggericht, tiefgekühlt	0,1256		5,42	0,1241		
01	01	01	47	Fertiggericht, gekühlt	0,0667		2,88	0,0660		
01	01	01	73	Mischbrot	0,1044		4,51	0,1063		
01	01	01	74	Spezialbrot	0,3008		12,99	0,3061		
01	01	01	75	Weißbrot	0,1643		7,10	0,1672		
01	01	01	76	Semmel	0,1488		6,43	0,1514		
01	01	01	77	Gebäck	0,3580		15,46	0,3643		
01	01	01	78	Weckerl zum Fertigbacken	0,0668		2,88	0,0679		
01	01	01	85	Frühstückscerealien	0,0701		3,03	0,0713		
01	01	01	86	Müsli	0,0464		2,01	0,0473		
01	01	01	87	Butterkekse	0,0537		2,32	0,0547		
01	01	01	88	Haselnussschnitten	0,1055		4,55	0,1073		
01	01	01	89	Salzstäbchen	0,0280		1,21	0,0285		
01	01	01	91	Crackers	0,0096		0,42	0,0098		
01	01	01	103	Langkornreis	0,0562		2,43	0,0572		
01	01	01	106	Weizenmehl	0,0669		2,89	0,0681		
01	01	01	107	Teigwaren	0,1096		4,74	0,1116		
01	01	01	110	Kindergrieß	0,0062		0,27	0,0063		

Inflation Rate – Consumption Basket

02				ALKOHOLISCHE GETRÄNKE UND TABAK	3,0402	10		3,1691	10	
02	01				Alkoholische Getränke	1,1018	8	1,1281	8	
02	01	01			<i>Spirituosen</i>	0,1557	2	100,00	0,1594	2
02	01	01	130	Rum	0,1038		66,68	0,1063		
02	01	01	131	Wodka	0,0519		33,32	0,0531		
02	01	02			<i>Wein</i>	0,4707	3	100,00	0,4820	3
02	01	02	123	Rotwein	0,1815		38,56	0,1858		
02	01	02	125	Weißwein	0,1801		38,25	0,1844		
02	01	02	127	Sekt	0,1092		23,19	0,1118		
02	01	03			<i>Bier</i>	0,4754	3	100,00	0,4867	3
02	01	03	119	Dosenbier	0,1456		30,62	0,1490		
02	01	03	120	Flaschenbier	0,2175		45,74	0,2227		
02	01	03	121	Spezialbier	0,1124		23,64	0,1151		
02	02				Tabak	1,9384	2	2,0410	2	
02	02	00			<i>Tabak</i>	1,9384	2	100,00	2,0410	2
02	02	00	628	Zigaretten	1,8628		96,10	1,9614		
02	02	00	629	Zigarren	0,0756		3,90	0,0796		

Inflation Rate

Why Do Economists Care About Inflation?

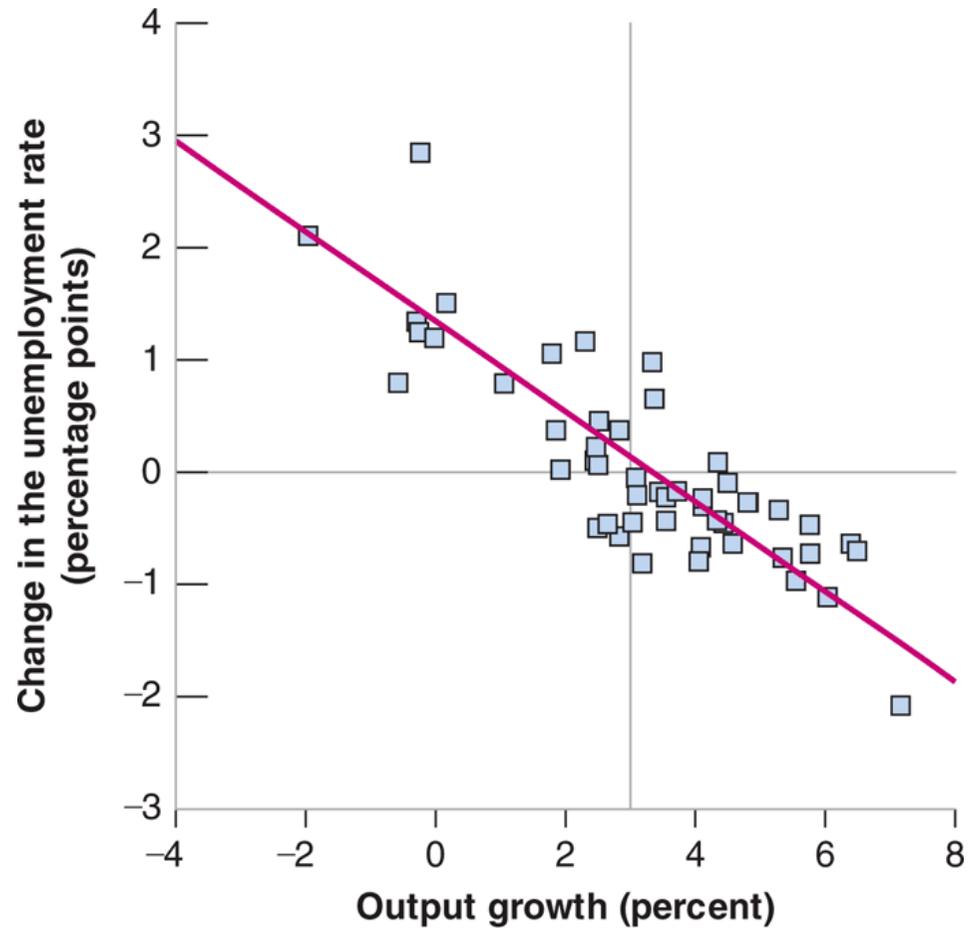
Economists care about inflation for two reasons:

- During periods of inflation, not all prices and wages rise proportionately, inflation affects income distribution.
- Inflation leads to other **distortions** (uncertainty).

Are there any relationships between output, unemployment and inflation?

Output, Unemployment, Inflation

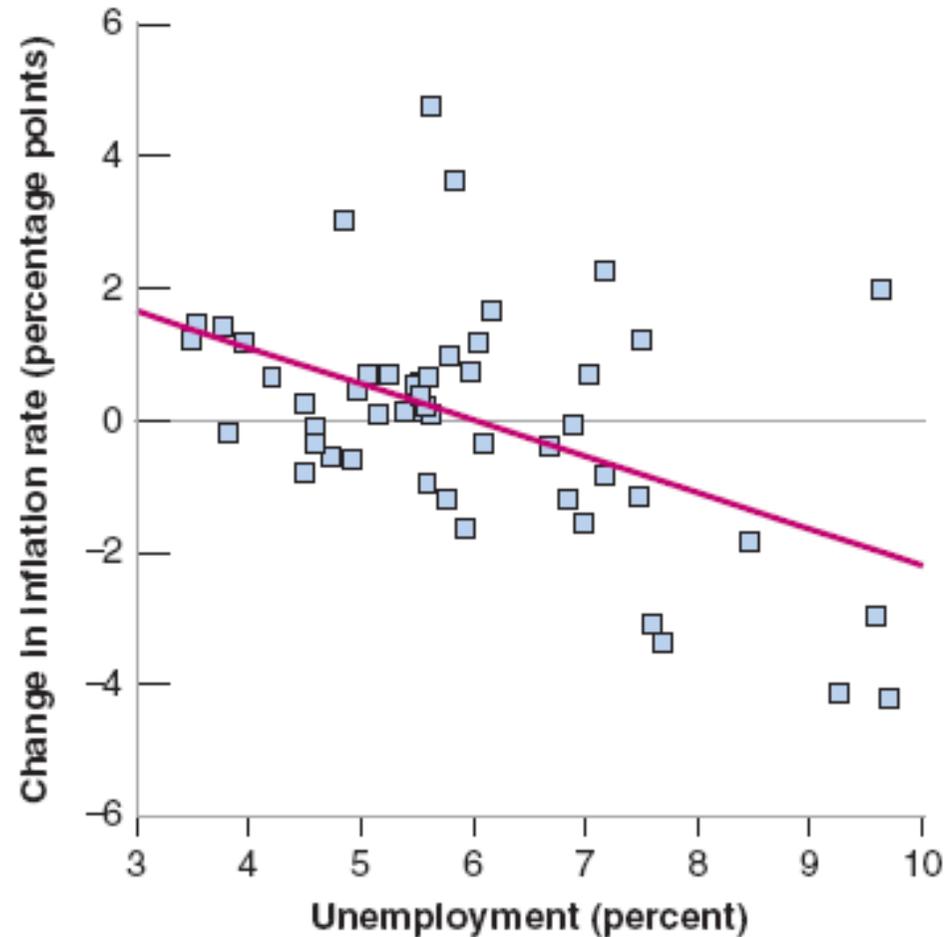
Okun's Law: Changes in the unemployment rate versus output growth in the United States, 1960–2010



Source: See Figures 2-2 and 2-3.

