Macroeconomics

Macro economics is the study of the macro economy (countries as a whole, the globe as a whole, a continent)
Examples:

The news is laced with mentions of:

- Unemployment
- Inflation
- Business cycle
- Monetary policy, central bank
- Fiscal policy
- …

Economics think of the world as a system where the different parts interacts: inflation is related to the business cycle, the labour marked,…

This course provides a framework that ties these concepts together

In this course: we'll see a framework (or a model) that connects all these parts (but very simplified)
With the framework: if event a happens than this will happen to b

Course content

- **Basic concepts** (CH 2) (inflations, economic growth, wealth)
- **Short run** → Fluctuations in the economicy that aren’t about long therm economic growth (≠ growth we see in decades ≠ our concern)
  = buisness cycles
  > economy is booming or there is a recession
  To study these short run fluctuations we well study:
  - Goods market (CH 3)
  - Financial market (CH 4)
  - IS-LM model (CH 5)
    = the combined model of C4&C3
  - Open economy (CH 6&7)

Short run: demand is often the most important driver
> if you want to change production: then you start to take investing = taking more time
> finding a different job = more time

Course content (cont'd)

- **Medium run**
  Supply will start to take a more intresting role
  - Labour market (CH 8)
  - All markets together: AS-AD model (CH 9)
    = economy as a whole = good financial and labour mrket
  - Phillips curve, natural rate of unemployment and inflation (CH 10)
  - Inflation, money growth and the real interest rate (CH 11)
- Additional **Topics**
  - The Great Recession / Great Financial Crisis
  - The Great Lockdown / Pandemic recession
  - Current inflation / high inflation
  - High Debt

Course evaluation: D0R71a

Either:

- Multiple-choice exam (100%)

Or

- Midterm assignment (20%)
  = 4 punten
- Multiple-choice exam (80%)

You choose.

and your grade is better then your exam then your grade is going to count for 20%

→ score 28/30

→ $4 \cdot \frac{28}{30} = 3{,}733 \approx 3{,}7$

Dus $9{,}5 - 3{,}733 = 5{,}76$

$5{,}76 / 16 = 0{,}3604$

$= 36\%$

Structure: "Short term"

We will first look at 2 individual markets first:

- CH 3: Goods market => IS
- CH 4: Financial market => LM

and later combine them in C5

- Approach:
  - Market
    When we think of markets we think of

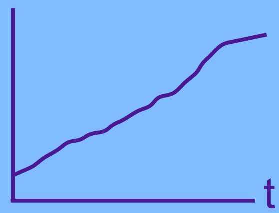
Market is about:

- Demand
  what determines demand?
- Supply
  what determines suply?
- Equilibrium: demand = supply
  = one specific data point
  > what happens if this or this happens?

- CH 5: Equilibrium in all markets: IS-LM

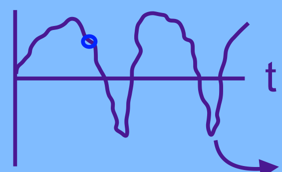
Did the demand or supply
curve change due to
fluctuations?

GDP = Y



Over time: economies grow (long term)
This course:
> we'll not look at long term grow
> we look at the fluctuations:

$\Delta Y/Y$



recessions
= negative growth

Part 1: short run

C3 Goods Market
C4 Financial markets
C5 IS-LM model
C6 IS-LM open economy

THE CORE

THE SHORT RUN

CHAPTER 3: THE GOODS MARKET

To summarise: You can think about aggregate output – *GDP* – in three different, but equivalent, ways:

- From the *production side* – GDP equals the value of the final goods and services produced in the economy during a given period.
- Also from the *production side* – GDP is the sum of value added in the economy during a given period.
- From the *income side* – GDP is the sum of incomes in the economy during a given period.

Total of production in the economy = GDP (gross demestic product)
- the first measure of looking how economy is doing
- is equal to the amount of income in an economy (is equal to production)
- this fluctuates: we're in a boom or a recession

Our focus will be western economies

Stylised facts: facts that seem to hold across time across amost all countries
> Table = ex. of stylised facts
> Table = 5 components of GDP

3.1 The Composition of GDP

How important are these components?

> the most important one: consumption
- = ±60% of GDP, varied through the years)
- that's why it's always featured in the news
- is the key component in our model

> investement = relativly small component (±20%)

		Billion euros	Percentage of GDP
GDP (Y)		11,634	100
1 Consumption (C) 60%	CLOSED ECONOMY	6,735	57.9 ± 60
2 Investment (I) 20%		1,892	16.3 ± 15
3 Government spending (G)		2,566	22.1 ± 20
4 Net exports		136	1.1
Exports (X)		4,890	42
Imports (IM)		−4,754	−40.9
5 Inventory investment		60	0.5

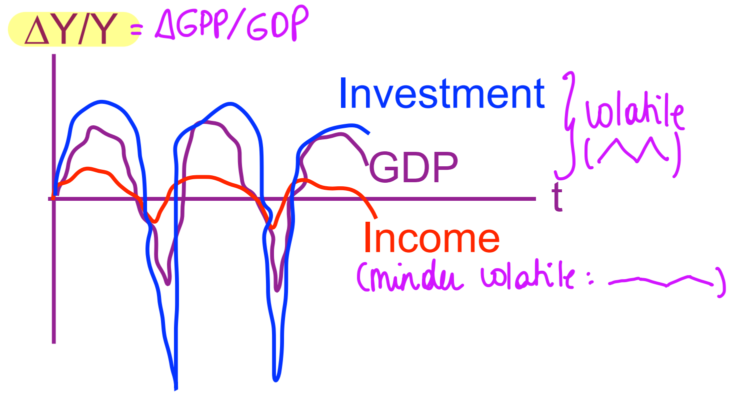
We are intrested in buisness cycles, and there is an important difference in between these two in terms of dynamics

> consumption (change over time): increases when GDP increases, but it's not as volotile as GDP (so maybe income is hing, consumption is high too but in relative terms consumpiton isn't going to grow as fast as income - same for recession: consumption doesn't drop as steeply as income).

That's why we spent a lot of time on investment

> investemt = very sensitive to the buisness cycle = more volatile (when there is a recession, investment wil thank or visa versa), that's why it's alo !

> governement spending (isn't always big), varies between countries



= 3 MAIN COMPONENTS (in closed economy models)

3.1 The Composition of GDP (Continued)

Defenitions of the components in the model

The 3 most important ones for a closed economy

1 • Consumption (C) refers to the goods and services purchased by consumers. in a country What drives consumption?

2 • Investment (I), sometimes called fixed investment, is the purchase of capital goods. It is the sum of non-residential and residential investment.
(factorys, machines, buildings)

3 • Government spending (G) refers to the purchases of goods and services by the federal, state and local governments. It does not include government transfers, nor interest payments on the government debt.
what does the governement buys in terms of goods and services ?

goods that are used in producing other goods, rather than being bought by consumers. Often contrasted with consumer goods.

3.1 The Composition of GDP (Continued)

Other relevant factors when looking at an open economy

4 Net exports, consist of:

- a • **Imports (*IM*)** are the purchases of foreign goods and services by consumers, business firms and the EU government(s).

- b • **Exports (*X*)** are the purchases of EU goods and services by foreigners.

  Net exports = insignificant chare of total GDP
  > we may think these economys are as good as closed economys
  > open economy: net exports or the difference between exports and imports
  > these net exports are rather insignificant of total GDP, which may lead you to think these economys are as good as closed economys
  = only when we look at the net number, when we look to simply total export or import they are quite big

3.1 The Composition of GDP (Continued)

- Net exports ($X - IM$) is the difference between exports and imports, also called the trade balance.

$$\begin{aligned} &\text{Exports} = \text{imports} \Leftrightarrow \text{trade balance} \\ &X - IM = + \\ &\text{Exports} > \text{imports} \Leftrightarrow \text{trade surplus} \\ &X - IM = - \\ &\text{Exports} < \text{imports} \Leftrightarrow \text{trade deficit} \end{aligned}$$

5 • Inventory investment is the difference between production and sales. ≈ 0

= mostly small and negeerbaar (= insignificant)
= gaan we dus niet meer verder bekijken
> soms gaan we de 4e component ook negeren (en ze pas echt gebruiken vinnen 3 weken)

3.2 The Demand for Goods

PART A: EXPLAINING THE MODEL

DEFINITION

- **The total demand for goods is written as:**

Y= income = $Z \equiv C + I + G + X - IM$

consumption + investment + goverment spending + exports - imports

= net exports

The symbol '≡' means that this equation is an **identity**, or definition.

What drives this model?
> how is the behaviour of agents (households, firms, governements)

To determine *Z*, some simplifications must be made:

ASSUMPTIONS:

- Assume that all firms produce the same good, which can then be used by consumers for consumption, by firms for investment or by the government.

3.2 The Demand for Goods (Continued)

- Assume that firms are willing to *supply* any amount of the good at a given price, *P,* and meet the demand in that market. (short term)

- Assume that the economy is *closed*, that it does not trade with the rest of the world, then both exports and imports are zero.

- Under the assumption that the economy is closed, $X = IM = 0$, then:

Total demand = $$Z = C + I + G$$

is a good for countrys that mostly rely on internal production like US, Japan

3.2 The Demand for Goods (Continued)

Consumption (C)

What determines consumption?

- Disposable income, ($Y_D = Y - T$), is the income that remains once consumers have paid taxes and received transfers from the government.

1

$$C = C(\underset{(+)}{Y_D})$$

Consumpiton depends on the income (Yd = Income, disposable = how much of my income is disposable = taxed income = total income - taxes)

The function $C(Y_D)$ is called the **consumption function**. It is a **behavioural equation**, that is, it captures the behaviour of consumers.

uitbreiding

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

2

$$C = c_0 + c_1(Y_D)$$

onafhankelijk

AUTONOMOUS

C = c0 if there is no income (~~automonus~~ income)
> c0 = intercept
> c1 = if we earn more money we spend more (not only spending on food, but also on clothing or houses)

3.2 The Demand for Goods (Continued)

Consumption (C)

This function has two **parameters**, c_0 and c_1:

neiging om te consumeren

- c_1 is called the (marginal) **propensity to consume**, or the effect of an additional dollar of disposable income on consumption.

Marginaal = hoeveel extra consumtie er komt per extra euro inkomen

- c_0 is the intercept of the consumption function.

= autonomous spending

Disposable income is given by:

$$\boxed{Y_D \equiv Y - T}$$

> T = taxes, transfers (bv unenployment assurence, diability insurance)
> Y - T = net wage

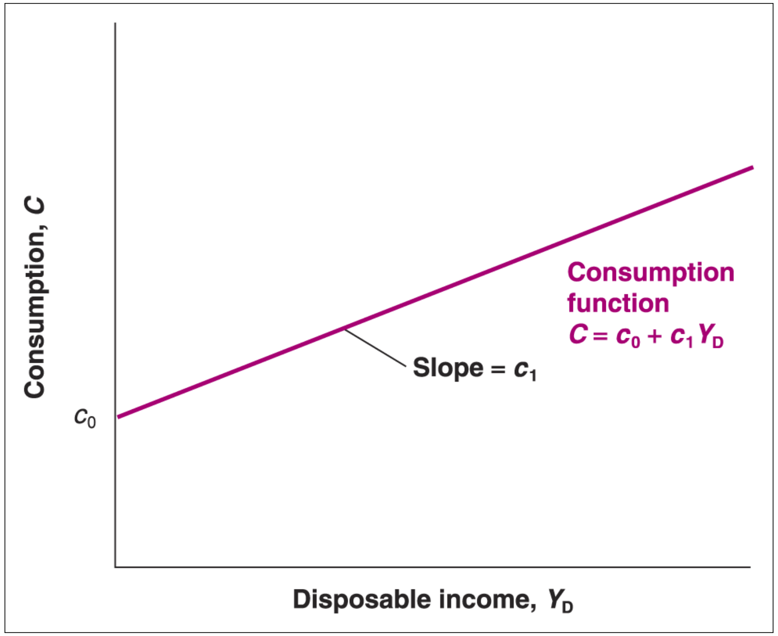
3.2 The Demand for Goods (Continued)

Consumption (C)

$$C = C(Y_D)$$

$$Y_D \equiv Y - T$$

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

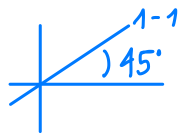


If the disposable income is zero, you still have to spend on food

Figure 3.1 **Consumption and disposable income**
Consumption increases with disposable income, but less than one for one.
A lower value of c_0 will shift the entire line down.

consumption is positivly related to GDP (but not so volotile)
> so c1 is going to be positive
> c1 is not as volotile as Y, so c1 < 1
> bigger income: consume more + more saving, saving is the counterpart of consumption so c1 is not only positive, but also bellow 1 (so slope is lover than 45°)

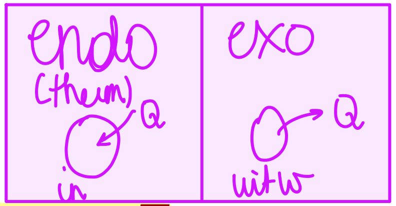
$C_1 < 1$, $= \oplus$ } rico < 45°



3.2 The Demand for Goods (Continued)

We are not going to think much of I and G (we'll think of them as outside fo the model = exogenous)

- *Investment (I)*
  - Variables that depend on other variables within the model are called endogenous. Variables that are not explained within the model are called exogenous. Investment here is taken as given, or treated as an exogenous variable: $I = \bar{I}$



- *Government spending (G)*

  Government spending, *G*, together with taxes, *T*, describes **fiscal policy**—the choice of taxes and spending by the government.

  G is exogenous, but we'll leave it in the model because we want policy to play ea role in the model
  > if consumption is low: the governement can undertake steps

3.2 The Demand for Goods (Continued)

We shall assume that *G* and *T* are 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.

3.3 The Determination of Equilibrium Output

Assuming that exports and imports are both zero, the demand for goods is the sum of consumption, investment and government spending:

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

Then:

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

3.3 The Determination of Equilibrium Output (Continued)

Equilibrium in the goods market requires that production, *Y*, be equal to the demand for goods, *Z*:

$$Y = Z$$

production (supply)= demand

The **equilibrium condition** is that, production, *Y*, be equal to demand. Demand, *Z*, in turn depends on income, *Y*, which itself is equal to production.

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

3.3 The Determination of Equilibrium Output (Continued)

PART B: CALCULATING WITH THE MODEL

How does the market evolve?

We can study this in 3 ways:

Macroeconomists always 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.**

3.3 The Determination of Equilibrium Output (Continued)

1 Using algebra

Rewrite the equilibrium equation:

$Y = Z = C_0 + \ldots$

$$Y = c_0 + c_1 Y - c_1 T + \bar{I} + G \longrightarrow \text{Isoleer } Y$$

Move $c_1 Y$ to the left side and reorganise the right side:

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

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

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

3.3 The Determination of Equilibrium Output (Continued)

Using algebra

The equilibrium equation can be manipulated to derive some important terms:

Definition of autonomous consumption: This is the level of consumption which does not depend on income. The argument is that even with zero income you still need to buy enough food to eat – either through borrowing or running down saving

$C = C_0 + C_1 \cdot \boxed{f(Y_D)}$ = 0 → zelfs bij geen inkomen moeten we consumeren (voedsel) = autonomous cons.

$Y = C$ + $f(..) = 0$ → zelfs bij geen inkomen moeten we geld uitgeven = autonomous spending

income

- Autonomous spending and the multiplier
- The term $[c_0 + \bar{I} + G - c_1 T]$ is that part of the demand for goods that does not depend on output (= Y); it is called = **autonomous spending**. If the government ran a balanced budget, then $T=G$. because it's unrelated to income

Zie eerst grafische uitleg voor meer duidelijkheid

- Because the (marginal) 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**.

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

= positive and bigger than 1, because $c1$ = positive & <1

Thus this has a multiplicer effect on Y: if we decide to consume more (in respect to what we earn), then income and production are going to increase (but by more then we increase consumption)

↳ consump ↗ : prod ↗ : income ↗ : cons ↗

3.3 The Determination of Equilibrium Output (Continued)

Using algebra

The equilibrium equation can be manipulated to derive some important terms:

- 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**.
- Or, the derivative of output w.r.t. autonomous spending is >1
- Or, if exogenous spending increases, output will increase by more

$\hookrightarrow$ G = exog $\nearrow$

Y = multipl. ($\nearrow$)

Y = $\nearrow\nearrow$

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

3.3 The Determination of Equilibrium Output (Continued)

2 Using a graph

we have a lineair function:

demand = $Z = \underbrace{(c_0 + \bar{I} + G - c_1 T)}_{\text{autonomous spending} = \text{onafh v. } Y = \text{intercept}} + c_1 Y$

PLOT PRODUCTION & CONSUMPTION IFV INCOME

- First, plot production Y as a function of income (45-degree line)
- Second, plot demand Z as a function of income.
- In equilibrium, production equals demand (where the two curves cross)

production = income
Y = Y
production = supply

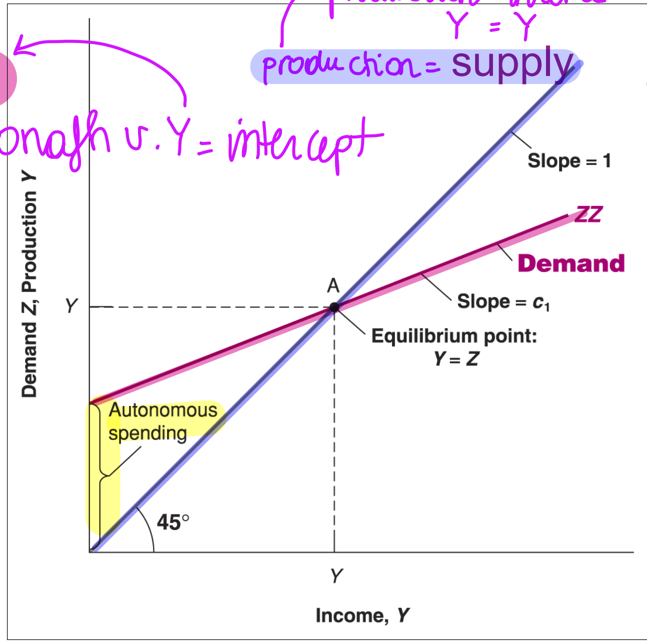


Figure 3.2 **Equilibrium in the goods market** Supply meets demand = point A
Equilibrium output is determined by the condition that production be equal to demand.

In Figure 3.2, measure production on vertical axis. Measure income on horizontal axis. Plotting production as a function of income is straightforward: recall that production and income are identically equal. Thus, the relation between them is the 45° line, the line with a slope equal to 1.

> slope less then 45° (because positive and smaller than 1)
> constant term = autonomous spending (like food: food we have te spend regardless of our income)

So in recession: demand is low, if the governement wants to help us out it can spend in recession and it will get more then 1 out of 1 euro (multiplier effect)

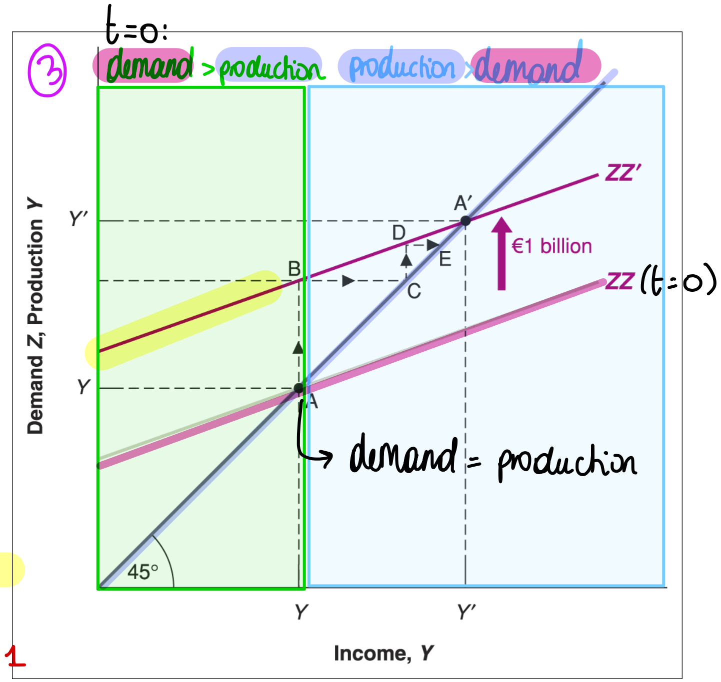
↳ ↗Z = ... + G↗ dus Z↗: demand goes up

3.3 The Determination of Equilibrium Output (Continued)

Using a graph

1

Demand depends on autonomous spending and on income – via its effect on consump- tion. The relation between demand and income is drawn as ZZ in the graph. The intercept with the vertical axis – the value of demand when income is equal to zero – equals autonomous spending.
2
The slope of the line is the propensity to consume, c1: when income increases by 1, demand increases by c1. Under the restriction that c1 is positive but less than 1, the line is upward sloping but has a slope of less than 1.



if c0 increases (autonomous spending)

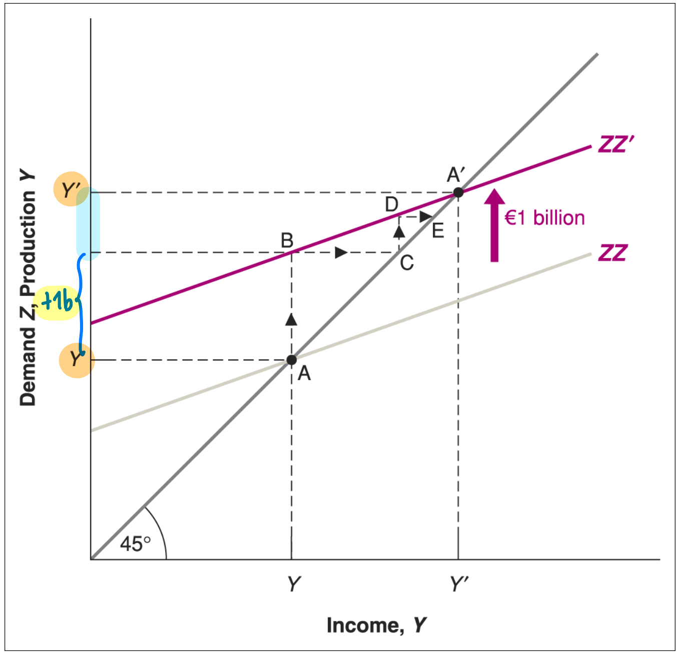
consumption $C = C_0 + C_1 . Y_D$ income ↗ with 1
= demand = ... $C_1 . (+1)$
$\in]0,1]$
=
↓
demand ↗ minder dan 1

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.

3.3 The Determination of Equilibrium Output (Continued)

Using a graph

sit 1: Y = Y
sit 2: spend 1b
Y evolves to Y''
Y + 1b
$\underbrace{\text{+ extra}}_{\text{1b. multipl}}$ = Y''



if c0 increases (autonomous spending)

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.

3.3 The Determination of Equilibrium Output (Continued)

Using a graph

• $C_0 \nearrow$ with €1 b.

demand $= C_0 + C_1 . Y$

$\nearrow 1b$

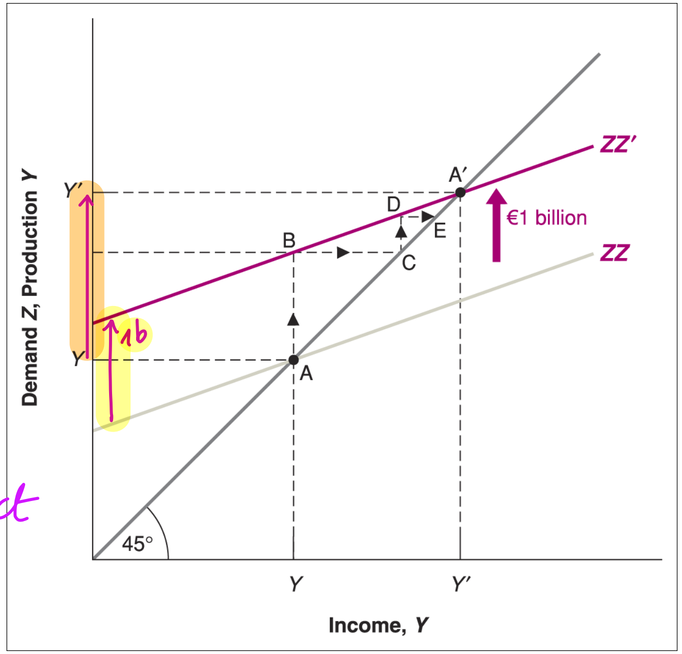
$\nearrow 1b$

• dus demand (consump) $\nearrow$ 1b

= shifting up of curve with 1b

• $Y \nearrow\nearrow$ with more than 1b : multiplier effect

$\underset{\nearrow 1b}{\text{demand}} = \underset{\nearrow 1b}{C_0} + C_1 . Y$



if c0 increases (autonomous spending)

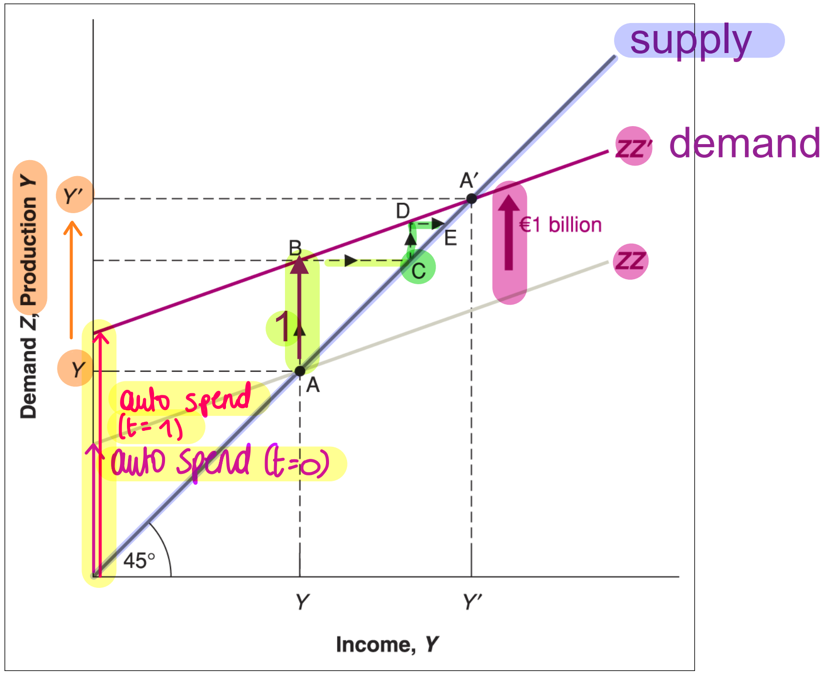
Y = income
= production :

since • demand $\nearrow$ with AB
• production $\nearrow$ with BC
= income
• since incom $\nearrow$ demand $\nearrow$
with CD → . . .

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.

autonomous spending increases > demand curve Z goes up > changes the behaviour of curves > production is increased (because whatever is the demand, factorys are going to produce
> our 45° supply curve remains unaffected
- c0 increases, we produce more but there is a multiplicator effect (so it's not a 1-1 relationship, but production increases more then 1!)
- income hasn't changed: we consume more (how much more = distance AB)
> so we started in A, there is a shock and our autonomous consumption increases, initial demand is not equal to supply (point B), but firms are going to produce more to meet the supply: if we demand the amount of point B then the firms are producing an additional amount of goods: BC. Note that the increased demand AB = the increased production BC = 1 billion

- The first-round increase in demand, shown by the distance *AB* equals €1 billion.
- This first-round increase in demand leads to an equal increase in production, or €1 billion, which is also shown by the distance in *AB.*
- This first-round increase in production leads to an equal increase in income, shown by the distance *BC*, also equal to €1 billion.

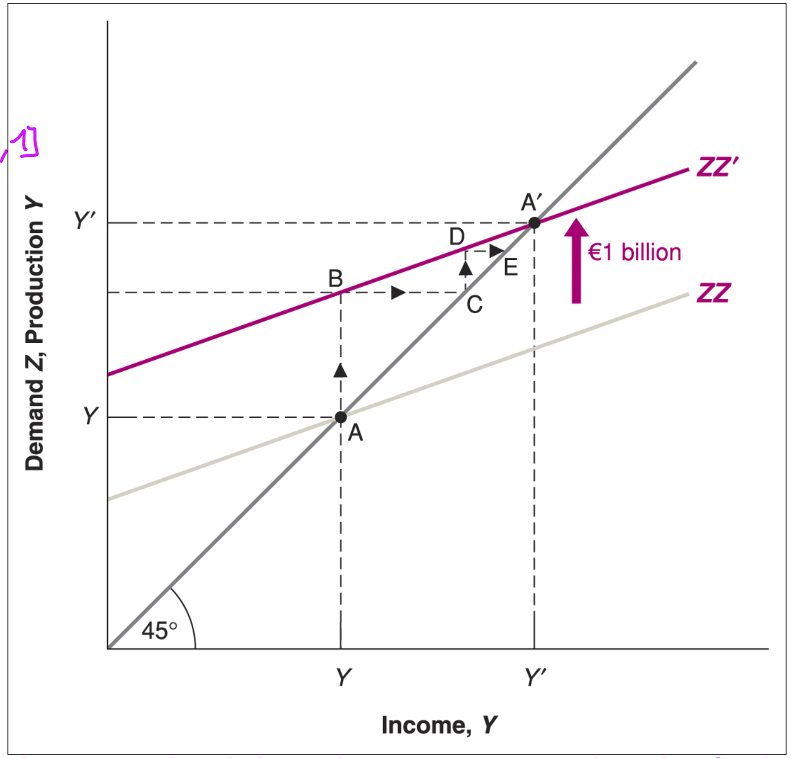


> so we will be at point C
> if firms produce more = additional production = additional income created (and we the consumerr are earning that income), so C isn't an equilibrium because it's not taking into account that we earn more (and when we earn more our demand is increasing)
> our demancs increases with the distance C to D (line CD), so firms produce more (the exact amount = DE) > so our income increases (maar in mindere mate) > … > untill new equilibrium is reached

3.3 The Determination of Equilibrium Output (Continued)

Using a graph

- The second-round increase in demand, shown by the distance in *CD*, equals €1 billion times the marginal propensity → $\in [0,1]$ to consume. €1.C_1 < €1b
- This second-round increase in demand leads to an equal increase in production, also shown by the distance *DC*, and thus an equal increase in income, shown by the distance *DE.*
- The third-round increase in demand equals €c_1 *billion, times* c_1*, the marginal propensity to consume; it is equal to* 1b.$\text{€}c_1 \times c_1 = \text{€}c_1^2$ *billion.*



V 0

income is rising, but consumption isn't rising as much because c1 is positive but smaller then 1 (we only consume the disposable income), so we save more as the income grows > as we earn more we don't spend it on additional consumption, we're putting more and more aside)
> so if income rises > demand is increasing (but that increase is less than proportional)

3.3 The Determination of Equilibrium Output (Continued)

Using a graph

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

first round + second round + third + n^{th}

$$= 1 + 1c_1 + 1c_1^2 + \cdots + 1c_1^n$$

$$= \frac{1}{1-c_1} \quad \text{thus} \quad 1b \cdot \frac{1}{1-c_1}$$

- **Such a sum is called a** geometric series**.**
  - Algebra:
    - Limit: 1/(1-c1)
    - Multiplier

So we focussed on C0 for this example, but the same happens for the other components of automonus spending)
> so let's focus on G: if the governement wants income to rise > it could spend more > by doing so it's going to increase demend > that's going to start the multiplier effect
If G spends 1 euro, then it know's the income is going to rise with more then 1 euro

3.3 The Determination of Equilibrium Output (Continued)

3 **To summarise:**

- 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 behavioural equations and their parameters, economists use **econometrics**—a set of statistical methods used in economics.

Economists try to evaluate: if the governement spends 1 euro, ow much ectra acitivity is this giving us this?

> the value of C1 has an enormous effect:

- close to 0: almost no extra activity generated

- close to 1: a lot of extra activity

$\frac{1}{1-C_1} \rightarrow$ $= 0{,}99 \approx 1$ $\frac{1}{0{,}01} \approx 100$

$= 0{,}01 \approx 0$ $\frac{1}{0{,}99} \approx 1$

We have these abstract relationships (we made it linear) > economics focusses on estimating these nummers (this is done by econometrics)

When there is an change in autonomous consumption
> we've seen an increase in spending (that's going to shift up the demand curve)
> we already know the new equilibrium is moving fro A to A'
> we talked about the adjustment mechanisms that make sure we get from A to A'

3.3 The Determination of Equilibrium Output (Continued)

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.

> whatever the change in demand, an adjustmant takes place
> but nothing is sad about timing in this model: so we do not move from A to A' in an instant (it's not going to happen in 1 day)
> so when there is a choque in economy (if it's us deciding to spend more or the governement to change G') = taking time for income to adjust > timing is having a relative role, but when wy try to match models to data we need to take time into account

Example: the brief picture (moment in time) about the great recession
- burst in 2008 (sept): disposable income (blue, Yd) & aggregate consumption (red line)
- Q2 > Q3: banks faling - income starting to fail (drops) - continues for quite some time after
- consumption (red line) also follows: reduces (but not as much/drastic - less than 1 due to marginality)

The Lehman bankruptcy, fear of another Depression and shifts in the consumption function

This model is a rough approximation: with one equation we try to capture a whole economy (so not perfect)
> it's always on average: consumption moves with income and is more stable (moves less volatile)

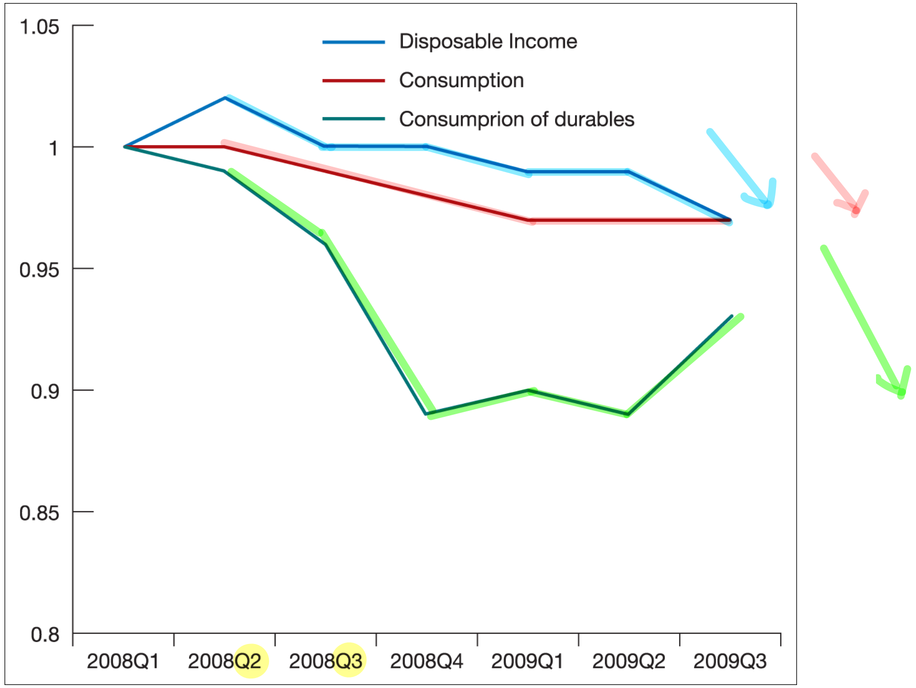


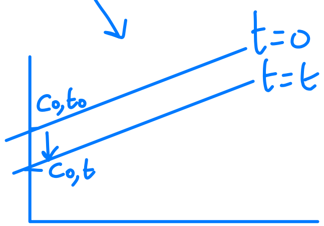
Figure 3.4 **Disposable income, consumption and consumption of durables, USA, 2008:1 to 2009:3**

> green line = consumpiton of durables (furniture or cars) = component of consumption that is closer with investment (capital goods) = the part of consumption looks to investment because it's product looks like capital goods: drops a lot more then total consumption (togheter with total income)
= the first thing we drop
= pro cyclical (positive collolation with buisness cycle and with a high volatility)

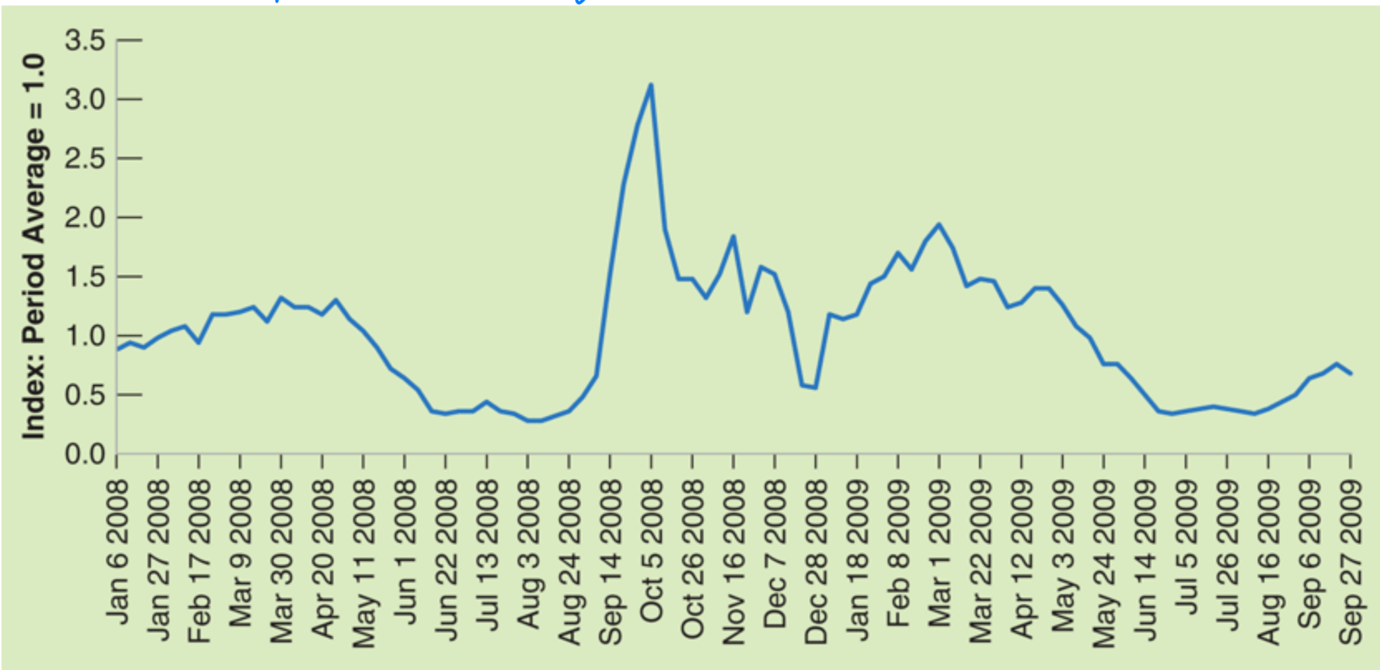
We've seen income and consumption go dow: as soon as banks started failling > increase in uncertainty (people started looking at what happend during recession) > brought a lot of uncertainty for people who experienced tranquillity > they try to be safe: less investment > increase in savings (= counterpart of consumption)

Uncertainty => precaution => saving (c0)

= holding of consumption = reducing c0 (sit out and wait for what happens with economy) > this explains why both income and consumption in previous graph started falling



↓ reduce consumption = saving



Source: Google Trends, "Great Depression."

Saving = the part of income that is not consumes (Yd = disposable income - taxes)
= private saving (saving by private incomes)
<> public saving (= saving from the governement)

3.4 Investment Equals Saving: An Alternative Way of Thinking About the Goods–Market Equilibrium

Saving **is the sum of private plus public saving.**

$$S = \boxed{Y_D} - C \qquad S = \boxed{Y - T} - C$$

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

$P = T - G$

- **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.

Public saving is what the governement taxes to what it spends:
if it taxes more = saving surplus

3.4 Investment Equals Saving: An Alternative Way of Thinking About the Goods–Market Equilibrium

↳ consumption + saving = Y_D

* equil. cond:

$$Y = C + \bar{I} + G$$

income/production = total demand

} saving = part of disp. inc (Y_D) that isn't consumed

$$Y - T - C = \bar{I} + G - T$$

$$S = \bar{I} + G - T$$

in EQUILIBR: investment = saving

$$\boxed{\bar{I} = S + \underbrace{(T - G)}_{\text{puplic saving}}}$$

private saving

$$\underset{-T}{Y} = C + \bar{I} + \underset{-T}{G}$$

$$Y - T - C = \bar{I} + G - T$$

$$\underbrace{Y_D - C}_{S} = \bar{I} + \underbrace{G - T}_{\text{determine deficit/surplus of governem}}$$

$$\bar{I} = \overset{\text{private saving}}{S} + \underbrace{(T - G)}_{\text{public saving}}$$

IS-RELATION

3.4 Investment Equals Saving: An Alternative Way of Thinking About the Goods–Market Equilibrium (Continued)

$$\bar{I} = S + (T - G)$$

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 (I=S)**. What firms want to invest must be equal to what people and the government want to save.

3.4 Investment Equals Saving: An Alternative Way of Thinking About the Goods–Market Equilibrium (Continued)

- **Consumption and saving decisions are one and the same.**

$$S = Y - T - C$$

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

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

- The term **(1–c_1)** is called the **marginal propensity to save.**

marginal prop to cons. $\in [0, 1]$

In equilibrium:

$$\bar{I} = -c_0 + \underbrace{\boxed{(1 - c_1)}}_{\text{marg prop to save}}(Y - T) + (T - G)$$

Rearranging terms, we get the same result as before:

$$Y = \underbrace{\frac{1}{1 - c_1}}_{\text{multiplier}}[c_0 + \bar{I} + G - c_1 T]$$

The Paradox of Saving

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.

Question – show this mathematically: reduce c0

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

$dY/c_1 = 0 - T + 0 + 0 + Y$

$= Y - T$

- Equilibrium level of output: take derivative to c0
- Savings equation: take derivative to c0, realizing that Y is endogenous
- Highlights use of mathematics to complete logic

$* \; S + C = Y_D$

$* \; C\downarrow = c_0 + \downarrow c_1 \cdot Y_D$

$\}$?

FOCUS

The paradox of saving

As we grow up, we are told about the virtues of thrift. Those who spend all their income are condemned to end up poor. Those who save are promised a happy life. Similarly, governments tell us, an economy that saves is an economy that will grow strong and prosper. The model we have seen in this chapter, however, tells a different and surprising story.

Suppose that, at a given level of disposable income, consumers decide to save more. In other words, suppose consumers decrease c_0, therefore decreasing consumption and increasing saving at a given level of disposable income. What happens to output and to saving?

Equation (3.12) makes it clear that equilibrium output decreases: as people save more at their initial level of income, they decrease their consumption, but this decreased consumption decreases demand, which decreases production. → we earn less income

Can we tell what happens to saving? Let's return to the equation for private saving, equation (3.11) (recall that we assume no change in public saving, so saving and private saving move together):

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

↓ we are saving less

On the one hand, $-c_0$ is higher (less negative): consumers are saving more at any level of income; this tends to increase saving. On the other hand, their income, Y, is lower: this decreases saving. The net effect would seem to be ambiguous. In fact, we can tell which way it goes.

To see how, go back to equation (3.10), the equilibrium condition that investment and saving must be equal:

$$\bar{I} = S + (T - G)$$

: S = cte dus

S ↗ (meer sav.) dan S ↘ (mind. income)

By assumption, investment does not change: $I = \bar{I}$. Nor do T or G. So the equilibrium condition tells us that in equilibrium, private saving, S, cannot change either. Although people want to save more at a given level of income, their income decreases by an amount such that their saving is unchanged.

This means that as people attempt to save more, the result is both a decline in output and unchanged saving. This surprising pair of results is known as the paradox of saving (or the paradox of thrift).

So should you forget the old wisdom? Should the government tell people to be less thrifty? No. The results of this simple model are of much relevance in the short run. The desire of consumers to save more led for example to the German recession of 2002–2003. However, as we will see later in this book, when we look at the medium run and the long run, other mechanisms come into play over time, and an increase in the saving rate is likely to lead over time to higher saving and higher income. A warning remains, however: policies that encourage saving might be good in the medium run and in the long run, but they can lead to a recession in the short run.

3.5 Is the Government Omnipotent? A Warning

- We considered G and T as exogenous and under control of the government. 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.

Key Terms

- Consumption (*C*)
- Investment (*I*)
- Fixed investment
- Non-residential investment
- Residential investment
- Government spending (*G*)
- Government transfers
- Imports (*IM*)
- Exports (*X*)
- Net exports (*X-IM*)
- Trade balance
- Trade surplus
- Trade deficit
- Inventory investment
- Identity
- Disposable income (Y_D)
- Consumption function
- Behavioural equation
- Linear relation
- Parameter
- Marginal propensity to consume (c_1)
- Endogenous variables

Key Terms (Continued)

- Exogenous variables
- Fiscal policy
- Equilibrium
- Equilibrium in the goods market
- Equilibrium condition
- Autonomous spending
- Balanced budget
- Multiplier
- Geometric series
- Econometrics
- Dynamics
- Saving
- Private saving (S)
- Public saving ($T-G$)
- Budget surplus
- Budget deficit
- *IS* relation
- Propensity to save ($1-c_1$)
- Paradox of saving

Last week: goods market

CHAPTER 4:

This week

FINANCIAL MARKETS

= where prices are determined and which sort of prices: prices of financial assets (bonds or the opportunity cost of bonds > determines the price of production or the price of borrowing)

> what happens on financial market will feedback on what happens on good markets (and vice versa)

> Now: financial markets in isolation (and equilibrium)

What does demand looks like?

4.1 The Demand for Money

2 types of financial assets:

Liquid form of

1 • **Money**, which you can use for transactions, pays no interest. There are two types of money:

- **currency** (coins and bills) and
- **checkable deposits,** the bank deposits on which you can write cheques.

Investing money:

2 • **Bonds** pay a positive interest rate, *i*, but they cannot be used for transactions.

= type of loan (a governement bond in our case, not a bond of a firm)

HOW TO CHOOSE BETWEEN THESE 2?

The proportions of money and bonds you wish to hold depend mainly on two variables:

Depends on :

- *Your level of transactions (transactions demand)*

  If we earn income we'll have money we want to spend

- *The interest rate on bonds (speculative demand)*

  If we know we are not going to spend it but save it and we'd rather earn intrest

4.1 The Demand for Money (Continued)

With those two motives we are going to form a money demand function:

Deriving the demand for money

Let's go from this discussion to an equation describing the demand for money.

$$M^d = €Y \underset{(+)}{} \; L\underset{(-)}{(i)}$$

The minus sign under i in L(i) captures the fact that the interest rate has a negative effect on money demand: an increase in the interest rate decreases the demand for money, as people put more of their wealth into bonds.

Read this equation in the following way: *the demand for money, M^d, is equal to nominal income, €Y, times a function of the interest rate, i, with the function denoted by L(i).*

The demand for money:

- increases in proportion to nominal income (€*Y*), and
- depends negatively on the interest rate (*L*(*i*) and the negative sign underneath).

Money demand:
- Income = important for how much money we want, is a proxy for the transactions motive ($ we earn determine the $ we spend)
- L(i) = liquidity demand, the part of the liquidity that is spectaculative, is in function of the intrest rate

So the higher the intrest rate, the lower the amount of money we'll want to hold, because with higher intrest rate our speculative demand is higher because investments become more attractive.

Real vs nominal explained

25 April 2021 by Tejvan Pettinger

- Nominal values are the current monetary values.
- Real values are adjusted for inflation and show prices/wages at constant prices.
- Real values give a better guide to what you can actually buy and the opportunity costs you face.

Nominal	Real
The current monetary value	Takes into account the effects of inflation.
Presents the current headline monetary figure.	Provides a guide to actual purchasing power and the opportunity cost of workers.
Nominal wages + 8%. (Inflation is 6.5%.)	Increase in real wages = **1.5%**
Nominal interest rate 3%. Inflation 2%.	Real interest rate = **1%**

Nominal and real GDP

Year	nominal GDP	Price level	Population	Real GDP	Real GDP per capita
2000	100	100	100	100	**100**
2001	107	102	101	105	**104**

This shows how real GDP and nominal GDP are different with inflation in the economy.

- Between 2000 and 2001, nominal GDP rose 7%, but with inflation of 2%, the real increase was a 5% rise.

https://www.economicshelp.org/blog/146717/economics/real-vs-nominal/

Er wordt onderscheid gemaakt tussen het nominale BBP en het reële BBP. Het nominale BBP wordt berekend met de prijzen die gelden in de periode van meting. Bij het reële BBP wordt het nominale BBP gecorrigeerd voor inflatie. Het reële BBP is een betere indicatie van de economische prestatie omdat het rekening houdt met de verandering van de prijs van goederen en diensten. Het reële BBP houdt dus rekening met de verandering in de koopkracht.
Wanneer het BBP in een jaar procentueel toeneemt vergeleken met het voorgaande jaar, is er sprake van economische groei. Indien het BBP echter vergeleken met het voorgaande jaar procentueel afneemt, is er sprake van een krimp.

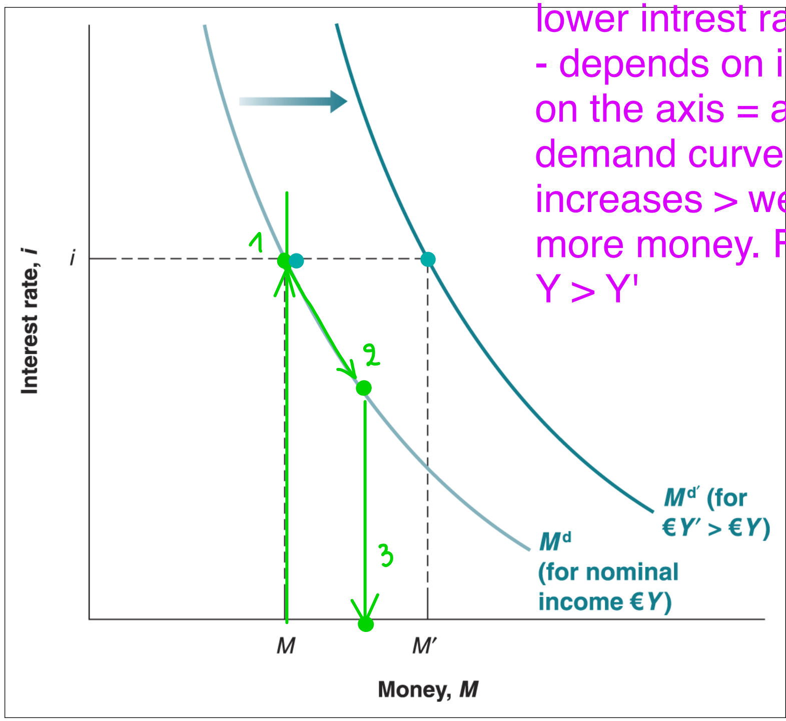
Nominaal BBP vs Reëel BBP Nominaal BBP = BBP aan lopende prijzen. We nemen de prijzen en hoeveelheden uit de huidige periode t. Reëel BBP = BBP aan constante prijzen.

Remember
> start looking at demand
> dan look at supply
> eq is where the two meet

4.1 The Demand for Money (Continued)

Deriving the demand for money

$$M^{d} = €YL(\underset{(-)}{i})$$



Money demand:
- money demand wil be higher for lower intrest rate (negative slow)
- depends on income, but income isn't on the axis = a shifter of the money demand curve. When income increases > we spend more > need more money. For a given intrest rate i, Y > Y'

Important to know is when we move along the curve or when there is a shift of the curve

Figure 4.1 **The demand for money**

For a given level of nominal income, a lower interest rate increases the demand for money (movement along the curve). Intrest rate moves: we move along

At a given interest rate, an increase in nominal income shifts the demand for money to the right. (movement of the curve)

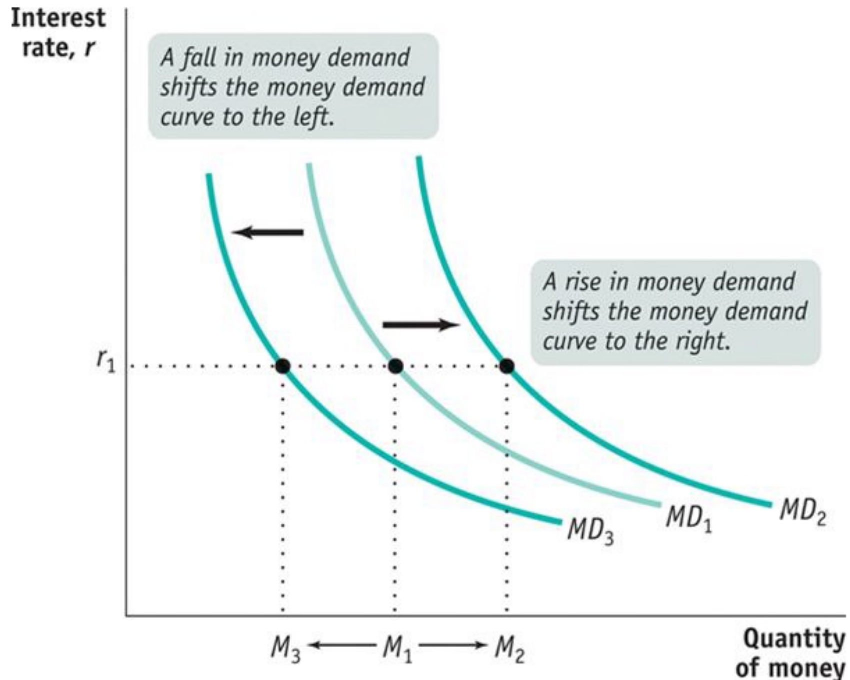
Income = a shifter of the curve

Shifts in Money Demand

1) The Demand for Money
- Opportunity Costs
- Money Demand Curve
- Shifts in Money Demand

2) Money & Interest Rates
- Money Supply
- Liquidity Preference Model

3) Examples



Difference between stock and flow valuables
- flow: variables that change from one period to the next
- stocks = the acumulation of flows

Semantic Traps: Money, Income and Wealth

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.

CONSUMER GOODS

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.

Euro versus US Dollar as a Leading International Reserve Currency

Of the total amount of US currency in circulation, $750 billion in 2006, around $170 billion was held by US households and around $80 billion by firms. The remaining $500 billion, or 66% of the total, was held by foreigners.

The dollar is adopted in some countries as a currency for transactions.

With the birth of the euro, the dollar now has a potential competitor, but it is still—and is likely to be for a long time—dominant.

For supply:
- we'll use a similar argument as for governement spending or taxes
- money supply = the amount of money that is in the economy is going to be controlled by the governement (which part of the government, the branches = the central bank)

What will supply look like?

4.2 Determining the Interest Rate: Part 1

Money demand, money supply and the equilibrium interest rate

Equilibrium in financial markets requires that money supply be equal to money demand, or that *M*= *M*ˢ = *M*ᵈ. Then using this equation, the equilibrium condition is:

$$M = €YL(i)$$

Equilibrium: **Money supply = Money demand**

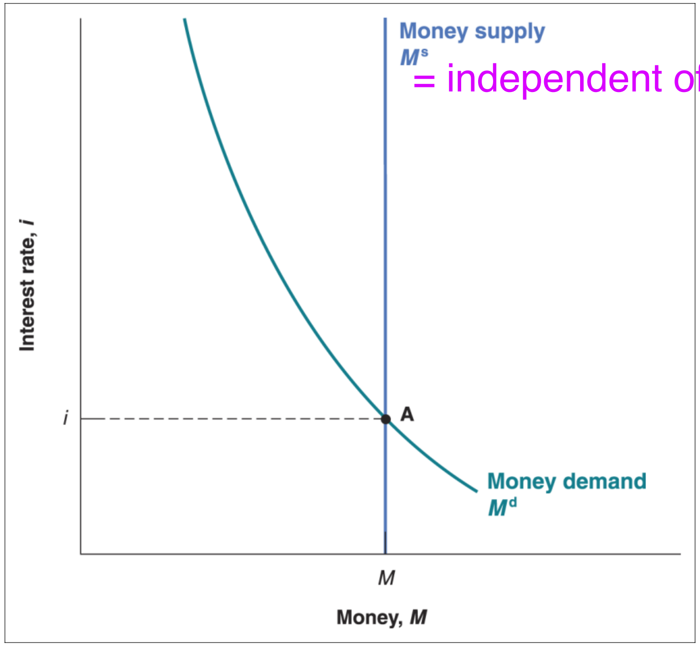
So for money suply (Ms) we are not stipulating a funciton
= exhaugenous determined
= a policy level
= thus independent of everything

↳ dus verticale lijn
(w̄ onafh v i)

This equilibrium relation is called the *LM* relation.

4.2 Determining of the Interest Rate, I (Continued)

- Money demand, money supply and the equilibrium interest rate



= independent of intrest rate

At A: equilibrium
= the LM relation (liquid and money)

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).

If there is a new eq: how did we move away from the curve?
- is that because demand shifted up
- or is it because supply shifted up
- or is it both

total amount of money in a economy

Whatever occured: in the data we only observe only 1 point and we'll only observe M (money) = the combination of Ms and Md
(we kunnen ze niet individueel waarnemen)

Bonds = loans = a commitment to pay (you loan money to government - the government repays you after 1 year)
> how much you are willing to pay for it? You want to earn an intrest rate, the price you pay is less than you recieve. The intrest rate depends on how risky the governement is
> for example a bond that earns you 100 $
- Be governement: you loan 98$
- Greek governement: 50$

4.2 Determining of the Interest Rate, I (Continued)

> price of the bond (is a loan) = nominal amount of the loan =repayment price
> price of bond = purchasing price
> you earn the difference between these 2

Monetary policy and open market operations

Bond prices and bond yields

- **Understanding the relation between the interest rate and bond prices will prove useful both here and later in this book:**

  - **Treasury bills**, or **T-bills** are issued by the government promising payment in a year or less. If you buy the bond today (€P_B) and hold it for a year, the rate of return (or interest) on holding a €100 bond for a year is (€100 − €P_B)/€P_B.
  - If we are given the interest rate, we can figure out the price of the bond using the same formula.

Return
= intrest rate
= how much you get back, relative to huw much I payed

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

> Price of the bond = nominal value you payed but discounted at the intrest rate
> inverse relation between price and intrest rate: high prices = low intrest rate

Vb $i = \frac{100 - 87}{87} = 0{,}14$

$P = \frac{P_0}{1+i}$ dus $P \sim \frac{1}{i}$

From a bond price to an interest rate

- Bond: Example
  - E.g. promise to pay \$100 next year
  - Price: $\$P_B$
  - Keeping the bond until expiration date (next year) => return:
  - $\frac{\$100-\$P_B}{\$P_B}$=interest
  - E.g.:
    - $\$P_B = \$99 \Rightarrow i = \frac{1}{99} = 0{,}01 = 1\%$ (per year)
    - $\$P_B = \$90 \Rightarrow i = \frac{10}{90} = 0{,}111 = 11{,}1\%$ (per year)

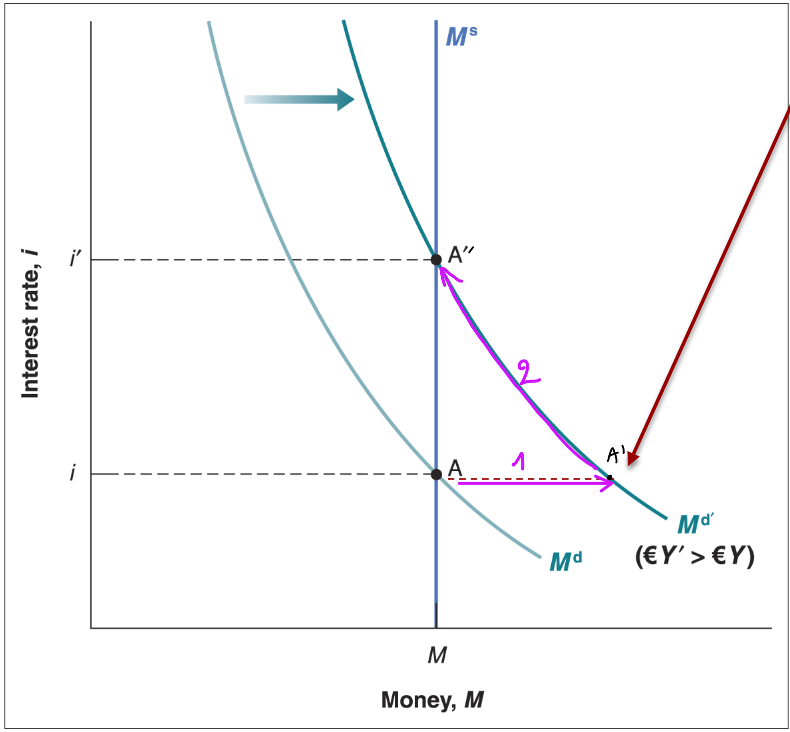
- In general: price of an obligation is inversely related to the interest rate
- $\$P_B = \frac{\$100}{1+i}$

!

SHOCK 1: shift in income

4.2 Determining of the Interest Rate, I (Continued)

Money demand, money supply and the equilibrium interest rate



Suppose i remained the same
=> Md'(i)>Ms

Not an equilibrium
People have less money than they need for transactions => sell bonds for cash
⇒ Demand for bonds falls
⇒ Price of bonds falls
⇒ Interest rate rises

How does market react to shocks?
> look at the effect of an increase in income:
- income increases > money supply is not responding (because it's exhaugenous), money supply curve remains
- income increases > we'll want to spend more > more money demand (we need more cash) > increase from Y to Y' > increase money demand > for a given intrest rate we demand more money > curve shift to right: we move to A' (no eq)

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.

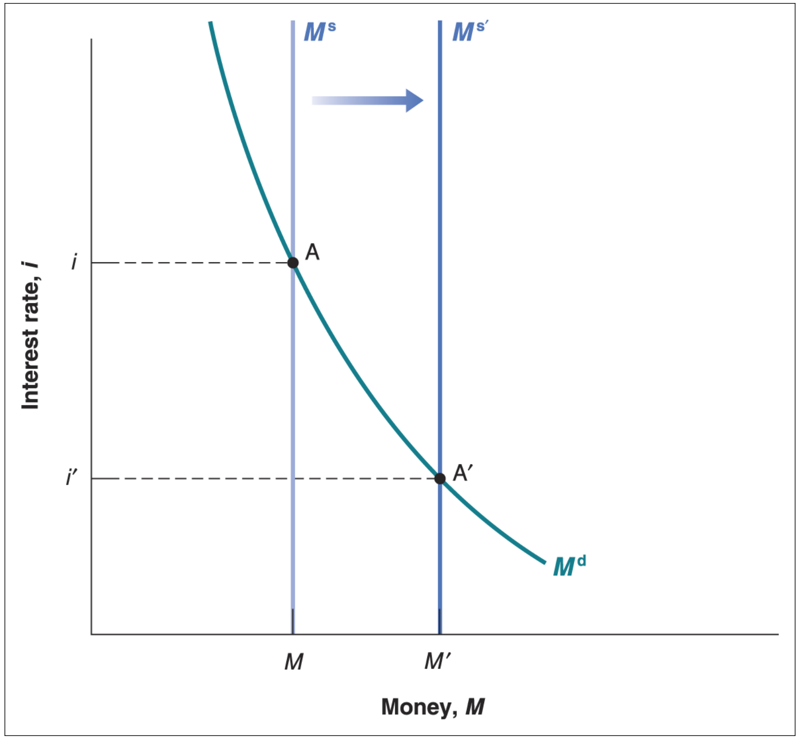
A' = no eq: we demand more money for a given intrest rate: we want more money but the central bank only has this much. How can we get more money: we dump bonds. If I push my bonds on the market = less demand for bonds in the market (with additional suppl) > bonds are less attractive > price falls > price is inverse to intrest rate > intrest rate increases > we move to A" = equilibrium

!

SHOCK 2: increase in money supply
- money supply: > we start in A > mone money supply (additional money is printed by central bank) > money supply curve MS moves to MS'
- money demand: remains the same (unaffected by money suply)

4.2 Determining of the Interest Rate, I (Continued)

Money demand, money supply and the equilibrium interest rate



Suppose i remained the same
=> Md(i)<Ms'

Not an equilibrium
People have more money than they need for transactions => buy bonds to earn interest rate
$\Rightarrow$ Demand for bonds rises
$\Rightarrow$ Price of bonds rises
$\Rightarrow$ Interest rate falls

We start in A > go to A':
- central bank injects money, people don't need it (we have the same amount of income) > we might as wel buy bonds since we're not going to spend it > intrest rate seems attractive: we buy bonds > demand for bonds increases > price rises > price is inverse to intrest rate: intrest rate decreases

Figure 4.4 **The effects of an increase in the money supply on the interest rate**
An increase in the supply of money leads to a decrease in the interest rate.

4.2 Determining of the Interest Rate, I (Continued)

Monetary policy and open market operations

Central bank is involved in

Open market operations

- Open market operations**, which take place in the 'open market' for bonds, are the standard method central banks use to change the money stock in modern economies.

  > central bank prints money and buys bond

- **If the central bank buys bonds, this operation is called an** expansionary open market operation **because the central bank increases (*expands*) the supply of money.**

  > it sells bond and is taking money out of the economy

- **If the central bank sells bonds, this operation is called a** contractionary open market operation **because the central bank decreases (*contracts*) the supply of money.**

Central bank buying bonds = an expensive open market operation or expensive monotary policy = the central bank is injecting money (lower intrest rates)
<=> contractionary monetary policy (takes money out of economy)

4.2 Determining of the Interest Rate, I (Continued)

Monetary policy and open market operations

Open market operations

Central bank balance sheet:

(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

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.

Intrest rate = determined by the central bank (they control money supply)

4.2 Determining of the Interest Rate, I (Continued)

Monetary policy and open market operations

Bond prices and bond yields

Let's summarise what we have learned so far in this chapter:

- The interest rate is determined by the equality of the supply of money and the demand for money.
- By changing the supply of money, the central bank can affect the interest rate.
- The central bank changes the supply of money through open market operations, which are purchases or sales of bonds for money.
- Open market operations in which the central bank increases the money supply by buying bonds lead to an increase in the price of bonds and a decrease in the interest rate.
- Open market operations in which the central bank decreases the money supply by selling bonds lead to a decrease in the price of bonds and an increase in the interest rate.

4.2 Determining of the Interest Rate, I (Continued)

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.

Central bank = change of amount of money in the economy
> central bank is in full control of money supply
> news: central bank sets the intrest rate at x percent (communication is happening around the vertical axis)
Central bank sets an intrest rate = commiting to moving the money supply to whatever extend to enforce that intrest rate

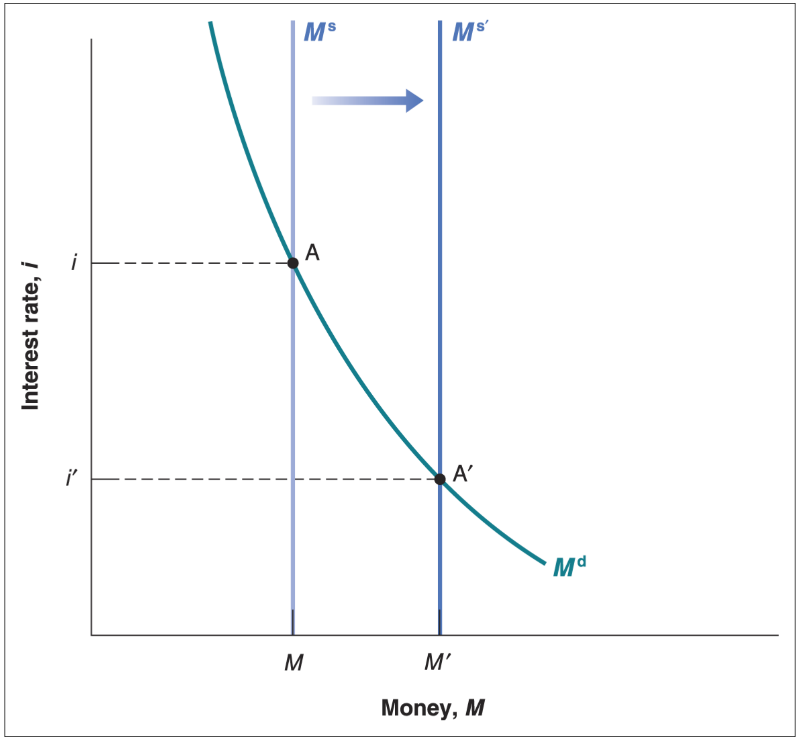


Figure 4.4 **The effects of an increase in the money supply on the interest rate**
An increase in the supply of money leads to a decrease in the interest rate.

central bank = M_s
$i \downarrow$: $M_s \nearrow$

4.2 Determining of the Interest Rate, I (Continued)

So far we 've only looked at Now we'll look at

Money, bonds, and other assets

We have been looking at an economy with only two assets: money and bonds. This is obviously a much simplified version of actual economies, with their many financial assets and markets.

There is one dimension, however, to which our model must be extended. We have assumed that all money in the economy consists of currency supplied by the central bank. In the real world, money includes not only currency but also checkable deposits. = checks, but we all have deposits in the bank

> difference between deposits and currency: one is provided by the bank (deposits) while the currency is printed by central banks

4.3 Determining of Interest Rate, II*

What banks do

Financial intermediaries are 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.

- 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.

4.3 Determining of Interest Rate, II* (Continued)

What banks do

Banks hold reserves for three reasons:

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 cheques to people with accounts at other banks, and people with accounts at other banks write cheques to people with accounts at the bank.

= to satisfy the governement = regulation enforcement

3. Banks are subject to reserve requirements. The actual **reserve ratio**—the ratio of bank reserves to bank checkable deposits—is about 10% in the United States today.

$\frac{\text{bank res}}{\text{check dep}} = 0{,}1$

Because we've seen plenty of financial crisis: bank run = clients running en masse before the bank to withdrawn their money = distrust of depositors
> to prevent that: you need to be able to cope with withdrawls and have a certain amount of money at hand

> 10% in cash, so 90% is out there
> government will provide deposit ensurance: all our deposits are guaranteed by the governement = to prevent bank runcs and financal crisis

Bank Runs

Rumours that a bank is not doing well, and some loans will not be repaid, will lead people to close their accounts at that bank. If enough people do so, the bank will run out of reserves—a **bank run**.

To avoid bank runs, the U.S. government provides **federal deposit insurance**.

→ rekeningen zijn verzekerd tot €100k.

An alternative solution is **narrow banking**, which would restrict banks to holding liquid, safe, government bonds, such as T-bills.

Banks do not engage in lending: they only accept deposits and rather dan granting loans the bank kan only save in safe government bonds

4.3 Determining of Interest Rate, II* (Continued)

What banks do

- Loans represent roughly 70% of banks' non-reserve assets. Bonds count for the rest, 30%.

We're splitting money in 2 types of money: currency and reserves (the account that the banks has at the central bank)

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**. The new feature is that not all of central bank money is held as currency by the public. Some of it is held as reserves by banks.

4.3 Determining of Interest Rate, II* (Continued)

What banks do

(a) **Central Bank**

Assets	**Liabilities**
Bonds	Central bank money = Reserves + Currency

(b) **Banks**

Assets	**Liabilities**
θ Reserves	Deposit accounts
$1-\theta$ { Loans, Bonds	

<> private bank: accepts deposits (is a liability), these are used (a part can't be used and are posted at the central banks because of regulation) for buying bonds, the predominant source of profit = loans

Figure 4.6 **The balance sheet of banks and the balance sheet of the central bank, revisited**

With this additional component: how does this affect our model?
We'll zoom in to what the central bank directly controls: they control reseves and currency, but we'll see there is more = central bank money

4.3 Determining of Interest Rate, II* (Continued)

The supply and the demand for central bank money

Let's think in terms of the supply and the demand for *central bank money:*

- The demand for central bank money is equal to the demand for currency by people plus the demand for reserves by banks.
- The supply of central bank money is under the direct control of the central bank.
- The equilibrium interest rate is such that the demand and the supply for central bank money are equal.

Start on the left side: the demand for money by people is for both deposit accounts and currency. Because banks have to hold reserves against deposit accounts, the demand for deposit accounts leads to a demand for reserves by banks. Consequently, the demand for central bank money is equal to the demand for reserves by banks plus the demand for currency

4.3 Determining of Interest Rate, II* (Continued)

The supply and the demand for central bank money

The extension of our model
> demand for money = supply by central bank (will now be deposits and currency)
> demand for currency is the same as before
> the deposits in the bank: go into the blaance sheet (we don't hold that in our own wallet) > bank uses that for reserves, loans or bonds

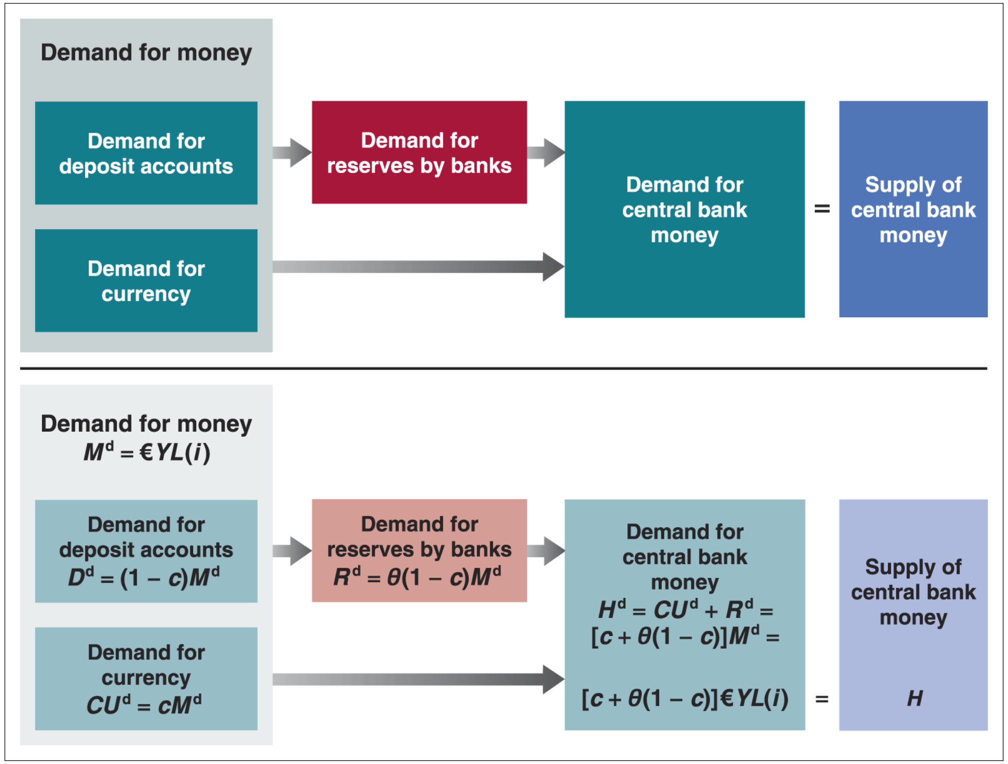


Figure 4.7 **Determinants of the demand and supply of central bank money**

4.3 Determining of Interest Rate, II* (Continued)

The supply and the demand for central bank money

The demand for money

= unchanged = unaffected by the destinguising between currency or deposits (doesn't affect the amount we want to spend)

When people can hold both currency and checkable deposits, the demand for money involves *two decisions*.

First, people must decide how much money to hold. Second, they must decide how much of this money to hold in currency and how much to hold in checkable deposits.

1. We can assume that overall money demand is given by the same equation as before: $M^d = €YL(\underset{(-)}{i})$

We're not earning an intrest rate on deposits/ cash: how the intrest rate is affecting our choices is also unaffected

2. The demands for currency and checkable deposits are given by:

A fraction of the monney demand is cash
The other fraction of money demand is currency

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

Currency: no bank involved

Deposits: bank is involved because bank has to ceep a fraction in reserves (that fracion is theta)

4.3 Determining of Interest Rate, II* (Continued)

The supply and the demand for central bank money

The demand for reserves

The larger the amount of checkable deposits, the larger the amount of reserves the banks must hold, for both precautionary and regulatory reasons.

The relation between reserves (*R*) and deposits (*D*):

$$R = \theta D$$

= the fraction the bank holds in term of reserves of our deposits at the bank

The demand for reserves by banks is given by:

fill in D

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

4.3 Determining of Interest Rate, II* (Continued)

The supply and the demand for central bank money

The demand for central bank money = H= high powered money

The demand for central bank money is equal to the sum of the demand for currency and the demand for reserves.

We want currency > the banks wanting reserves as a response on the deposits we demand

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

Replace CU^{d} and R^{d} with their expressions from equations (4.4) and (4.7) to get:

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

= Currency demand + reserve demand

Finally, replace the overall demand for money, M^{d}, with its expression from equation (4.3) to get:

Since Md didn't change

$$H^{d} = \left[c + \theta(1-c)\right]€YL(i)$$

c = fraction of money we demand for holding cash
1-c = fraction we hold for deposits
Theta = fraction of the deposits that the banks hold in reserves
= all positive and between 0 and 1

4.3 Determining of Interest Rate, II* (Continued)

The supply and the demand for central bank money

The determination of the interest rate

- **In equilibrium, the supply of central bank money (*H*) is equal to the demand for central bank money (H^d):**

Supply is demand:

$$H = H^d$$

Or restated as: equilibrium:

$$H = H^d = \left[c + \theta(1-c)\right] €YL(i)$$

4.3 Determining of Interest Rate, II* (Continued)

The supply and the demand for central bank money

The determination of the interest rate

Graphically: noting much changes
> we now tak about the money that is directly under control of the central bank
> demand for central bank money is proportional to money demand so curve looks similar to previous curve, same is for equilibirum: same shift will occur as in the money market

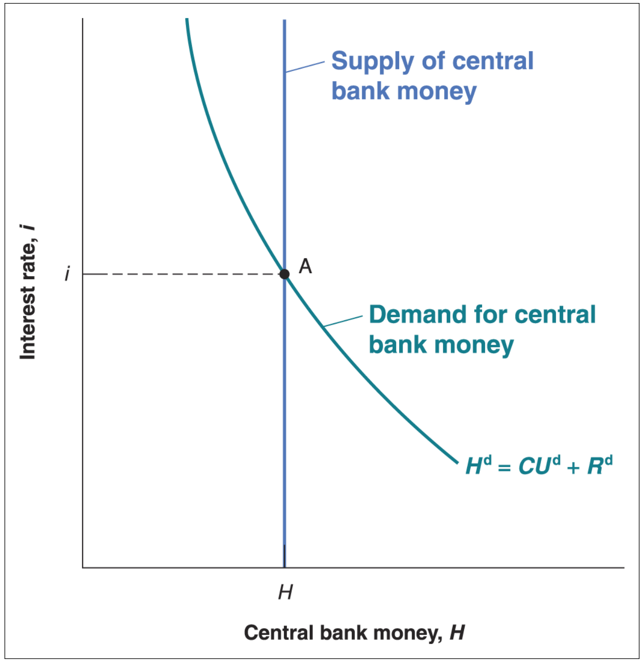


Figure 4.8 **Equilibrium in the market for central bank money and the determination of the interest rate**

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

Why is this usefull?
> because we observe these 2 types of money in the economy
> we can rewrite our eq condition

4.4 Two Alternative Ways of Looking at the Equilibrium

The Federal Funds Market and the Federal Funds Rate

The equilibrium condition that the supply and the demand for bank reserves be equal is given by: $H - CU^{d} = R^{d}$

supply

The **federal funds market** is a market for bank reserves. In equilibrium, demand (R^{d}) must equal supply ($H - CU^{d}$). The interest rate determined in the market is called the **federal funds rate**.

4.4 Two Alternative Ways of Looking at the Equilibrium (Continued)

The supply of money, the demand for money and the money multiplier

We rewrite our condition:

$$\boxed{\frac{1}{[c+\theta(1-c)]}}H = €YL(i)$$

This factor = bigger than 1

Supply of money = Demand for money

Central bank has influence over a small portion of money relative to the total amount of money in the economy, but by doing so it will have more than an proportional impact on the total amount of money

= second multiplier!

- The overall supply of money is equal to central bank money times the **money multiplier**:

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

- **High-powered money** is the 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**.

4.4 Two Alternative Ways of Looking at the Equilibrium (Continued)

The supply of money, the demand for money and the money multiplier

Understanding the money multiplier

- **We can think of the ultimate increase in the money supply as the result of *successive rounds of purchases of bonds*—the first started by the Fed in its open market operation, the following rounds by banks.**

What's happening?
> when central bank preforms a change in money suply > rise to a sequence of responses by private angents and banks
> let's put C = 0 (for example net slide)

The money multiplier: $\frac{1}{[c+\theta(1-c)]}$

- Mechanism?
- Assume: there are only deposits (no cash), c=0
- $\frac{1}{[c+\theta(1-c)]} \rightarrow \frac{1}{\theta}$
  - Increase in H with 1 leads to increase in money stock $\frac{1}{\theta}$

An increase in H with 1 unit wil result to an increase in the total money stock in the economy with 1/theta

- Assume: reserve-ratio: $\theta = 10\%$
- O.M.O.: CB buys \$100 worth of bonds
  - Central Bank prints \$100 cash
  - Seller 1: receives \$100 cash => deposits it in her account at bank A (Bacause c = 0: no cash, cannot keep it in their wallet)
  - Bank A: keeps 10% in reserves, buys $0{,}9 * \$100$ =\$90 bonds (or lends out \$90)
  - Seller 2: receives \$90 cash => deposits it in her account at bank B
  - Bank B: keeps 10% in reserves, buys $(0{,}9)^2 * \$100$ bonds
  - Seller 3: …
  - Quantity of new deposits? $(1 + 0{,}9 + 0{,}9^2 + \cdots) * \$100$ = accumulation
  - $(1 + 0{,}9 + 0{,}9^2 + \cdots) = 1/(1 - 0{,}9) = 10$

To make things easier, let's consider a special case where people hold only deposit accounts, so $c = 0$. In this case, the multiplier is $1/\theta$. In other words, an increase of a euro of high-powered money leads to an increase of $1/\theta$ euros in the money supply. Assume further that $\theta = 0.1$, so that the multiplier equals $1/0.1 = 10$. The purpose of what follows is to help you understand where this multiplier comes from and, more generally, how the initial increase in central bank money leads to a ten-fold increase in the overall money supply.

Suppose the central bank buys €100 worth of bonds in an open market operation. It pays the seller – call him seller 1 – €100. To pay the seller, the central bank creates €100 in central bank money. The increase in central bank money is €100. When we looked earlier at the effects of an open market operation in an economy in which there were no banks, this was the end of the story. Here, it is just the beginning:

- Seller 1 (who, we have assumed, does not want to hold any currency) deposits the €100 in a deposit accounts at this bank – call it bank A. This leads to an increase in deposit accounts of €100.
- Bank A keeps €100 times 0.1 = €10 in reserves and buys bonds with the rest, €100 times 0.9 = €90. It pays €90 to the seller of those bonds – call her seller 2.
- Seller 2 deposits €90 in a deposit account in her bank – call it bank B. This leads to an increase in deposit accounts of €90.
- Bank B keeps €90 times 0.1 = €9 in reserves and buys bonds with the rest, €90 times 0.9 = €81. It pays €81 to the seller of those bonds – call him seller 3.
- Sellers 3 deposits €81 in a deposit account in his bank – call it bank C.
- And so on.

By now, the chain of events should be clear. What is the eventual increase in the money supply? The increase in deposit accounts is €100 when seller 1 deposits the proceeds of his sale of bonds in bank A, plus €90 when seller 2 deposits the proceeds of her sale of bonds in bank B, plus €81 when seller 3 does the same, and so on. Let's write the sum as:

$$€100(1 + 0.9 + 0.9^2 + \ldots)$$

The series in parentheses is a geometric series, so its sum is equal to $1/(1 - 0.9) = 10$. (See Appendix 1 at the end of this book for a refresher on geometric series.) The money supply increases by €1000 – 10 times the initial increase in central bank money.

Equilibrium in financial markets (CH4)

- Demand for money $M^d = f(Y, i)$
- Central bank controls money supply M^s
- Equilibrium: $M^s = M^d \Rightarrow i$

The central bank may be in control of the monetary basis of the quantity of highpowerd money, but the total amount of money is objectable to potential fluctuations that the central bank might not be able to control

John Maynard Keynes (1883-1946)

Country of origin: United Kingdom
Affiliation: University of Cambridge, UK
Contribution: marginal propensity to consume, spending multiplier
Important work: “The General Theory of Employment, Interest and Money” (1936)
Noteworthy: Advisor at Bretton Woods Conference (1944)

Keynes (right) and the US representative Harry Dexter White at the inaugural meeting of the IMF's Board of Governors in 1946.

Key Terms

- Income
- Flow
- Saving
- Savings
- Financial wealth, wealth
- Stock
- Investment
- Financial investment
- Money
- Currency
- Deposit accounts
- M1
- Bond
- Money market funds
- *LM* relation
- Liquidity
- Open market operation
- Expansionary, and contractionary, open market operation
- Financial intermediary
- (Bank) reserves
- Bank run
- Reserve ratio
- Central bank money
- Wholesale funding
- Narrow banking
- Interbank market
- EONIA
- Money multiplier
- High-powered money
- Monetary base
- Marginal lending facility

CHAPTER 5: GOODS AND FINANCIAL MARKETS: THE *IS–LM* MODEL

When something happens in the good market will that affect the financial market?

- Earlier:
  - Basics goods market equilibrium: how much demand for given interest rate? (IS)
    = how output is determined
  - Basics financial market equilibrium: how much interest rate for given output? (LM)
    = where intrest rate is determined
- Now:
  - Joint equilibrium: IS-LM
    Relation between output and intrest rates
  - => output and interest rate simultaneously determined, accounting for the fact they affect one another

5.1 The Goods Market and the *IS* Relation

- Equilibrium in the goods market exists when production, *Y*, is equal to the demand for goods, *Z*. This condition is called the *IS* relation.

- In the simple model developed in Chapter 3, the interest rate did not affect the demand for goods. The equilibrium condition was given by:

Equilibrium or IS relation:
> total amount of produciton = total demand = $Y = C(Y - \bar{T}) + \bar{I} + \bar{G}$

= exhaougenous determined

Financial markets weren't included but:
> when intrest rates change > saving behaviour changes (higher intrest rates = more saving) > could infuence the intrest rate for consumption
> investment is no longer exhaugenous but determined by intrest rate

5.1 The Goods Market and the *IS* Relation (Continued)

Investment, sales and the interest rate

Investment depends primarily on two factors:

- The level of sales (+)
- The interest rate (−)

$$I = I(Y, i)$$
$$(+, -)$$

Firms invest more when the economy is doing well
- investment: high output Y in buisness > high investment
- intrest: low intrest > high investment (little cost of credit and borrowing funds)

5.1 The Goods Market and the *IS* Relation (Continued)

Determining output

Taking into account the investment relation, the equilibrium condition in the goods market becomes:

Analyse T with the intrest rate:

$$Y = C(Y - \overline{T}) + I(\underset{+}{Y}, \underset{-}{i}) + \overline{G}$$

More income Y > partly leadts to more spending + partly leads to additional investment

For a given value of the interest rate, *i*, demand is an increasing function of output, for two reasons:

2 endoughenous variables

- An increase in output leads to an increase in income and also to an increase in disposable income. $Y \nearrow : Y_d \nearrow : C \nearrow$
- An increase in output also leads to an increase in investment.
  $Y \nearrow : i \nearrow$

More taxes > less dipsposable income > consumtion goes down (undepandable of intrest) > less income

5.1 The Goods Market and the *IS* Relation (Continued)

Determining output

Note two characteristics of ZZ:

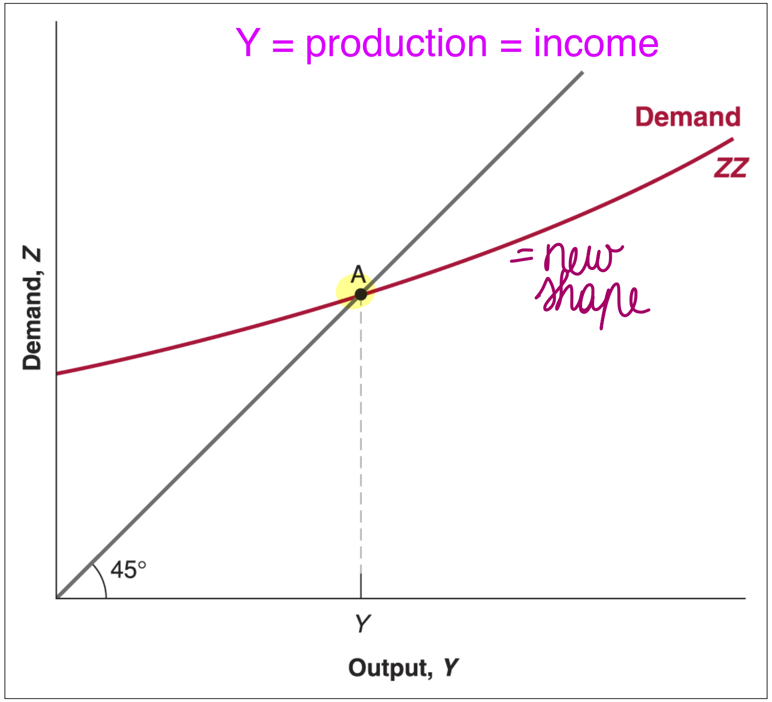
- Because it is assumed that the consumption and investment relations in Equation (5.2) are linear, ZZ is, in general, a curve rather than a line.

- ZZ is drawn flatter than a 45-degree line because it is assumed that an increase in output leads to a less than one-for-one increase in demand.

Equilibrium: intersection with demand and 45° line
> but now there is an intrest rate included (influences demand) = newly shaped curve
> this eq is a combination of output Y an an intrest rate i (instead of just Y)
> how does the equilibrium changes when i changes?

5.1 The Goods Market and the *IS* Relation (Continued)

Determining output



Note:
- Equilibrium A is the intersection of supply and demand ZZ
- Demand includes investment
- Investment is a function of i

⇒ Equilibrium A is associated with a level of the interest rate i

⇒ In other words, equilibrium can be seen as a combination of (Y,i)

Figure 5.1 **Equilibrium in the goods market**
The demand for goods is an increasing function of output. Equilibrium requires that the demand for goods be equal to output.

We characterised equilibrium in the goods market as the condition that production, Y, be equal to the demand for goods, Z. We called this condition the IS relation.

> intrest rate i: when intrest rate changes > how does that effect the equilibrium in the goods market (the IS curve?)
- higher intrest rate = expensive credit/loans > demand goes down > less investment
- in the goodsmarket: the result of this shift be a new intersection of the new demand curve with the 45° line
- A' is where income = Y' (higher intrest rate from i to i' > lower income from Y tot Y'

5.1 The Goods Market and the *IS* Relation

Deriving the *IS* curve

$Z = Y = \ldots I(Y, i)$ ↗ Y ↓

(a) An increase in the interest rate decreases the demand for goods at any level of output, leading to a decrease in the equilibrium level of output.

(b) Equilibrium in the goods market implies that an increase in the interest rate leads to a decrease in output. The IS curve is therefore downward sloping.

(Higher intrest rates = less activity)

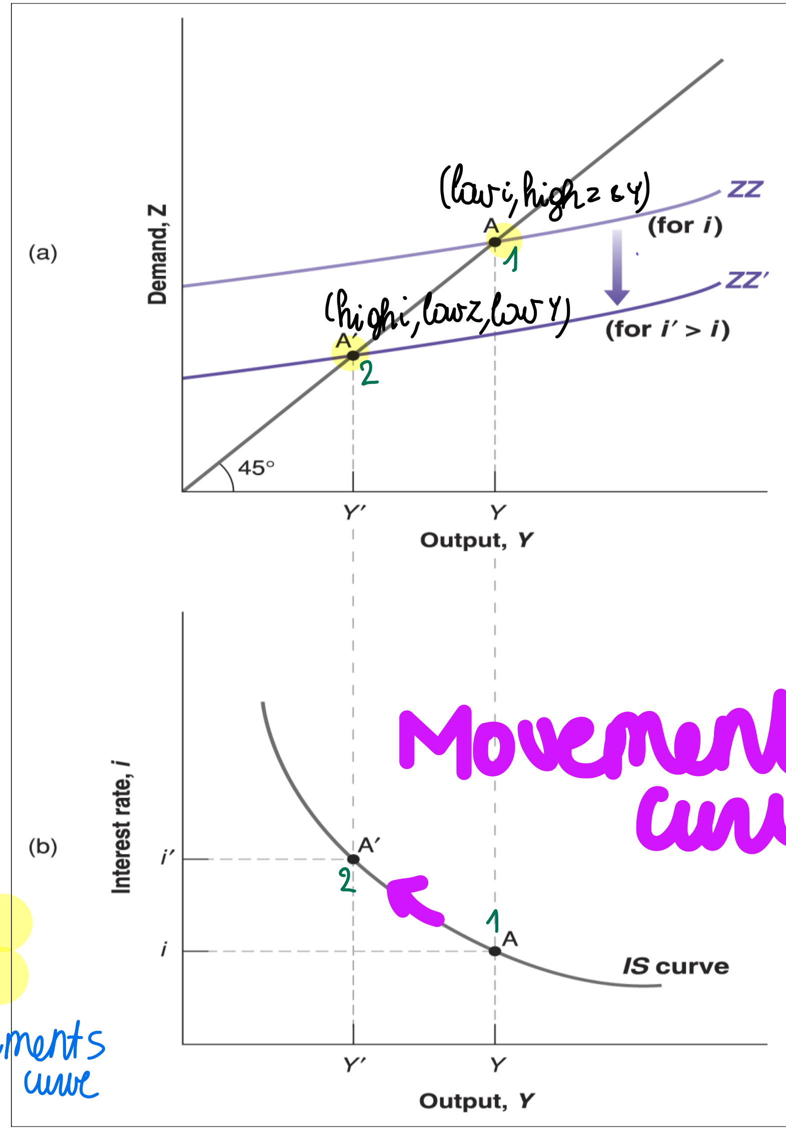


Figure 5.2 **The derivation of the *IS* curve**

investments saving curve

5.1 The Goods Market and the *IS* Relation (Continued)

Reasons for shifts, or moves along the curve

Shifts of the *IS* curve

We have drawn the IS curve in Figure 5.2, taking as given the values of taxes, *T*, and government spending, *G*. Changes in either *T* or *G* will shift the *IS* curve.