Output, Unemployment, Inflation

Phillips Curve: Changes in the inflation rate versus the unemployment rate in the United States, 1960–2010



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The Goods Market

Chapter 3



ALWAYS LEARNING

PEARSON

Composition of GDP

US GDP 2010

		Billions of Dollars	Percent of GDP
	GDP (Y)	14,660	100
1	Consumption (C)	10,348	70.5
2	Investment (I)	1,756	12.0
	Nonresidential	1,415	9.7
	Residential	341	2.3
3	Government spending (G)	3,001	20.4
4	Net exports	- 516	- 3.5
	Exports (X)	1,838	12.5
	Imports (IM)	- 2,354	- 16.0
5	Inventory investment	71	0.5

Source: Survey of Current Business, May 2010, Table 1-1-5

Composition of GDP

Austria GDP 2016

<i>Source: Statistik Austria</i>	Billions of €	share of GDP in %
Consumption private households(C)	184,15	52,6%
+ Government spending(G)	69,66	19,9%
+ Investment (I)	82,84	23,7%
= Domestic use of goods and services	336,65	96,2%
+Net exports (X-IM) (exports minus imports)	13,30	3,8%
Exports (X)	182,49	52,1%
Imports (IM)	169,19	48,3%
= GDP (Y)	349,95	

Composition of GDP

➤ Consumption (*C*)

- goods and services purchased by consumers

➤ Investment (*I*)

- purchase of capital goods, i.e., it is the sum of nonresidential investment and residential investment

➤ Government Spending (*G*)

- purchases of goods and services by the federal, state, and local governments
- does not include government transfers, nor interest payments on the government debt

Composition of GDP

➤ Imports (*IM*)

- purchases of foreign goods and services by domestic consumers, firms and government

➤ Exports (*X*)

- purchases of domestic goods and services by foreigners

➤ Net exports (*X-IM*)

- difference between exports and imports, i.e., **trade balance**

$$\text{Exports} = \text{imports} \Leftrightarrow \text{trade balance}$$

$$\text{Exports} > \text{imports} \Leftrightarrow \text{trade surplus}$$

$$\text{Exports} < \text{imports} \Leftrightarrow \text{trade deficit}$$

➤ Inventory investment

- difference between production and sales
- mostly small (less than 1% of GDP)

The Demand for Goods

➤ **total demand (Z)** for goods is written as:

$$Z \equiv C + I + G + X - IM$$

The symbol “ \equiv ” means that this equation is an **identity**, or definition.

To determine Z , some assumptions are necessary:

- all firms produce the same good, which can then be used by consumers for consumption, by firms for investment, or by the government.
- firms are willing to supply any amount of the good at a given price, P , and demand in that market.
- Assume that the economy is closed, that it does not trade with the rest of the world, then both exports and imports are zero.

$$Z \equiv C + I + G$$

Consumption

➤ Disposable income (Y_D)

- income that remains once consumers have paid taxes and received transfers from the government

$$Y_D \equiv Y - T$$

- $C(Y_D)$ is called the **consumption function**. It is a **behavioral equation**, i.e., it captures the behavior of consumers.

$$C = C(Y_D)$$

(+)

- specific form of the consumption function is this linear relation:

$$C = c_0 + c_1 Y_D$$

- c_1 is the **(marginal) propensity to consume**
- c_0 is the **autonomous consumption**

Consumption

Consumption Function

■ Figure 3 - 1

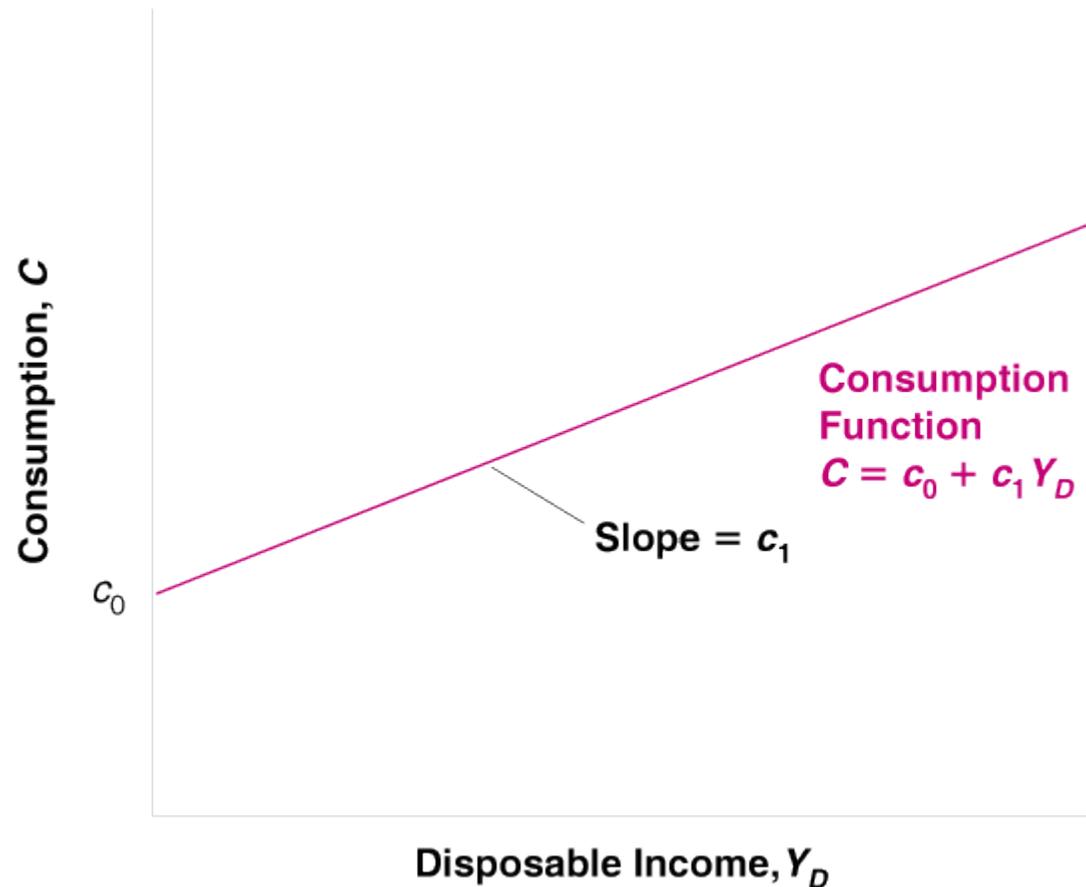
Consumption and Disposable Income

Consumption increases with disposable income but less than one for one.

$$C = C(Y_D)$$

$$Y_D \equiv Y - T$$

$$C = c_0 + c_1(Y - T)$$



Investment, Government Spending

➤ Investment (I)

- **exogenous** variable (not explained in the model)

$$I = \bar{I}$$

➤ Government spending (G)

- together with **taxes (T)** it describes **fiscal policy**—the choice of taxes and spending by the government

Assumption: G and T also exogenous for two reasons:

- Governments do not behave with the same regularity as consumers or firms.
- Macroeconomists must think about the implications of alternative spending and tax decisions of the government.

The Determination of Equilibrium Output

- Assume $IM=X$, then the demand for good is:

$$Z \equiv C + I + G$$

or:
$$Z = c_0 + c_1(Y - T) + \bar{I} + G$$

- Looking for an **equilibrium**. What could this be?
- **Equilibrium condition** is that production (Y) be equal to demand (Z)

$$Y = Z$$

or:
$$Y = c_0 + c_1(Y - T) + \bar{I} + G$$

The Determination of Equilibrium Output

➤ Macroeconomists now use these three tools:

1. **Algebra** to make sure that the logic is correct
2. **Graphs** to build the intuition
3. **Words** to explain the results

The Determination of Equilibrium Output

Using Algebra

Rewrite the equilibrium equation:

$$Y = c_0 + c_1Y - c_1T + \bar{I} + G$$

Move c_1Y to the left side and reorganize the right side:

$$(1 - c_1)Y = c_0 + \bar{I} + G - c_1T$$

Divide both sides by $(1 - c_1)$:

$$Y = \frac{1}{1 - c_1} [c_0 + \bar{I} + G - c_1T]$$

The Determination of Equilibrium Output

Using Algebra

- The equilibrium equation can be manipulated to derive some important terms:
 - Autonomous spending and the multiplier:
 - The term $[c_0 + \bar{I} + \bar{G} - c_1T]$ is that part of the demand for goods that does not depend on output, it is called **autonomous spending**. If the government ran a **balanced budget**, then $T=G$.
 - Because the propensity to consume (c_1) is between zero and one, $\frac{1}{1-c_1}$ is a number greater than one. For this reason, this number is called the **multiplier**.

$$Y = \frac{1}{1-c_1} [c_0 + \bar{I} + \bar{G} - c_1T]$$

The Determination of Equilibrium Output

Using a Graph

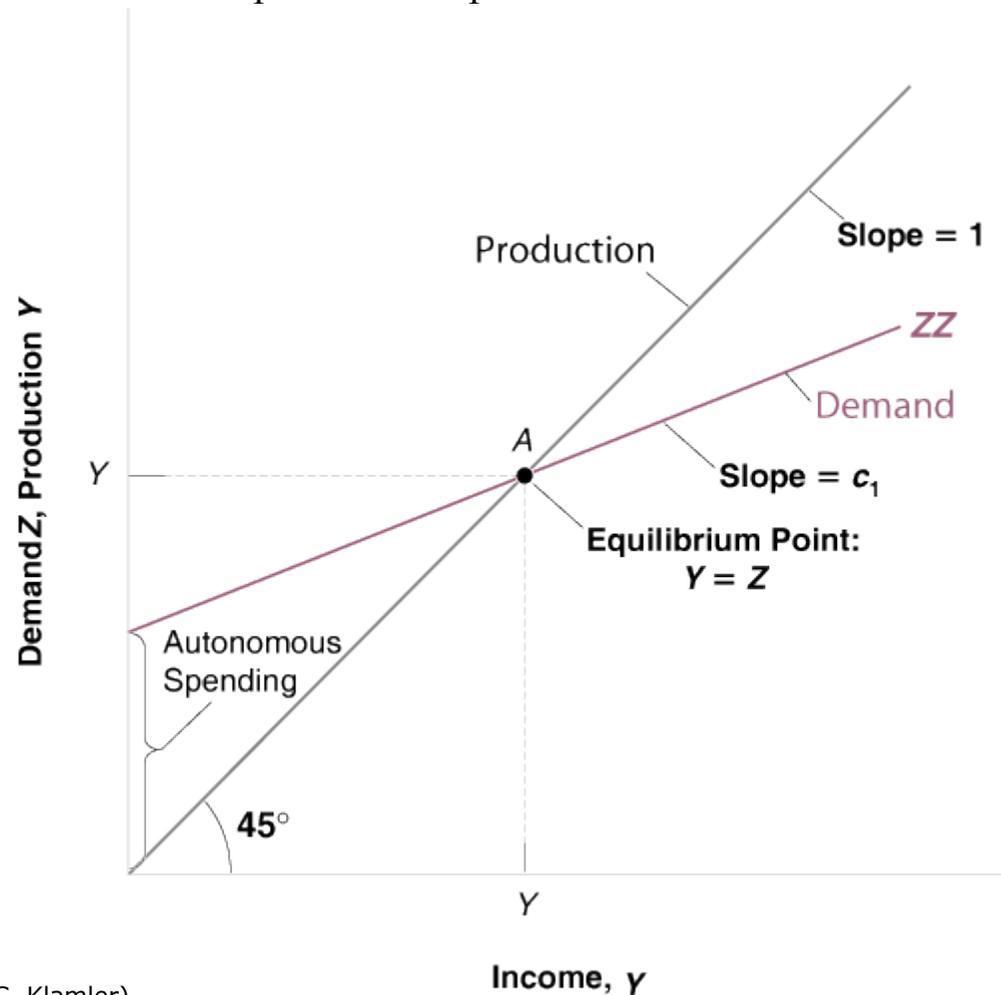
$$Z = (c_0 + \bar{I} + G - c_1T) + c_1Y$$