To summarize:

- Equilibrium in the goods market implies that an increase in the interest rate leads to a decrease in output. This relation is represented by the downward-sloping *IS* curve.
- Changes in factors that decrease the demand for goods, given the interest rate, shift the *IS* curve to the left. Changes in factors that increase the demand for goods, given the interest rate, shift the *IS* curve to the right.

5.1 The Goods Market and the *IS* Relation (Continued)

shift of curve: Δ T or G

Shifts of the *IS* curve

More generally, any factor that, for a given interest rate, decreases the equilibrium level of output causes the IS curve to shift to the left. We have looked at an increase in taxes, but the same would hold for a decrease in government spending or a decrease in consumer confidence (which decreases consumption, given disposable income). Symmetrically, any factor that, for a given interest rate, increases the equilibrium level of output – a decrease in taxes, an increase in government spending, an increase in consumer confidence – causes the IS curve to shift to the right.

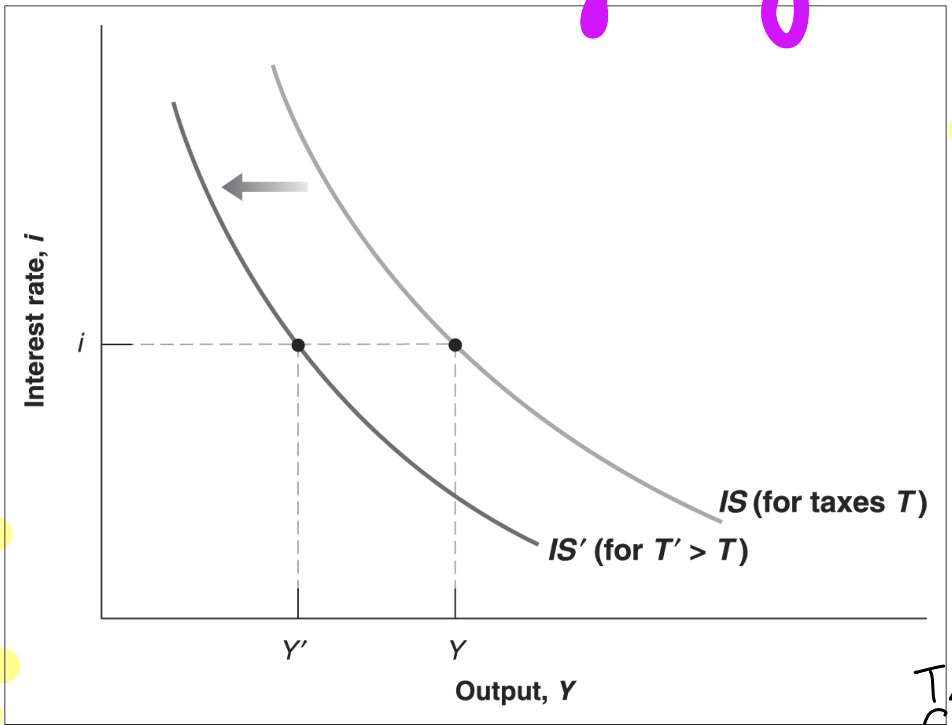
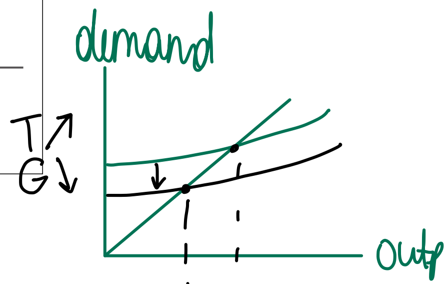


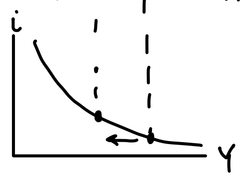
Figure 5.3 **Shifts in the *IS* curve**

An increase in taxes shifts the *IS* curve to the left.

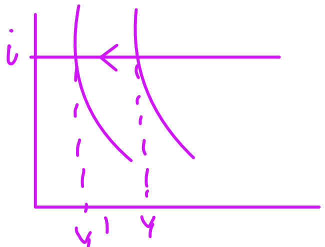
- If the intrest rate remains the same > higher taxes > consumpiton falls > less demand > income falls > multiplyer effect on top: we'(ll have lower income > equilibrium in IS curve shifts to the left
- if G falls > IS curve also shifts to the left
- changes in intrest rate make us move along the IS curve



G↘ of T↗ : Y↓ : investment ↘ : i↗



$T\nearrow$ } IS shifts to left:
$G\searrow$



$T\nearrow$: $Y_d = Y - T = \downarrow$

$G\searrow$: $Y\searrow$

If something changes in the goods market, how is that going to impact the financial market
> Eq condition in the financial market: we will no longer make a distinction between currency and deposits

5.2 Financial Markets and the *LM* Relation

The interest rate is determined by the equality of the supply of and the demand for money:

Equilibrium condition in fanancial market:

$$M = €YL(i)$$ = LM relationship

NOMINAL:

M = nominal money stock
€*YL*(*i*) = demand for money
€*Y* = nominal income
i = nominal interest rate

remember: nominal vs real GDP

5.2 Financial Markets and the *LM* Relation (Continued)

Real money, real income and the interest rate

- **The equation $M = €YL(i)$ gives a relation between money, nominal income and the interest rate.**
- **The *LM* relation: In equilibrium, the *real money supply* is equal to the *real money demand*, which depends on real income, *Y*, and the interest rate, *i*:**

$$\frac{M}{P} = YL(i)$$

From chapter 2, recall that Nominal GDP = Real GDP multiplied by the GDP deflator:

$$€Y = YP$$

Equivalently:

$$\frac{€Y}{P} = Y$$

We can express that in nominal or real terms, so we can talk about:
> euro's or
> the amount of goods * their price
= same as nominal income and real income
> at this point it's not relevant because P = price level in the economy, we're focussing on the short term analysis of the economy and prices tend to be sticky - don't change from day to day, so weather we talk about real or nominal income or money that doesn't matter (if we divide by a constant or not)

Horizontal: M or M/P (price remains constant), so the difference between these two is irrelevant
Vertical: intrest rate
The question: what is equilibrium in the financial mark (is where money supply meets money demand = A)
- in our money demand curve (LM relation) there. Is an influence of the goods market= equilibrium in financial markets is not inrespective to goods market because income actually matters: how much income we have determines how much we want to spend

5.2 Financial Markets and the *LM* Relation (Continued)

- thus there is an influence of income on money demand
- behind any equilibrium (for example point A) = where the intrest rate is determined, but this goes had in hand with a certain income level, so this equilibrium applys a certain intrest rate and output level

Deriving the *LM* curve

a) An increase in income leads, at a given interest rate, to an increase in the demand for money. Given the money supply, this increase in the demand for money leads to an increase in the equilibrium interest rate.

b) Equilibrium in the financial markets implies that an increase in income leads to an increase in the interest rate. The *LM* curve is therefore upward sloping.

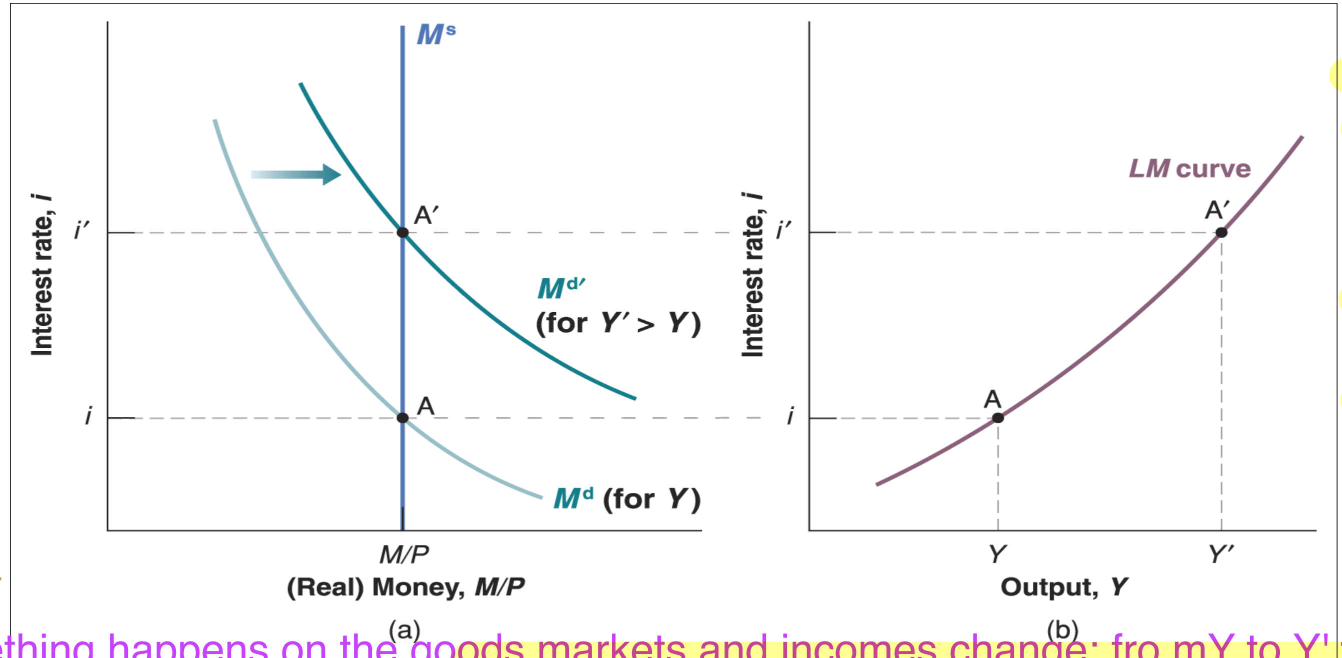


Figure 5.4

A': intrest rate will be higher > higher income (since LM curve is positivly sloped: more income = more intrest)

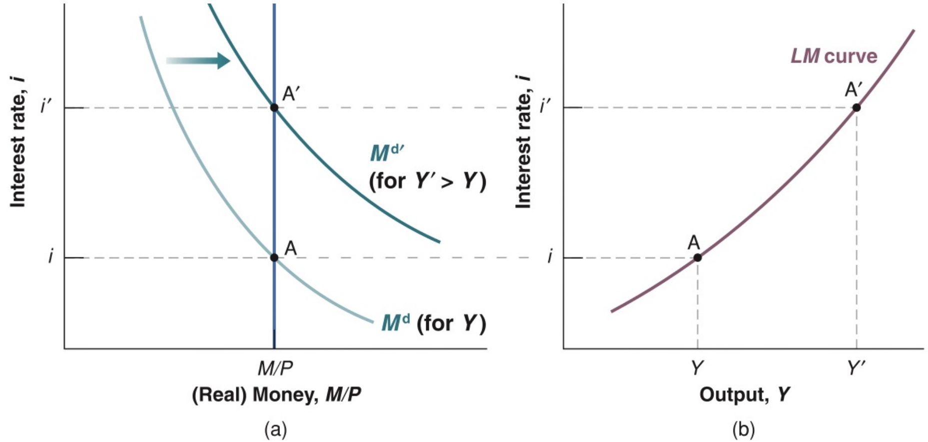
- what happens when something happens on the goods markets and incomes change: fro mY to Y' > the money demand curve will shift to the right (more income > we want to spend more for a given intrest rate) > shift to the right for the money demand curve, if the central bank does not adjust (because central bank determines the money supply curve which is out of our model and will thus remain vertical), adjustment mechanism: people will sell bonds > new eq: A'

Figure 5.4

The derivation of the *LM* curve

(a) An increase in income leads, at a given interest rate, to an increase in the demand for money. Given the money supply, this increase in the demand for money leads to an increase in the equilibrium interest rate.

(b) Equilibrium in the financial markets implies that an increase in income leads to an increase in the interest rate. The *LM* curve is therefore upward sloping.



Why do we think about shifts of the *IS* curve to the left or to the right, but about shifts of the *LM* curve up or down? The reason:

- We think of the goods market as determining *Y* given *i*, so we want to know what happens to *Y* when an exogenous variable changes. *Y* is on the horizontal axis and moves right or left.
- We think of financial markets as determining *i* given *Y*, so we want to know what happens to *i* when an exogenous variable changes. *i* is on the vertical axis and moves up or down.

Now consider an increase in income from Y to Y', which leads people to increase their demand for money at any given interest rate. Money demand shifts to the right, to $M^{d'}$. The new equilibrium is at A′, with a higher interest rate, i'. Why does an increase in income lead to an increase in the interest rate? When income increases, money demand increases; but the money supply is given. Thus, the interest rate must go up until the two opposite effects on the demand for money – the increase in income that leads people to want to hold more money (instead of bonds) and the increase in the interest rate that leads people to want to hold less money (and more bonds) – cancel each other out. At that point, the demand for money is equal to the unchanged money supply, and financial markets are again in equilibrium.

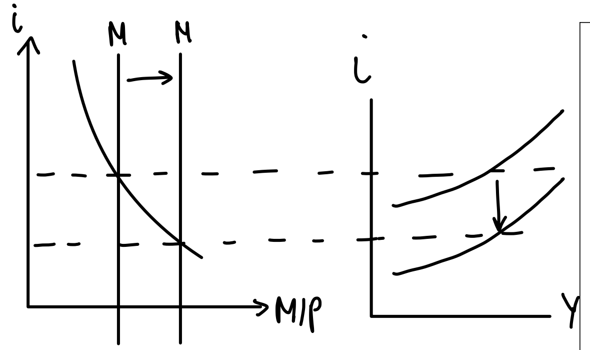
5.2 Financial Markets and the *LM* Relation (Continued)

Deriving the *LM* curve

- **Figure 5.4(b) plots the equilibrium interest rate, *i*, on the vertical axis against income on the horizontal axis.**
- **This relation between output and the interest rate is represented by the upward sloping curve in Figure 5.4(b). This curve is called the *LM* curve.**

5.2 Financial Markets and the *LM* Relation (Continued)

Shifts of the *LM* curve



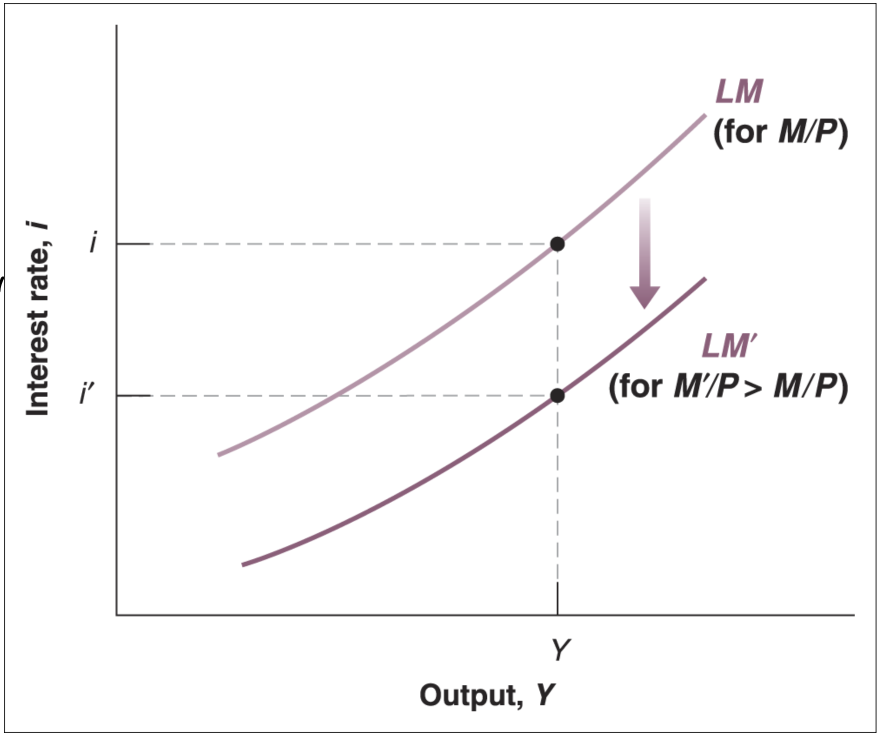


Figure 5.5 **Shifts in the *LM* curve**

An increase in money causes the *LM* curve to shift down.

This curve will be subjected to shifts: for a given level of output, we know that intrest rates might change, if the central bank decides to change the amount of money in the economy: if they inject money > intrest rate will fall > shift downward of the LM curve

- LM captures eq on financial market
- So taken as given what happens on the goods market, this shift is going the financial market to change so the LM curve is shifting down
- IS curve shifts to the left (= what happens to the goods markets)

= a difference between shifting left and right (IS and LM curve) ! Pay attention

5.2 Financial Markets and the *LM* Relation (Continued)

Shifts of the *LM* curve

Equilibrium in financial markets implies that, for a given real money supply, an increase in the level of income, which increases the demand for money, leads to an increase in the interest rate. This relation is represented by the upward-sloping *LM* curve.

- An increase in the money supply shifts the *LM* curve down; a decrease in the money supply shifts the *LM* curve up.

Lm: all points of eq in financial markets
Is: all eq points in goods market
Let's consider them at the same time: IS-LM model

5.3 Putting the *IS* and the *LM* Relations Together

$$IS\ relation:\ Y = C(Y - T) + I(Y, i) + G$$

$$LM\ relation:\ \frac{M}{P} = YL(i)$$

↗i : ↘Y

Y↗ : i↗

Equilibrium in the goods market implies that an increase in the interest rate leads to a decrease in output. This is represented by the *IS* curve. Equilibrium in financial markets implies that an increase in output leads to an increase in the interest rate. This is represented by the *LM* curve. Only at point A, which is on both curves, are both goods and financial markets in equilibrium.

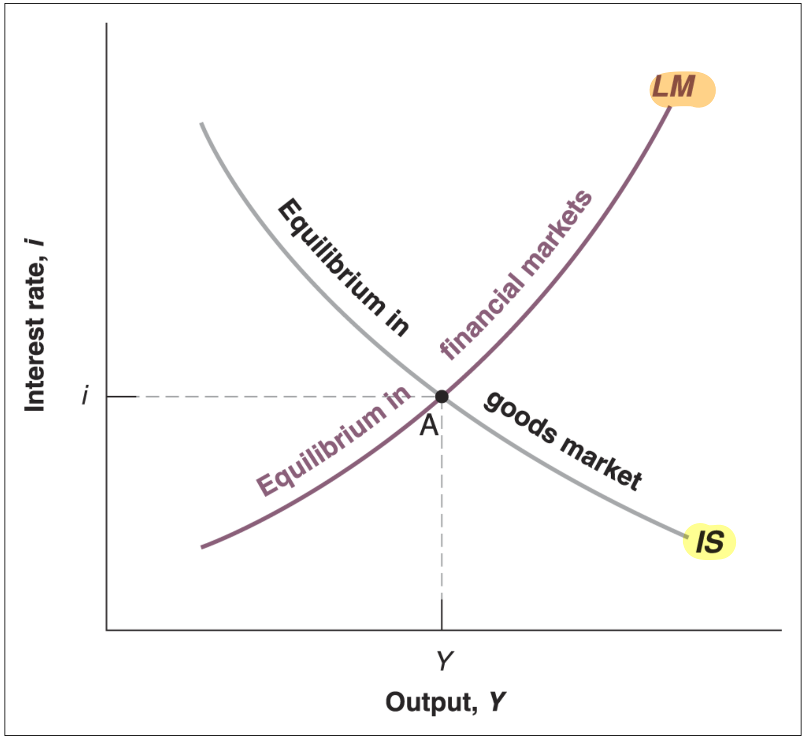


Figure 5.7 **The *IS–LM* model**

5.3 Putting the *IS* and the *LM* Relations Together (Continued)

How do shocks influence not only one market but both markets (and thus the joint equilibrium)

Fiscal policy, activity and the interest rate

- **Fiscal contraction, or fiscal consolidation, refers to fiscal policy that reduces the budget deficit.**
- **An increase in the deficit is called a fiscal expansion.**
- **Taxes affect the *IS* curve, not the *LM* curve.**

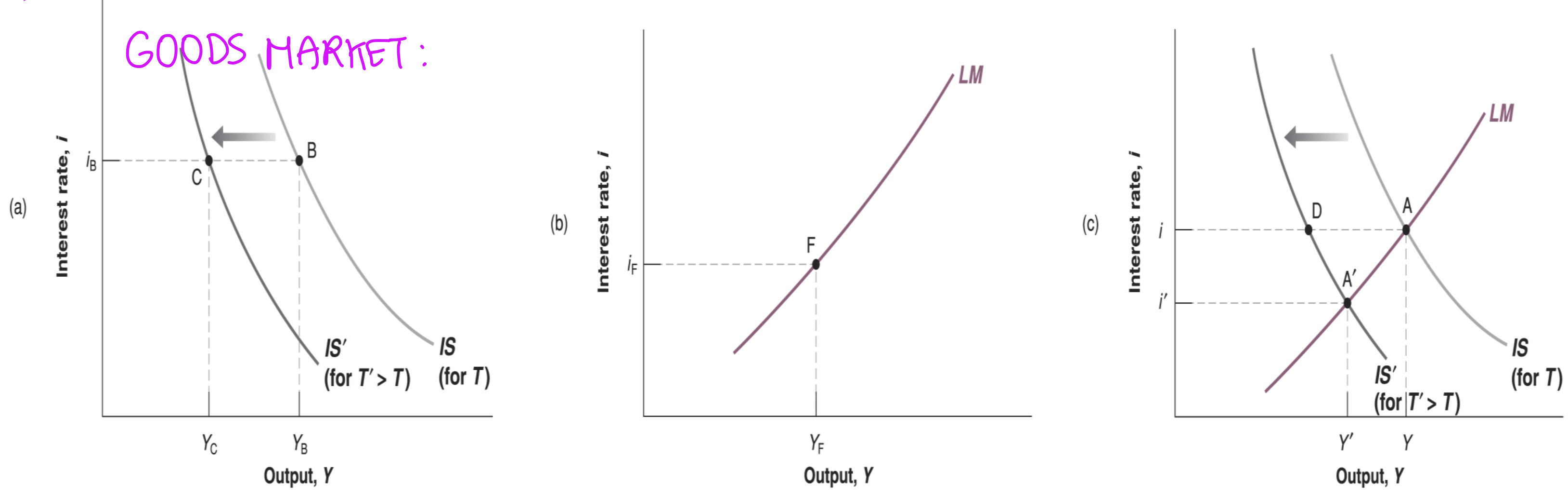
Result:
1. LM curve is onaffected
2. Taxes enter consumption function > will shift demand: for a given intrest rate goods market (IS curve) will shift to the left: from B to C - if intrest rates remain the same

5.3 Putting the *IS* and the *LM* Relations Together (Continued)

Fiscal policy, activity and the interest rate

3. Are intrest rates going to be the same? The IS curve will move grom A to D = on the IS curve, so there is an equilibirum on point D but this si a temporarily eq, for this intrest rate i: the financial market is going to be in eq if the income level is Y, but in D the income is lower: Y'.

GOODS MARKET:



We do not have a joint eq: only goods market is eq, but not the financial market. So we are shocked out of our initial eq A: the new eq will be in the crosspoint of the old LM curve (which doesn't change), with the new IS curve

Figure 5.8 **The effects of an increase in taxes**

An increase in taxes shifts the *IS* curve to the left and leads to a decrease in the equilibrium level of output and the equilibrium interest rate.

Overall result: increase in taxes > reduction in output > will lead to a recession. The intrest rate will be lower in this new equilibrium, this is no surprise: income is lower > intrest rate goes down since we demand les money

Let's put the adjustment from A to A' in words, too

- At the prevailing level of interest rates i and income Y:
  - Equilibrium in financial markets occurs at point A (on LM)
  - The increase in taxes however, has reduced demand. How much?
    - If interest rates remain the same, to an income level consistent with point D
    - At this point, the goods market is in equilibrium (on IS)
- Since IS and LM do not cross at this point, no general equilibrium so far => further adjustment:
  - Less income => lower demand for money => buy bonds => interest rate falls (price of bonds rises): move along the LM curve (from A to A')
  - Falling interest rate => stimulates investment: implies move along the IS curve (from D to A')

5.3 Putting the *IS* and the *LM* Relations Together (Continued)

Monetary policy, activity and the interest rate

- Monetary contraction, or monetary tightening, refers to a decrease in the money supply.

- An increase in the money supply is called monetary expansion.

- Monetary policy does not affect the *IS* curve, only the *LM* curve. For example, an increase in the money supply shifts the *LM* curve down.

1. If the central bank conducts monetary expansion: reducing the intrest rates.
2. The central bank prints more money = increase of money supply from M to M' (price doesn't matter: in the short run the prices are fixed, thus M (=increased)/P(=ct)= increase, as a result for a given level of output: our equilibrium in the financial market is going to shift down

5.3 Putting the *IS* and the *LM* Relations Together (Continued)

- Monetary policy, activity and the interest rate

3. We go from A to A" = not a new joint eq because we are not on the IS curve > adjustment mechanism. Our new general eq is there were the old IS curve meets the new LM curve

Money (IS): money supply does not appear on our eq in goods market > IS curve is unaffected

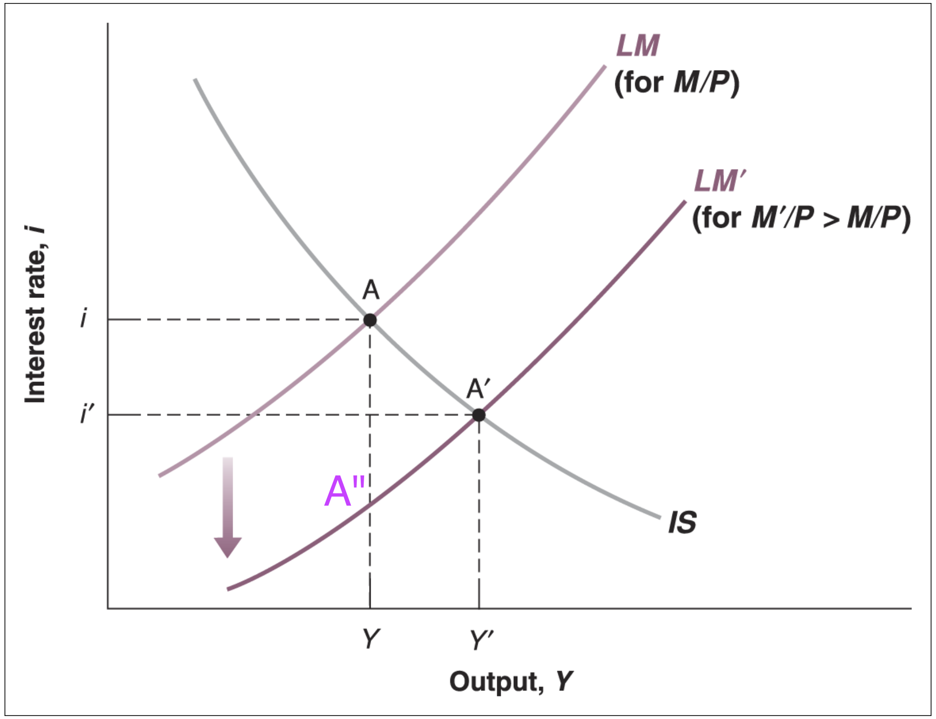


Figure 5.9 **The effects of a monetary expansion**

A monetary expansion leads to higher output and a lower interest rate.
= a boom in the economy

5.4 Using a Policy Mix

How do shocks change the IS-LM curve?

Table 5.1 The effects of fiscal and monetary policy

	Shift of *IS*	Shift of *LM*	Movement in output	Movement in interest rate
Increase in taxes	**Left**	**None**	**Down**	**Down**
Decrease in taxes	**Right**	**None**	**Up**	**Up**
Increase in spending	**Right**	**None**	**Up**	**Up**
Decrease in spending	**Left**	**None**	**Down**	**Down**
Increase in money	**None**	**Down**	**Up**	**Down**
Decrease in money	**None**	**Up**	**Down**	**Up**

5.4 Using a Policy Mix (Continued)

- The combination of monetary and fiscal polices is known as the monetary—fiscal policy mix, or simply, the policy mix.
- Sometimes, the right mix is to use fiscal and monetary policy in the same direction.
- Sometimes, the right mix is to use the two policies in opposite directions—for example, combining a fiscal contraction with a monetary expansion.

Focus: The U.S. Recession of 2001

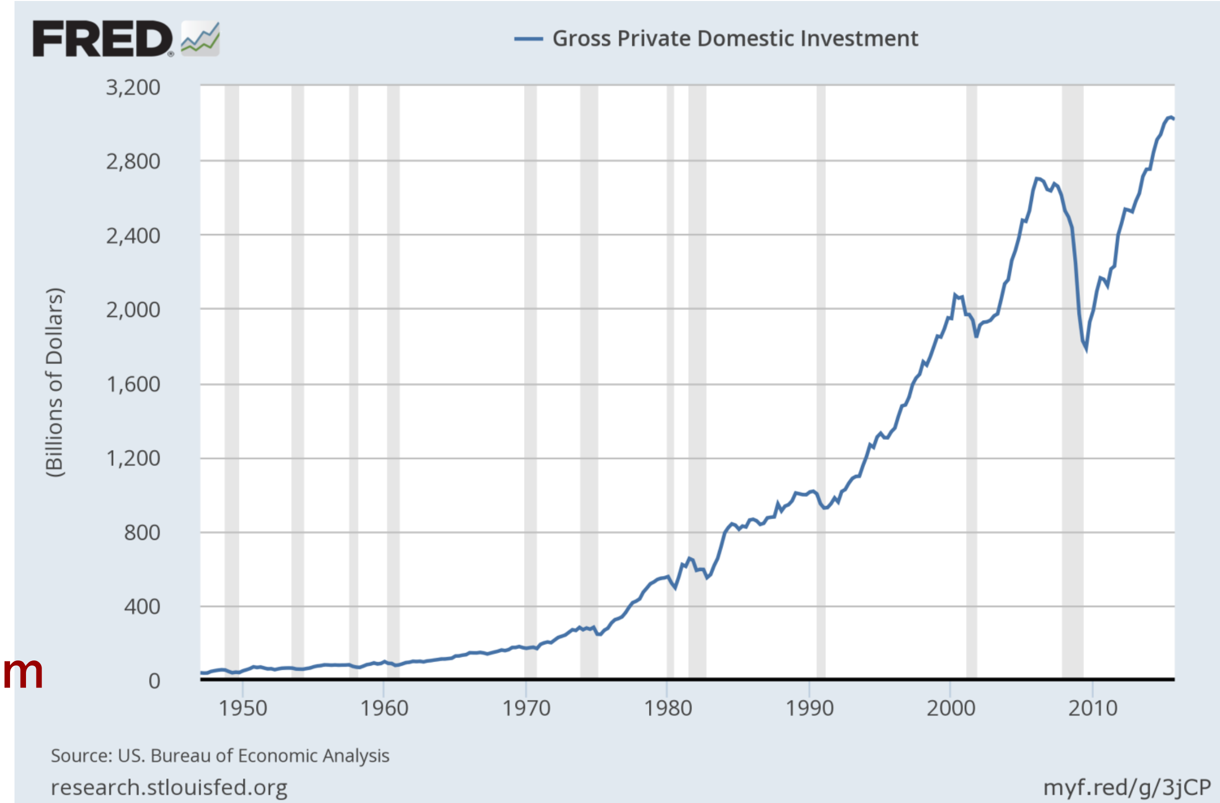
Figure 1 The U.S. Growth Rate, 1999–1 to 2002–4

Source: Calculated using Series GDPC1, Federal Reserve Economic Data (FRED) http://research.stlouisfed.org/fred2/

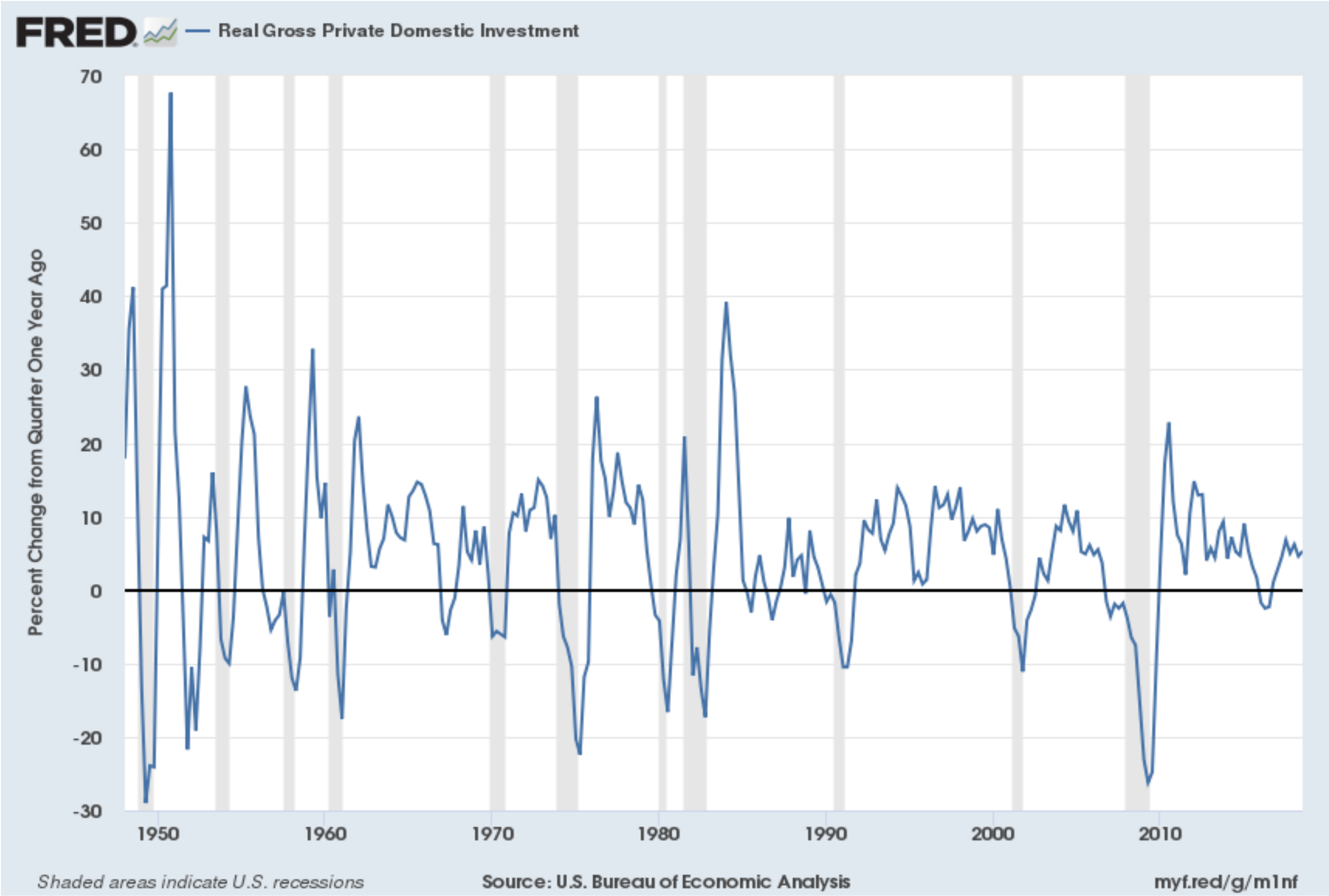
Example of the recession in the 2001: growth rate of real GDP, around 2001: turns negative (= grey area = recession), before the recession: growth was positive and is only occasionally negative, but now growth turns negative
- so howe home and what to do about it?

This is a longer time series plot from 1950 up untill now
> grey lines = the official US recession periods = similar to previous graph, but the figure is not capturing GDP growth, but investment (the level of investment)
> in the decade before the 200 recession: investment is booming, he called it a period of irrational exuberance: there is to much optimism, this will not last > led to an end of optimism (also due to fraud) > after the decade of growth and investment (next graph)

- 2nd half of 90's: optimism
- Lots of investment: Uninterrupted strong growth
- Greenspan: "Irrational exuberance"
- End of optimism



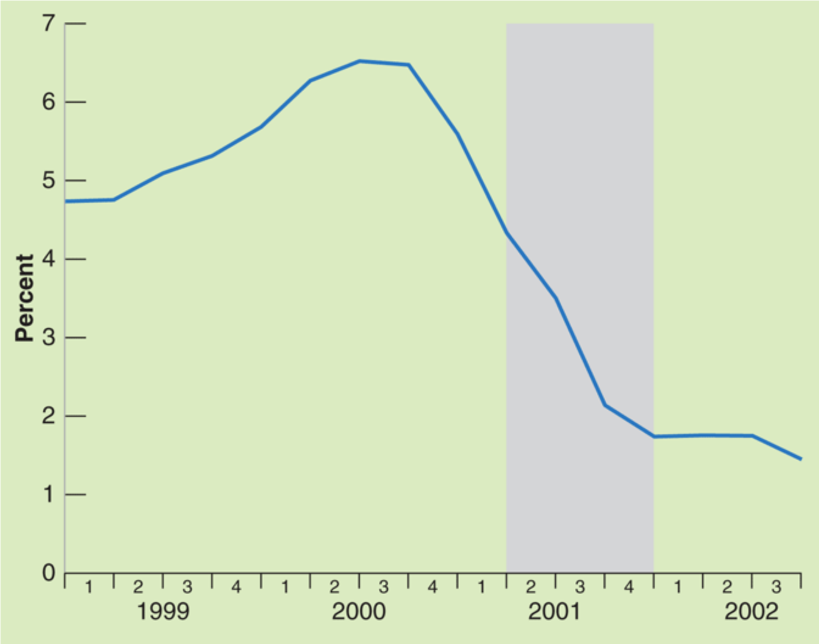
Note: previous graph is nominal, in levels. This graph is real, in percent change.



Investment turns negative, we know that in the IS-LM: economic activity will go down (output goes down) > economy tanks > what can we do about it?

Focus: The U.S. Recession of 2001

Figure 2 The Federal Funds Rate, 1999–1 to 2002–4



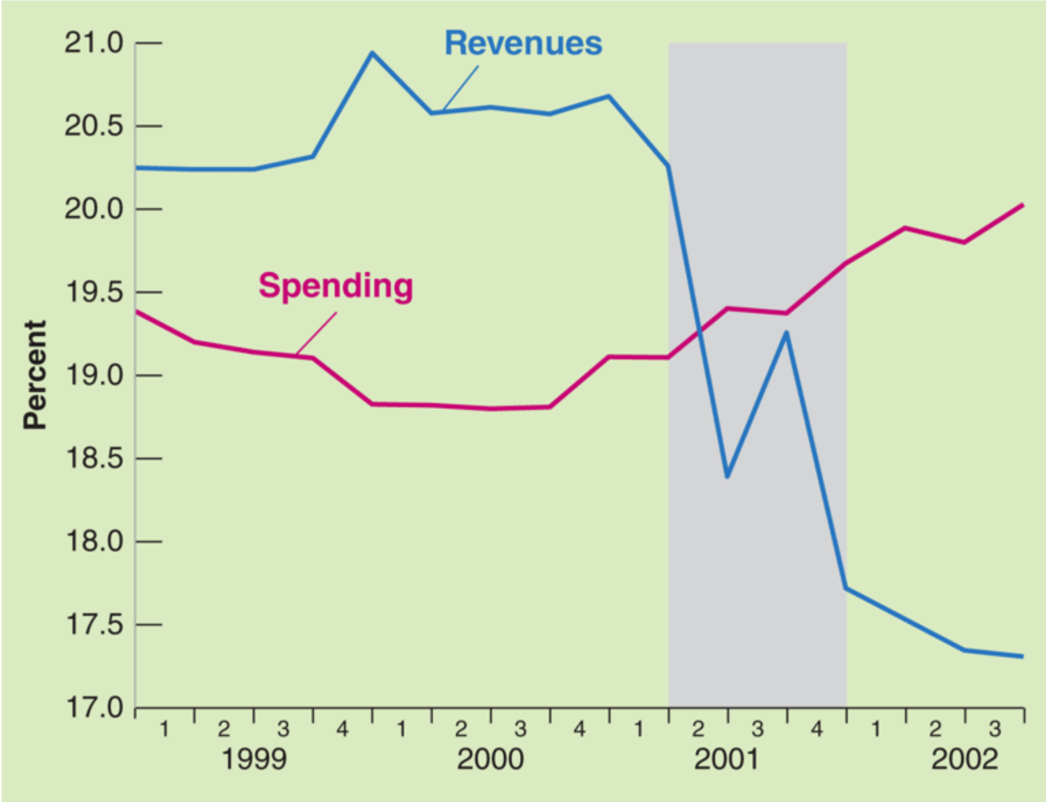
Source: Series FEDFUNDS, Federal Reserve Economic Data (FRED) http://research.stlouisfed.org/fred2/

A plot of the federal funds rate around that period
> the intrest rate was slached from 6 tot 1% = extensive monitary policy
> also action on the fiscal dimension (next graph)

also action on the fiscal dimension: there are two lines
that roughly mimic the GMT in our model

Focus: The U.S. Recession of 2001

Figure 3 U.S. Federal Government Revenues and Spending (as Ratios to GDP), 1999–1 to 2002–4

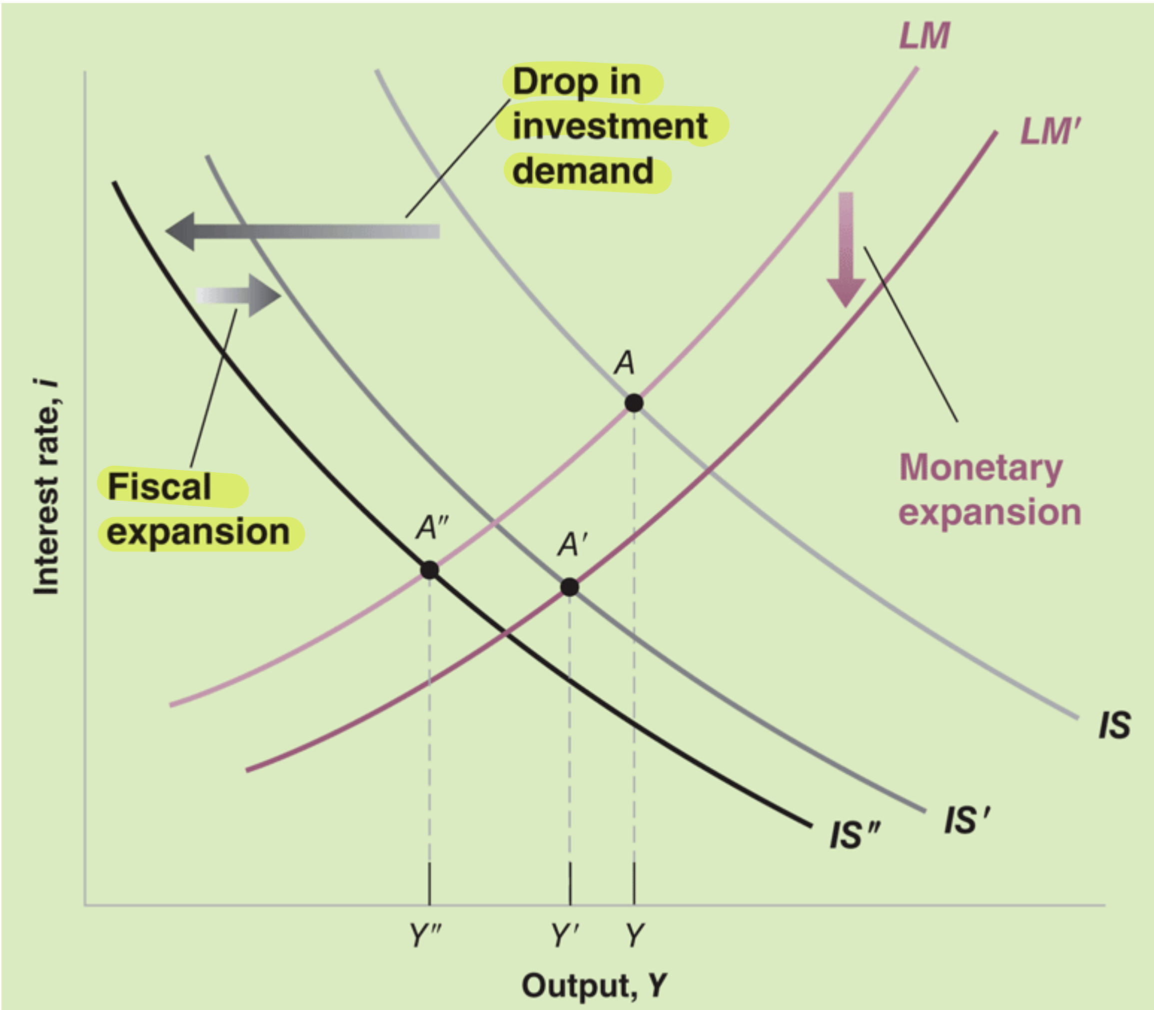


Source: Calculated using Series GDP, FGRECPY, FGEXPND, Federal Reserve Economic Data (FRED) http://research.stlouisfed.org/fred2/

Taxes were strongly reduced during the recession: governement wants to stimulate economy > let's lower taxes > let's at the same time increase spending (= increase G) > governement is trying to combat the recession

1. Period before the recession: inital eq = point A. the goods market was in eq on the IS curve and the LM curve also suggets that we are in eq with financial markets: youtput = Y and i = i
2. Crash of optimism: investment demand is going to drop (shock to investment) > investment is low.

Figure 4 The U.S. Recession of 2001



1. IS boom
2. IS'' recession
3. IS' (govern. interv.)

Remember:
- consumption func. (Lin.) = autonomous consumption + margenal prepensity to consume * (Y-T) = C = Ca+ Cm*(Y-T)
- investment func. (Lin) = autonomous investment + ... = I = Ia + By + D*intrest rate

When output is high (sales are high) > more investment

Recall: financial crisis caused a lot of uncertainty > consumer decided to save more (as a precousion) = reduction in autonomous investment > drop in investment demand > shift of the IS curve to the left

- IS shifts from IS > IS" = shift to the left because this is a shift in the goods market for a given intrest rate

Policy intervention=
- if no intervention: we would end up where IS" meets old LM curve = A" (with Y = Y")
- governement doesn't want such a big recession:
A) changes in taxes and spending: fiscal authority isn't staying silent, taxes are reduced and governement spending is increased > generates additional demand = additional exhougenous demand (since more disposible income > more consumption > more income > reinforces this multiplier mechanism)
B) extensive monitary policy: recution in intrest rate (by increasing the money supply): for a given level of output the LM curve shifts down to LM'
= SHIFT OF IS curve to the right (from IS" > IS')

- new eq: A'
In A': our eq output is Y', as a result of the governement action, the recession has been reduced to a mild recession

5.6 How Does the *IS–LM* Model Fit the Facts?

Introducing <u>dynamics</u> formally would be difficult, but we can describe the basic mechanisms in words.

- Consumers are likely to take some time to adjust their consumption following a change in disposable income.
- Firms are likely to take some time to adjust investment spending following a change in their sales.
- Firms are likely to take some time to adjust investment spending following a change in the interest rate.
- Firms are likely to take some time to adjust production following a change in their sales.

How long do the adjustments take?

5.6 How Does the *IS–LM* Model Fit the Facts?

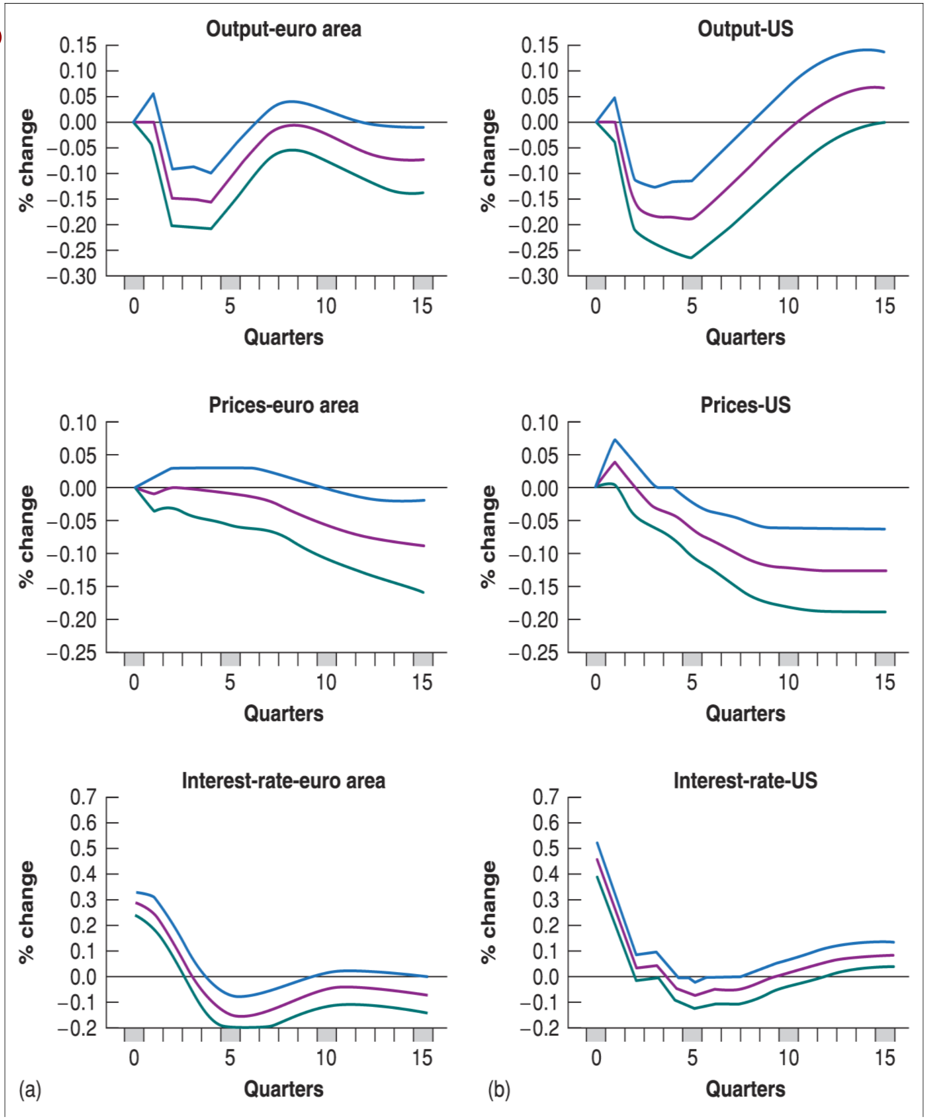


Figure 5.13 **The empirical effects of an increase in the interest rate in (a) the euro area and (b) the USA**

In the short run, an increase in the interest rate leads to a decrease in output and to an increase in unemployment, but it also has little effect on the price level.

Source: G. Peersman and F. Smets, 'The monetary transmission mechanism in the euro area: more evidence from VAR analysis', European Central Bank, working paper No. 91, December 2001.

Increase in intrest rate: what is the impact?
- horizontal axis: time - supprise increase at period 0
> it lasts for a bit and before it goes back to eq
- first row = response of output in EU area and in the US
- at the time the intrest rate changes in period 0: no change in output in eather EU or the US
- middle line = best estimate, two other lines = bounds of uncertainty
> we see in US and EU: in the first two quarters there is effectivly no change in economic activity, only later we see the influence of monitary policy on economic activity.
> it takes even longer for prices to adjust

Two remarks on the LM curve

- Zero Lower Bound / liquidity trap
- Interest rate setting vs. money supply steering

We're currently in an exeptional situation: central bank intrest rates are lower then they ever were before (close to 0) = a liquidity trap (intrest rates are stuck at the zero lower bound, since they are not exactly zero we'll talk about the effective lower bound)

> intrest rate can't become very negative.

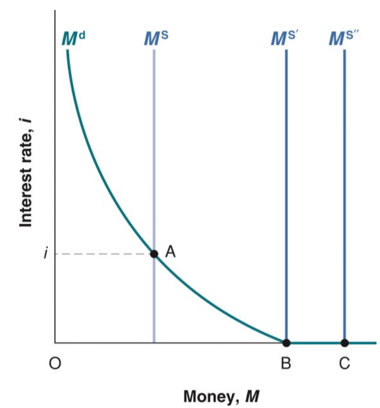
The liquidity trap

In the previous section, we assumed that the central bank could always affect the interest rate, by changing the money supply. However, there is a limit to what the central bank can do: it cannot decrease the interest rate below zero.

Go back first to our characterisation of the demand and the supply of money in Section 4.1. There we drew the demand for money, for a given level of income, as a decreasing function of the interest rate. The lower the interest rate, the larger the demand for money – equivalently, the smaller the demand for bonds. What we did not ask is what happens when the interest rate goes down to zero. The answer: once people hold enough money for transaction purposes, they are then indifferent between holding the rest of their financial wealth in the form of money or in the form of bonds. The reason they are indifferent: both money and bonds pay the same interest rate: zero. Thus, the demand for money is as shown in Figure 4.6:

> Look at Figure 4.1. Note how we avoided the issue by not drawing the demand for money for interest rates close to zero.

- As the interest rate decreases, people want to hold more money (and thus fewer bonds): the demand for money therefore increases.
- As the interest rate becomes equal to zero, people want to hold an amount of money at least equal to the distance OB. This is what they need for transaction purposes, but they are willing to hold even more money (and therefore hold fewer bonds) because they are indifferent between money and bonds. Therefore, the demand for money beyond point B becomes horizontal.



When the interest rate is equal to zero, and once people have enough money for transaction purposes, they become indifferent between holding money and holding bonds. The demand for money becomes horizontal. This implies that, when the interest rate is equal to zero, further increases in the money supply have no effect on the interest rate.

Now consider the effects of an increase in the money supply:

- Consider a case in which the money supply is M^s, so the interest rate consistent with financial market equilibrium is positive and equal to i. (This is the case we considered in Section 4.1.) Starting from that equilibrium in Figure 4.6, an increase in the money supply – a shift of the M^s line to the right – leads to a decrease in the interest rate.
- Now consider a case in which the money supply is $M^{s'}$, so the equilibrium is at point B; or the case where the money supply is $M^{s''}$, so the equilibrium is given at point C. In either

5.5 IS–LM and the Liquidity Trap

Adjustment mechanism (financial market): eq is where Ms = Md (money demand = supply), that trade of we're making: we demand oney as long as we need it for consumpiton
> if the central bank keeps injecting money (more money then we need) > the adjustment mechanism is going to push down the intrest rate (we get more and more money and we do not need that money any more, we're even not going to push that into bonds any more since we also don't need bonds > price of bonds is not longer going to react = happens when the intrest rat is 0

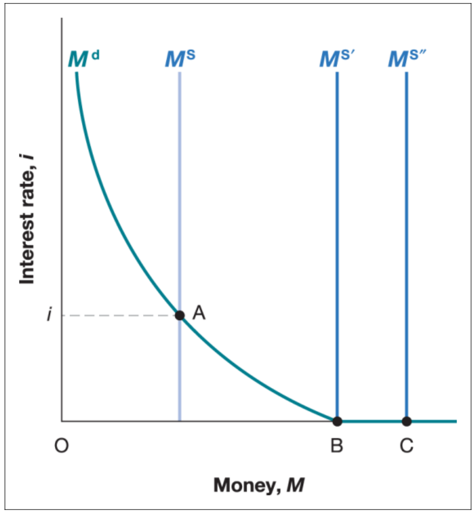


Figure 5.10 **Money demand, money supply and the liquidity trap**

When the interest rate is equal to zero, and once people have enough money for transaction purposes, they become indifferent between holding money and holding bonds, the demand for money becomes horizontal. This implies that, when the interest rate is equal to zero, further increases in the money supply have no effect on the interest rate.

So at this point, for the level of income:there is a level of money at with the intrest rate stops adjusting and we don't care any more about having the money in our pockets or into bonds (and we stop buying bonds)
= additional liquidity falls in a trap (it's going nowhere, so it's no use investing)
> increases in money supply no longer have their usually impact

5.5 IS–LM and the Liquidity Trap

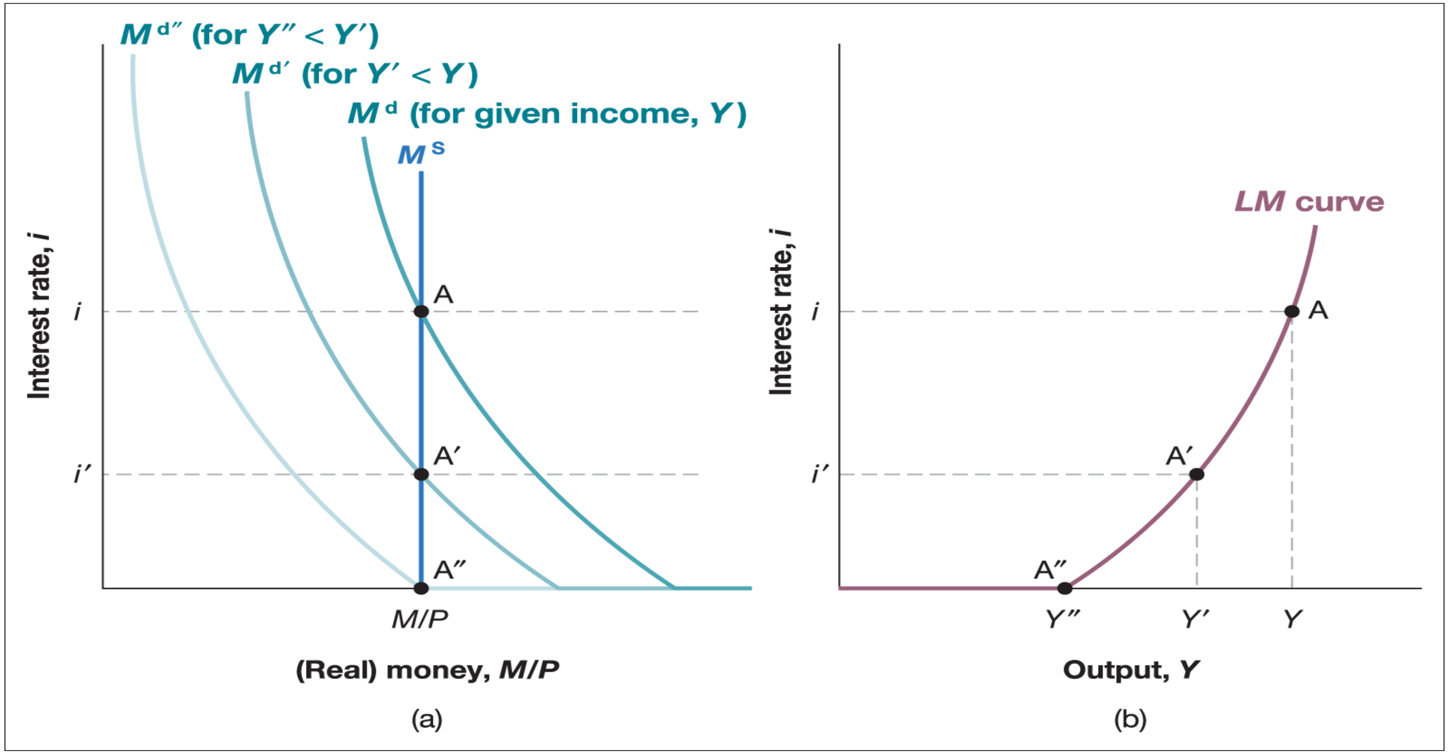


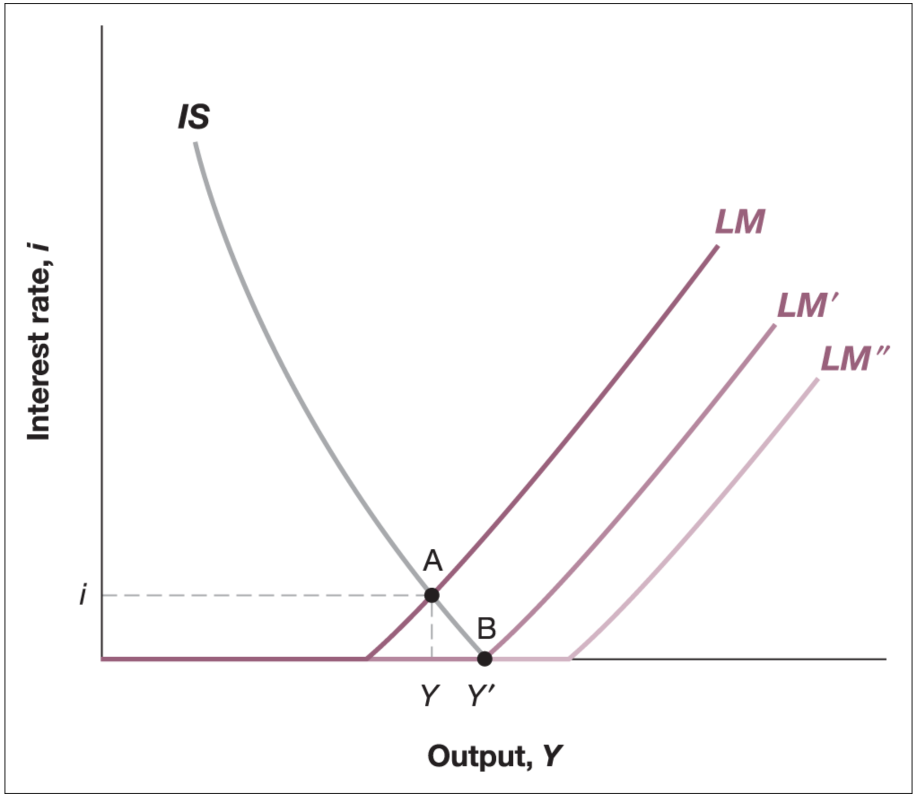
Figure 5.11 **The derivation of the *LM* curve in the presence of a liquidity trap**

For low levels of output, the LM curve is a flat segment, with an interest rate equal to zero. For higher levels of output, it is upward sloping: an increase in income leads to an increase in the interest rate.

As income goes lower and lower: money demand curve is going to shift (to the left) > if the central bank doesn't do anything - at some point we have so little income that we don't have money to invest any more = no longer substitution between money and bonds = eq will be at zero intrest rate (no more adjustment of intrest rates and bond prices: LM curve will turn flat

> once income falls below Y": it can drop further but we are not going to see changes in intrest rate (horizontal LM curve = we're in a liquidity trap > the central bank can't do it's usual business any more)

5.5 IS–LM and the Liquidity Trap



even if monetary policy is expanded: pushing the LM curve down, once the intrest rate is zero it can't be pushed down more > the central bank becomes powerless

Figure 5.12 The *IS–LM* model and the liquidity trap

In the presence of a liquidity trap, there is a limit to how much monetary policy can increase output. Monetary policy may not be able to increase output back to its natural level.

In our model we're talking about the central bank as controlling the amount of money > in the newspaper it communicates by communicating intrest rate than talking about money growth or money stocks
> assumption in the model isn't necesarily realistic or it might not even be what you hear
> central bank doesnet necisarily decide on it's policy exhaugenously - the reasing why the central bank is decreasing intrest rate depends on what happens exhaugenously in the economy
> even if we don't do this in our model: ecnonomist often write down policy rules (how money suppy would move and what are the reasons behind the move
> example = taylor rule:

LM ~ Interest rate (Taylor) rule

How policy intrest rates responds to economic activity

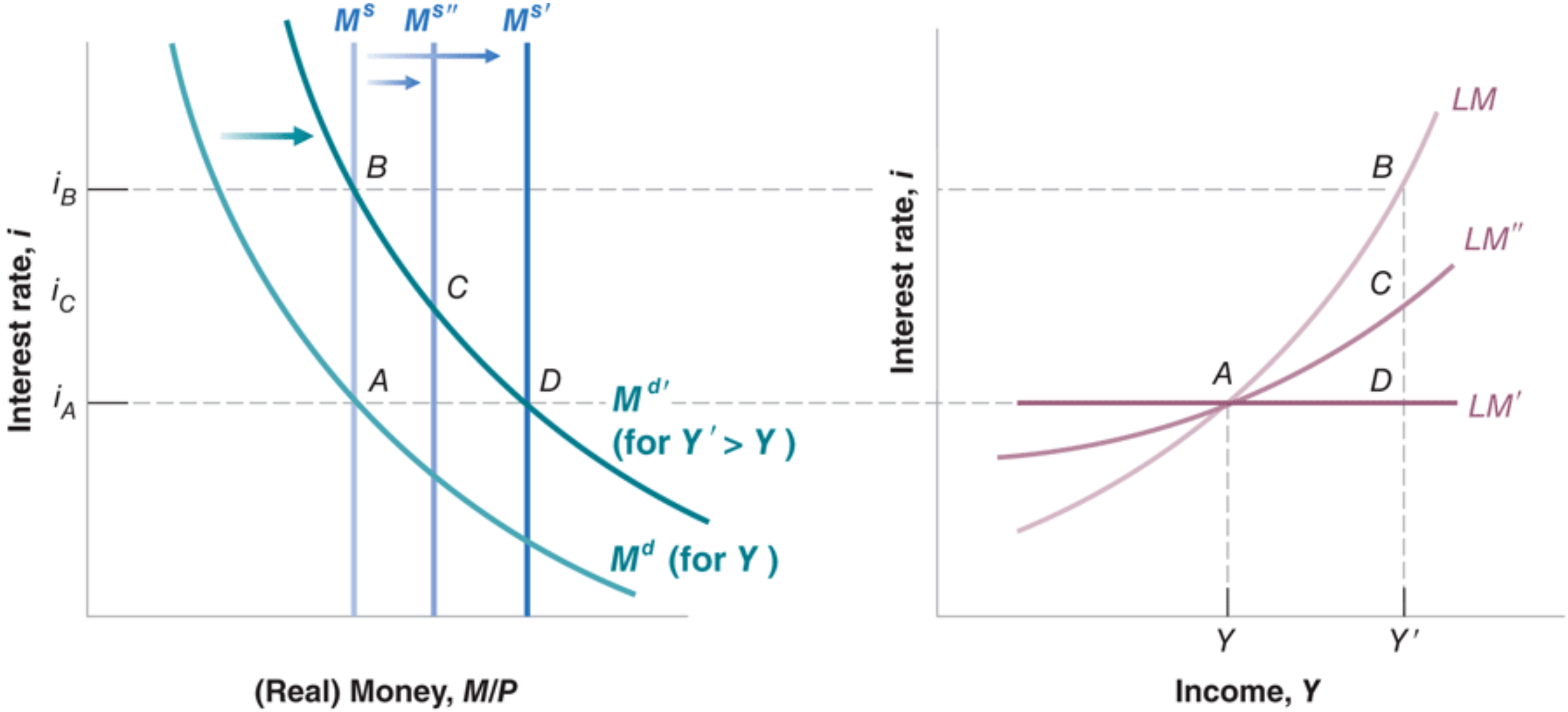
- Thus far: Central Bank keeps money stock constant
- Not necessarily very realistic
- Reality: Central Bank decides on how high the policy interest rate is, and then changes M^s to maintain that interest rate

- Figure: Increase in income => M^d shifts
- If CB does not respond (M^s constant) => interest rate changes to i_B: implies LM
- If CB wants to keep policy rate constant => increase money stock to $M^{s\prime}$ => LM'
- If CB wants to mitigate (but not totally undo) the increase in the interest rate: $M^{s\prime\prime}$ => LM''

Eq in money market: point A = a point on the LM curve (because it captures all eq on financial markets)
> recall how we derived the LM: there is a change in income, so there is a change in the goodsmarket > how does that affects our eq on the financial market and impacts our intrest rate
> we will derive 3 different lines: let's start from point A where income = Y
> we depart from A and we increase income (exhaugenously something is happening in goods market) > how does this affect money market: does not responds because it's echaugenous entirely. So if income increases > money demand shifts out > intrest rate is going to increase to Ib because the central bank is not adjusting policy

Appendix: An Alternative Derivation of the *LM* Relation as an Interest Rate Rule

Figure 1 The *LM* Relation as an Interest Rate Rule

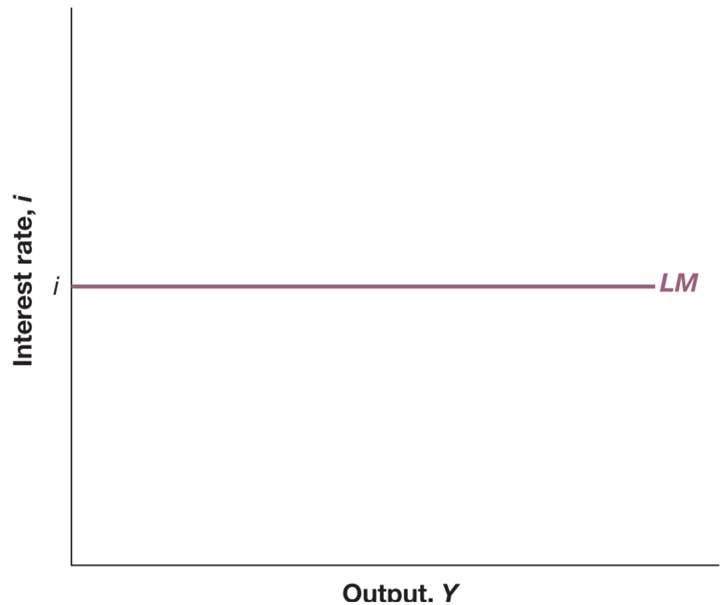


> Taylor rule: when output is high central bank will start increasing intrest rate so let's consider alternative policies here
> if the central bank sees the increase in income from Y to Y' and the central bank decides to keep the intrest rate fixed (even if income changes) = shift away from eq A, but central bank will adjust money supply, it wants to keep i to Ia: so A > D = represented by a horizontal LM curve
> Different ways in which the central bank conducts policy are going to influence the steepness of the LM curve. This LM curve is normally always positive (except when it's flat)

Note: LM

- Contrary to earlier versions, the 2017 edition of the BAG book works, in some chapters only, with a horizontal LM curve as a baseline (see below)
- We will NOT follow that approach

The central bank chooses the interest rate (and adjusts the money supply so as to achieve it).



John Hicks (1904-1989)

Country of origin: UK
Affiliation: Oxford University, UK
Contribution: IS-LM diagram based on Keynes' "General Theory".
Important work: "Mr Keynes and the 'Classics' " (Econometrica, 1937)
Noteworthy: Nobel Prize 1972

Homework: revision of IS-LM model

- Revise chapters 2-5 in the textbook, then do Self-Assessment Part 1 on Toledo. The test should help you anticipate the type of questions you will encounter in the exam, and prepare yourself accordingly. You can take the test as many times as you wish.

Q1

Question 1

1 out of 1 points

Which of the following transactions enters the computation of Belgian Gross Domestic Product (GDP)? Recall the concept of GDP as the total value of all final goods and services sold within the country.

Answers:

A Belgian family is on holiday in Greece and spends 100 euros on a meal in a restaurant.

A baker purchases flour for his bakery.

A student from Leuven spends 15 euros on a haircut.

None of the above transaction is counted in the calculation of Belgian GDP.

No answer.

Response Feedback: Correct answer: C. The haircut is a service purchased within Belgium. Answer A is incorrect; this transaction counts toward Greek GDP. In answer B, the good purchased is an intermediate good (= a good that is used to produced another good) and not a final good.

Q2

Question 2

-0.33 out of 1 points

A firm's value added equals:

Answers:

Its revenue minus all its costs.

Its revenue minus its wages.

Its revenue minus its wages and profits.

Its revenue minus its cost of intermediate goods.

No answer.

Response Feedback: Correct answer: D. Value added is defined as revenue (=price per output unit, multiplied by the number of output units) mines the cost of the intermediate goods. A firm's revenue minus its total cost is called *profits*. The wages a firm pays workers is a factor cost. Workers and capital are factors of production, while intermediate goods are goods that are used up in the production of other goods.

Q3

Question 3

-0.33 out of 1 points

Consumption demand has an autonomous component and an income-sensitive component:

C=c0+c1*Yd,   where 0<c1<1.

The parameter c1 is called the 'marginal propensity to consume'. What happens when c1 rises?

Answers:

The IS curve shifts to the right.

The IS curve shifts to the left.

The government spending multiplier rises.

The government spending multiplier falls.

No answer.

Response Feedback: Correct answer: C. The IS curve shifts only when a component of autonomous demand changes, i.e. when autonomous consumption or investment, government spending or taxes change. Therefore, answers A and B cannot be correct. The fiscal multiplier is computed as follows. First, aggregate demand is given by Z=C+I+G, consumption is given by the function C=c0+c1*Yd as shown above, where Yd is disposable income, Yd=Y-T, T are taxes and G is government spending. Plugging the consumption function into the aggregate demand function yields

Z=c0+c1*(Y-T)+I+G

Equilibrium in the goods market obtains when production equals demand, Y=Z. Imposing equilibrium and rearranging, we obtain

Y=c0+c1*(Y-T)+I+G

(1-c1)*Y=c0-c1*T+I+G

Y=[1/(1-c1)]*[c0-c1*T+I+G]

The first term in square brackets is the government spending multiplier. It depends positively on the marginal propensity to consume, c1. Therefore, answer C is correct.

Q4

Question 4

-0.33 out of 1 points

Suppose that the demand for consumption goods is interest-sensitive, perhaps because households borrow money to purchase certain (durable) goods. When the interest rate rises, consumption falls, such that the consumption function becomes

C=c0+c1*Yd-c2*i,   where c2>0.

In comparison with the benchmark model where c2=0, in this model...

Answers:

the IS curve is steeper.

the IS curve is flatter.

autonomous consumption is larger.

autonomous consumption is smaller.

No answer.

Response Feedback: Correct answer: B. Consumption demand now depends (negatively) on the interest rate, similar to the demand for investment goods. This means that a given fall in the interest rate now induces a rise in the demand for consumption goods in addition to the additional demand for investment goods. The total demand for goods increases more than in the benchmark model with c2=0. A greater rise in total goods demand for a given fall in the interest rate implies that the IS curve is flatter; recall that the IS-curve is a downward-sloping curve in (i,Y)-space. Autonomous consumption is the part of consumption demand that is exogenous, i.e. not a function of an endogenous variable such as the interest rate or disposable income. In the above example, c0 represents autonomous consumption.

Q5

Question 5

-0.33 out of 1 points

Consider the following statements:

(i) The IS curve represents the combinations of output (Y) and the price level (P) at which the goods market is in equilibrium.
(ii) Along the IS curve, the interest rate (i) and the level of output (Y) are such that investment equals saving.

Answers:

Statement (i) is true and statement (ii) is true.

Statement (i) is true and statement (ii) is false.

Statement (i) is false and statement (ii) is true.

Statement (i) is false and statement (ii) is false.

No answer.

Response Feedback: Statement (i) is false. It is correct that the IS curve represent equilibrium in the goods market. However, the IS curve is drawn in (i,Y)-space and not in (P,Y)-space; it represents the interest-output pairs that are consistent with goods market equilibrium. Statement (ii) is true. Equilibrium in the goods market can be viewed as the equality of demand for goods and production, or alternatively, as the equality between investment and saving (in a closed economy setup). This is where the IS curve got its name from: Investment = Saving.

Q6

Question 6

-0.33 out of 1 points

The money multiplier depends on:

Answers:

the interest-sensitivity of money demand.

the interest-sensitivity of investment demand.

the ratio of reserves to bank deposits.

the supply of central bank money.

No answer.

Response Feedback: Correct answer: C. Recall how we derived the money multiplier. Suppose that people hold a fraction c of their money in cash and the remainder, 1-c, in the form of bank deposits. Then, cash holdings are given by c*M, while deposits are given by D=(1-c)*M. Banks obtain deposits from households and hold a fraction theta of those deposits as reserves, R=theta*D. Plugging in the function we derived for deposits, this is R=theta*(1-c)*M. Financial market equilibrium can be expressed as the equality of the supply of and demand for central bank money. The supply of central bank money is H. The demand for central bank money is given by the sum of demand for cash and demand for reserves, H=c*M+theta*(1-c)*M. Setting the two equal, we obtain:

H=[c+theta*(1-c)]*M.

Rearranging yields the money multiplier, which is the first term on the LHS:

1/[c+theta*(1-c)]*H=M

The money multiplier depends on c and theta, not on the supply of central bank money (H). Therefore, answer C is correct. The interest-sensitivity of money demand determined the slope of the LM curve, the interest-sensitivity of investment demand determines the slope of the IS curve.

Q7

Question 7

-0.33 out of 1 points

What happens when the central bank decides to purchase bonds via open-market operations?

Answers:

The money supply increases and the LM curve shifts up.

The money supply increases and the LM curve shifts down.

The money supply decreases and the LM curve shifts up.

The money supply decreases and the LM curve shifts down.

No answer.

Response Feedback: Correct answer B. When the central bank purchases bonds, it pays for these bonds with money. Therefore, the money supply in circulation increases; answers C and D are incorrect. What happens to the LM curve when the money supply increases? Real money holdings rise. To clear the financial market, people must be induced to hold this additional money stock, and so for a given income and hence a given transactions demand for money, the interest rate must fall. Then people want to hold fewer bonds and more money. When the interest rate falls for a given production level Y, this means that the LM curve shifts down; answer B is correct.

Q8

Question 8

1 out of 1 points

Suppose that the LM curve is horizontal. Which of the following statements is correct?

Answers:

A government spending expansion has no effect on the interest rate.

A tax cut has no effect on output.

The aggregate demand curve is horizontal.

The aggregate supply curve is vertical.

No answer.

Response Feedback: Correct answer: A. If the LM curve is horizontal at a particular interest rate ibar and the IS curve is downward-sloping in (i,Y)-space, this means that a shift in the IS curve has no effect on the interest rate. Recall that a shift in the IS curve is caused by a change in fiscal policy (G or T) or autonomous spending. Therefore, answer A is correct: a government spending expansion has no effect on the interest rate. How can this happen? In the benchmark model, a rise in G increases the demand for goods above production. The IS curve shifts out: production increases to meet the increases demand for goods. Money demand depends positively on income and thus increases above money supply, which raises the interest rate. If money demand is instead insensitive to income, money demand and therefore the interest rate remain unchanged. A shift in the IS curve does affect output in this case; therefore, answer B is incorrect.

The aggregate supply curve does not depend on the slope of the IS and LM curves; answer D is incorrect.

Q9

Question 9

1 out of 1 points

Suppose that government spending has two components: public consumption G as before and, in addition, public investment GI. Public consumption is exogenous, but public investment depends negatively on the interest rate i. Aggregate demand becomes:

$$Z = C + I + G + \underset{(-)}{GI(i)}.$$

In comparison with the baseline model of the goods market, the model with the public investment has:

Answers:
- a flatter IS curve and a flatter AD curve.
- a steeper IS curve and a flatter AD curve.
- a flatter IS curve and a steeper AD curve.
- a steeper IS curve and a steeper AD curve.
- No answer.

Response Feedback: Correct answer: A. There is now an additional component of aggregate demand that depends (negatively) on the interest rate. This means that a fall in the interest rate i leads to a greater increase in investment demand relative to the baseline model: the IS curve becomes flatter. Recall that the IS curve is downward-sloping in (i,Y)-space. So answers B and D cannot be correct. What about the AD-curve? Recall that the AD-curve is derived by looking at what happens to the LM curve when the price level P changes. When P decreases, the LM curve shifts downwards. People demand less money and for a given income level, the interest rate must rise to induce people to hold the money that is available: i increases. When the IS curve is flatter, this implies that for a given fall in the price level P, and resulting rise in the interest rate i, the rise in equilibrium income is greater, i.e. the AD curve becomes flatter. Therefore, answer A is correct.

Question 10

1 out of 1 points

Q10

Suppose that equilibrium in the goods market is given by the relation

(IS) Y = (c0+c1*Y)+(i0-i1*i%)+G,

where c0=2, c1=0.9, i0=2, i1=0.06 and G=1.

Equilibrium in the money market is given by the relation

(LM) M/P = Y - i2*i%,

where M/P=42 and i2=0.2.

Solve for the equilibrium interest rate! Hint: solve both equations (in general terms) for output (Y) in terms of the interest rate (i), set them equal to one another to eliminate Y, then solve for the equilibrium interest rate.

Answers: The equilibrium interest rate is 2%.

The equilibrium interest rate is 4%.

The equilibrium interest rate is 8%.

The equilibrium interest rate is 10%.

No answer.

Response Feedback: Correct answer: D. Solving both equations for output in terms of the interest rate, we obtain:

(IS) Y = [1/(1-c1)]*(c0+i0+G) - [i1/(1-c1)]*i%

(LM) Y = M/P + i2*i%

1 points Save Answer

:he relation

$$\text{is}: Y = [2 + 0{,}9Y) + (2 - 0{,}06i) + 1$$
$$Y - 0{,}9Y = 2 + 2 + 1 - 0{,}06i$$
$$Y = 5/0{,}1 - (0{,}06/0{,}1)i$$
$$Y = 50 - 0{,}6i$$

ɿuations (in general terms) for output (Y) in terms of the interest rate (i), set
ɿe equilibrium interest rate.

$$\text{LM}: 42 = Y - 0{,}2 \cdot i$$
$$42 = (50 - 0{,}6i) - 0{,}2i$$
$$-8 = -0{,}8i$$
$$i = 10\%$$

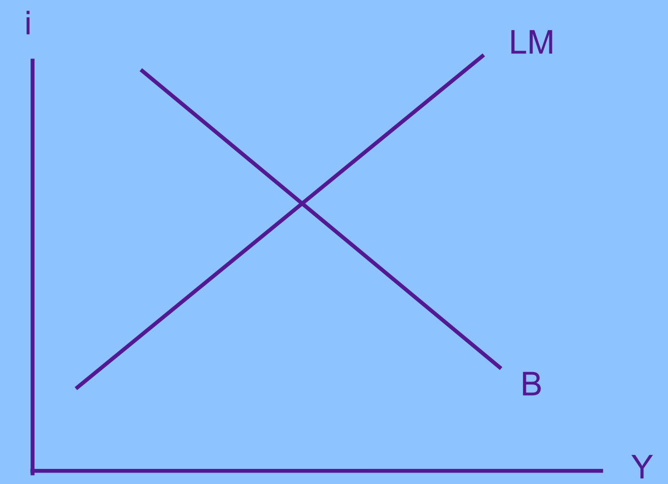
Key Terms

- *IS* curve
- *LM* curve
- Interest rate rule
- Fiscal contraction, fiscal consolidation
- Fiscal expansion
- Monetary expansion
- Monetary contraction, monetary tightening
- Monetary–fiscal policy mix, policy mix

CHAPTER 6:
THE *IS–LM* MODEL IN AN OPEN ECONOMY

What happens in the goodsmarket will have a feedback on financial market and vice versa

Closed economy (no trade across borders, no trade from financial accets)



1. Goods market
What determines the equilibrium?
- X = exports
- IM = imports
- E = exchanges

2. Financial markets
What determines the equilibrium in the money market?
- CA/BP
- UIP: uncoverd incomstrate parody condition

We want 3 markets that will come to an equilibrium ?

Until now: closed economy model

The *IS–LM* Model in an Open Economy

Openness has three distinct dimensions:

1. **Openness in goods markets**. Free trade restrictions include no **tariffs** and **quotas**.
   Trade across borders, restrictions about policys which restrict trade

2. **Openness in financial markets**. so no **Capital controls** place restrictions on the ownership of foreign assets. So capital cannot flow freely
   Examples: capital control, exchange rate intervention

   We will start with ignoring this

3. **Openness in factor markets**. The ability of firms to choose where to locate production, and workers to choose where to work. The EU is the biggest ever common market among sovereign countries, with 27 member states.
   = more in medium to long term

   = less frequent than 1 and 2, so we will ignore this

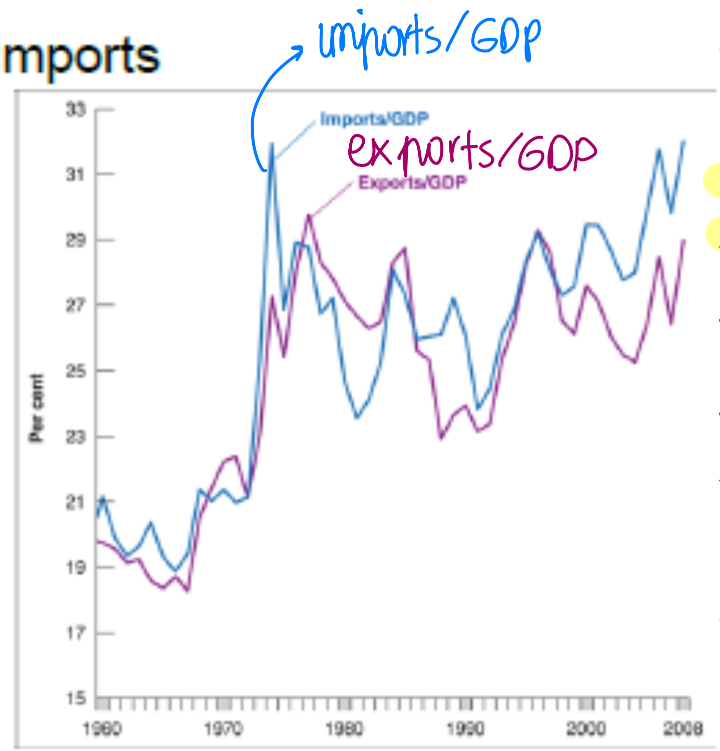
   Production is based on input factors (labour and capital can move to another country)

6.1 Openness in Goods Markets

Defenition of concepts

Exports and imports

Exports and Imports



(both trade in good and services)
> UK example: exports and imports are defined as a fraction of GDP.
> we want to think of ratios with GDP
> US has little export -but when compared to belgium:
X,us > X,be
> But it's important that we don't look at the absolute numbers but that we look at how important the export is relative to the production:
X,us/Y,us and X,be/Y,be
> We see 3 fluctuactions so trade is an important part of GDP (trade is around 25% of GDP)
> we see a big range of fluctuations (from 17 to 33), so open economy is a source of fluctuation in economic growth

Figure 6.1 **UK exports and imports as ratios of GDP since 1960**
Since 1960, exports and imports have increased by around 10 percentage points in relation to GDP
Source: UK Office for National Statistics

> We have 2 time series but they tend to move togheter.
Remember the net exports = NX = X- IM = the difference between the 2 lines on the graph
When the difference is small, we might be thinking about closed economy's

Measure of how important is trade for a country:
1) X,i/Y,i = net exports/ GDP = bad, for example UK (trade is important but net export is very small)
2) (X + IM)/Y note that (X-IM)/Y would be a bad measure because when there are a lot of exports and imports it will seem the same as when there are none

6.1 Openness in Goods Markets

Exports and imports

The behavior of exports and imports in the United Kingdom is characterized by:

- The UK economy has become more open over time. Exports and imports, which were around 20% of GDP in 1960 are now equal to about 30% of GDP (29% for exports, 32% for imports).
- Although imports and exports have broadly followed the same upward trend, they have also diverged for long periods of time, generating sustained trade surpluses and trade deficits.

6.1 Openness in Goods Markets (Continued)

Exports and imports

- A good index of openness is the proportion of aggregate output composed of tradable goods—or goods that compete with foreign goods in either domestic or foreign markets.

- With exports around 30% of GDP, it is true that the UK has one of the smallest ratios of exports to GDP among the rich countries of the world.

> BE: quantity of exports is high
> Ireland: exports are higher then GDP
> Geography: if you're very isolated than you might have to ship trade goods (distance and thus geography: mountains, rivers, other trade barriers) are going to matter
> seize of a country is also is going to matter

6.1 Openness in Goods Markets (Continued)

Exports and imports

Country	Export ratio (%)	Country	Export ratio (%)
Ireland	101	Norway	41
Belgium	80	Finland	40
Netherlands	78	UK	30
Sweden	50	Spain	27
Germany	47	Japan	15
Italy	27	USA	13

open

closed

> Japan and US = close
> BE = open

Table 6.1 **Ratios of exports to GDP (%) for selected OECD countries, 2010**

Source: Eurostat.

- **The main factors behind differences in export ratios are geography and country size:**
- **Distance from other markets.**

(Geography: if you need to ship goods for long distances or have mountains = trade barriers)

- **Size also matters: The smaller the country, the more it must specialise in producing and exporting only a few products and rely on imports for other products.**

Smaller countries won't be able to produce the whole range of goods

Small countries tend to import more (because there is a whole range of goods we want to consume, but a small country can't produce them all)

Can Exports Exceed GDP?

yes

- Countries can have export ratios larger than the value of their GDP because exports and imports may include exports and imports of intermediate goods.

- In 2007, the ratio of exports to GDP in Singapore was 229%!

When we allow trade across borders then we have antoher question
> now we are open to trade when have the questioon: will we buy the domestic produced good or the foreign good = a question of prices (not a difference in quality)

6.1 Openness in Goods Markets (Continued)

The choice between domestic goods and foreign goods

- When goods markets are open, domestic consumers must decide not only how much to consume and save but also whether to buy domestic goods or foreign goods.

- Central to the second decision is the price of domestic goods relative to foreign goods, or the
1 real exchange rate.

= the relative price of goods ≠ what you see in the papers
(what you see in papers = nomilal exchange rate = relative price of currency)

Open economy:
> will we buy the domestically produced good or the foreign good?
> for this we think about prices
> price of goods: we'll need to include exchange rates
> the real exchange rate (is not the number you see in the press = the nominal exchange rate = the relative price of the currency, but is the relative price of good)

6.1 Openness in Goods Markets (Continued)

2 **Nominal exchange rates**

- Different ways to quote:
- Price of domestic currency in terms of foreign currency:
  - Price of 1 euro in pound: EUR/GBP=0,74 (7 Jan 2016)
    - How many pounds do you get/pay for 1 euro?

    = the definition we will use = E= nominal exchange rate

Are obiously related

- ~~Price of foreign currency in terms of domestic currency:~~
  - ~~Price of 1 pound in euro: GBP/EUR=1,35 (7 Jan 2016)~~
    - How many euros do you pay to buy 1 pound?

  We will not use this

We will not always use Europe as home country

- Nominal exchange rate = E = Price of domestic currency in terms of foreign currency (1 EUR = E GBP)

Home currency = buitenlandse currency
where are we?
This is the home currency

6.1 Openness in Goods Markets (Continued)

- Nominal exchange rates

FREE FLOATING EXCHANGE RATE

Our definition of the nominal exchange rate E is *the price of the domestic currency in terms of the foreign currency*.

- An **appreciation** of the domestic currency is an increase in the price of the domestic currency ~~in~~ → so we can buy less foreign monney with our €1 terms of the foreign currency, which corresponds to an *increase* in the exchange rate.

- A **depreciation** of the domestic currency is a decrease in the price of the domestic currency in terms of the foreign currency, or a decrease in the exchange rate.

6.1 Openness in Goods Markets (Continued)

- Nominal exchange rates

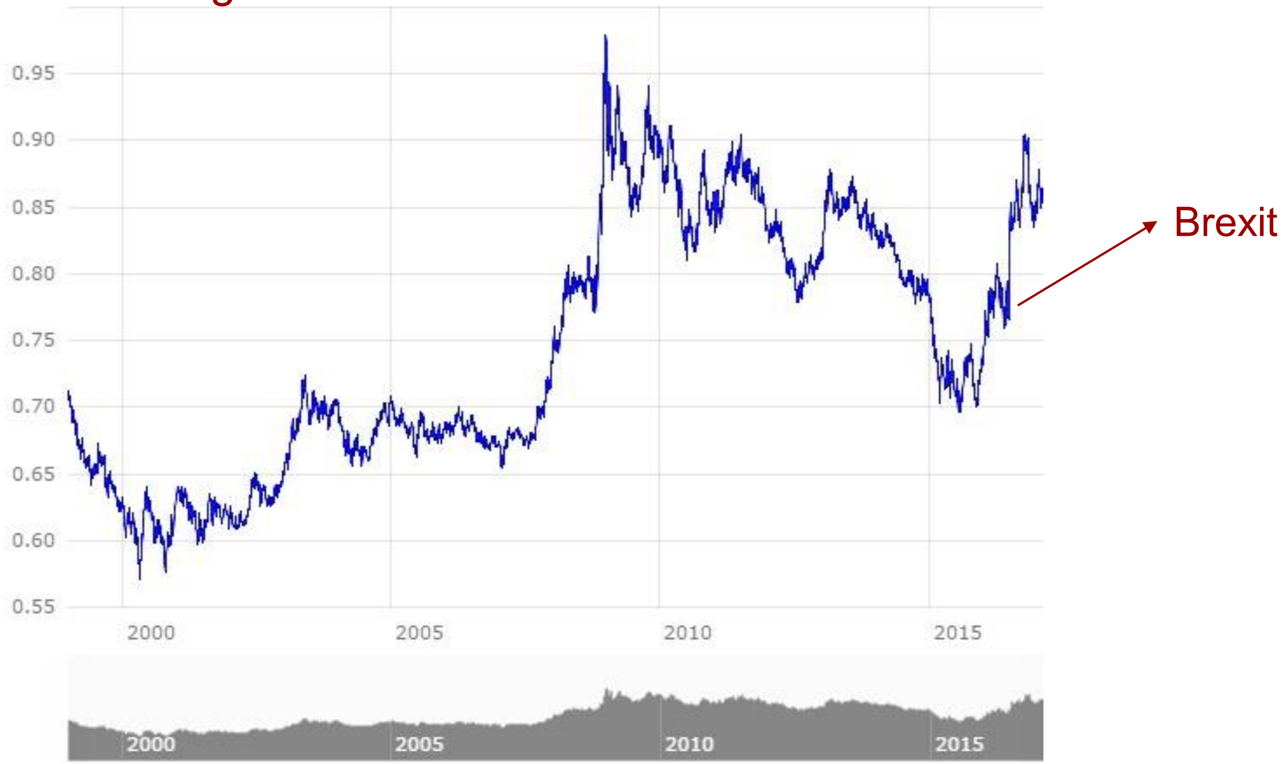


Figure 6.2 **The nominal exchange rate between the British pound and the euro since 1999 (pound per euro)**

Source: European Central Bank.

How many pounds do we get for 1 euro
> this value is typically below 1, meaning that for 1 euro you get less then a pound in return

6.1 Openness in Goods Markets (Continued)

- Nominal exchange rates

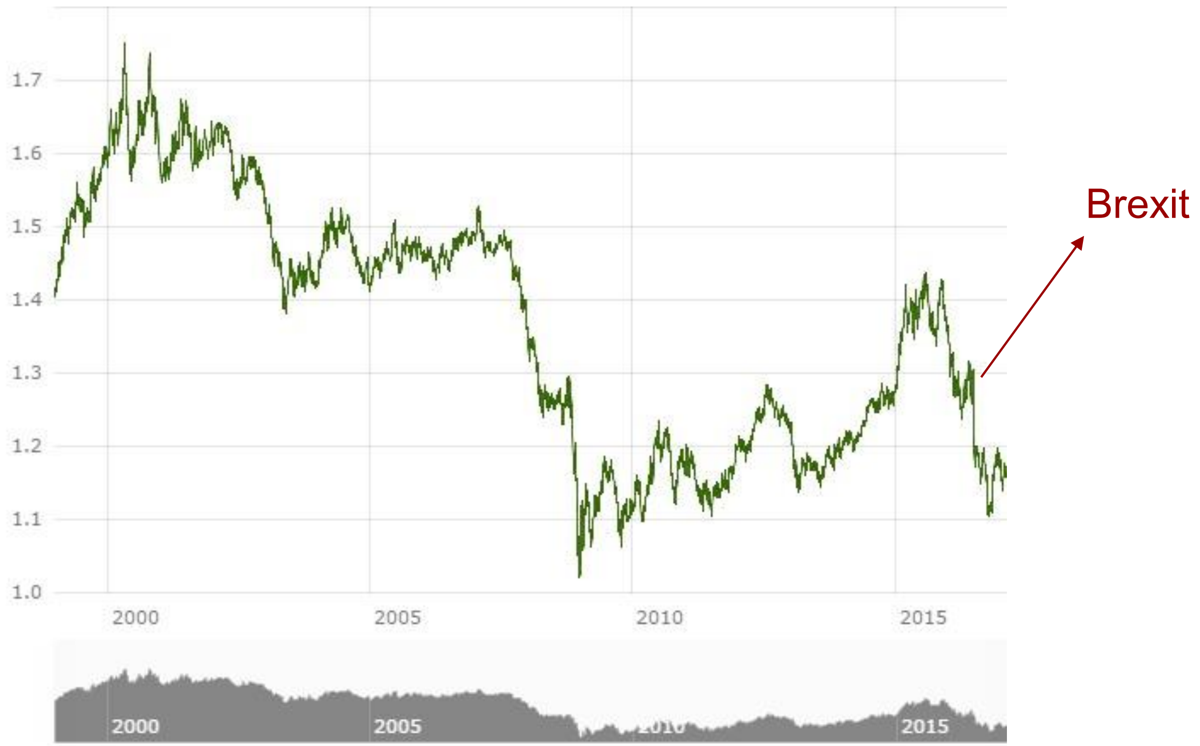


Figure 6.2 **The nominal exchange rate between the British pound and the euro since 1999 (euro per pound)**

Source: European Central Bank.

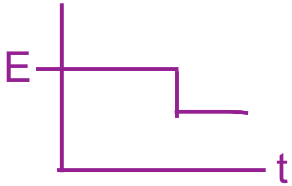
How many euro's do I get for 1 pound
= the flip side of the previous slide
> today: a lot of bad UK news = drop of pound (almost equal to 1 now)

Even in short periods of time: large fluctuations in in- & exports, caused by change in exchange rates
> for the most western countries: exchange rates = “free floatig” they float from 1 day to the next, there is not exchange rate intervention

6.1 Openness in Goods Markets

> the opposite = “fixed exhanged rate”: price is constant, it’s the governement that keeps that value fixed
Why: if you let financial markets determine the price, you get the enormous flows (in previous graphs) > will cause a lot of fluctuations in exports and imports > production will fluctuate a lot

- Nominal exchange rates



Fixed exchange rate: niet geloofwaardig, dus na een tijd gaat de waarde van de exchange rate moeten worden ge her evalueerd worden en krijg je een drop (of minder waarde)

Note the two main characteristics of the figure:

- *The trend decrease in the exchange rate*—there was a depreciation of the pound vis-à-vis the euro over the period.
- *The large fluctuations in the exchange rate*—there was a very large appreciation of the pound at the end of the 1990s, followed by a large depreciation in the following decade.

> Increase of E (= appriciation) = revaluation
> Decrease of E (= depreciation) = devaluation = an intentional decision <> free floating: changes always happen

6.1 Openness in Goods Markets (Continued)

□Nominal exchange rates

When countries operate under <u>fixed exchange rates</u>, that is, maintain a constant exchange rate between them, two other terms used are:

- **Revaluations**, rather than appreciations, which are increases in the exchange rate, and
- **Devaluations**, rather than depreciations, which are decreases in the exchange rate.

	free floating	fixed
↗	appreciation	revaluation
↘	depr.	deval.

We are not intrested in the relative price of currency, but in the relative price of goods

What we realy care about: real things

From nominal to real exchange rates

2 slides that do the same thing, but with another perspective

1

- Assume: each country produces 1 good: DE – Mercedes, UK – Jaguar
- Book: **perspective is that of the UK!**
  - => here E is #euro per pound, since UK is seen as "home" country
- Real ER: price of Jaguars in terms of Mercedes; or price of UK goods in terms of European goods
- Price of both goods in pounds:

  1. Price of product
  - Price Mercedes: €50.000
  - E=1,23. Value of 1 pound: 1 GBP=1,23 EUR
    - => 1 EUR = $\frac{1}{E}$ GBP

  2. Convertion to home currency
  - => Mercedes €50.000/1,23=£40.650
  - Price Jaguar: £30.000

  3. Compare price in same currency of both products
- Relative price of Jaguar in terms of Mercedes =£30.000/£40.650=0,738 (74% Mercedes buys a Jaguar)

  = price home product/ price foreighn product

  ε =
  - RER = E*P(Jaguar)/P(Mercedes)
    - Recall: here E is #euro per pound, since UK is seen as "home" country

    Real Exchange Rate (RER)
    = Price home product / [price foreighn product / E]
    = P/[P*/E]

From nominal to real exchange rates

- Assume: each country produces only 1 good: DE – Mercedes, UK – Jaguar

2

- Here: **perspective Europe**
- Real ER: price of Mercedes in terms of Jaguars
- Price of both goods in pounds:
  - Price Mercedes: €50.000
  - E=0,81. Value of 1 euro: 1 EUR=0,81 GBP
  - Mercedes €50.000*0,81=£40.500
  - Price Jaguar: £30.000
- Relative price of Mercedes in terms of Jaguar =£40.500/£30.000=1,35 (1 Mercedes buys more than 1 Jaguar)
  - RER = E*P(Mercedes)/P(Jaguar)
    - (Note: here E is #pound per euro)

RER = Real Exchange Rate

6.1 Openness in Goods Markets (Continued)

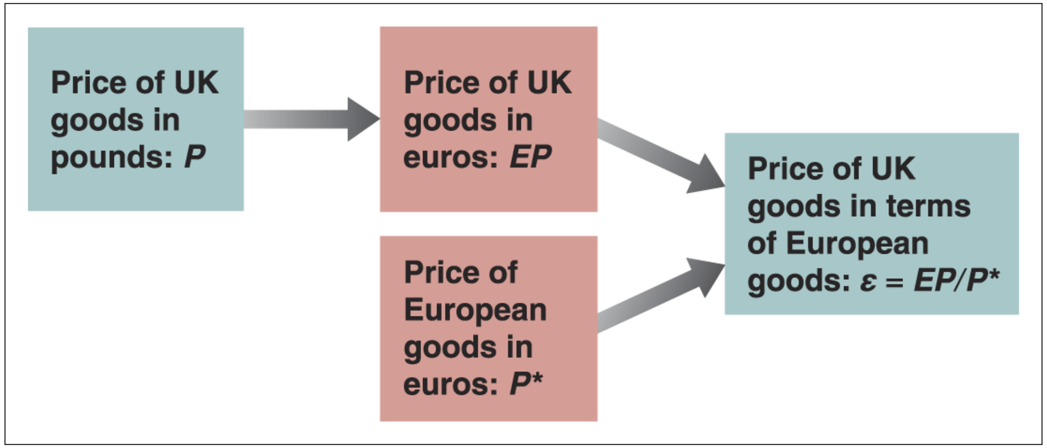
From nominal to real exchange rates

To generalize this example to *all* of the goods in the economy, we use a price index for the economy, or the GDP deflator.

Changes in price index = inflation

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates **(Note: Example in book is from UK perspective)**



1. *P* = price of UK goods in pounds

* = foreign

2. *P** = price of European goods in euros

Real exchange rate = $\boxed{\varepsilon = \frac{EP}{P^*}}$

Real exchange rate = nominal exchange rate/ the relative price level of goods (between home and foreign country, P* = the same value but in the foreign country)

Figure 6.3 **The construction of the real exchange rate (Note: here E is #euro per pound)**

UK perspective

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates

Like nominal exchange rates, real exchange rates move over time:

- An increase in the relative price of domestic goods in terms of foreign goods is called a **real appreciation**, which corresponds to an increase in the real exchange rate, ε.

- A decrease in the relative price of domestic goods in terms of foreign goods is called a **real depreciation**, which corresponds to a decrease in the real exchange rate, ε.

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates

The real exchange rate moves close to the nominal exchange rate
> whenever the nominal exchange rates moves > the real exchange rate moves
> all while the prices over countries haven't moved much over time:
- P and P* haven't moved much over time
- nominal and real move togheter (because of P and P* haven't changed over time)
- this is because there has barely byen any inflation

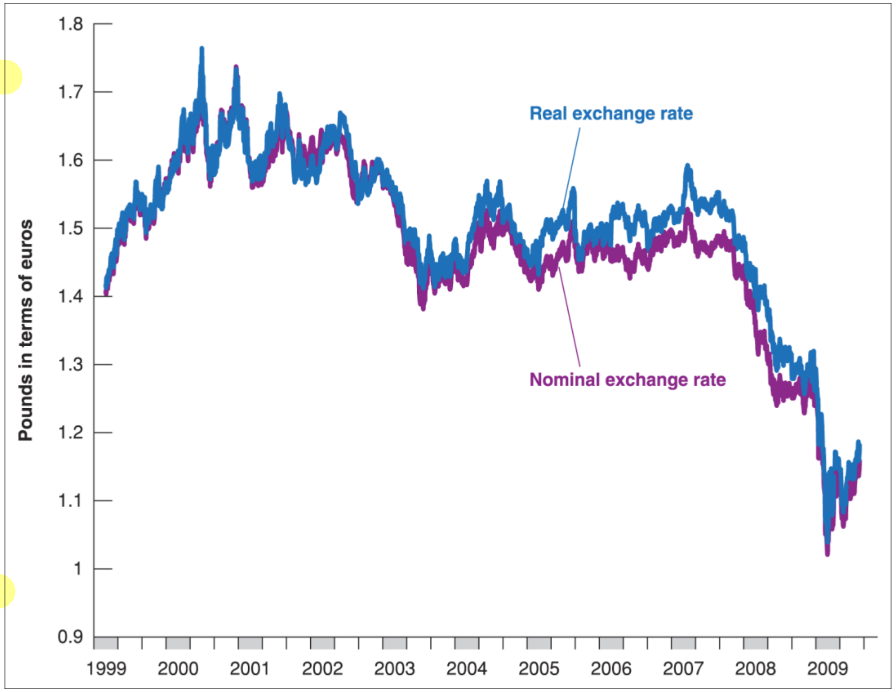


Figure 6.4 **Real and nominal exchange rates in the UK since 1999**

The nominal and the real exchange rates in the UK have moved largely together since 1999.

Source: ECB, Eurostat, Bank of England.

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates

Note the two main characteristics of Figure 6.4:

- The large nominal and real appreciation of the pound at the end of the 1990s and the collapse of the pound in 2008–2009.
- The large fluctuations in the nominal exchange rate also show up in the real exchange rate.

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates

- Since 1999, the nominal exchange rate and the real exchange rate have moved nearly together.

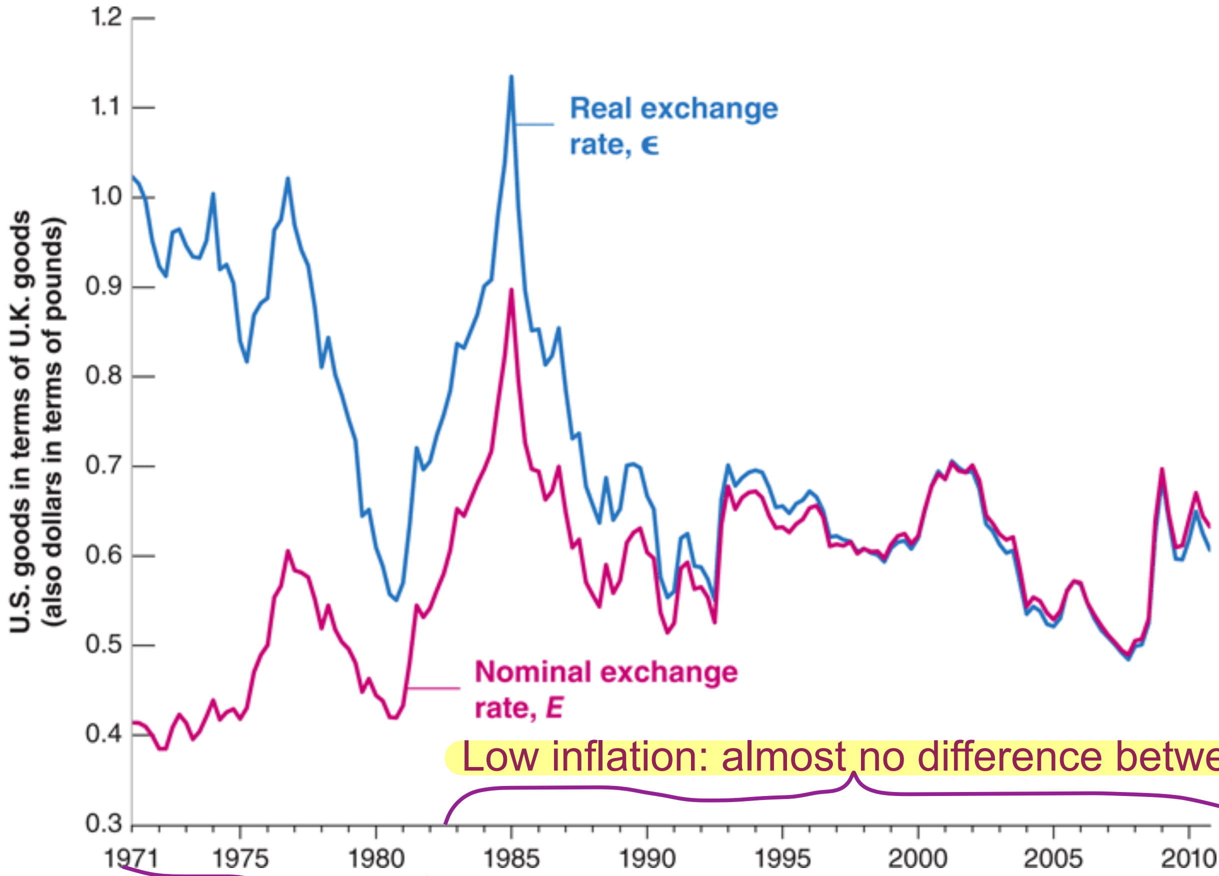
- This reflects the fact that, since then, inflation rates have been very similar— and low—in both areas.

Real and Nominal Exchange Rates between the United States and the United Kingdom since 1971

- Perspective US vs. UK(*)
- Index P and P*: 2000=100
- E and ϵ can move in opposite directions
- Why? Inflation-differentials in the two countries: P/P*

Exchange rate: pound relative to US (because € didn't exist before 200)

Source: Series GDPDEF, GBRGDP-DEFQISMEI and EXUSUK from Federal Reserve Economic Data (FRED) http://research.stlouisfed.org/fred2/



Low inflation: almost no difference between curves

High inflation in all countries, but higher in some then in others

> inflation in US was high (values around 20%), it reached much bigger peaks in the UK

> dollar incrased in value relative to pounds

> but at the same time the real exchange rate dropped: because inflation in UK was higher

6.1 Openness in Goods Markets (Continued)

From bilateral to multilateral exchange rates

- Bilateral exchange rates are exchange rates between two countries. Multilateral exchange rates are exchange rates between several countries.

- For example, to measure the average price of UK goods relative to the average price of goods of UK trading partners, we use the UK share of import and export trade with each country as the weight for that country, or the multilateral real UK exchange rate.

So far: comparing one country to another = bilateral realtion
<> exporting: we export to more than one country = multilateral relation, we want a relative price for all our partners ≠ what is listed in the news rate = weighted average of the exchange rate of the difference countries

6.1 Openness in Goods Markets (Continued)

From bilateral to multilateral exchange rates

Equivalent names for the relative price of foreign goods vis-á-vis UK goods are:

Synonyms for multilateral exchange rates:

- The real **multilateral** UK exchange rate.
- The UK **trade-weighted** real exchange rate.
- The UK **effective** real exchange rate.
  Effective because it's the relevant one to study trade

6.1 Openness in Goods Markets (Continued)

From bilateral to multilateral exchange rates

All volatility is inerented from nominal exchange rates and nominal price rates
> we see a lot of swings
> we see the depreciation of the pound

Figure 6.5 **The UK multilateral real exchange rate since 1980**

The 1980s and 1990s were characterised by large swings in the real exchange rate. The real exchange rate was much more stable since the end of the 1990s, until the large real depreciation in 2009.

Source: Bank of England.

6.2 Openness in Financial Markets

Open borders for capital are important, once we can trade in capital we can sell assets, trade stocks and bonds. When we want to buy foreighn stock, we need to invest in foreign currency

- **The purchase and sale of foreign assets implies buying or selling foreign currency—sometimes called** foreign exchange**.**

Reasons to do this:

- **Openness in financial markets allows:**

Why investing in foreighn stoks?

Financial investors to diversify—to hold both domestic and foreign assets and speculate on foreign interest rate movements.

= investment advise so that you're less affected by local shocks

So you're not affected by local shocks too heavinly

Allows countries to run trade surpluses and deficits. A country that buys more than it sells must pay for the difference by borrowing from the rest of the world.

6.2 Openness in Financial Markets

- International macro accounting: How international good and capital flows get measured

6.2 Openness in Financial Markets (Continued)

The balance of payments

DEF:

- The balance of payments account summarizes a country's transactions with the rest of the world.

- Transactions above the line are **current account** transactions.
- Transactions below the line are **capital account** transactions.

- The current account balance and the capital account balance should be equal, but because of data gathering errors they aren't. For this reason, the account shows a statistical discrepancy.

Balance of payements consits of 2 parts
A. Current account
B. Capital account

Table 18-3 The U.S. Balance of Payments, 2010, in Billions of U.S. Dollars

Current account:
- Exports: payment from abroad
- Imports: payment to abroad
1 - Difference = **Trade balance**

- Income received from holding foreign assets (e.g. coupon of a bond, dividend, …)
- Income paid on domestic assets held by foreign agents
2 - Difference = **Income balance**

3 - **Net-transfers**: foreign aid (e.g. developing countries)

Shortage of $471bn (~3% GDP)
⇒ Needs to be borrowed from abroad
⇒ How? Capital account

Current Account		
Exports	1838	
Imports	2338	
Trade balance (deficit = −) (1)		−500
Income received	663	
Income paid	498	
Net income (2)		165
Net transfers received (3)		−136
Current account balance (deficit = −) (1) + (2) + (3)		−471
Capital Account		
Increase in foreign holdings of U.S. assets (4)	1260	
Increase in U.S. holdings of foreign assets (5)	1005	
Capital account balance (deficit = −) (4) − (5)		255
Statistical discrepancy		216

Source: Survey of Current Business, August 2011, Table F2

Above the line = the current account

Bellow the line = the capital account = changes in financial accets

1. Exports and imports:
> Us: more exports than imports, so we have a trade balance deficite = a negative number
> Net exports tend to be the biggest determinant of the final trade balance
> other components:
2. Coutries recieve money because they have invested in accets abroad, the balance of payment keeps track of those monney flows —> income we recieve and income we pay, for example: france borrows from us. Net income is much smaller than trade flows
3. Net transfers recieved (for example foreighn aid)

Table 18-3 The U.S. Balance of Payments, 2010, in Billions of U.S. Dollars

Capital account:

1 (4) Abroad buys domestic assets

⇒ Foreign currency flows to the US – can be used to finance the (excess) imports

(5) Home buys foreign assets

2 Net: **Capital account**

- More in than out: surplus (capital flows to the US) (increase in net foreign holdings of US assets)
- More out than in: deficit

Surplus on the capital account shows how a deficit on the current account is financed

Current Account		
Exports	1838	
Imports	2338	
Trade balance (deficit = −) (1)		−500
Income received	663	
Income paid	498	
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Source: Survey of Current Business, August 2011, Table F2

= big: because every country has it's ownly definition of what is supposed to be in this table, not all trade flows can be measured

If we look at the total vieuw: there is more going in then comming out, the US is balancing this by shipping financial assets

Table 18-3 The U.S. Balance of Payments, 2010, in Billions of U.S. Dollars

Statistical discrepancy:

- The balance is not entirely correct: US imported more than it exported. This is not fully paid by dollars that flow to abroad
- Consequence of measurement error. Data comes from various sources, various statistical agencies, …

- Macro-data is often harder to compare across countries, different methodologies across countries, …
- In theory the sum of current accounts over the world should be 0
- In practice sum of current accounts tends to be <0
- Trade with Mars? Measurement error?

Current Account		
Exports	1838	
Imports	2338	
Trade balance (deficit = −) (1)		−500
Income received	663	
Income paid	498	
Net income (2)		165
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Source: Survey of Current Business, August 2011, Table F2

6.2 Openness in Financial Markets (Continued)

The balance of payments

The current account

- The transactions above the line record payments to and from the rest of the world are called current account transactions:

  - The first two lines record the exports and imports of goods and services.

  - Home/domestic residents receive **investment income** on their holdings of foreign assets and vice versa.

  - Countries give and receive foreign aid; the net value is recorded as **net transfers received**.

6.2 Openness in Financial Markets (Continued)

The balance of payments

The current account

The sum of net payments in the *current account balance* can be positive, in which case the country has a *current account surplus*, or negative—a *current account deficit*.

6.2 Openness in Financial Markets (Continued)

The balance of payments

The capital account

- Transactions below the line are called capital account transactions.
- The capital account balance, also known as net capital flows, can be positive (negative) if foreign holdings of US assets are greater (less) than US holdings of foreign assets, in which case there is a capital account surplus (deficit). Negative net capital flows are called a capital account deficit.
- The numbers for current and capital account transactions are constructed using different sources; although they should give the same answers, they typically do not. The difference between the two is called the statistical discrepancy.

GDP vs GNP

For exmple: dutch people move across the border during day and produce products and come back by night

- GDP: Gross Domestic Product Income generated in belgium
- GNP: Gross National Product (added value by national production factors)

- GDP=GNP in a closed economy
- Different in an open economy, as a result of:
  - - Foreigners working in domestic production
  - + Nationals earning wage income abroad
  - - Foreigners receiving income from holding national assets
  - + Nationals earning income from holding foreign assets
  - NI: net-income
- GNP=GDP+NI
  = Income generated in BE + Income generated by BE guesst workers
- Usually the difference is relatively small (US: 1%) So we don't care mostly
  - Exceptions

Exception of Ireland
> income generated in Ireland (GDP), is much bigger then GNP (income generated by irisch people)
> net income is negative: a lot of income isn't paid to irish labour or people
> reason: Ireland is realy profitable to invest or to be based in (Google has head quarters in Ireland) = production of Google in Ireland but the pay is not going to Irisch people because it's not produced by Irisch people

GDP versus GNP: The Example of Ireland

Gross domestic product (GDP) is the measure that corresponds to value added products, domestically.
Gross national product (GNP) corresponds to the value added products by domestically owned factors of production.

Lots of FDI (Foreign Direct Investment): leads to domestic production on the basis of foreign capital

Year	GDP	GNP	Net factor income
2002	130,258	106,562	–23,696
2003	139,763	118,039	–21,724
2004	149,098	126,219	–22,879
2005	162,091	137,188	–24,903
2006	176,759	152,529	–24,230
2007	189,751	161,244	–28,507
2008	181,815	154,596	–27,218

Note: numbers are in millions of euros.

Table 6.4 **GDP, GNP and net factor income in Ireland, 2002–2008**
Source: Central Statistics Office Ireland.

GDP, GNP, and Net Income in Kuwait, 1989–1994

Shortly after the oil discovery part of oil-revenues was invested in foreign assets
⇒ Big surpluses on current account {(1)>0}
⇒ Big deficits on capital account {(5)>0}
⇒ Lots of foreign financial assets in portfolio
⇒ Lots of income from abroad {(2)>0}

Reduction of NI after war: rebuilding financed by selling off foreign financial assets from portfolio
⇒ Less income from portfolio

Year	GDP	GNP	Net Income (NI)
1989	7143	9616	2473
1990	5328	7560	2232
1991	3131	4669	1538
1992	5826	7364	1538
1993	7231	8386	1151
1994	7380	8321	941

Source: International Financial Statistics, IMF. All numbers are in millions of Kuwaiti dinars. 1 dinar = $3.6 (2011)

6.2 Openness in Financial Markets

- **International macro accounting: How international good and capital flows get measured**

- **International investment decisions**

> How big is the intrest rate I can earn domesticaly (i) vs the intrest rate i can earn abroad (i*)?	i (known) <> i* (known)
> Currency risk is important: me and my savings are in the local currency (with this i can by my belgian bonds, but I cannot buy the foreign bonds. So the exchange rate E is going to be important (at time t: because today I have money to invest)	E,t (known from newspaper)
> the value at the end of my investment matters (so the exchange rate after 1 period is important, 1 period = i) > We are still missing the risk	E, t+i (unknown) so risk is involved: E^{e}_{t+i} We rewrite with e (expectation)

The invester has 2 options:
1. Can invest in UK = domestic bonds = simple; you invest 1 pound > you get back 1 pound + intrest rate
2. Investing in US = we convert our money into dollars at day t (= available info), these dollars we invest in US bonds > that is going to give us our money back + intrest (in foreighn currency) > so has to be converted again

6.2 Openness in Financial Markets (Continued)

The choice between domestic and foreign assets

The decision of whether to invest abroad or at home depends not only on interest rate differences but also on your expectation of what will happen to the nominal exchange rate.

our 2 investment strategies and our 2 possible returns:

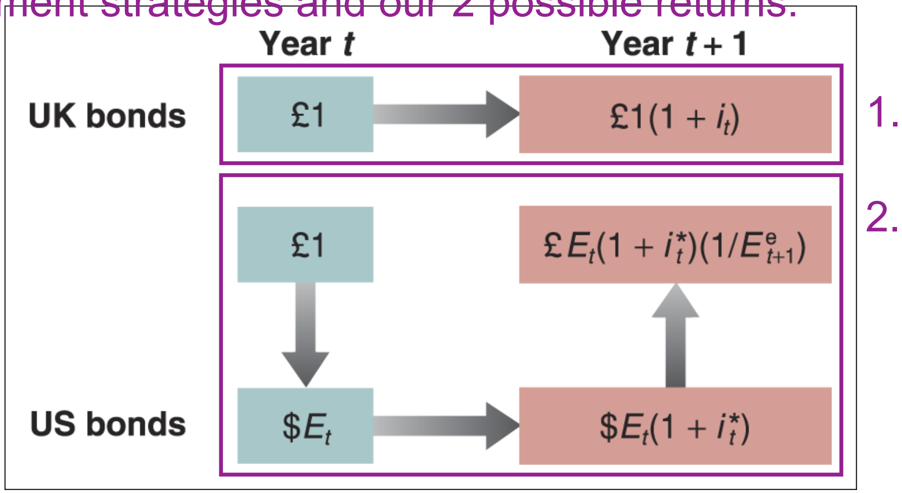


Figure 6.6 **Expected returns from holding one-year UK bonds or one-year US bonds**

We choose the highest investment return, in reality: we see investers do both (investing in US and UK), we ‘ll only have maximal profit if the return of option 1 and option 2 is the same

If UK bond would pay more intrests (the left side of the equation) > people with more money would invest all their funcs on the left > demand of UK bonds decreases > price increases > intrest rates decreases > it becomes more profitable to invest in the VS where the intrest rate increases because the demand decreases (demand is omgekeerd evenredig met intrest rate # vorige week)

6.2 Openness in Financial Markets (Continued)

The choice between domestic and foreign assets

- If both UK bonds and US bonds are to be held, they must have the same expected rate of return, so that the following arbitrage relation must hold:

Return of : UK bonds US bonds

$$(1+i_t) = (E_t)(1+i_t^*)\left(\frac{1}{E_{t+1}^e}\right)$$

- Rearranging the equation, we obtain the uncovered interest parity relation, or interest parity condition:

UIP = decides where capital should be invested in

Rewritten

$$(1+i_t) = (1+i_t^*)\left(\frac{E_t}{E_{t+1}^e}\right)$$

6.2 Openness in Financial Markets (Continued)

The choice between domestic and foreign assets

The assumption that financial investors will hold only the bonds with the highest expected rate of return is obviously too strong, for two reasons:

The previous equation isn't perfect because there is a deviation caused by:

- It ignores transaction costs.
- It ignores risk.

  We talked about currency risk, but there is other risk: maybe we won't get payed (the foreighn country would default) = default risk

6.2 Openness in Financial Markets (Continued)

Interest rates and exchange rates

The relation between the domestic nominal interest rate, the foreign nominal interest rate and the expected rate of depreciation of the domestic currency is stated as:

$$(1+i_t) = \frac{(1+i_t^*)}{[1+(E_{t+1}^e - E_t)/E_t)]}$$

A good approximation of the equation above is given by:

$$\boxed{i_t \approx i_t^* - \frac{E_{t+1}^e - E_t}{E_t}}$$

> i = i* (unless there are unexpected changes in the intrest rate)
> (E,tomorrow - E today)/Etoday = relative E
> I invest in the country with the highest I, but i take the change of E into account (the risk): I won't invest in the VS this year if next year I will be aple to buy less pound than the original amount of pounds I invested in
> if E is a constant then i = i*

(Note: details on approximations -> appendix)

6.2 Openness in Financial Markets (Continued)

Interest rates and exchange rates

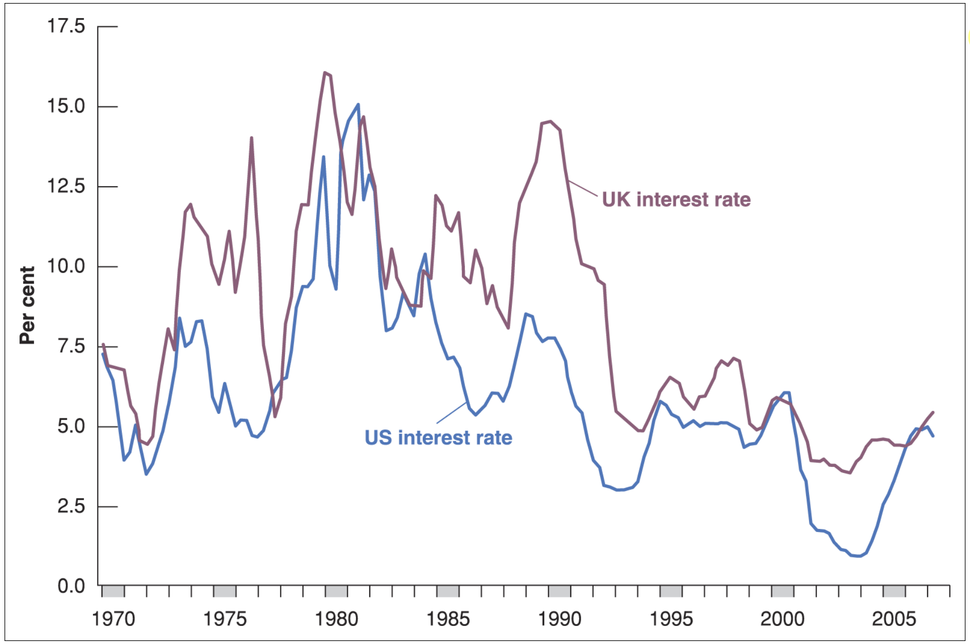
This is the relation you must remember:

Arbitrage implies that the domestic interest rate must be (approximately) equal to the foreign interest rate plus the expected depreciation rate of the domestic currency.

If $E^e_{t+1} = E_t$**, then** $i_t = i^*_t$

6.2 Openness in Financial Markets (Continued)

Interest rates and exchange rates



Short term intrest rates: these two tend to move togheter (periods of big discrepencies or fluctuations)
> both low in 70
> both high in 80
> bot have trended down since then

Figure 6.7 **Three-months' nominal interest rates in the USA and in the UK since 1970**

UK and US nominal interest rates have largely moved together over the past 40 years.

Buying Brazilian bonds

Shouldn't you be buying Brazilian bonds at a monthly interest rate of 36.9%? (September 1993)

What rate of depreciation of the *cruzeiro/real* should you expect over the coming month? A reasonable assumption is to expect the rate of depreciation during the coming month to be equal to the rate of depreciation during last month (August '93: 34.6%).

The expected rate of return in dollars from holding Brazilian bonds is only (1.369/1.346 – 1) = (1.017 – 1) = 1.7% per month.

Think of the risk and the transaction costs—all the elements we ignored when we wrote the arbitrage condition. When these are taken into account, you may well decide to keep your funds out of Brazil.

UIP: example

- US, Brazil* (September 1993):
  - i=0,2%, i*=36,9% (per month)
  - Seems a no-brainer
  - Return Brazilian bond:
  - $\dfrac{(1+i_t^*)}{(1+\frac{E_{t+1}^e-E_t}{E_t})}=\dfrac{(1+36{,}9\%)}{(1+?)}$
  - Static expectation:
    - Expected depreciation cruzeiro (real) = depreciation previous period
      - (appreciation dollar)
    - Juli 93: 1 dollar = 100.000 cruzeiro
    - Aug 93: 1 dollar = 134.600 cruzeiro
    - % change = 34,6%
  - Return = 1,7%
    - $\frac{(1+36{,}9\%)}{(1+34{,}6\%)}$ = 1,017
  - Still higher than the US return, but does not take into account transaction costs
  - (Note: don't use approximations here. Why?)

Sudden stops, the Strong Dollar and the Limits to the Interest Parity Condition

The interest parity condition assumes that financial investors care only about expected returns.

Investors care not only about returns but also about risk and about liquidity.

Perceptions of risk often play an important role in the decisions of large financial investors.

Sudden stop: when perceived risk is too high and the investors sell all the assets they have in that country.

Examples: Latin America in the 1980s, appreciation of the dollar in 1990s.

Goods market in an open economy

Note: next slides are a detailed version of the end of CH6 and CH7.
(Material is the same, but numbering equations/figures is different.)

Open goods market

- Important for various reasons, e.g.
- Belgium: small open economy
- US recession => effect on other countries
- Brexit
- …

(wage indexation: if our wages rises > index rises > labour and thus good labour production is more expensive here then in other countries. Because we sell a lot to other countries our relative price compared to other countries is important

US stopped importing > demand fell > less production in other countries > less income

IS in an open economy

- IS: demand for goods Demands is important!
  - Demand for domestic goods Z
    We are intrested in the demand for domestic produced goods (z)
  - $Z \equiv C + I + G - \frac{IM}{\epsilon} + X$
    - value of imports + value of exports
    Rather than being intrested in
  - $C + I + G$: Domestic demand for goods (irrespective of origin)
  - Domestic demand for goods produced abroad: $\frac{IM}{\epsilon}$ (ϵ = the real exchange rate)
    $\varepsilon = E . \frac{P}{P^*}$
    - Why $/\epsilon$?
    - IM are foreign goods (P*) with price p*
    - ϵ is the price of domestic goods in terms of foreign goods (EP/P*)
    - $\frac{1}{\epsilon}$ is the price of foreign goods in terms of domestic goods (P*/EP)
  - Foreign demand for domestically produced goods: X

Note: example on import notation

- Suppose: Europe imports 2 Jaguars J from UK
- Quantity of goods imported IM: 2J
- Value in pound: 2J x P*
- Value of euro? 1 eur = E gbp => 1/E eur = 1 gbp
- Thus value in euro is: (2J x P*)/E
- Value in real terms? Divide by domestic price level: (2J x P*)/(EP)
- Thus value of import is: IMxP*/(EP) = IM/epsilon

IS in open economy: determinants

- IS: demand for goods
  - $C + I + G$: domestic demand for goods (irrespective of origin)

  - Consumer chooses between domestic and foreign goods (composition) in function of the exchange rate
    - → No reason why she would adjust her total level of consumption

  - Firm that invests may decide to buy foreign capital goods depending on the exchange rate
    - → But the level of investment remains the same

real exchange rate

  - Domestic demand: $C(Y - T) + I(Y, r) + G$
    - Note: r versus i (short term – difference is not relevant at this point)

Determinants (what determines) of investments (I) are the same as before:
1. The economy itself = Y (lots of income > lots of sales > high demand > good time to invest)
2. The intrest rate = r (higher intrest rate: if I have to borrow for my investement I'll have to borrow more for my loadn)

IS determinants: IM

What determines the import function?

- IS: demand for goods
  - Imports: domestic demand for foreign goods
  - Domestic income
    - More income leads to more demand for goods, irrespective of their origin (hence also more foreign goods) => higher imports
  - Real exchange rate
    - If domestic goods are more expensive (P↑) => higher imports
    - If foreign goods are cheaper (P*↓) => higher imports
    - If foreign currency cheap (E ↑) => higher imports

IM (income of econmy, real exchange rate)

The import function: $$IM = IM(\underset{(+)}{Y}, \underset{(+)}{\epsilon}) \qquad (19.2)$$

If I want to buy a car: do I want to buy it hero or in the UK (i'll buy the cheapest one = real exchange rate)

positive derivative: higher income > we'll import more

- Note: If $\epsilon \uparrow$
  - $IM \uparrow$
  - $\frac{1}{\epsilon} \downarrow$
  - $\frac{IM}{\epsilon}$?: effect on the value of import (in terms of domestic goods) is unclear

$\varepsilon = E \cdot \frac{P}{P^*}$

- If E increases, the nominal exchange rate depreciates > the real exchange rate depreciates > imports are going to rise bv E = 0,8 → E = 1,2 (mijn 1€ = 1,2 pont → ik ga meer £ kopen)

- If price mercides > jaguars: then i'll buy mercides and will be more likely to import

IS determinants: X

What determines the export function?

- IS: demand for goods
  - Exports: Foreign demand for domestic goods
  - Foreign income: Y*
    - More income abroad leads to more demand, irrespective of origin (thus also more domestic) => higher exports
  - Real exchange rate
    - If domestic goods are more expensive (P↑) => lower exports
    - If goods abroad are cheaper (P*↓) => lower exports
    - If home currency is more expensive (E↑) => lower exports

$$X = \underset{(+,\ -)}{X(Y^*, \epsilon)} \qquad (19.3)$$

19-1 The *IS* Relation in the Open Economy

$$\boxed{Z \equiv C + I + G - IM/\epsilon + X} \qquad (19.1)$$

$$\underset{(+,\ +)}{IM = IM(Y, \epsilon)} \qquad (19.2)$$

$$\underset{(+,\ -)}{X = X(Y^*, \epsilon)} \qquad (19.3)$$

2

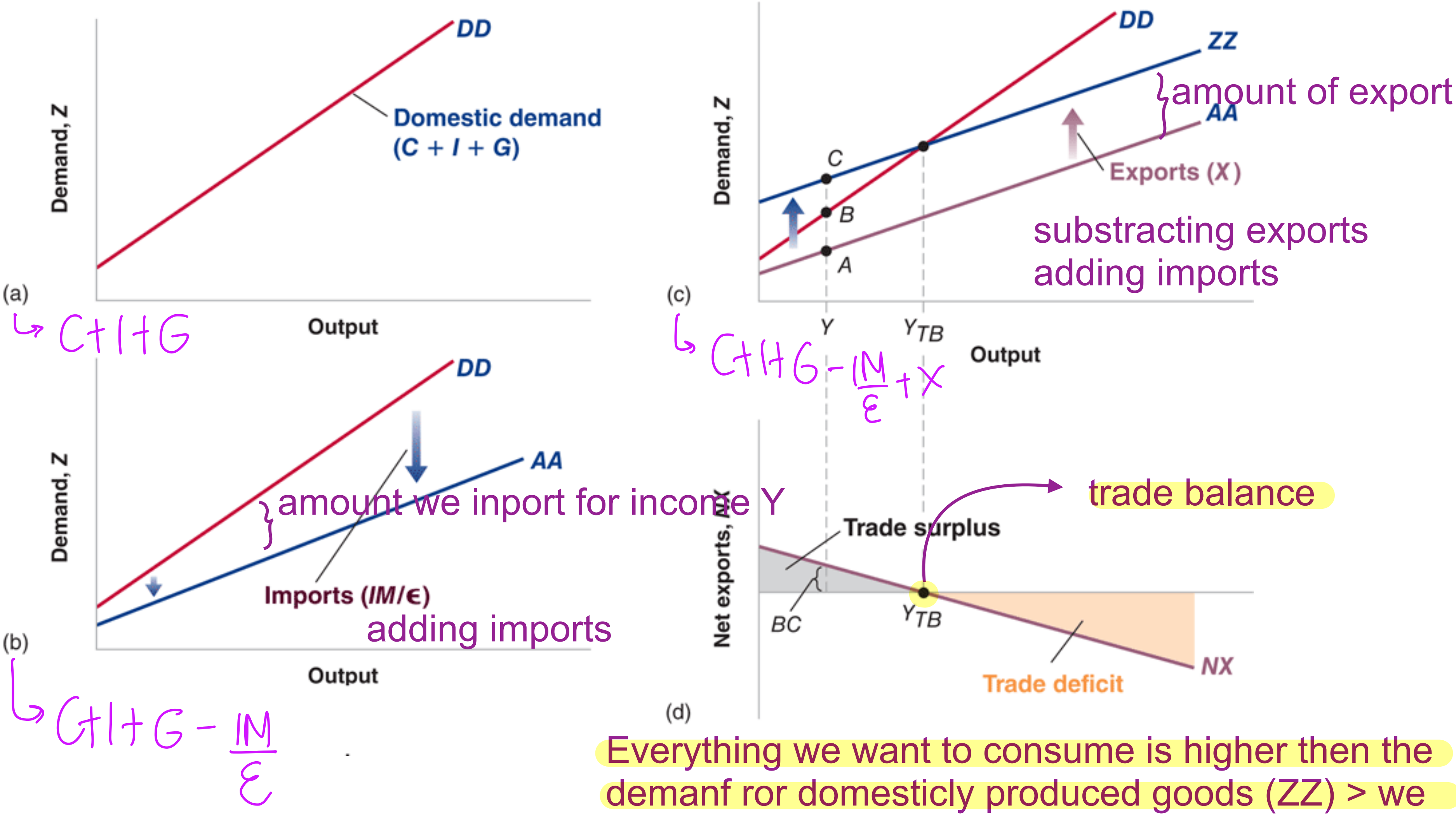
Figure 19-1 The Demand for Domestic Goods and Net Exports

DD: Domestic demand = C+I+G

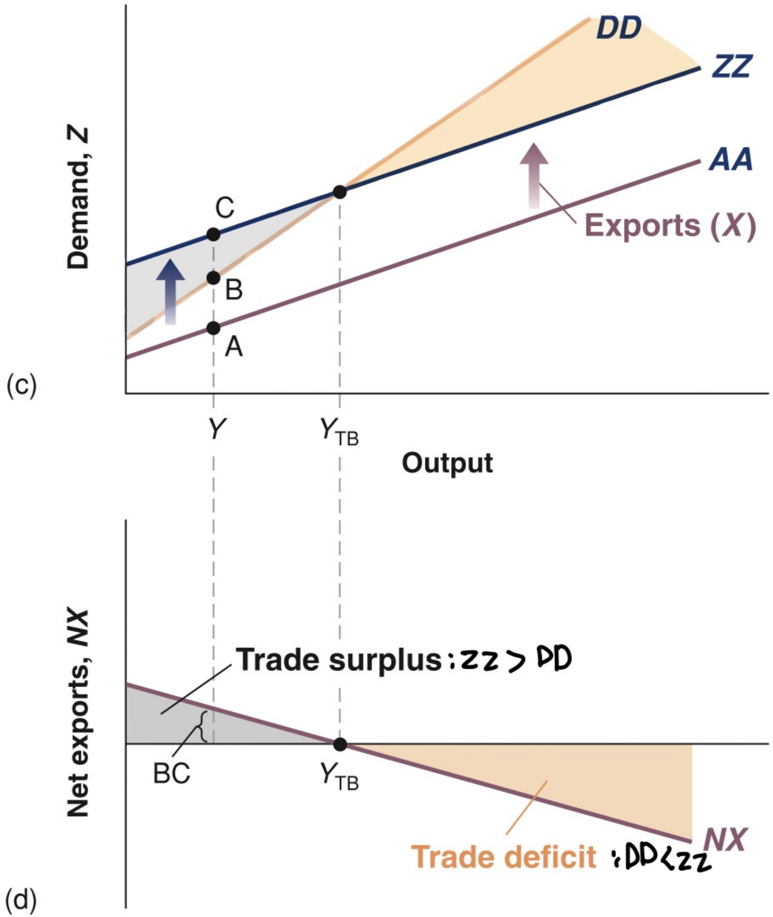
AA: Domestic demand for domestic goods $\left(DD - \frac{IM}{\epsilon}\right)$ (Note: IM is a function of output Y) = C+I+G−IM/ε

ZZ: Demand for domestic goods $(AA + X)$ (Note: X is not a function of Y, only Y*) = $C+I+G \underbrace{-IM/\epsilon + X}_{NX}$

$NX = X - \frac{IM}{\epsilon}$



Everything we want to consume is higher then the demanf ror domesticly produced goods (ZZ) > we consume more then we produce ourselves, so we have a tradce decific (net export = negative)



PRODUCTION

DEMAND

$ZZ - DD = $ 1) $+$

2) $-$

1 PREVIOUS SLIDE:
1. Top left: there is domestic demand , we are going to correct fo inn and exports (so first we will substract imports), this gives us:

2. Bottom left: for each level of income we know how much we want to consume or invest. But now we want to correct for the goods we don't correct ourself, so well subsrat the amount of imports from DD. As the output increases we'll substract a higher and higher amount, since as income rises: we consume more and our imports increases

3. Top right: we want to preform a correction for exports, so we'll add our X (export) function. This is a function not determined by the income we have but by the amount of income abroud.
The amount of exports is the same (irrespective to the level Y), so adding exports shifts the curve up by a constant amount

4. Bottom right: represents both domestic domand (DD curve) and ZZ (the demand for demesticly produced goods = demands that comes from us and from abroad).
The last figure gives us net exports = most important part of international payement

3 PREVIOUS SLIDE:
> trade surplus is the net export we preform (DC) > imports

Equilibrium Output and the Trade Balance

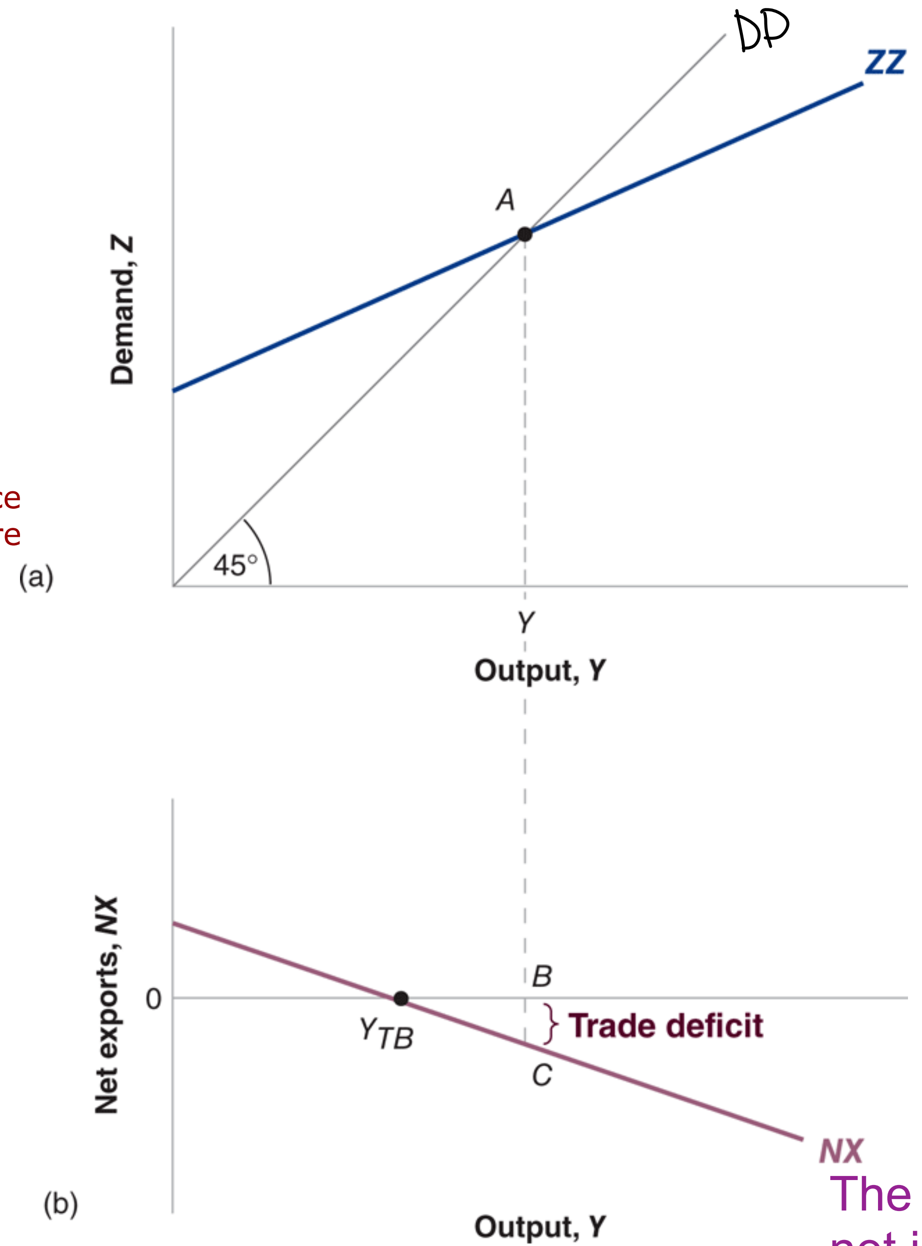
- net import + net export

$$Y = C(Y - T) + I(Y, r) + G - IM(Y, \epsilon)/\epsilon + X(Y^*, \epsilon) \qquad (19.4)$$

Figure 19-2 Equilibrium Output and Net Exports

- Equilibrium: demand = supply
- No reason why equilibrium output would also imply equilibrium on the trade balance
- (equilibrium on trade balance occurs where ZZ=DD)
- $Y > Y_{TB}$: trade deficit
- $Y < Y_{TB}$: trade surplus

Equilibrium in the goods market does not require we have a a balance in the trade balance (that the net import = export)



The amount of net import

Exhaugenous changes in policys

For example if for some reason governement spending increases: G increases > demand increases

1.

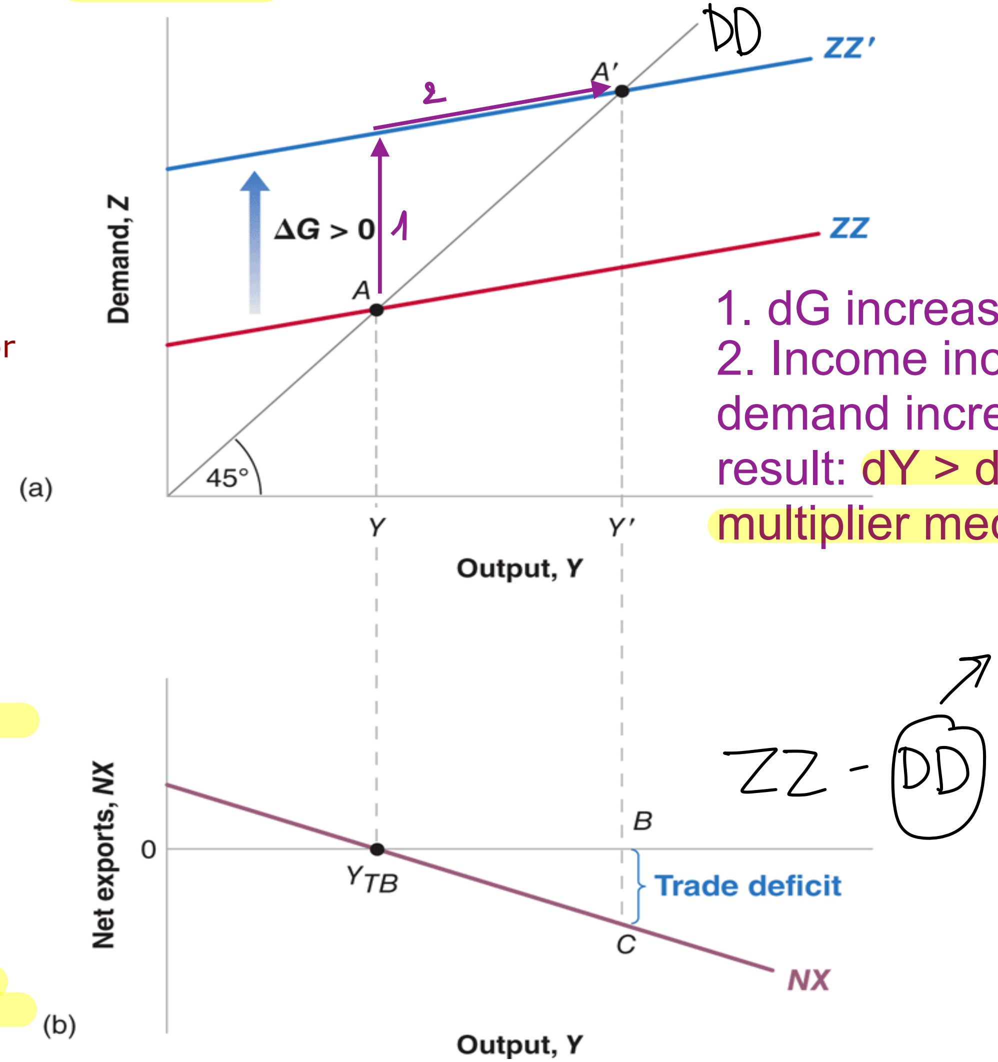
Figure 19-3 The Effects of an Increase in Government Spending

- Starting point A: Z=Y, $Y = Y_{TB}$ (not necessary)
- Increase in G => increased demand ZZ for given Y: ZZ'
- New equilibrium A'
- Multiplier: $\Delta G < \Delta Y \ (= YY')$

1. G has no direct impact on X or IM
⇒ NX curve does not shift
⇒ Via NX: more Y implies more IM
⇒ Trade deficit

2. Increase in demand goes partly to foreign goods
⇒ Multiplier is smaller than in a closed economy (where every additional demand is demand for domestic goods)
(Note: if ZZ flat => multiplier=1)

The more open a country is, the smaller the effects of an increase in G (small multiplier)



1. dG increases
2. Income increases: demand increases
result: dY > dG (door multiplier mechanism)

One of the shocks in an open economy and it's effect on the trade balance

2.

Figure 19-4 The Effects of an Increase in Foreign Demand = foreign country gets richter

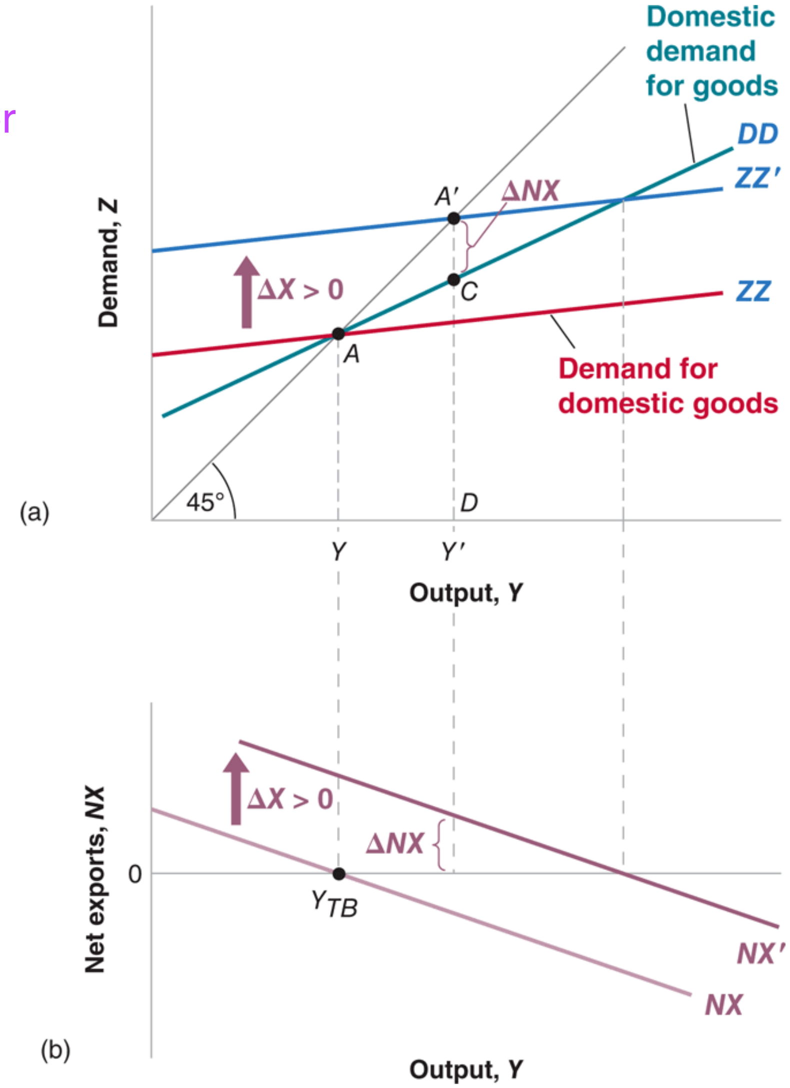
Starting point A: ZZ, DD
Difference: NX
If ZZ=DD => trade balance Y_{TB}

Y* rises (e.g. G*)
(a)=> X increases, demand for domestic goods increases: ZZ' => A'

(b) DD unchanged

(c) => NX shifts: for given Y, X increases
By how much does NX shift? To the point where DD=ZZ'
Hence:
Foreign demand increases
⇒ Higher export of domestic goods
⇒ Higher output
⇒ Higher domestic demand (multiplier, via DD)

How large is the increase in IM? Bigger than X? (and thus a trade deficit?)
No: DD does not shift (via) => ZZ' above DD



Point A crosses the domestic demand for goods

Fiscal policy and the trade balance

Output increases = worse TB

- Increase domestic demand => increase Y, deterioration TB
- Increase foreign demand => increase Y, improvement TB

So depending on the shock, it can be that income goes in the same direction but the effect on net exports might be different

- What happens in a country has implications for all other countries
  - More for more open countries
  - Crisis: US demand falls, IM US falls, X all other countries falls, growth all other countries falls (Fig 18-1)

- Policy coordination
  - Governments don't like trade balance deficits (=build-up of debt to foreign countries => higher interest payments)
  - => prefers to get out of a recession via an increase in foreign demand (G*) rather than an increase in domestic demand (G)
  - Reluctance can lead to inaction => Need for coordination

If we as a country want more income (and we're an open economy), then we could invest in G (domestic demand) = will cost us, or we can have more income by foreign demand increasing = doesnt cost us. So sometimes countries wait for other countries to move. At the international stage there is no policy coordination, so we can have a situation where all countries are waiting for the other (leads to inaction).

Fiscal multipliers in an open economy

- Consider a world of two countries, Home and Foreign

Multiplier of *Home's* fiscal policy:

$$\frac{\delta Y}{\delta G} = \frac{1}{1 - c_1 + \frac{m}{\varepsilon}}$$

- In an open economy the fiscal multiplier is lower than in a closed economy (1/(1-c1)).
  - Why? Part of the additional demand is for foreign goods
  - Countries with higher import intensities have lower fiscal multipliers

Multiplier of *Foreign's* fiscal policy:

$$\frac{\delta Y}{\delta G^*} = \frac{m^*}{1 - c_1 + \frac{m}{\varepsilon}}$$

- Fiscal stimuli abroad have expansionary effects also at home

In this graph: a measure of openness of the economy: import penetration or how relevant are imports relative to total activity
> the more to the right: the opener the economy
> vertical line = an estimate of the fiscal multiplier (=$\partial Y/\partial G$)
> we see a negative relation: more open economies will have smaller fiscal multipliers

Fiscal Multipliers in an Open Economy (Continued)

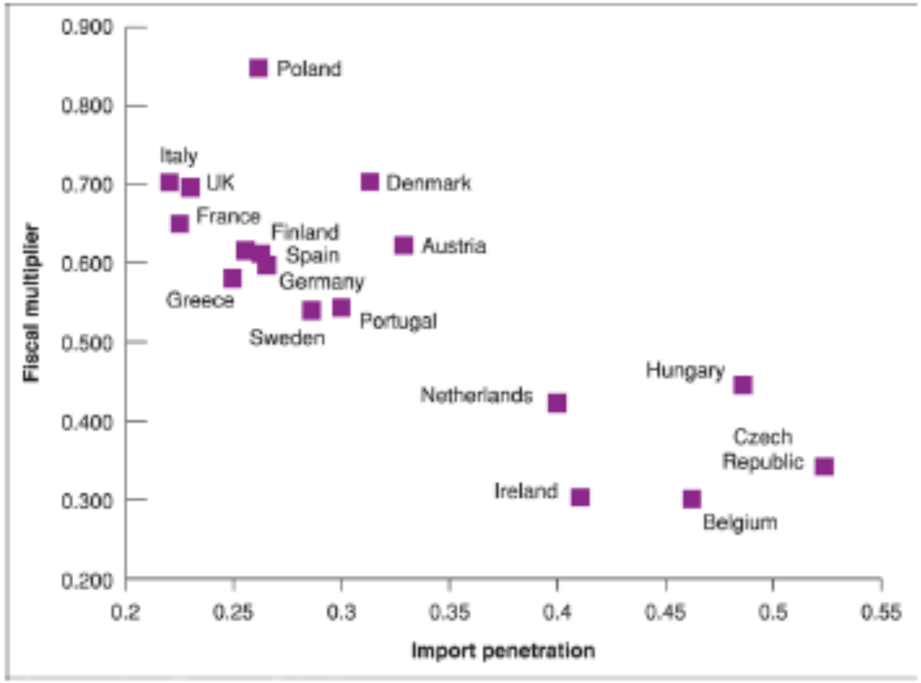


Figure 18.3 **Fiscal multipliers and import penetration**

Source: Ali Al-Eyd, Ray Barrell and Dawn Holland (2006), *The role of financial markets' openness in the transmission of shocks in Europe, National Institute of Economic and Social Research, Discussion Paper No. 271, p. 18*

Depreciation

- Assume: government takes measures to achieve a depreciation: $E\downarrow$
- $\epsilon = \frac{EP}{P^*}$ = relative exchange rate
  - ϵ : Price of domestic goods in terms of foreign goods
  - E : Price of domestic currency in terms of foreign currency
  - Short term: price levels P and P* given
  - => $E\downarrow \Rightarrow \epsilon\downarrow$
    - USD depreciates with x% relative to the yen => goods in US x% cheaper compared to Japan

We're still looking at demand (supply was passive) so we're still looking in the short term, in the short term we assume the price is constant.
So what moves the real exchange rate we'll look at what happens to the nominal exchange rate.

Net export function: real exchange rate comes up in 3 different places so it will have 3 different effects

1. Determinant of exports: the € becomes cheaper > i falls > Y falls > the world will buy more EU goods (because they become cheaper) = more countries will import from us
2. Imports: As the € looses its value, it will be more expensive for us to import goods = change in relative good price

Depreciation and the trade balance

3. The valuation if imports: even if I keep the amount of jaguars fixed that I import, I now have to pay more for them (the same quantity will now cost more)

= Behaviour effects & accounting effect

- $NX = X - \frac{IM}{\epsilon} = X(Y^*, \epsilon) - \frac{IM(Y,\epsilon)}{\epsilon}$
- $E\downarrow \Rightarrow \epsilon\downarrow$
- $NX = X(Y^*, \epsilon)\uparrow - \frac{IM(Y,\epsilon)\downarrow}{\epsilon\downarrow}$
  - Exports cheaper
  - For given Y, imported goods more expensive:
    - Composition shifts toward domestic goods
  - Relative price of foreign goods in terms of domestic goods $\frac{1}{\epsilon}\uparrow$:
    - The same quantity of imports now costs more => the value of imports $\frac{IM}{\epsilon}$ rises

These 3 effects don't work in the same direction:

1. Improves net exports
2. Improves net exports
3. Worsens net exports

- Total effect on NX is uncertain in theory
  - Improvement trade balance if $X > \frac{IM}{\epsilon}$
  - Marshall-Lerner condition (is assumed to hold in practice)

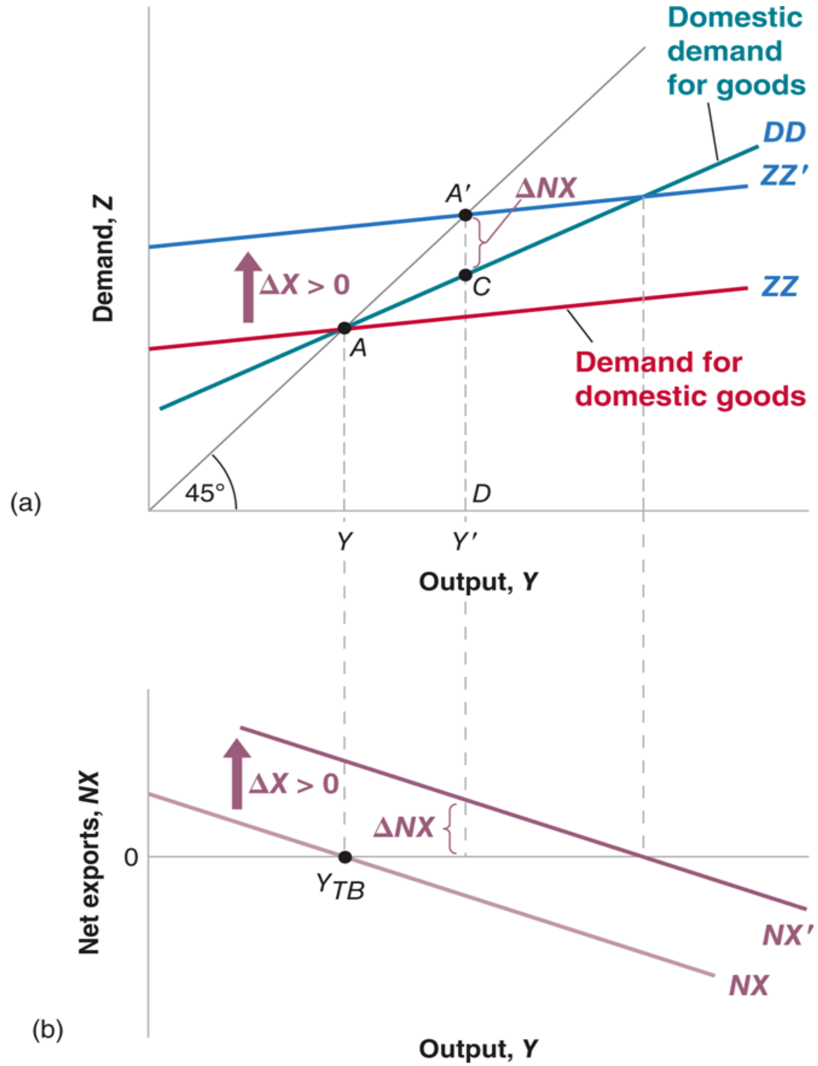
So we don't know the real theoretical effect since some effects work against each other. The trade balance is only going to improve if the export effect dominates the total import effect. When we look at data this is acutally the case. When nominal exchange rates devalue (loose value = depreciatie) = god news for net exports = the Marshial learner condition.

The analysis can be preformed graphically

1. When the exhange rates depreciate: additional demand from abroad (is the same when what happens when Y* increases = the exact same analysis) = exhougenous shift in net exports for a given level of output we now get more exports because epsilon or i decreases. Net export curve shifts up (this is supported by data).

Depreciation and output

- We considered the direct effect
  - $NX = X(Y^*, \epsilon) \uparrow - \frac{IM(Y,\epsilon)\downarrow}{\epsilon\downarrow}$
  - M-L: for given output, $\epsilon \downarrow \Rightarrow \text{NX} \uparrow$
  - i.e. for given Y, Y*
  - Shift of NX curve
- New equilibrium A'
  - Positive trade balance: A'C
- Hence: depreciation =>
  - Demand for domestic goods rises (from home and abroad)
  - Increase in domestic output and improvement of trade balance



We can generate the income effects and some are more feasanable than others: if the foreign income spends more = great way to get out of the recession, so Y* increasing increases our income. But decreasing the value of the currency would also work: if we manage to lower the value of the € we would gain in net exports and thus income. But there are 2 issues with that:

- The value of the EU zone is determined in financial markets. As a governement we don't exert control over the exact bvalue of the exchange rate, that's different if we are in a fixed exchange rate (there the central bank imposes a value of the currency but even ther, there is aproblem)

- a depreciation = devaluation = reduction in value has benificial effects (net exports increase) but it's realy unpopular = pretty hars for the population because now all the imports get more expensive > direct effect = reduction in purchasing power
  So protest against devaluation with the people.

So not all sources of additional demand are equaliy feasable

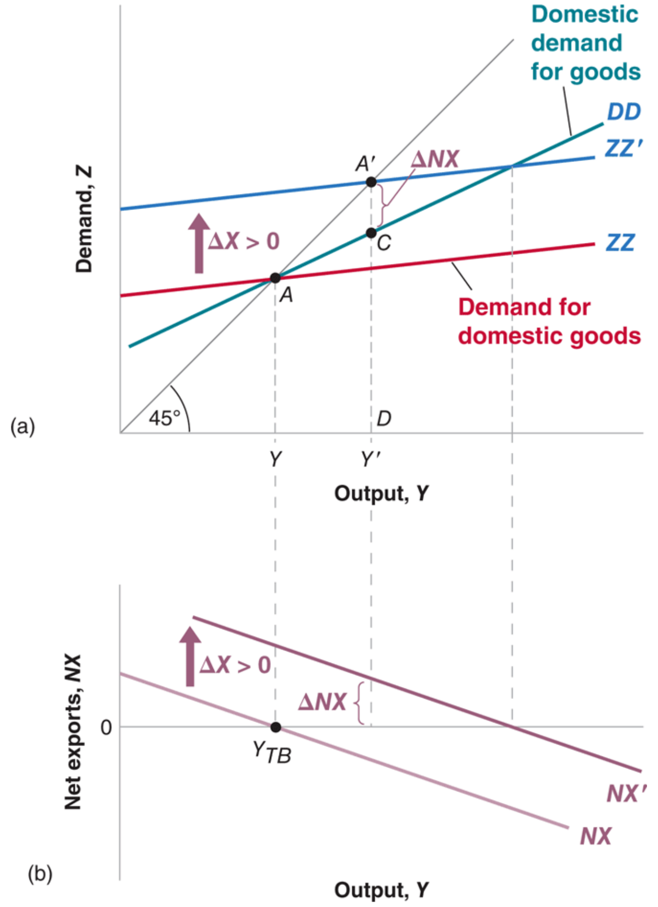
1. Waiting on other countries may lead to inaction. Gettin gout of an recession in an open economy can be problematic

Depreciation and foreign output

- Figure gives the effect of a depreciation, but equally shows the impact of a RISE in Y*
- Note 1:
  - Difference in feasibility
  - Devaluation is painful: civilians must pay more for the same foreign goods
  - Since it is a decision of the government, that can lead to protest

    Y* = foreighn economy
  - Increase in Y* comes from abroad => not the domestic government's influence
- Note 2:
  - In the reasoning on the previous slide
  - Y* is implicitly kept constant (also in the book)
  - Why?
  - Rise in NX can lead to a drop in NX* abroad
  - And thus a reduction in Y*
    - But we treated Y* as exogenous => Y* does not respond

    When Y changes in our model, it is not going to effect the rest of the world (assumption) > Y* is constant

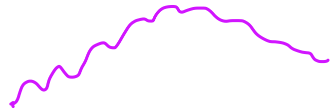


1 It becomes possible to trade with other countries > this implies that capital or assets can move country, the US has to pay for the trade deficit.
So governments can have multiple objectives. There is a long term trend in output, what the governments trys to do with fiscal and monetary policy is to try and keep output close to that trend level

Combination of exchange rate and fiscal policy

- Assume $Y = Y_n$, NX<0
- Government wishes to achieve $Y = Y_n$, NX=0
- Devaluation?
  - $Y > Y_n$, NX=0
- Fiscal contraction?
  - $Y < Y_n$, NX=0
- The right combination of both can lead to $Y = Y_n$, NX=0

2 GDP over time: upwards trend, but there are cycles (little business cycles), we would rather have small fluctuations and not to many volatility



3 We like output to be equal to some natural level (Yn)= where the economy in the long terms run to, when all the short term shocks and fluctuations have worked there way. They want actual income to be close to Yn

4
Now we've opend the economy we can import and export but we can also build up depth:
> net exports is negative = deficit on trade balance = we have to pay for that, we do so by transferring capital to other countries. Not all countries like that (remember Trumph)

(5)

(NX = 0)

> so how do you achieve Y = Yn and you want to get rid of a trade deficit? Chocks to economy will change output and exports, now let's suppose we want to achieve both of these adjetives. Starting point: Y = Yn, but there is a trade deficit? Is devaluation going to work? This is good news for exports (more than for imports) = improved trade balance!

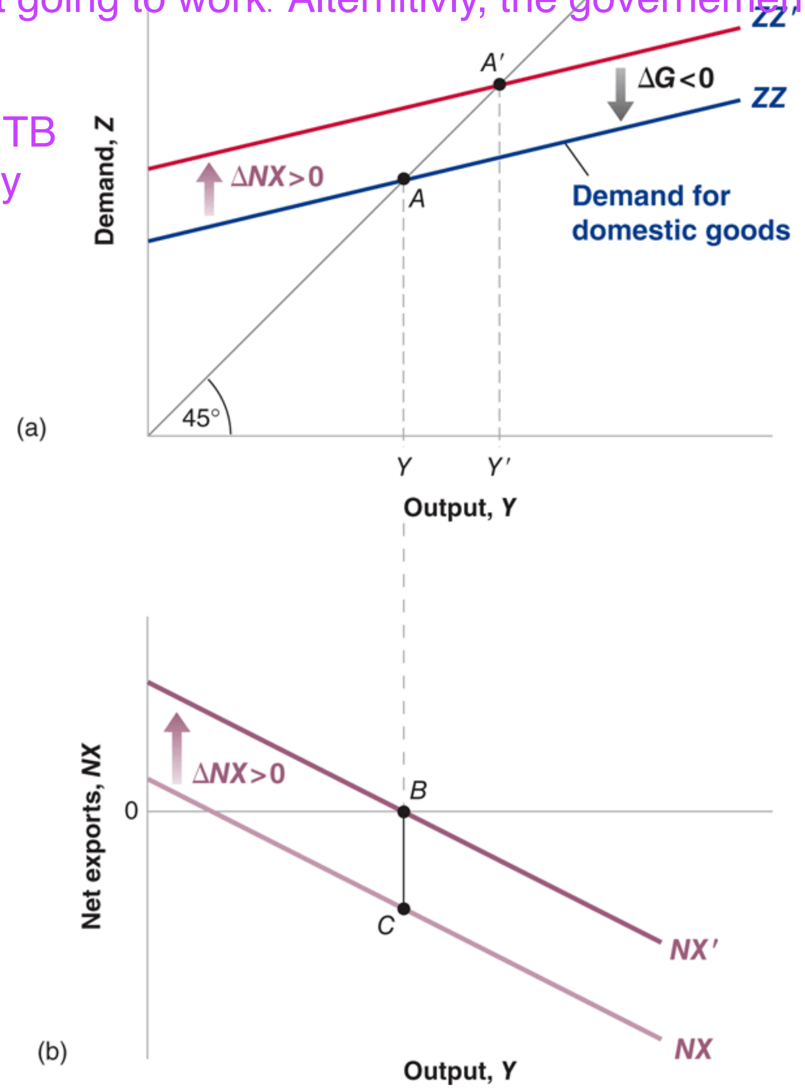
But the way in which this happens: we go from Y to Y* (generating additional income), so we might achieve trade balance but we are going to overhsoot on Y. So that is not going to work. Alternitivly, the governement can create a fiscal contraction = a drop in G

Increase of G spending = worsening in TB, so if we want TB to improve we can reverse the situation. Problem: the way in which we do that = by reducing income: we'll loose Y... = start of recession

Figure 19-5 Reducing the Trade Deficit without Changing Output

Step 1: depreciation such that trade deficit is undone (shift of NX to NX')

Step 2: fiscal contraction to undo the excess output (for given NX' curve)



The right combination is to combine both options: to get rid of TB and to keep output at it's natural level (Y = Yn) = the Tinbergen rule

- if you have multiple objectives, you need as many instruments to implement those objectives
- Isn't always and everywhere the case but in a lot of cases

Combination:

1. Depreciation: C > B, this wil generate additional income and we want to avoid that
2. Fiscal contraction = devaluing the currency = using fiscal policy to shift the demand that comes from the additional income (prevents us from going from A to A' and ensures we stay at A)

Policy combinations

- 2 objectives
  - Output, trade balance
- 2 policy instruments
  - Fiscal and exchange rate policy
- Aka Tinbergen rule (Nobel 1969)
  - Number of objectives = number of instruments

- Depending on the initial state of the economy and the objective, different policy combinations are called for

Depreciation, the Trade Balance, and Output

Table 19-1 Exchange Rate and Fiscal Policy Combinations

We can play around with different starting situations

Initial Conditions	Trade Surplus	Trade Deficit
Low output	ϵ? G↑	ϵ↓ G?
High output	ϵ↑ G?	ϵ? G↓

What if I wanted net exports to increase/decrease while income stays constant or vica versa (how do I get out of recession while keeping the TB)

Our model doen't pay much attention to timing, we don't really have: when we talked about the multeplier effect we sad there is the first round effect, second round effect, third roudn effect = it takes time to fully take effect
= true also for the open economy, particullary for net exports: depending on the exchange rates, when the exchange rate changes net export changes in our model, but we haven't been very precise with the timing whith which that happens.
So there are 2 behavioral effect (export and import function = how we consumers response ≠ happening immediatly = these behavioral relations take time), the third effect: that the value of import changes = happens in seconds
So what does that imply?

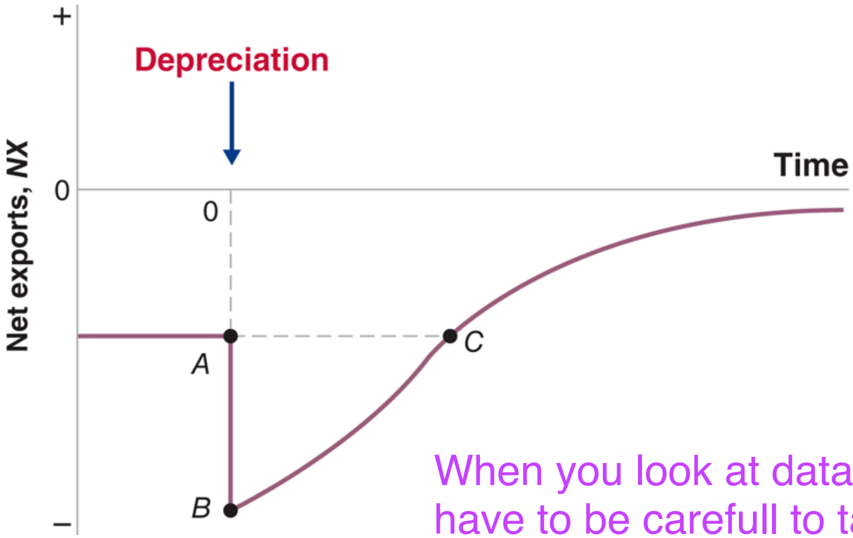
What we have here: impulse responses before
> when we look at en economy over time: net exports over time (horizontal time axis): assume we had a trade balance deficit (at t=0 Nx = 0 = depreciation > lead to more income, it would improve net exports = what the model says). What we say here: as soon as the depreciation happens, your net exports aren't actually going to improve, in fact they worsen = our trade balance is going to look worse. Because as soon as the exchange rate drops we'll be paying more for the imports that we make. So net exports are going to fall, only when time progresses and we change our consumpiton behaviour that we see the improvements in TB

Figure 19-6 Dynamics: J-Curve

0A: initial deficit

Effect of a depreciation on $X - \frac{IM}{\epsilon}$ over time

- Quantities don't necessarily adjust immediately: e.g. consumers don't realize the price difference, firms plan their purchases ahead of time, both need time to revise
- => X, IM initially unchanged
- Value-effect immediately realizes: $\frac{1}{\epsilon}\uparrow$
- Consequence: $NX \downarrow = X - \frac{IM}{\epsilon\downarrow}$
- Only after a while quantities start adjusting: $X\uparrow, IM\downarrow$
- And only then $NX\uparrow$

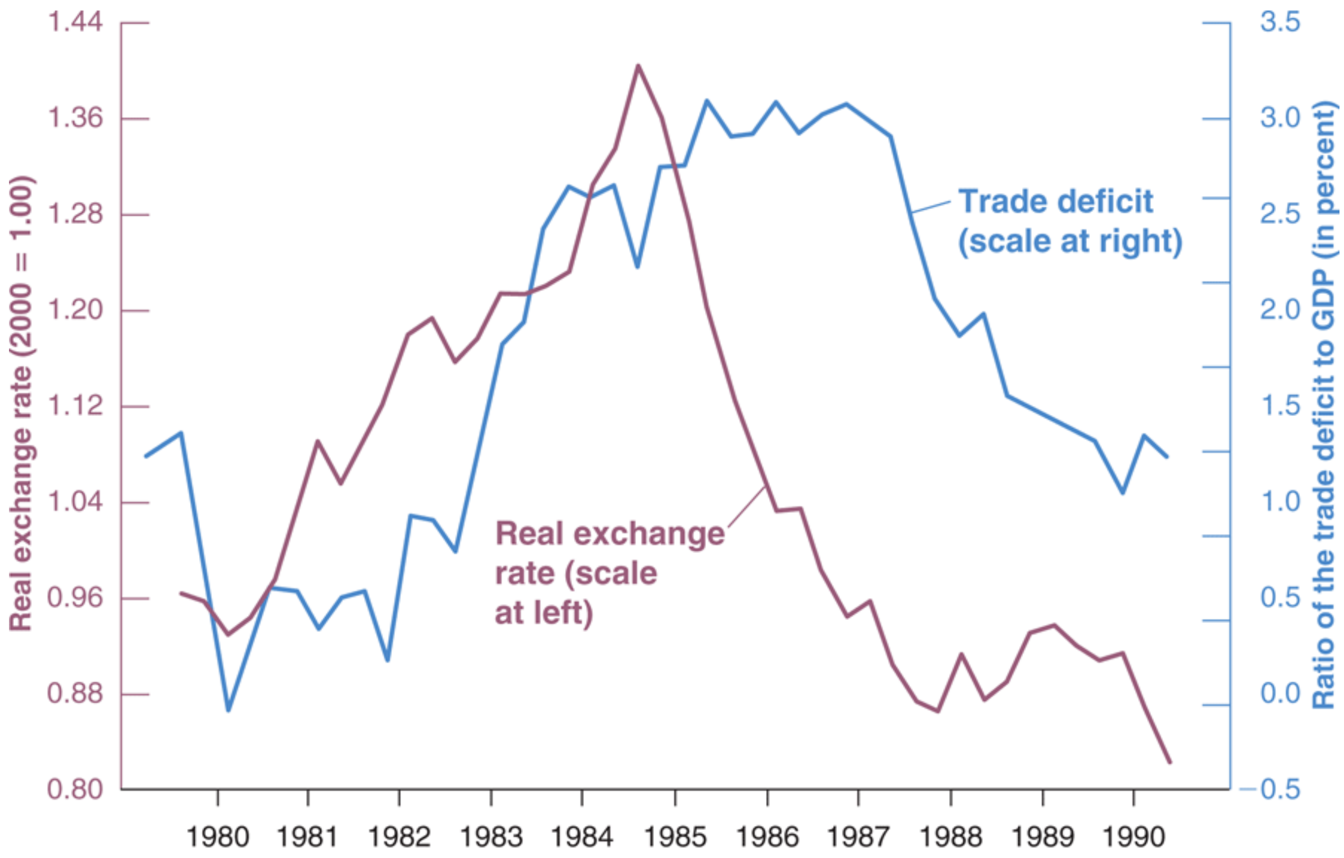


When you look at data, we have to be carefull to take into account the potentially changing speeds at which these effect materialise

What we can see: look like they are positivly correlated
> as the real exchange rate drops, eventually the trade deficit also drops (but eventually took a couple of years)
> is the monitary policy that the FED persues the right one? They increased intrest rates by quite a bit and inflation is still rising, even do the reasing fort the FED for increasing the intrest rate is the rising inflation. Their argument: adjustments take time (monts to a year before we see the impact).

Figure 19-7 The Real Exchange Rate and the Ratio of the Trade Deficit to GDP: United States, 1980–1990

1. Positive correlation
2. Substantial lags (J-curve)



Source: See Figures 18-1 and 18-5

Closed economy: eq in goods market gives rise to IS curve, the IS curve (equality between investment and savings): private saving + public saving = investment
> opening up the economy: those two sides don't have to be equal to each other because other countries are involved

Trade balance and savings/investment

- $Y = C + I + G - \frac{IM}{\epsilon} + X$
- $Y - T - C = I + (G - T) + NX$
- $(Y + NI + NT) - T - C = I + (G - T) + (NX + NI + NT)$
- $(Y + NI + NT) - T - C$: Disposable income – consumption = savings
- $NX + NI + NT$: Current Account (CA)
  - Note: Current Account ≈ Trade Balance (income & transfers persistent)
- $S = I + (G - T) + CA$
- $CA = S + (T - G) - I$
  - CA= savings (private+public) – investment
  - CA surplus: savings > investment => lend to rest of the world (negative capital account)
  - CA deficit: savings < investment => borrow from rest of the world (positive capital account)

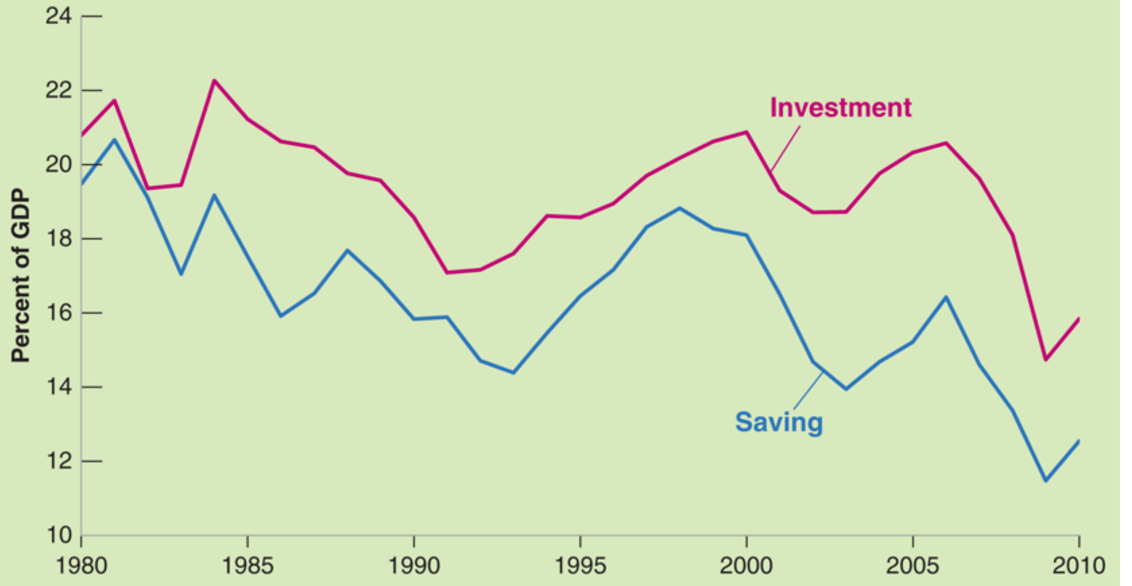
Current account = savings + (taxes - governement spending) - investment
> US: current account is the difference between total savings and investinvestment. the US has consistenly been investing more than it's saving, and that is the counter part of a negative current account, so the US is getting funds from elsewhere

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

- Increase in I implies an increase in savings or a deterioration of the CA
- Deterioration of public finance must be absorbed by more savings, less investment, or will lead to a deterioration of the CA
- A country that saves a lot, will either invest a lot, or have a large CA surplus

$$CA = S + (T - G) - I \tag{19.5}$$

Figure 1 Ratios of Saving and Investment to GDP in the United States since 1980

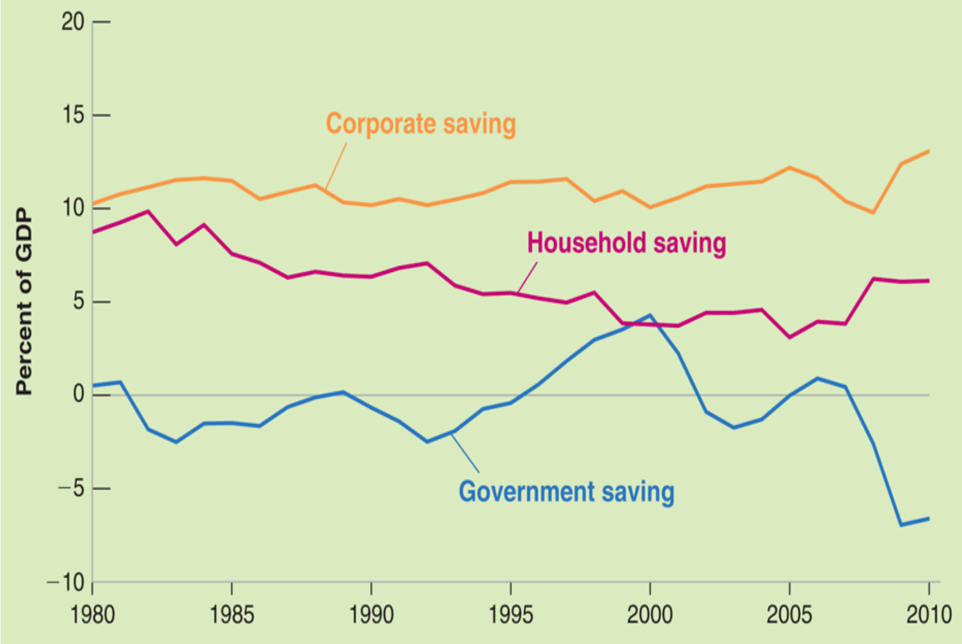


Source: NIPA Table 5-1. Saving and Investment by Sector

Figure 2 Ratios of Household, Corporate, and Government Saving to GDP in the United States since 1980

4 periods:

- Pre 92: Sh↓, Sg<0
- 92-00: Sh↓, Sg↑ => CA deficit ↓
- 01-07: Sh↓, Sg↓ => CA deficit ↑
- 07-: Sh ↑, Sc ↑, Sg ↓ (countering fall in demand: Z=C+I+G+NX)



Source: NIPA Table 5-1, Saving and Investment by Sector

- So far: exchange rate as a policy instrument (short-cut)
- But the exchange rate is determined on the foreign exchange market, not by the government

- What determines the exchange rate? What is the influence of the government?
- IS-LM in an open economy (Mundell-Fleming model)

What happens in financial markets in addition to goods markets?