■ Figure 3 - 2

Equilibrium in the Goods Market

Equilibrium output is determined by the condition that production be equal to demand.

- First, plot production as a function of income.
- Second, plot demand as a function of income.
- In Equilibrium, production equals demand.



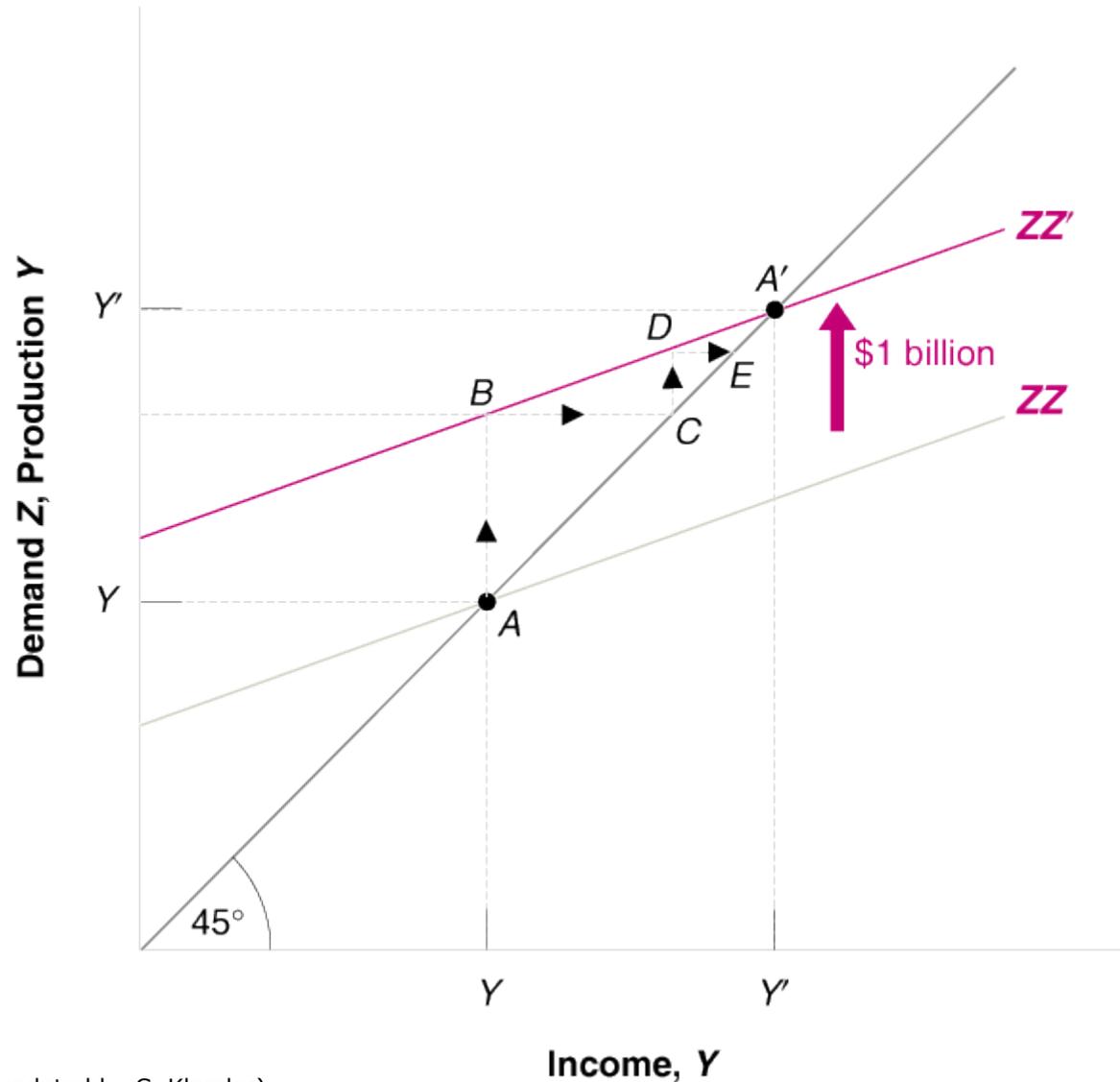
The Determination of Equilibrium Output

Using a Graph

■ **Figure 3 - 3**

The Effects of an Increase in Autonomous Spending on Output

An increase in autonomous spending has a more than one-for-one effect on equilibrium output.



The Determination of Equilibrium Output

Using a Graph

Following this logic, the total increase in production after, say, $n + 1$ rounds, equals \$1 billion multiplied by the sum:

$$1 + c_1 + c_1^2 + \dots + c_1^n$$

Such a sum is called a **geometric series**.

Example: $C = 160 + 0.6Y_D$

$$I = 150$$

$$G = 150$$

$$T = 100$$

Calculate GDP!

What happens if G decreases to $G = 110$?

The Determination of Equilibrium Output

Using Words

To summarize:

- An increase in demand leads to an increase in production and a corresponding increase in income. The end result is an increase in output that is larger than the initial shift in demand, by a factor equal to the multiplier.
- To estimate the value of the multiplier, and more generally, to estimate behavioral equations and their parameters, economists use **econometrics**—a set of statistical methods used in economics.

The Determination of Equilibrium Output

How Long Does It Take for Output to Adjust?

- Describing formally the adjustment of output over time is what economists call the dynamics of adjustment.
 - Suppose that firms make decisions about their production levels at the beginning of each quarter.
 - Now suppose consumers decide to spend more, that they increase c_0 .
 - Having observed an increase in demand, firms are likely to set a higher level of production in the following quarter.
 - In response to an increase in consumer spending, output does not jump to the new equilibrium, but rather increases over time.

The Lehman Bankruptcy

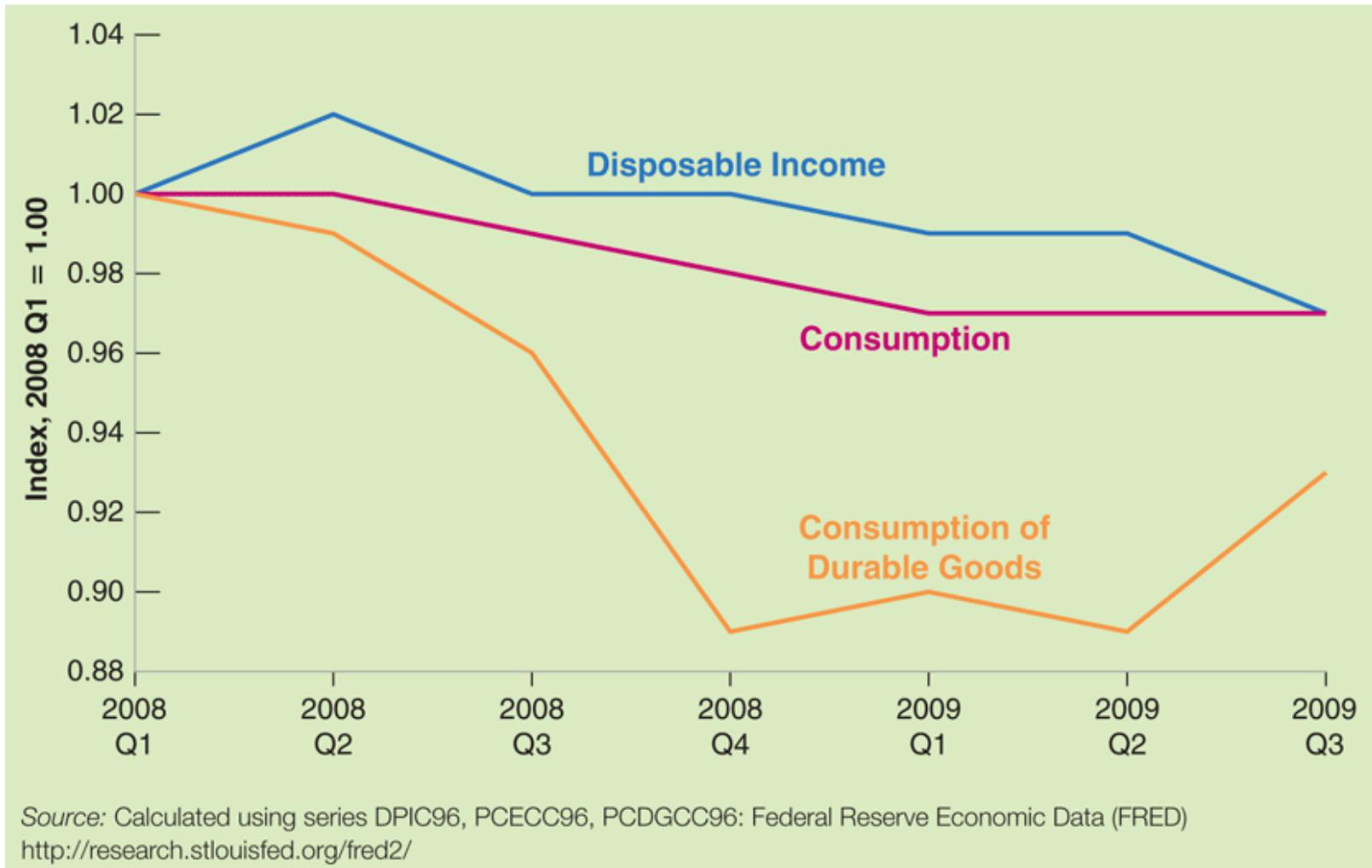


Figure: Disposable income, consumption, and consumption of durables in the United States, 2008:1 to 2009:3

Alternative Approach

Saving is the sum of private plus public saving.