Equilibrium in the Goods Market (IS)

$$Y = \underset{(+)}{C(Y - T)} + \underset{(+,\,-)}{I(Y, r)} + G + \underset{(-,\,+,\,-)}{NX(Y, Y^*, \epsilon)} \qquad (20.1)$$

- *Effect financial market:*
- $r \uparrow \Rightarrow I \downarrow \Rightarrow demand \downarrow \Rightarrow Y \downarrow$ (multiplier)

- $\epsilon \uparrow \Rightarrow$ $(composition) shift\ in\ demand: more\ foreign\ goods$
- $\Rightarrow NX \downarrow \Rightarrow demand\ domestic\ goods \downarrow \Rightarrow Y \downarrow$ (multiplier)

> intrest rates:
• I = nominal intrest rate = how much intrest you earn on a bond = reflect money
• R = real intrest rate = how many goods you earn after investing = reflecting goods
What is the difference between these two? Inflation! **Real intrest rate = nominal intrest rate - inflation (π = P(t) - P(t-1) in % = relative change in price level)**
If I loot at an investment: if I can earn a 5% intrest rate (seems a good deal) = looking at nominal intrest rate, but if the price of goods rises by 10% = a poor idea

What is important is the real intrest rate!
We're in the short term: prices are constant
Price of goods today is the same price as the price of the goods yesterday
So in the short term: implies inflation is zero, so nominal rate = real rate

When intrest rate inceases: ivestment rate drops, total demands drop, we start producing less > less income > increase in intrest rates = lower eq output (door multiplier) = closed economy
However: additional financial market that matters = foreign exchange market = where the exchange rate is determined (= EP/P*, with constant prices: whatever happens with real exchange rate comes from nominal exchange rate)
So there is this other financial market that determines echange rates > impact our goods markets: if exhange rate increases = shift in demand because our currrency is wordt more so it will be cheaper to buy foreign goods = more imports or less net exports, the demand for domestic goods falls, and again through the multiplier effect: higher exchange rate = lower output
So we have two effects on the finandial market

Effect financial market: exchange rate increases > composition shift; currency is worth more so it's more cheaper to buy more foreighn good (shift in demand) = more imports, less net exports, demand for domestic foods falls, through the multiplier effect: higher exchange rate = lower output

We can rewrite our eq in the goods market:
Supply = demand = determined by nominal intrest and exchange rate

$$Y = \underset{(+)}{C(Y-T)} + \underset{(+,-)}{I(Y, r)} + G + \underset{(-,+,-)}{NX(Y, Y^*, \epsilon)} \tag{20.1}$$

- Simplifying assumptions:
- $P = P^* = 1 \Rightarrow \epsilon = E$
- $\pi^e = 0 \Rightarrow r = i$

$$Y = \underset{(+)}{C(Y-T)} + \underset{(+,-)}{I(Y, i)} + G + \underset{(-,+,-)}{NX(Y, Y^*, E)} \tag{20.2}$$

Equilibrium in Financial Markets 1

- Choice between money and bonds: does not change in an open economy
- LHS: Real money supply: exogenous
- RHS: Money demand determined by transaction- and speculative demand

$$\frac{M}{P} = Y\,L(i) \qquad (20.3)$$

We want to integrate those 2 financial market with the goods market so let's first look at the monoy market: are we keeping cash in pocket or are we investing in bods?
> with open economy: that decision doesn't changue even with our economy opening, so our LM curve doesn't change

Exchange rate today depends on 3 things (if we look at UIP condition)

1. If we (BE) pay more intrest on bods > financial investors globally are going to want to invest > increased demand of euro > value of euro increases
2. If intrest in US: demand for dollars increases > dollar will fall = lower value of exchange rate
3. Expected exchange rate: if we expect the euro to be word more in a year we are going to hold more (demand increases)

Equilibrium in Financial Markets 2

- Choice between domestic and foreign bonds:
  This choise is decided by the UIP condition
- UIP

$$E_t = \frac{1 + i_t}{1 + i_t^*} E_{t+1}^e \qquad (20.4)$$

- $(1 + i_t) = (1 + i_t^*) \frac{E_t}{E_{t+1}^e}$

$$E = \frac{1 + i}{1 + i^*} \bar{E}^e \qquad (20.5)$$

- Assume: expected exchange rate constant
  Ties nominal exchange rate of second financial market to first financial market

- UIP: $(1 + i_t) = (1 + i_t^*)\frac{E_t}{E_{t+1}^e}$ = driver for exchange rate
  - LHS=invest in home bond
  - RHS=invest in foreign bond
- E.g.: US (home) – Japan: starting point
  - *E: 1USD=100yen*
  - $E = \frac{1+2\%}{1+2\%}100$
  - UIP holds

$$E = \frac{1 + i}{1 + i^*}\overline{E}^e$$

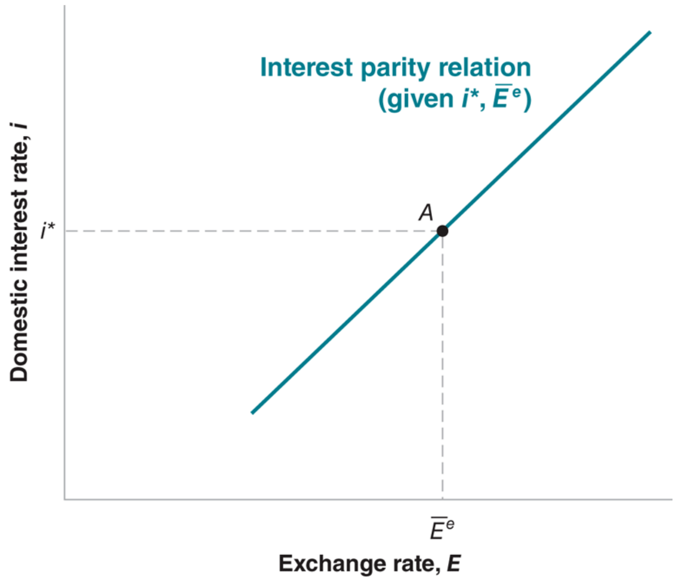
- Assume: expected depreciation of 10%: UIP => invest in US (LHS>RHS)
  - Investors sell Japanese bonds for yen, exchange yen for dollar, buy US bonds with dollars
  - Result? Demand for dollar rises => dollar appreciates
  - How much? To $E = \frac{1+2\%}{1+2\%}110$: equilibrium

- Other example: i rises from 2 to 5% (Fed increases the Fed Funds rate)
  - Interest rate Japan: 2%
  - Expected exchange rate constant: 100
- At unchanged exchange rate today (E):
  - Sell Japanese bonds, exchange yen for dollar, buy US bonds
  - => appreciation dollar
  - How much? $E = 103 = \frac{1+5\%}{1+2\%} 100$

$$E = \frac{1 + i}{1 + i^*} \overline{E}^e \tag{20.5}$$

Figure 20-1 The Relation between the Interest Rate and the Exchange Rate Implied by Interest Parity

- Higher (home) interest rate => appreciation
- Interest rate home=foreign => $E = E^e$ => point A



UIP condition = Higher intrest rate
= higher exchange rate
= higher upwards sloping curve

So when the intrest rate changes, the exchange rate changes along the curve
When Y* changes than the UIP condition (and thus the curve) is going to shift: higher intrest rate abroud is reducing the valuie of the exchange rate

Goods and financial markets together

- Goods market: (IS curve)
  - $Y = C(Y-T) + I(Y,r) + G + NX(Y,Y^*,\epsilon)$
  - $Y = C(Y-T) + I(Y,i) + G + NX(Y,Y^*,E)$
- Money market: LM curve
  - $\frac{M}{P} = YL(i)$
- Foreign exchange market: We'll simplify these 3 conditions to just 2 markets so we will take the UIP condition and substitute it in our IS curve
  - $E = \frac{(1+i)}{(1+i^*)}E^e$

- 3 markets in equilibrium: determines Y, i and E

Goods and financial markets together

- Simplify to a system in 2 equations and 2 unknowns
  - Simplify by substituting E for UIP
  - Hence UIP is satisfied
  - Compute 3rd variable (E) separately via UIP

The IS curve with the UIP rate substituted

- Goods market: (note: E^e given)
- IS: $Y = C(Y-T) + I(Y,i) + G + NX(Y, Y^*, \frac{(1+i)}{(1+i^*)} E^e)$
- Money market:
- LM: $\frac{M}{P} = YL(i)$

= a simple eq of 2 markets

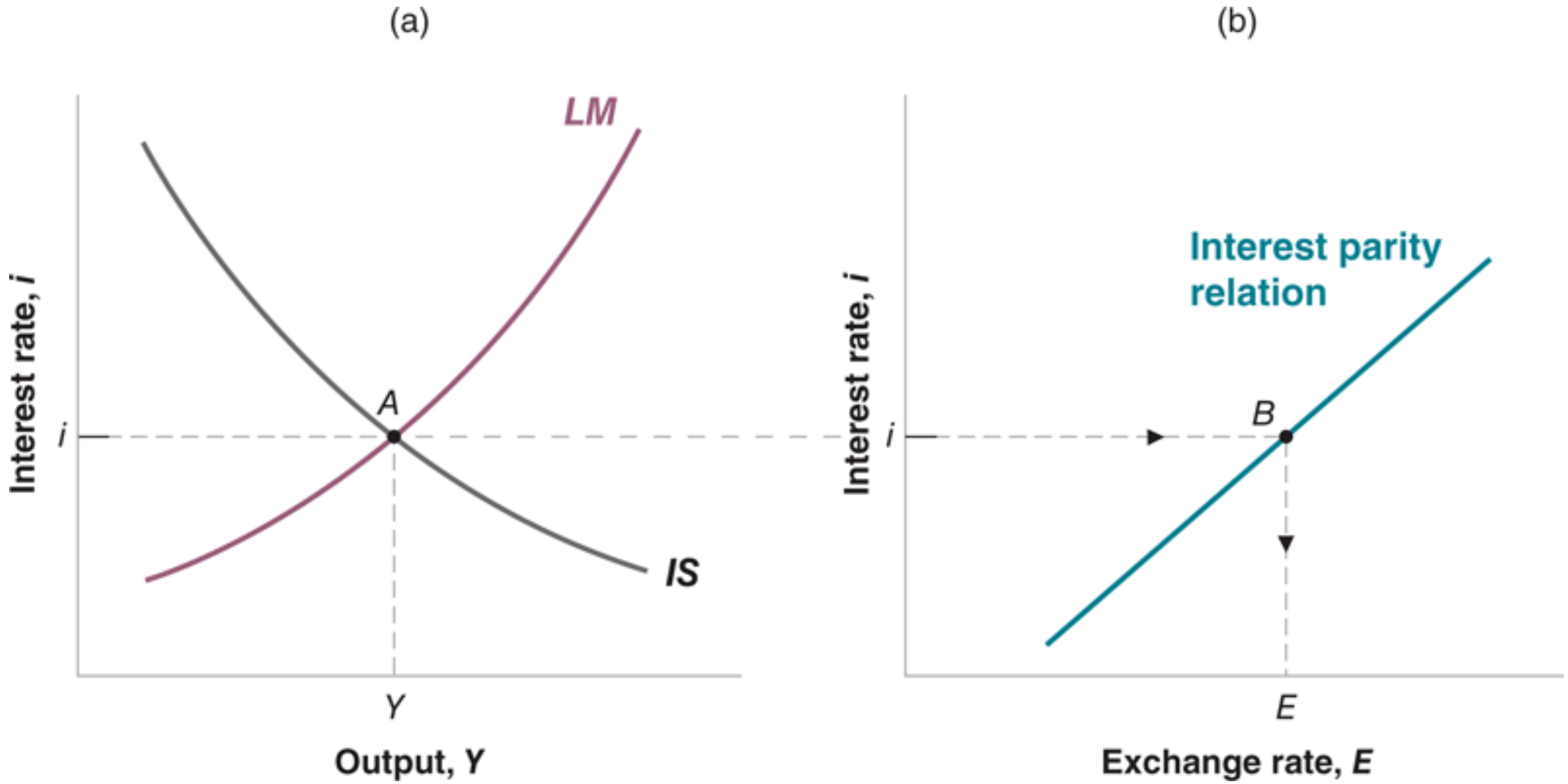
- IS: $Y = C(Y-T) + I(Y,i) + G + NX(Y, Y^*, \frac{(1+i)}{(1+i^*)}E^e)$
- Effect of <u>interest rate increase</u> on output:
  - Direct: Investment less profitable (same as in closed economy) => I↓
  - Indirect: Exchange rate appreciates => NX ↓
  - => Y ↓
  - Hence slope IS-curve<0
- IS for given: T, G, Y*, i*, E^e
  - All lead to a shift of the IS-curve
- LM same as in the closed economy
  - For given M/P, the rise in Y leads to an increase in money demand and thus i↑
  - Hence slope LM-curve>0

IS curve is negativly sloped: when the financial rate changes > how does this affect the goods market = how we derive the slope of the IS curve.
> so when intrest rates increase: demand direct effect = reduction of investment + additional kick > investors worldwide will want to invest in EU bonds, so the value of the currency increases, net exports worsen = less income = direct and indirect reason of why IS curve is negativly sloped

We had 3 markets and the third market is seen on the right and subsituted in our 2 market situation

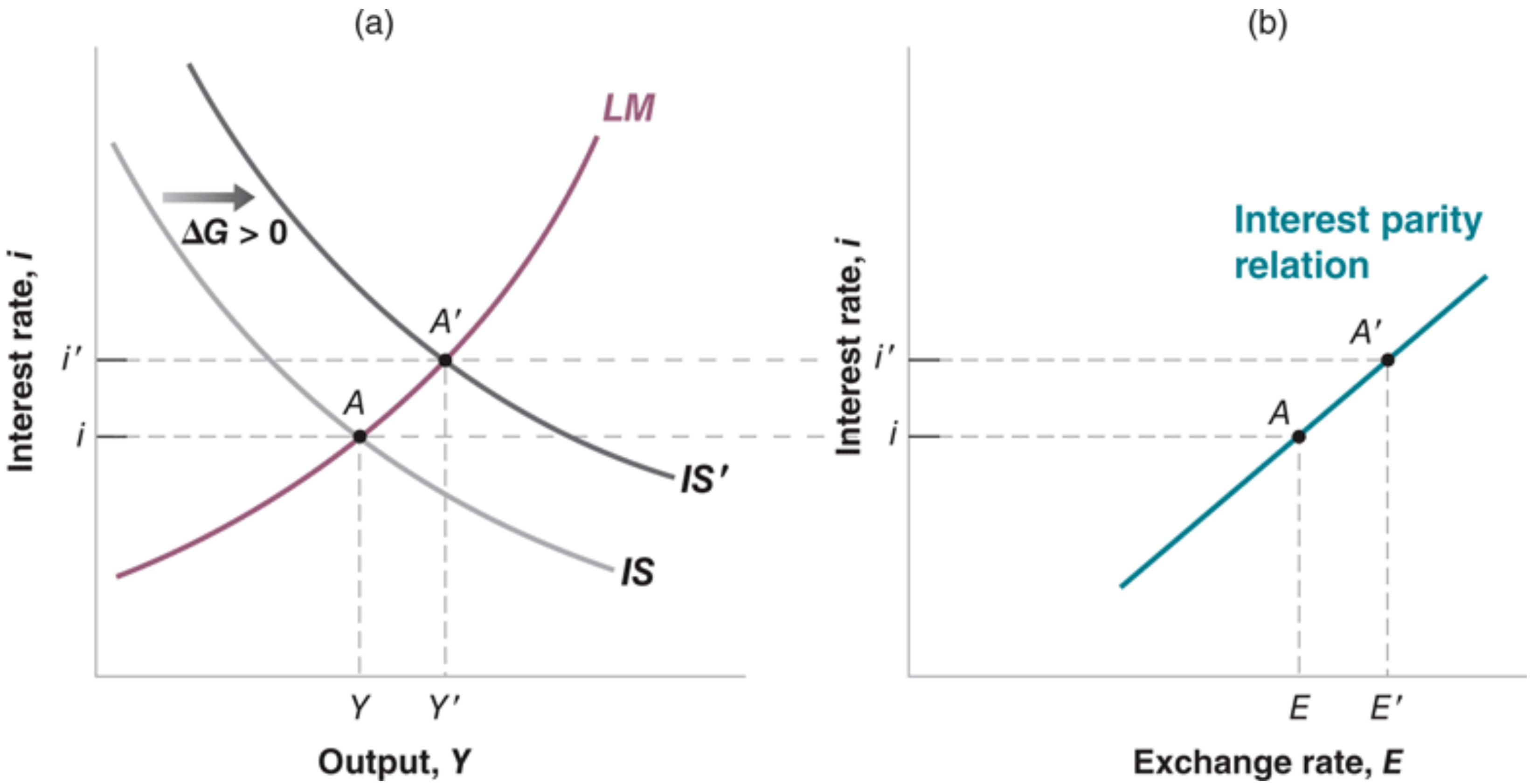
Open economy: similar to IS LM in closed economy, we move along IS as intrest rate is however more nuanced now: not just the investment effect, but also the exchange rate effect that affects the net exports (but even with that included the IS curve is still negativly sloped)

Figure 20-2 The *IS–LM* Model in the Open Economy
Equilibrium where IS and LM cross
⇒ Equilibrium interest and equilibrium output
⇒ Use UIP to calculate equilibrium exchange rate



How policy has an impact: G spending increases
> LM curve is unafffected (G not present in the curve)
> Is curve moves to the right: for a given level of intrest rate we are now getting additional deman > require us to spend more > substitute investments for bonds for money > demands for bonds fall > intrest rates rise > we go to A' = standard closed economy. But as i increases from i to i*, the exchange rate increases > more intresting to invest in EU bonds: net exports are worsening
So slope of IS curve is different due to additional leakage (due to exchange rate effects)

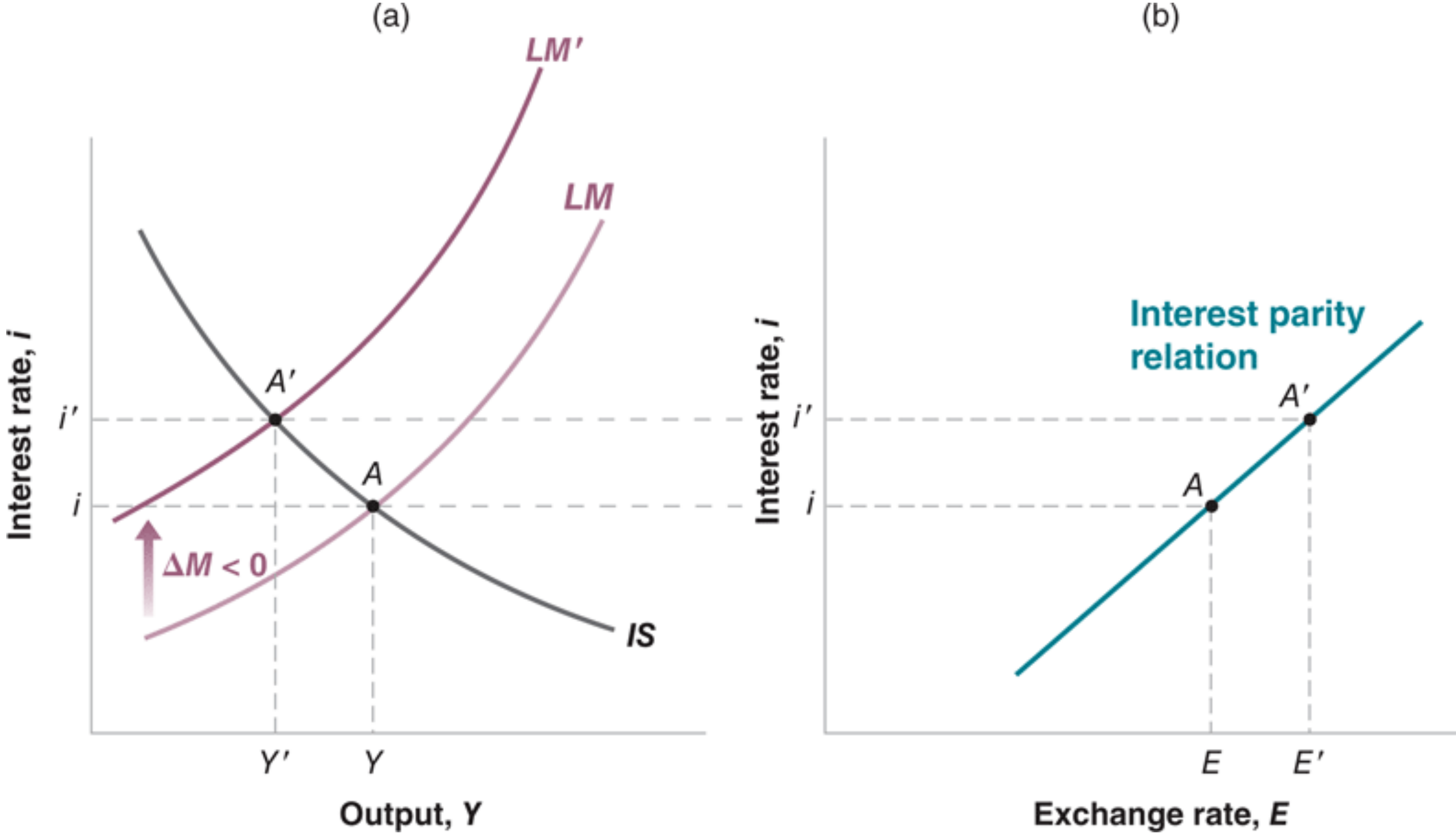
Figure 20-3 The Effects of an Increase in Government Spending



Floating and fixed exchange rates

- fixed: if we're in an eq A and the echange rate is E and we want it fixed that means the intrest rate can't change (because if intrest rate changes E is affected).
- Higher intrest rate: people want to invest in EU bonds > exchange rate increases > central bank doesn't allow that to happen: more demand so let's print more euro's such that the value of the exchange rate doesn't increase. Printing more euro's = increasing money supply = preventing intrest rate from rising

Figure 20-4 The Effects of a Monetary Contraction



Fixed exchange rates

- So far: exchange rate determined in the foreign exchange market
  - Central bank sets the interest rate, E adjusts
- Not true for all countries
- Different exchange rate regimes
- Free floating: US, UK, Japan, Canada
- Fixed exchange rates:
  - Peg: pegged to another currency
    - E.g.: Argentina 91-01: pegged to the dollar (1dollar=1peso)
    - Value CAN float through time: Devaluation & revaluation
      - Infrequent: decision of the government (not determined on financial market)
- In-between systems:
  - Crawling peg: gradual adjustment to another currency
  - Bands around a central parity: EMS
- Euro: fixed between members of the eurozone, floating relative to other currencies

- Note: fixed exchange rate relative to one country does not necessarily mean fixed to all other currencies

- Deciding to adopt a fixed exchange rate is more than deciding on a particular value
- Why? Fixed or floating, UIP holds:
  - As a result of capital mobility
  - $(1 + i_t) = (1 + i_t^*)\frac{E_t}{E_{t+1}^e}$
- Peg $E_t = \bar{E}$
  - If financial market deems the peg credible: $E_{t+1}^e = \bar{E}$
  - UIP: $(1 + i_t) = (1 + i_t^*) \Rightarrow i_t = i_t^*$
  - If investors expect a constant exchange rate, then the interest rate in both countries must be the same
  - Fixed exchange rate + perfect capital mobility $\Rightarrow i_t = i_t^*$
  - => $\frac{M}{P} = YL(i^*)$

Increase in Y

Floating: $\frac{M}{P} = YL(i)$

- Assume Central Bank leaves M/P unchanged
- Increase in transactions demand for money
- Interest rate rises
- Currency appreciates E

Fixed: $\frac{M}{P} = YL(i^*)$

- Assume CB leaves M/P unchanged
- Increase in transactions demand for money
- If interest rate rises, an appreciation will follow
- But CB cannot allow the exchange rate to appreciate
- => CB must expand M/P to keep the domestic interest rate equal to the interest rate abroad, and thus prevent an appreciation (=CB accommodates the additional money demand)
- <u>Under fixed exchange rates the Central Bank loses monetary policy as a policy instrument!</u>

Fixed Exchange Rates

$$\frac{M}{P} = YL(i^*) \qquad (20.6)$$

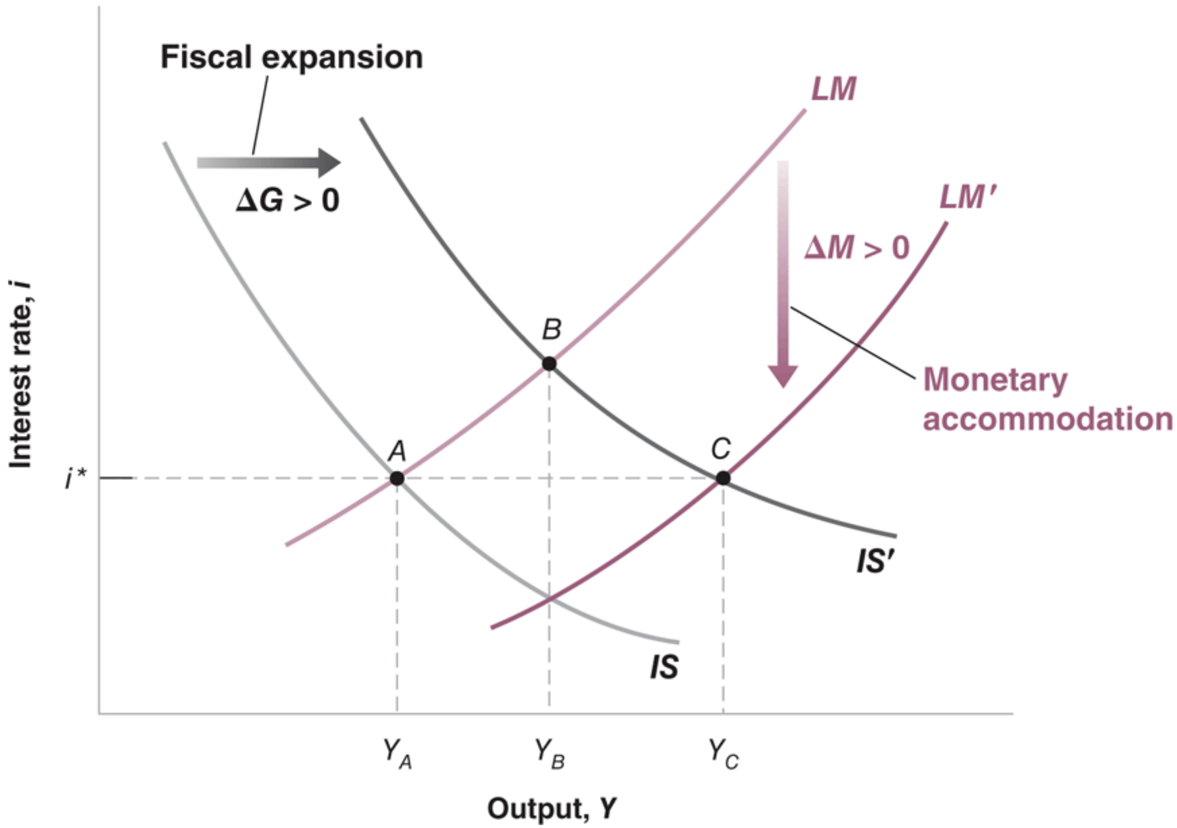
Fiscal policy under fixed exchange rates

- G rises
- => IS shifts, LM remains
- Floating ER: immediately new equilibrium
- Fixed ER:
  - Interest rate cannot rise
  - => CB must increase M to prevent appreciation (monetary accommodation)

- Fiscal policy is more powerful under fixed exchange rates than under floating exchange rates
- More powerful under fixed exchange rates than compared to a closed economy? Ambiguous
  - Why? (leakage)

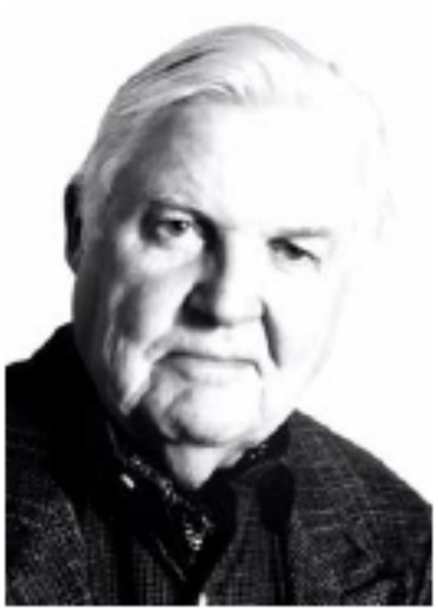
We started in A, the government implements a fiscal expansion: IS curve shifts to right, we would move up to point B, but the central bank doesn't allow this to happen because then the intrest rate would increase so the central bank responds and accommodates the additional demand for euro's so the LM curve is shifted to neutralise the effect: we are now moving to C.

Figure 20-5 The Effects of a Fiscal Expansion under Fixed Exchange Rates



UIP condition: if we fix E, then i(t) needs to be kept constant: i(t) = i(t*): domestic central bank is loosing all power, we can't independently decide to change all intrest rates

Robert Mundell (*1932)



Country of origin: Canada
Affiliation: Columbia University, USA
Contribution: Optimal Currency Area Theory, Mundell-Fleming Model
Important work: Open economy extension of IS-LM model
Noteworthy: Nobel Prize 1999

Part 2: medium run

C7 Labour market
C8 AS-AD model
C9 Unemployment
C10 Inflation & growth

Untill now: we've just talked about demand , we've sad: supply in the short run is going to be very responsive, firms are producing however we want
But ultimatly they also change: we are also supplyers, we provide labour
Supply will now adjust more in the medium term. Big difference:
- Short term: prices stay fixed
- Medium term: prices vary/evolve

Medium term:
Labour market

Labour market

- <u>**Numbers**</u>
- Theories
- Model

The total EU27 population in 2008 was 490 million (Figure 7.1). Excluding those who were either under working age (under 15), or above the retirement age (65), the number of people potentially available for employment, the population in working age, was 330 million. **The labour force** – the sum of those either working or looking for work – was only 238 million. The other 92 million people were **out of the labour force**, neither working in the marketplace nor looking for work. **The participation rate**, defined as the ratio of the labour force to the population in working age, was therefore 238/330, or 72%.

bc stay at home moms

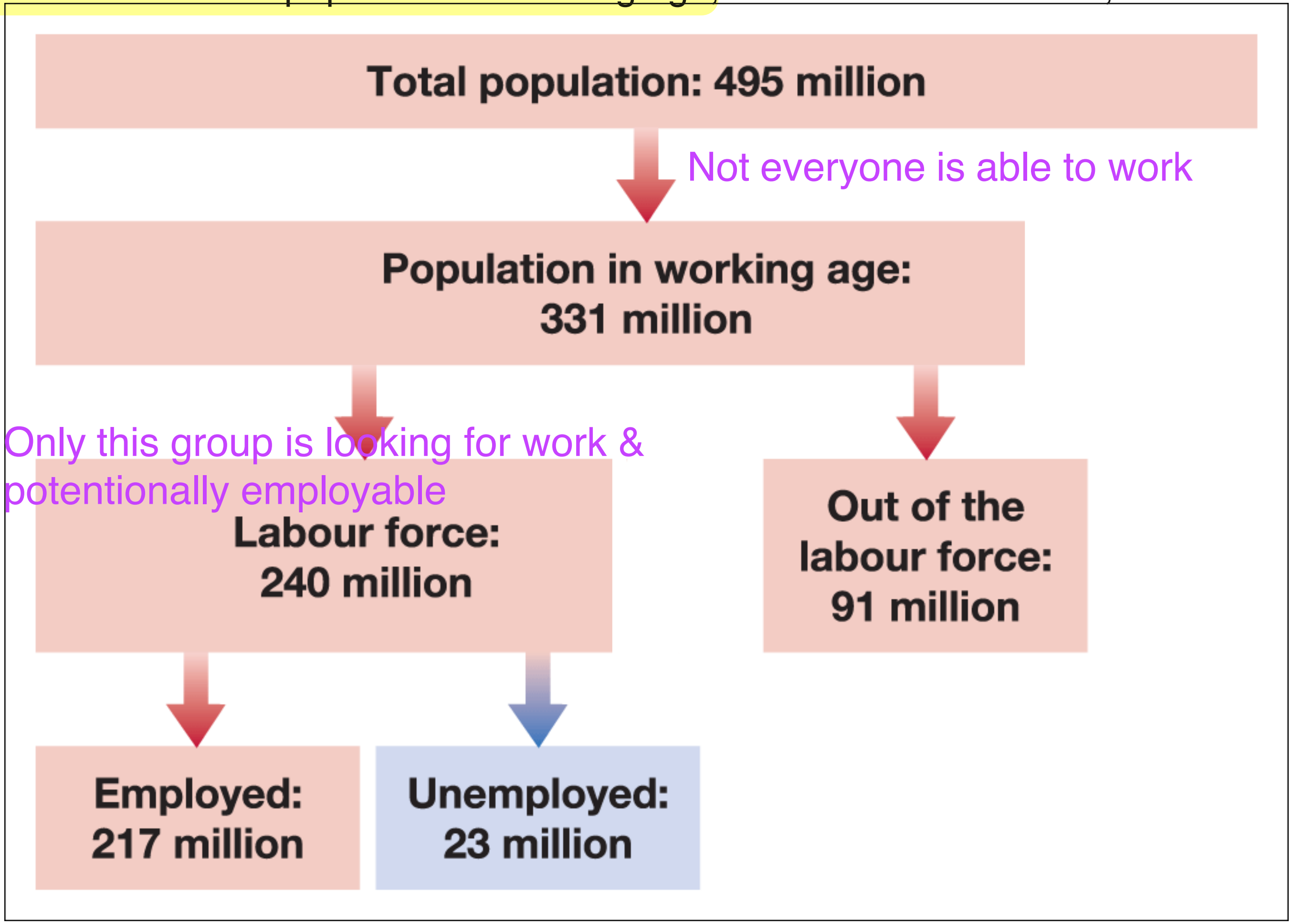


Figure 8.1 **Population, labour force, employment and unemployment in the EU-27 (in millions), 2010**

Source: Eurostat.

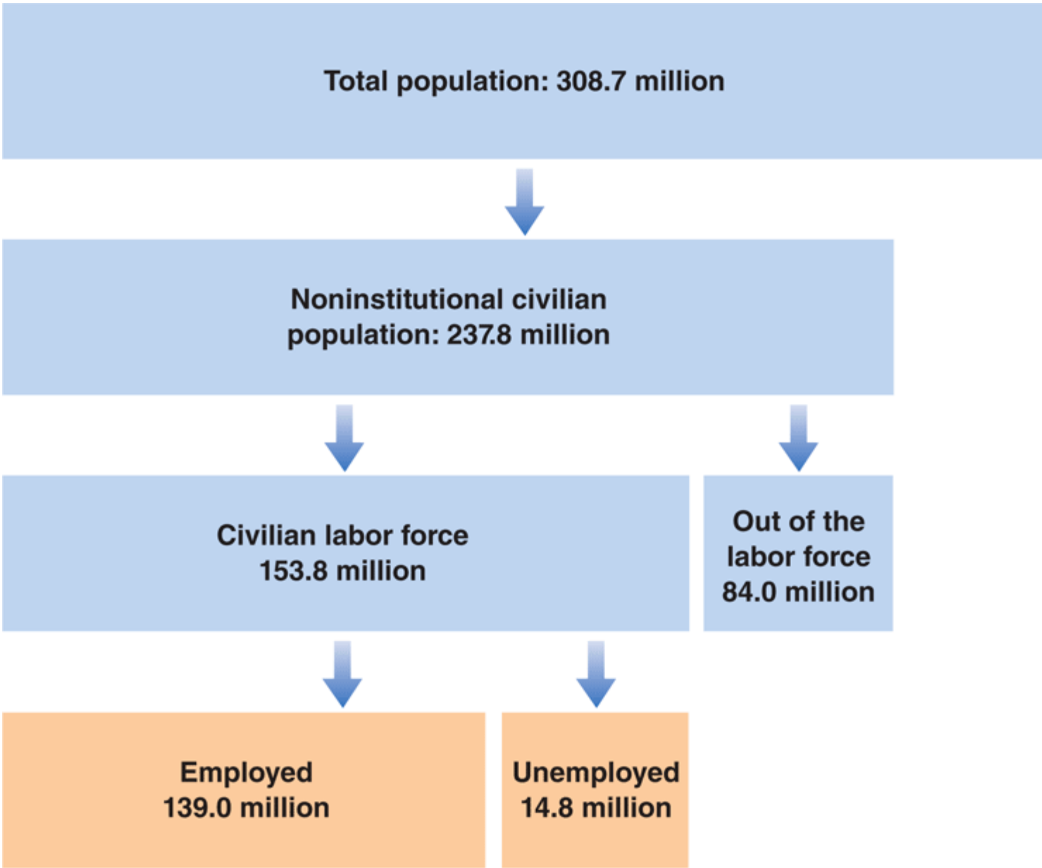
Production = the goods a firm produces = determined by production function
> more goods = more needed labor and machines
> today we assume: producing an additional good = only requiring additional labour

Static

The labour market

Static = at one point in time

Figure 6-1 Population, Labor Force, Employment, and Unemployment in the United States (in millions), 2010



Source: Current Population Survey
http://www.bls.gov/cps/

Number of unemployement relative to the labor force (the fraction that doesn't have a job of the labour force)

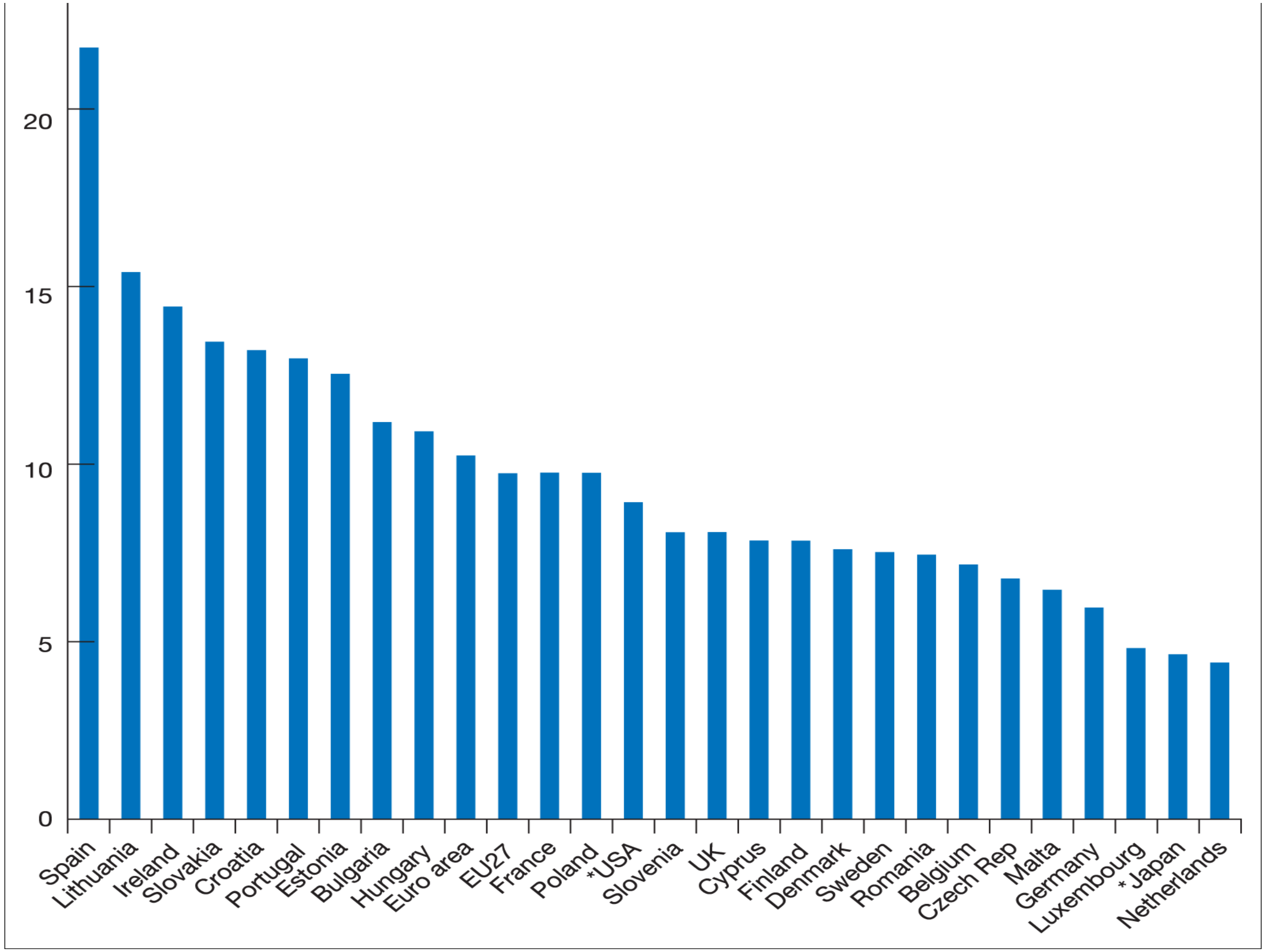


Figure 8.3 **Unemployment rate (Unemployed/Labor force) in European countries, 2011**
The average unemployment rate in Europe hides big differences among countries.
Source: Labour market statistics. Labour force statistics by sex and age: indicators. OECD Employment and Labour Market Statistics *http://stats.oecd.rog/*

The economy isn't in a good state
Participation rate = what is the fraction of people that can work that is actually working

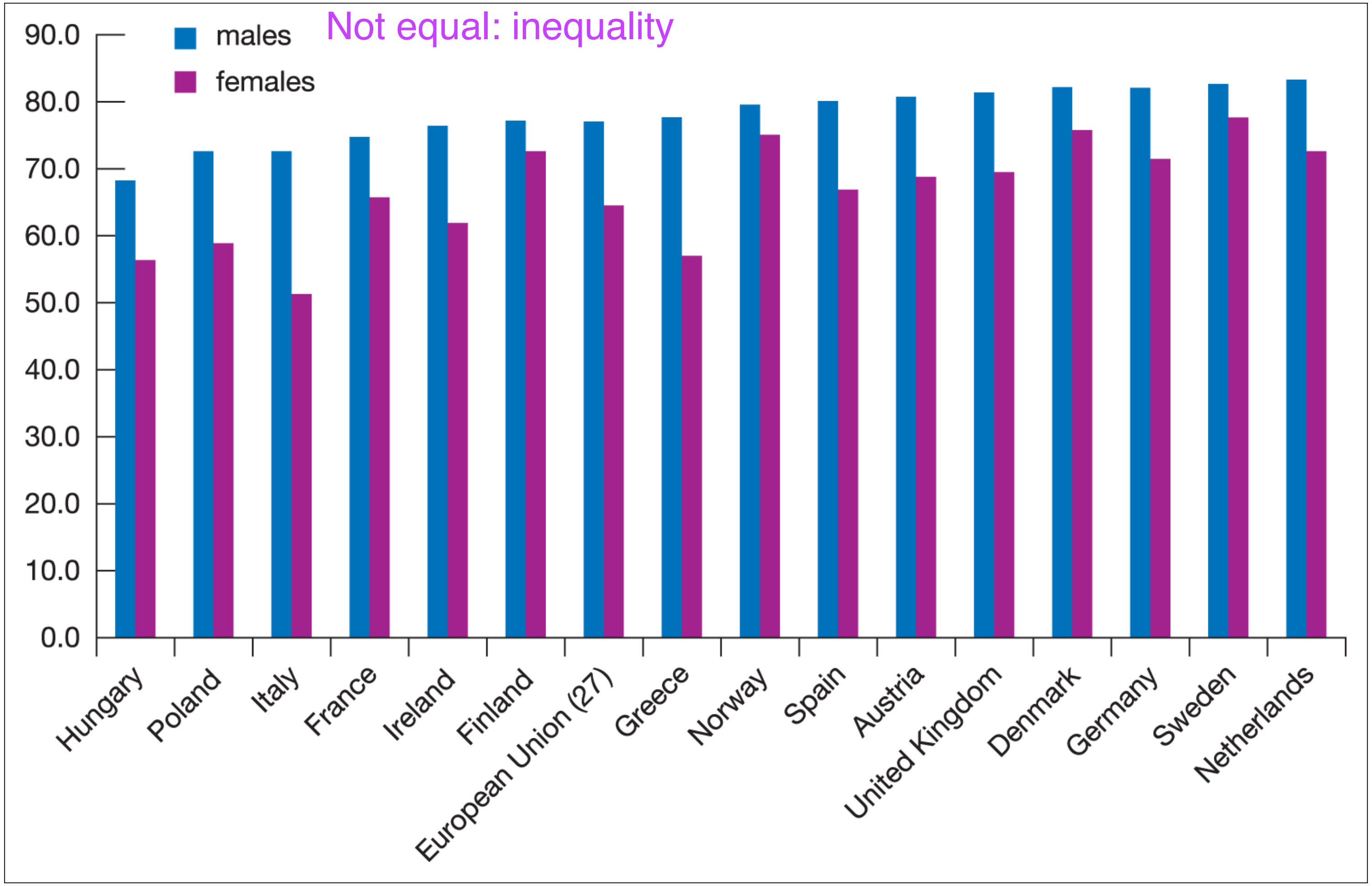


Figure 8.2 **The participation rate (labor force / working age population) of men and women in Europe, 2010**

Source: Eurostat.

Sweden: almost equal
Italy: definitely not equal

Static

looking for work

- 3 categories (**E**mployed, **U**nemployed, **O**ut of the labor force)

  n looking for work
- Careful with definition of U:
  - Discouraged workers: in O
  - Politics and changing definitions
  - => u=U/L does not always tell a full story = unemploymant rate

    unempl/labor force
- Informative:
  - Employment rate = E / (E+U+O)
  - Participation rate = (E+U) / (E+U+O)

They are in effect discouraged workers. And while they are not actively looking for a job, they will take one if they find one. This is why economists sometimes focus on the non-employment rate, the ratio of population minus employment to population, rather than the unemployment rate.

$$\frac{P-E}{E+U+O=P}$$

Static: you only look at one specific point in time
<> Dynamic: a lot of movement between the 3 categories (if you look further than a specific time slot = the flows between the categorys)

Static vs. dynamic

- Unemployment is just a number (stock)
  - Underlying dynamics (flow) determine how problematic
- 3 categories (**E**mployed, **U**nemployed, **O**ut of the labor force)
- 7 flows
- Separations:
  - EE
  - EU
  - EO

One third (2 out of 6 million) of all separations are **leavers** – workers leaving their jobs for a better alternative. The remaining two-thirds are layoffs. **Layoffs** may come from changes in employment levels across firms. At any given time, some firms are suffering decreases in demand and decreasing their employment; other firms are enjoying increases in demand and increasing employment. If **aggregate employment numbers are stable, this does not mean nothing happens in the labour market, a high number of layoffs suggests a reality of continual job destruction and job creation across firms**.

To get a sense of what a given unemployment rate implies for individual workers, consider the following analogy. Take an airport full of passengers. It may be crowded because many planes are coming and going, and many passengers are quickly moving in and out of the air- port. Or it may be crowded because bad weather is delaying flights and passengers are stuck, waiting for the weather to improve. The number of passengers in the airport will be high in both cases, but their plights are quite different. Passengers in the second scenario are likely to be much less happy.

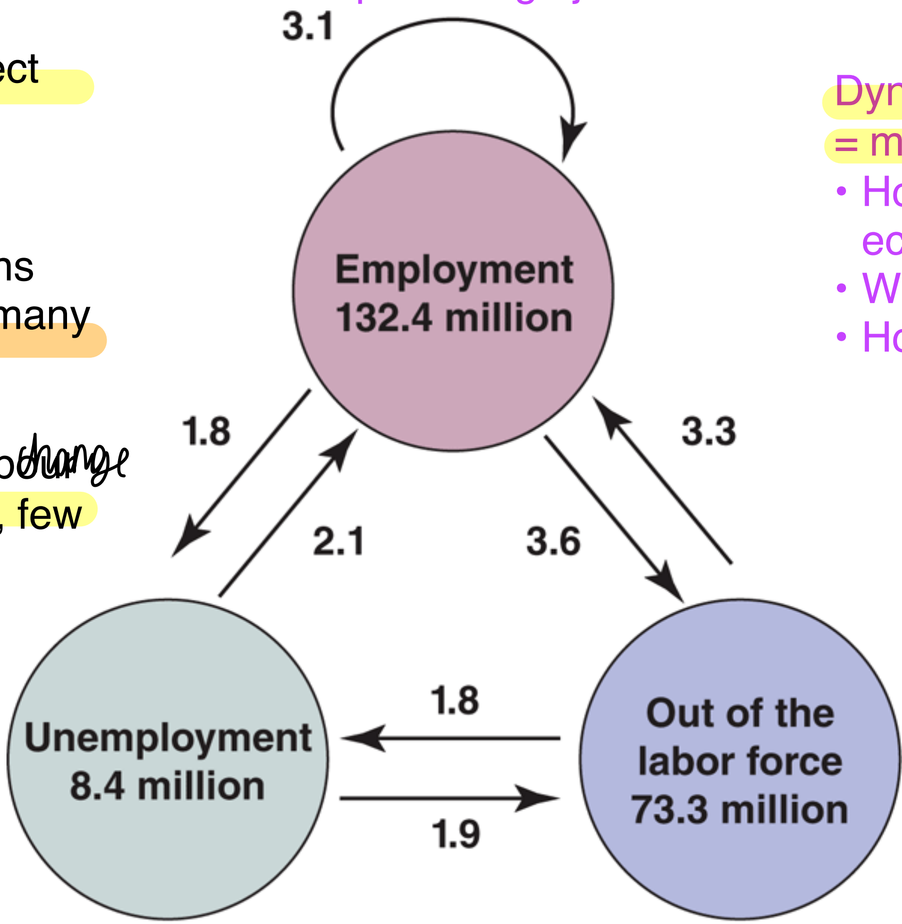
Dynamic

In the same way, a given unemployment rate may reflect two very different realities.

1. may reflect an active labour market, with many separations and many hires, and so withmany workers entering and exiting unemployment;
2. or it may reflect a sclerotic labour = slow change market, with few separations, few hires and a stagnant unemployment pool.

Figure 6-2 Average Monthly Flows between Employment, Unemployment, and Nonparticipation in the United States, 1994 to 2011 (millions)

People change jobs



Dynamic: how big are the flows = monthly fluctuations

- How do these flows move with the economy
- When do these flows occur
- How do the flows change over time

Unemployment rate = % of people in the labor force looking for a job but not finding one

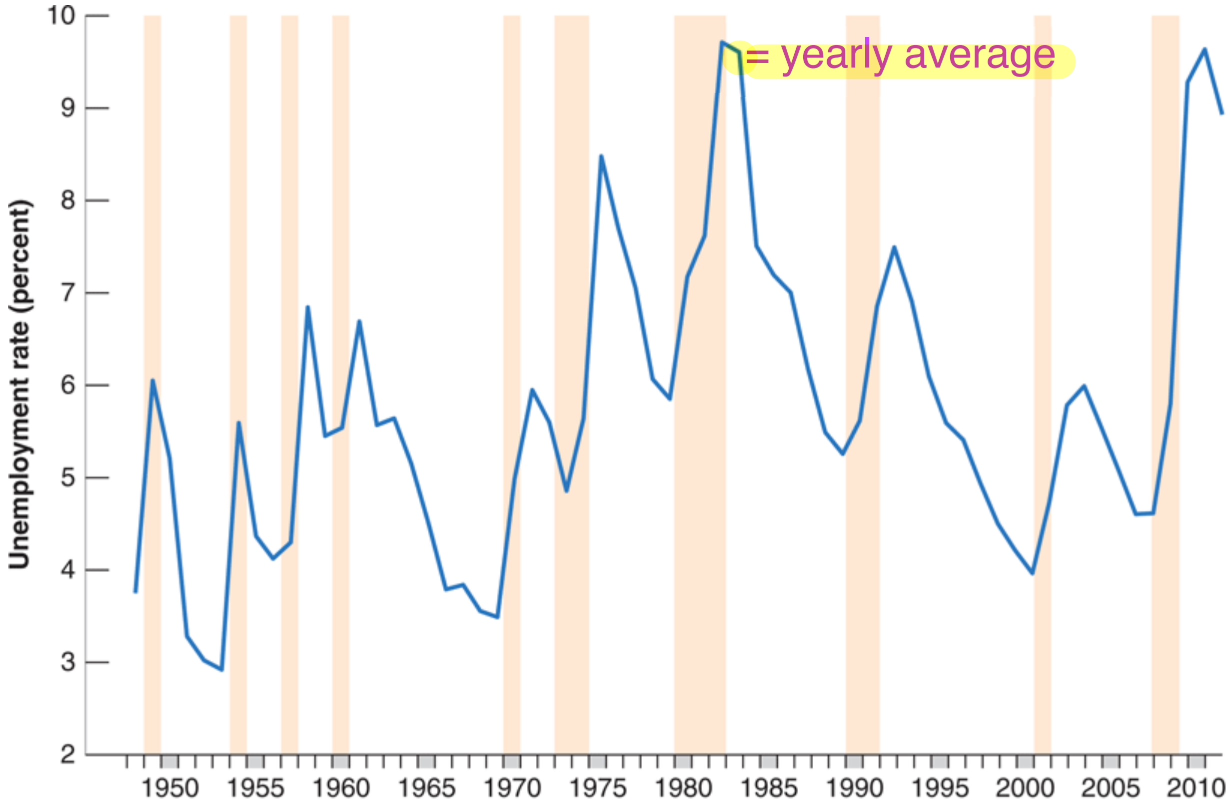
Unemployment & the business cycle

Figure 6-3 Movements in the U.S. Unemployment Rate, 1948–2010

- Level:
  - Min (frictional)
  - Max (yearly average)
- Cyclical:
  - Lag: slow expansion, EPL

Lightly coloured bars = recessions = negative economic growth

- around every recession: unemployment rate goes up
- Unemployment rate peaks after the recession bar ends
- Thus there is cyclicality in unemployment: when economy is doing well (white) - unemployment rate is low = counter cyclical = correlates negative to the economic cycler (good economy = low unemployment). Highest unemployment happens after recession happens, so unemployment rate respons slowly to economic activity



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

Unemployment is never zero (and we don't want it to because we want labour availabilityin the market)

Why cyclical? Effects?

- *U* has several different effects on an individual employee:

- A firm that faces less demand, has less need for inputs
- Options:
  - Hire fewer people
    - *UE* lower, since:
      - Less jobs
      - More candidates
  - Reduce wage
  - Fire
    - *EU* higher

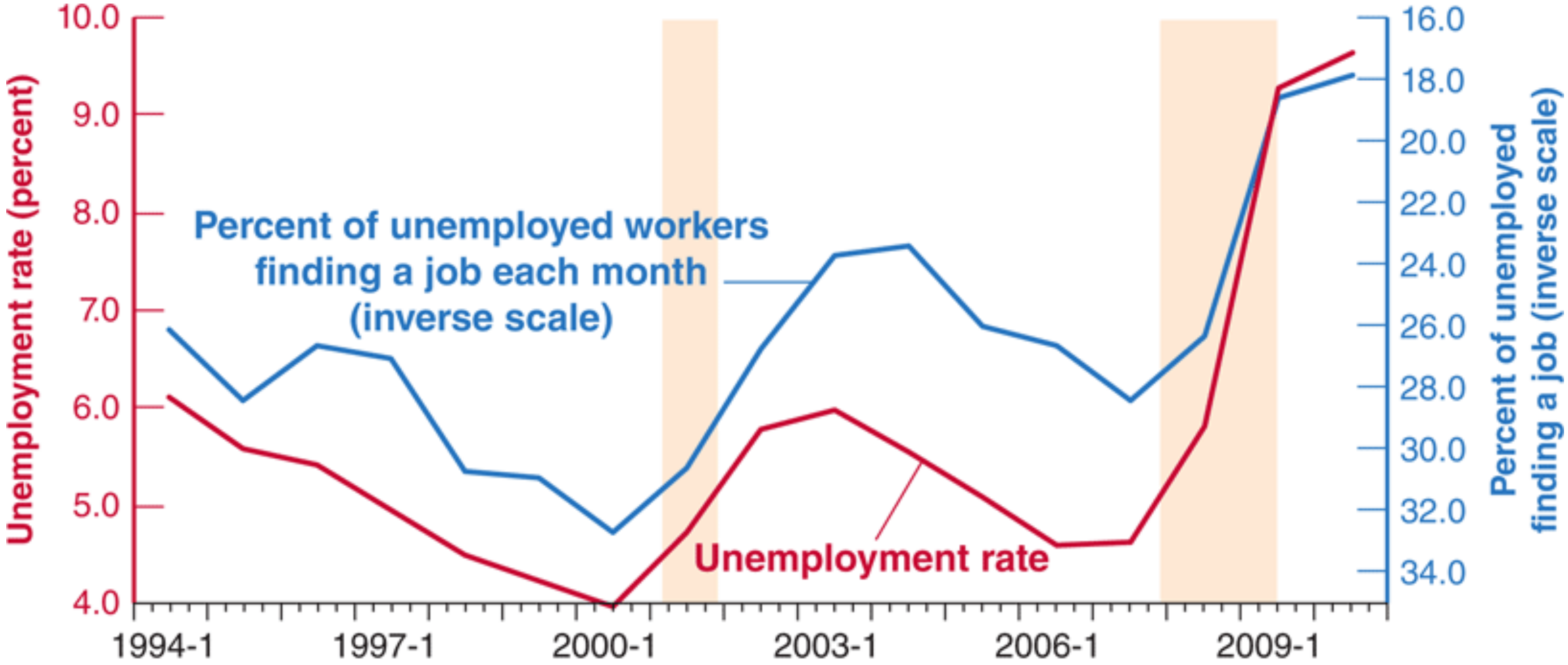
Income fluctuates over time = GDP fluctuating > affecting firms demands and sale of firms > affects how many workers the firm need

- recession: not selling a lot of goods, you won't be able to employ more people. If you stop hire people, fewer people move out of unemployment to employment. Most drastic: firing people

6-2 Movements in Unemployment

Figure 6-4 The Unemployment Rate and the Proportion of Unemployed Finding Jobs, 1994–2010

= UE / U



Source: See Figure 6-2.

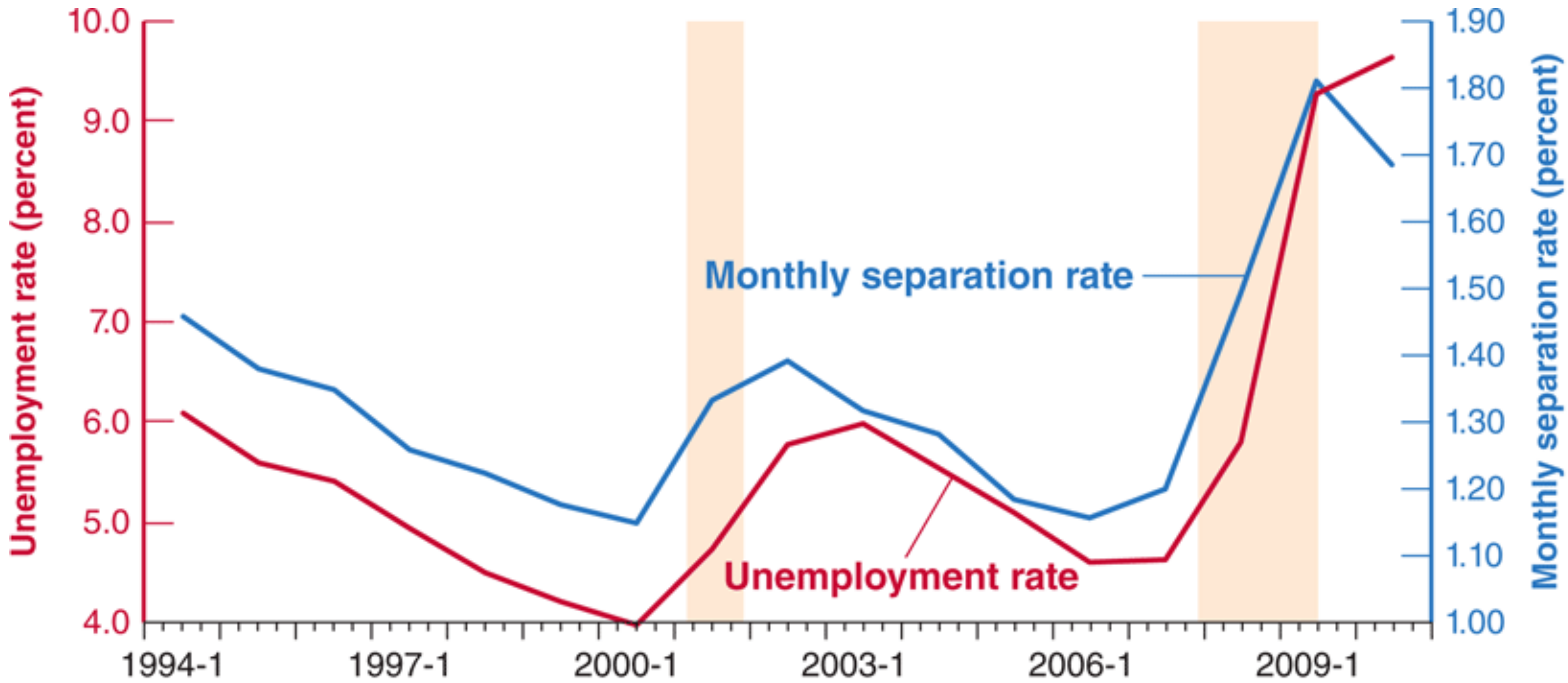
The probability (blue) co moves with the unemployment rate = same cyclicality

- as the unemployment rate is high there are few people finding a job

6-2 Movements in Unemployment

Figure 6-5 The Unemployment Rate and the Monthly Separation Rate from Employment, 1994–2010

= (EU + EO) / E



Seperation rate = the people in the employed category, how many of them move into unemloyment of out of labour force?

> when unemployment rate is high (during recession = red line is high), the seperation rate is high: higher probability of getting fired

Unemployment US and Europe

= striking pattern over time

- 80's:
  - Change in pattern
- Recent crisis:
  - Numbers
  - Composition (e.g. youth unemployment, long-term unemployment)
- Length *U*: US (2-3 months) << Europa
- Why?
- Policy options?

US: fluctuates over time and goes down after every recession (average unempl = 4 to 6%)
EU: very low unemployment rate in 60 and 70's, which then massivly increased as we had recessions, but the unemployment rate are not getting down any more (we have an average of 10%)

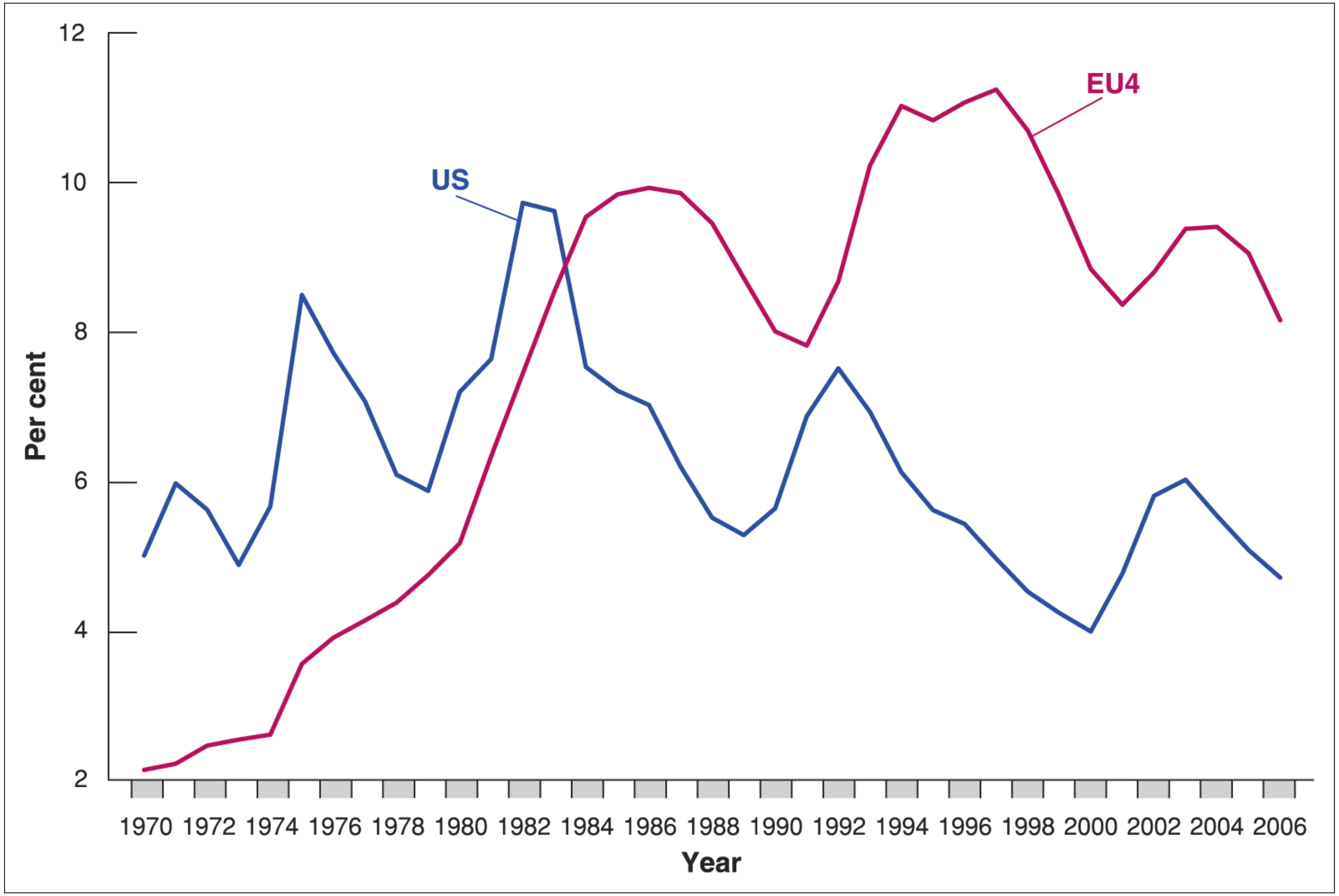
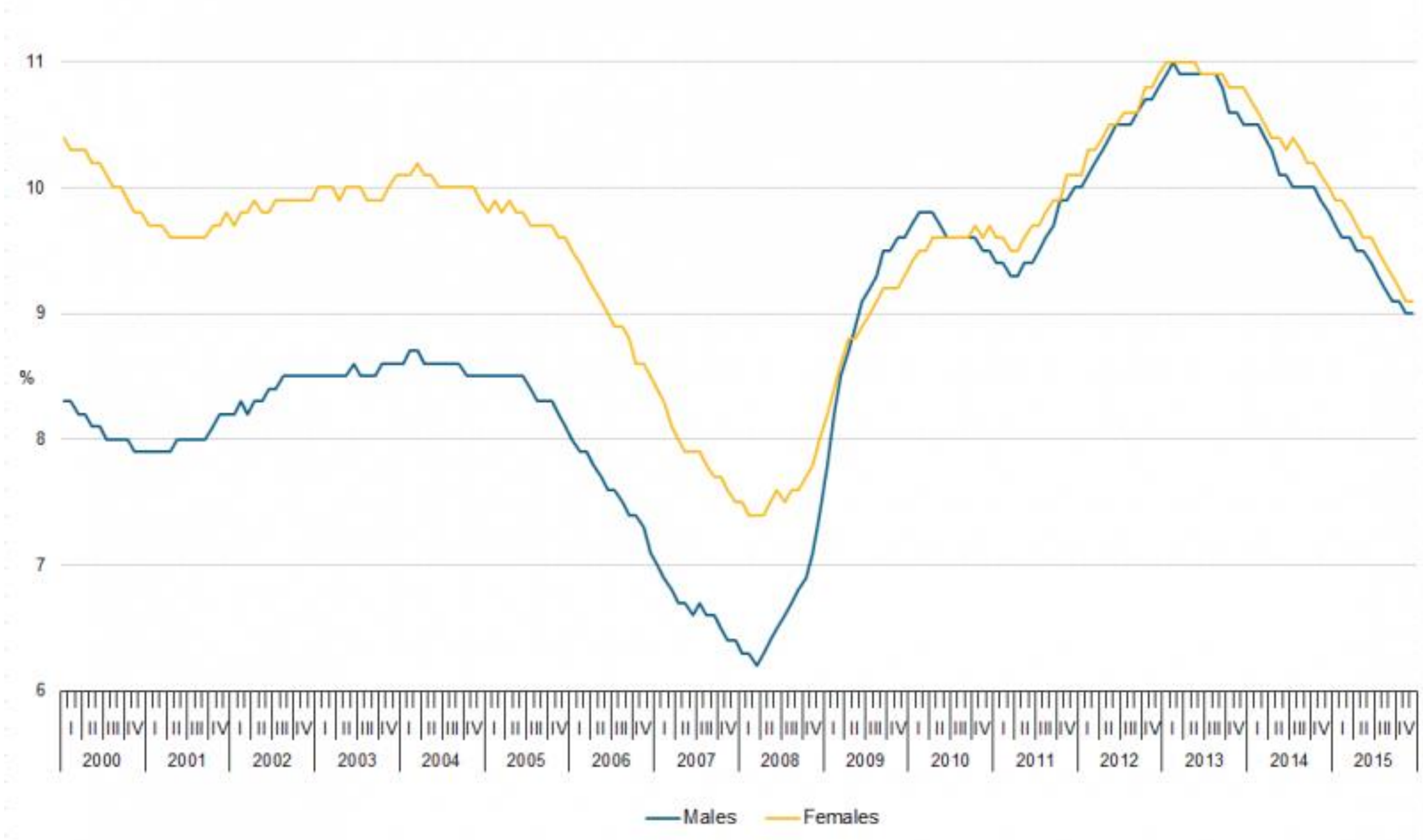


Figure 1.2 **The unemployment rate in continental Europe and the USA since 1970**
Until the beginning of the 1980s, the unemployment rate in the four major European countries was lower than the US rate, but then it rapidly increased.
Source: IMF, World Economic Outlook, Spring 2009, p. 1.

Unemployment rates by gender, EU, seasonally adjusted, January 2000 - December 2015



Youth unemployment

High youth unemployment rates do reflect the difficulties faced by young people in finding jobs. However, this does not necessarily mean that the group of unemployed persons aged between 15 and 24 is large, as many young people are studying full-time and are therefore neither working nor looking for a job (so they are not part of the labour force which is used as the denominator for calculating the unemployment rate). For this reason, youth unemployment ratios are also calculated, according to a somewhat different concept: the unemployment ratio calculates the share of unemployed for the whole population. Table 1 shows that youth unemployment ratios in the EU are much lower than youth unemployment rates; they have however also risen since 2008 due to the effects of the crisis on the labour market.

Source: Eurostat

	Youth unemployment rate				Youth unemployment ratio		
	2012	2013	2014	2014Q4*	2012	2013	2014
EU-28	23.3	23.7	22.2	21.4	9.8	9.9	9.1
Euro area	23.5	24.4	23.8	23.2	9.6	9.8	9.4
Belgium	19.8	23.7	23.2	22.4	6.2	7.3	7.0
Bulgaria	28.1	28.4	23.8	23.0	8.5	8.4	6.5
Czech Republic	19.5	18.9	15.9	14.5	6.1	6.0	5.1
Denmark	14.1	13.0	12.6	11.2	9.1	8.1	7.8
Germany	8.0	7.8	7.7	7.4	4.1	4.0	3.9
Estonia	20.9	18.7	15.0	14.4	8.5	7.4	5.9
Ireland	30.4	26.8	23.9	21.9	12.3	10.6	8.9
Greece	55.3	58.3	52.4	51.1	16.1	16.5	14.7
Spain	52.9	55.5	53.2	51.7	20.6	21.0	19.0
France	24.4	24.8	24.1	24.6	8.9	8.9	8.5
Croatia	42.1	50.0	45.5	46.3	12.7	14.9	15.3
Italy	35.3	40.0	42.7	42.0	10.1	10.9	11.6
Cyprus	27.7	38.9	35.9	33.9	10.8	14.9	14.5
Latvia	28.5	23.2	19.6	18.2	11.5	9.1	7.9
Lithuania	26.7	21.9	19.3	18.5	7.8	6.9	6.6
Luxembourg	18.0	16.9	21.2	23.5	5.0	4.0	6.0
Hungary	28.2	26.6	20.4	18.9	7.2	7.3	6.0
Malta	14.1	13.0	11.8	11.1	7.2	6.9	6.2
Netherlands	11.7	13.2	12.7	11.9	6.6	7.7	7.1
Austria	9.4	9.7	10.3	10.2	5.6	5.7	6.0
Poland	26.5	27.3	23.9	22.0	8.9	9.1	8.1
Portugal	38.0	38.1	34.7	33.3	14.1	13.3	11.9
Romania	22.6	23.7	24.0	23.6	6.9	7.1	7.1
Slovenia	20.6	21.6	20.2	19.1	7.1	7.3	6.8
Slovakia	34.0	33.7	29.7	26.9	10.4	10.4	9.2
Finland	19.0	19.9	20.5	21.1	9.8	10.3	10.7
Sweden	23.7	23.6	22.9	22.4	12.4	12.8	12.7
United Kingdom	21.2	20.7	16.9	16.1	12.4	12.1	9.8
Iceland	13.6	10.7	10.0	9.7	10.2	8.3	7.5
Norway	8.6	9.1	7.9	7.8	4.8	5.2	4.3
Switzerland	:	:	:	:	5.7	5.8	5.8
Turkey	15.8	17.1	18.0	19.2	5.9	6.6	7.3
United States	16.2	15.5	13.4	12.6	:	:	:
Japan	8.1	6.8	6.3	:	:	:	:

: data not available

* The quarterly youth unemployment rate is seasonally adjusted.

Labour market

- Numbers

So what moves labour market?

- **Theories**
- Model

Wage setting: In practice

- Especially in Europe:
  - Collective bargaining: unions
  - Different bargaining levels (firm, sector, country)
- Less so in the US:
  - Wage determined by employer
  - Individual negotiations

Features that characterise labour market in EU
- demand: firms that want to produce need input
- Supply: workers in the firms

Price of labour = wage
So how are wages in EU set?
- set by collective bargening: by unions
- The bargening is at sector level, country level,...
- These negotations are dominating the wage setting process

<> US: they do not want collective barganing procedures, when you talk about the wage is a conversation between you and an your employer

-Workers paid a wage that exceeds their **reservation wage**, the wage that would make them indifferent between working or being unemployed.
-Wages typically depend on labour market conditions. The **lower the unemployment rate, the higher the wages**.
Two broad lines of explanation. The first is that even in the absence of collective bargaining, workers have some bargaining power, which they can and do use to obtain wages above their reservation wages. The second is that firms themselves may, for a number of reasons, want to pay wages higher than the reservation wage.

Wages (and unemployment)

*= firms are paying a wage higher than reservation wage because firms want to (because if we pay workers better > motivated workers > more profit)

2 important conditions:

- Crucial factors in wage setting: (Wage = w)
  - Reservation wage – the wage at which you prefer not to work
  - Labor market conditions (U ~ 1/W)

Bad times: employer might fire you, you go not ask for a pay raise

- 2 types of theories:
- $\boxed{\text{Bargaining}}$ (irrespective of the level) = organisation vs employee
  - Employees have power to bargain W > reservation W

depends on two factors:
1) how costly it would be for the firm to replace him or her, were he or she to leave the firm.
2) how hard it would be for him or her to find another job, were he or she to leave the firm.
=> The more costly it is for the firm to replace the worker, & easier it is for him or her to find another job, the more bargaining power he or she will have.

- Efficiency wages*
  - Firms want to pay W > reservation W

efficiency ~ productivity

- Irrespective the theory, 2 types of determinants:
  - Job-specific characteristics
  - Labour market characteristics

But if workers are paid only their reservation wage, they will be indifferent between staying or leaving. In this case, many of them will quit, and the turnover rate will be high. Paying a wage above the reservation wage makes it the jobs more attractive and better financially attractive for workers to stay. It decreases turnover and increases productivity.

A low unemployment rate makes it more attractive for employed workers to leave: when unemployment is low, it is easy to find another job. This means that when unemployment decreases, a firm that wants to avoid an increase in leavers will have to increase wages to induce workers to stay with the firm.

Bargaining

- Bargaining power determines the level of the wage

- How hard is it for an <u>employer</u> to hire a new candidate?
  - Job-specific:
    - Required firm-specific knowledge very high => employee has a lot of power
  - Labour market specific:
    - Many candidates looking for a job (U high) => employee has little power

- How hard is it for an <u>employee</u> to find a new job?
  - Job-specific:
    - Is all acquired knowledge firm-specific?
  - Labor market specific:
    - U low: easy to find a different job => W high
    - U high: many other applicants for the same job => less power => W low

Efficiency wages

- Wage above the reservation wage because the employer wants the employee to stay
  - Reducing turnover (=separations/E)
  - E.g.:
    - To validate on-the-job-training
    - To avoid new costly search
    - To motivate employees
    - …
- Wage => productivity, efficiency

- Job-specific:
  - Morale ~ Innovation ~ wage
- Labour market specific:
  - If U low, (relatively) more interesting to resign => firm increases the wage to avoid that

Famous example of efficiency wages

- high turnover rate (almost 400%) your workforce disappears 4 times in 1 year ≠ stable production: new people and training needed
- What they decided: let's double the wage, people weren't layed off as much but they also quit less frequently = lower turnover rate
- By more wages thay were able to stabilise the labour market flows of hiring and firing + productivity increased (you worked with more expierienced people) = increased profits

Focus: Henry Ford and Efficiency Wages

Table 1 Annual Turnover and Layoff Rates (%) at Ford, 1913–1915

	1913	1914	1915
Turnover rate	370	54	16
Layoff rate	62	7	0.1

High turnover

Suddenly: double wage

Absenteism: 10% (1913) => 2,5% (1914)

Productivity: + 30 a 50%

Profit rises despite enormous increase in wage bill

Labour market

- Numbers
- Theories
- **Model**

What moves price and quantiy in the labour market?
> quantity: (un)employment rate
> price: wage

Model

- Supply of labour: Supplying labour = workers
  - Depends on the wage
  - Wage setting by employees (unions)

- Demand for labour: firms demand labours since for production labour is an important input
  - Producing firms require inputs
  - Decide on prices (price-setters)

- Equilibrium
  - Demand labour = supply labour
    - How much we work depands on the wage, barganing theories: the hight of wage is set in negotation = by unions (in EU)
    - Firms demand labour: they demand labor to produce, they agree to pay the wage (passive) but are active in price setting, so once the wage is known they are pricing the product they are selling

Behavioral relationship: wage (nominal wage in euro's) = determined by
1) Pe = price index of economy, expected = at some point in the future = future price because we don't care about the nominal wage but we care about what we can buy. Why do we care about expectation: when employe and employer are sitting down togheter the wage for the next years is decided (we're stuck with it): it's not influenced wit higher of lower prices
2) unemployment rate
3) other = z

Wage formation: model

= wage setting = labour supply

$$W = P^e F(u, z) \qquad (6.1)$$
$$(-, +)$$

-The unemployment rate, u.
-A catchall variable, z, that stands for all other variables that may affect the outcome of wage setting.

BE: wage indexation (is very unique) = to prevent dramatically fall down of wages due to inflation

- Nominal wage W
- (Expected) Price-level P^e
  - Why real $(\frac{W}{P})$? workers care $\frac{W}{P}$ about
    - Consumer: how many goods of price P does my wage W buy?
    - Firm: how much W am I paying compared to the price P I receive for a sold good
  - Why expected (P^e)?
    - Bargaining/wage-setting W happens in advance
      - Unions: 2-3 year in advance
    - You want to buy goods once you receive W
    - If you expect that P^e x2 => you will demand W x2
    - A firm that expects to receive twice as much for a good, will be willing to pay twice the wage

why do wages depend on the expected price level, Pe, rather than the actual price level, P? Because wages are set in nominal (say, euro) terms, and when they are set, the relevant price level is not yet known. For example, in many union contracts in Europe, nominal wages are set in advance for a few years. Unions and firms have to decide what nominal wages will be over the following years based on what they expect the price level to be over those years. E

$$W = P^e F(u, z) \qquad (6.1)$$
$$(-, +)$$

So if $u \nearrow$: $W \searrow$

- u => W
    - Bargaining
    - Efficiency wages

If we think of wages as being determined by bargaining, then higher unemployment weakens workers' bargaining power, forcing them to accept lower wages. If we think of wages as being determined by efficiency wage considerations, then higher unemployment allows firms to pay lower wages and still keep workers willing to work.

- z: various factors Zie HB
    - For given P^e and u
    - Reservation wage (+) Higher reservation wage = higher z = higher wage W needed
    - Unemployment insurance (+) The better the unemploymant benifits, the higher the wage in the labour market will be + how long do you get these benifits
    - Minimum wage (+) If minimum wage is higher = lower bound of firm > lower bound increases > nominal wage increases
    - Employment protection (e.g. how hard is it to fire employees?)
        - Power of the union How well protected are you against layoffs (differs between countries) + notice period

      If it's hard to fire employees (and costly) > shift the balance of power towards employees > unions will have a lot of bargaining power > higher nominal wage
    - Labor market policy (e.g. activation of the unemployed)
        - For given u, how easy is it to find alternative employees?

          = maintaining qualtiy of unemployed

          = re activation = learning new stuff or activities that keep you motivated to enter the labour market (to prevent depreciation of human capital) heterogeneity between countries

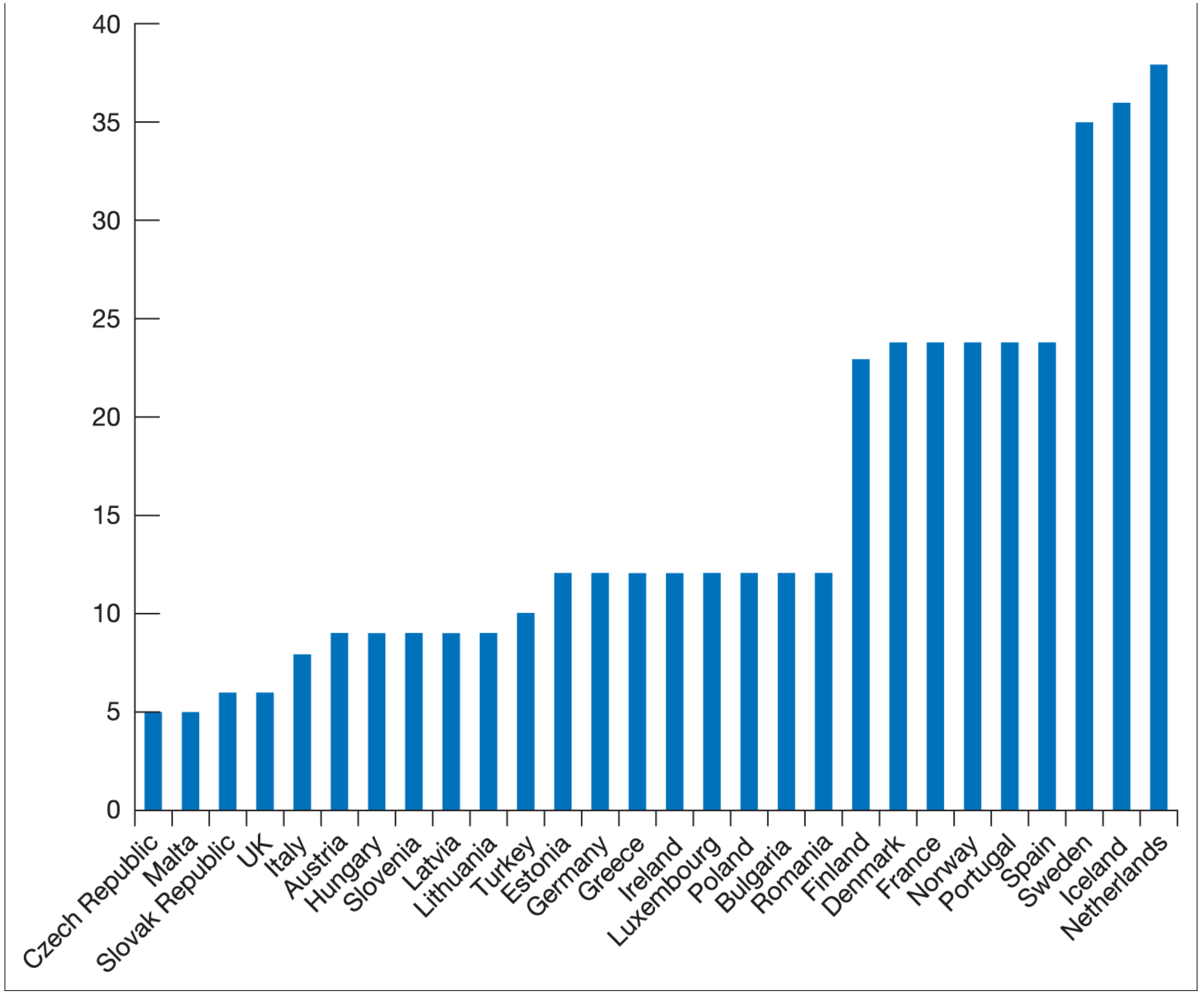
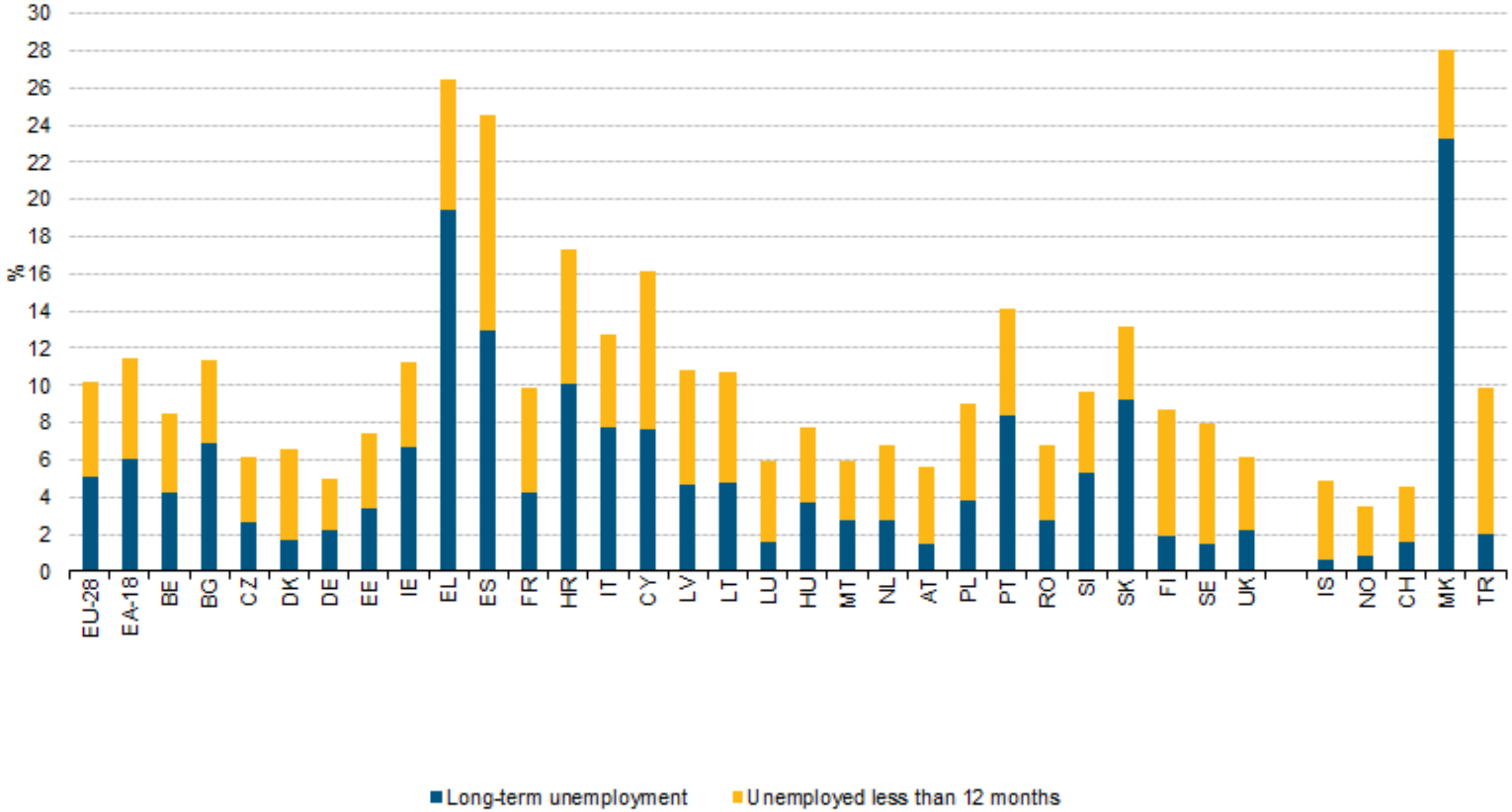


Figure 8.7 **Duration of unemployment insurance in Europe, 2010 (in months)**

Source: Benefits and Wages, OECD indicators
www.oecd.org/els/social/workincentives

heterogeneity between countries: quality of work pool
> concerning: blue = how many have been long term unemployment = a lot of attention to this fraction because that tends to be persistent, once you're 12 months out of a job it's hard to re enter and you aren't attractive to be hired

Long-term unemployed



A lot of heterogeneity

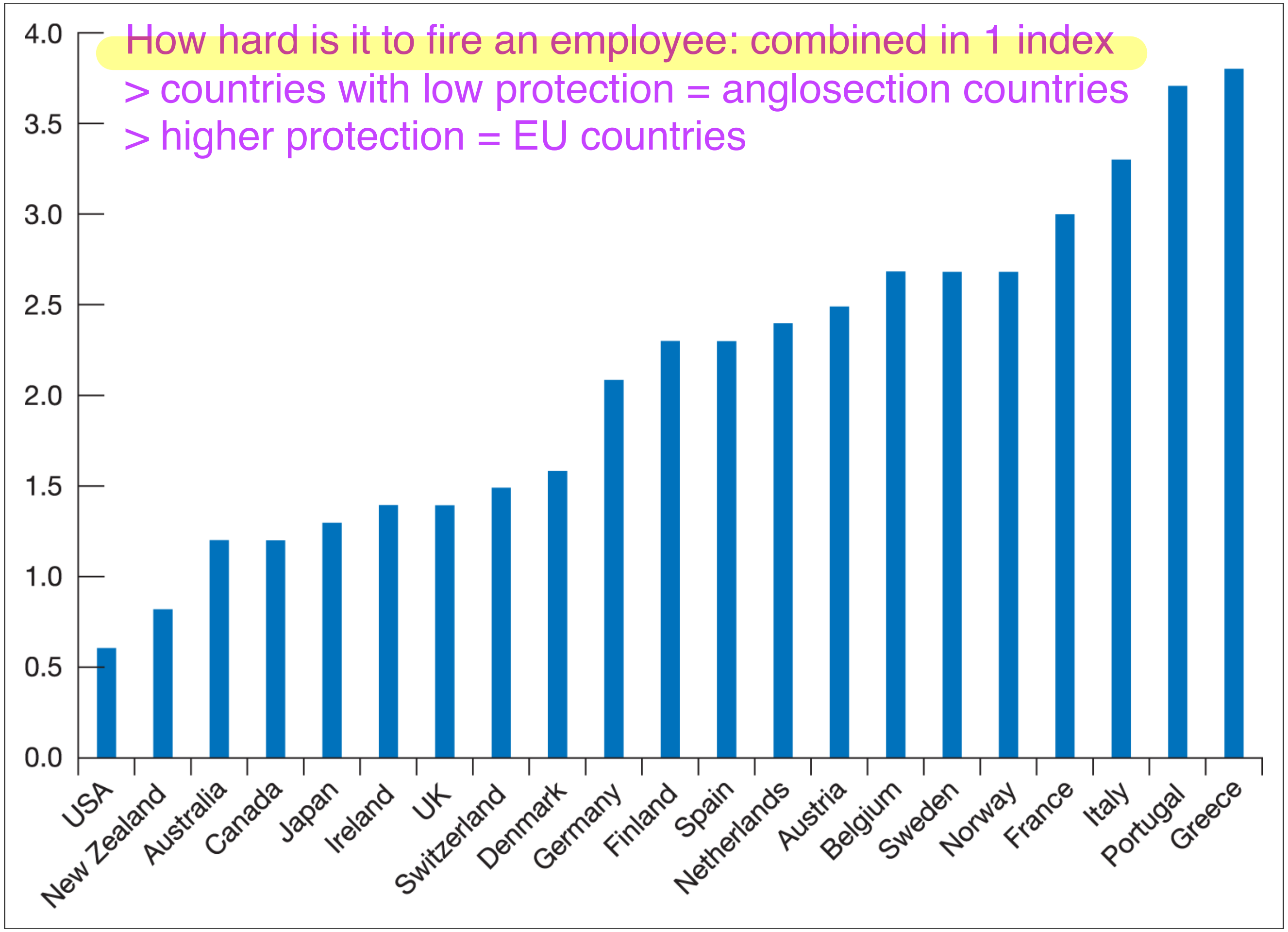


Figure 8.8 **Employment protection across European countries, 2003**

Source: Allard, Gayle, 'Measuring job security over time: in search of a historical indicator for EPL', IE Working Paper, WP05-17, Madrid 2005. CESifo, DICE database www.cesifo-group.de/portal/page/portal/ifoHome/a-winfo/d3iiv

Price setting = labour demand

- Price ~ cost ~ production function

- Production function:
- In general: Y=f(inputs)
  - f includes productivity of inputs
  - Possible inputs:
    - N: labour
    - K: capital
    - Materials, oil, …

Simplest function: if we want to produce goods Y, we needs some labour N (we are not going to specify the labour productivity, ...)

So what does it cost to produce an additonal cost = the cost of an additional worker = marginal cost = the wage

- Here: simplifying assumptions:
  - Only 1 production factor: labour (N)
  - Technology A constant
  - Y=AN
  - A=1 => Y=N
  - Constant returns to scale: input (N) x2 => output (Y) x2

Y is output, N is employment and A is labour productivity.

Price setting

- Marginal cost of one unit production Y
  - 1 unit production requires 1 employee N
  - Cost of an employee: wage W

How much the firm can charge (price for their goods) depends on:

- Price setting depends on (competitiveness) environment in which the firm operates:
- 1. Perfect competition
  - $P = W$
- 2. Imperfect competition Not all markets are equally competitive = more realistic in our world
  - $P = (1 + m)W$
  - m=markup (market power) >0
    - Note: m (Blanchard Johnson) = μ (Blachard Amighini Giavazzi)

The production function, Y = N, implies that the cost of producing one more unit of out- put is the cost of employing one more worker, at wage W. Using the terminology introduced in your microeconomics course: the marginal cost of production – the cost of producing one more unit of output – is equal to W.

If there were perfect competition in the goods market, the price of a unit of output would be equal to marginal cost: P would be equal to W. But many goods markets are not compet- itive, and firms charge a price higher than their marginal cost

Unemployment

- Supply of labour:
  - Depends on the wage
  - Wage setting by employees (unions)

- Demand for labour:
  - Producing firms require inputs
  - Decide on prices (price-setters)

- Equilibrium
  - Demand labour = supply labour
  - => Equilibrium unemployment (natural rate of unemployment)

Let's look for equilibrium

Wage-Setting relation

- We saw earlier:

$$W = P^e F(u, z) \quad (6.1)$$
$$(-, +)$$

Assumption: we're in the medium term where

- Simplifying assumption (Medium term): $P^e = P$

Than we can write this in:

If something surprises us, it's won't surprise us a second time, you can't keep fooling people

$$\frac{W}{P} = F(u, z) \quad (6.4)$$

= real wage we negatioate as unions

$$(-, +)$$

The wage chosen by wage-setters: WS

Figure 6-6 Wages, Prices, and the Natural Rate of Unemployment

Real wage or price

Quantity or unemployment rate

High umployment rate: wage setters will be accepting lower wages because they're scare to fall in unemployment = difficult to get out of because there is a lot of competition with other unemployment

Price

$P = (1+m) \cdot W$

$\downarrow$

$W/P = \frac{1}{1+m}$

$W = P^e \cdot F(u, z)$

$= P \cdot F(u, z)$

$\downarrow$

$\frac{W}{P} = F(u, z)$

If there is a change in catchall: the purple curve is shifting: a higher z = higher real wage (if I prefer to stay at home, inrespective to how many unemployment there is in the market firms are going to have to pay me more)

Price-setting: PS

- Firm chooses price P: $P = (1 + m)W$ (6.3)

- For given wage W
- Which implies real wage W/P

Higher te markup > more marketpower > higher m inxreases: higher i set prices > wage we pay is going to pay fewer goods

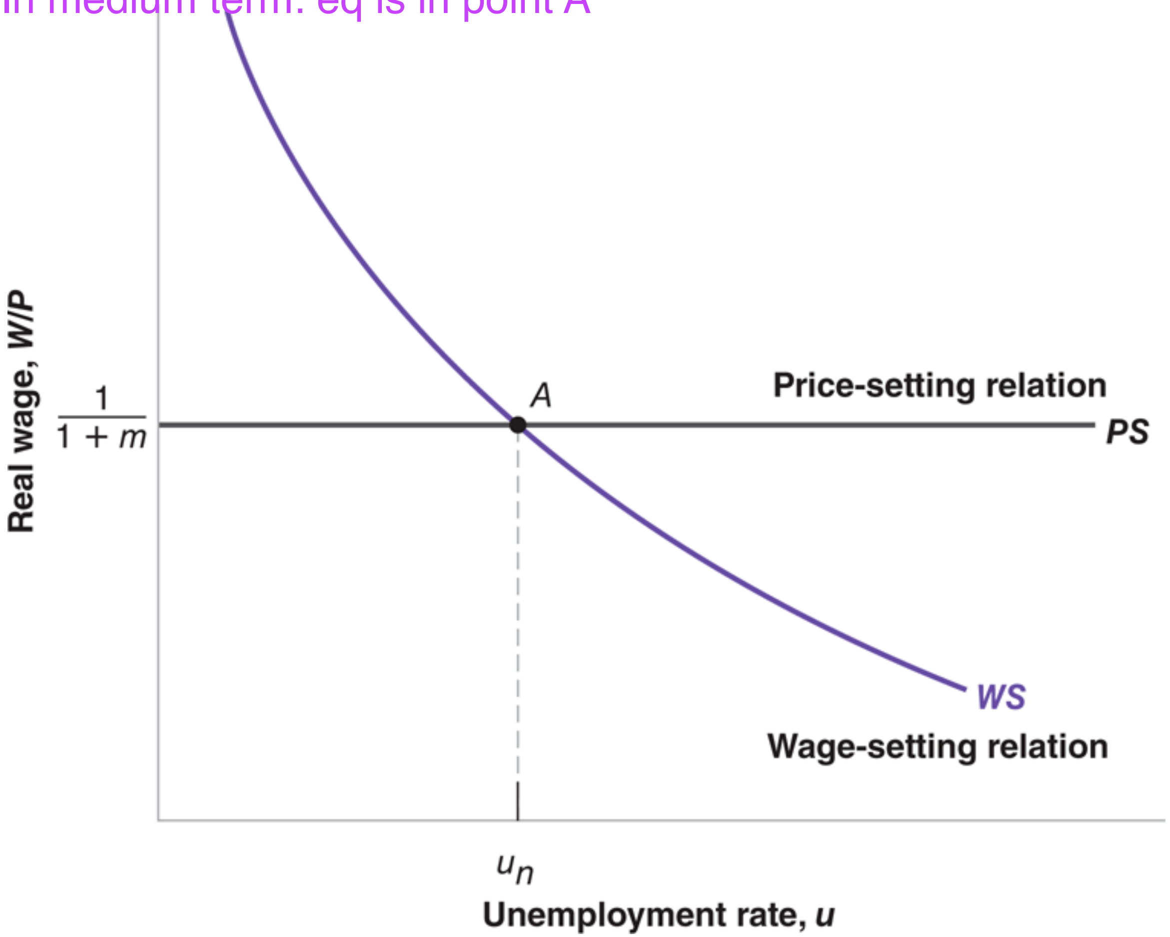
$$\frac{P}{W} = 1 + m \tag{6.5}$$

$$\frac{W}{P} = \frac{1}{1 + m} \tag{6.6}$$

Price setting curve = demand
Real wage = 1/ (1+m), no unemployment present = undependant = straight line

The price (and thus real wage) chosen by price setters: PS

In medium term: eq is in point A



Un, with n = natural unemployment rate

Natural (structural) Rate of Unemployment

$$\frac{W}{P} = F(u, z) \tag{6.4}$$

$$(-,+)$$

$$\frac{W}{P} = \frac{1}{1+m} \tag{6.6}$$

- Labour market equilibrium

$$\boxed{F(u_n, z) = \frac{1}{1+m}} \tag{6.7}$$

  - Note:
  - “Natural”: without human influence (policy)

= natural rate of unemployment
Because we're in medium term: short term
policis (monitary, fiscal policy = short therm) =
their effects will have died out
= structural unempoyment rate

Increase in unemployment benefits

Figure 6-7 Unemployment Benefits and the Natural Rate of Unemployment

In words: at a given unemployment rate, higher unemployment benefits lead to a higher real wage. A higher unemployment rate is needed to bring the real wage back to what firms are willing to pay.

Increase in unemployment benifits: for a given level of unemployment when the benfitits increase we are going to stay home more often = we demand higher wages

So wage demand increased > but firms are only willing to pay the real wage > so firms increase their prices > real wage starts to fall > prices increase > so wet get to A' (in this point the real wage didn't change, the nominal wage and prices did change) = increase in natural rate of unemployment

Politics and labour market policies

Unemployment benefits: perspectives

- Individual perspective
  - Insurance against unemployment
  - Expanding appears a social measure

- Macro perspective
  - Increase in unemployment benefits can lead to higher equilibrium wage and thus to an increase in unemployment
  - Not particularly socially desirable

IF we pay more > unempoyment rate is going to increase
> more unemployment = not socially desirable

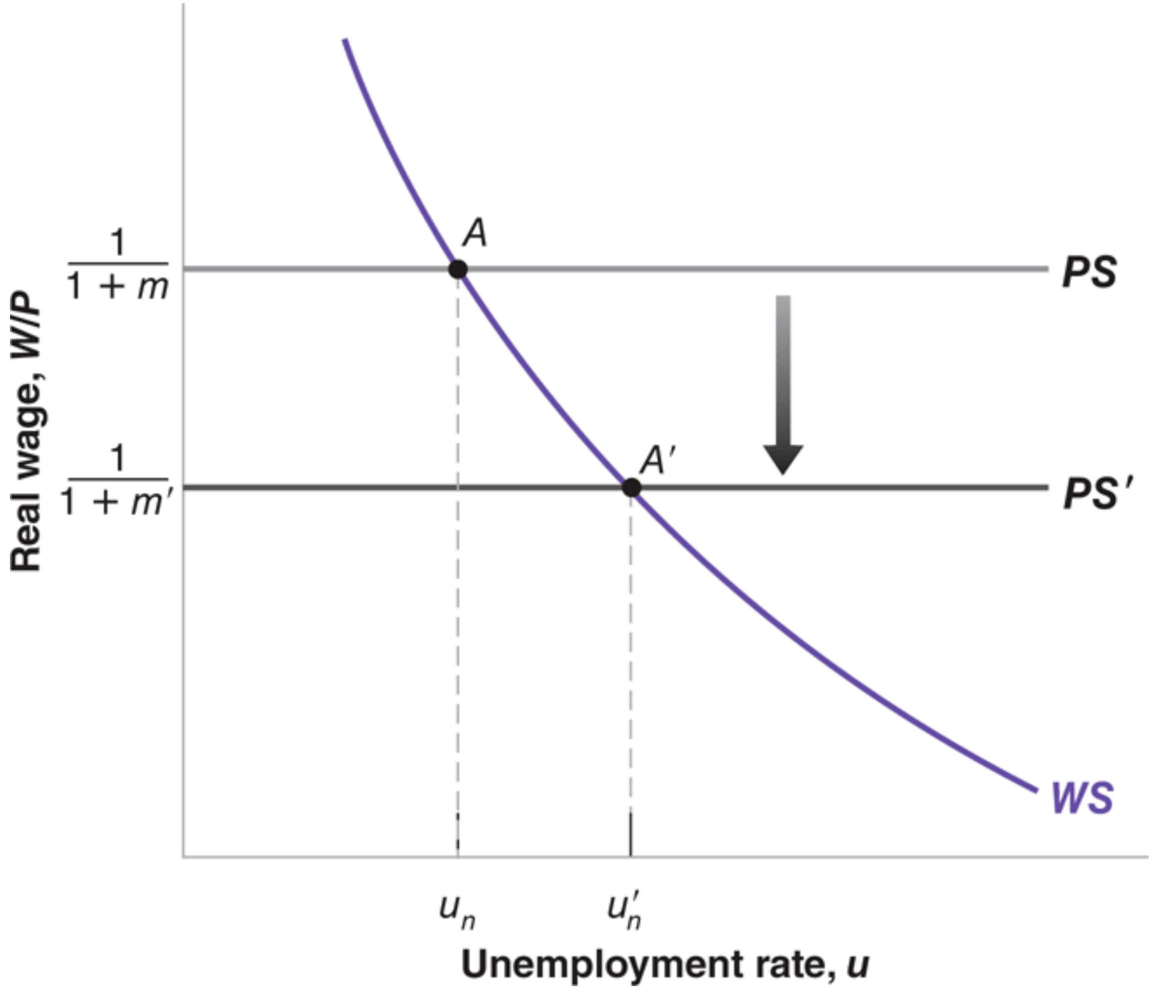
- Why a difference between the two perspectives?
  - Micro: no general equilibrium thinking
  - Prices do adjust (in macro)

- Analogous to other policy measures or shocks
  - E.g. extending the power of unions

What happens when firm are subjective to shocks: if the market power changes

Less stringent competition oversight

Figure 6-8 Markups and the Natural Rate of Unemployment



A less stringent enforcement of existing competition law – To the extent that this allows the firms to collude more easily and increase their market power, it leads to an increase in their mark-up – an increase in μ. The increase in μ implies a decrease in the real wage paid by firms, and so it shifts the price-setting relation down, from PS to PS′ in Figure 7.14. The economy moves along WS. The equilibrium moves from A to A′, and the natural rate of unemployment increases from un to un′.

We start in A

Less competition > m changes: higher m > lower real wage > higher natural unemployment rate: A'

Natural Rate of Unemployment => N

- Unemployment rate u (%):
  - U: unemployment (#)
  - N: employment (#)
  - L: Labor force (#)
- $u = \frac{U}{L} = \frac{L-N}{L} = 1 - \frac{N}{L}$
- $N = L(1-u)$
- Natural (structural) level of employment:
- $N_n = L(1-u_n)$

This means we can estimate our output

Natural Rate of Unemployment => Y

We substitute our production funciton in our labor market equilibrium (real wage by firms = real wage demanded by wage setters)

- N is input in production function
- Here: Y=N
- Natural output level:

Structural unemployment rate = 1- (Yn/L)

$$F\Big(\underbrace{1 - \frac{Y_n}{L}}_{u}, z\Big) = \frac{1}{1+m} \qquad (6.8)$$

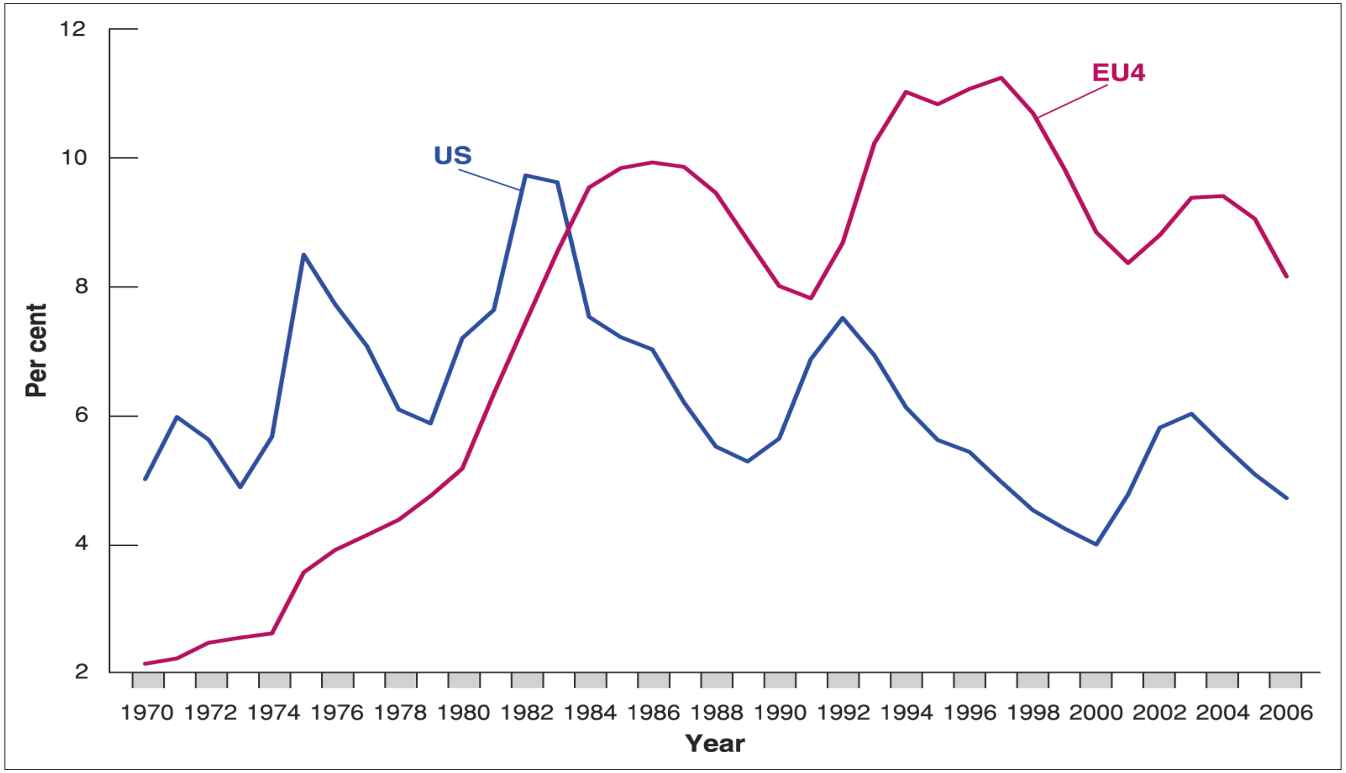
Difference between EU and US
> EU: unemployment stayed high
> is the protection the explaining factor?

Exercise

Why is the (current) unemployment in EU > US?

Using the model, discuss if the following factors can (not) explain this finding:

- **Employment protection legislation: EU>US**
- **Unionization : EU>US**
- **Unemployment benefits: EU>US**
- **Unemployment duration: EU>US**



Monetary/fiscal policy and the labour market

- Labour market equilibrium => u => Y
- Earlier (IS-LM):
  - Y determined by monetary, fiscal policy, …
  - Do not appear in (6.8) => hence no effect

= short term (while we were looking at medium term: short term has no effect): in next chapter they will start mattering again

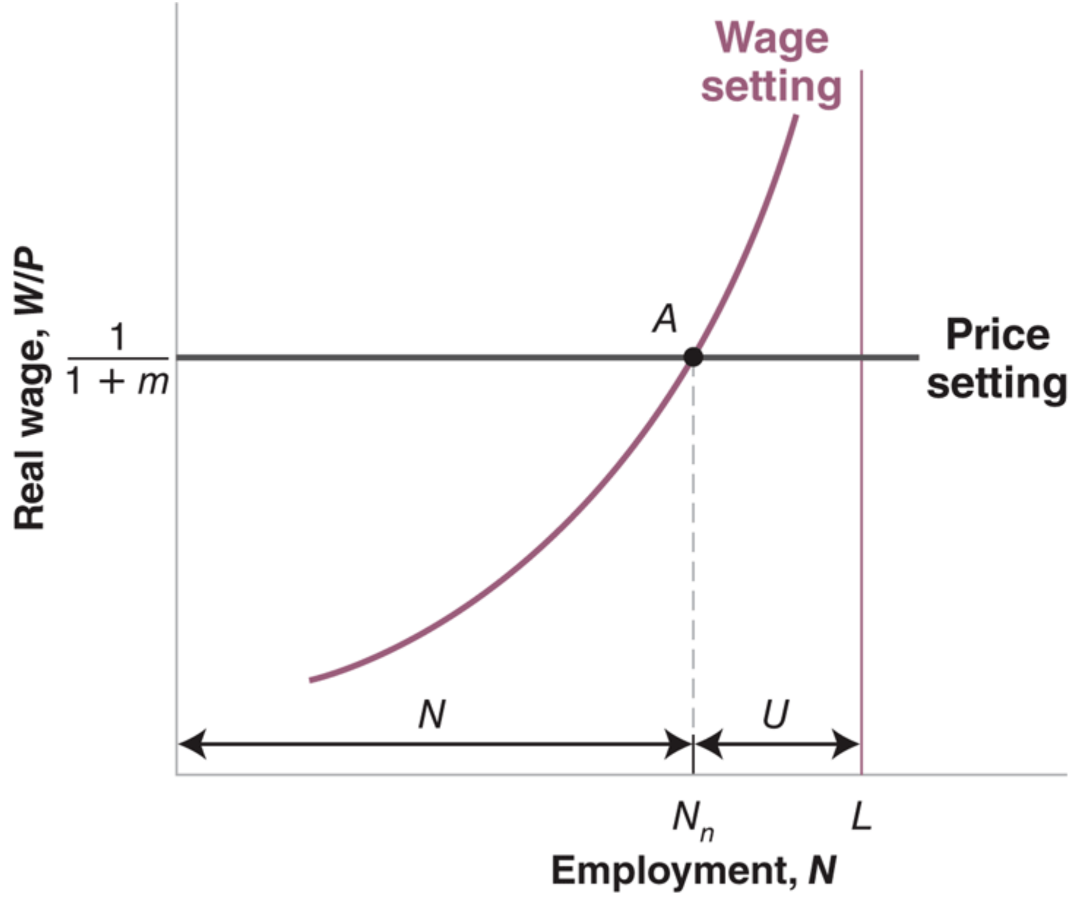
- Inconsistent?
- Assumptions:
  - Labour market equilibrium
  - Important assumption: $P = P^e$
    - Does not need to hold in the short run
    - Prices can evolve different from their expectations (the expectations people had at the wage negotiation stage)
  - In the medium run prices are not systematically different from their expectation
    - => Labour market equilibrium as we saw it holds

Appendix: Wage- and Price-Setting Relations versus Labor Supply and Labor Demand

This graph is a complement of the model

Figure 1 Wage and Price Setting and the Natural Level of Employment

- Same analysis as before
- Graph plots L and N instead of u on x-axis
- WS = labour supply
- PS = labour demand



AD-AS

Aggregate demand and aggregate supply: all markets interact

AS: Aggregate Supply

- WS: Now we focus on the short term thus P is not equal to Pe
  - We abandon the assumption that $P = P^e$ (i.e.: now focus on short term)
  - $W = P^e F(u, z)$ = prom previous chapter but without substituting Pe
- PS:
  - $P = (1 + m)W$ This can be subsituted in the firs equaiton
- Equilibrium (PS=WS):
  - $P = P^e(1 + m)F(u, z)$
- Express in terms of Y Unemployment rate can be written in function of output Y
  - $u = \frac{U}{L} = \frac{L-N}{L} = 1 - \frac{N}{L} = 1 - \frac{Y}{L}$

$$\boxed{P = P^e (1 + m) F\left(1 - \frac{Y}{L}, z\right)} \qquad (7.2)$$

Aggregate Supply

$$P = P^e (1 + m) F\left(1 - \frac{Y}{L}, z\right) \qquad (7.2)$$

- Price level:
  - Rises with a higher expected price level
    - Higher wage demands
    - Higher production costs
    - Higher price set by firms (for given markup)
  - Rises with production
    - More production (Y)
    - More employment (N)
    - Less unemployment (L-N), lower rate of unemployment (1-N/L)
    - Higher wage demands
    - Higher production costs
    - Higher price set by firms

> Prices are high if expected prices are high: if I expect inflation to be high > I demand an higher wage because I want my purchasing power to remain the same
> when firms decide to charge higher markups (firm becomes less competitive and firms are more concentrated): for a given level of wages > higher wages
> Y: when there is more production (income is high) > demand is high > more employment > firms need to produce additional goods > more employment = low unemployment = higher wages (better negotiating) > higher production cost = higher price

Aggregate Supply: Equilibrium output

$$P = P^e (1 + m) F\left(1 - \frac{Y}{L}, z\right) \qquad (7.2)$$

- When output is equal to natural output, $Y = Y_n$ (defined in the chapter on labour market):

$$F\left(1 - \frac{Y_n}{L}, z\right) = \frac{1}{1 + m} \qquad (6.8)$$

- => $P = P^e$

So in the medium term, the labor market reaches this natural unemployment rate
So when P = Pe = we're in the medium term equilibrium: this gives us additional information.
The AS curve is a positive relation between output and prices, we also know that in the medium term the AS curve is such that the prices = expected prices > AS curve attains the natural output level Yn

If output is higher: unemployment rate (is a complement of output): unemployment rate is lower than natural level of unemployment level = economy in a boom =high wage demands > higher prices set by firms

AS: $Y \neq Y_n$

- AS:

$$P = P^e (1 + m) F\left(1 - \frac{Y}{L}, z\right) \tag{7.2}$$

- If $P = P^e$

$$F\left(1 - \frac{Y_n}{L}, z\right) = \frac{1}{1 + m} \tag{6.8}$$

- If $Y > Y_n$:
    - $1 - \frac{Y}{L} < 1 - \frac{Y_n}{L}$
    - $u < u_n$
    - $F(u) > F(u_n)$

AS: $Y \neq Y_n$

$$P = P^e (1 + m) F\left(1 - \frac{Y}{L}, z\right) \tag{7.2}$$

$$F\left(1 - \frac{Y_n}{L}, z\right) = \frac{1}{1 + m} \tag{6.8}$$

- If $Y > Y_n$:
  - $1 - \frac{Y}{L} < 1 - \frac{Y_n}{L}$
  - $u < u_n$
  - $F(u) > F(u_n)$

- $P > P^e$
- Higher economic activity => higher prices
- AS: upward sloping
- Shifts of (P^e, m, z) and changes along (Y)

So important to make a difference between shifts or moves along

Figure 7-1 The Aggregate Supply Curve

Aggregtae supply relation = positive relation between output and price level = upward sloping

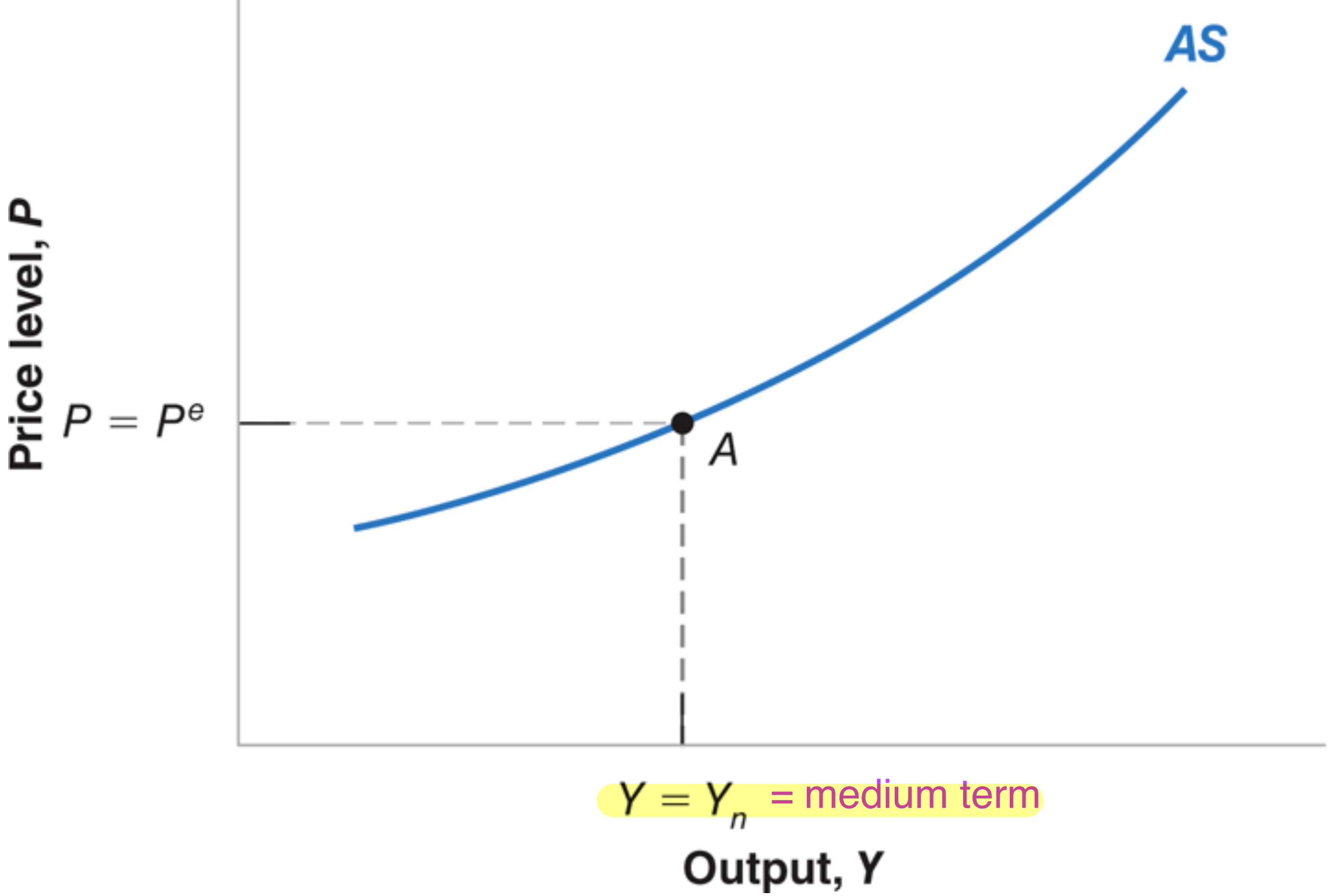
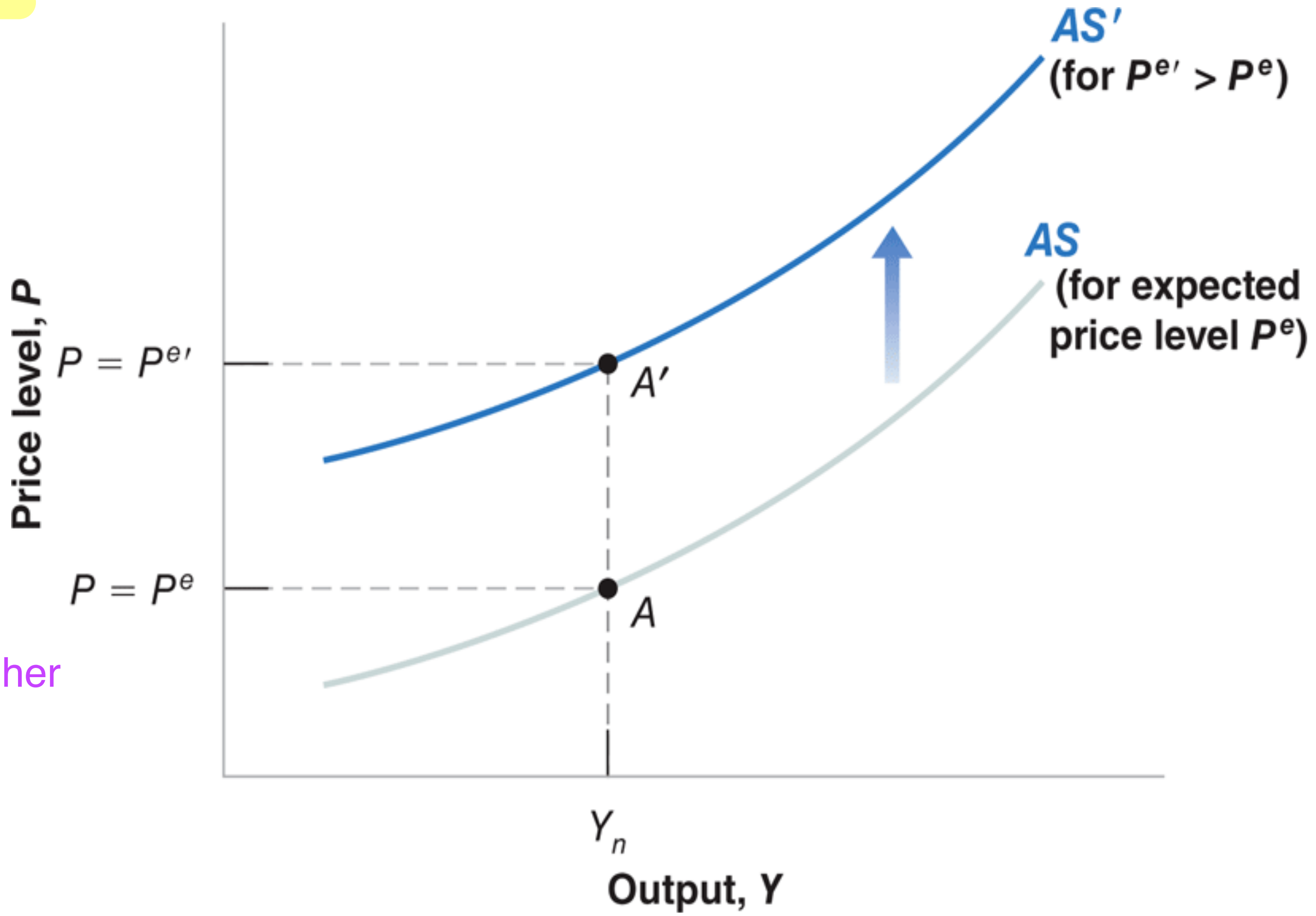


Figure 7-2 The Effect of an Increase in the Expected Price Level on the Aggregate Supply Curve

Curve shifts for different reasons

- Expected price increase
  - For given Y
- Higher wage demands
  - For given u
- Higher price
  - For given markup



If we start in A and workers expect higher prices > AS curve moves up

AD: Aggregate Demand

- IS: (Y as a function of i)
  - Equilibrium goods market
  - $Y = C(Y - T) + I(Y, i) + G$

  Consumpiton + investment + governement spending
  = affected by what happens on financial or money market: is where i is determined

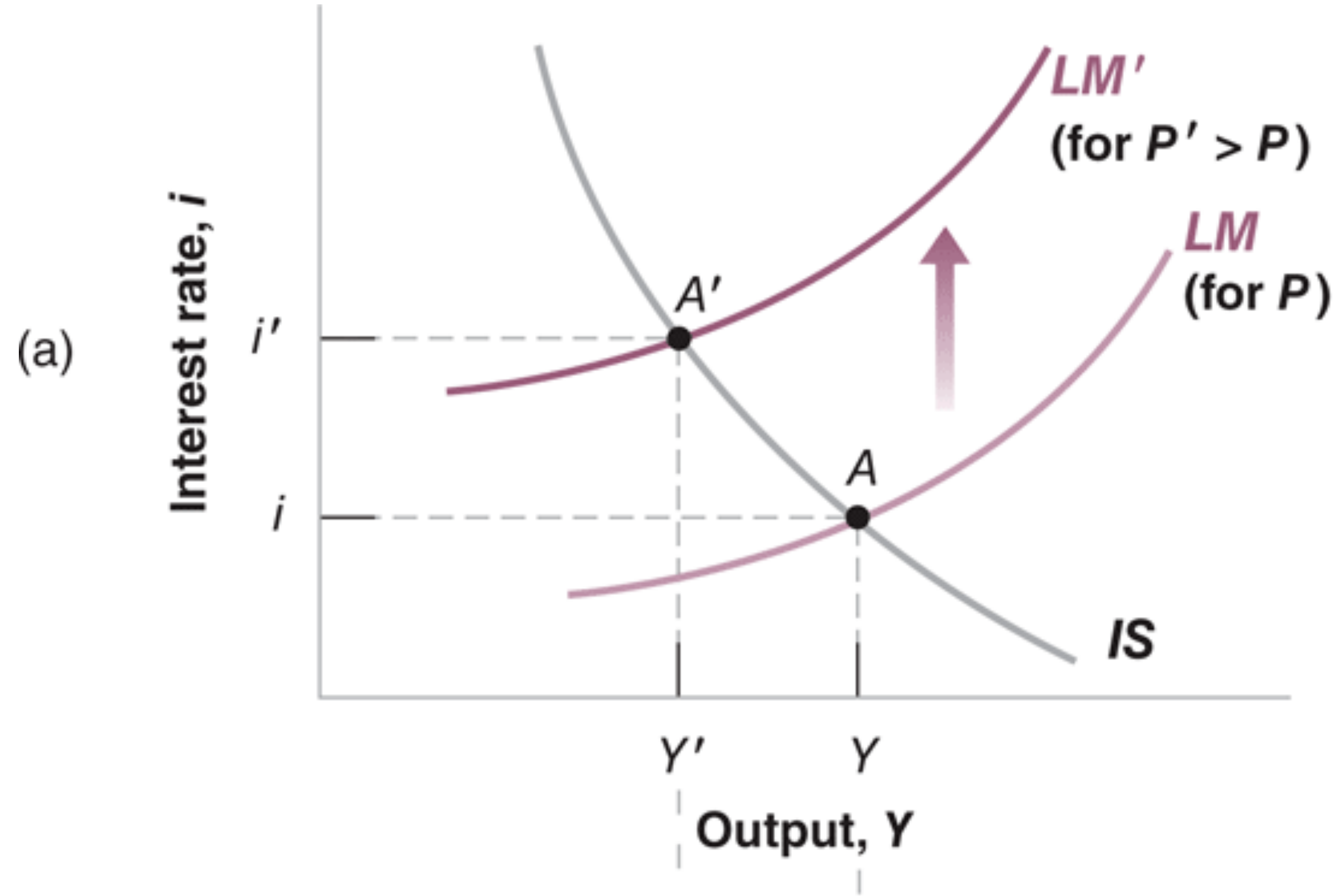
- LM: (i as a function of Y)
  - Equilibrium money market
  - $\frac{M}{P} = YL(i)$

So far we assumed P is constant, however what matters for spending is not nominal money we can spend but real monney

- Effect price increase P=>P':
  - M/P falls
  - LM: for given Y, i must increase – upward shift

If prices change > real amount of money in economy falls > real amount of money shrank > we don't have enoug money > in money market: intrest rate will have to increase. So we want to consume a level of goods Y, but we don't have enough money > so we subsitute our bonds for money > intrest rate increases

Figure 7-3 The Derivation of the Aggregate Demand Curve



IS LM > We start in A, when the price increases: P increases or left hand side reduces (M/P) = Y*L(i) > impact is similar to monetary contraction (and central bank reduces M) = increasing intrest rate for a given level of output > as intrest rate increases: investment reduces and income falls, so income drops and we move along the LM > we end up at A'

Figure 7-3 The Derivation of the Aggregate Demand Curve

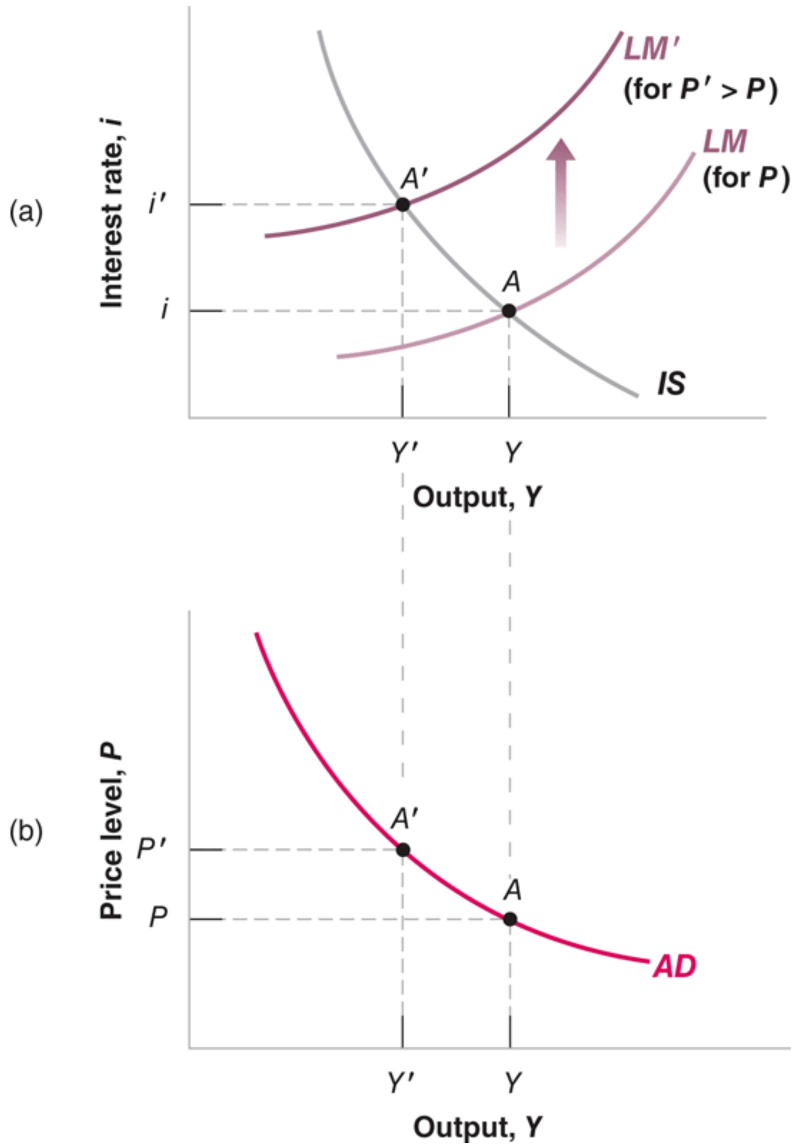
Upward shift of LM:

- For given Y, interest rate increases

Movement along IS:

- Higher interest rate means lower investment

Aggregate output Y drops as a result of the price increase



Aggregate Demand Is defined by function Y

- Change in P => movement **along** AD
- Change in any other factor => shift **of** AD
  - i.e. for given price level P, more/less demand Y

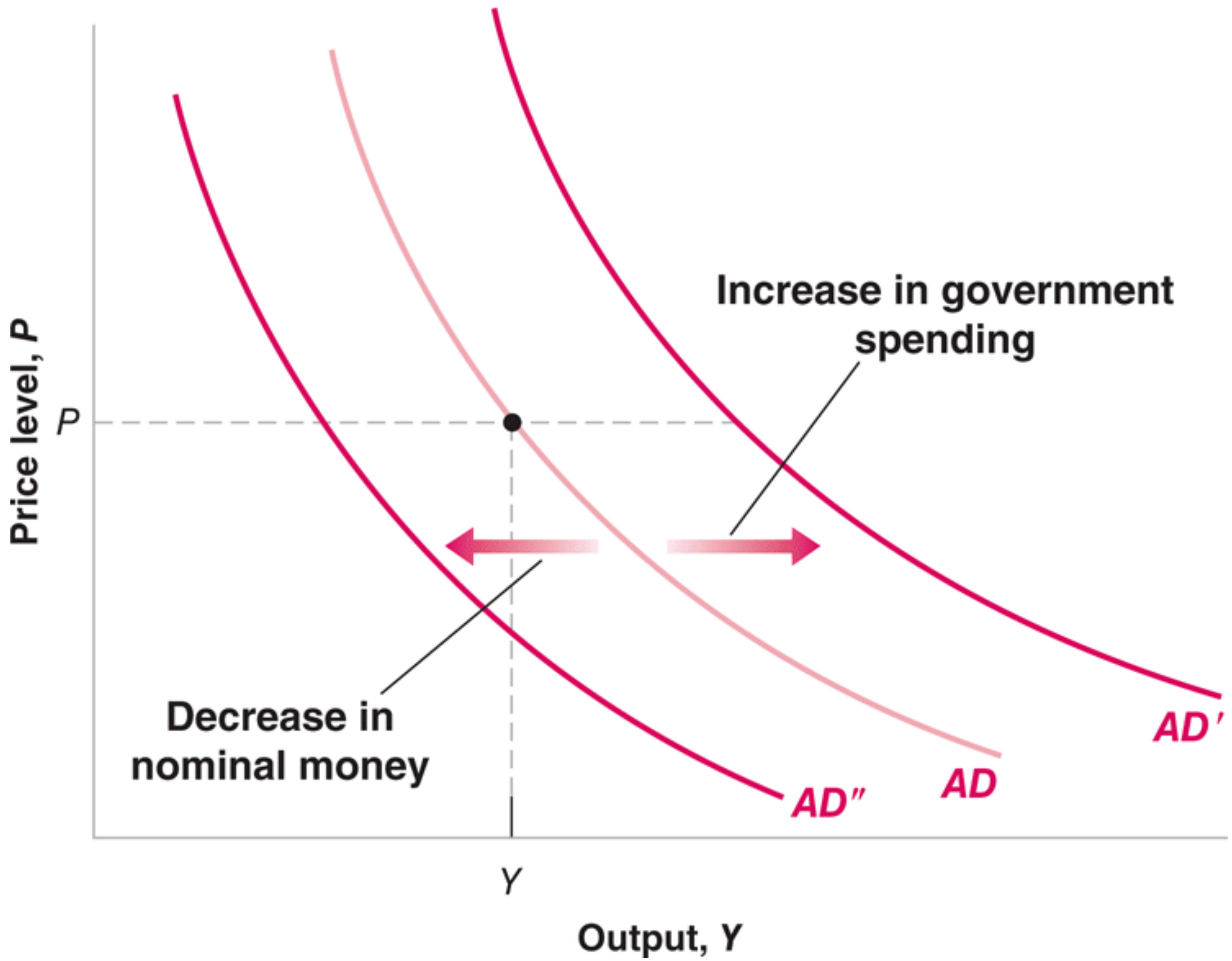
AD depends on:

$$Y = Y\left(\frac{M}{P}, G, T\right) \qquad (7.3)$$

$$(+, \quad +, -)$$

Monetary tightening: central bank reduces money supply or increases intrest rate = lower AD for given prices

Figure 7-4 Shifts of the Aggregate Demand Curve



We will now make a difference between short term and medium term eq
> short: price expectations = given
> medium: Pe variable

Equilibrium: AD = AS

First lecture: AS is the passive 45° line > has now changed

- AS: $P = P^e(1+m)F\left(1-\frac{Y}{L}, z\right)$
- AD: $Y = Y(\frac{M}{P}, G, T)$

Demand: still in accordance - AD is a convolution of what is going on in the goods market and it's influenced by financial market in the closed and open economy (money market and foreign exchange market)

- Short term: P^e given
- Medium term: P^e variable

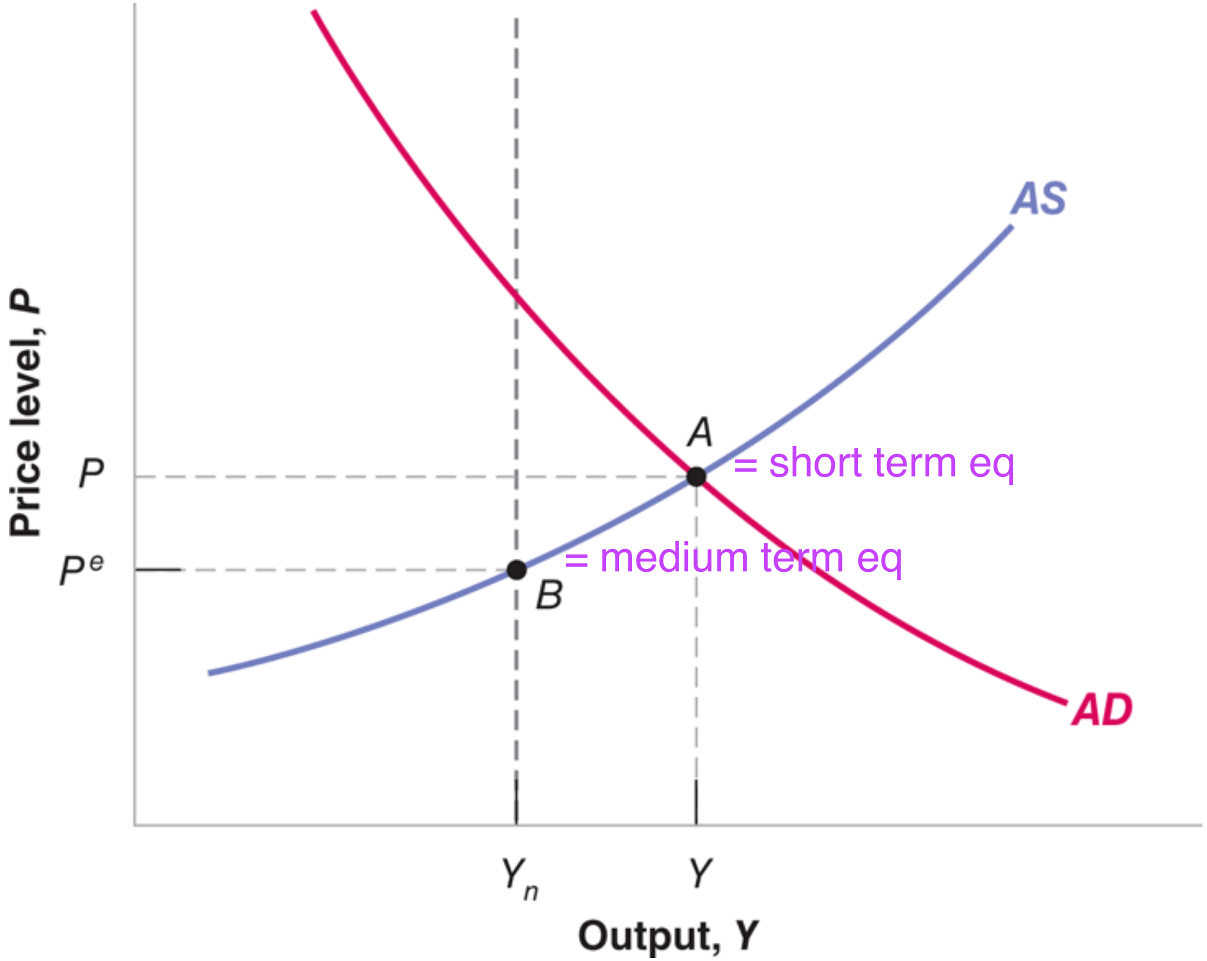
How does this equilibrium happen?
> how does it change when monotary value (m) is changed?

What's happening when phiscal policy adjusts?
> G-T = governement budget deficit

Equilibrium in the Short Run and in the Medium Run

Figure 7-5 The Short-Run Equilibrium

- If $P = P^e$, then $Y = Y_n$
  - Point B
- Short term equilibrium: AD=AS: (Y,P)
  - Point A
  - Equilibrium in:
    - Goods market (on AD)
    - Financial market (on AD)
    - Labour market (on AS)
  - $P \neq P^e$



Short term

- Every market is in equilibrium
- Not necessary that $(Y, P) = (Y_n, P^e)$
- Depends on:
  - Position AD
  - Level P^e

- In figure $P > P^e$
  - => Wage setters have underestimated price level
    They have lost purchasing power

Medium term

- $P > P^e$
  - => wage-setters have underestimated price level
  - Next round of negotiations (medium term): higher price expectation $P^{e\prime}$
- $P^{e\prime} > P^e$ => AS shifts
  - Underlying mechanism:
  - Higher wage demands (for given u)
  - Higher price (for given markup)
  - P'>P
- Movement along AD
  - M/P adjusts
- Movement along new AS'
  - u adjusts: Y falls, u rises, W falls
- To new equilibrium A'
- If $P^e = P$ consistent with Yn => stable
- If not: price expectation adjusts again, and above adjustment repeats itself
  - Etcetera until A'' is reached

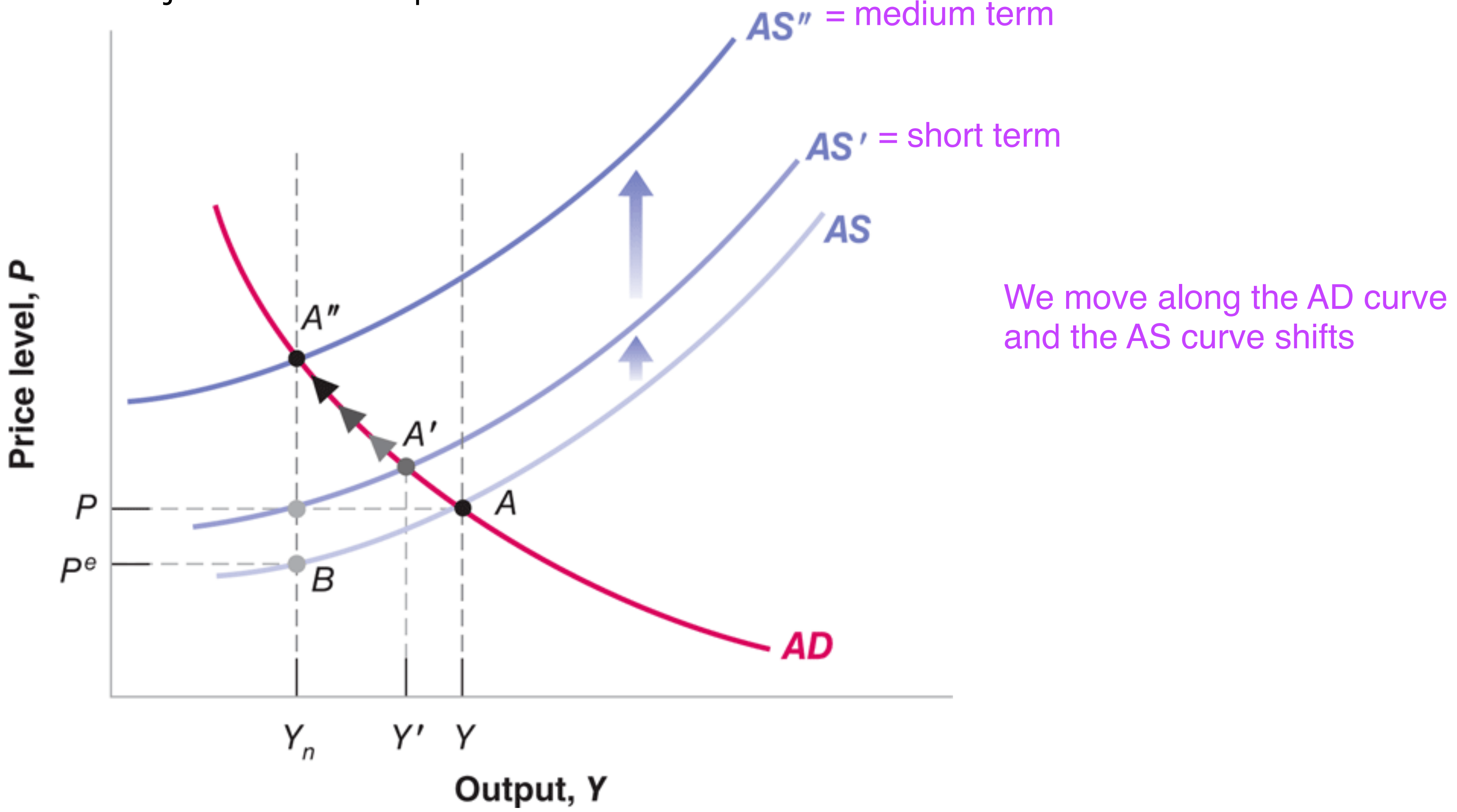
If prices are higher > that is embedded in wage negotiating

> we increase price expectation

In the short run: increase in price expectations is going to lead to upward shift in the As curve to As '

Equilibrium in the Short Run and in the Medium Run

Figure 7-6 The Adjustment of Output over Time



- Short term
  - $P \neq P^e \rightarrow Y \neq Y_n$

- Medium term
  - $P = P^e \rightarrow Y = Y_n$

Applications

- Monetary policy
- Fiscal policy
- Oil prices

Monetary policy: AD - AS

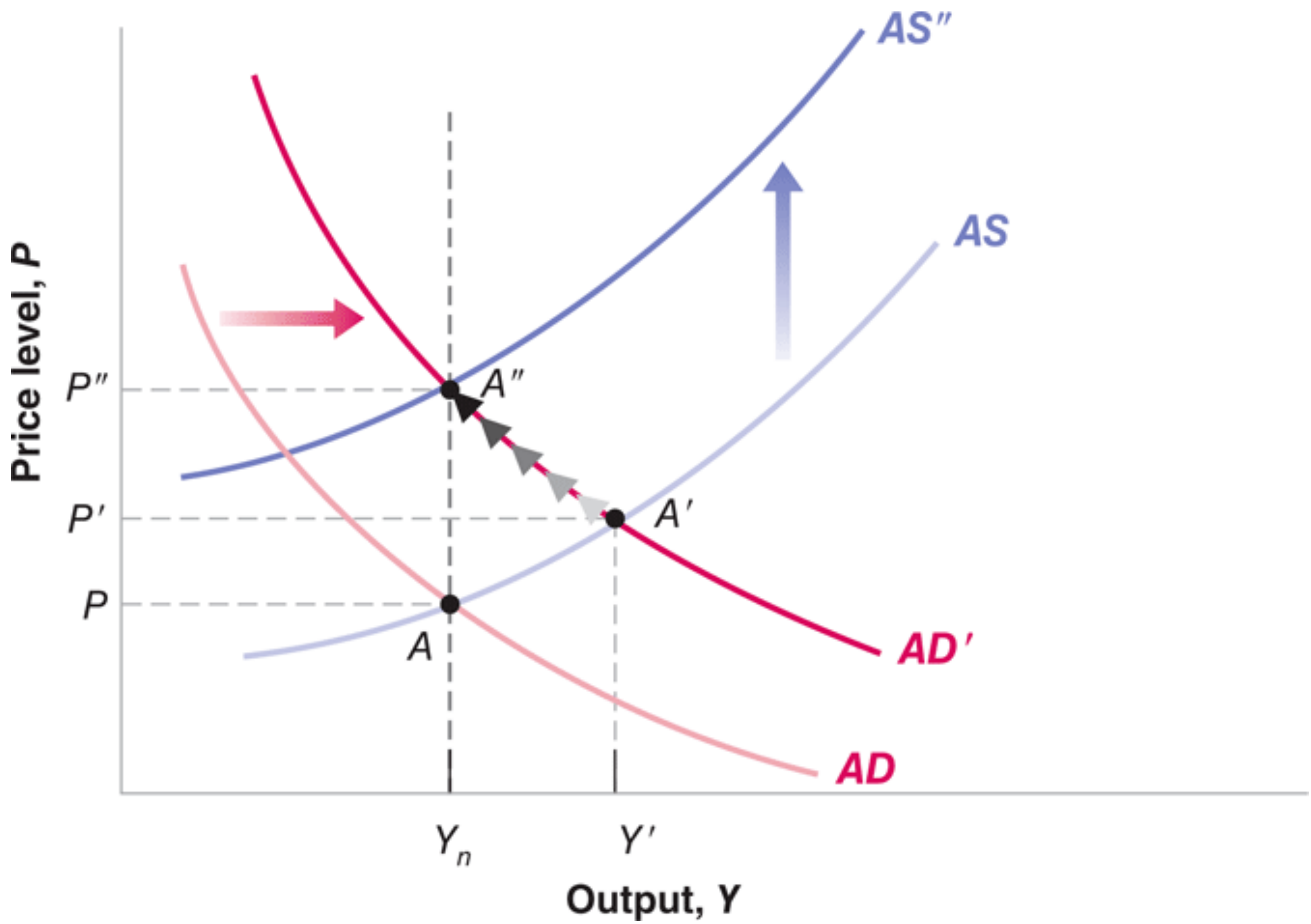
- AD shifts, since a function of M (M/P)
- AS initially does not shift (not a function of M)

AS

but

- But after the short term P^e changes
- Which does make AS shift

Figure 7-7 The Dynamic Effects of a Monetary Expansion



MP: IS - LM

- (for given P)
- Ms increases
- M/P increases
  - LM: $\frac{M}{P} = YL(i)$
  - For given Y, i falls
  - Downward shift of LM (fig: LM -> LM'')
- Movement along IS
  - IS: $Y = C(Y - T) + I(Y, i) + G$
  - Quantity Y as a function of the interest rate

- Yet from AD/AS we see
- Price increases (in the short run)
- Also has an impact in IS – LM
- M/P falls
- Partially undoes the initial shift of LM (LM’’ -> LM’)

Figure 7-8 The Dynamic Effects of a Monetary Expansion on Output and the Interest Rate

(b)

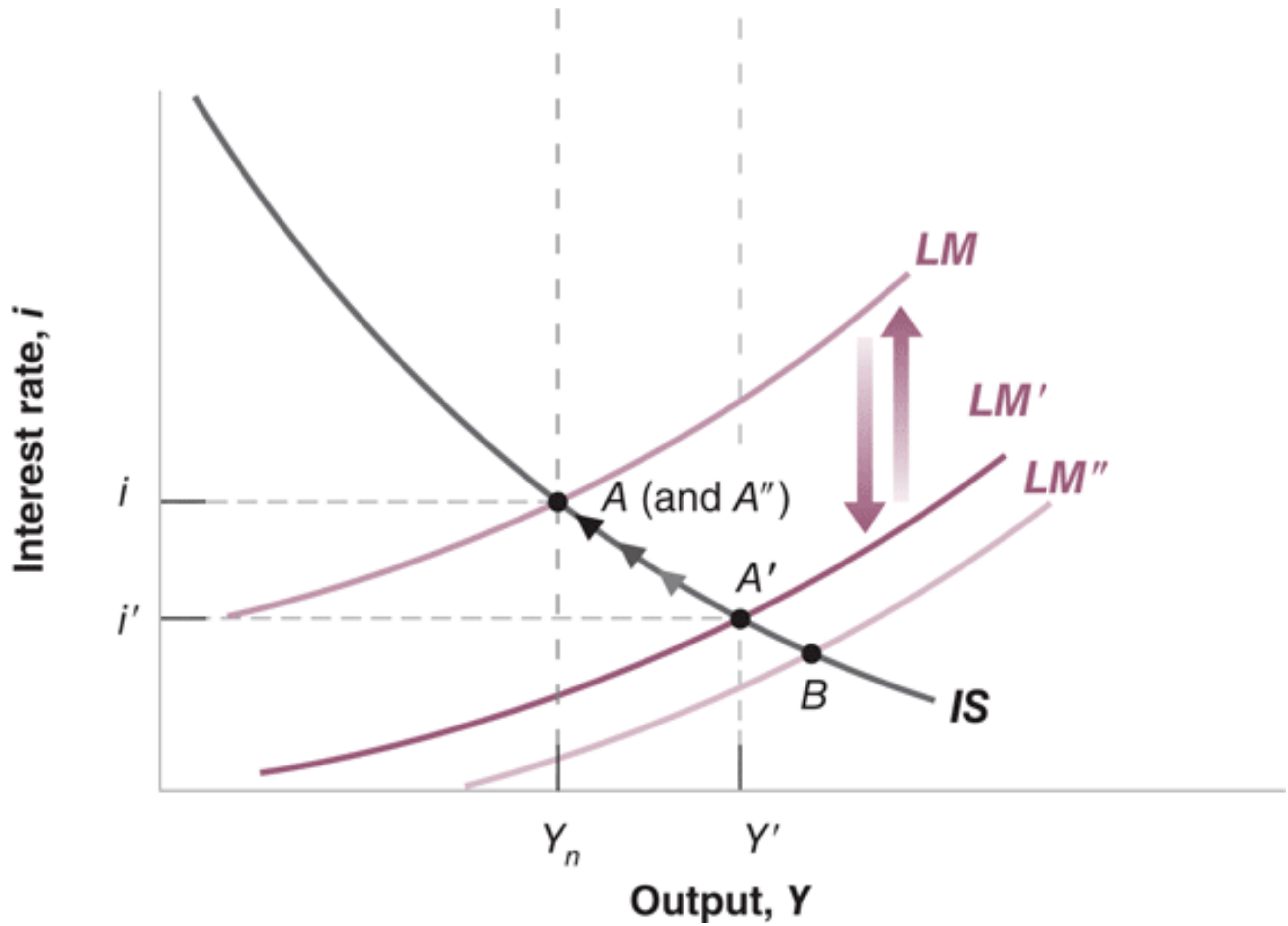


Figure 7-8 The Dynamic Effects of a Monetary Expansion on Output and the Interest Rate

Initial equilibrium A (Y=Yn)

Ms increases:

1.

⇒Ms'/P rises

⇒LM shifts down: LM''

2.

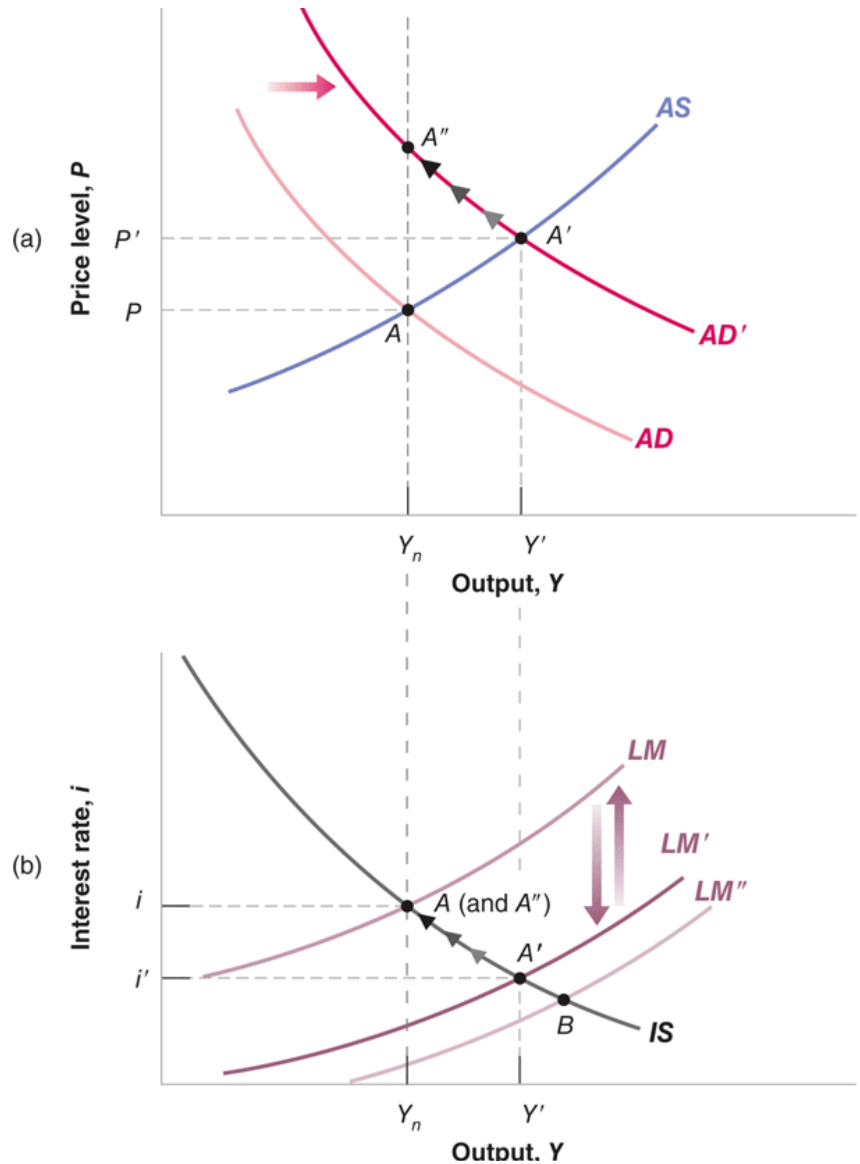
Step 1 implies an increase in demand

⇒Price increase: P'

⇒Ms'/P' falls (relative to Ms'/P)

⇒Shift of LM is less pronounced than under constant prices: LM'

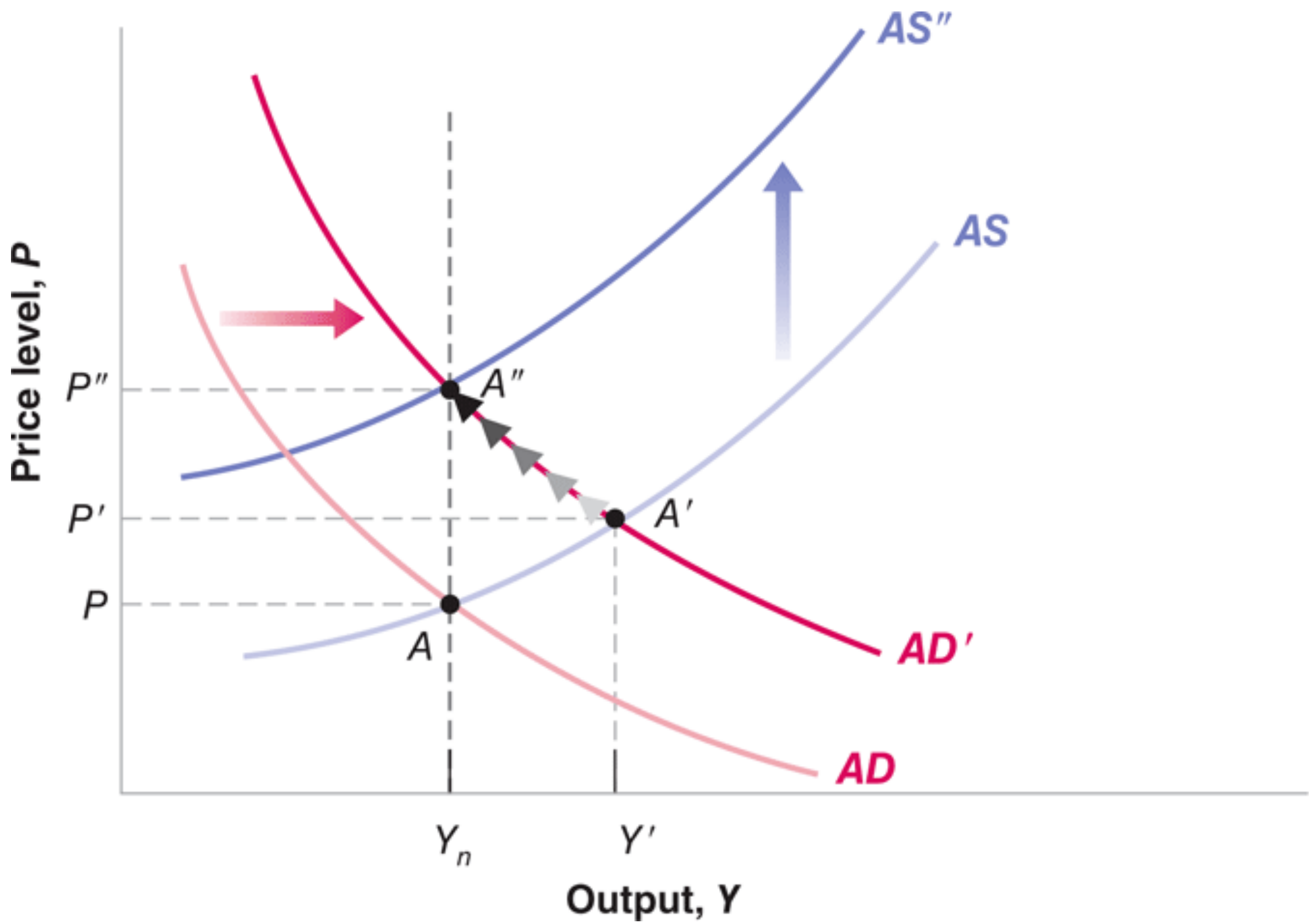
⇒New short run equilibrium A'



Medium term

- AS shifts, for given AD’
- AS: P^e adjusts, as before

Figure 7-7 The Dynamic Effects of a Monetary Expansion



Neutrality of MP

- In the short run
  - Monetary expansion leads to:
    - Increased output
    - Reduced interest rate
    - Increased price
- In the medium run
  - Price expectation adjusts to the new price level
    - Output drops back to its initial (natural) level
    - Interest rate returns to its initial level:
      - The change in M translates entirely into P, hence M/P (the LM-curve) is back to its initial level

- Thus in the medium run the price level changed, but output did not
- Monetary policy can have short term output effects (e.g. recession), but can not affect it in the medium term

Model impulse responses

- For each of the experiments, and for each variable (e.g. Y, P)
- Draw impulse responses:
  - Initial period
  - Short term equilibrium
  - Adjustment to long term equilibrium

Focus: How Long Lasting Are the Real Effects of Money?

Figure 1 The Effects of an Expansion in Nominal Money in the Taylor Model

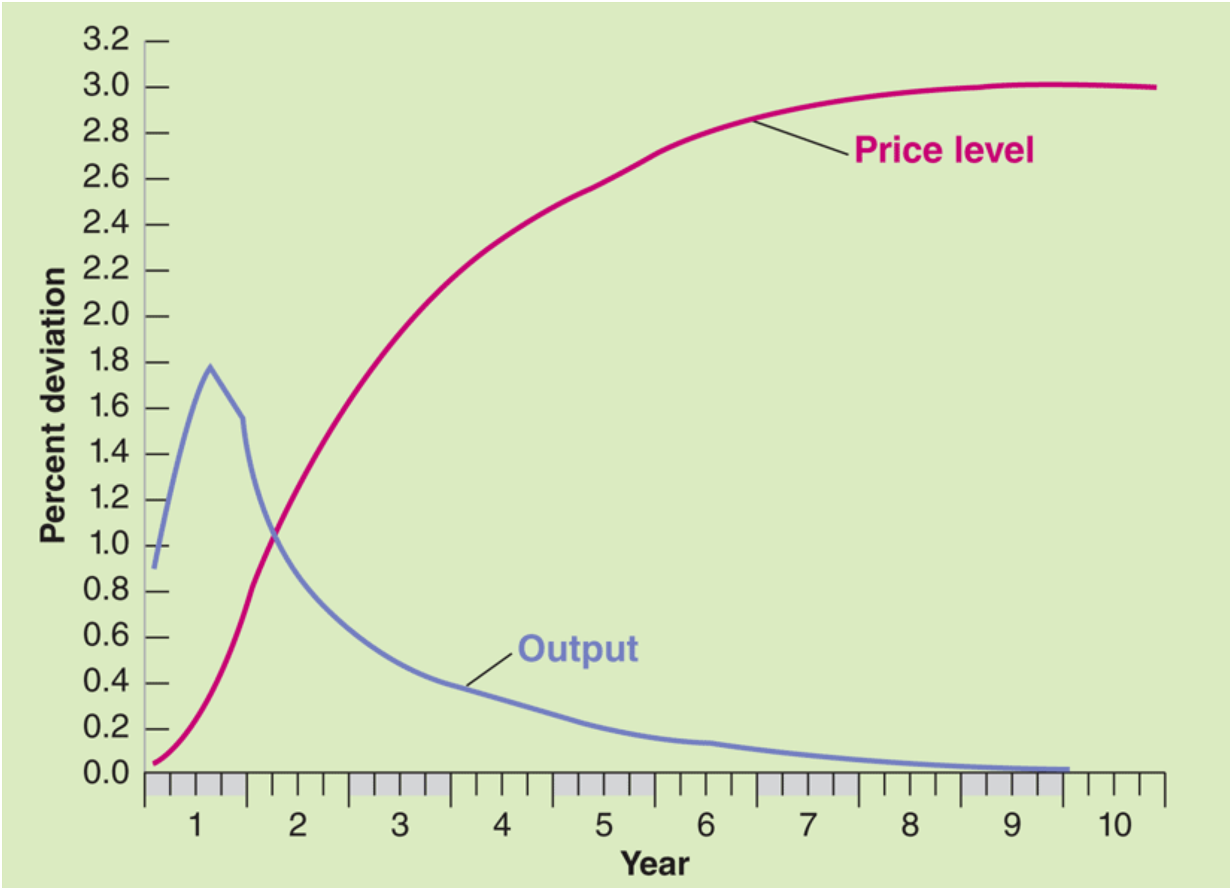
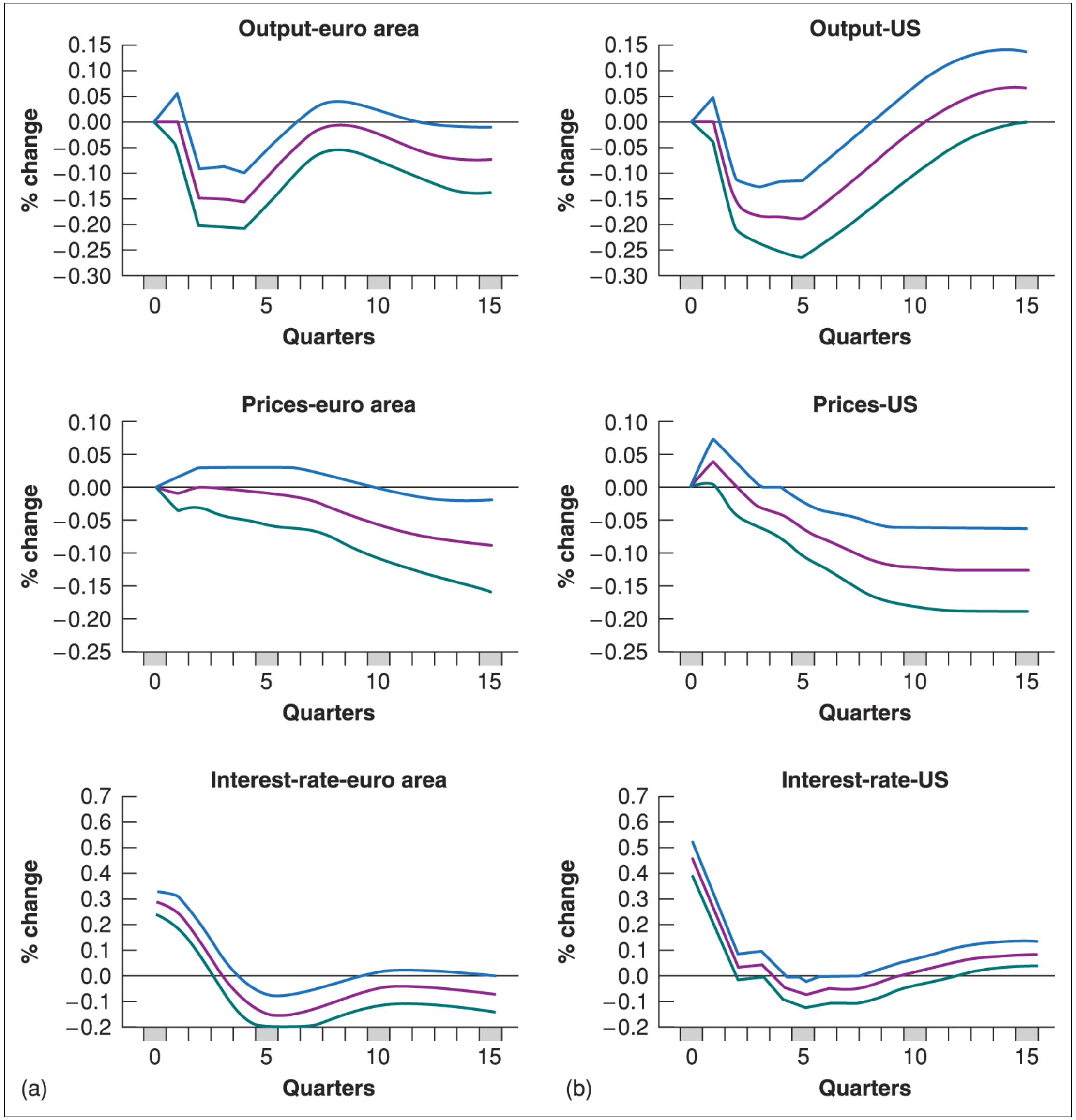


Figure 5.13 **The empirical effects of an increase in the interest rate in (a) the euro area and (b) the USA**

In the short run, an increase in the interest rate leads to a decrease in output and to an increase in unemployment, but it also has little effect on the price level.

Source: G. Peersman and F. Smets, 'The monetary transmission mechanism in the euro area: more evidence from Var analysis', European Central Bank, working paper No. 91, December 2001.



A reduction in the government deficit

- Deficit: G-T
- G falls
- AS: no direct effect
- AD: for given price, less consumption => recession

The impact of G dropping = shift in the AD curve
- AD curve gives you y = y(M/P, G, T)
- if P changes we move along the AD curve
- if G falls, we have an AD curve that is going to shift (P will have less governement consumption > less overall consumption)

$$Y = Y\left(\frac{M}{P}, G, T\right)$$

$$P = P^e(1+m)F\left(1-\frac{Y}{L}, Z\right)$$

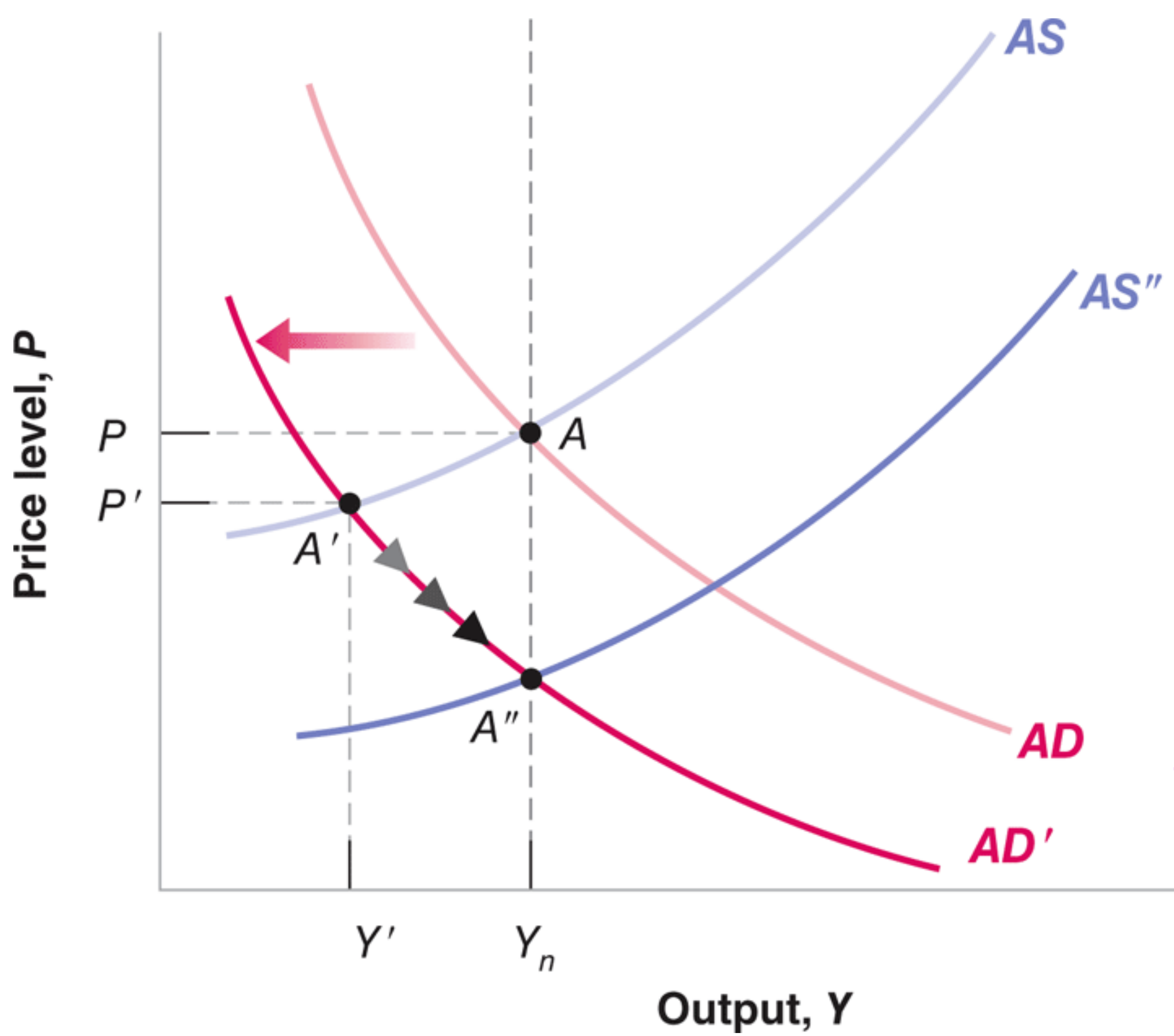
$P^e = P > P'$ DUS $\boxed{P^{e'} \downarrow}$

if $P^{e'} - P^{P} > P^*$ DUS $\boxed{P^{e*} \downarrow}$

is filled in in AS

$\boxed{A'': P^{e'} = P''}$ DUS NO MORE ADDITIONAL ADJUSTMENTS = LONG TERM EQ.

Figure 7-9 The Dynamic Effects of a Decrease in the Budget Deficit



So fiscal restrictions can generate a recession, but only temporary untill the new equilibrium is reached = the agregate model of multiple markets

We start in A (eq between AS and AD), at this point, the price level is P and the medium or long term equilibrium is Yn the natural output.

> price expectaions: can be reaed of the AS curve, where AS crosses the natural output level, so the price expectationsin point A are equal to the level P

> G falls (exhaugenous consumption that is taken away)

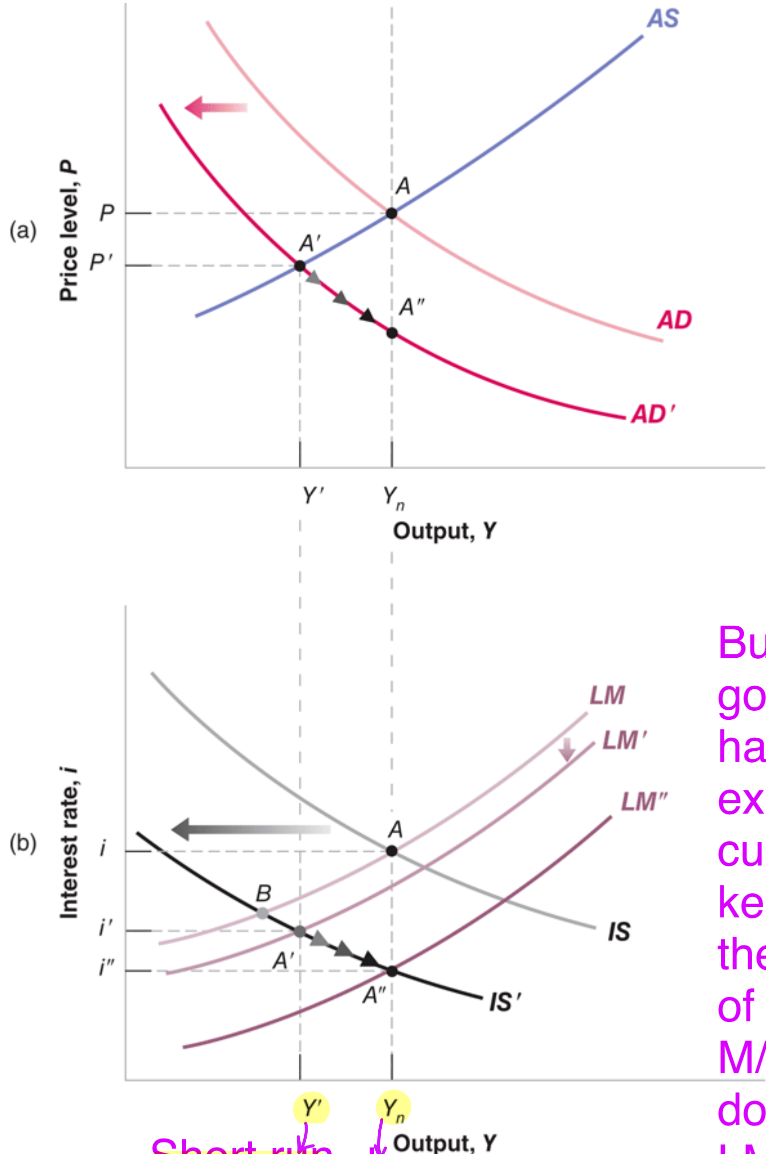
> AD curve is going to shift to the left (AD is lower))

> prices will start adjusting, so we will not go to A, due to the price adjusting (demand is lower then supply: prices start falling) > we move along AD and we end up in A"

> we have more money available for consumption

> The new equilibrium: A' (old AS curve) > that old AS curve intersects with AD, but price shifts (because A' is a short term equilibrium) because we're in a recession, Y' < Yn, but more importantly: prices are lower then the prices we expected (price P), but P'<P, that means we are going to get changes in wage formation > we move along AD to the new point AD"

Figure 7-10 The Dynamic Effects of a Decrease in the Budget Deficit on Output and the Interest Rate



We start in point A
> if G is reduced, then we know that whithin the model that the IS curve is going to shift to the left
> for a given intrest rate there is less demand
> IS shift to the left,if prices remain the same: AD curve shifts to the left (but if does not hold), because prices do hold (prices drop to P' in the short term equilibrium) > our money balances go up > expensive monitary policy > LM curve is going to shift as wel
> a given level of output is giving lower intrest rates
> short term eq. happens where the new IS curve intersects with the LM curve that reflects the adjustments of prices

Short run recession

Long run: we ended where we started, but with low intrest rate = more investment

But we don't stay in A', we go to A". How does this happen: price expectations falling, AS curve is dropping > prices keep falling. As prices fall, the automatic adjustment of real money balances: M/P is constant, if P goes down, M goes up. So the LM curve goes down (Prices fell > intrest rate fell > M went up)

$G\downarrow \rightarrow i\downarrow \rightarrow I\nearrow$

$G\nearrow$ $\quad\nearrow$ $\quad\searrow$

interest rate $\quad$ investment $\quad$ less dynamic economy

$\bar{Y} = C + I\searrow + G\nearrow$

To do: make derrivations of this two previous graphs (prev slide): there is an inconsistency between the top and the bottom graph

- Hence, also fiscal policy does not have a lasting impact on Y
- But it does affect i and P
  - => change in the composition of Y
  - Crowding in/out

Just like monitary policy, physcal policy can generate recessions, but these don't last

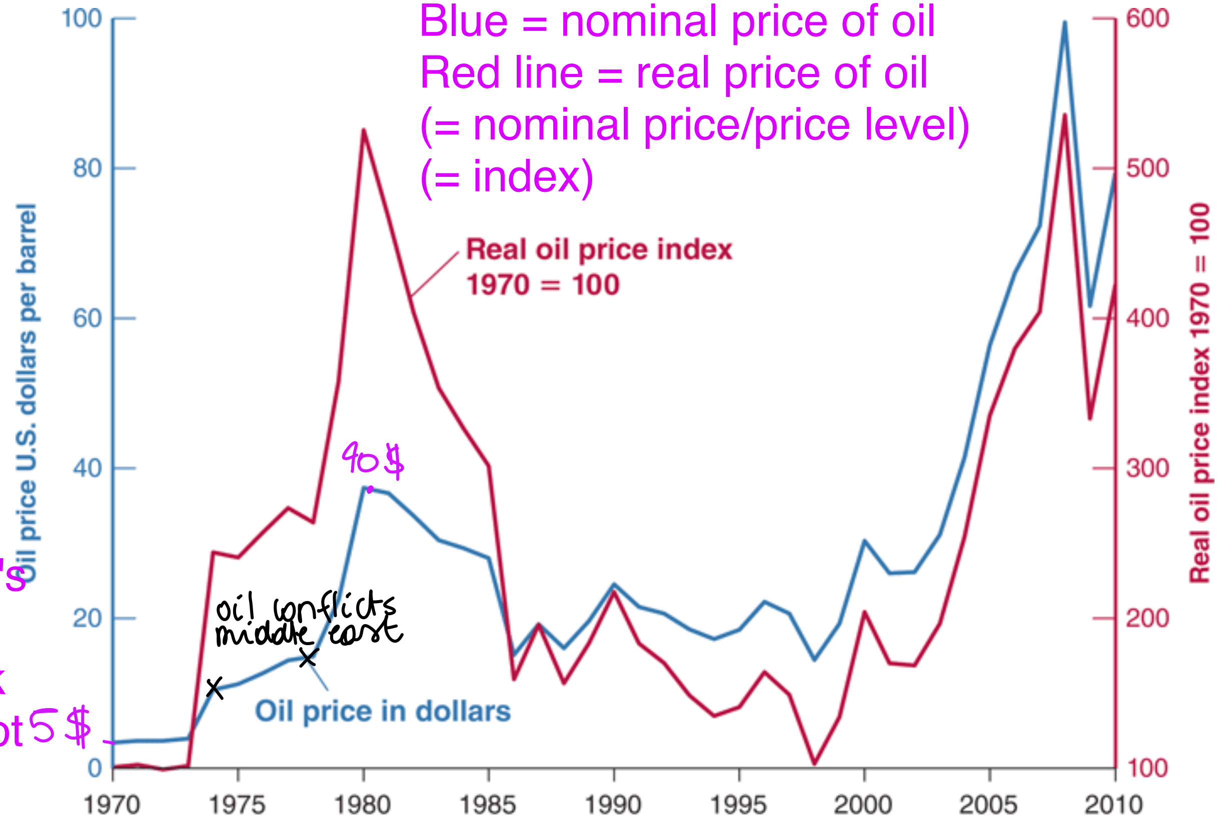
- Note:
  - Prices fall in the model
  - Does not occur too often in the data
  - Model can be extended to include M-growth

In this model, as a result of governement spending: prices fall, the aggregate price level goes down.
<> inflation is almost never negative (doesn't really happen a lot)

7-6 An Increase in the Price of Oil

Figure 7-11 The Nominal and the Real Price of Oil, 1970–2010

- Supply (70's):
  - OPEC
  - Wars
- Demand (00's):
  - China
- More recently
  - Technology
  - Reduced demand: Great Recession



Blue = nominal price of oil
Red line = real price of oil
(= nominal price/price level)
(= index)

Source: Series OILPRICE, CPIAUSCL Federal Reserve Economic Data (FRED) http://research.stlouisfed.org/fred2/. The value of the index is set equal to 100 in 1970.)