- **Private saving (S)** is saving by consumers.

$$S \equiv Y_D - C$$

$$S \equiv Y - T - C$$

- **Public saving** equals taxes minus government spending.
 - If $T > G$, the government is running a **budget surplus**—public saving is positive.
 - If $T < G$, the government is running a **budget deficit**—public saving is negative.

$$Y = C + I + G$$

$$Y - T - C = I + G - T$$

$$S = I + G - T$$

$$I = S + (T - G)$$

What happens in the previous example?

Alternative Approach

$$I = S + (T - G)$$

- The equation above states that equilibrium in the goods market requires that investment equals saving—the sum of private plus public saving.
- This equilibrium condition for the goods market is called the **IS relation**.
 - What firms want to invest must be equal to what people and the government want to save.

Alternative Approach

- Consumption and saving decisions are one and the same.

$$S = Y - T - C$$

$$S = Y - T - c_0 - c_1(Y - T)$$

$$S = -c_0 + (1 - c_1)(Y - T)$$

- term $(1 - c_1)$ is called the **propensity to save**

In equilibrium:

$$I = -c_0 + (1 - c_1)(Y - T) + (T - G)$$

Rearranging terms, we get the same result as before:

$$Y = \frac{1}{1 - c_1} [c_0 + I + G - c_1 T]$$

The Paradox of Saving



FOCUS

The **paradox of saving** (or the paradox of thrift) is that as people attempt to save more, the result is both a decline in output and unchanged saving.

Is the Government Omnipotent?

- Changing government spending or taxes is not always easy.
- The responses of consumption, investment, imports, etc, are hard to assess with much certainty.
- Anticipations are likely to matter.
- Achieving a given level of output can come with unpleasant side effects.
- Budget deficits and public debt may have adverse implications in the long run.

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Financial Markets

Chapter 4

The Demand for Money

➤ Money

- can be used for transactions, but pays no interest
- two types of money:
 - **currency** (coins and bills)
 - **checkable deposits** (the bank deposits on which you can write checks)

➤ Bonds

- pay a positive interest rate, i , but cannot be used for transactions
- how much will you hold of either?

Money market funds pool together the funds of many people. The funds are then used to buy bonds—typically government bonds.

Semantic Traps: Money, Income, and Wealth



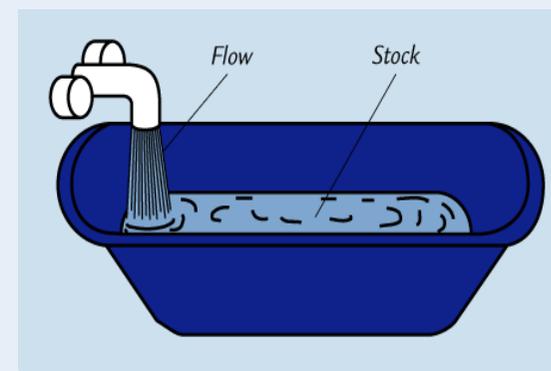
S
A
V
I
N
G
F
O
O
T
P
R
I
N
T

Income is what you earn from working plus what you receive in interest and dividends. It is a **flow**—that is, it is expressed per unit of time.

Saving is that part of after-tax income that is not spent. It is also a flow. Savings is sometimes used as a synonym for wealth (a term we will not use in this book).

Your **financial wealth**, or simply **wealth**, is the value of all your financial assets minus all your financial liabilities. In contrast to income or saving, which are flow variables, financial wealth is a **stock** variable.

Investment is a term economists reserve for the purchase of new capital goods, from machines to plants to office buildings. When you want to talk about the purchase of shares or other financial assets, you should refer them as a financial investment.



Deriving the Demand for Money

How can we describe the **demand for money**?

$$M^d = \$Y L(i)$$

(-)

- The demand for money:
 - increases in proportion to nominal income ($\$Y$)
 - depends negatively on the interest rate ($L(i)$ and the negative sign underneath).

- what quantity of bonds would you hold if the interest rate was equal to zero?

The Demand for Money

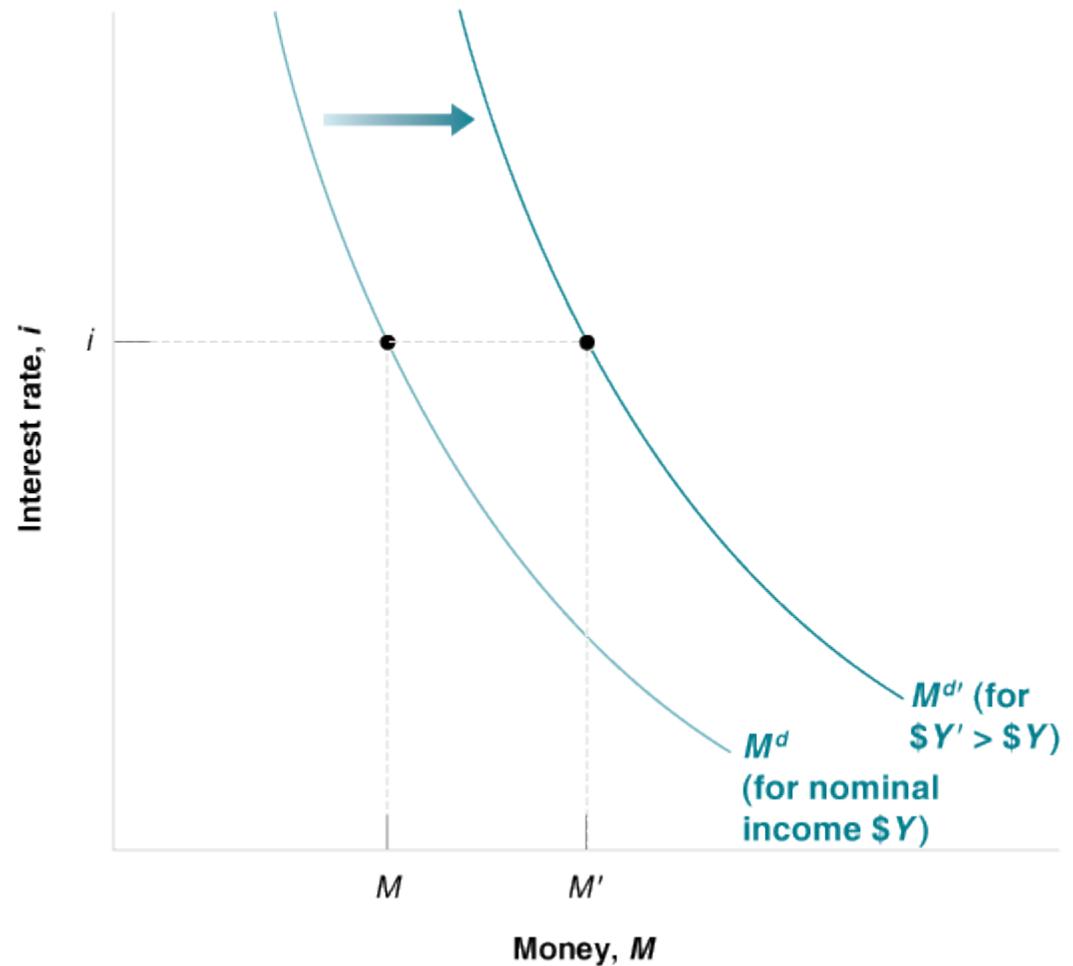
$$M^d = \$YL(i)$$

(-)