Nominal price changes dramatically in the 70's due to conflicts in the middle easts
> nominal price doesn't say much, so we look at real oil price: went up a lot! Oil became a lot more expensive relative to the other goods in the economy
> early 2000's: we see something similar, due to war, demand (China has grown rapidly > stimulated demand) > increased prices
> what do real price changes of oil to our model?

It's the changes in the red line that tells us something

Oil

- Oil = input, production factor
  - In more sophisticated models, oil is modeled as such
  - Here: we'll consider the oil price increase to be an additional production cost, which increases the markup *m*
    - For given wage, firms require a higher price

Oil is used in production mostly
> production function in the labour market was a very simple production function
> how much a production produces is in function of the labour
> goods produced: $Y = AF(K, N, \underbrace{O}_{\text{oil}})$ NEW

Firms use oil
> firms not only pay the wage of wages
> in our model there is the markup m = increases in what the firm charges in terms of prices above the wage: P = W*(1+m)
> if price of oil changes (if W stays the same) > firms have to increase prices for reasons other than the wage

Effect of a change in m: Labour market

- Price setting: $P = (1 + m)W$

Consequence:

- PS shifts: $\frac{W}{P} = \frac{1}{1+m}$

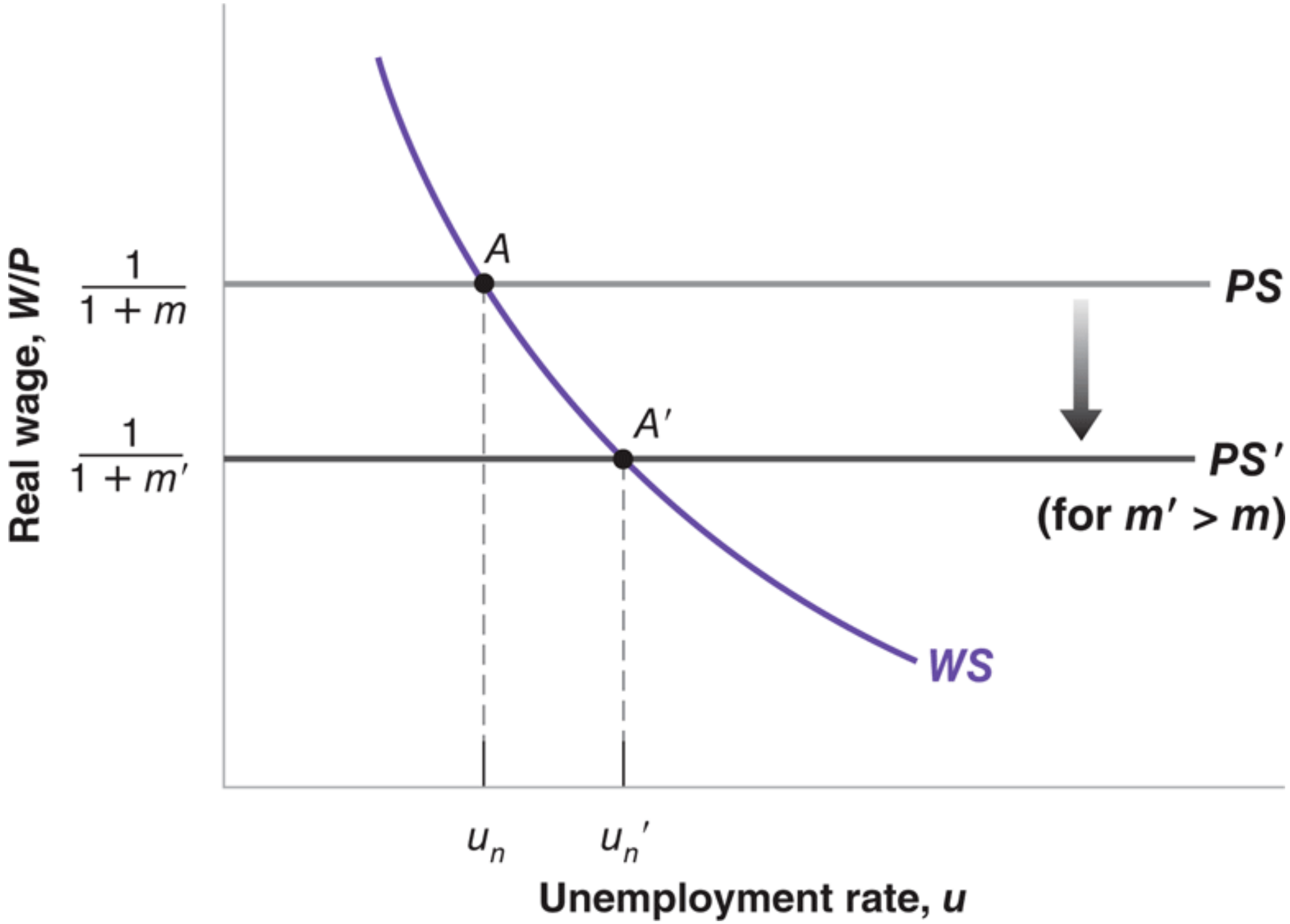
If m increases > 1/(1+m) falls >
new wage is reduced

- New equilibrium on the labour market:
  - => W/P falls
  - => u_n rises

Wage setting (nothing changes: determined by price expectations, unenployement and Z), but price setting curve is going to fall

The increase in the price of oil is not in the short run but is going to last in the long term (will have impact on the labour market)

Figure 7-12 The Effects of an Increase in the Price of Oil on the Natural Rate of Unemployment



The natural rate of unemployment increased ~1/ natural level of output, thus this natural level of of output is decreasing
> AS curve shifts up, we know exactly by how much it shifts up

What happens
> m does not appear in AD
> m apprears in AS
> for a given price expectaiton we will now have an increase in prices

Effect of a change in m: AS

- AS:

$P = (1+m) \cdot W$

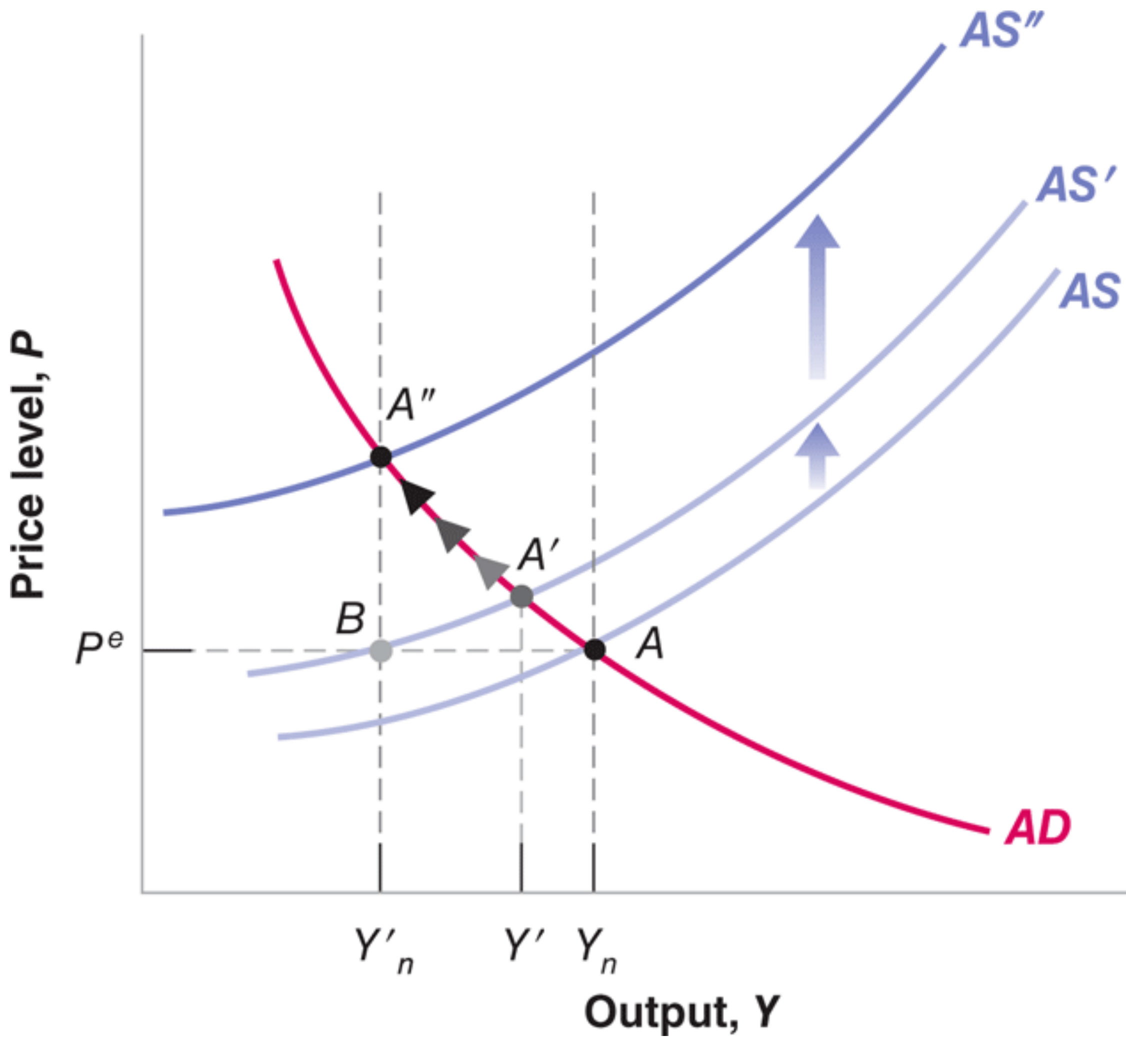
- $P = P^e(1+m')F(1-\frac{Y}{L}, z)$
- For given output and price expectation, prices rise: AS'

- How much does AS shift?
- Property AS: runs through the point $(Y, P) = (Y_n, P^e)$
- Point B: $P = P^e(1+m')F(1-\frac{Y_n'}{L}, z)$

- New short term equilibrium A':
  - Prices higher than expected, output above natural output
  - => Pe rises => … => AS''

- Hence: Medium term effect on Y and P

Figure 7-13 The Dynamic Effects of an Increase in the Price of Oil



Result: for fixed price expectations and fixed output we'll see m increase and thus prices increase
> for fixed output even if price expectations remain the same we have an upward shift of AS to AS'
> AS shifted
> point B helps us discover to where the new AS curve shifts to
> prices increase to Pe
> A' is a short equilibrium, because the price s higher then the expected Pe
> prices higher then expected prices > union are unhappy > they come with higher price expectations P' > the nominal wage goes up
> we go from A' to A"
This process takes up tot he point where Pe have increased to reflect the price level A"
= only at this level that the price = new price expectation

Remarks

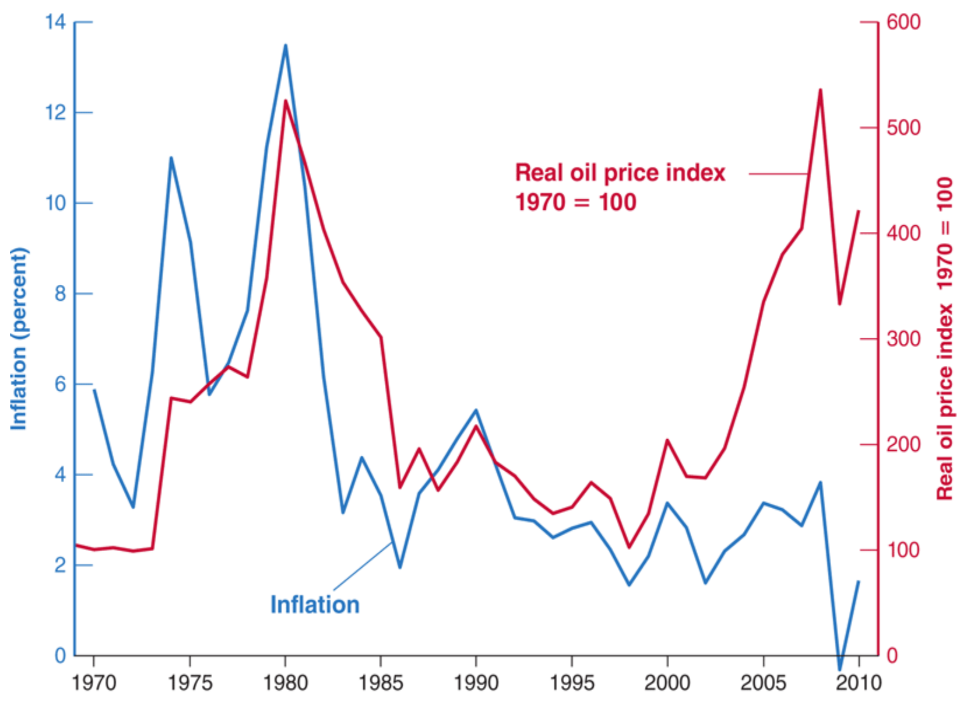
- Difference between temporary and permanent shocks
- Temporary
  - => initial effect undone after a while
  - => medium term does not change
  - Natural output and natural rate of unemployment do not change

- AD: no effect
  - Simplification
  - One can imagine possible demand effects:
  - (+) Investment in less oil-intensive technology can rise
  - (-) Shift in income from oil-users to oil-producers (and the latter having a smaller propensity to consume)
  - …

Oil Price Increases and Inflation/unemployment in the United States since 1970

70’s: just as the model predicts (“stagflation”)

00’s: high unemployment, yet no increase in inflation



Source: Real Oil Price Index—see Figure 7-10. *Inflation calculated as annual rate of change of series, CPIAUSCL Federal Reserve Economic Data (FRED)* http://research.stlouisfed.org/fred2/

Source: Real Oil Price Index—see Figure 7-11. Unemployment rate Series UNRATE: Federal Reserve Economic Data (FRED) http://research.stlouisfed.org/fred2/

Red line = the same as before, but we have added inflation

> inflation increased along with oil = good for our model: as price of oil increased, prices increased = consistend

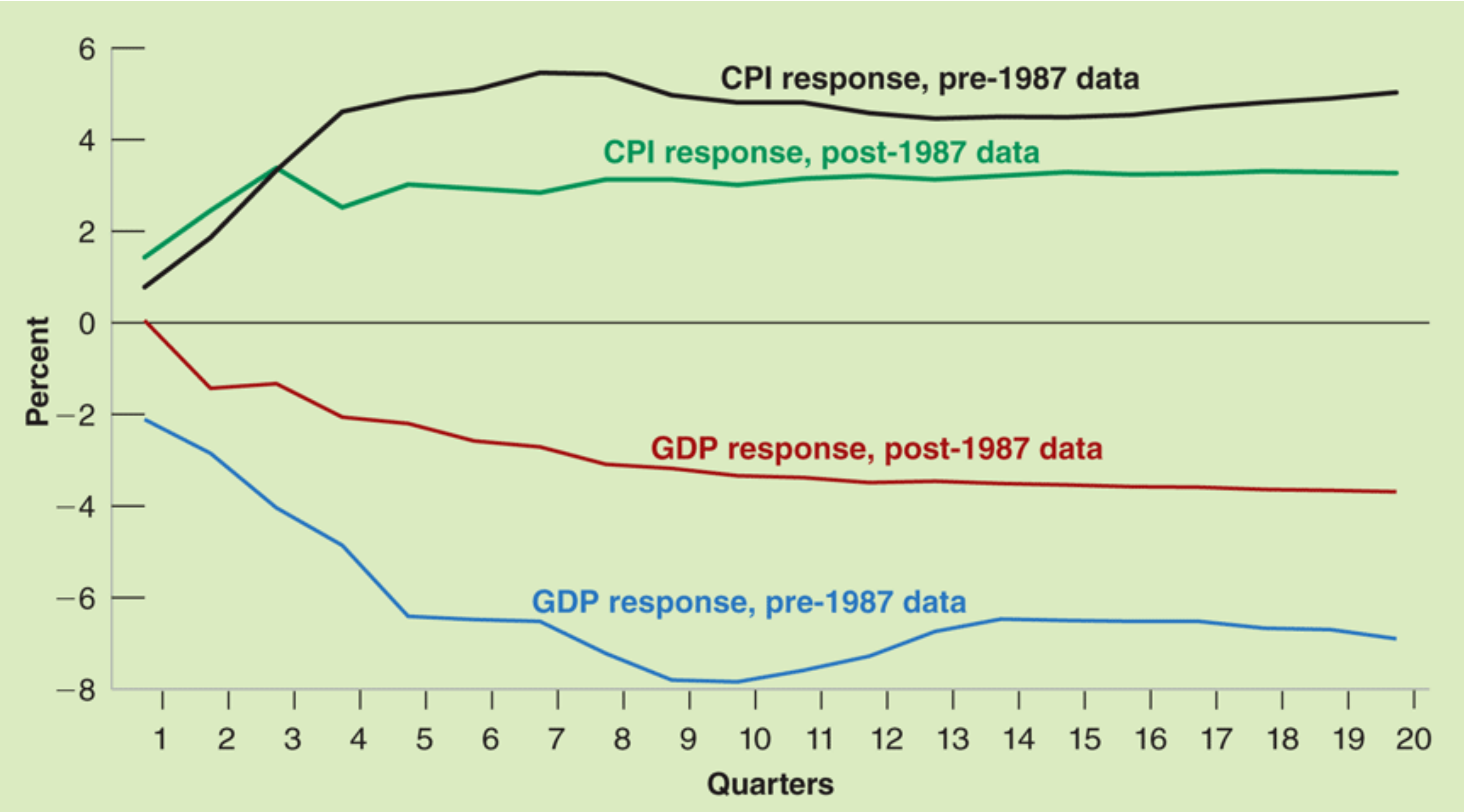
> stagflation: economys went into recession, low growth, high unenployement and high inflation

Why no inflation in 00's?

- Other shocks:
  - 70's:
    - It wasn't only oil that was expensive, other commodities were too
    - Effect? => similar effect (m rises further), amplifies
  - 00's:
    - Less bargaining power for employees as a result of globalization, increased international competition
    - Effect? WS: $W = P^e F(u, z)$F: how strong unions respond to labour market (was more flexibel)
- Other effects of the same shocks (fig)
  - Change in the slope
    - Increased willingness to accept lower wages: F'
    - Exercise: compare the effects of a same change in m under 2 different WS-slopes
  - Better monetary policy
    - Not so much M/P, but more keeping P^e under control

Focus: Oil Price Increases: Why Were the 2000s so Different from the 1970s?

Figure 1 The Effects of a 100% Permanent Increase in the Price of Oil on the CPI and on GDP. The effects of an increase in the price of oil on output and the price level are smaller than they used to be



> As Y falls, GDP falls: goes down and stays down
> prices: as oil price increase, the prices increase
Data = backing up what happens in model

Table 7-1 Short-Run Effects and Medium-Run Effects of a Monetary Expansion and a Budget Deficit Reduction on Output, the Interest Rate, and the Price Level

	Short Run			Medium Run		
	Output Level	Interest Rate	Price Level	Output Level	Interest Rate	Price Level
Monetary expansion	increase	decrease	increase (small)	no change	no change	increase
Deficit reduction	decrease	decrease	decrease (small)	no change	decrease	decrease

Homework: open economy, AS-AD model

- Revise chapters 6-9 in the textbook, then do Self-Assessment Part 2 on Toledo. The test should help you anticipate the type of question you will encounter in the exam, and prepare yourself accordingly. You can take the test as many times as you wish.

Phillips curve

~ CHAPTER 9

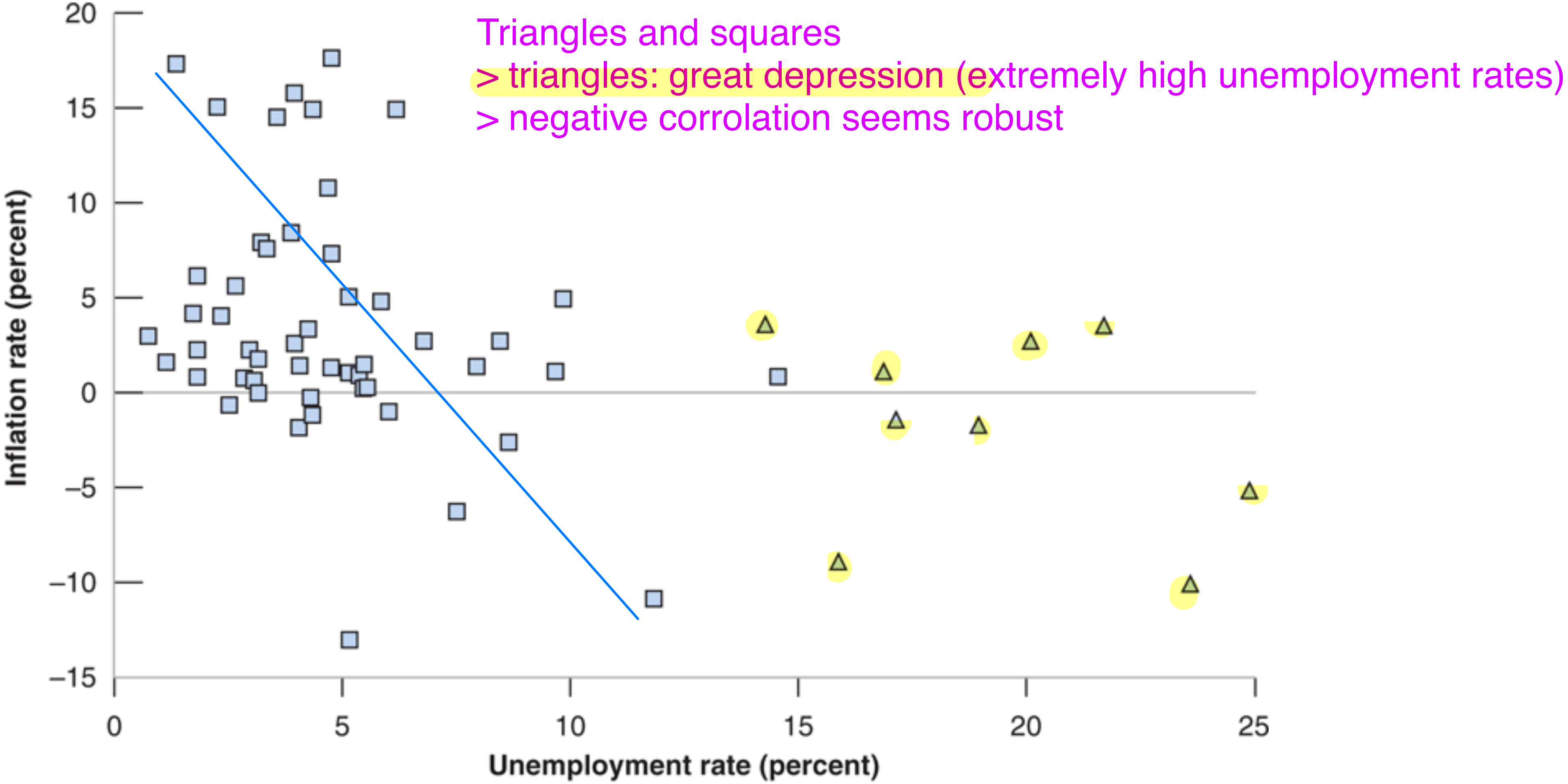
It appeared to imply that countries could choose between different combinations of unemployment and inflation. A country could achieve low unemployment if it were willing to tolerate higher inflation, or it could achieve price-level stability – zero inflation – if it were willing to tolerate higher unemployment.

Phillips curve

Even if oil prices were low again, the inflation
didn't go down. We was a

- Pre 70's: negative correlation between inflation (rate) and unemployment (rate)
  - Phillips (UK)
  - Samuelson & Solow (US)
- 70's: stagflation
- Post 70's: negative correlation between the NEW! *change in* inflation and unemployment (rate)

Figure 8-1 Inflation versus Unemployment in the United States, 1900–1960



Source: Historical Statistics of the United States. http://hsus.

Inflation, Expected Inflation, and Unemployment

- Rewrite AS:
  - Specific linear form of $\mathrm{F(u,z)} = 1 - \alpha u + z$

$$P = P^e(1 + m)(1 - \alpha u + z) \qquad (8.1)$$

  - In terms of inflation instead of price level: $\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}}$

We'll write the AS curve in terms of inflation:
> gives an dynamic AS curve

$$\pi = \pi^e + (m + z) - \alpha u \qquad (8.2)$$

if inflat = 0

$$\pi_t = \underbrace{\pi_t^e}_{=0} + (m + z) - \alpha u_t \qquad (8.3)$$

  - Time-subscript *t*; m, z here constant/exogenous
  - Everything that held for prices, also holds true for inflation

Pre 70's: Phillips Curve

- Inflation low, fluctuates around zero (fig)
- => inflation expectations (taken to the negotiation table) around zero

$$\pi_t = (m + z) - \alpha u_t \tag{8.4}$$

- Absent positive inflation expectations
- Wage demands higher if unemployment is low
- Higher wages => higher prices
- Wage-price spiral:
  - Starting from equillibrium: $P_t^e = P_{t-1}$
  - Drop in unemployment $u \downarrow$
  - Higher wage demands => higher prices
  - Higher prices => higher wage demands
  - …

Lineair negative relation between inflation and employment

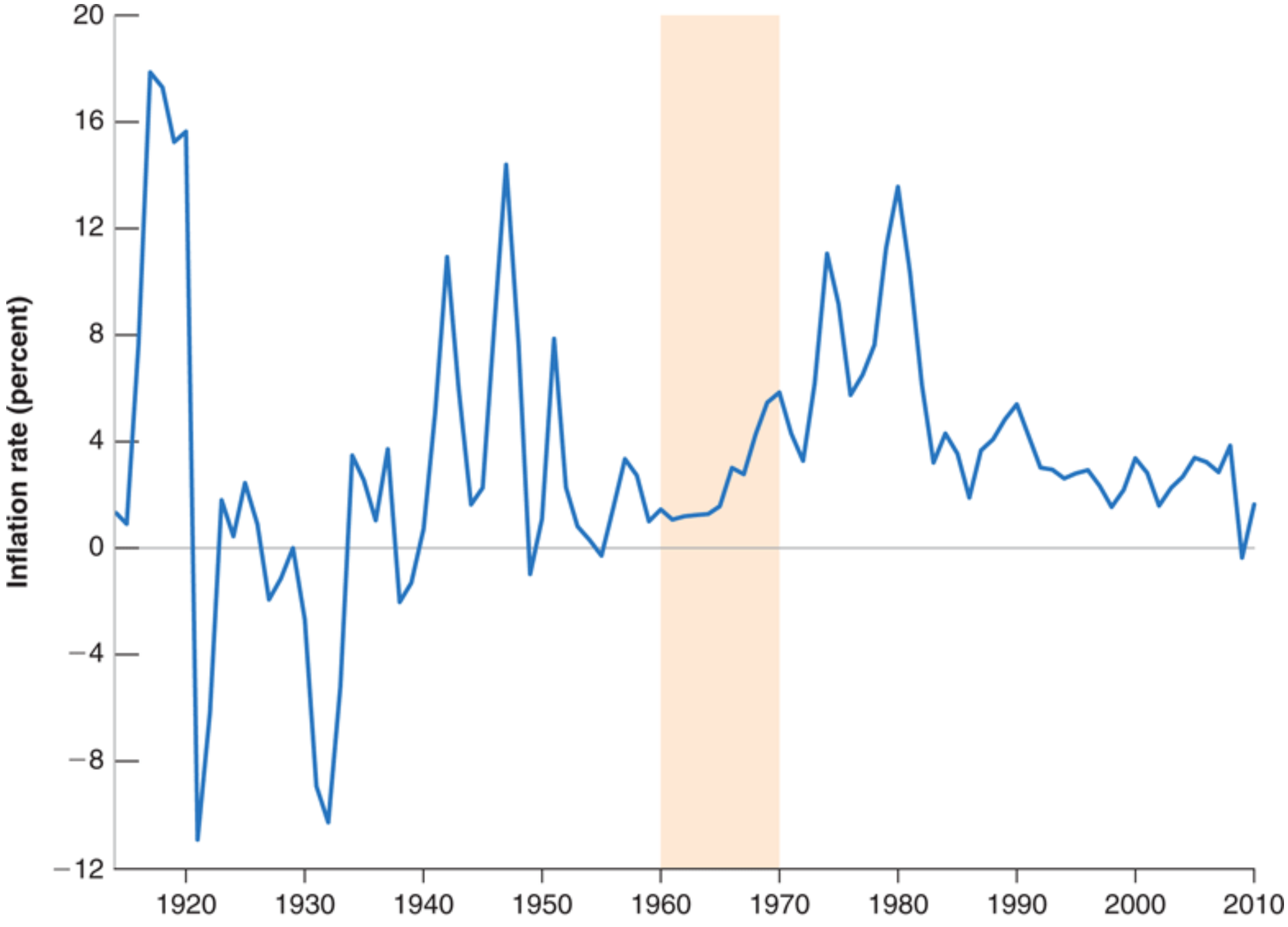
$$P_t^e = P_{t-1} : \downarrow u_t \Rightarrow \uparrow W_t \Rightarrow P_t \uparrow \Rightarrow \frac{P_t - P_{t-1}}{P_{t-1}} \uparrow \Rightarrow \pi_t \uparrow$$

Time series of inflation
> up to the 60-ies: what we see in the blue line = very erratic > inflation goes up and down by large amounts
> we see deflation: inflation goes negative. The result: before the 60-ies: inflation tended to hover around 0, after the 60-ties = positive

Figure 8-4 U.S. Inflation, since 1914

> looking at time series: pretty stark change in dynamics of inflation

- Pre-70:
- Volatile around zero



Source: Years 1900–1914, Histori-

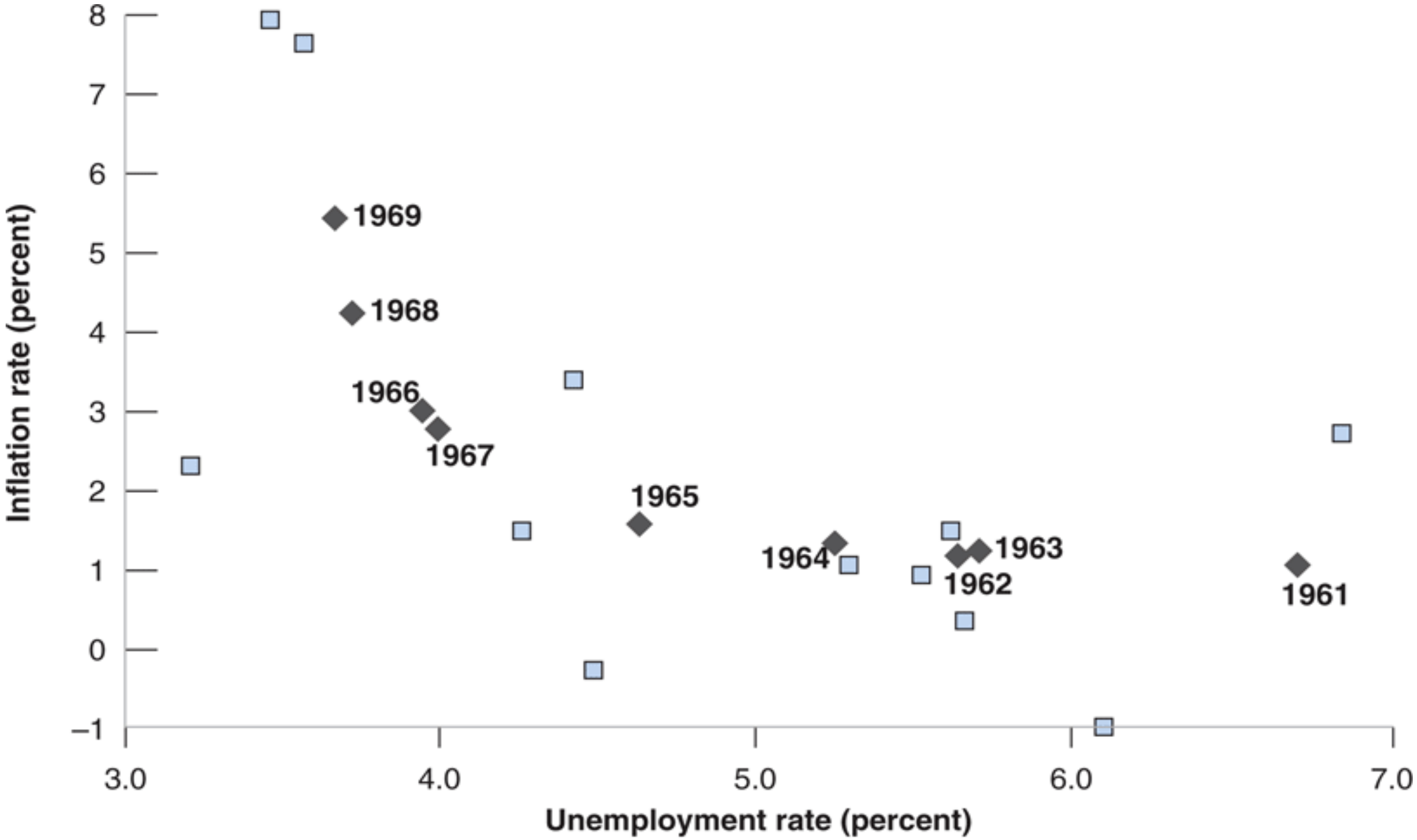
Black squares: high unemployment and low inflation > reduced unemployment > higher inflation
> people started believe this to be true
> policy makers: we can exploit this relationship: better change of getting re elected if unemployement is low (then we need to make sure that the inflation is higher)
= looked like we could have a booming economy permanently
> but this relation didn't hold
> inflations behaviour started to change in the 70 and 80-ies

Pre 70’s: Phillips Curve

Figure 8-2 Inflation versus Unemployment in the United States, 1948–1969

Often seen as a policy choice:

Can reduce unemployment (even permanently), at the cost of higher inflation



70's and later: Phillips Curve?

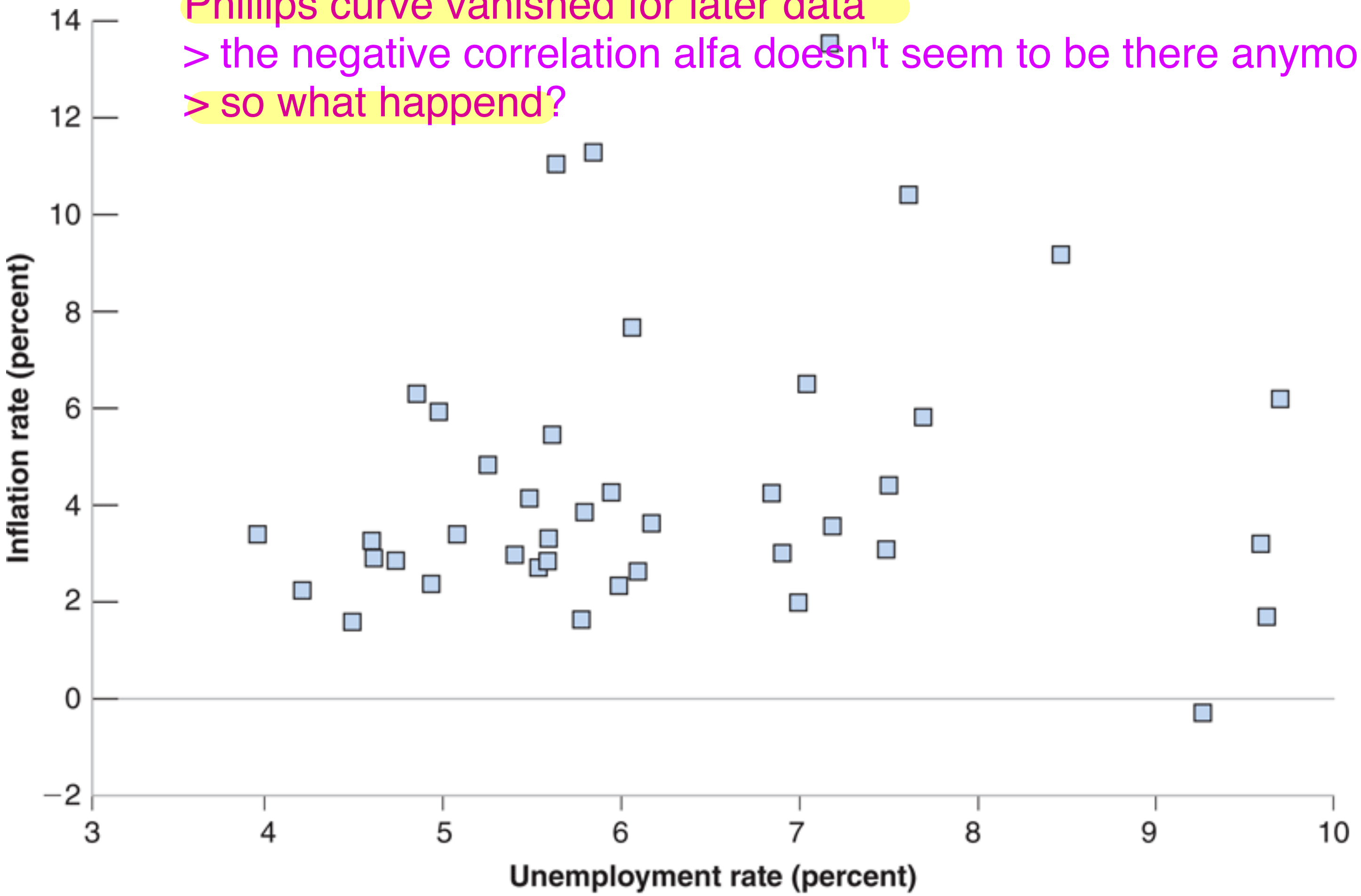
Figure 8-3 Inflation versus Unemployment in the United States, 1970–2010

But: no clear correlation

Phillips curve vanished for later data

> the negative correlation alfa doesn't seem to be there anymore

> so what happend?



70's

What happend?

- Stagflation
  - Inflation and unemployment jointly high $\boxed{P} = P^e(\boxed{m}+1)F\left(1-\frac{Y}{L}, z\right)$
  - Inconsistent with the Phillips curve
- Deviation from the relation between inflation and unemployment can be explained by oil-shocks *m*

$$\pi_t = (m + z) - \alpha u_t \quad (8.4)$$

The philips curve itself shift (we no longer move along the curve as in the 60-ies): m increases, for a given level of unemployement we'll have a higher inflation
> after 70-ies: oil prices went high and inflation remained high

- Yet the behavior of inflation changes more than that

What inflations expectations should I make?
> 60-ties around 0
> afterwards: inflation was never negative - inflation expectations should be positive

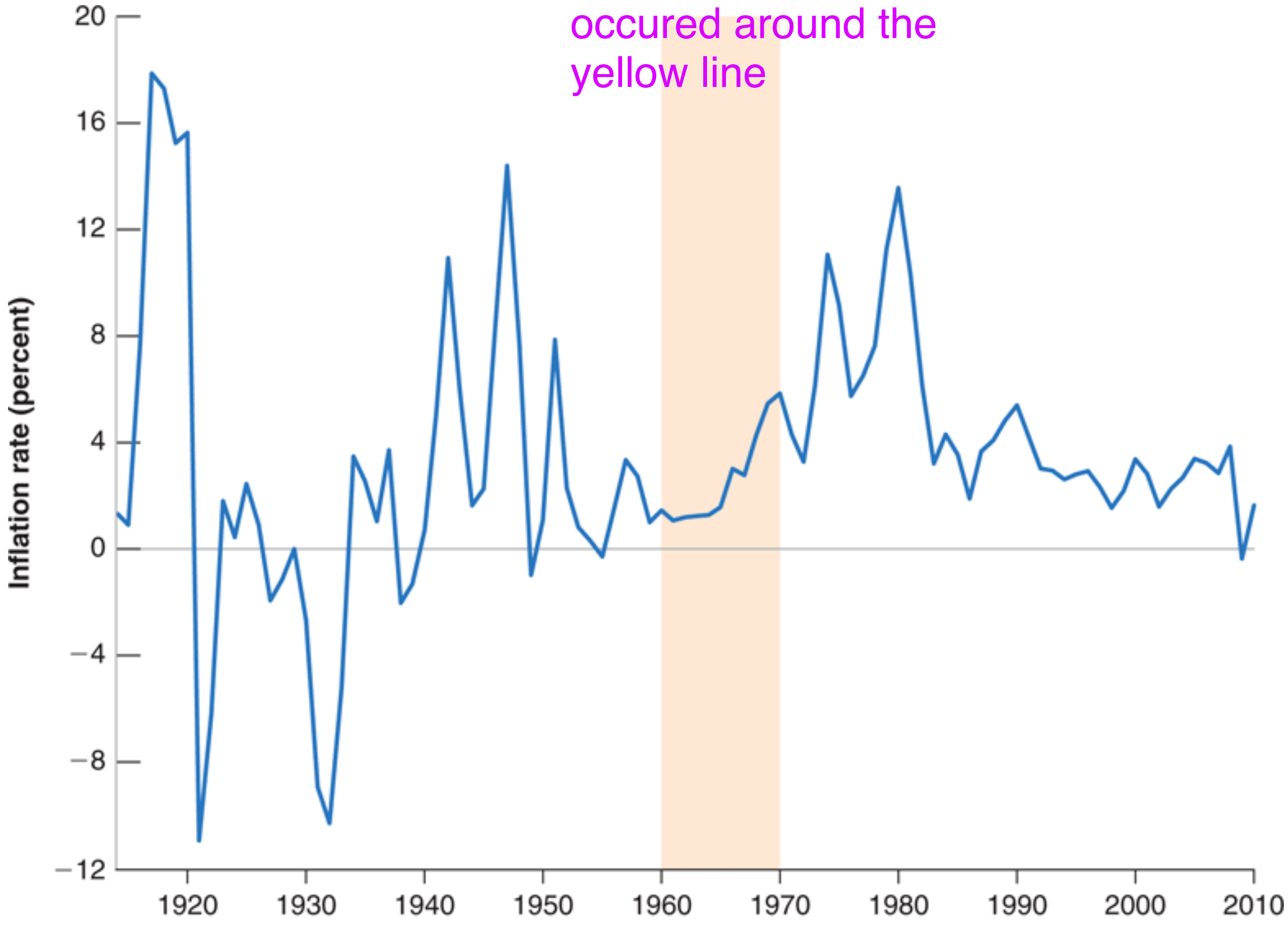
Figure 8-4 U.S. Inflation, since 1914

- After 1970:
- From volatile and around zero
- To persistent and positive

- $\pi_t^e = 0$?

We need other inflation expectations, but are based on whatever inflation was in the past

Change in inflation occured around the yellow line



Inflation expectations

- Sequence of positive inflation numbers
- Wage was negotiated based on a zero inflation expectation $\frac{W}{P^e}$
- => resulting real wage $\frac{W}{P}$ consistently lower
- Wage setters adjust inflation expectations
- Persistence:
- $\pi_t^e = \theta \pi_{t-1}$ Expected inflation = inflation in the previous time * theta

- Pre 70: θ=0
- After: θ rises, to 1

Changing inflation expectations: Implications for the Phillips Curve

- $\pi_t \;= \pi_t^e + (m+z) - \alpha u_t$

Actual behaviour of inflation

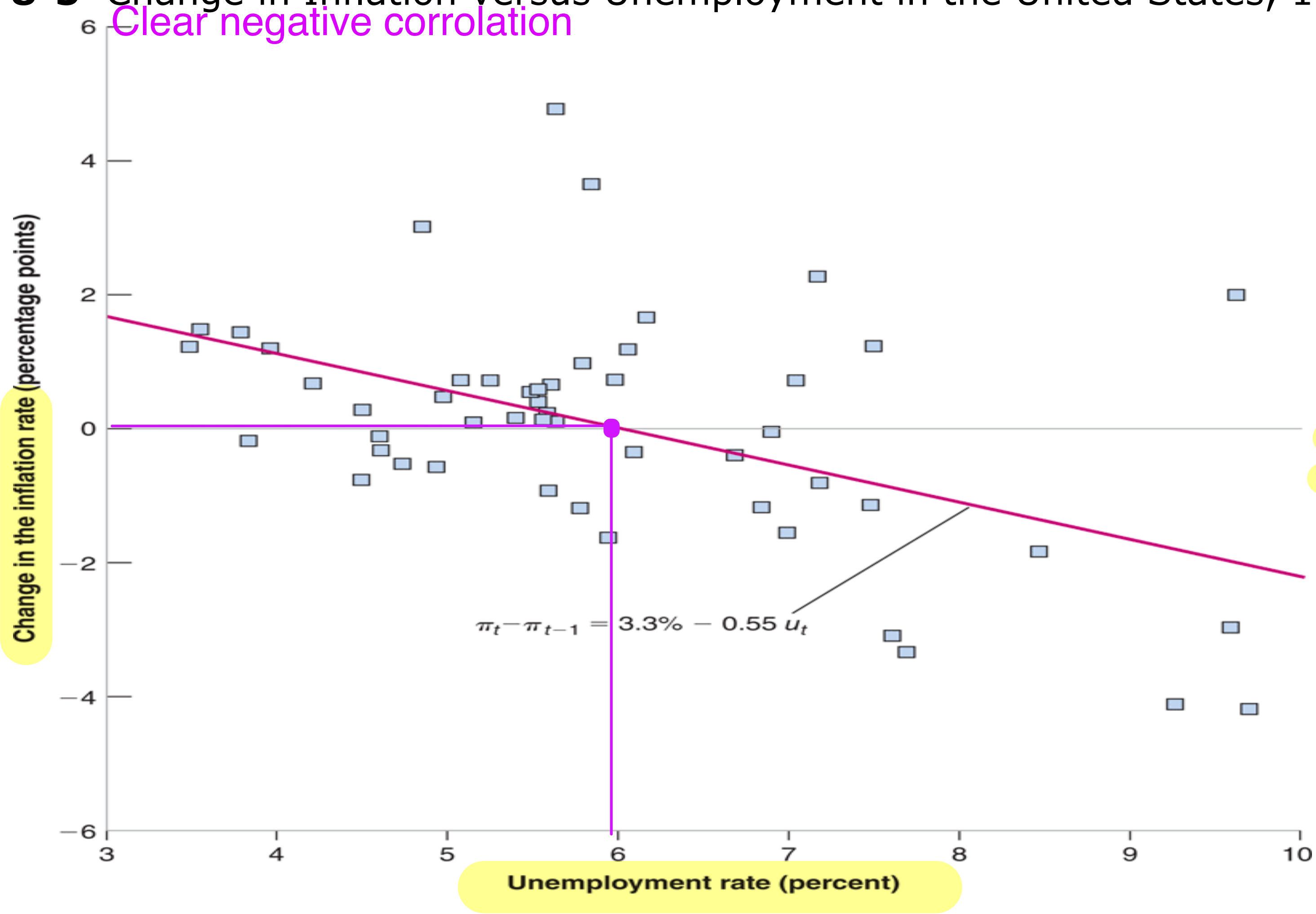
$$\pi_t^e = \theta\,\pi_{t-1} \tag{8.5}$$

- $\theta = 0$
    - $\pi_t^e = 0$
    - $\pi_t \;= 0 + (m+z) - \alpha u_t$ Results in Philips curve

- $\theta = 1$
    - $\pi_t^e = \pi_{t-1}$
    - $\pi_t \;= \pi_{t-1} + (m+z) - \alpha u_t$

$$\pi_t - \pi_{t-1} = (m+z) - \alpha u_t \tag{8.6}$$

Figure 8-5 Change in Inflation versus Unemployment in the United States, 1970–2010



If we wanted inflation to be stable, then the unemployment rate would be around 6%

So there is a stable level that the economy can reach (for this US sample)

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

- Original Phillips curve
- $\pi_t = (m + z) - \alpha u_t$

- Expectations-augmented Phillips curve
- $\pi_t - \pi_t^e = (m + z) - \alpha u_t$
- A.k.a. accelerationist Phillips Curve
- $\pi_t - \pi_{t-1} = (m + z) - \alpha u_t$

So in the medium run:
> the left hand side of our excectations augmented philips curve would be zero

Natural unemployment

- Medium run: $\pi_t = \pi_t^e$
- $\Rightarrow \; 0 = (m + z) - \alpha u_n$
- $\Rightarrow u_n = \frac{m+z}{\alpha}$

- Expectations-Augmented Phillips Curve:
  - $\pi_t - \pi_t^e = (m + z) - \alpha u_t$
  - $\pi_t - \pi_t^e = -\alpha(u_t - \frac{m+z}{\alpha})$
  - $\pi_t - \pi_t^e = -\alpha(u_t - u_n)$ (ut<un: economy is booming = negative) * negative sign = positive = inflation is higher then expected
  - $\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$

NAIRU

- $\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$

- $u_t < u_n \Rightarrow \pi_t > \pi_{t-1}$
- Inflation rises if unemployment is below natural unemployment
- $u_t = u_n$ is the unemployment rate at which inflation is constant
- $\Rightarrow$ NIIRU: non-increasing inflation, rate of unemployment

- Is sometimes called NAIRU
  - Bit of a misnomer: acceleration refers to the price level, not inflation

NAIRU

- $\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$

- US since 1970:
- $\pi_t - \pi_{t-1} = 3.3\% - 0.55u_t$
- $0 = -0.55(u_t - \frac{3.3\%}{0.55})$
- u_n =6% (Remember earlier)
  But it is not always true: it changes over time

The Phillips Curve (Continued)

Back to the natural rate of unemployment

$$\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$$

Our dynamic philips curve helps us look at the data to understand the relation between inflation and unemployement

The equation above is an important relation for two reasons:

- It gives us another way of thinking about the *Phillips curve*: as a relation between the actual unemployment rate u_t, the natural unemployment rate u_n and the change in the inflation rate $\pi_t - \pi_{t-1}$
- It also gives us another way of thinking about the *natural rate of unemployment*. The *non-accelerating inflation rate of unemployment, (or NAIRU)*, is the rate of unemployment required to keep the inflation rate constant.

The Phillips Curve (Continued)

Let's summarize what we have learned so far:

- **The aggregate supply relation is well captured in the United States today by a relation between the change in the inflation rate and the deviation of the unemployment rate from the natural rate of unemployment.**

- **When the unemployment rate exceeds the natural rate of unemployment, the inflation rate decreases. When the unemployment rate is below the natural rate of unemployment, the inflation rate increases.**

Application

A

- Policy:
  - Trade-off inflation and unemployment: permanent?
  - Costs of disinflation
  - Deflation
  - High inflation & wage indexation

B

- Natural unemployment: differences across time/countries

Policy

- Original Phillips curve
- $\pi_t \; = (m + z) - \alpha u_t$
  - Implies (at constant m, z) that unemployment can be persistently low, as long as you are willing to accept inflation
  - In other words: there is no u_n

60-ies: clean trade of between inflation and policy, so policy makers started to look at this (was good for elections): we have to reduce inflation rates

- Expectations-augmented Phillips curve
- $\pi_t \; - \pi_t^e = (m + z) - \alpha u_t$
  - Implies that unemployment can only be persistently low if $\pi_t \; - \pi_t^e$>0
  - In other words: wage setters systematically underestimate inflation
  - Friedman & Phelps
  - Absent systematic mistakes: $0 = (m + z) - \alpha u_n$

Smart economists: no that is not true (the philips trade of curve cannot be rue), it is onlly true if we assume stupid unions (which they aren't), behaviour adjusts to it's surroundings

Theory Ahead of Facts:

A

Trade off

Milton Friedman and Edmund Phelps

Economists are usually not very good at predicting major changes before they happen. Here is an exception.

In the late 1960s—precisely as the original Phillips curve relation was working like a charm—two economists, Milton Friedman and Edmund Phelps, argued that the appearance of a trade-off between inflation and unemployment was an illusion.

=> Friedman could not have been more right. A few years later, the original Phillips curve started to disappear, in exactly the way Friedman had predicted.

As a policy maker: you cannot choose how much unemployment there is

Deflation: prices fall, or inflation is negative (didn't happen much)

Disinflation

- $0 < \pi_t < \pi_{t-1}$ = getting inflation down (not negative numbers, but lower then before)
  = what is happening now
  $\pi_t > \pi_{t-1} > 0$ We want inflation to go down $\pi_t < \pi_{t-1}$
- Recall stagflation: high inflation and unemployment
  Getting there isn't easy
- How to get out of it?
- $\pi_t - \pi_{t-1} = -\alpha(\overbrace{u_t - u_n}^{\oplus})$ $<\ = \ominus \rightarrow$
  We need higher unemployment
- LHS negative (given π_{t-1}) requires accepting high unemployment
- By how much must unemployment increase? "Sacrifice Ratio"

- How to achieve disinflation? Central bank
  - Reduces money-growth
  - (Later: money-growth ~ inflation)

Alfa describes past behaviour, but it doesn't describe the future behaviour
> in our philips curve we've made assumptions: we've assumed that inflations expectations today are determined by past inflation expectations, but that isn't nesesarilly the case (in the sixties we expected them to be zero, but that didn't stay true), so we can't take this as a given.
> if we want to think about policy options we shoudn't be thinking about the philips curve were we substituted the inflation. Let's use the forward looking curve instead of the backward

Disinflation (Continued)

A first pass

$$\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$$

In the Phillips curve relation above, disinflation—a decrease in inflation—can be obtained only at the cost of higher unemployment.

$$(\pi_t - \pi_{t-1}) < 0 \Rightarrow (u_t - u_n) > 0 \Rightarrow u_t > u_n$$

A **point-year of excess unemployment** is a difference between the actual and the natural unemployment rate of one percentage point for one year.

Disinflation (Continued)

A first pass

For example, let's assume that $\alpha = 1$

- Suppose the central bank wants to achieve the reduction in inflation in one year, then one year of unemployment at 10% above the natural rate is required.
- Suppose the central bank wants to achieve the reduction in inflation over 2 years, then 2 years of unemployment at 5% above the natural rate is required.
- By the same reasoning, reducing inflation over five years requires five years of unemployment at 2% above the natural rate (five times 2% = 10%); reducing inflation over 10 years requires 10 years of unemployment at 1% above the natural rate.

Disinflation (Continued)

A first pass

$$\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$$

The <u>sacrifice ratio</u> is the number of point-years of excess unemployment needed to achieve a decrease in inflation of 1%.

Sacrifice ratio = 1/ α

For example, if α is roughly equal to one, as the estimated Phillips curve suggests, then the sacrifice ratio is roughly equal to one.

If α is lower, then a given change in unemployment gap will lead to a lower change in inflation => higher sacrifice ratio

Disinflation (Continued)

Expectations and credibility: the Lucas critique

- The **Lucas critique** states that it is unrealistic to assume that wage setters would not consider changes in policy when forming their expectation.

- If wage setters could be convinced that inflation was indeed going to be lower than in the past, they would decrease their expectations of inflation, which would in turn reduce actual inflation, without the need for a change in the unemployment rate.

- Thomas Sargent, who worked with Robert Lucas, argued that in order to achieve disinflation, any increase in unemployment would have to be only small.

- The essential ingredient of successful disinflation, he argued, was credibility of monetary policy—the belief by wage setters that the central bank was truly committed to reducing inflation. The central bank should aim for fast disinflation.

Let's use the forward looking curve
> if we want to reduce the inflation rate, maybe we can adjust the inflation expectations instead of the unemployment
> don't trust the statistical relationship of the past: realise that expectations matter

Disinflation (Continued)

Expectations and credibility: the Lucas critique

- $\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$
- LHS negative (given π_{t-1}) requires accepting high unemployment

- Lucas critique
  - The existing relation between variables is not necessarily "policy-invariant"
- The above assumes unchanged inflation expectations
- $\pi_t - \pi_t^e = -\alpha(u_t - u_n)$
- If disinflatie-policy is credible => expectations change
- LHS=0 => RHS=0!
  - => A credible disinflation policy need not be painful (Sargent)

Union: we do not need higher wages than the whole whage price spiral stops > if wages aren't increasing > firms don't increase prices > inflation stops
So getting inflation down doesn't necisarilly mean a recession, convince people you will solve the problem!
> but how will you convince people

Table 8-1 US Inflation and Unemployment, 1979–1985

Volcker leading the Fed

Monetary restriction

Painful disinflation

Lack of credibility?

Late 70-ties: high inflation rates, inflation came down in the 80-ies: desinflate
> was it as easy as expected?
> not really: unemployment rate increased first from 6 to 10% and afterwards it went down to 7%, so it wasn't a free lunch and it was pretty painfull

	1979	1980	1981	1982	1983	1984	1985
CPI inflation (%)	13.3	12.5	8.9	3.8	3.8	3.9	3.8
GDP growth (%)	2.5	–0.5	1.8	–2.2	3.9	6.2	3.2
Unemployment rate (%)	5.8	7.1	7.6	9.7	9.6	7.5	7.2

Disinflation (Continued)

There are a lot of features in real life economics

Nominal rigidities and contracts

- A contrary view was taken by Stanley Fischer and John Taylor. They emphasized the presence of nominal rigidities, or the fact that many wages and prices are not readjusted when there is a change in policy.

- If wages are set before the change in policy, inflation would already be built into existing wage agreements.

- While Fischer argued that even with credibility, too rapid a decrease in nominal money growth would lead to higher unemployment, Taylor's argument went one step further.

- He argued that wage contracts are not all signed at the same time, but that they are staggered over time.

- He showed that this staggering of wage decisions imposed strong limits on how fast disinflation could proceed without triggering higher unemployment.

Nominal rigidities and contracts

Simulation in the model: the optimal disinflation - high inflation level is not just going immediately to low inflation level, it is more slowly and needs moor gradual adjustment

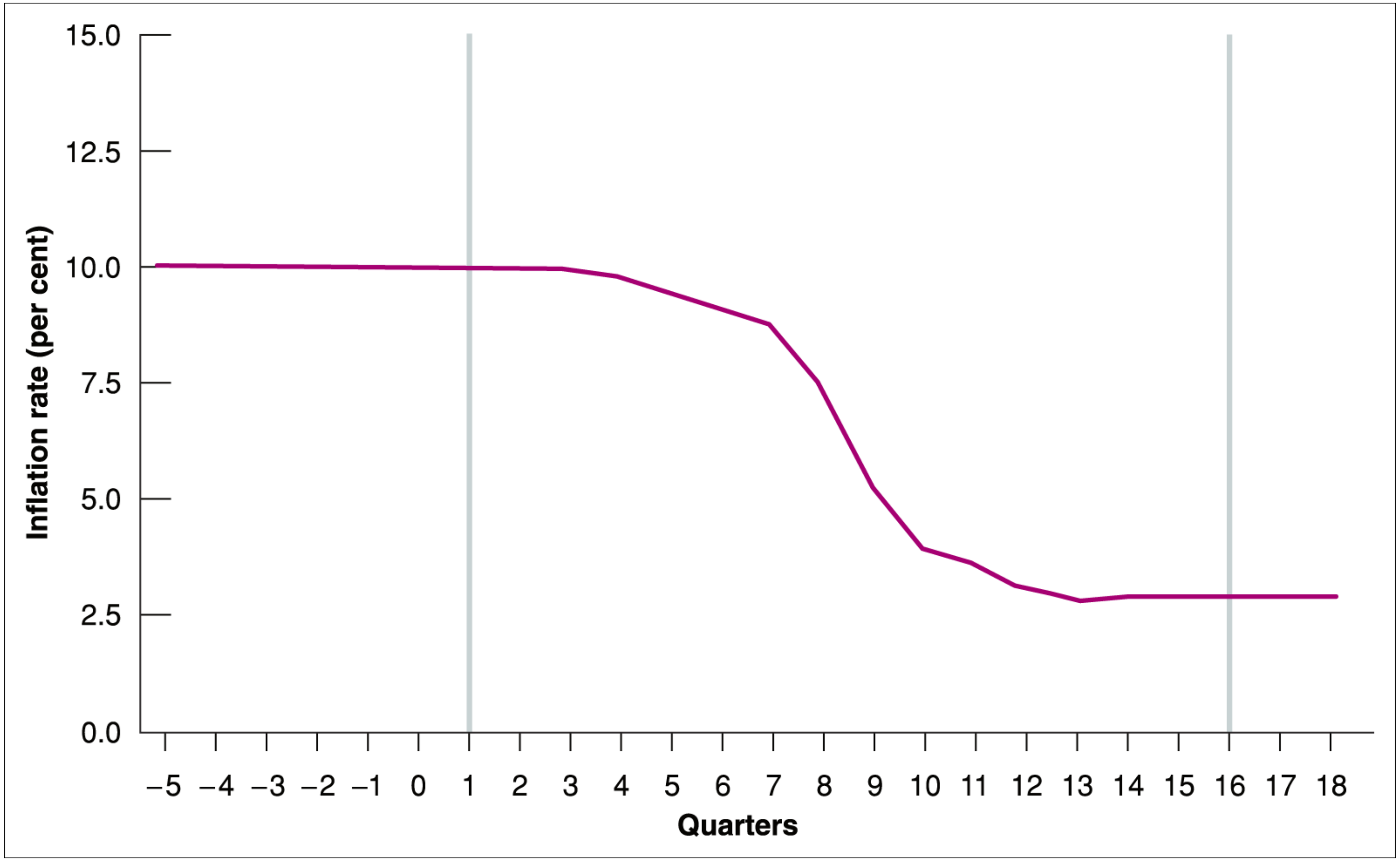


Figure 11.10 **Disinflation without unemployment in the Taylor model**

If wage decisions are staggered, disinflation must be phased in slowly to avoid an increase in unemployment.

Disinflation (Continued)

Nominal rigidities and contracts

In 1993, Laurence Ball, from Johns Hopkins University estimated sacrifice ratios for 65 disinflation episodes in 19 OECD countries over the last 30 years. He reached three main conclusions:

- Disinflations typically lead to a period of higher unemployment.
- Faster disinflations are associated with smaller sacrifice ratios.
- Sacrifice ratios are smaller in countries that have shorter wage contracts.

Disinflation in the UK, 1979–1985

- In 1979, the economic performance of the UK was rather poor.
The inflation rate was higher than 13% and the immediate objective was to reduce it.

- The government instituted a Medium Term Financial Strategy (MTFS).
The rate of growth of the monetary base slowed from 12.1% in 1979 to 2.6% in 1981

- However, the most obvious failure has been the level of unemployment. The evolution of inflation and unemployment in the second half of the 1980s, in the UK as well as continental Europe, shows that rising trends in unemployment have gone along with apparent stickiness of wage inflation.

- The Phillips curve theory has great difficulties in explaining wage–price movements over the 1980s in the UK and in much of Europe. (i.e. why didn't inflation continue to decline with such high unemployment?)

Disinflation, 1979–1985

Estimates for the sacrificie ratio

	Inflation		Unemployment		'Sacrifice ratio'
	1980	1985	1980	1985	
Germany	4.9	2.3	3.0	7.2	6.8
France	11.6	5.9	6.3	10.2	2.1
Italy	21.5	9.2	7.5	10.1	0.7
Japan	3.9	1.5	2.0	2.6	1.0
Sweden	11.9	6.9	2.0	2.8	0.4
UK	19.1	5.8	6.4	11.2	1.8
USA	9.1	3.0	7.0	7.1	1.0

Source: Charles Bean and James Symons, 'Ten Years of Mrs T', in *NBER Macroeconomics Annual*, Volume 4, 13–61, Table 3, p. 23. NBER, Cambridge, MA, 1989.

Table 11.3 **Comparative inflation and unemployment performance**

Germany: to get the inflation ratio down, the unemployment rate were very high
> what is behind the sacrifice ratio: that is what is behind the function F

Deflation

- $\pi_t < 0$
- Differs from disinflation: $(0 <)\pi_t < \pi_{t-1}$

- Is only rarely observed
- Great Depression
  - 1930: Δ in earlier figure
- Very high unemployment
- Inflation higher (deflation lower) than expected through the Phillips Curve
  - Refusal to accept nominal wage reductions at the negotiation table
  - Europe today

Last ting

High Inflation

High inflation and the Phillips curve relation

- The relation between unemployment and inflation is likely to change with the level and the persistence of inflation.
- When inflation is high, it is also more variable.
- The form of wage agreements also changes with the level of inflation. Wage indexation, a rule that automatically increases wages in line with inflation, becomes more prevalent when inflation is high.

High inflation

- Expectation formation adjusts to its environment
- E.g.: VS 70, inflation high and persistent

- Wage indexation becomes more prevalent at high inflation
  - Rather than negotiate on the basis of *expected* inflation, W is adjusted to *actual* (realized) inflation
  - Hedge against unexpected price changes
- λ: proportion of indexed contracts
- $\pi_t = [\lambda\pi_t + (1-\lambda)\pi_t^e] - \alpha(u_t - u_n)$
- $\pi_t = [\lambda\pi_t + (1-\lambda)\pi_{t-1}] - \alpha(u_t - u_n)$
- λ =0: $\pi_t = \pi_{t-1} - \alpha(u_t - u_n)$
- $\lambda \to$ 1: $\pi_t = \lambda\pi_t - \alpha(u_t - u_n) \Rightarrow \pi_t = -\frac{\alpha}{1-\lambda}(u_t - u_n)$
  - Hightened effect of unemployment on inflation (stronger wage-price spiral)
  - High inflation => frequent renegotiations/indexation => inflation volatile/unstable

Variation in the Phillips-curve

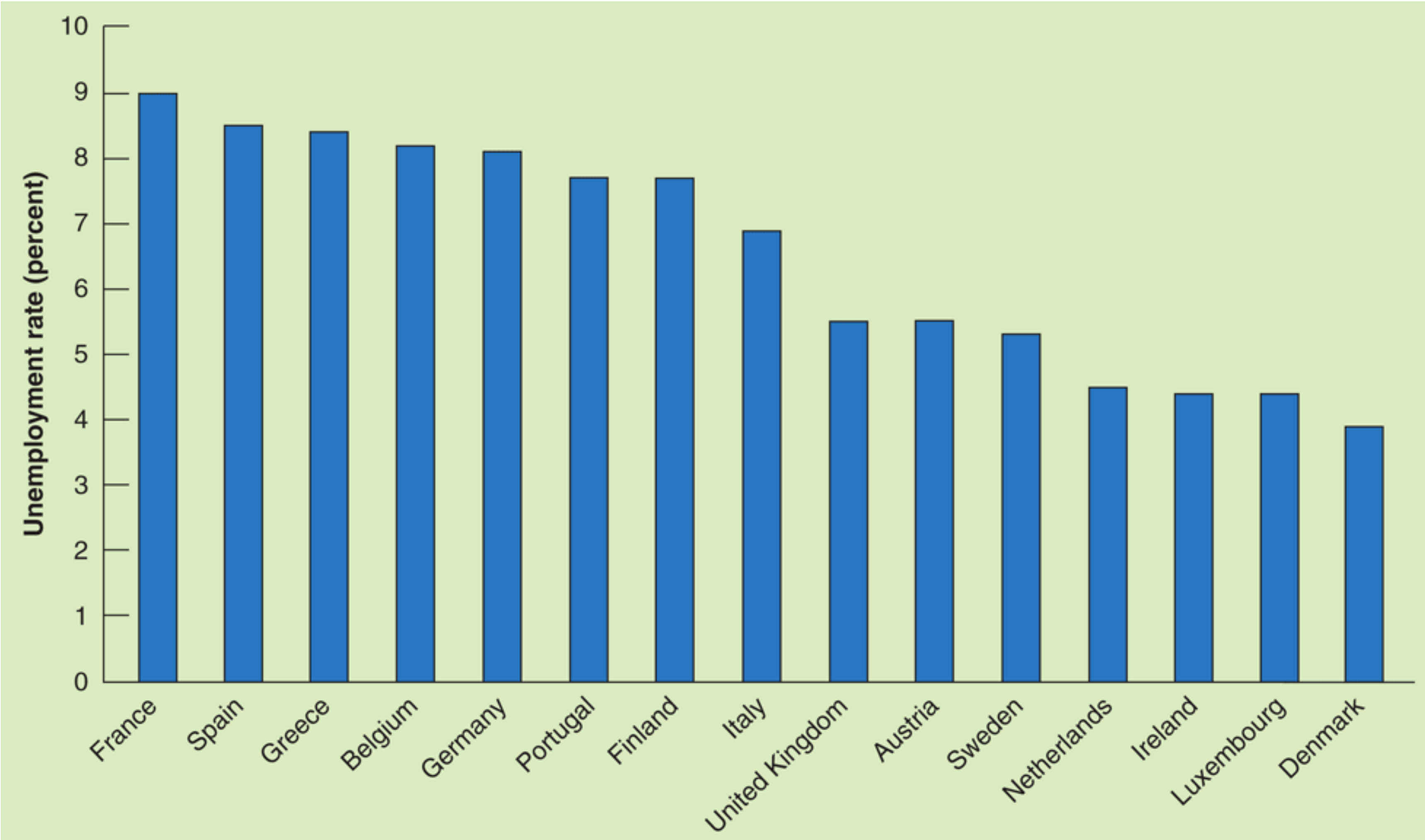
- Across countries
  - EU vs. US
- Over time
  - US, EU

$$\boxed{u_n = \frac{\mu + z}{\alpha}}$$

The factors that affect the natural rate of unemployment above differ across countries. Therefore, there is no reason to expect all countries to have the same natural rate of unemployment.

Focus: What Explains European Unemployment?

Figure 1 Unemployment Rates in 15 European Countries, 2006



B

The Phillips Curve and the Natural Rate of Unemployment in Europe

$$\pi_t - \pi_{t-1} = (\mu + z) - \alpha u_t$$

- In the equation above, the terms μ and z may not be constant but, in fact, vary over time, leading to <u>changes in the natural rate of unemployment</u>.

- In Europe, the natural unemployment rate has increased a lot since the 1960s. In the United States, the natural unemployment rate increased by 1–2% from the 1960s to the 1980s, and appears to have decreased since then.

The Phillips Curve and the Natural Rate of Unemployment in Europe (Continued)

PMR ~ m

PS: $W/P=1/(1+m)$

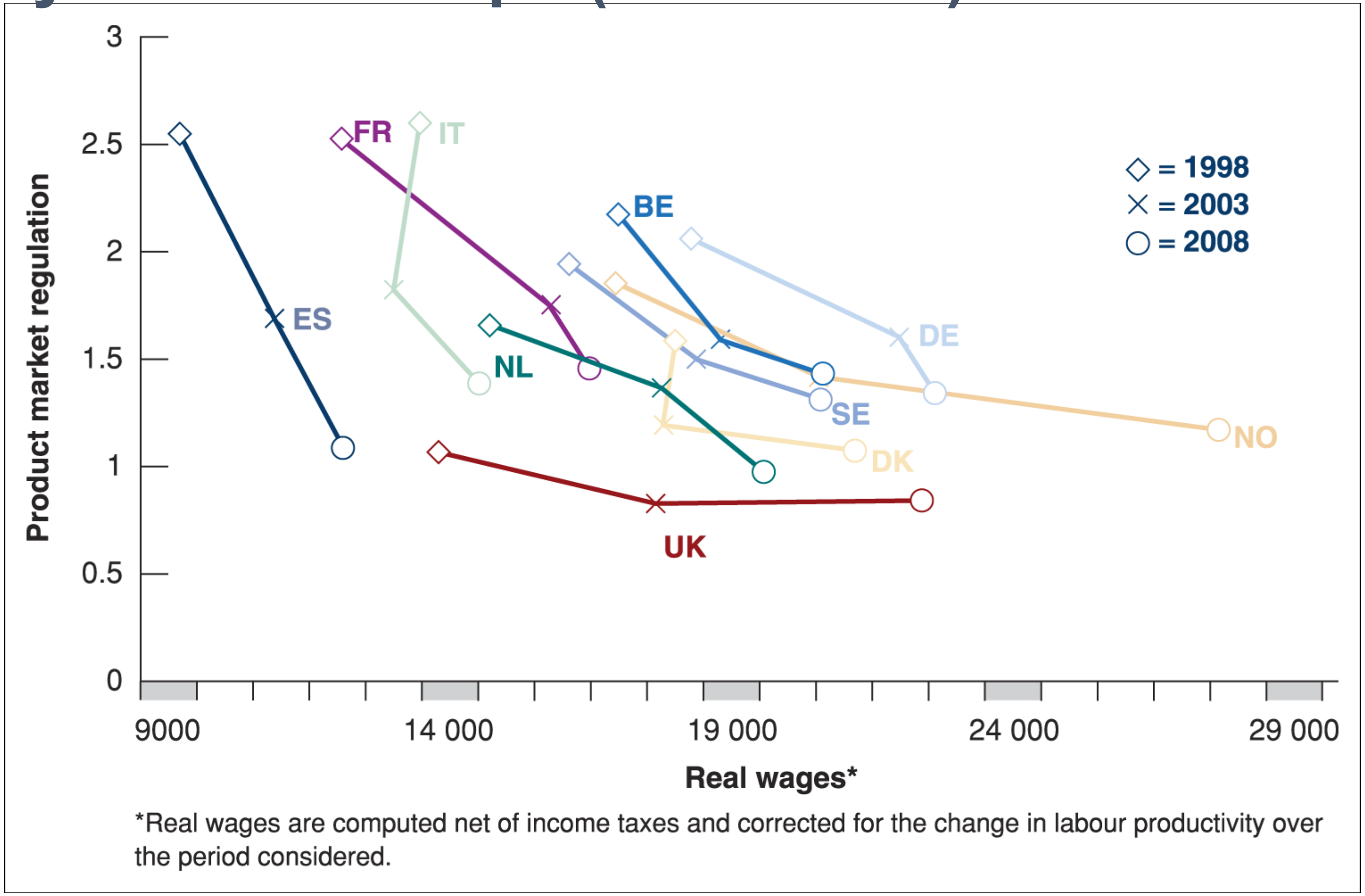


Figure 10.6 **Relationship between trends in product market regulation and wages in Europe (1998, 2003, 2008)**

Source: OECD, Eurostat.

The Phillips Curve and the Natural Rate of Unemployment in Europe (Continued)

What explains European unemployment?

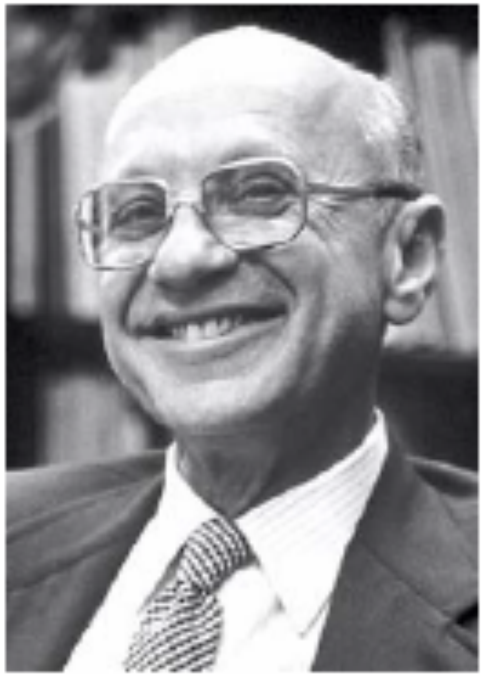
Labour market rigidities:

- A generous system of unemployment insurance
- A high degree of employment protection
- Minimum wages
- Bargaining rules

Labour market rigidities

- Stark contrast between US and EU
  - Unemployment benefits
    - Height (replacement ratio=benefit/previous net wage) and length
  - Employment Protection Legislation
    - Redundancy pay, judicial details (e.g. required motivation employer), …
  - Minimum wage
  - Collective bargaining agreements ("CAOs")
  - …
- So EU performs pretty poorly in terms of *u*, however:
  - Is not necessarily the only yardstick to evaluate policy
    - Social protection/poverty could be another (EU>US)
  - Was different pre 80s:
    - The switch cannot be attributed to rigidities alone
  - Rigidities do not explain all cross-sectional differences (Fig)
    - Some EU countries do have low unemployment, despite ample rigidities
  - Details of labour market (policy) matter (e.g. activating unemployed)

Milton Friedman (1912-2006)



Country of origin: USA
Affiliation: University of Chicago, USA
Contribution: permanent income hypothesis, theory of inflation
Important work: “A Monetary History of the United States, 1867-1960“ with Anna Schwartz. Princeton University Press
Noteworthy: Nobel Prize 1976

CHAPTER 11: INFLATION, MONEY GROWTH AND THE REAL RATE OF INTEREST

11.1 Output, Unemployment and Inflation

This chapter characterizes the economy by three relations:

- Okun's Law, which relates the change in unemployment to *output growth*.
- The Phillips curve, which relates the changes in *inflation* to *unemployment*.
- The aggregate demand relation, which relates *output growth* to both nominal *money growth* and *inflation*.

11.1 Output, Unemployment and Inflation (Continued)

Okun's law

$$u_t - u_{t-1} = -g_{yt}$$

- **According to the above equation, the change in the unemployment rate should be equal to the negative of the growth rate of output.**

- **For example, if output growth is 4%, then the unemployment rate should decline by 4%.**

The unemployment rate is that part of the labour force (L) that is not employed (N)

- **Strict relation follows from our previous assumptions:**
  - **Y=N**
    - **=> change in output Y leads to proportional change in employment N**
  - **L is constant**
    - **=> change in N leads to proportional change in u (=1-N/L)**

    This version of Okun's law follows directly from the previous equations

11.1 Output, Unemployment and Inflation (Continued)

Okun's law

- The actual relation between output growth and the change in the unemployment rate is known as Okun's law.

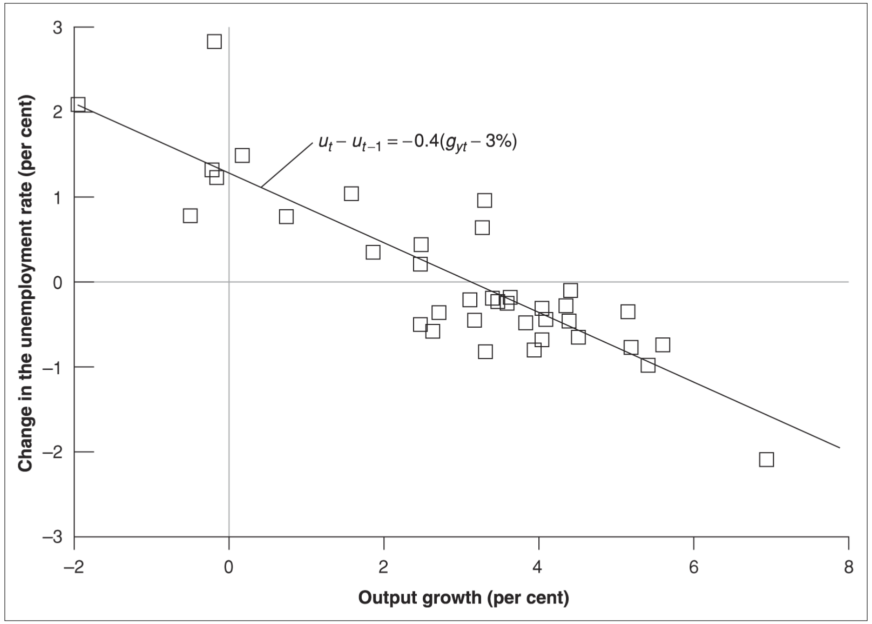
- Using 30 years of data, the line that best fits the data is given by:

There is a constant term:

$$u_t - u_{t-1} = -0.4(g_{yt} - 3\%)$$

11.1 Output, Unemployment and Inflation (Continued)

Okun's law



We have a clear cloud of data point around the negative sloping curve
> The change in uneployment is equal to a constant and a variable term (ut=...)
> constant term: is output growth is zero, (so economy doesn't grow), than it looks like unemployment rate increases
> if we want unemployment to be stable then we will need positive output growth of 3%

Figure 11.1 **Changes in the unemployment rate versus output growth in the USA since 1970**

High output growth is associated with a reduction in the unemployment rate; low output growth is associated with an increase in the unemployment rate.

> macroeconomics: time series of GDP show that economies grow over time

11.1 Output, Unemployment and Inflation (Continued)

Okun's law

$$u_t - u_{t-1} = -0.4(g_{yt} - 3\%)$$

= stark relation in western economies

According to the equation above,

$$\text{If } g_{yt} > 3\%, \text{ then } u_t - u_{t-1} = -0.4(+) < 0$$

$$\text{If } g_{yt} < 3\%, \text{ then } u_t - u_{t-1} = -0.4(-) > 0$$

$$\text{If } g_{yt} = 3\%, \text{ then } u_t - u_{t-1} = -0.4(0) = 0$$

To maintain the unemployment rate constant, output growth must be 3% per year. This growth rate of output is called the **normal growth rate.**

assumed constant, but:

Δ over time

$$u_t = \frac{L - N}{L} \qquad L \nearrow$$

$$u_t = 1 - \frac{N \nearrow}{L \nearrow}$$

Why is positive (rather than zero) growth required?

1) When L grows, N needs to grow as much to keep *u* constant The labor force tends to grow
2) When labour productivity grows (Y=AN) => need less employees for the same output

Y=N
Y=AN with A = tech process

As workers become more productive, workers have to work less, so we need fewer workers and unemployment increases

11.1 Output, Unemployment and Inflation (Continued)

Okun's law

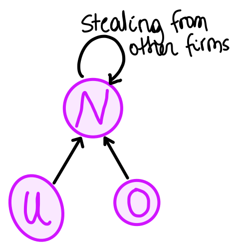
$$u_t - u_{t-1} = -0.4(g_{yt} - 3\%)$$

According to the above equation, output growth 1% above normal leads only to a 0.4% reduction in unemployment, for two reasons:

There are 2 main reasons:

- **Y → N**: *Labour hoarding*: firms prefer to keep workers rather than lay them off when output decreases.
  - Lay-off costs, training investment, minimum staff to run operations, …
- **N → u**: When employment increases, not all new jobs are filled by the unemployed (UE).
  - Labour force participation changes (OE)

- Changes in employment (N) doesn't immediatly lead to changes in u
- Labour market
1. O: those out of labour force
2. U: unemployed
3. N. The labour force



-How a change in production > change in employment
- Y = AN is not a 1:1 relationship between Y and N
- there is a lag

↓

- Change in employement > leads to a change in unemployment
- changes in unemployment are thus rigid in changes in demand
- even if you sell less you want to keep your workers on board because finding good workers is hard
= labour hoarding

11.1 Output, Unemployment and Inflation (Continued)

Okun's law

$$u_t - u_{t-1} = -0.4(g_{yt} - 3\%)$$

Using symbols rather than numbers:

The evolution of employment rate is going to depend on the relation between:

$$u_t - u_{t-1} = -\beta(g_{yt} - \bar{g}_y)$$

Output growth above (below) normal leads to a decrease (increase) in the unemployment rate. This is Okun's law:

$$g_{yt} > \bar{g}_y \Rightarrow u_t < u_{t-1}$$

$$g_{yt} < \bar{g}_y \Rightarrow u_t > u_{t-1}$$

Okun’s Law across Countries

The coefficient *β* in Okun’s law gives the effect on the unemployment rate of deviations of output growth from normal. A value of *β* of 0.4 tells us that output growth 1% above the normal growth rate for one year decreases the unemployment rate by 0.4%.

Country	1960–1980	1981–2007
Germany	0.20	0.29
Denmark	0.18	0.72
UK	0.15	0.48
France	0.14	0.41
Netherlands	0.13	0.50
Sweden	0.09	0.49
Italy	0.08	0.11
Non-European countries:		
USA	0.39	0.41 = 0.4 in equation
Australia	0.26	0.47
Japan	0.02	0.11

Table 11.1 **Okun’s law coefficients across countries and time**

1960-1980: high rate of job security, EPL

1981-2007: reduction in EPL

- In respective of the country we look at, there seems to be the positive estimate for the ß coefficient
- the rate changes over time: why?
> Y --> N
> N --> u

EPL has gone down over time > unemployment responding more

11.1 Output, Unemployment and Inflation (Continued)

- The Phillips curve

Gives a dynamic relation: how the relative change in prece level depends on inflation expectations and to where the economy is relative to it's long term level of steady state

- $\pi_t = \pi_t^e - \alpha(u_t - u_n)$
- Inflation depends on expected inflation and on the deviation of unemployment from the natural rate of unemployment.

Higher inflation expectations > higher prices > higher inflation

- When π_t^e is well approximated by π_{t-1}, then:
- $\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$
  - $u_t < u_n \Rightarrow \pi_t > \pi_{t-1}$
  - $u_t > u_n \Rightarrow \pi_t < \pi_{t-1}$

11.1 Output, Unemployment and Inflation (Continued)

- The aggregate demand relation

The aggregate demand relation, as stated in Chapter 7, adding the time indices:

$$\text{AD Relation} \quad Y_t = Y\left(\frac{M_t}{P_t}, G_t, T_t\right)$$

Ignoring changes in output caused by factors other than the real money stock, then:

$$Y_t = Y\left(\frac{M_t}{P_t}\right)$$

> Money stock expands > low intrest rates > high investments > additional exchange rate in open economy (high money growth = low intrest rate = low value of exchange rate = boost to net export)

11.1 Output, Unemployment and Inflation (Continued)

- The aggregate demand relation

$$Y_t = \gamma \frac{M_t}{P_t}$$

Keep in mind this simple relation hides the mechanism you saw in the *IS–LM* model:

- An increase in the real money stock leads to a decrease in the interest rate.
- The decrease in the interest rate leads to an increase in the demand for goods and, therefore, to an increase in output.

$$g_{yt} = g_{mt} - \pi_t$$

Growth today (real GP growth today) depands positivly on the growth rate of monney and negativly on the inflation rate
> real GP grows when money balances grow (prices evolve according on the philips curve, which depends on the state of the labour market)

11.4 The Effects of Money Growth

- Okun's law relates the change in the unemployment rate to the deviation of output growth from normal:

$$u_t - u_{t-1} = -\beta\left(g_{yt} - \overline{g_y}\right)$$

- The Phillips curve relates the change in inflation to the deviation of the unemployment rate from the natural rate:

$$\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$$

- The aggregate demand relation relates output growth to the difference between nominal money growth and inflation.

$$g_{yt} = g_{mt} - \pi_t$$

11.4 The Effects of Money Growth (Continued)

Policy does have an influence
> central bank
> fiscal policy
> ...

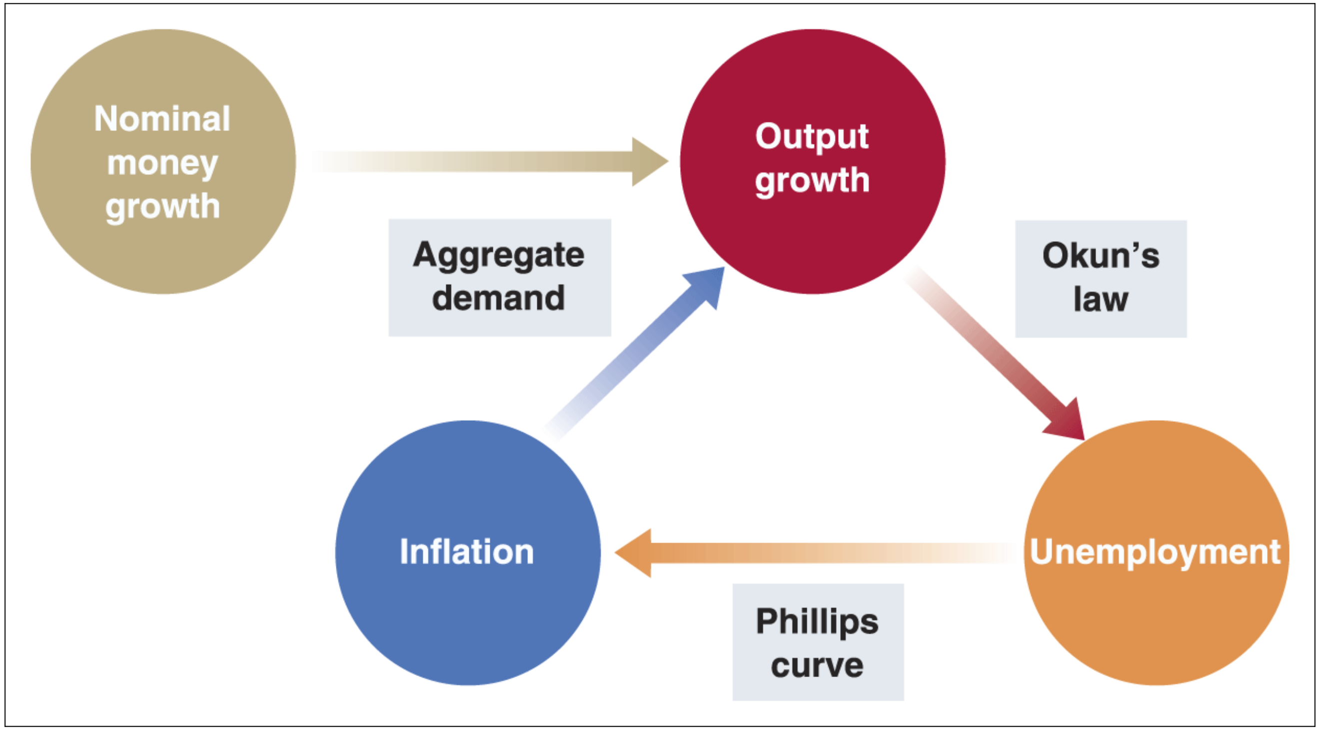


Figure 11.4 **Output growth, unemployment, inflation and nominal money growth**

11.4 The Effects of Money Growth (Continued)

The medium run

Assume that the central bank maintains a constant growth rate of nominal money, call it $\bar{g}_m$. In this case, the values of output growth, unemployment and inflation in the *medium run*:

In the medium term, unemployment will be stable

- Output must grow at its normal rate of growth, $\bar{g}_y$

  $$g_{yt} = \overline{g_y} \Rightarrow u_t = u_{t-1} \quad \text{(Okun)}$$

- If we define **adjusted nominal money growth** as equal to nominal money growth minus normal output growth, then *inflation equals adjusted nominal money growth. (AD)*
  - $\overline{g_m} - \overline{g_y} = constant$
  - $\Rightarrow \pi_t = \pi \quad = \overline{g_m} - \overline{g_y}$

- ⇒ *The unemployment rate must be equal to the natural rate of unemployment. (PC)*

From our aggregate demand relation, the economy is at it's medium to long term growth rate
> the difference between the two is constant
> the difference between the growth rate and the money growth rate is inflation (if monay and growth rate are constant) > inflation is constant

11.4 The Effects of Money Growth (Continued)

The short run

Now suppose that the central bank decides to decrease nominal money growth. What will happen in the short run?

$$u_t - u_{t-1} = -\beta\left(g_{yt} - \overline{g_y}\right)$$
$$\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$$
$$g_{yt} = g_{mt} - \pi_t$$

11.4 The Effects of Money Growth (Continued)

The short run

Now suppose that the central bank decides to decrease nominal money growth. What will happen in the short run?

- Given the initial rate of inflation, lower nominal money growth leads to lower real nominal money growth and thus to a decrease in output growth. (AD)
- Now, look at Okun's law, output growth below normal leads to an increase in unemployment.
- Now, look at the Phillips curve relation. Unemployment above the natural rate leads to a decrease in inflation.

11.4 The Effects of Money Growth (Continued)

The short run

Numerical example:

- Starting from a medium term equilibrium, year 0
- The central bank reduces real money growth with 2,5% (point) in year 1
    - (But doesn't the central bank control nominal money? Book assumes the central bank changes nominal money to accomplish a certain real change.)
- The central bank increases real money growth with 2,5% (point, relative to year 0) in year 2
- Assuming the coefficients below

$$u_t - u_{t-1} = -0{,}4 * \left(g_{yt} - \overline{g_y}\right)$$
$$\pi_t - \pi_{t-1} = -1 * (u_t - u_n)$$
$$g_{yt} = g_{mt} - \pi_t$$

11.4 The Effects of Money Growth (Continued)

The short run

In words: In the short run, monetary tightening leads to a slowdown in growth and a temporary increase in unemployment. In the medium run, output growth returns to normal and the unemployment rate returns to the natural rate.

		Year 0	Year 1	Year 2	Year 3
	gm-pi	3	0,5	5,5	3
	gy	3	0,5	5,5	3
	u	6	7	6	6
	pi	5	4	4	4
	gm	8	4,5	9,5	7

Table 11.2 **The effects of a monetary tightening**

11.2 Nominal versus Real Interest Rates

- Interest rates expressed in terms of dollars (or, more generally, in units of the national currency) are called nominal interest rates.

- Interest rates expressed *in terms of a basket of goods* are called real interest rates.

11.2 Nominal versus Real Interest Rates (Continued)

i_t = nominal interest rate for year t.

r_t = real interest rate for year t.

$(1+i_t)$: lending one dollar this year yields $(1+i_t)$ dollars next year. Alternatively, borrowing one dollar this year implies paying back $(1+i_t)$ dollars next year.

P_t = price this year.

P^e_{t+1} = expected price next year.

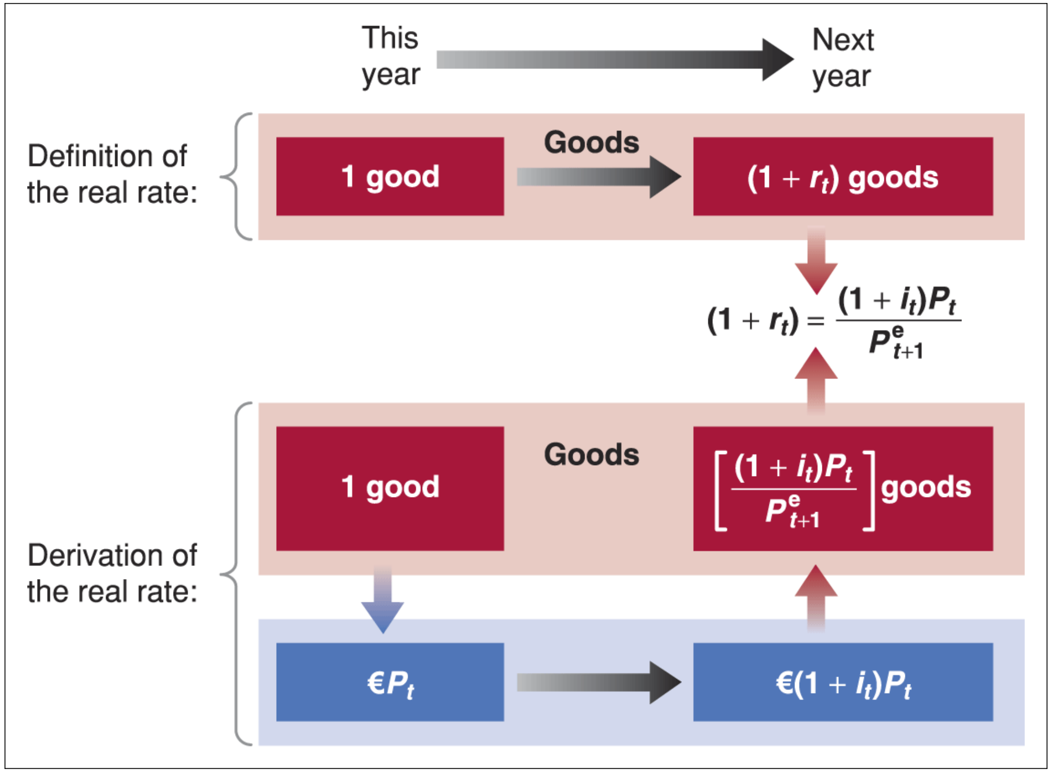


Figure 11.2 Definition and derivation of the real interest rate

Derivation: If I want to understand how much return I have, the real intrest rate is what I earn and is driven by: the nominal intrest rate (what I can earn on saving)s, how much I can get for my good today and how much I need to pay for my good tomorrox

11.2 Nominal versus Real Interest Rates (Continued)

Definition real rate: $1 + r_t = (1 + i_t)\,\frac{P_t}{P_{t+1}^e}$

Knowing that $\frac{P_t}{P_{t+1}^e} = \frac{1}{(1+\pi_{t+1}^e)}$

And $\pi_{t+1}^e = \frac{P_{t+1}^e - P_t}{P_t}$

Gives: $1 + r_t = \frac{(1+i_t)}{(1+\pi_{t+1}^e)}$

If the nominal interest rate and the expected rate of inflation are not too large, a simpler expression is:

$$r_t \approx i_t - \pi_{t+1}^{e}$$

Real intrest rate = nominal intrest rate - expected inflation

The real interest rate is (approximately) equal to the nominal interest rate minus the expected rate of inflation.

11.2 Nominal versus Real Interest Rates (Continued)

$$r_t \approx i_t - \pi^e_{t+1}$$

Here are some of the implications of the relation above:

- If $\pi^e_t = 0 \Rightarrow i_t = r_t$
- If $\pi^e_t > 0 \Rightarrow i_t > r_t$
- if $\bar{i}_t \Rightarrow \uparrow \pi^e_t \rightarrow \downarrow r_t$

11.2 Nominal versus Real Interest Rates (Continued)

Nominal and real interest rates in the UK since 1980

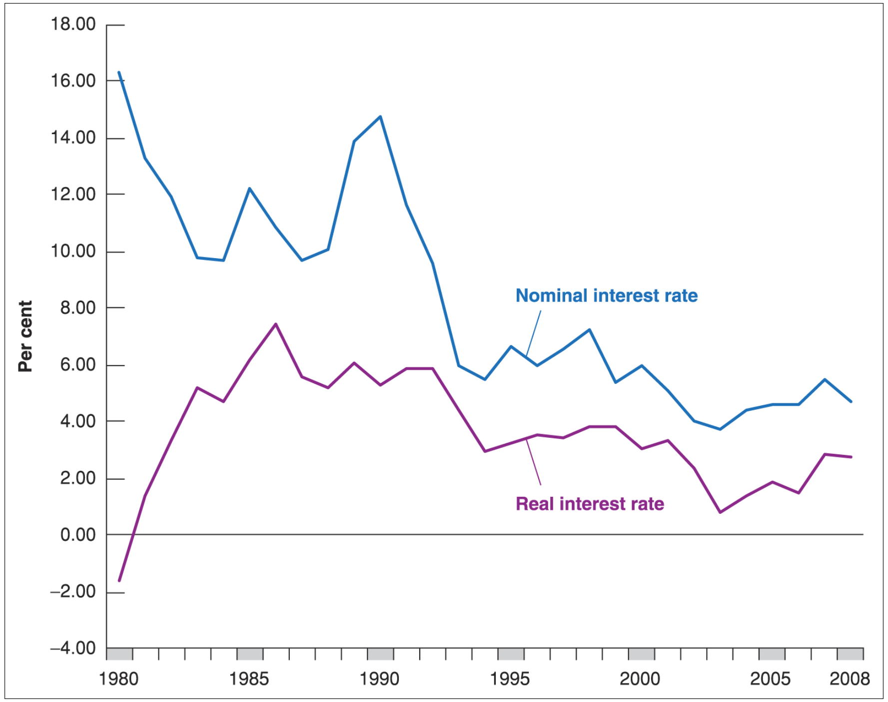


Figure 11.3 **Nominal and real interest rates in the UK since 1980**

Although the nominal interest rate has declined considerably since the early 1980s, the real interest rate was actually higher in 2008 than in 1980.

11.3 Nominal and Real Interest Rates and the IS–LM Model

When deciding how much investment to undertake, firms care about real interest rates. Then, the *IS* relation must read:

$$Y = C(Y - T) + I(Y, r) + G$$

- The interest rate directly affected by monetary policy – the one that enters the *LM* relation – is the nominal interest rate, then:

$$\frac{M}{P} = YL(i)$$

The real interest rate is: $r = i - \pi^{e}$

The level of the intrest rate is not as high as where inflation is at today, the intrest rate = 5 <> inflation = 10. So the real rate = negative
> output and investment is still going to be high
<> bank: to get demand down, we need to increase the intrest rate (discussion today)

short term
long term: prices increase : $P \nearrow$, $\left.\begin{matrix}\frac{M}{P}\nearrow \\ P\nearrow\end{matrix}\right\}$ effect is undone

monatary policy has an effect on:

Difference
-Ex ante intrest rate : $r^{a}\downarrow = i\downarrow - \pi^{e}$
= what we have been working with
→ Δ slowly : only after wage negotiations
→ Δ fast : bank decides immediatly
-Ex post : $r^{e} = i - \pi$
→ real inflation level

11.3 Nominal and Real Interest Rates and the IS–LM Model (Continued)

Note an immediate implication of these three relations:

- The interest rate directly affected by monetary policy is the nominal interest rate.
- The interest rate that affects spending and output is the real interest rate.
- So, the effects of monetary policy on output depend on how movements in the nominal interest rate translate into movements in the real interest rate.

11.5 Money Growth, Inflation and Nominal and Real Interest Rates

This section focuses on the following assertions:

Real an nominal rate don't change in the same way, due to inflation

- Higher money growth leads to lower <u>nominal</u> interest rates in the *short* run, but to higher nominal interest rates in the *medium* run.

- Higher money growth leads to lower <u>real</u> interest rates in the *short* run, but has no effect on real interest rates in the *medium* run.

11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Revisiting the *IS–LM* model

Reducing the *IS* relation, *LM* relation and relation between the real and nominal interest rate gives us:

$$IS = Y = C(Y - T) + I(Y, i - \pi^{e}) + G$$

$$LM = \frac{M}{P} = Y\ L(i)$$

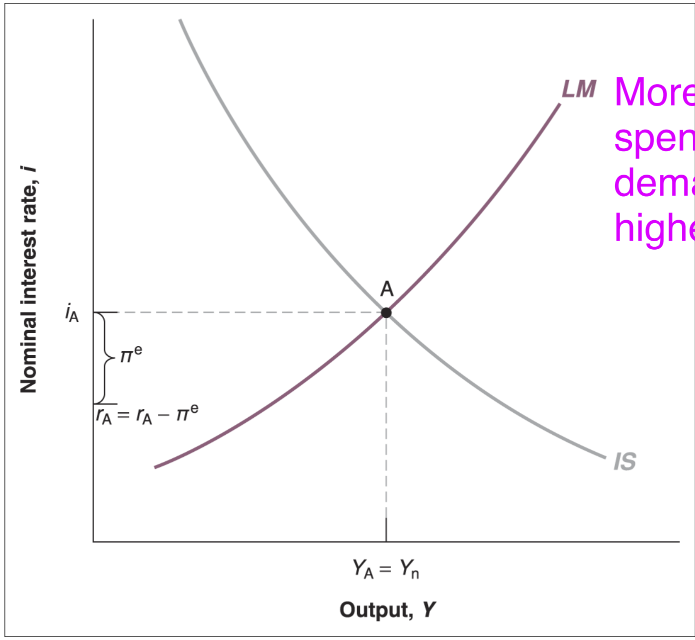
- The *IS* curve is still downward-sloping.
- The *LM* curve is upward-sloping.
- The equilibrium is at the intersection of the *IS* curve and the *LM* curve.

11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Revisiting the *IS–LM* model

$$If\ \ r = i - \pi^e \Rightarrow \Delta r = \Delta i - \Delta \pi^e$$

$$If\ \ \pi^e \text{ is constant, } \Delta \pi^e = 0 \Rightarrow \Delta r = \Delta i$$



More output > more spending > more demand for monney > higher intrest rates

A: we can read the output and intrest rate = nominal intrest rate

Figure 11.8 Equilibrium output and interest rates
The equilibrium level of output and the equilibrium nominal interest rate are given by the intersection of the *IS* curve and the *LM* curve. The real interest rate equals the nominal interest rate minus expected inflation.

11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Nominal and real interest rates in the short run

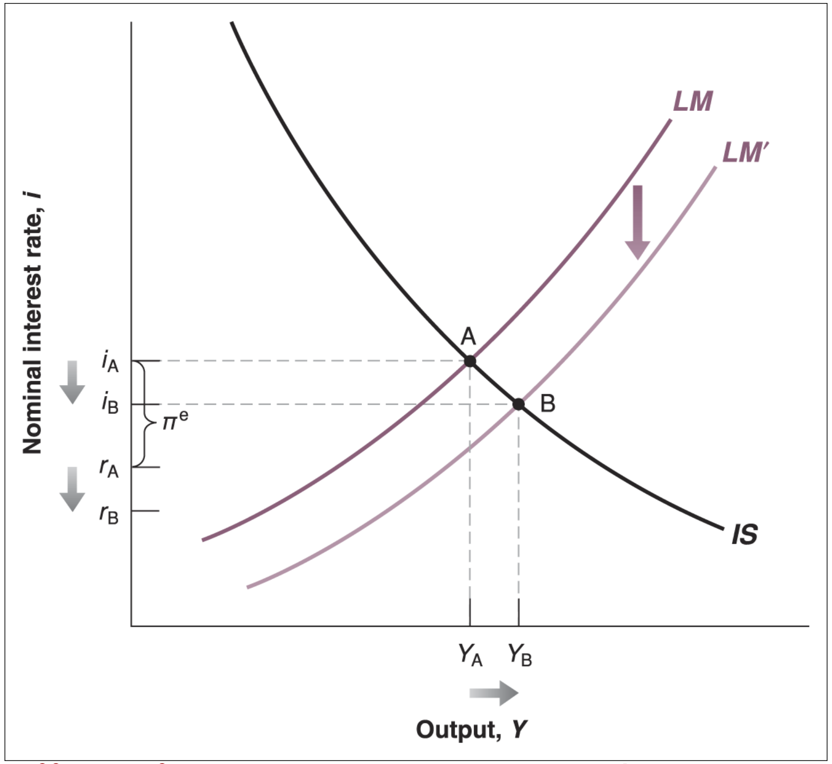


Figure 11.9 The short-run effects of an increase in money growth

An increase in money growth increases the real money stock in the short run. This increase in real money leads to an increase in output and decreases in both the nominal and real interest rates.

11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Nominal and real interest rates in the medium run

- Implication for interest rate?
- Short run: $r = i - \pi_{t+1}^{e}$
  - For given (or slowly adjusting) inflation expectations *i* and *r* comove

11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Nominal and real interest rates in the medium run

- In the medium run, output returns to the natural level of output Y_n:
  - So output growth g_y will be zero
    - (or at least constant, growing at the same rate as Y_n)
  - AD: $g_y = g_m - \pi$
  - If output does not grow => $\pi = g_m$
    - (proportionality if output does grow but at a constant rate)
  - Inflation expectations are correct ($\pi^e = \pi$)
  - => $\pi^e = \pi = g_m$ Inflation is always and everywhere a monetary phenomenon
  - Definition of the real rate:
    - (natural) real rate = nominal rate – expected inflation
  - => (natural) real rate = nominal rate – money growth
    - $r_n = i - g_m$

11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Nominal and real interest rates in the medium run

In the medium run, the nominal interest rate increases one-for-one with inflation. This result is known as the Fisher effect, or the Fisher Hypothesis.

$$i = r_n + \pi$$

For example, an increase in nominal money growth of 10% is eventually reflected by a 10% increase in the rate of inflation, a 10% increase in the nominal interest rate and no change in the real interest rate.

$$i = r_n + g_m$$

Rn with n = natural (long term)

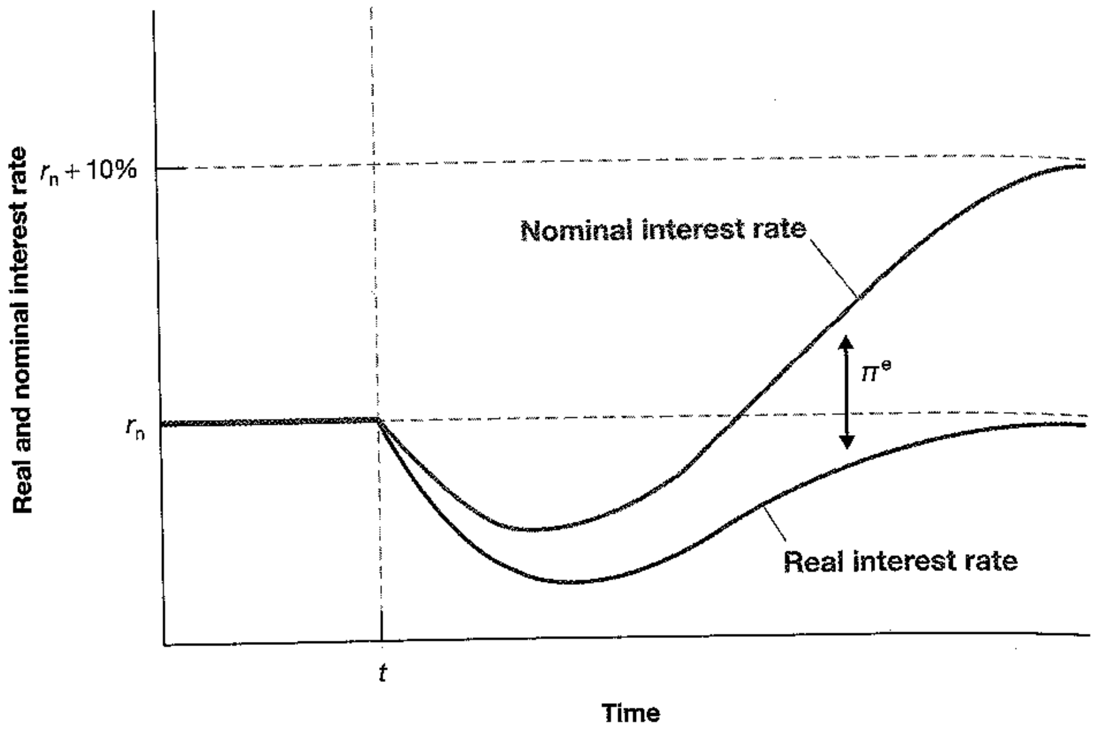
11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Nominal and real interest rates in the medium run

Figure 11.5

The adjustment of the real and the nominal interest rates to an increase in money growth

An increase in money growth leads initially to decreases in both the real and the nominal interest rates. Over time, however, the real interest rate returns to its initial value, and the nominal interest rate converges to a new higher value, equal to the initial value plus the increase in money growth.



In sum:

Short run:

Because inflation expectations are not adjusting, a reduction in the nominal rate imply a reduction in the real rate (i.e. comovement)

Which sets in motion a **transition**:

1) Because the monetary stimulus causes a boom, prices increase (AS-AD)
2) Because this means inflation expectations were too low relative to actual prices, expectations start increasing

Towards the **medium run**, where inflation expectations have fully adjusted, i.e. to a higher level consistent with the higher money growth rate

11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Nominal and real interest rates in the medium run

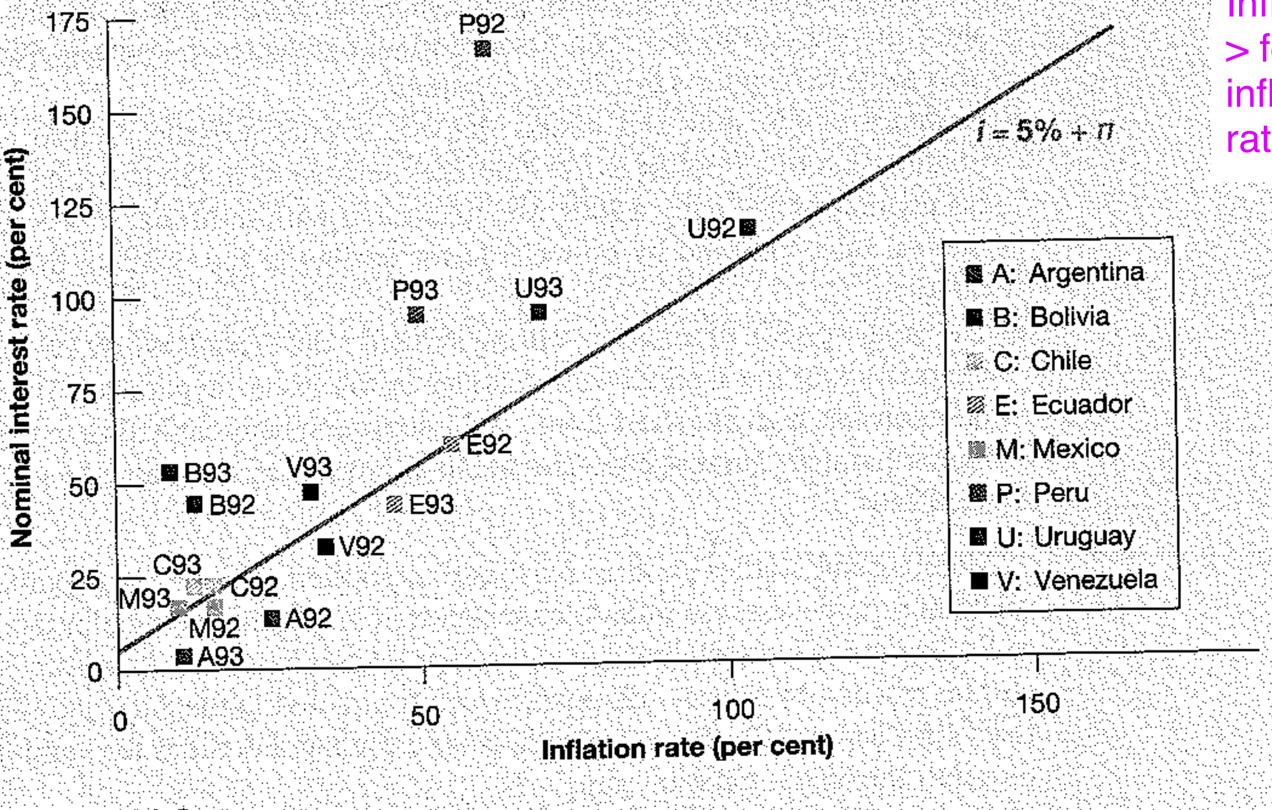


Figure 11.6

Nominal interest rates and inflation in Latin America, 1992–1993

Inflation rates of 50 to 100% > for countries with high inflation, the nominal intrest rate tends to be high too

11.5 Money Growth, Inflation and Nominal and Real Interest Rates (Continued)

Nominal and real interest rates in the medium run

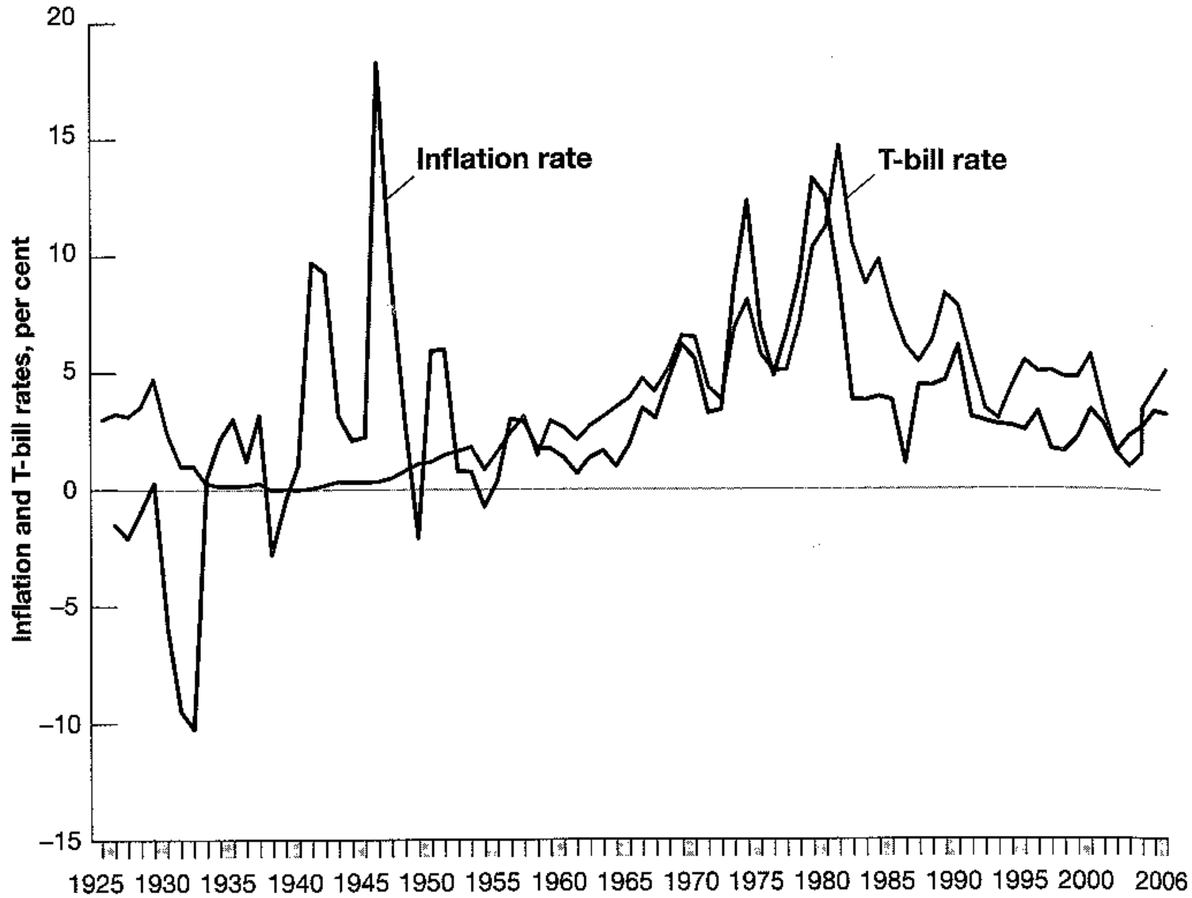


Figure 11.7

The three-month US treasury bill rate and inflation since 1927

The increase in inflation from the early 1960s to the early 1980s was associated with an increase in the nominal interest rate. The decrease in inflation since the mid-1980s has been associated with a decrease in the nominal interest rate.

Key Terms

- Okun's law
- Normal growth rate
- Labour hoarding
- Nominal interest rates
- Real interest rates
- Adjusted nominal money growth
- Fisher effect, fisher hypothesis
- Disinflation
- Point-year of excess unemployment
- Sacrifice ratio
- Lucas critique
- Credibility
- Nominal rigidities
- Staggering of wage decisions

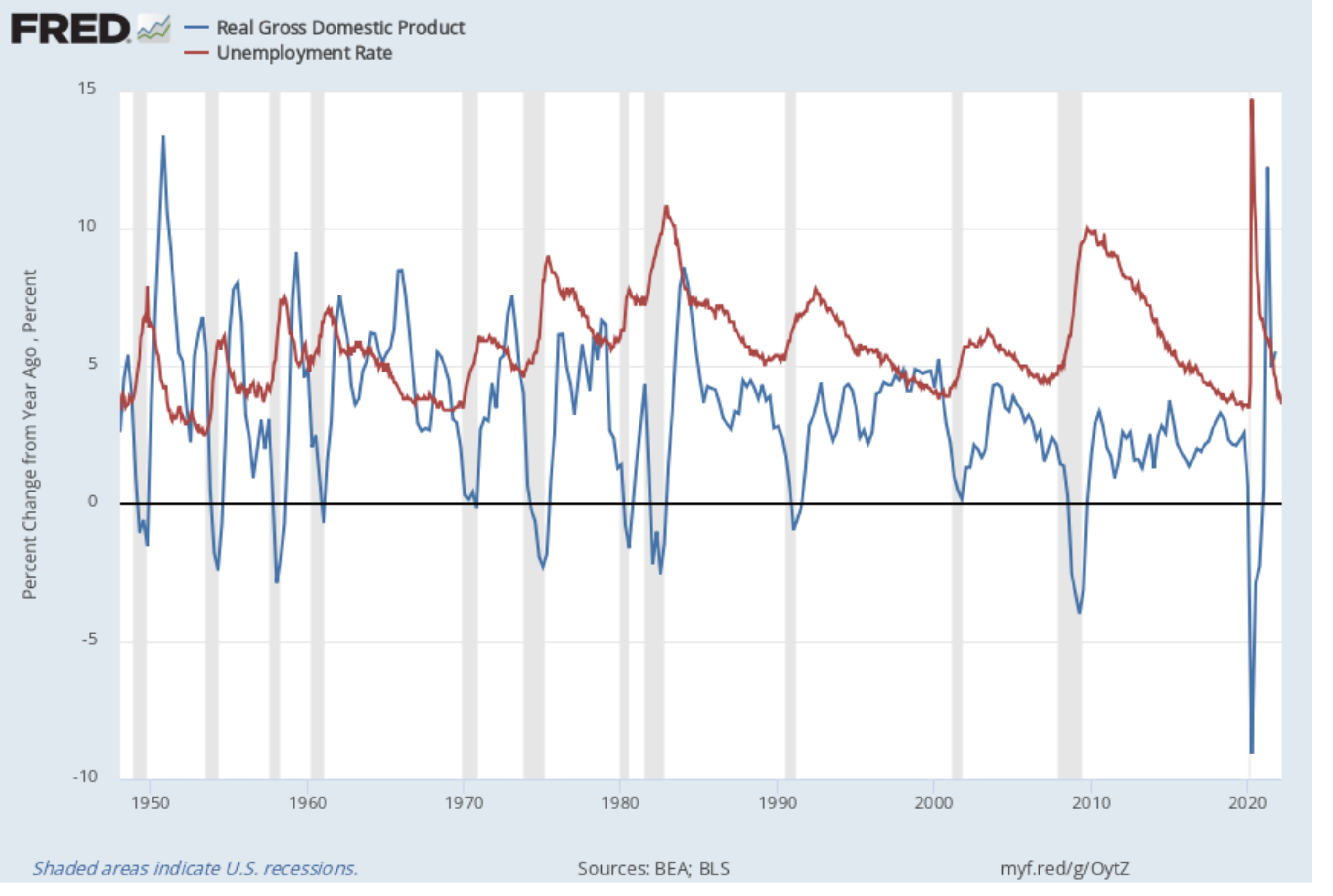
Part 3: special topics

Great financial crisis
High debt
Covid recession

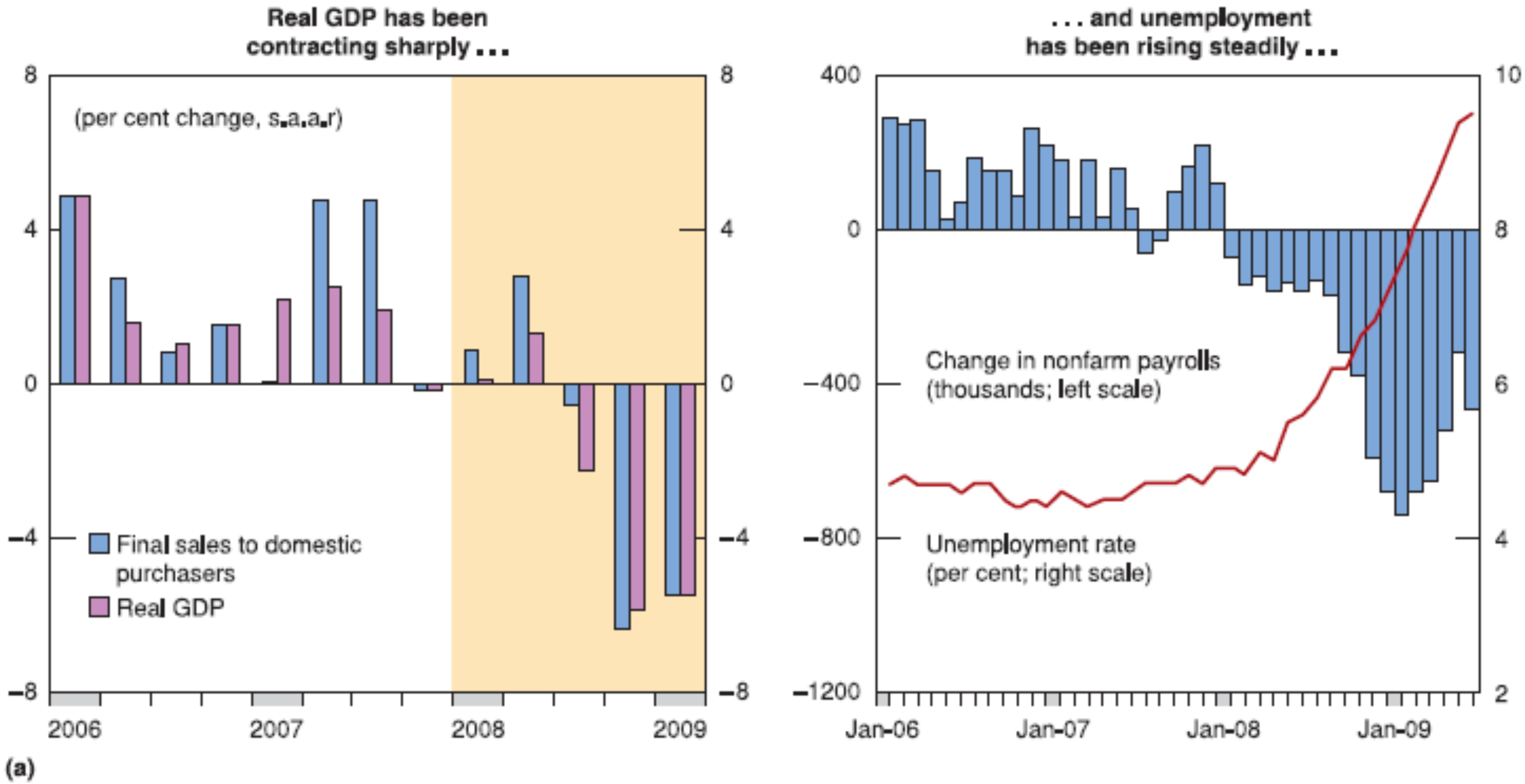
The Great Financial Crisis

The great financial crisis = the great recession = one of the deepest recent regressions we have seen
> Blue: real GDP growth
> Red line: unemployment (tends to peak a little bit later)
> grey bars: recession

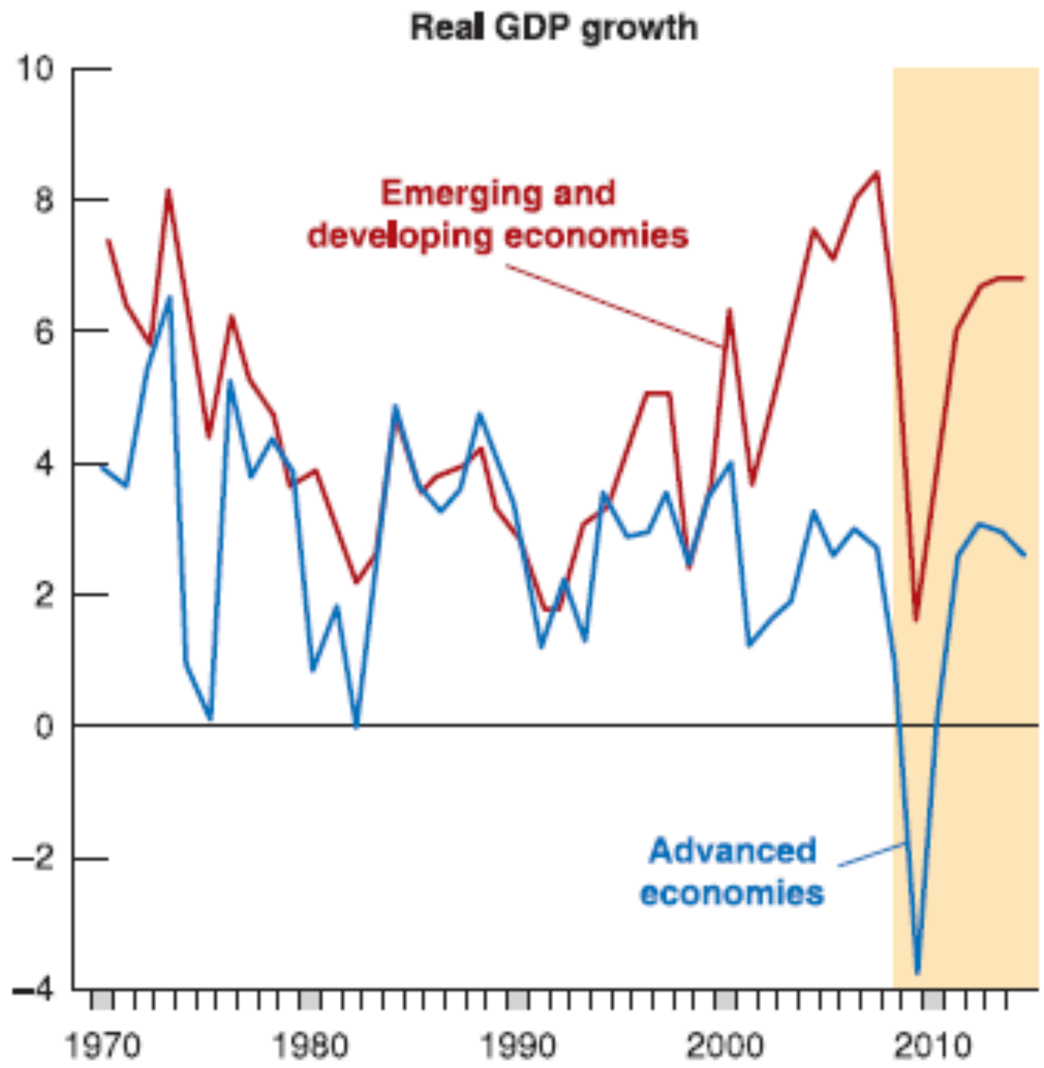
Started in september 2008



What was the nature of the crisis/ the causes?
> Labour market: drop in employment rate = very presostant



> advanced economies have a very negative growth rate
> emerging markets: sharp drop in growth rate (often they were faster since they can copy from advanced economies)



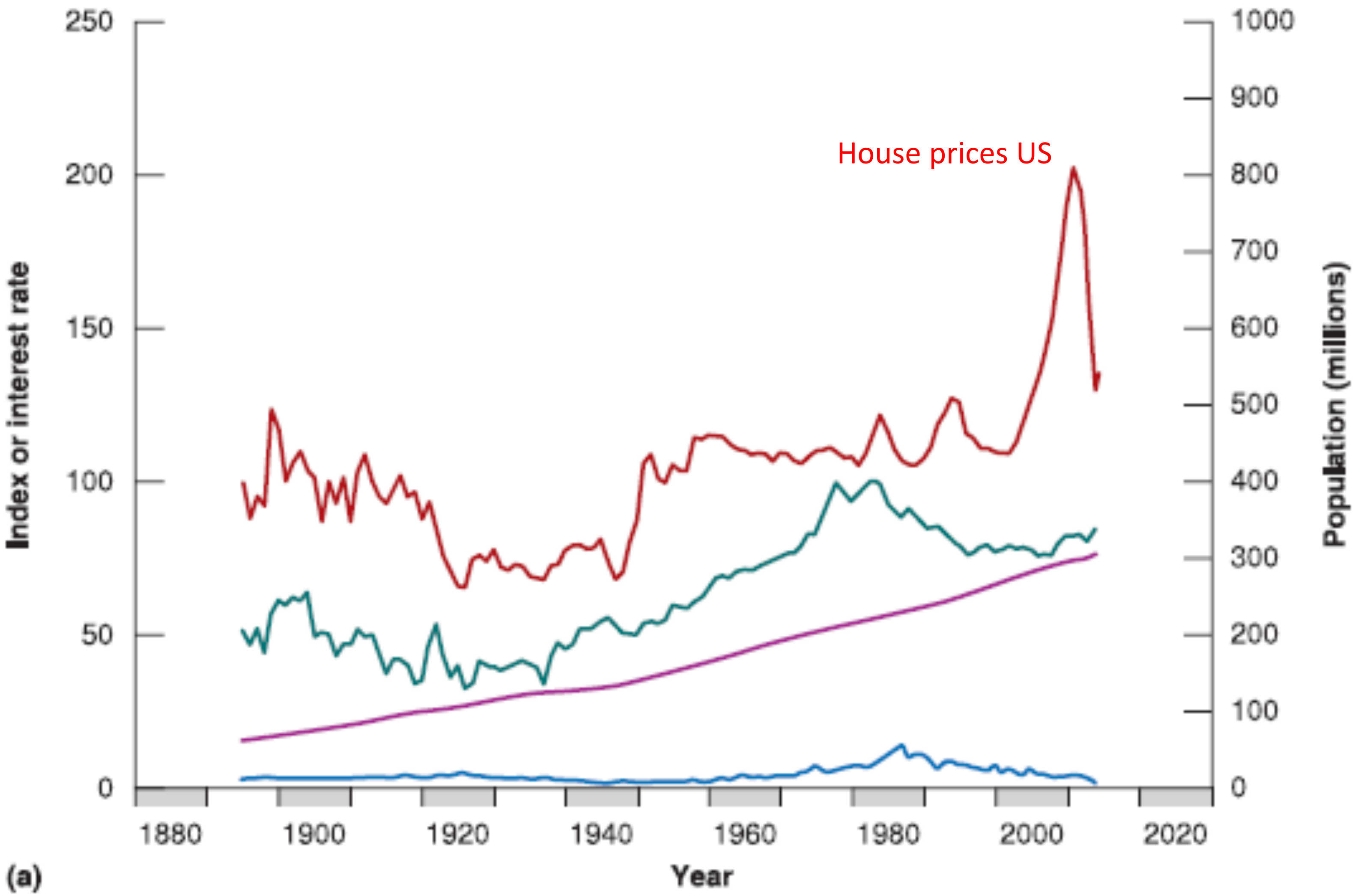
(b)

Main issues

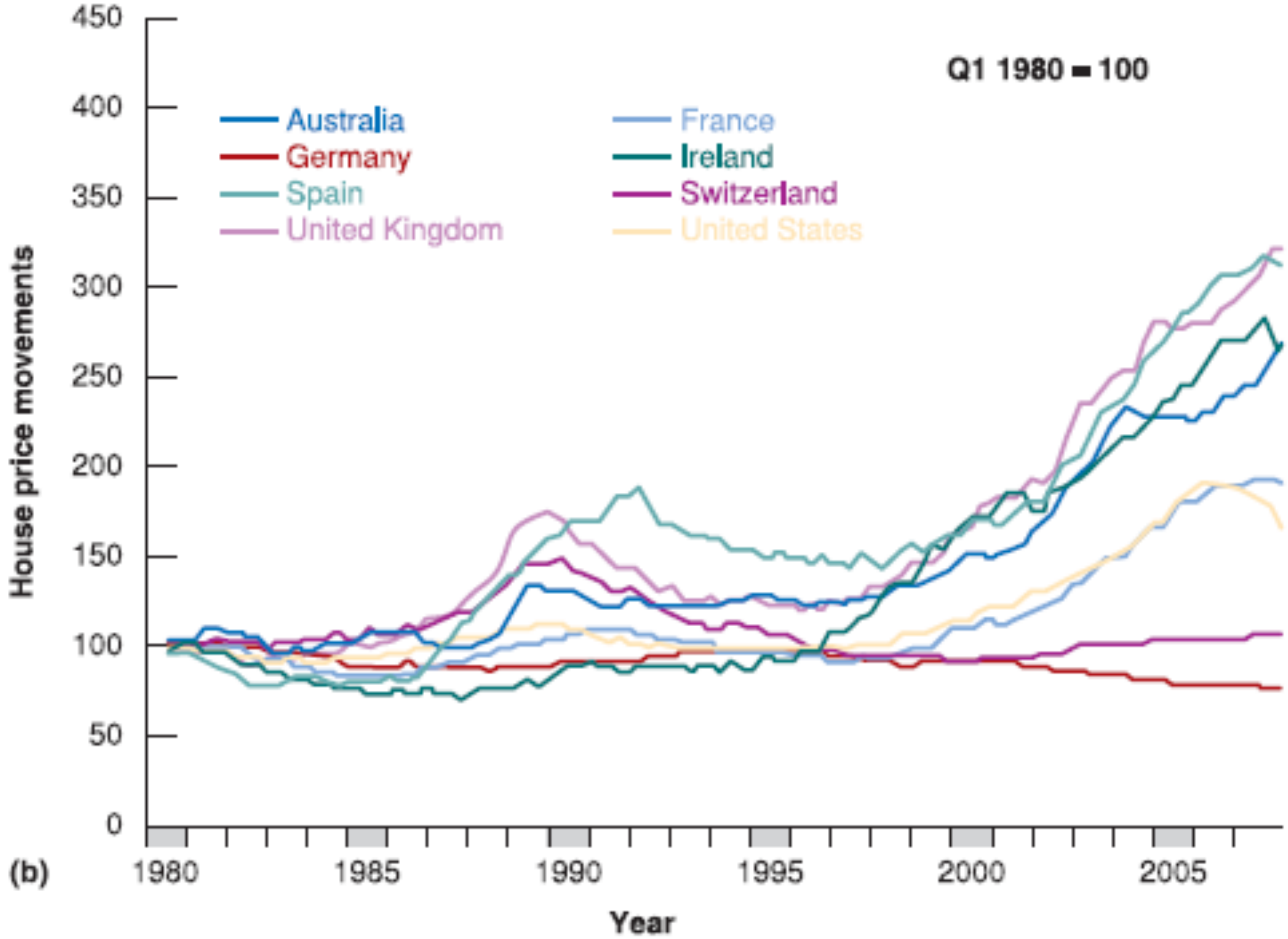
- US House prices
- US Banks (and spillovers abroad)
- Policy What did policy do and what did it not do?
- Post-crisis

The house prices (red): enormous peak in house prices from 2000 to 2006, that could not be explained with the traditional indicators (other lines)

- Pink = population growth
- Blue = intrest rate (low intrest rates = high house prices)



House price for different countries
> booms in many countries



Credit supply
= more and more ability to act on those expectations, the financial system was providing people with the ability to lend out more, so risky credit supply
= lots of new financial instruments that had never defaulted > so they issued the staff to get more of them > growth into new instruments > more money in the financial systems > is used to grant more loans

Why did the value of house prices shoot up after 2000?

- “Irrational exuberance”, Robert Shiller
- Increased risky credit supply

Irrational:
> House prices start increasing (we think we are in a new world where house prices are going to keep increasing)
> More and more funds are popping up: where trading is done by computers. The data fed in the computers is recent so it has only seen increasing house prices
> asset prices: Ps

- Ps = stock price
- I can not only earn an intrest rate, but if I pay a stock I can earn a divident. After 1 period I can resell the stock
- Intrest rates earned on savings: (1+i)*Ps <> DIV + P*s: dividend + future stock price

If intrest rate is higher: everybody would be investing in bonds and not in stocks, so these two must be equal
Ps = [Div + P*s]/(1+i) = asset price equation = how you need to think about stock markets. If stock markets are on the rise there are only 3 couses

1. Intrest rates were low (was the case)
2. Dividends are high (dividend of owning a house = the rent, or the opportunity cost of not renting a house). But rents have not gone as fast upwards as housing prices so that cannot really explain the house prices
3. Remaining component: you expect high house prices in the future = people are overly optimistic

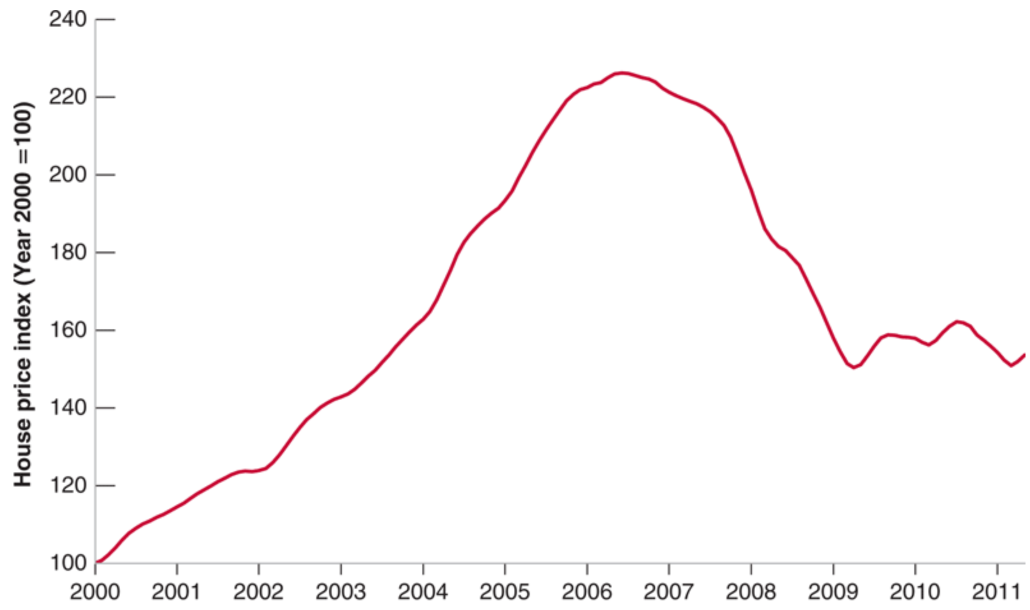
Figure U.S. Housing Prices since 2000

00-06:
- Persistently low interest rates (discount effect)
- Increased availability of mortgage credit for risky borrowers (subprime), due to cheap financing (low interest rates) and expected continued house price appreciation

06-09:
- Mortgages underwater (value loan>house price)
- Underestimated risk (Adjustable Rate Mortgages)

⇒ Default:
Mid 2008: 300 billion dollar
(=2% US GDP; a lot, but in itself not sufficient to cripple the financial system)

House price boom didn't last: flattening and decrease in prices
> poor household: I can buy a house, since the price keeps rising I can always repay my loan if I sell my house. But if the price falls: I default on the loan
> new instruments: adjustable rate mortgage = banks started selling this = you get the opportunity to buy something and pay in the future (after a year or a year of 2: you will have incredibly steep intrest rates : very profitable)
> a lot of people default on mortgages = default in housing market
> financial sector had some buffers so it should be able to cope with it



Source: Case-Shiller Home Price Indices, http://www.standardandpoors.com/indices/main/en/us

> Blue line: loans = how many percentage (once you issue a mortage) the percent of default you have each month after giving the loan = amount of people that will default
> As times goes by: increasing percentages but nothing out of the ordinary till 2004 = the data used by computers (so computers could not estimate 2006 and 2007)

> 2006: default due to house price reducing

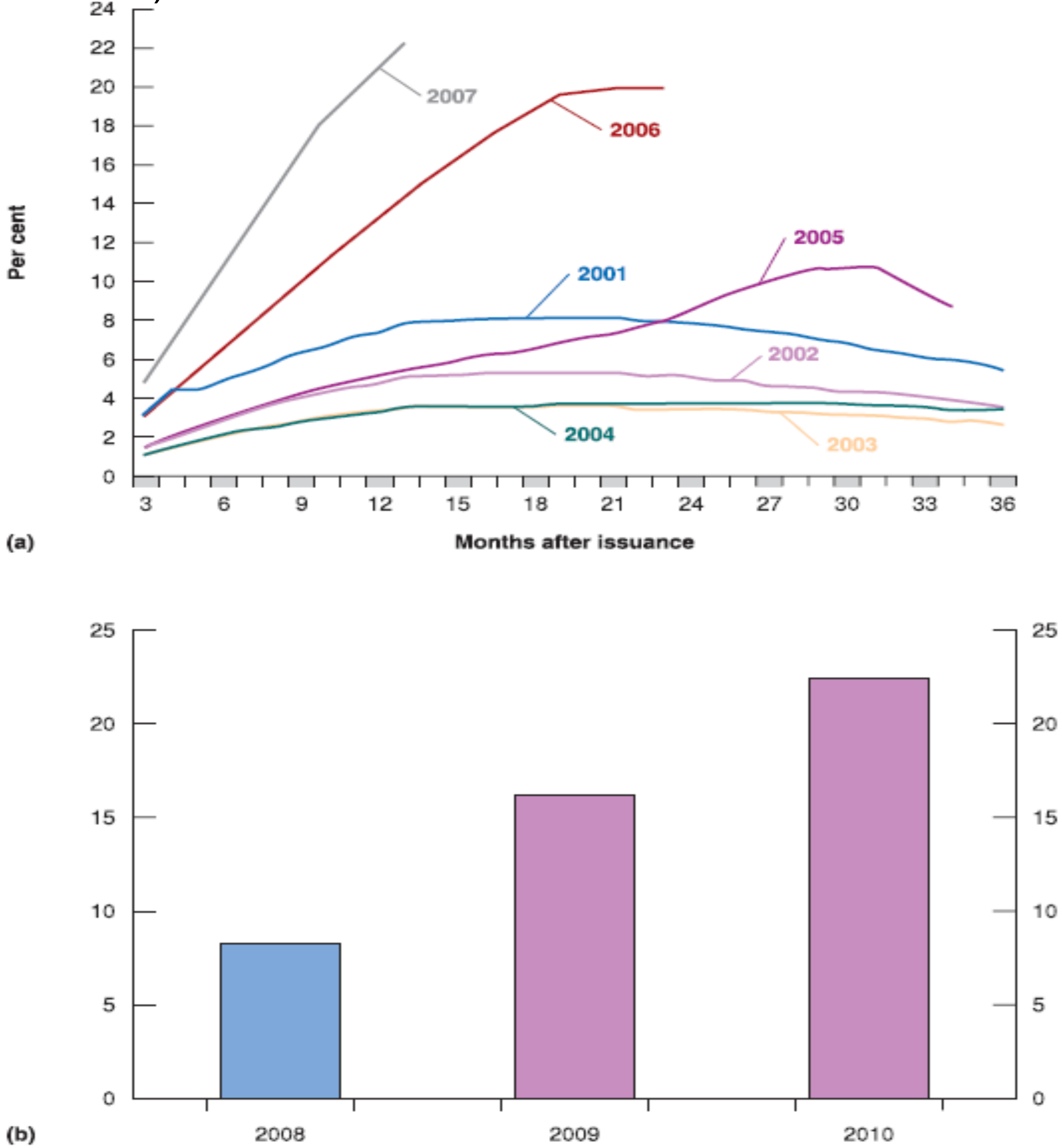


Figure 20.3

Defaults on US sub-prime mortgages

(a) Default rate by year of origination of the mortgage.

Source: Moody's Investors Service.

(b) Homeowners with negative equity (who own more on their mortgages than their homes are worth; millions) (per cent of all homeowners – data are for 2008; thereafter estimates).

Source: IMF *World Economic Outlook* 2009.

Why were banks affected so much? They had buffers so what was the problem?
> Bank in the 90-ies: granted loans in the neighbourhood
> Bank at the end: more global entities = more activities
> Bank leverage = how much equity you put into something

Banks

- Bank leverage
  - Implies an amplified effect of house prices: a stronger transmission channel from house prices to banks
  - Leverage = assets / capital

= important = amplified effect of house prices on banks
High ratio = a lot of risk (when there is a drop in asset value: bank might have to absorb the loss, then why do they do it: a lot of profit) = a lot of profits due to high risk

- A high leverage ratio is risky: in the event of a drop in the value of its assets, the bank may become insolvent
- A high leverage rate implies high potential profits, so banks like it
- As long as house prices were rising, high leverage meant banks could earn huge profits. But once house prices stopped rising, many banks went bankrupt

Example

- Bank 1 and 2 have the same amount of assets
- Bank 2 is more highly leveraged than Bank 1

	Assets	Liabilities		Leverage
	Loans + other assets	Deposits	Capital	
Bank 1	100	80	20	100/20 = 5
Bank 2	100	95	5	100/5 = 20

1) Suppose asset prices rise by 10%

	Assets	Liabilities		Profit	Return to capital
	Loans + other assets	Deposits	Capital	Loans: +10% Deposits: 0%	
Bank 1	110	80	20	100*10%=10	10/20 = 50%
Bank 2	110	95	5	100*10%=10	10/5 = 200%

- (simplifying assumption: deposits pay 0% interest)
- Profit for both banks: 10
- But bank 2 invested much less capital
- => low capital (or high leverage) => high returns
  = more profit

2) Suppose asset prices fall by 20%

Bank capital = the buffer to absorb losses

- Bank 1 has just enough capital to survive
- Bank 2 goes bust

	Assets	Liabilities		Leverage
	Loans + other assets	Deposits	Capital	
Bank 1	80	80	0	Solvent
Bank 2	80	95	-15	Insolvent

= negative =not possible to pay back the depositers

- High leverage => high risk
- Leverage: trade-off between risk and return

Leverage pre-crisis

3 issues that caused the financial crisis

- Increase in leverage / risk
  - Underestimated risk: Everybody was underestimating the risk
    - House price decreases
    - Subprime default
  - Banker contracts rewarding short term return: contracts are still the same
  - Incomplete financial regulation (e.g. securitization: banks offload risk from their balance sheet, which is then hard for the regulator to monitor)

The way banks conduct businesses is messed up: these contracts tell you - rent as many loans as you can because you bonus depends on it (so you will give loans to people wo cannot pay, if the people not pay back = in the future = i might be working at another bank = not my problem)
> leverage is increasing
> regulators didn't understand the risk + bank = very opaque business
> loans are bundles, puts them in a bag and let other securities buy it > loans is sold on somebody els, the return they get depends on the default rates. Thus the bank has sold those: didn't needed to be on the balance sheets > so it became ever harder to monitor banks

Banks were very dependent on house prices
> when problems O° occuring: value of assets fell > some banks defaulted: they could not provide any more loans
> remaining banks had to absorb losses but they need more capital: go to the stock markets but no investors that trust banks > they could not get capital > they needed to reduce the size of their business = stop lending or get rid of assets you're investing in. Stop lending = an issue that causes macro eco effects: stops consumption, investment
> All banks are seling assets: (everybody is selling) > supply is high > prices fall

When the value of their assets fell, some banks with high leverage went bust. These obviously stopped lending.

But also the banks which had enough capital and survived started worrying. They strengthened their position in three ways:

1. They tried to raise more capital.
2. They reduced the amount of loans they were holding.
3. They sold other liquid assets (e.g. stocks).

The result was a credit freeze and a fire sale in the stock market, which hit investment and consumption, respectively.

Result: a fire sale + a credit freeze (banks aren't willing to lend any more): durable investments need loans, so fire sales: prices have dropped so my wealth has also dropped = i will save more because I become poor

Complexity

- Securitization
  - Traditionally: loan remains on bank balance sheet => local exposure
  - Recent: sell loan-pool => diversification Other people are bearing the risk, sound like a good idea
  - Ex.: 2 main financial instruments
    - MBS: mortgage-backed security
      - claim on a portfolio of loans
    - CDO: collateralized debt obligation
      - claim on the return of certain assets, with differences in seniority
  - Problem:
    - Creating new securities on the basis of other assets creates opaqueness
    - Risk assessment harder
    - Rating agencies fluked = on banks and financial products (many of the products "would never go bust")
    - "Toxic assets": no one is willing to hold them
      > markets plummeted

(Note: for accurate entertainment: Film – The big short)
> feds started buying but they themselves had no idea of the value of the assets

Liquidity

How does the money funds its business?

- Traditionally: bank runs
  - Deposits can be withdrawn in short term, in large quantities

- Recent: wholesale funding
  - Market financing, without deposit insurance, very flexible
- Cash pools
  - E.g. new big, liquid firms, sitting on loads of cash (e.g. Google)
- SIV (structured investment vehicle)
  - Has very volatile liabilities (wholesale deposits)
    - At the first hint of trouble, funding dries up
  - Has assets that are very complex and possibly toxic
    - In the event of a crisis: fire sales – can only sell at dumping prices

Banks became global

> more and more of the liquidity no longer came from regular depositors but was essentially market funding (where the government doesn't pay you back if the bank goes bust) = very liquid firms, like Google = sitting on loads of cash and wanting a return = putting it in whole sale bank, as soon as there is any risk: they will withdraw immediately

> liquidity evaporated = bank runs

> firms: government does not give guarantee > as soon there is any risk: firms withdraw (bank runks) > bank goes bust

Amplification

The whole story:

- House prices↓=> mortgages↓
- Value of bank assets↓ => bank capital ↓
- Requires more asset sales => fire sales > nobody wanted to buy funds
- Value of assets falls further
- Complexity => willingness to lend to banks↓
  - Funding dries up: wholesale, interbank (fig) – bank/funding run
- Willingness of banks to lend (to banks, firms and consumers) ↓
- => Macroeconomic crisis:
  - Expensive loans
  - Lack of confidence
  - Both essential for I, C

From the financial sector to the real economy: External financing

- Traditional IS-LM: 1 interest rate (Simplification but just one general intrest rate)
- Reality: i(loan) = i(deposit) + spread

Intrest rate ro = intrest rate i + spread x

  - $\rho = i + x$

x = external finance bringer

- Relevant for investment: ρ

= the intrest rate on loans

  - $I = I(Y, \rho)$

But there are 2 types of intrest rates
> intrest rate we pay on a loan (as consumpers or firms)
> intrest rates banks pay on deposits
> the difference between these two = the spread
= how banks earn profit

- x : "external finance premium"
- Factors determining x:
  - Capital/assets of banks (bank risk) => i(deposit)

    = leverage

    - E.g.: regulation, buffer
  - Capital/assets of firms (firm risk) => spread
    - E.g.: collateral, buffer

As firms take risk, the banks going to be less willing to lend the money
> riskier the borrowers, the higher the spread: x goes up thus ro goes up
> investment goes down
> asset values of firms go down: spread goes up, the value of collateral goes down
> falling house prices will have big effects: looks like a new recession

If the bank has little buffer > bank risk increases > risky banks: will have to pay higher intrest rate to attract depositors
So as bank risk rises the first component will be high. When bank needs to pay a high intrest rate on deposits > its going to charge an even higher intrest rate on the loans > x increases > ro increases > investment reduces

Back to IS-LM

Substitute new investment function in IS

(no effect on LM)

IS and equilibrium shifts as a result of a drop in value of the assets of:

- Banks: its borrowers are defaulting (consumers, firms and other banks)

=> Capital absorbs the loss

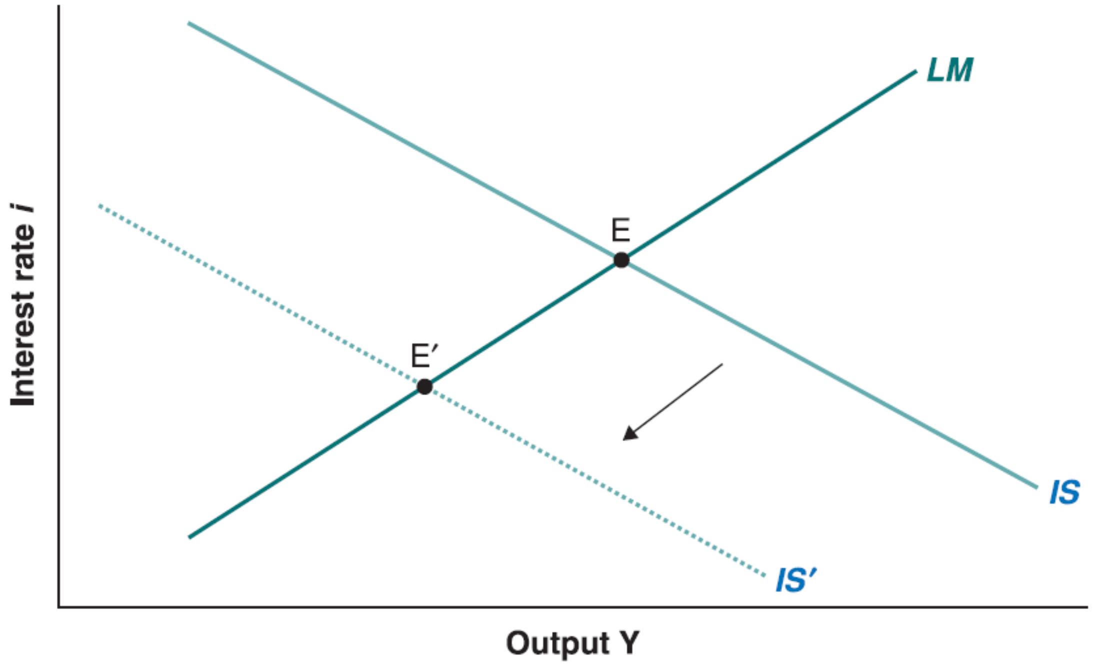
=> leverage increases

=> bank becomes riskier and must pay more for obtaining liquidity

- Firms and households: value of assets reduces implies less valuable collateral

=> loans more expensive

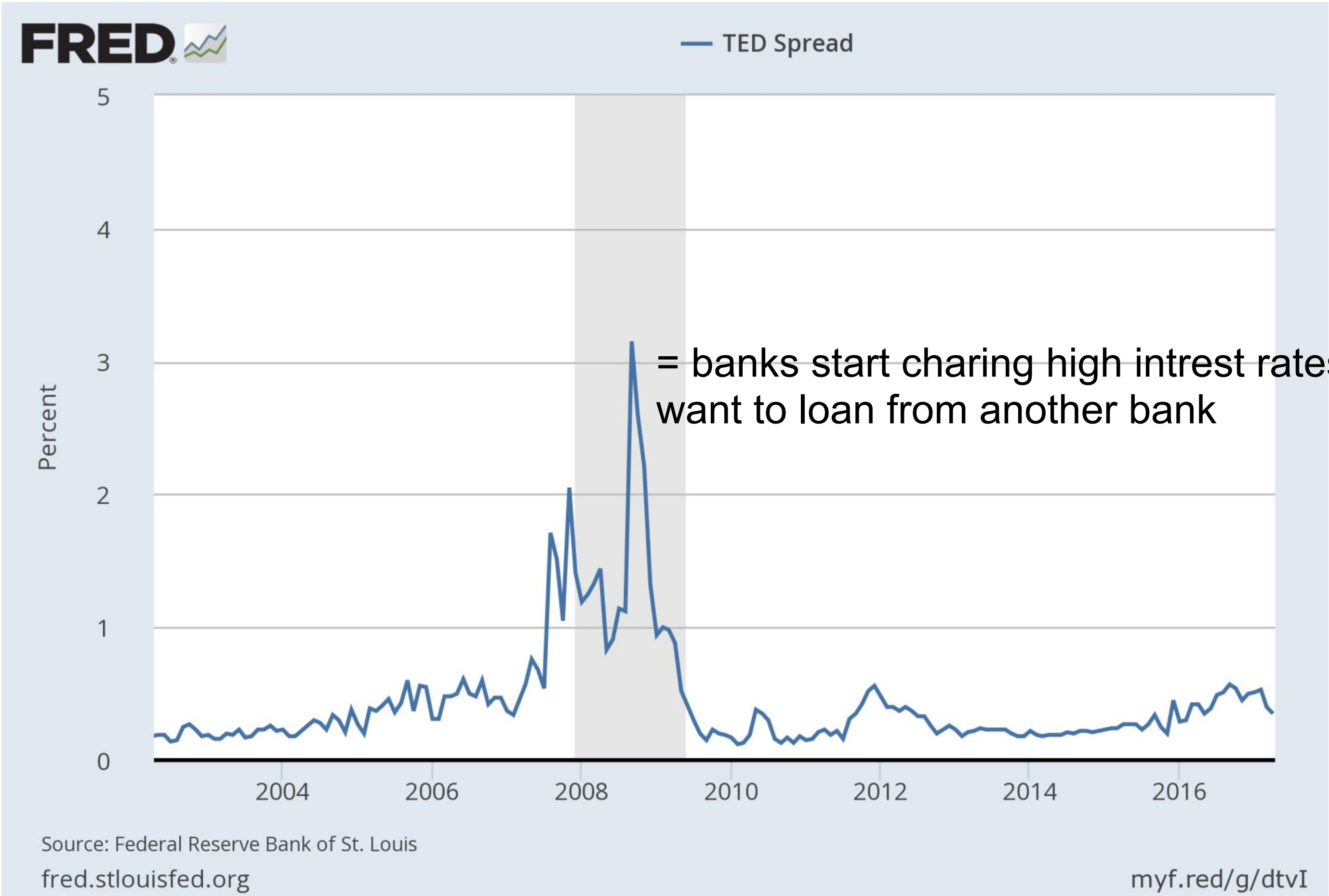
… causing the external finance premium to increase (for a given interest rate *i*)



Investment and traditional intrest rate stays negative: IS curve is still negatively sloped
> crisis: asset prices fall > capital is hid > spread goes up> for a given level of the nominal intrest rate i, because risk has increased > demand for investment is going to be lower (i remains the same, x goes up, so investment = rho goes down)

Ted spread = difference between treasury rate and libor rate (rate bank charges to other banks)

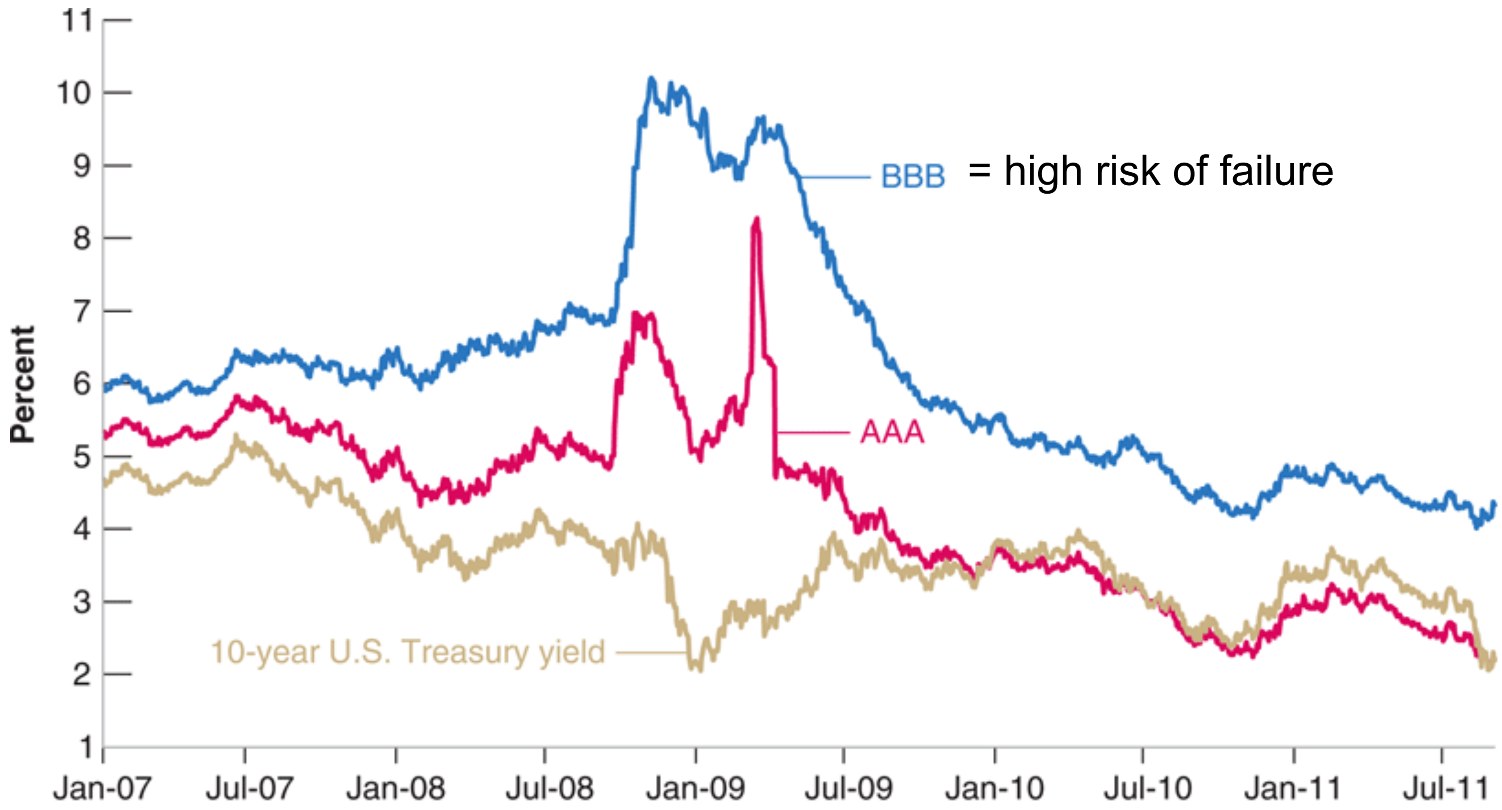
Figure The Ted Spread
Libor-Treasury = i(interbank market)-i(Monetary Policy)



= banks start charing high intrest rates if banks want to loan from another bank

Intrest rates
> triple A = best credibility of firms = very credit worthy

Figure Yields on 10-Year U.S. Government Treasury, AAA, and BBB Corporate Bonds, since 2007



Source: Bloomberg L.P.

Once financial crisis hit: sept 08: increases in intrest rates (even for AAA)
> government intrest rates is falling (since central bank is reducing intrest rates): gap between gold and red is widening, so intrest rates on investing, if government wasn't reducing intrest rates the red line would be even higher
> investment tanks

> also happens in the UK, EU (not only US)

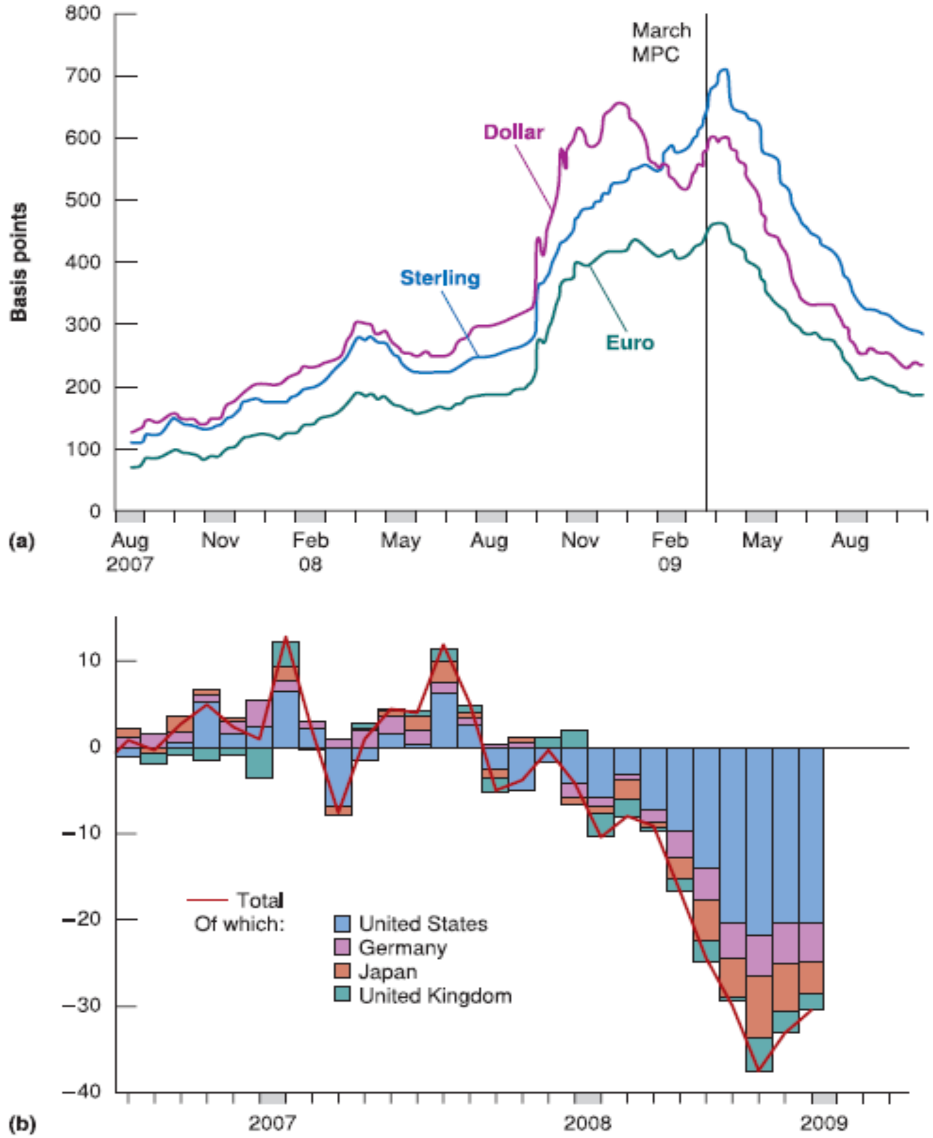


Figure 20.7

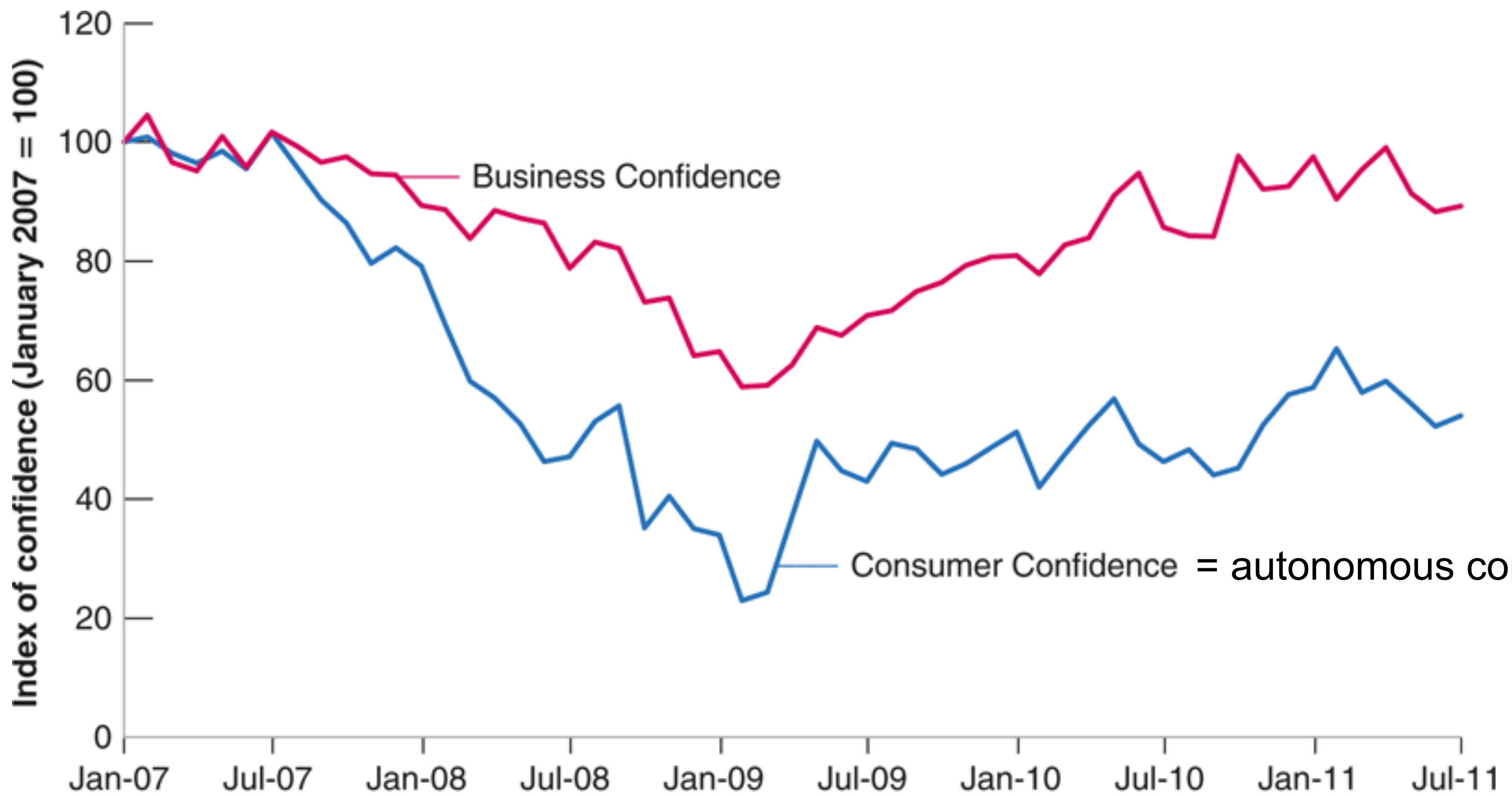
The external finance premium and the collapse of investment expenditure

(a) Corporate bonds (investment grade): spreads in the euro area, the UK and the USA.

(b) Capital goods orders.

Sources: IMF and Bank for International Settlements, 2009 Annual Report.

Figure 9-5 U.S. Consumer and Business Confidence, since 2007



= autonomous consumpiton

Source: Bloomberg L.P.

Confidence tanked > more savings > multiplier effect of everybody getting poorer

International transmission

- Financial channel: global banks, global exposures and contagion
- Goods channel: international trade

The main transmission channel was trade

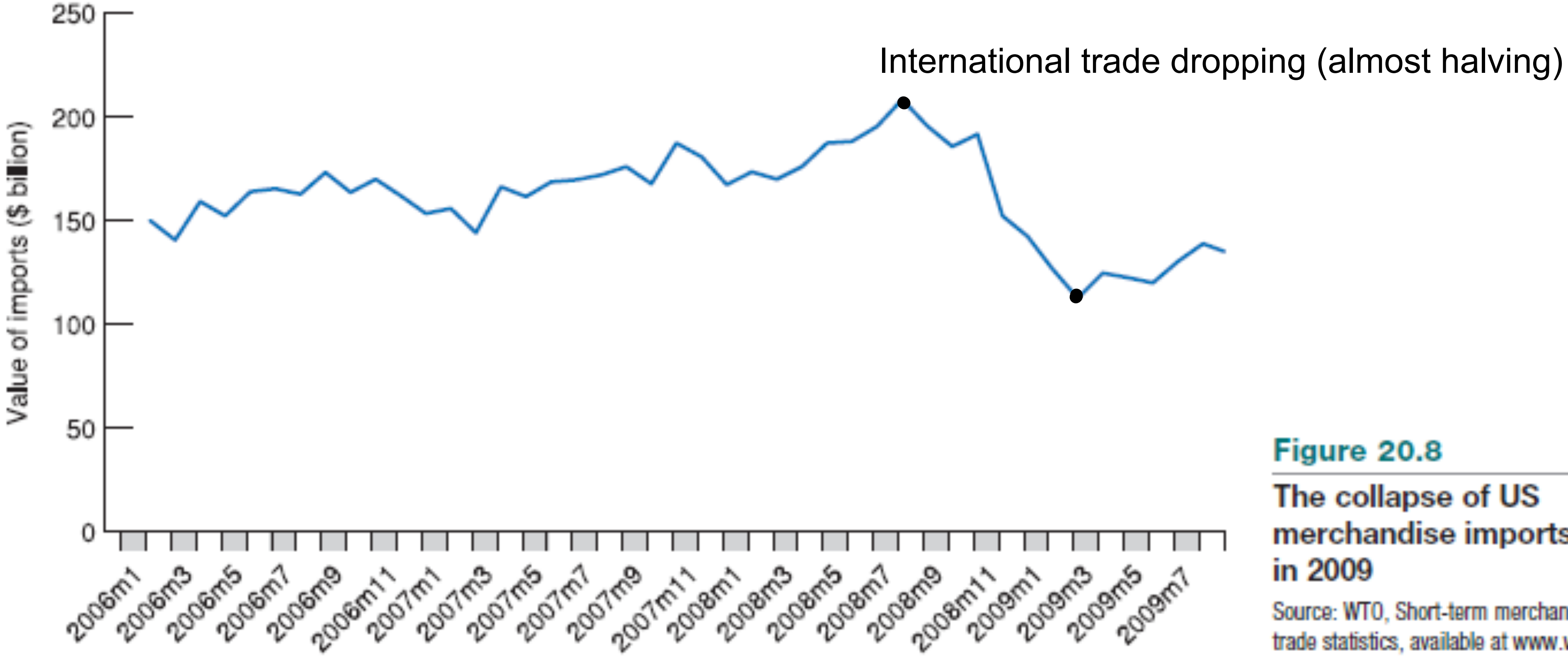
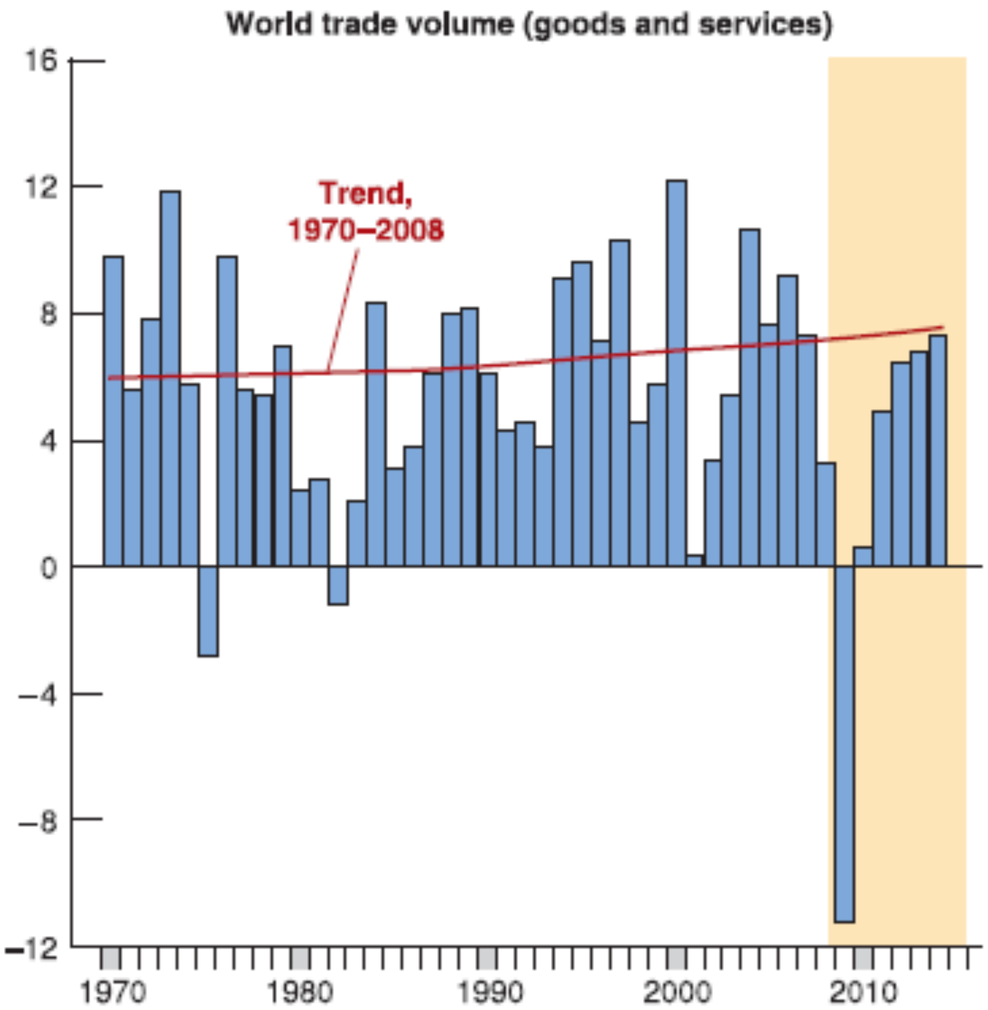


Figure 20.8

The collapse of US merchandise imports in 2009

Source: WTO, Short-term merchandise trade statistics, available at www.wto.org.



Was not only in us: in whole world trade

Figure 20.9

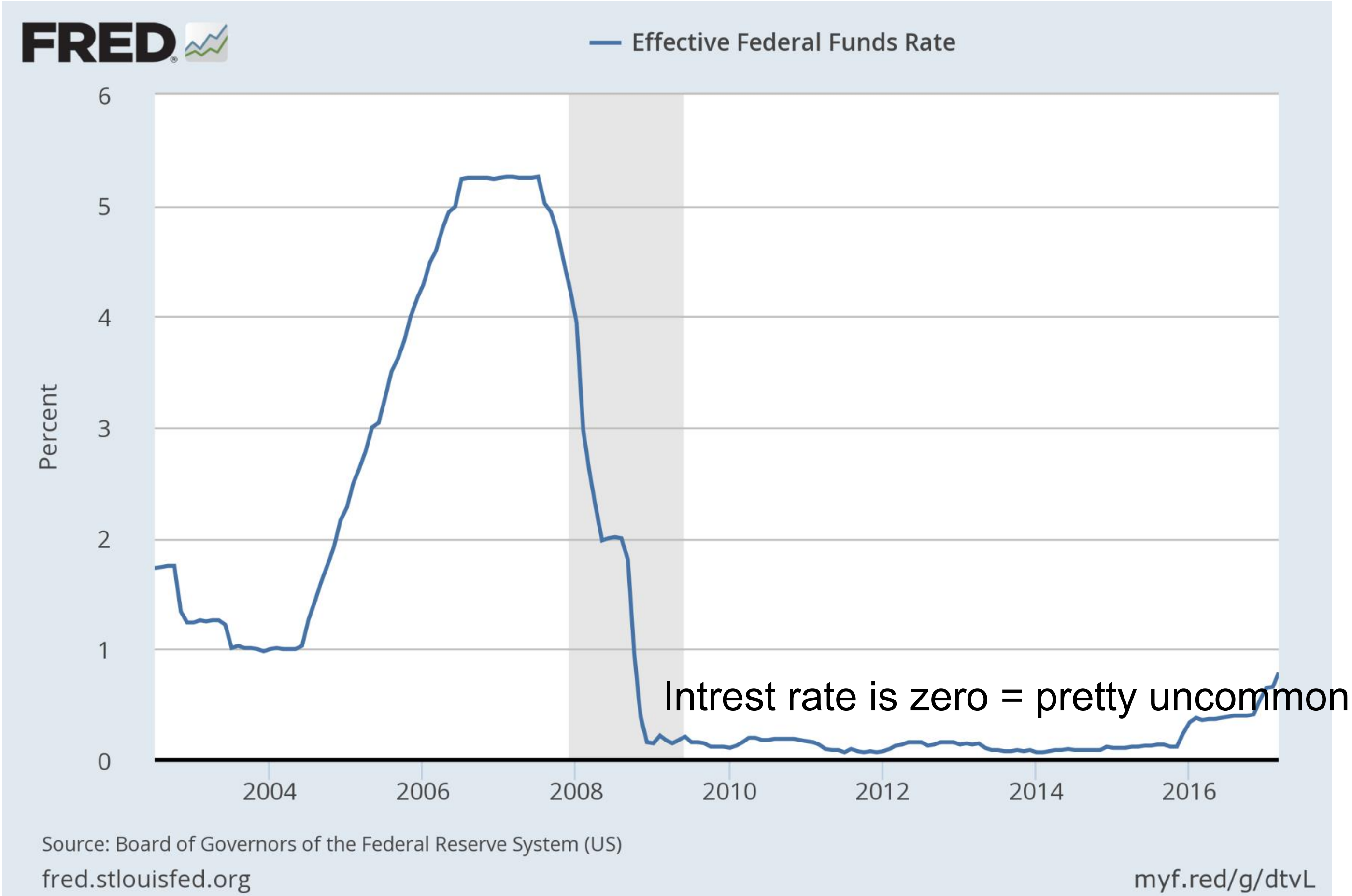
The collapse in world trade in 2009

Source: IMF *World Economic Outlook*.