Figure 4 - 1

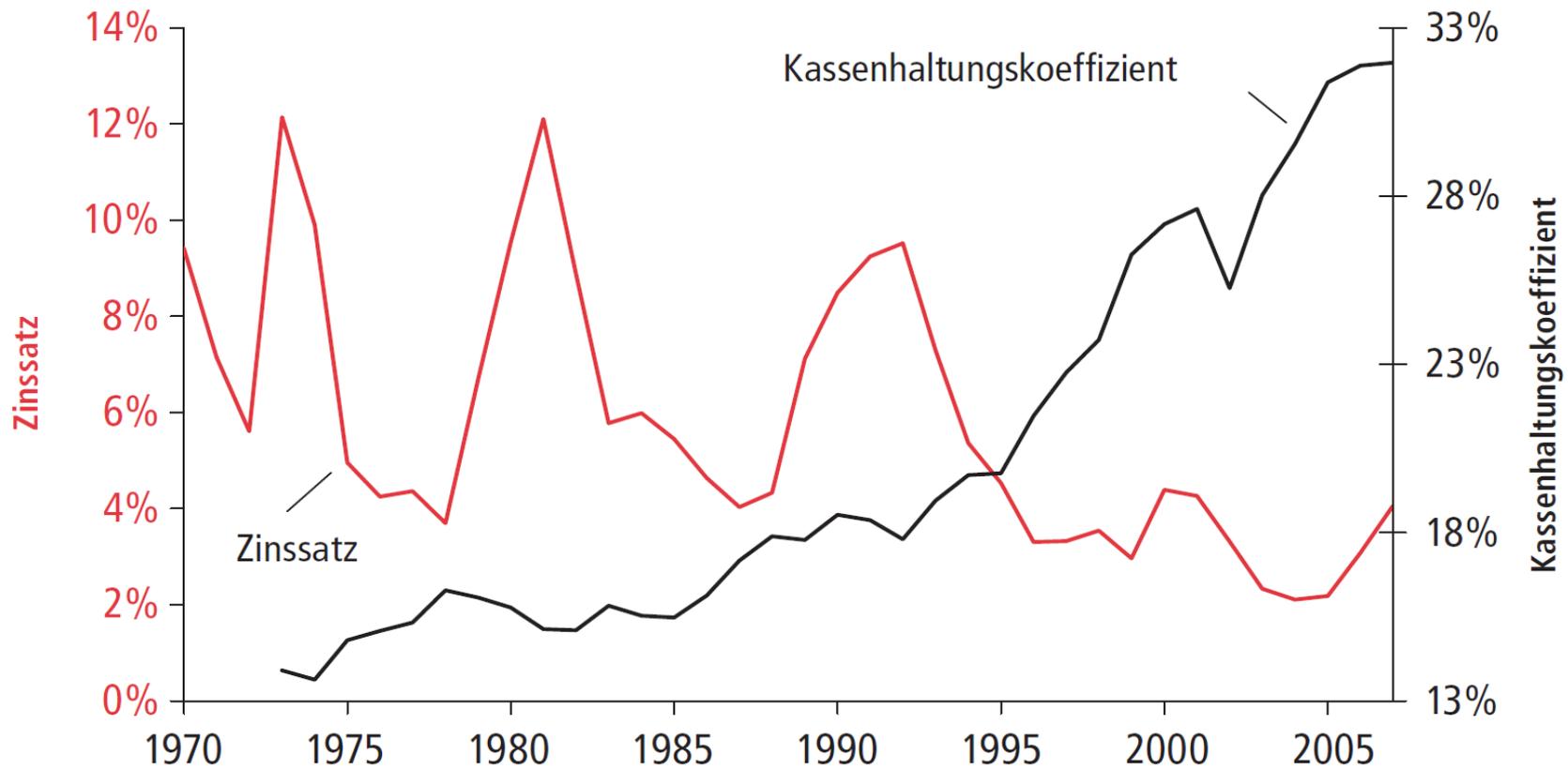
The Demand for Money

For a given level of nominal income, a lower interest rate increases the demand for money. At a given interest rate, an increase in nominal income shifts the demand for money to the right.



The Demand for Money

- How good an estimator is the money demand function?
 - money demand and interest rate should move in opposite directions



Germany, 1970 - 2005

Who Holds U.S. Currency?



S
D
C
O
F

According to household surveys, in 2006, the average U.S. household held \$1,600 in currency. If multiplied by the number of households in the U.S. the total would come to around \$170 billion. However, the Federal Reserve Board knows the amount of currency in circulation was much higher, \$750 billion.

Clearly some currency was held by firms rather than by households. And some was held by those involved in the underground economy or in illegal activities. However, this leaves 66% of the total unaccounted for. The balance of which is abroad and held by foreigners.

The fact that foreigners hold such a high proportion of the dollar bills in circulation has two main macroeconomic implications.

First, the rest of the world, by being willing to hold U.S. currency, is making in effect an interest-free loan to the United States of \$500 billion.

Second, while we shall think of money demand as being determined by the interest rate and the level of transactions in the country, it is clear that U.S. money demand also depends on other factors.

The Determination of the Interest Rate

- How do we find the equilibrium in financial markets?
 - requires money supply to be equal to money demand
 - $M^s = M^d$

$$M = PY L(i)$$

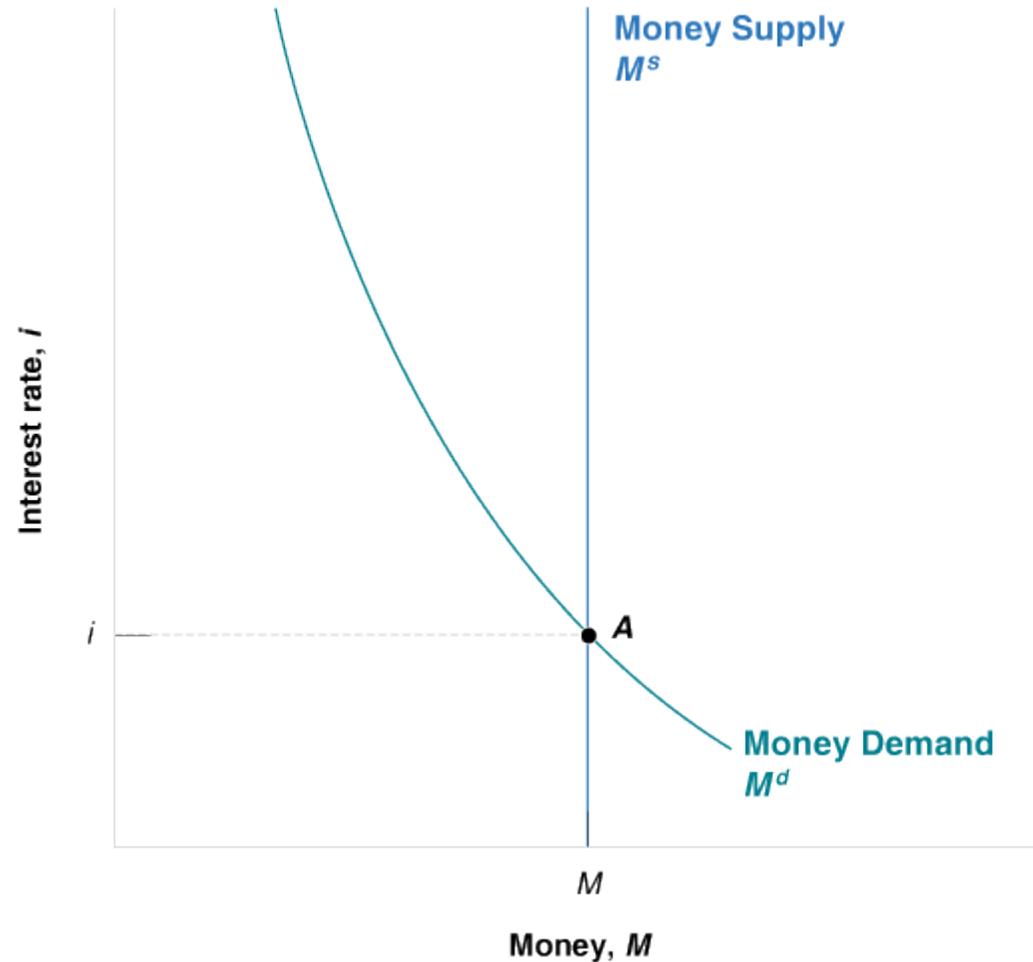
This equilibrium relation is called the **LM relation**.

The Determination of the Interest Rate

■ **Figure 4 - 2**

The Determination of the Interest Rate

The interest rate must be such that the supply of money (which is independent of the interest rate) is equal to the demand for money (which does depend on the interest rate).



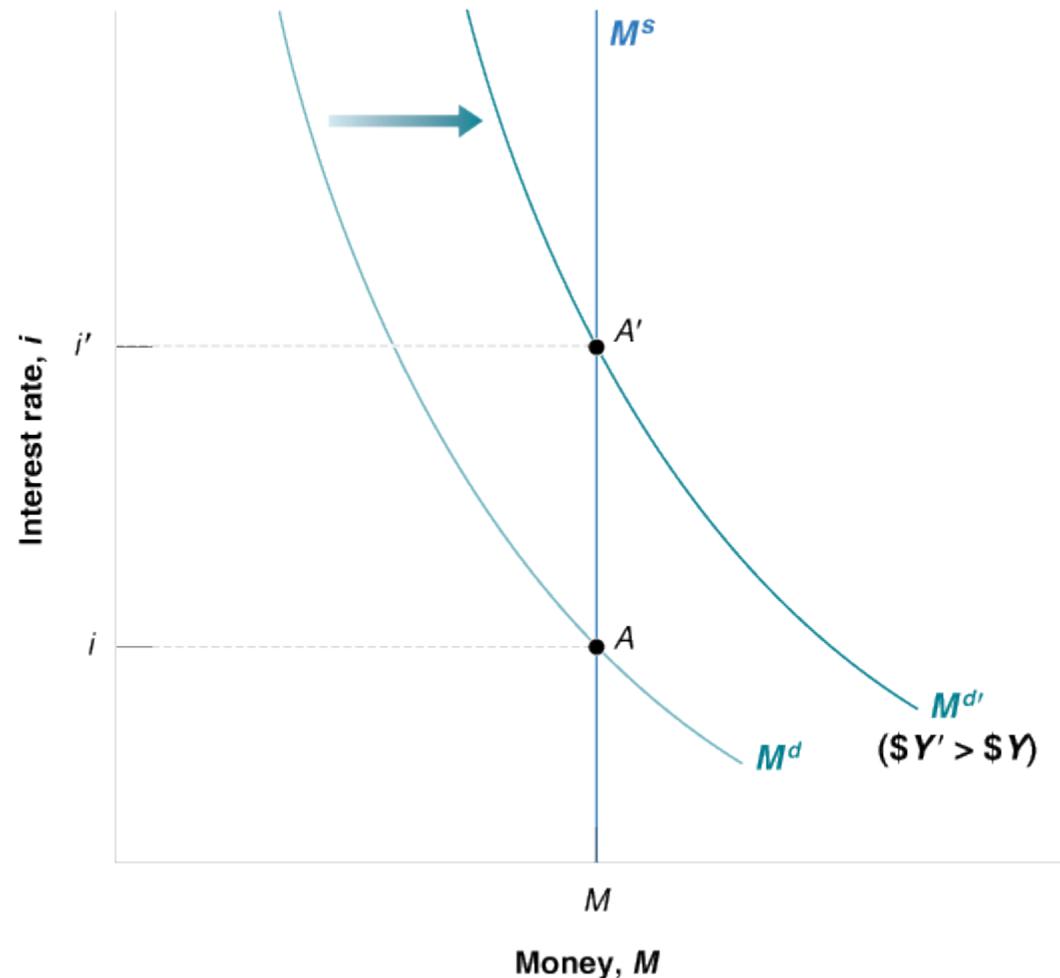
The Determination of the Interest Rate

Figure 4 - 3

The Effects of an Increase in Nominal Income on the Interest Rate

An increase in nominal income leads to an increase in the interest rate.

And what happens if money supply changes?



Monetary Policy

How can the (European) Central Bank (ECB) actually change money supply?

Open Market Operations

- take place in the “open market” for bonds
 - the standard method central banks use to change the money stock in modern economies

- buying bonds is called an **expansionary** open market operation
 - central bank increases (*expands*) the supply of money

- selling bonds is called a **contractionary** open market operation
 - central bank decreases (*contracts*) the supply of money

Monetary Policy

Open market operations

■ **Figure 4 - 5**

The Balance Sheet of the Central Bank and the Effects of an Expansionary Open Market Operation

The assets of the central bank are the bonds it holds. The liabilities are the stock of money in the economy. An open market operation in which the central bank buys bonds and issues money increases both assets and liabilities by the same amount.

(a)

Balance Sheet	
Assets	Liabilities
Bonds	Money (currency)

(b)

The Effects of an Expansionary Open-Market Operation	
Assets	Liabilities
Change in bond holdings: +\$1 million	Change in money stock: +\$1 million

How does such an open market operation influence bond price and interest rate?

Monetary Policy

Bond Prices and Bond Yields

What is the relation between the interest rate and bond prices?

- ✧ government issues a bond (e.g. nominal worth \$100)
- ✧ buying the bond today at price $\$P_B$ and holding it for a year leads to a rate of return (or interest) of

$$i = (\$100 - \$P_B)/\$P_B$$

- ✧ given the interest rate, the price of the bond is

$$i = \frac{\$100 - \$P_B}{\$P_B} \Rightarrow \$P_B = \frac{\$100}{1 + i}$$

Monetary Policy - ECB

how is money defined?

Table 2.12 Definitions of euro area monetary aggregates

Liabilities ¹⁾	M1	M2	M3
Currency in circulation	X	X	X
Overnight deposits	X	X	X
Deposits with an agreed maturity of up to 2 years		X	X
Deposits redeemable at notice of up to 3 months		X	X
Repurchase agreements			X
Money market fund shares/units			X
Debt securities issued with a maturity of up to 2 years			X

Source: ECB.

1) Monetary liabilities of MFIs and central government (post office, treasury) vis-à-vis non-MFI euro area residents excluding central government.

M1: a narrow monetary aggregate that comprises currency in circulation plus overnight deposits held with MFIs and central government (e.g. at the post office or treasury).

M2: an intermediate monetary aggregate that comprises M1 plus deposits redeemable at a period of notice of up to and including three months (i.e. short-term savings deposits) and deposits with an agreed maturity of up to and including two years (i.e. short-term time deposits) held with MFIs and central government.

M3: a broad monetary aggregate that comprises M2 plus marketable instruments, in particular repurchase agreements, money market fund shares and units, and debt securities with a maturity of up to and including two years issued by MFIs.

Monetary Policy - ECB

what amounts of money
are there in the Euro
zone?

and what changes do we
observe?

CI Monetary aggregates ¹⁾

(annual growth rates; seasonally adjusted)

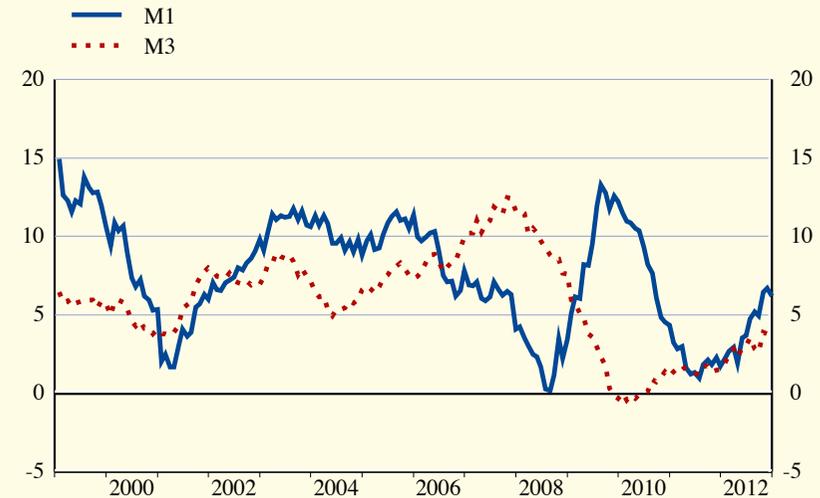


Table 4 Summary table of monetary variables

(quarterly figures are averages; adjusted for seasonal and calendar effects)

	Outstanding amounts as a percentage of M3 ¹⁾	Annual growth rates					
		2011 Q4	2012 Q1	2012 Q2	2012 Q3	2012 Oct.	2012 Nov.
M1	52.3	2.0	2.4	2.9	4.8	6.5	6.7
Currency in circulation	8.8	6.2	6.1	5.5	5.3	3.5	2.2
Overnight deposits	43.5	1.2	1.7	2.4	4.6	7.1	7.7
M2-M1 (=other short-term deposits)	39.6	2.1	2.6	2.6	1.3	1.7	1.8
Deposits with an agreed maturity of up to two years	18.4	1.6	3.0	2.3	-1.1	-1.8	-1.9
Deposits redeemable at notice of up to three months	21.2	2.5	2.1	2.9	3.7	4.9	5.2
M2	91.9	2.1	2.5	2.8	3.2	4.3	4.5
M3-M2 (=marketable instruments)	8.1	-3.6	-0.1	2.6	1.6	-0.4	-3.6
M3	100.0	1.5	2.2	2.7	3.1	3.9	3.8

Monetary Policy - ECB

which options does the ECB have?

1. Reverse transactions

Reverse transactions refer to operations where the Eurosystem buys or sells eligible assets under repurchase agreements or conducts credit operations against eligible assets

2. Outright transactions

Outright open market transactions refer to operations where the Eurosystem buys or sells eligible assets outright on the market.

Table 4.1 Eurosystem monetary policy operations

Monetary policy operations	Type of transaction ¹⁾		Maturity	Frequency
	Liquidity-providing	Liquidity-absorbing		
Open market operations				
Main refinancing operations	• Reverse transactions	–	• One week ²⁾	• Weekly
Longer-term refinancing operations	• Reverse transactions	–	• Three months	• Monthly
Fine-tuning operations	• Reverse transactions • Foreign exchange swaps	• Reverse transactions • Collection of fixed-term deposits • Foreign exchange swaps	• Non-standardised	• Non-regular
Structural operations	• Reverse transactions	• Issuance of ECB debt certificates	• Standardised/ non-standardised	• Regular and non-regular
	• Outright purchases	• Outright sales	–	• Non-regular
Standing facilities				
Marginal lending facility	• Reverse transactions	–	• Overnight	• Access at the discretion of counterparties
Deposit facility	–	• Deposits	• Overnight	• Access at the discretion of counterparties

Monetary Policy -ECB

➤ Main refinancing operations

- provide liquidity to the banks (for a week)
- bank needs guarantees (assets)
- minimum bid rate by ECB (set every month)
- banks bid for money on weekly basis
- highest bids served first until predefined ECB quantity ran out
- other banks have to borrow at [money market rates](#)

➤ Standing facilities

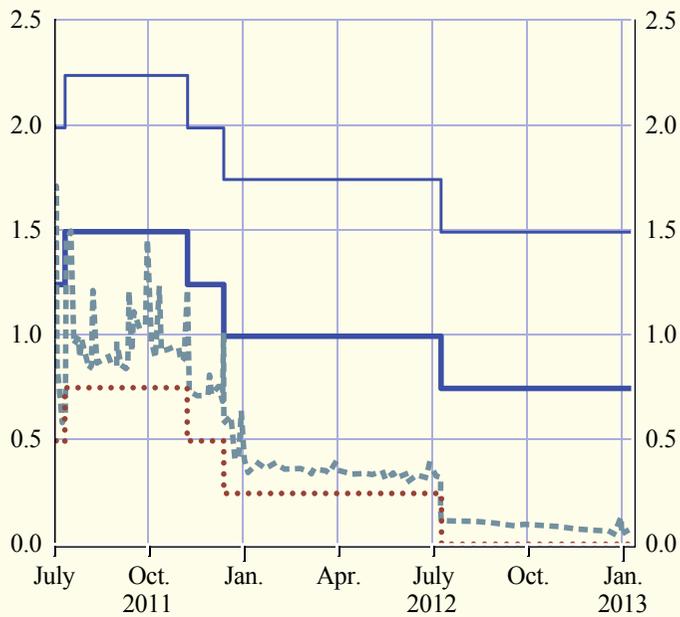
- **Marginal lending facility**
 - borrow money from ECB on a daily basis
 - **Deposit facility**
 - deposit money at ECB on a daily basis
- only used by banks if no other alternatives
- provide a sort of upper and lower limit to the money market

Monetary Policy - ECB

Chart 1.1 ECB interest rates and the overnight interest rate

(percentages per annum; daily data)

- fixed rate in the main refinancing operations
- interest rate on the deposit facility
- - - overnight interest rate (EONIA)
- interest rate on the marginal lending facility



Sources: ECB and Thomson Reuters.

Chart 9 Money market interest rates

(percentages per annum; spread in percentage points; daily data)

- one-month EURIBOR (left-hand scale)
- three-month EURIBOR (left-hand scale)
- - - twelve-month EURIBOR (left-hand scale)
- spread between twelve-month and one-month EURIBOR (right-hand scale)

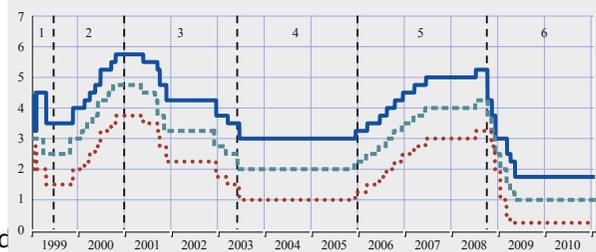


Sources: ECB and Thomson Reuters.

Chart 5.1 Key ECB interest rates in the six phases

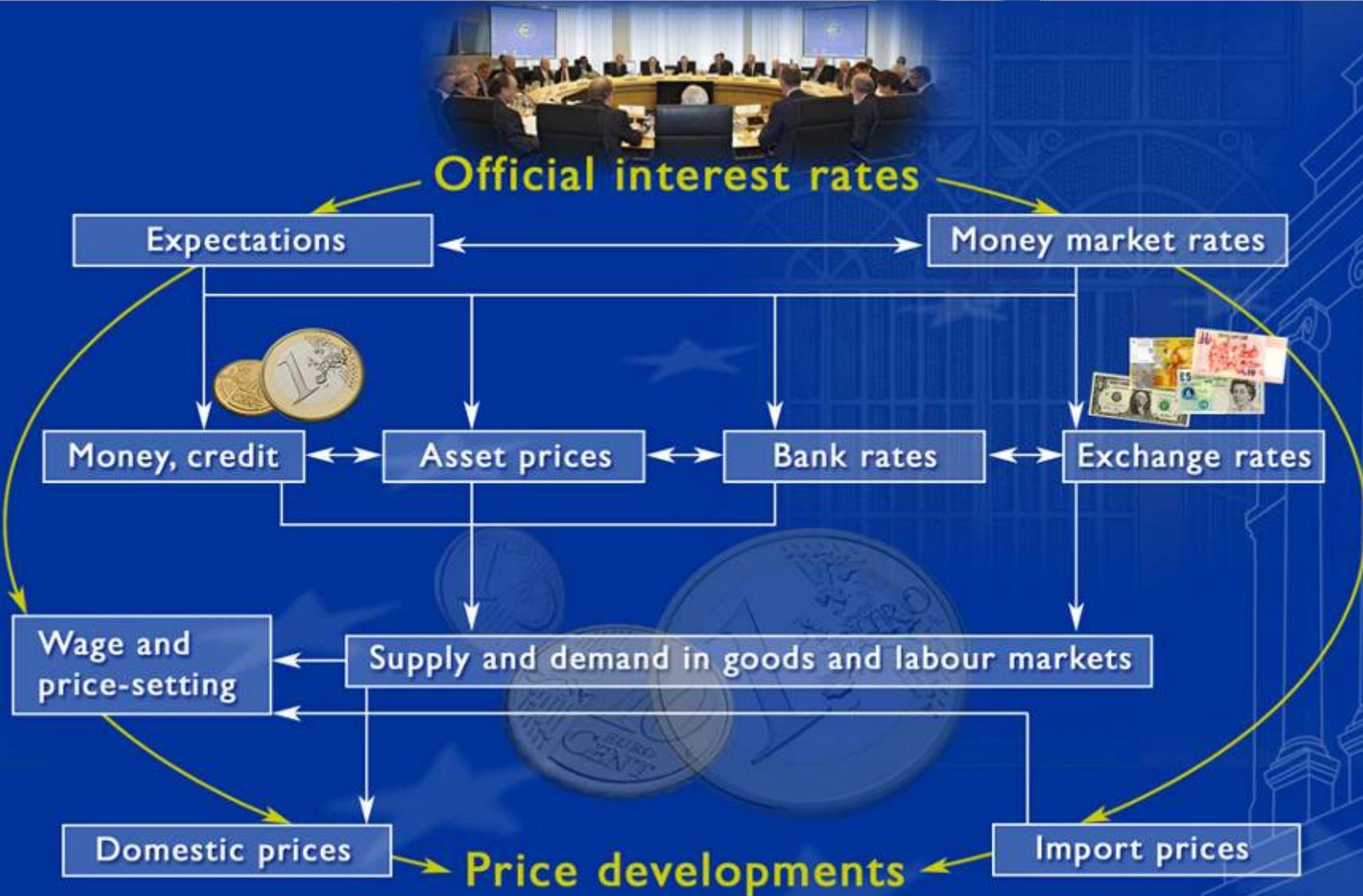
(annual percentage changes; daily data)

- marginal lending rate
- deposit rate
- - - main refinancing/minimum bid rate



Source: ECB.

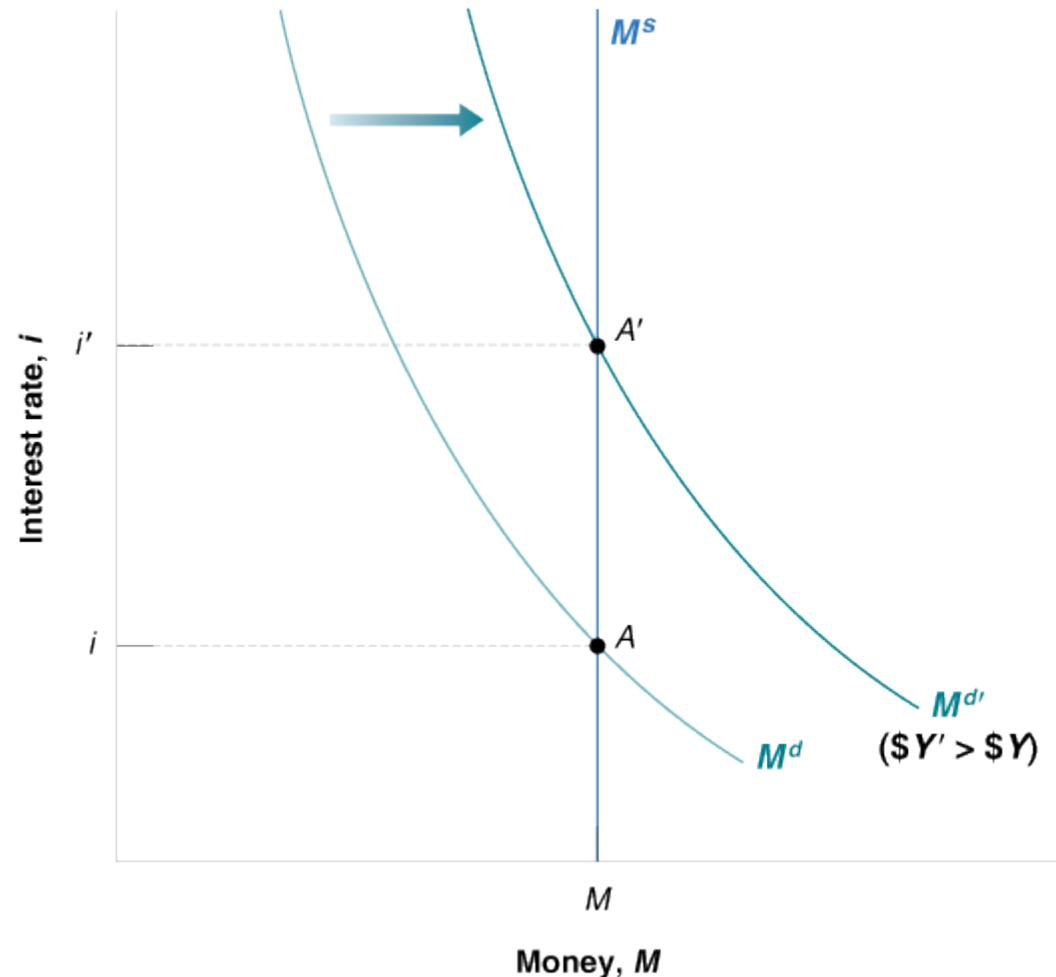
TRANSMISSION MECHANISM – HOW INTEREST RATES AFFECT PRICES



Monetary Policy - ECB

Choosing Money or Choosing the Interest Rate?

A decision by the central bank to lower the interest rate from i to i' is **equivalent** to increasing the money supply.



Extended Model

- so far: focus on an economy with only two assets
 - money and bonds
 - obviously a much simplified version of actual economies, with their many financial assets and many financial markets

- now: extension w.r.t. money which was assumed to be exclusively currency
 - in the real world, money includes not only currency but also **checkable deposits**

- introduce **financial intermediaries**
 - institutions that receive funds from people and firms, and use these funds to buy bonds or stocks, or to make loans to other people and firms
 - e.g. banks

Extended Model

What Banks Do

- Banks receive funds from people and firms who either deposit funds directly or have funds sent to their checking accounts.
- The liabilities of the banks are therefore equal to the value of these *checkable deposits*.
- Banks keep as **reserves** some of the funds they receive.

Why?

1. On any given day, some depositors withdraw cash from their checking accounts, while others deposit cash into their accounts.

2. In the same way, on any given day, people with accounts at the bank write checks to people with accounts at other banks, and people with accounts at other banks write checks to people with accounts at the bank.

3. Banks are subject to reserve requirements. The actual **reserve ratio** – the ratio of bank reserves to bank checkable deposits – is about 2% in the Euro zone today.

Extended Model

- Loans represent roughly 70% of banks' non-reserve assets. Bonds count for the rest, 30%.
- The assets of the central bank are the bonds it holds. The liabilities of the central bank are the money it has issued, **central bank money**.
 - **Important:** not all of central bank money is held as currency by the public!
 - some of it is held as reserves by banks

(a)

Central Bank	
Assets	Liabilities
Bonds	Central Bank Money = Reserves + Currency

(b)

Banks	
Assets	Liabilities
Reserves Loans Bonds	Checkable deposits

Alternative Approach for Interest Rates

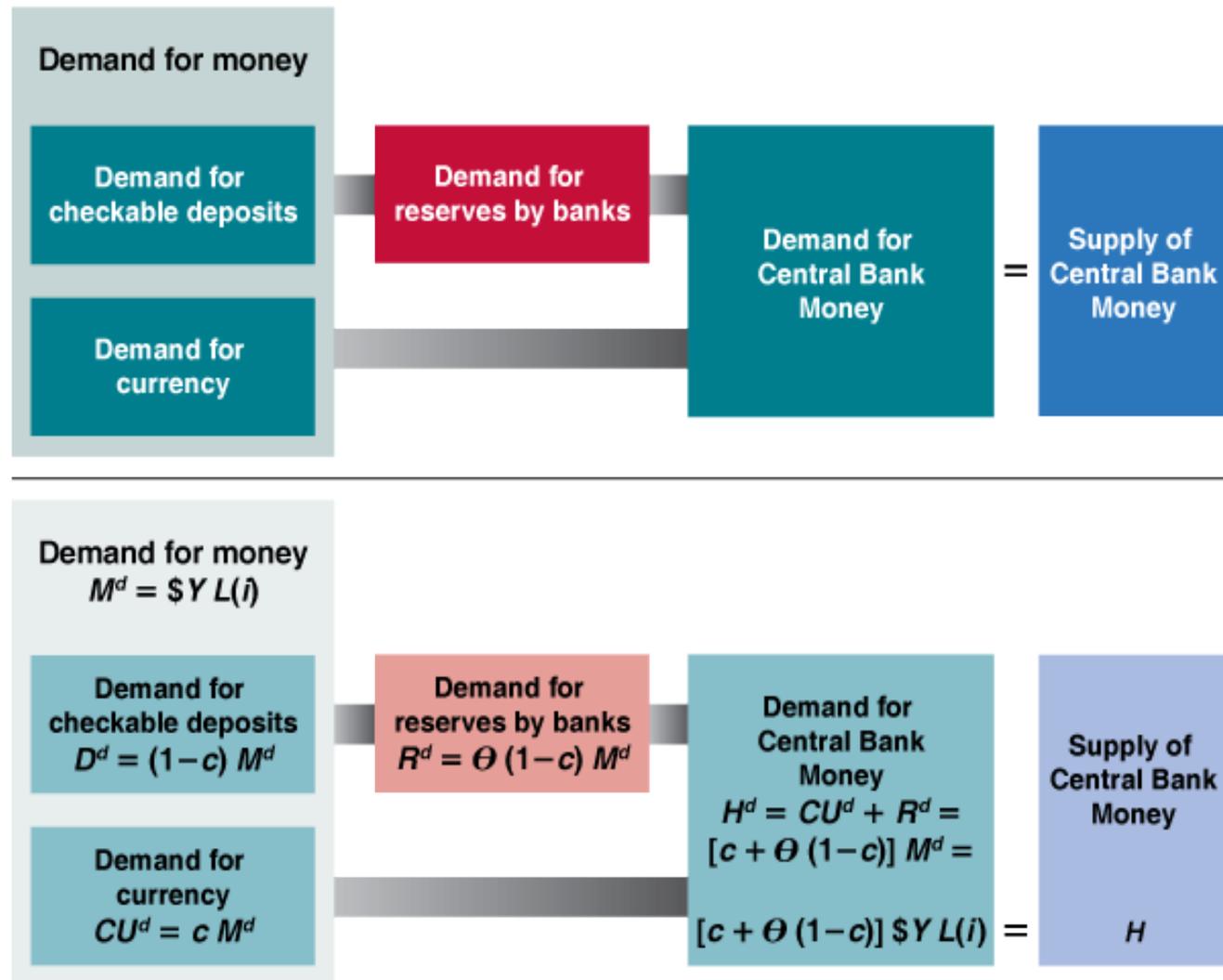
- think in terms of supply and demand for *central bank money*
 - demand for central bank money = demand for currency by people + demand for reserves by banks
 - supply of central bank money is under the direct control of the central bank.
 - equilibrium interest rate:
 - demand and the supply for central bank money are equal

Alternative Approach for Interest Rates

The Supply and the Demand for Central Bank Money

Figure 4 - 7

Determinants of the Demand and the Supply of Central Bank Money



Alternative Approach for Interest Rates

The Demand for Money

- When people can hold both currency and checkable deposits, the demand for money involves two decisions:
 - people must decide how much money to hold
 - they must decide how much of this money to hold in currency and how much to hold in checkable deposits.

overall money demand: $M^d = \$Y L(i)$
(-)

demands for currency and checkable deposits:

$$CU^d = c M^d$$

$$D^d = (1 - c) M^d$$

Alternative Approach for Interest Rates

The Demand for Reserves

- the larger the amount of checkable deposits (D), the larger the amount of reserves (R) the bank must hold

$$R = \theta D$$

demand for reserves by banks:

$$R^d = \theta(1 - c)M^d$$

Alternative Approach for Interest Rates

The Demand for Central Bank Money

- demand for central bank money (H) = demand for currency (CU) + demand for reserves (R)

$$H^d = CU^d + R^d$$

use previous equations to get:

$$H^d = cM^d + \theta(1-c)M^d = [c + \theta(1-c)]M^d$$

replace M^d to get:

$$H^d = [c + \theta(1-c)] \$Y L(i)$$

in equilibrium supply (H) = demand (H^d) and hence:

$$H = [c + \theta(1-c)] \$Y L(i)$$

Alternative Approach for Interest Rates

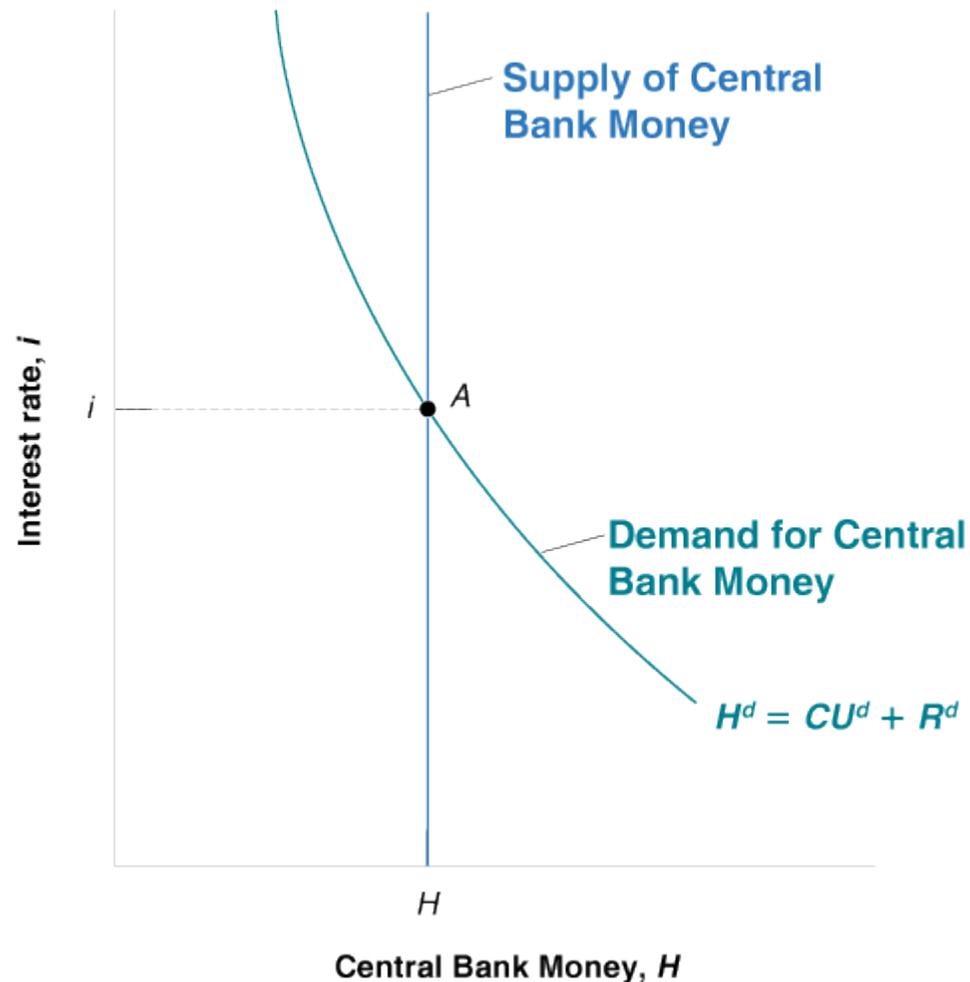
The Supply and the Demand for Central Bank Money

The Determination of the Interest Rate

■ Figure 4 - 8

Equilibrium in the Market for Central Bank Money and the Determination of the Interest Rate

The equilibrium interest rate is such that the supply of central bank money is equal to the demand for central bank money.



Alternative Ways of Looking at Equilibrium

- use equilibrium condition that **supply and demand for bank reserves** be equal:

$$H - CU^d = R^d$$

- banks do indeed trade daily in this market
- **money market interest rate**

Alternative Ways of Looking at Equilibrium

- use equilibrium condition that overall supply and overall demand for money (currency and checkable deposits) be equal:

$$H = [c + \theta(1 - c)] \$Y L(i)$$

to determine: $\frac{1}{[c + \theta(1 - c)]} H = \$Y L(i)$

Supply of money = Demand for money

- overall supply of money given by central bank money (H) times the **money multiplier**

$$1/(c + \theta(1 - c))$$

- **high-powered money**

- term used to reflect the fact that the overall supply of money depends in the end on the amount of central bank money (H), or **monetary base**.