Policy

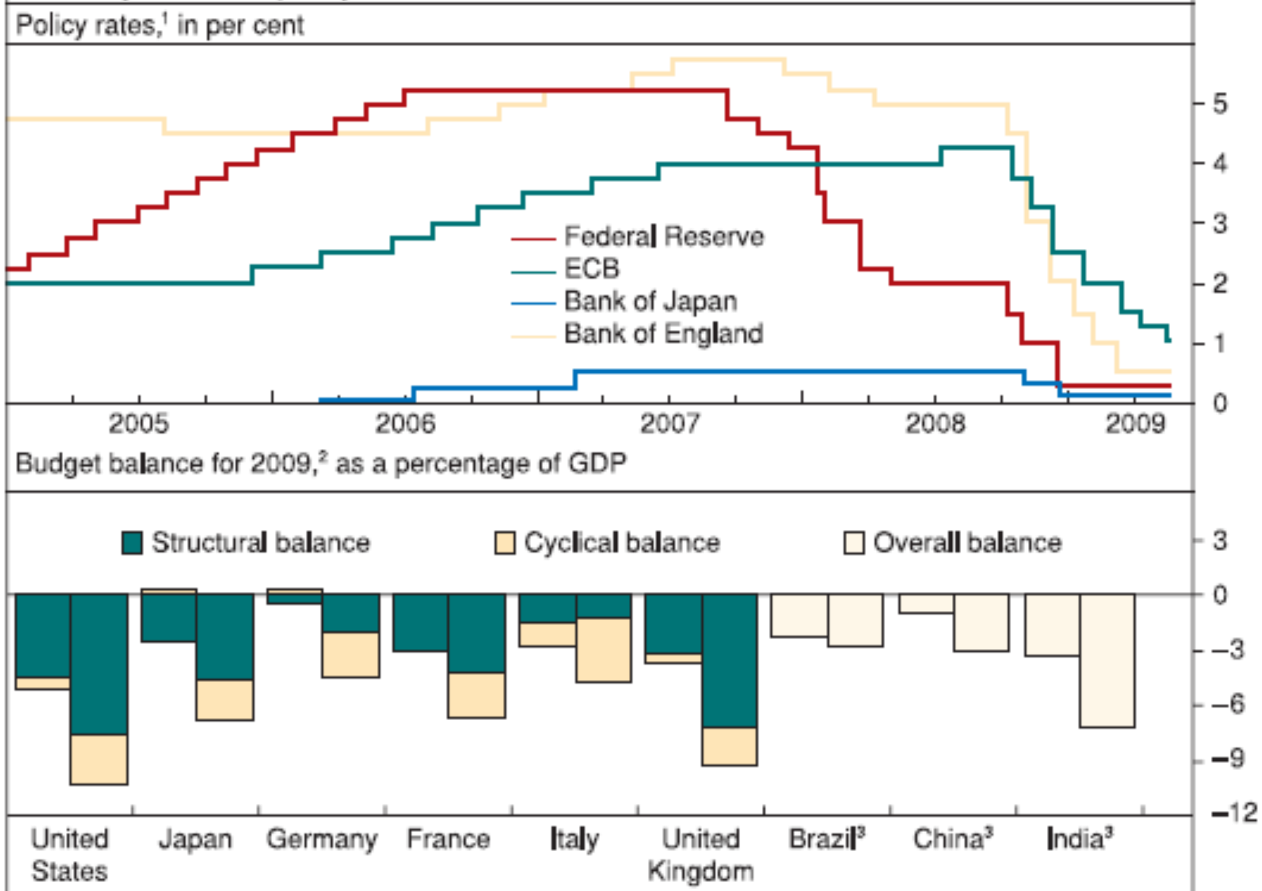
Recession: central bank will reduce i and governement will reduce T and increase G

- Financial
  Governement see people wanting to withdraw their money: wanting to avoid that
  - FDIC: Deposit insurance: $100.000→$250.000
    - Aim: prevent bank runs
  - Fed: additional liquidity
    - Expanded collateral
    - Also trying to extend beyond banks
    - Aim: liquidity ↑ => prevent forced asset (fire) sales
  - Treasury/Fed: TARP ($700 bn.) We have enough money to solve this: to calm down the markets
    Feds: use massive amount of money to buy complex assets
    - Buy complex assets (Troubled Asset Relief Program)
    - Initial aim: increase transparency bank balance sheets, support value of the bank balance sheets
    - Later: increase bank capital
- Monetary (fig) intrest rates slashed to zero lower bound
- Fiscal: T↓, G↑


FRED
Effective Federal Funds Rate
Percent
6
5
4
3
2
1
0
2004
2006
2008
2010
2012
2014
2016
Intrest rate is zero = pretty uncommon
Source: Board of Governors of the Federal Reserve System (US)
fred.stlouisfed.org
myf.red/g/dtvL

We see intrest rates go to zero really soon, we also know in the liquidity trap (adding additional liquidity will no longer have the substitute effect: we are not going to invest any more otherwise we will loose money).
> central banks are in the trap, but the economy is still in a bad shape
> so T go down, G goes up (not every country can do this)

Monetary and fiscal policy



[1] For the Federal Reserve, target federal funds rate: for the ECB, interest rate on the main refinancing operations: for the Bank of Japan, target for the uncollateralised overnight call rate: for the Bank of England, Bank rate.
[2] Projections before September 2008 (first column) and latest (second column).
[3] Breakdown not available.
Sources: OECD, *Economic Outlook*, Bloomberg; JP Morgan Chase: national data.

Economy is still tanking > something ells is needed
> central banks went over and beyond their usual limit: there are several intrest rates that matter for investment
> central banks tried to influence other intrest rates: in addition to short term intrest rate there are also other long term intrest rates that the banks wanted to influence

Policy

- Conventional monetary policy constrained (ZLB, liquidity trap)
- Unconventional monetary policy
  - IS-LM: only 1 short term interest rate (CB)
  - Reality: several interest rates
    - Loans to firms, households, mortgages, … (external finance premiums)
    - Future / long-term interest rates

3 ways to influence the longterm intrest rate:

1) • Credit easing = reduce long term intrest rates (CB starts buying G bonds)
2) • Quantitative easing
3) • Forward guidance

- Fiscal policy
  - Potentially effective, yet may be constrained by initial level of indebtedness

1. Looks like a good idee: will pull pull along some of the corporate bonds, one problem however: intrest rates on G bonds went down by quite a bit (but that didn't mean lower intrest rates for firms).
2. Similar to the first: rather than buying G bonds you buy corporate bonds > increases their price > intrest rate drops (P ~1/i)
3. Aimed at trying to reduce future intrest rates:

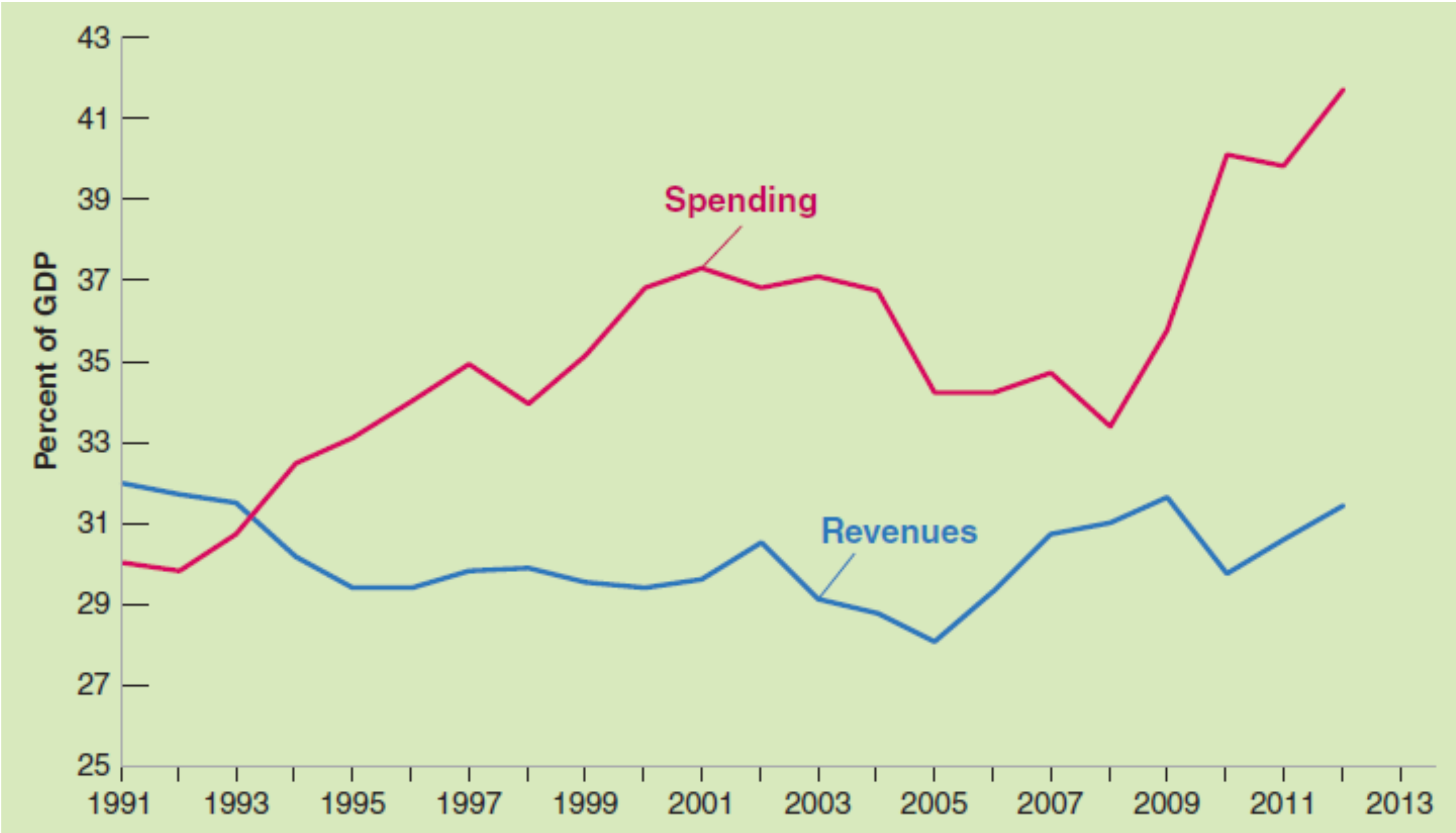
$[1+ i(2y)] = [1 + i(1y)]*\ [1 + i(+1y)]$ > central bank controls the short term intrest rates, but intrest rates on long terms are still high thus banks start promising that intrest rates on long periods will stay low

Japan has been in the liquidity trap since the 90 ies

Japan, the Liquidity Trap, and Fiscal Policy

Figure 1 The Interest Rate in Japan since 1990. Japan has been in a liquidity trap since the mid-1990s.

Figure 2 Government Spending and Revenues (as a percentage of GDP), Japan, since 1990. Increasing government spending and decreasing revenues have led to steadily larger deficits.



Governments were increasing G to increase demand

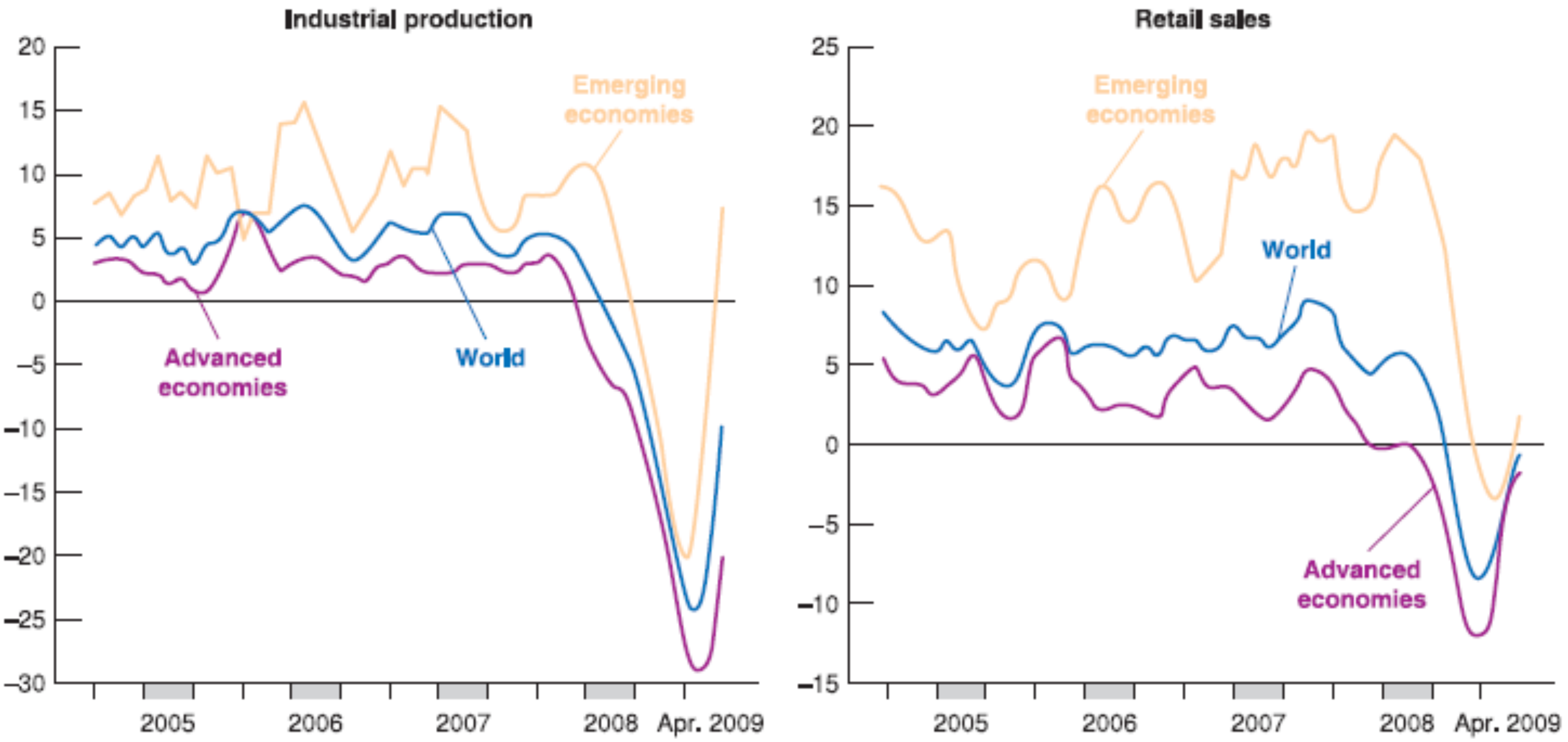


Figure 20.13

Effectiveness of the policy response to the crisis

Source: IMF, *World Economic Outlook*, July 2009 update, Fig. 2.

A lot of extreme intervention: definitely helped contain the crisis

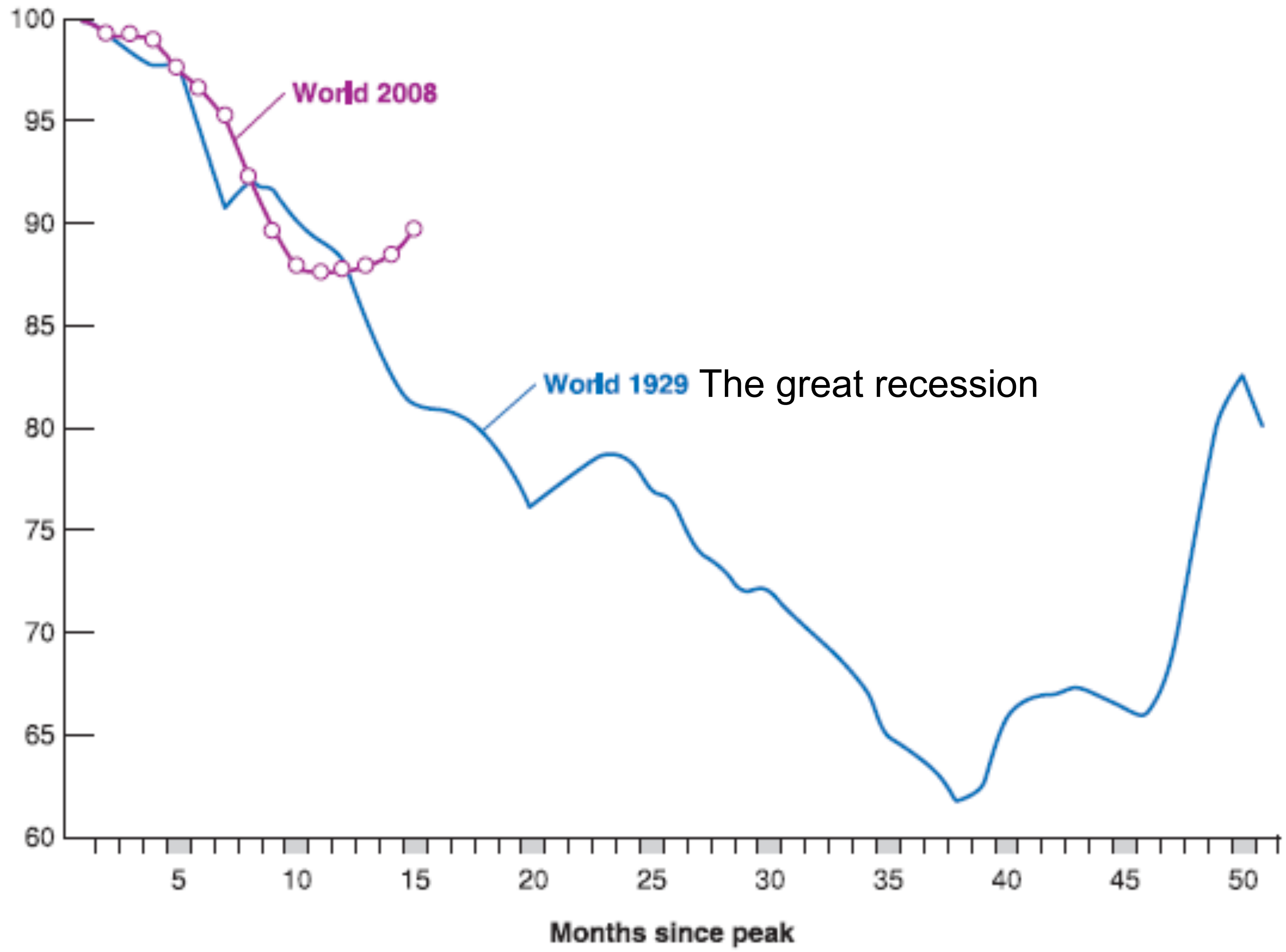


Figure 20.14

The 1930s and the 2007–2010 crisis

Source: Barry Eichengreen, and K. H. O'Rourke, *A Tale of Two Depressions*, Voxeu.org, September 2009.

People had a lot of fear > a lot of policy going to extreme lengths to prevent this

Why did Poland do so Well in the Crisis?

	GDP growth in 2009	Consumption growth in 2009	Budget deficit 2009 relative to 2007, + indicates a larger budget deficit	Euro exchange rate 2009 relative to 2007, – indicates a depreciation	IMF FCL US$bn
Poland	+1.0%	+2.5%	+3.4%	–15%	20
Hungary	–6.5%	–8.1%	–1.0%	–5%	12

Source: IMF.

Note: FCL are the IMF 'Flexible Credit Lines', a lending facility designed to support countries in the crisis.

- Poland responded to the crisis with a fiscal expansion, more specifically a tax cut that boosted consumption.
- Central bank accompanied the tax cut with a monetary expansion.
- Exchange rate depreciation, by raising the relative price of imported goods, shifted demand away from imports toward domestic products.

= depreciation of exchange rate > a lot of domestic goods are produced + a lot of exports also

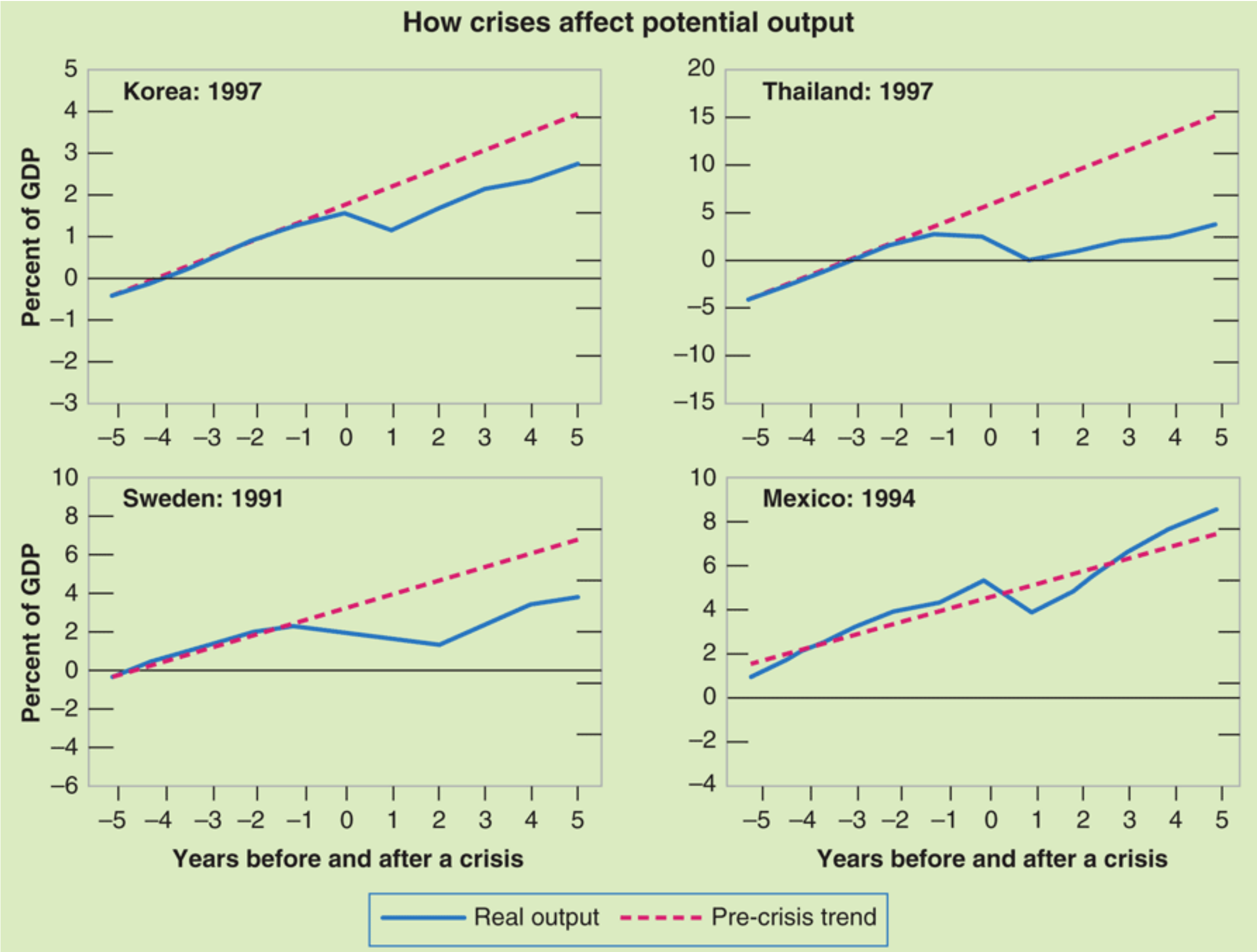
Crisis:
> new financial instruments that went overboard > a lot of lending > additional home building and production
> so if we ban the instruments: some markets will dry up permanently and AS will be down permanently

Recovery

- Initial recovery in the US very slow US = very flexible
  - Worrisome for EU:
    - External demand
    - But also as a benchmark: US economy is much more flexible
- Aggr. <u>supply</u>:
  - Reduction in Yn as a result of less efficient financial intermediation (less risk, stronger regulation, …)
  - Fig
- Aggr. <u>demand</u>:
  - Limits of policy: policy may not be able to ensure a return to initial output-level
  - Adjustment failure:
    - Normal times: $Y\downarrow < Y_n$, $P\downarrow$, $M/P\uparrow$, $i\downarrow$, $Y\uparrow$
    - Liquidity trap: $Y\downarrow < Y_n$, $P\downarrow$, $M/P\uparrow$, $i\rightarrow$, $Y\rightarrow$

SUPPLY: Do Banking Crises Affect the Natural Level of Output?

The Evolution of Output after Four Banking Crises



What we see

> real output = blue

> dashed: if we take trend of how output was evolving before the crisis and how is would have evolved after crisis if there was no crisis

> a lot of countries didn't pick up to the original level of output

Financial crisis can be severe in the long run

Demand: limits to policy
> we invented new policies but they all have limits (fiscal: debt limits), monetary (liquidity trap)

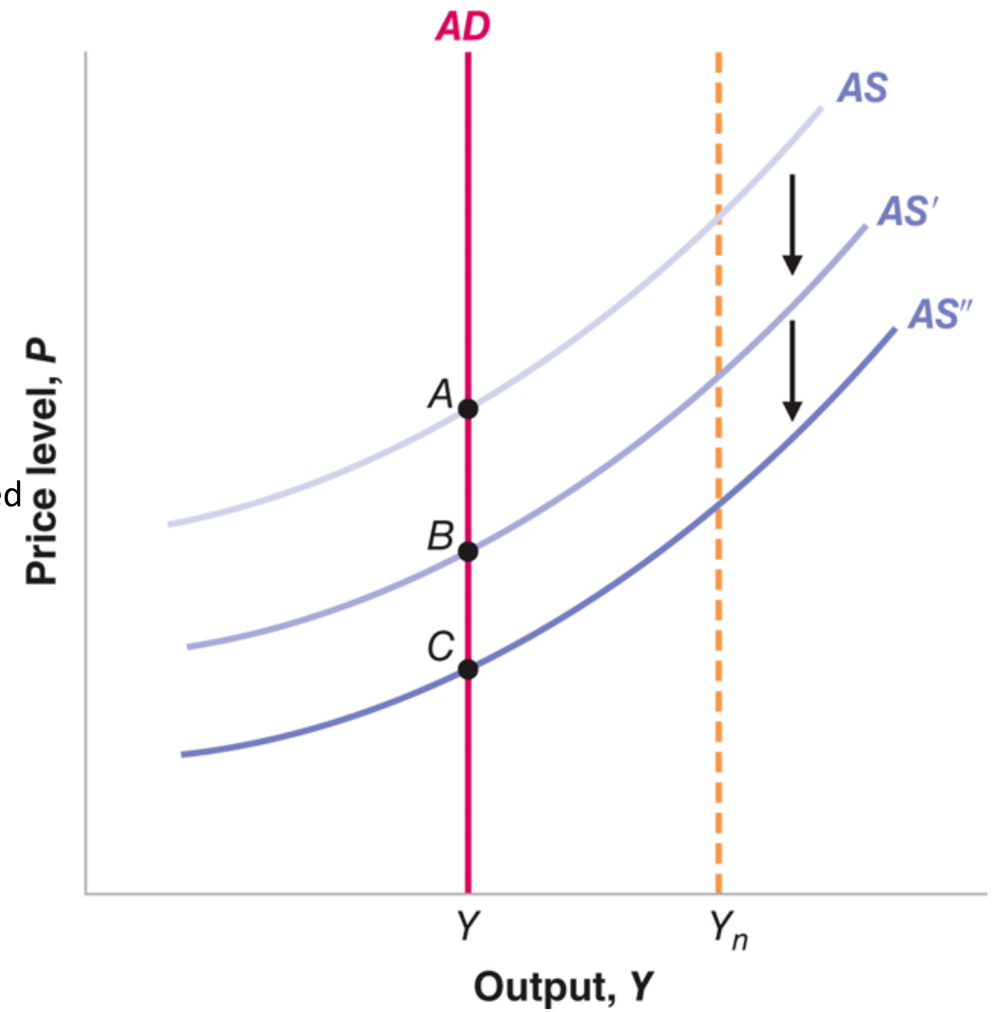
DEMAND:
The Liquidity Trap and Adjustment Failure

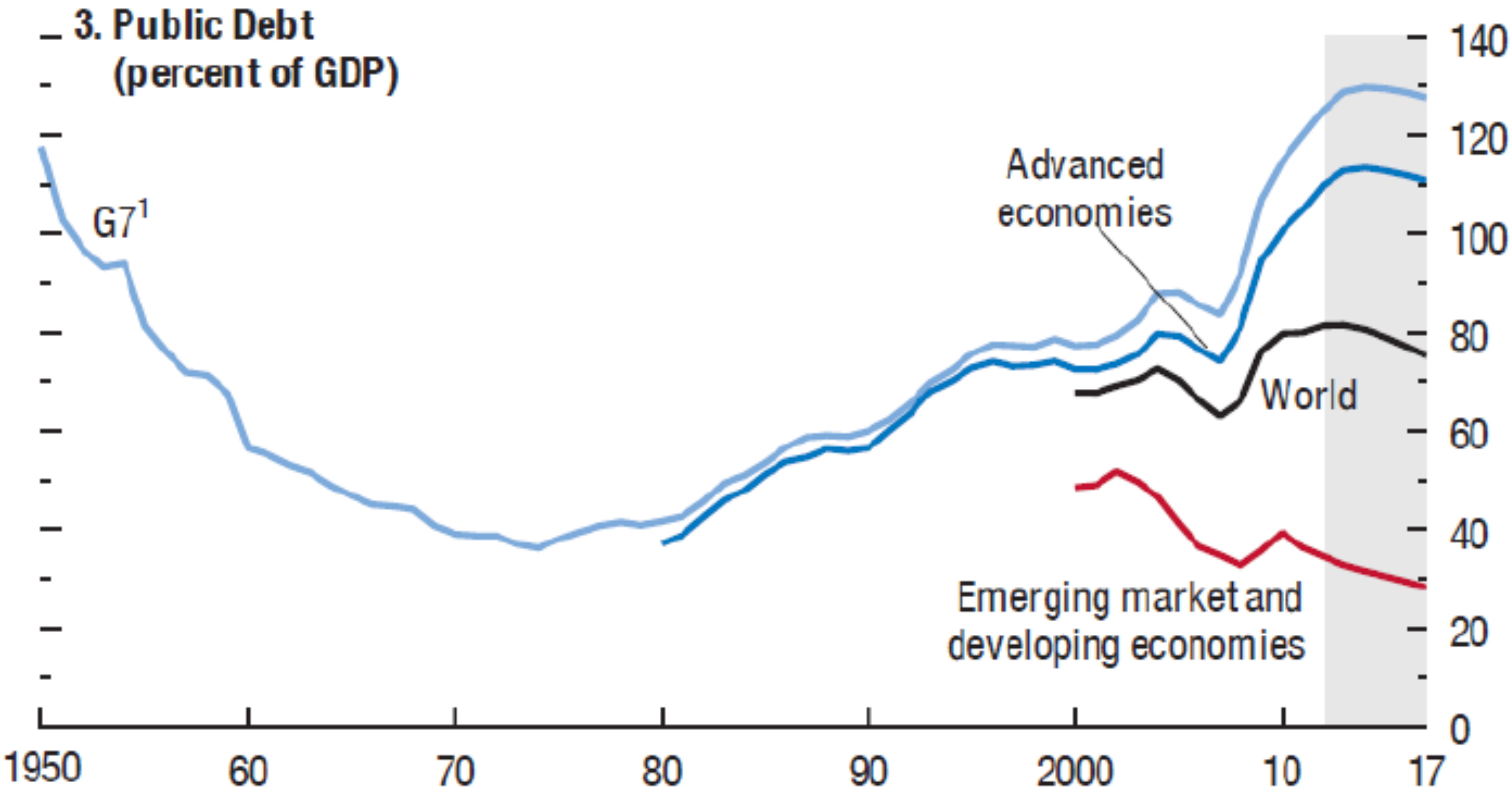
AD: Y(G,T)
Y↓<Yn, P↓,M/P↑, i →, Y →

AS: shifts as a result of price reductions (and their impact on expectations)
… but does not lead to a return to Yn

Never again Yn?
Probably spending will pick up eventually: pent-up demand
- Some types of consumption and investment can't be postponed indefinitely
- But can take a while (Japan)

AD curve becomes vertical





Legacies of the crisis: public debt

Source: IMF, ***World Economic Outlook***, October 2012, Fig. 1.4

Enorm increase in debt = worrisome

Several reasons for the dire fiscal situation

Why was debt so hard effected:

- High country risk premiums
- Automatic stabilizers
- Stimulus packages (G increased, T dropped)
- Rescuing banks
- Low growth

Macroeconomics (D0R71A)

KU Leuven

High Debt

Result of the recession: monetary policy to reduce intrest rates to minimum and fiscal policies: reducing T or increasing G
> Result government depth also increased

21-1 The Government's Budget Constraint

Suppose that the government, starting from a situation of balanced budget, decides to cut taxes while keeping public expenditure unchanged, thereby creating a budget deficit.

Governement $deficit_t = rB_{t-1} + G_t - T_t$

Governement saving = G-T

We define ***B*** **as all the bonds and bills issued by the government** and held by the private sector.
= all loans for the public

r **is the real interest rate**, which for now we assume to be constant. $\boldsymbol{rB_{t-1}}$ represents the real interest paid on government bonds in circulation.

$\boldsymbol{G_t}$ is government spending on goods and services in year *t*.

$\boldsymbol{T_t}$ are taxes less transfers in year *t*.

21-1 The Government's Budget Constraint (Continued)

If there is a deficit: the governement is going to need to borrow > it will need new bonds

We assume that the only means of deficit financing is selling securities to private investors. In this case:

$$B_t - B_{t-1} = deficit_t$$

So if the government runs a deficit, government debt increases. If the government has a surplus, debt decreases. The government budget constraint is:

$$B_t - B_{t-1} = \underbrace{rB_{t-1}}_{\substack{interest\\payments}} + \underbrace{(G_t - T_t)}_{\substack{primary\\deficit}}$$

= from the past

= whithing the powerment of the governement to change

Finally: $$B_t = (1+r)B_{t-1} + (G_t - T_t)$$

How to Compute the Budget Deficit Corrected for Inflation

Reported in official numbers:

Official measures of the budget deficit are constructed as the sum of nominal interest, *iB*, plus government spending on goods and services, *G*, minus taxes net of transfers, *T*.

> i = nominal intrest rate
> r = real intrest rate
> i-π (inflation) =r

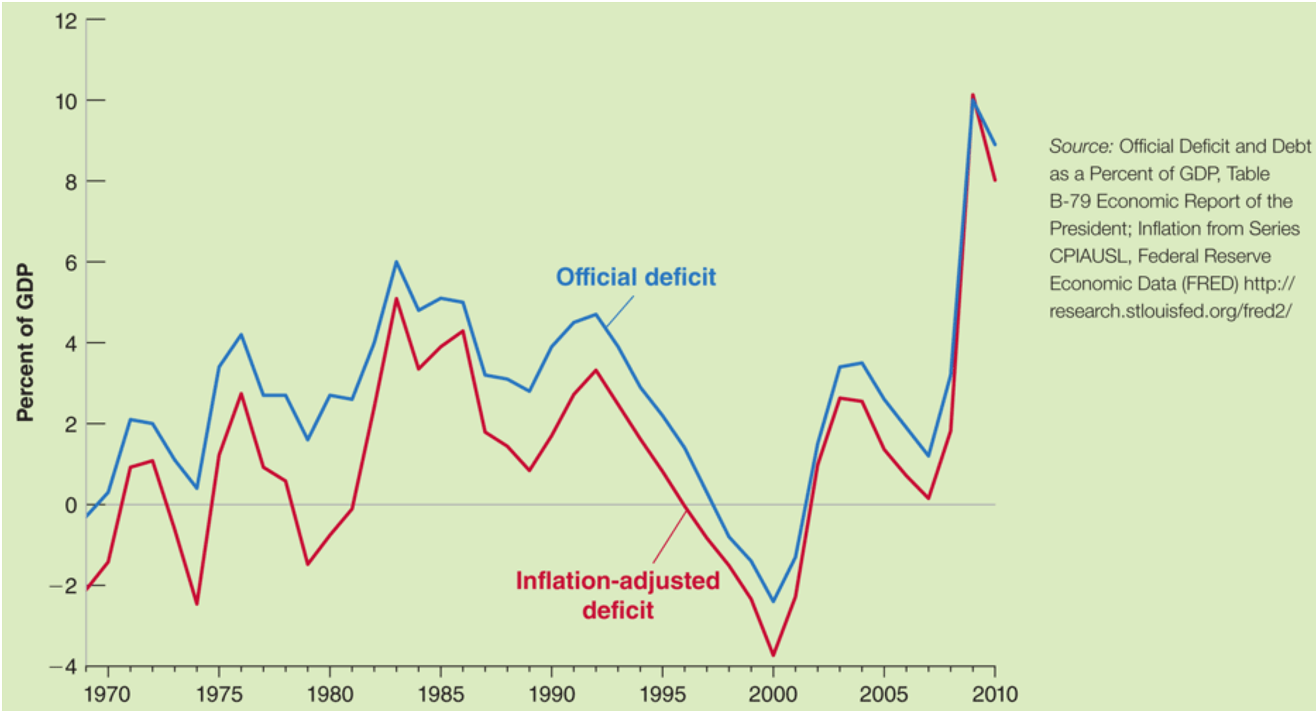
$$official\ deficit = iB + G - T$$

This is a measure of the change in *nominal debt*. If *B* is the debt and inflation is π, the official measure of the deficit overstates the correct measure by an amount equal to πB. The correct, inflation-adjusted measure of the deficit is in fact equal to:

Rewrite: $$iB + G - T - \pi B = (i - \pi)B + G - T = rB + G - T$$

where $r = i - \pi$ is the real interest rate.

How to Compute the Budget Deficit Corrected for Inflation (Continued)



Little difference between the lines, expect in the 70ies when inflaiton was high

Figure: **Official and Inflation-Adjusted Federal Budget Deficits for the United States since 1969**

21-1 The Government Budget Constraint (Continued)

Current and Future Taxes
Given an amount of depth, how will that evolve over time?

We want to study the effect on the evolution of debt and future taxes of a tax cut in year 0. In year 0, the government cuts taxes by 1 for one year. Then, debt at the end of year 0, B_0, will be equal to 1.

3 situations about when the governement wants the debt to be repaid:

What happens next?

1) • Repayment in year 1:

$$\overset{0}{B_1} = (1+r)\overset{1}{B_0} + (G_1 - T_1)$$

$$0 = (1+r) + (G_1 - T_1)$$

=> Primary surplus needed to repay debt in year 1:

$$T_1 - G_1 = 1 + r$$

21-1 The Government Budget Constraint (Continued)

Current and Future Taxes

2) • Repayment after *t* years:

Debt in year 1: $B_1 = (1+r)B_0 + 0 = (1+r)$

Debt in year 2: $B_2 = (1+r)B_1 + 0 = (1+r)^2$ = accumulation of intrest rates

$\vdots$

Debt in year t-1: $B_{t-1} = (1+r)^{t-1}$

Budget constraint in year t:

$$0 = B_t = (1+r)B_{t-1} + (G_t - T_t) = (1+r)^t + (G_t - T_t)$$

=> Primary surplus needed to repay debt in year t:

$$\boxed{T_t - G_t = (1+r)^t}$$

21-1 The Government Budget Constraint (Continued)

Current and Future Taxes

3) • Debt stabilisation

The government wants to keep debt equal to 1, B_t=1.

Budget constraint in year t:

$$B_t = (1+r)B_{t-1} + G_t - T_t$$
$$1 = (1+r) + G_t - T_t$$

=> Primary surplus needed each year: $T_t - G_t = r$

How much is the debt relative to the GDP?

21-2 The Evolution of the Debt/GDP Ratio

= an indication of how long we will need to pay back the debth

= comparable across countires

The Government Budget Constraint in Terms of GDP

Let’s divide both sides of the government budget constraint by real output, Y_t, to get:

A possible option to repay the debt: by increasing taxes on income

$$\frac{B_t}{Y_t} = (1+r)\frac{B_{t-1}}{Y_t} + \frac{G_t - T_t}{Y_t}$$

Rewriting:

$$\frac{B_t}{Y_t} = (1+r)\left(\frac{Y_{t-1}}{Y_t}\right)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

By defining g, the growth rate of output, we have $Y_{t-1}/Y_t = 1/(1+g)$. Moreover, by approximating $(1+r)/(1+g)$ with $1+r-g$, we obtain:

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r-g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

Debth this period - debth previous period = ∂Debth = debth of the past - growth rate (since GDP ≠ in periods) = r-g

When the economy is growing it's not hard to repay debt

If intrest rate > growth rate: (r>g): than Bt/Yt > Bt-1/Yt-A (ignoring G-T)

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Government Budget Constraint in Terms of GDP

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r-g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

This equation tells us that the change in the debt-to-GDP ratio is equal to the sum of two terms:

- The first is the difference between the real interest rate and the rate of growth of GDP, multiplied by the debt ratio at the end of the previous period. This term refers to interest payments, in real terms, corrected for the growth rate of real GDP.

- The second term is the ratio of the primary deficit to GDP.

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Debt Ratio in the Long Run

The evolution of the debt ratio,

$$\frac{B_t}{Y_t} = (1 + r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

is described by a difference equation, $y_t = \beta y_{t-1} + A$,

where y_t is the debt ratio, the parameter β is $(1 + r - g)$ and the exogenous variable A is $(G_t - T_t)/Y_t$.

We assume that the government runs primary deficits (or surpluses) in relation to GDP that are constant over time, namely that $(G_t - T_t)/Y_t$ is constant. We also continue to assume that r and g are constant.

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Debt Ratio in the Long Run

Before we solve the equation graphically, you can already guess that two main cases can arise:

1. The normal case – on most occasions, the growth rate of GDP is smaller than the real interest rate: $g < r$.
   => The equation is described by a straight line with slope *greater* than one ($1 + r - g > 1$).

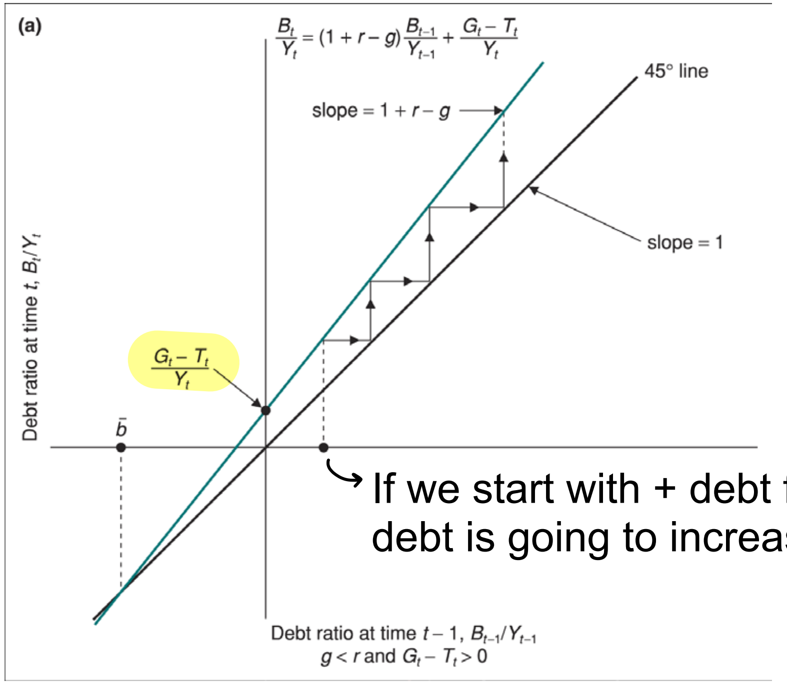
2. The more exotic case – although less frequent, it can happen that the GDP growth rate exceeds the real interest rate: $g > r$.
   => The equation is described by a straight line with slope *smaller* than one ($1 + r - g < 1$).

$$\frac{B_t}{Y_t} = \underbrace{(1 + r - g)}\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Dynamics of the Debt-to-GDP Ratio in the Long run

SITUATION 1: normal case
= when r-g>1



If we start with + debt from the past then the government debt is going to increase = the arrows on graph

Figure 21.5a **The dynamics of the debt-to-GDP ratio in the long run**
If $g < r$, and if the country has past debt and runs primary deficits ($G_t - T_t > 0$), then the debt ratio increases going farther away from equilibrium.

Debth ratio is going to keep increasing and going to explode

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Dynamics of the Debt-to-GDP Ratio in the Long Run

SITUATION 2: normal case
= when r-g>1

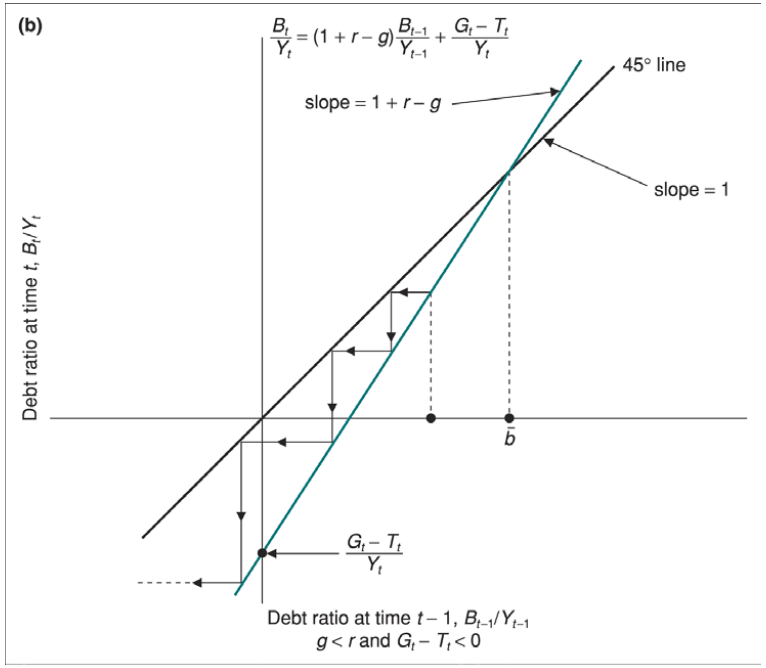


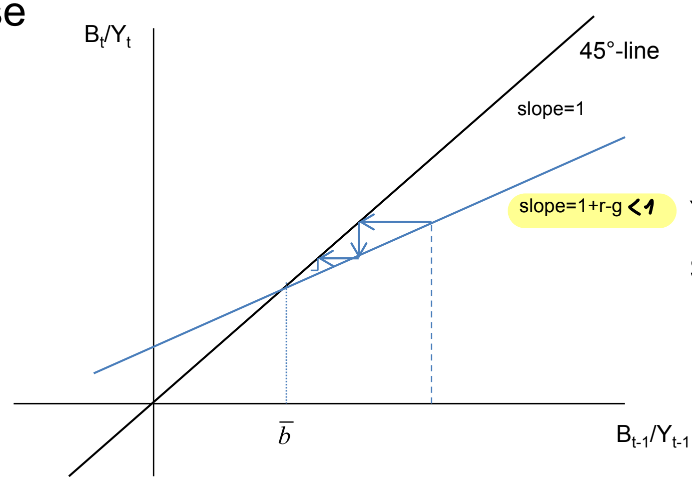
Figure 21.5b **The dynamics of the debt-to-GDP ratio in the long run**
Even if $g < r$, and if initial debt is positive, the debt ratio decreases over time if the government runs 'adequate' primary surpluses ($G_t - T_t < 0$)

We start with positive debt and debt ratio is going to reduce over time

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Dynamics of the Debt-to-GDP Ratio in the Long Run

SITUATION 3: abnormal case
= when r-g<1



Y grows faster than the debt, so we grow out of the debt

Figure 21.5c **The dynamics of the debt-to-GDP ratio in the long run**
If $g > r$, the debt ratio converges to the equilibrium level despite the presence of primary deficits ($G_t - T_t > 0$)

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Dynamics of the Debt-to-GDP Ratio in the Long Run

SITUATION 4: abnormal case
= when r-g<1

The effect is enforced/fastend if the governement also saves

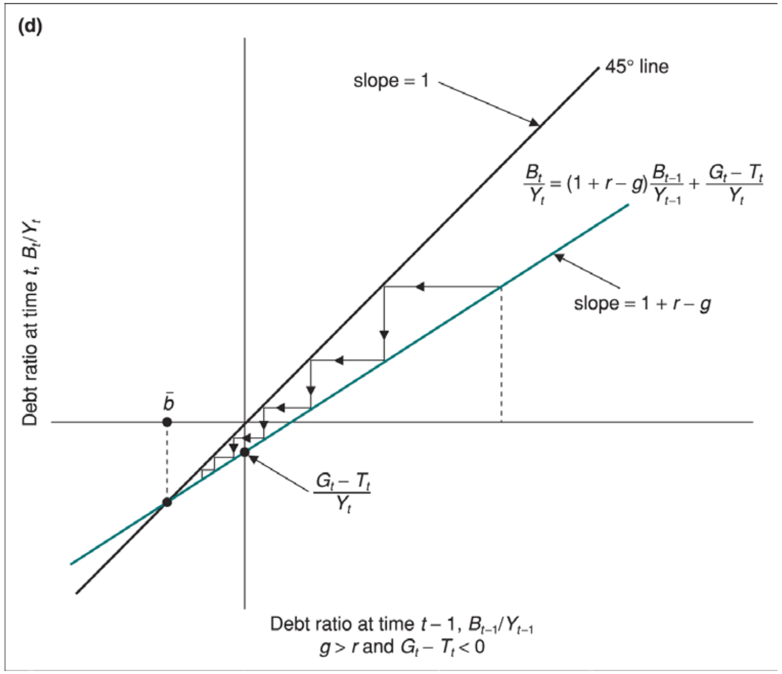


Figure 21.5d **The dynamics of the debt-to-GDP ratio in the long run**
If $g > r$ and the government runs primary surpluses ($G_t - T_t < 0$), then the debt ratio always converges to its equilibrium level

$$\frac{B_t}{Y_t} = (1 + r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

So most of the time: r>g, so debt will translate in higher debt in the future > if we want to repay depth it will not come from the first term in the equation but from the last (due to the self acumulating of the debth in the first term)

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Evolution of the Debt Ratio in Some European Countries

The 1960s was a decade of strong growth in all countries, so strong that the average growth rate exceeded the real interest rate almost everywhere.

Debth to GDP ratio fell

The 1970s, in contrast, were a period of much lower growth, but also of very low real interest rates (sometimes negative).

Inflation was high > real intrest rate = nominal intrest rate - - inflation
= low due to high inflation

In the early 1980s, real interest rates increased and growth rates slowed down. To avoid an increase in the debt-to-GDP ratio, many countries should have created large surpluses. But this did not happen, and the result was a sharp increase in debt ratios.

= we tried to fight inflation
> real intrest rates became high

T-G for different countries

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Evolution of the Debt Ratio in Some European Countries

During the 2007–2010 crisis there was a dramatic effect on debt and deficits of the use of fiscal policy

	Primary balance					
	1992–2001	2002–2006	2007	2008	2009	2010
Germany	1.00	−0.4	2.6	2.6	−1.0	−2.9
Ireland	4.50	2.4	1.1	−6.1	−9.8	−12.5
Spain	0.50	2.5	3.8	−2.3	−6.9	−7.8
France	−0.25	−0.5	0.0	−0.6	−3.8	−4.0
Italy	4.05	1.4	3.5	2.4	0.2	0.1
Netherlands	3.25	1.1	2.6	3.2	−0.8	−3.4
Euro area	1.60	0.7	2.3	1.1	−2.3	−3.3
Denmark	4.50	4.8	6.1	5.0	0.1	−2.3
Sweden	1.55	2.6	5.6	4.2	−1.2	−2.5
UK	0.30	−1.0	−0.5	−3.1	−9.4	−10.8
USA	2.40	−0.9	0.2	−3.0	−9.5	−11.6
Japan	−1.40	−3.5	0.0	−0.3	−3.6	−5.2

= great financial crisis

Table 21.1 **Primary balance, interest expenditure and gross debt in selected advanced countries since 1992.** Notes: values are expressed as a percentage of GDP, 1992-2010: primary balance: net lending/borrowing excluding interest payments.
Source: European Commission – Economic Forecast, Spring 2009, IMF World Economic Outlook, April 2009

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Evolution of the Debt Ratio in Some European Countries

During the 2007–2010 crisis there was a dramatic effect on debt and deficits of the use of fiscal policy

	Interest expenditure					
	1992–2001	2002–2006	2007	2008	2009	2010
Germany	3.25	2.9	2.8	2.8	2.9	3.0
Ireland	4.15	1.2	1.0	1.1	2.3	3.2
Spain	4.25	2.1	1.6	1.6	1.6	1.9
France	3.25	2.7	2.7	2.8	2.8	3.1
Italy	9.30	4.9	5.0	5.1	4.7	4.8
Netherlands	4.90	2.5	2.2	2.2	2.6	2.7
Euro area	4.95	3.1	2.9	3.0	3.0	3.0
Denmark	5.25	2.3	1.5	1.4	1.7	1.6
Sweden	4.75	2.0	1.8	1.7	1.5	1.4
UK	3.05	2.0	2.2	2.3	2.2	3.0
USA	4.25	2.7	2.9	2.9	2.6	2.6
Japan	3.50	2.6	2.5	2.5	3.0	3.5

Evolution of intrest rate didn't change much

Table 21.1 **Primary balance, interest expenditure and gross debt in selected advanced countries since 1992.** Notes: values are expressed as a percentage of GDP, 1992-2010.

Source: European Commission – Economic Forecast, Spring 2009, IMF World Economic Outlook, April 2009

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Evolution of the Debt Ratio in Some European Countries

During the 2007–2010 crisis there was a dramatic effect on debt and deficits of the use of fiscal policy

	Gross debt						
	2004	2005	2006	2007	2008	2009	2010
Germany	65.6	67.8	67.6	65.1	65.9	73.4	78.7
Ireland	29.4	27.5	24.9	25.0	43.2	61.2	79.7
Spain	46.2	43.0	39.6	36.2	39.5	50.8	62.3
France	64.9	66.4	63.7	63.8	68.0	79.7	86.0
Italy	103.8	105.8	106.5	103.5	105.8	113.0	116.1
Netherlands	52.4	51.8	47.4	45.6	58.2	57.0	63.1
Euro area	69.5	70.0	68.3	66.0	69.3	77.7	83.8
Denmark	44.5	37.1	31.3	26.8	33.3	32.5	33.7
Sweden	51.2	51.0	45.9	40.5	38.0	44.0	47.2
UK	40.6	42.3	43.4	44.2	52.0	68.4	81.7
USA	62.2	62.5	61.9	63.1	70.5	87.0	97.5
Japan	178.1	191.6	191.3	187.7	196.3	217.2	227.4

Ratio's increased fastly after crisis and even more fastly after COVID

Table 21.1 Primary balance, interest expenditure and gross debt in selected advanced countries since 1992. Notes: values are expressed as a percentage of GDP, 1992-2010.

Source: European Commission – Economic Forecast, Spring 2009, IMF World Economic Outlook, April 2009

21-2 The Evolution of the Debt/GDP Ratio (Continued)

The Dangers of a Very High Public Debt

The recent experience of some European countries with a debt ratio above 100% shows a risk of a **vicious circle**:

If governments don't start saving: slope gets more steep

Perceptions of default risk increase when the debt ratio becomes very high, leading investors to demand a higher return on holding government bonds. To increase the primary surplus, the government raises taxes. The fiscal tightening generates a recession, which reduces the rate of growth. The increase in the interest rate and the lower growth rate result in higher $r - g$, making it more difficult to stabilise the debt ratio.

It is therefore clear that countries with high debt should reduce it rapidly.

21-3 The Return From a High Debt

If the stock of public debt, as a ratio to GDP, reaches a very high level, the situation can escalate and lead to a debt crisis: for instance, the government finds it impossible to issue new debt except at extraordinary high interest rates.

Why do policy makers wait rather than immediately introducing adequate measures to adjust the budget?

- Governments often do not perceive the urgency of an adjustment. Politicians are affraid to save
- To avoid losing political consensus, and thereby opening social conflicts, governments tend to delay the fiscal correction.

21-3 The Return From a High Debt (Continued)

How to Reduce a High Debt?

There are only three ways to achieve this goal:

- Generate sufficient **primary surpluses**; to do so the government can cut spending and transfers or increase taxes. = not popular by politicians
- Resort to **monetary financing** by the central bank.
  = more interesting now = less discussions in parlement compared to the other options
- **Repudiate** the debt, in whole or in part: erase existing debt or introduce taxes on government securities.
  = defaulting of the government = also not popular: it will be harder to get loans in the future

Monetary financing works because of 3 reasons:
> if the spending increases growth higher then intrest rates we can keep funding dept (then g will be bigger and the slope of the curve might be reduced)
> for a given tax rate, if there is more income, tax revenue will increase
> the economy is stimulated > g is high > inflation will happen: i-π=r so π increases and r reduces
= One way to go out of high debt = by high inflation

21-3 The Return From a High Debt (Continued)

Towards a ‘Political’ Theory of Debt

Political theory of government debt:

Some economists argue that the choice of who should ‘pay’ for the reduction of a high debt is essentially a problem of redistribution of income and wealth between economic groups.

Two cases:

1. A stable political situation: a political party has enough power to start a fiscal adjustment.
2. An unnstable political situation: In this case, fiscal adjustment may not be politically feasible.
   => options are repudiation or monetisation

21-3 The Return From a High Debt (Continued)

Four episodes of reduction of a high public debt

1. Germany after the First World War
2. France after the First World War
3. The UK after the First World War
4. The USA after the Second World War

Homework: Inflation, unemployment, the crisis, debt

Revise chapters 10, 11, 20 and 21 in the textbook, then do Self-Assessment Part 3 on Toledo. The test should help you anticipate the type of questions you will encounter in the exam, and prepare yourself accordingly. You can take the test as many times as you wish. The topics covered are:

- Natural rate of unempl., Phillips Curve, Inflation
- The recent economic crisis
- High debt

A formula sheet is provided. Good luck!

The Covid recession

“The Great Lockdown”

Overview

- Numbers
- Shocks
- Policies

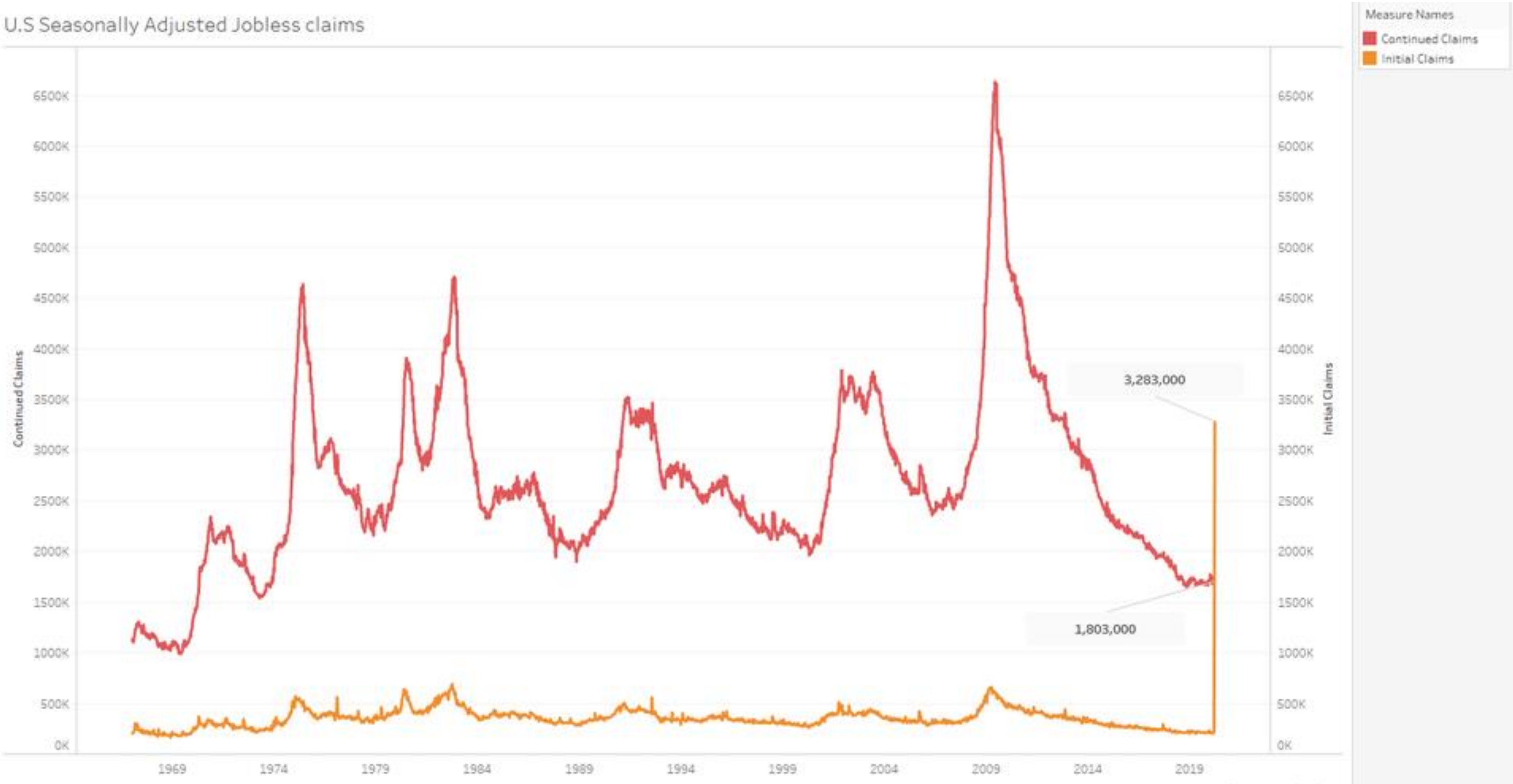
Numbers

Size of the crisis

- Perhaps the first sign in the West of just how dire the situation was:
- Initial Jobless Claims in the US
  - = inflow into unemployment ("EU" in slides labor market)
  - Available at weekly frequency
  - Countercyclical
  - Not necessarily leading the cycle, but high frequency means it is available soon

A quick glance at the scale (US labor market)

- [Dynamic version:](click)(click)



During covid recession: unseen amount of claimes compared to the decade before

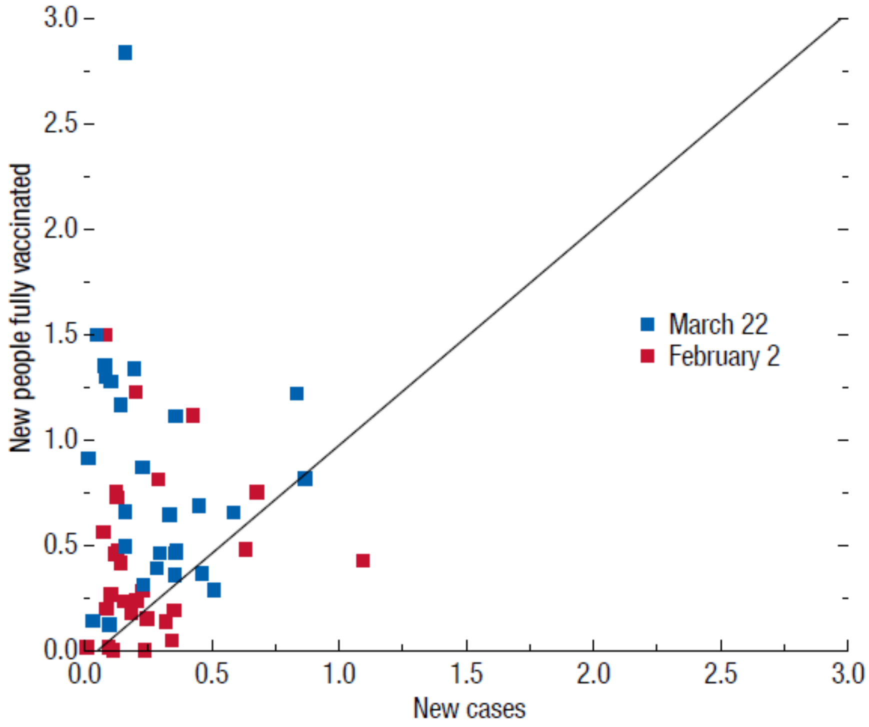
IMF WEO

- International Monetary Fund
- World Economic Outlook (WEO): gives an overvieuw of the relevant fluctuations
- Recent update on the world economy
- Appears each October & April

Figure 1.1. A Race between Virus and Vaccines

(Per thousand, seven-day moving average; latest observation: March 22, 2021)

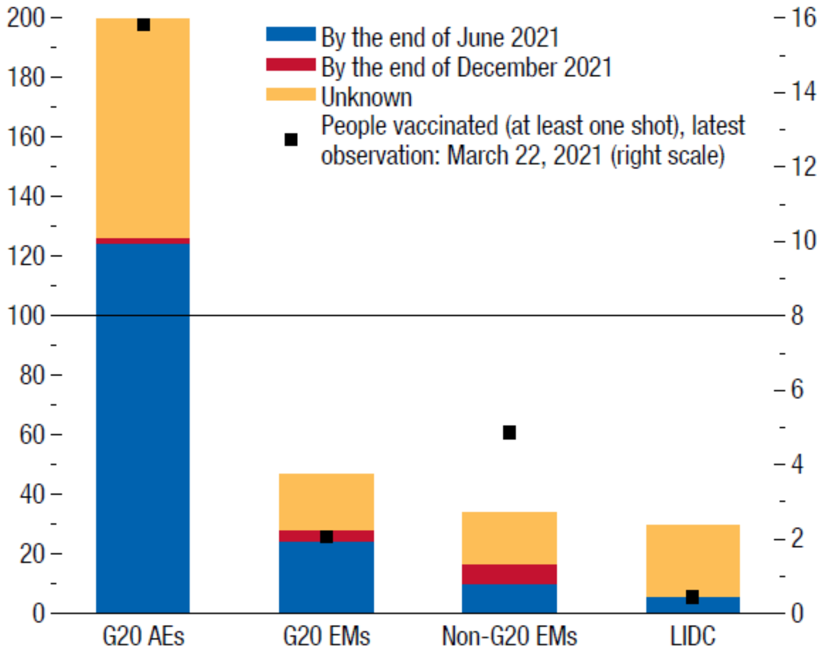
The race between the virus and vaccines has begun.



Sources: Johns Hopkins University COVID-19 statistics; and national government reports via *Our World in Data.*

Figure 1.2. Confirmed Vaccine Procurement
(Percent of population)

Procurement data suggest that most of the population in emerging market economies will not be vaccinated before 2022.



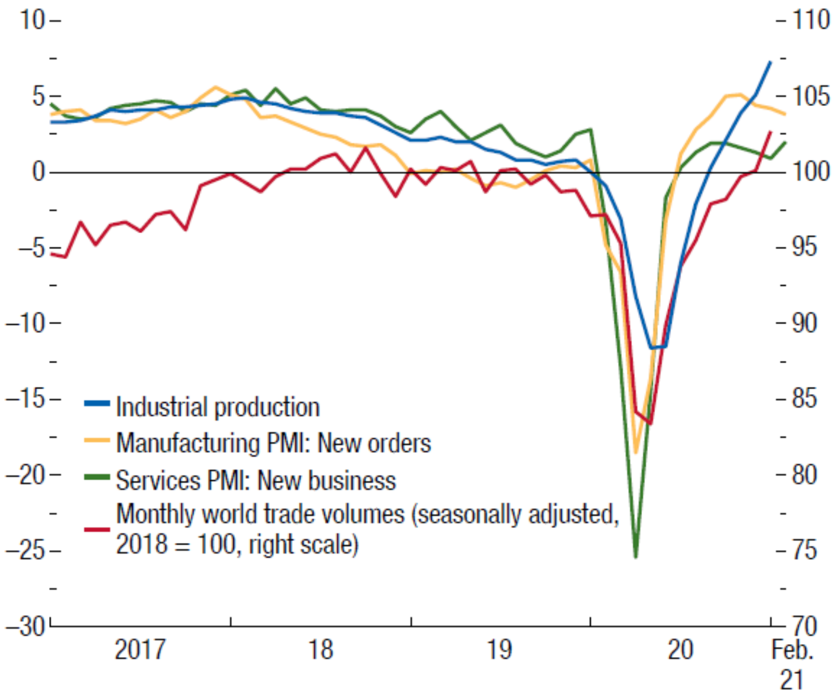
Sources: Duke Global Health Innovation Center; Johns Hopkins University COVID-19 statistics; and national government reports via *Our World in Data*.
Note: Vaccines are Gamaleya, Janssen (Johnson & Johnson), Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm, and Sinovac. AEs = advanced economies; EMs = emerging market economies; G20 = Group of Twenty; LIDCs = low-income developing countries.

Worldwide indicators
> halt since covid spread worldwide

Figure 1.3. Global Activity Indicators

(Three-month moving average, annualized percent change; deviations from 50 for PMI, unless noted otherwise)

High-frequency indicators suggest that manufacturing and trade are back to pre-pandemic levels, but there is still some way to go in the services sector.

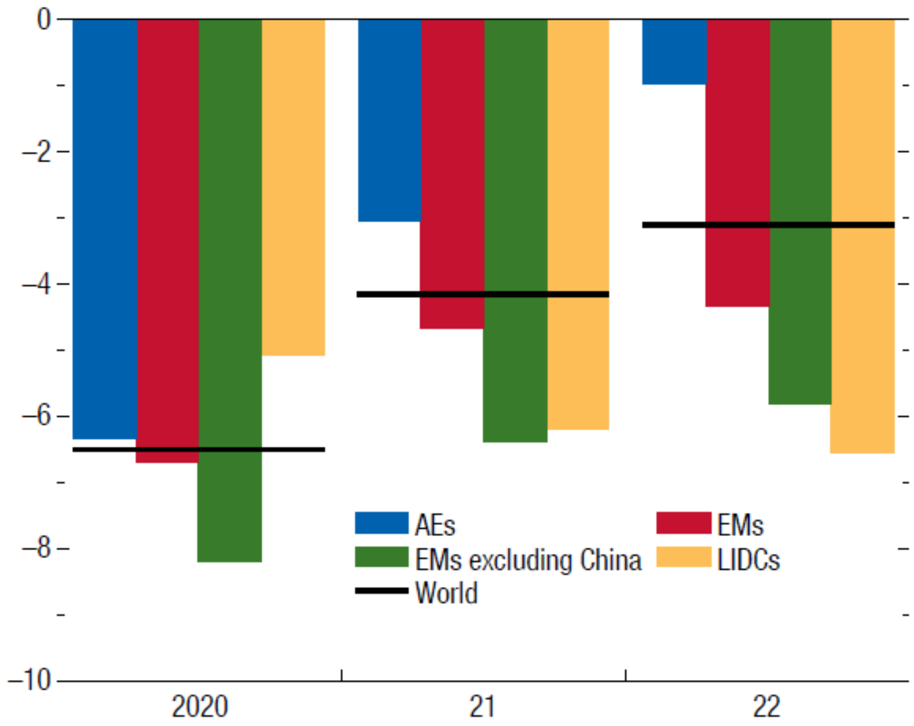


Sources: CPB Netherlands Bureau for Economic Policy Analysis; Haver Analytics; Markit Economics; and IMF staff calculations.
Note: PMI = purchasing managers' index.

> hetrogenity cross contries
> but it hit all countries

Figure 1.4. Hardest-Hit Groups

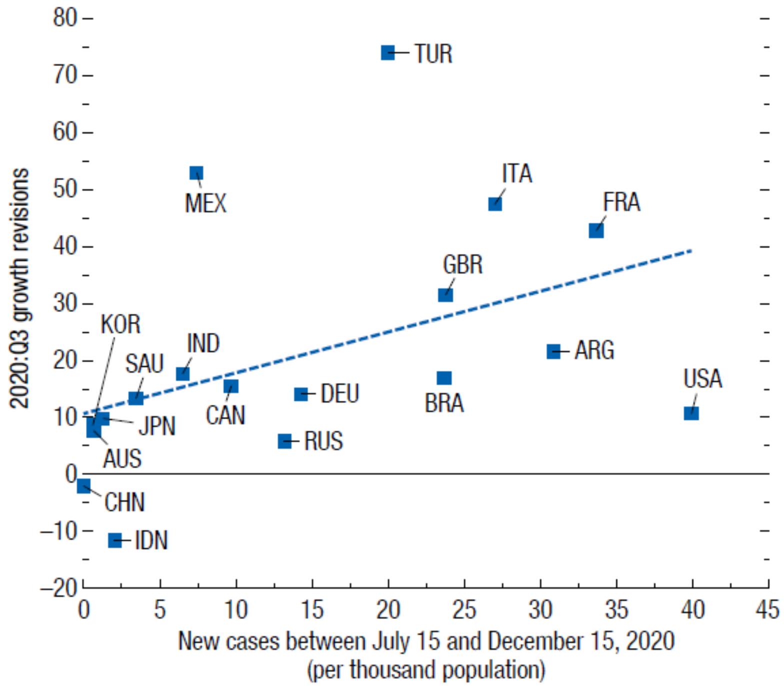
(Revisions to cumulative per capita GDP growth from 2019 between the January 2020 and April 2021 WEO forecasts, percent)



Source: IMF staff estimates.
Note: Per capita real GDP (2017 purchasing-power-parity dollars) is used in the calculations. AEs = advanced economies; EMs = emerging market economies; LIDCs = low-income developing countries; WEO = *World Economic Outlook*.

Figure 1.5. Growth Surprise and Rebound in COVID-19 Cases
(Percentage points; quarter over quarter seasonally adjusted annual rate)

Part of the positive growth surprise in 2020:Q3 resulted from reopening, leading to an infection surge and renewed lockdowns at the end of the year.

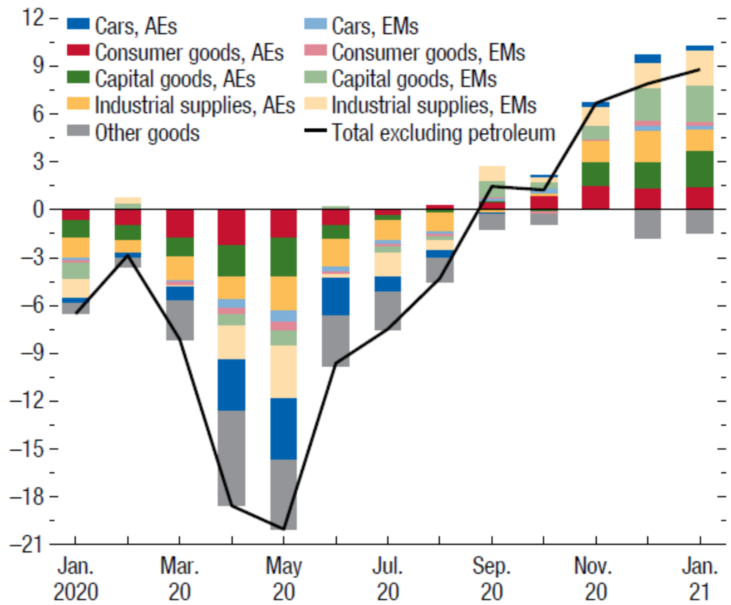


Sources: Johns Hopkins University COVID-19 statistics; and IMF staff calculations.
Note: Sample is G20 countries. Growth revisions are the difference between 2020:Q3 forecasts as of June 2020 and first estimates published by January 2021. Data labels use International Organization for Standardization (ISO) country codes. G20 = Group of Twenty.

Figure 1.6. Global Imports: Contributions, by Types of Goods and Regions

(Contribution to year-over-year percent change, percentage points; based on value in US dollars)

The sharp rebound in international trade in the second half of 2020 reflects pent-up demand for consumer durables (cars) from advanced economies and resumption of supply chains in emerging markets.

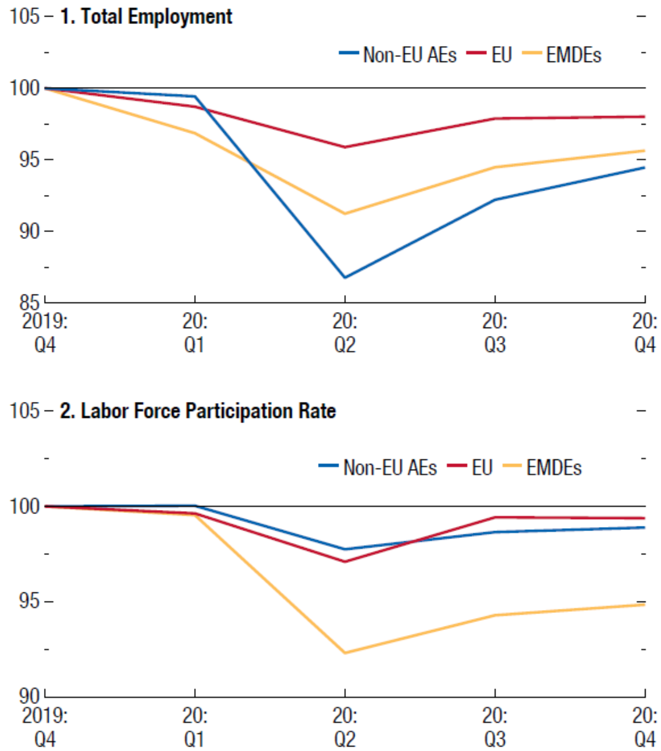


Sources: Haver Analytics; and IMF staff calculations.
Note: Advanced economies (AEs) comprise Australia, Canada, Denmark, euro area, Hong Kong SAR, Israel, Japan, Korea, New Zealand, Sweden, Taiwan Province of China, United Kingdom, and United States. Emerging market economies (EMs) comprise Argentina, Brazil, Chile, China, Colombia, Hungary, India, Malaysia, Mexico, Peru, Philippines, Poland, Russia, South Africa, Thailand, and Turkey.

> labour market fluctuations

Figure 1.7. Employment and Labor Force Participation
(Index, 2019:Q4 = 100)

There is still a long way to go to close the employment gap.



Sources: Haver Analytics; and IMF staff calculations.
Note: Based on 68 countries for panel 1 and 48 countries for panel 2 using seasonally adjusted quarterly series. Labor force participation rates are based on 15–64 years and indices are weight-averaged using the population from the latest WEO database. When 2020:Q4 data are not yet available, 2020:Q3 values are assumed. AEs = advanced economies; EMDEs = emerging market and developing economies; EU = European Union; WEO = *World Economic Outlook*.

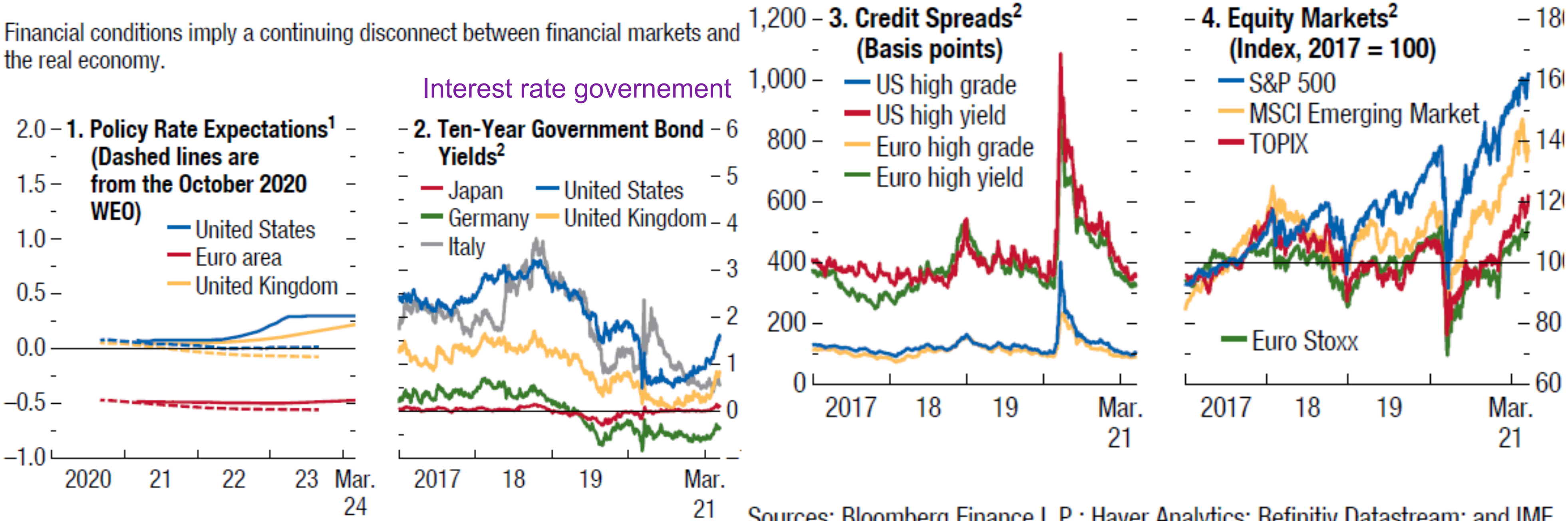
> policy measures: we started out prior to covid (we were already in a situation where we were already close to the liquidity trap)> so monotary policcy had put the intrest rate close to zero due to the recession > ther e was not much room for traditional monitary policy
> low intrest: governements were trying to keep economic activity from demand side high
> intrest rate governement ≠ intrest rate corporate

Figure 1.8. Advanced Economies: Monetary and Financial Market Conditions
(Percent, unless noted otherwise)

Intrest rate corporates

Financial conditions imply a continuing disconnect between financial markets and the real economy.

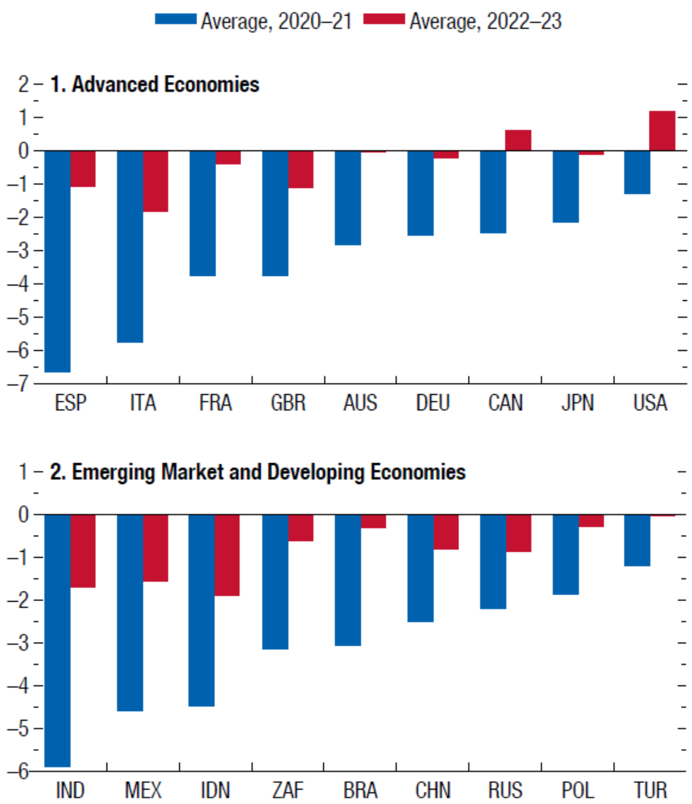
Interest rate governement



Sources: Bloomberg Finance L.P.; Haver Analytics; Refinitiv Datastream; and IMF staff calculations.
Note: MSCI = Morgan Stanley Capital International; S&P = Standard & Poor's; TOPIX = Tokyo Stock Price Index; WEO = *World Economic Outlook*.
[1]Expectations are based on federal funds rate futures for the United States, the sterling overnight interbank average rate for the United Kingdom, and the euro interbank offered forward rate for the euro area; updated March 17, 2021.
[2]Data are through March 17, 2021.

Figure 1.12. Output Gap Projections, 2020–23
(Percent of potential GDP)

Considerable slack is expected in advanced economies and emerging market and developing economies.

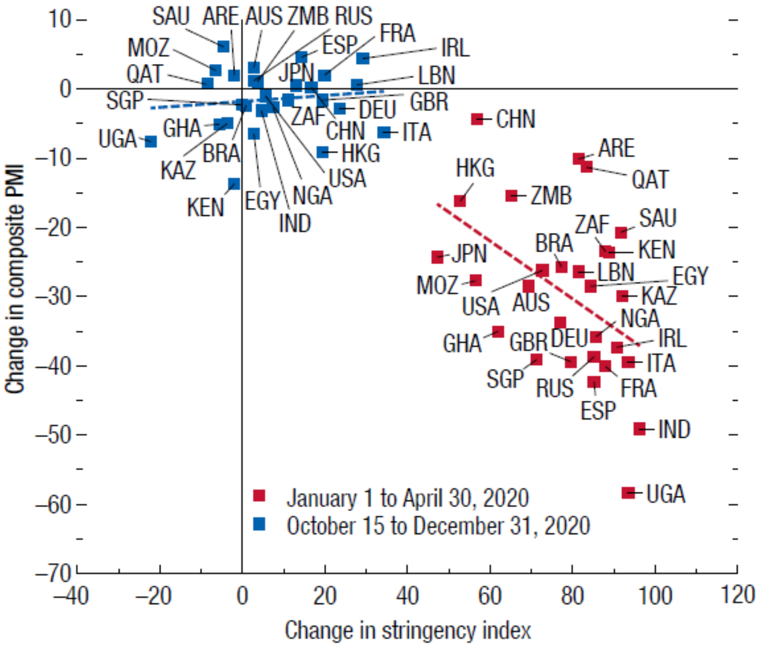


Source: IMF staff estimates.
Note: Data labels use International Organization for Standardization (ISO) country codes.

Figure 1.13. Effect of Lockdowns on Activity: Beginning versus End, 2020

(Index)

Economic activity became less sensitive to mobility curbs toward the end of the year.



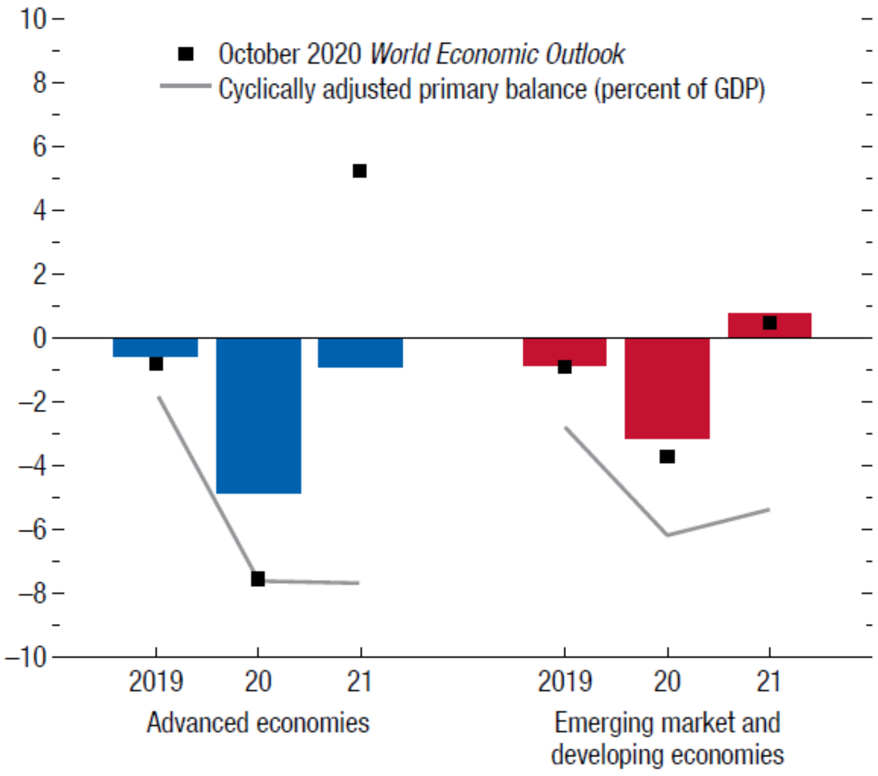
Sources: Markit PMI database; and Oxford COVID-19 Government Response Tracker.
Note: Samples comprise 28 countries where composite PMI values are available. Positive change in stringency index (0–100) denotes stronger measures; positive change in composite PMI denotes *relative* expansion. PMI = purchasing managers' index. Data labels use International Organization for Standardization (ISO) country codes.

Fiscal policy: due to great recession > hughe interventions: lots of governement spending > same for the governement lockdown

Figure 1.14. Fiscal Stance, 2019–21

(Change in structural primary fiscal balance, percent of potential GDP)

The fiscal stance is expected to remain accommodative in advanced economies in 2021.



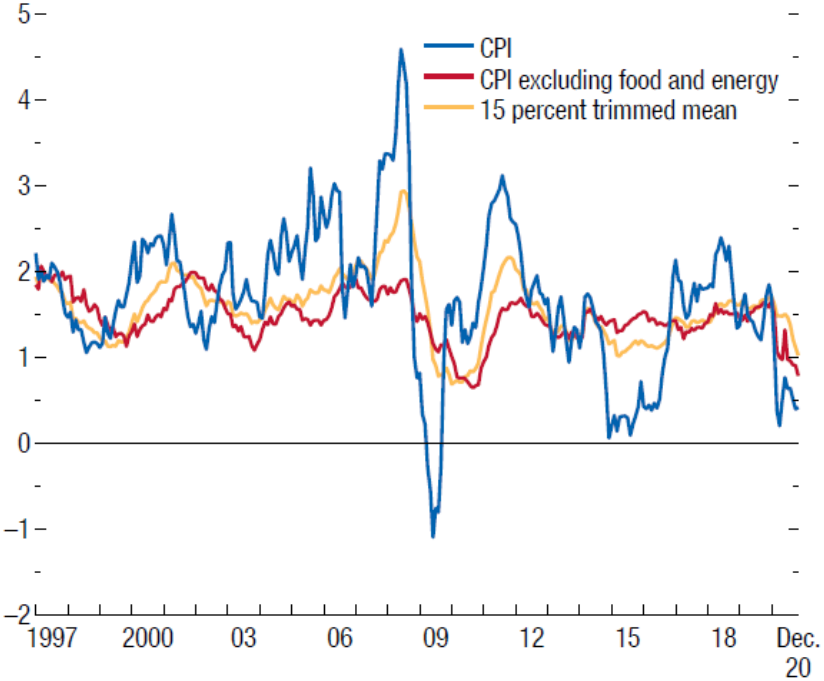
Source: IMF staff estimates.

Figure 1.18. Trend Inflation in Advanced Economies

(Percent)

Trimmed-mean inflation points to declining inflation pressure in advanced economies, in line with various measures of slack.

Inflation



Sources: Cleveland Federal Reserve; Haver Analytics; and IMF staff calculations.
Note: CPI = consumer price index.

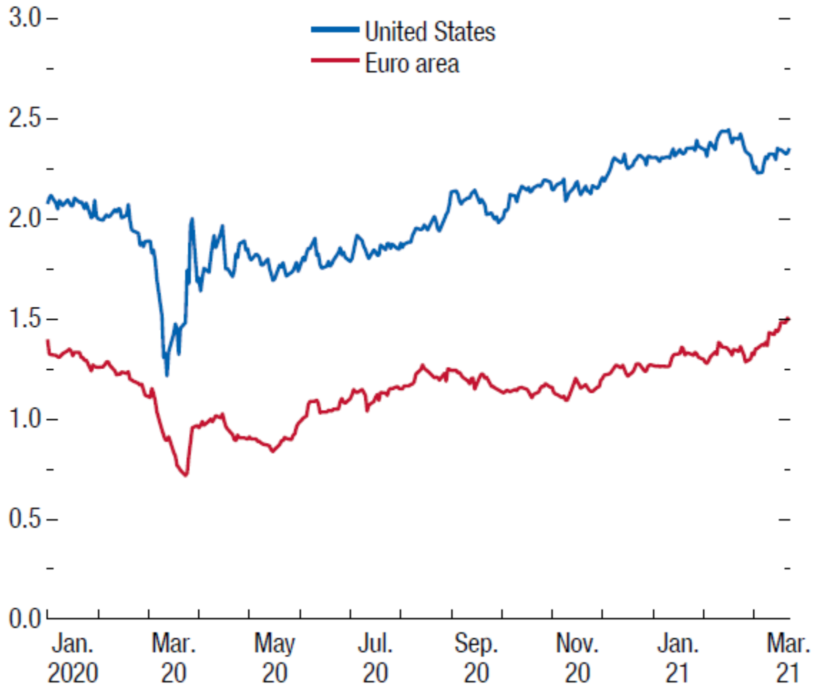
Not dat much is happening

Figure 1.19. Five-Year, Five-Year Inflation Swaps

(Percent; market-implied average inflation rate expected over the five-year period starting five years from date shown)

Market-based measures of long-term inflation expectations have been stable; they have increased slightly in the United States since May, but remain in line with the recently reformulated inflation objective of the Federal Reserve.

measures for expected inflation



Sources: Bloomberg Finance L.P.; and IMF staff calculations.
Note: Latest data available are for March 17, 2021.

Shocks

Supply vs. demand?

- The initial shock is clean supply
  - Supply chain disruption from China Supply chains all over the world were affected
  - Lockdowns
    - Retail closed/restricted > you can't buy products > no economic activity > production holds
    - Labor (input) stuck at home
    - Borders closed/travel restricted
    - (some measures imposed, others voluntary)
  - With global supply chains and a long lasting virus worldwide these effects will linger for a while
- But a lot of the endogenous response is demand
  We postpone consumption
  - Changes in income and saving, confidence & uncertainty, pent-up demand (and the impossibility to consume), …

Given these shocks …

- AS-AD model would suggest:
  - Both AS and AD shift to the left

=>

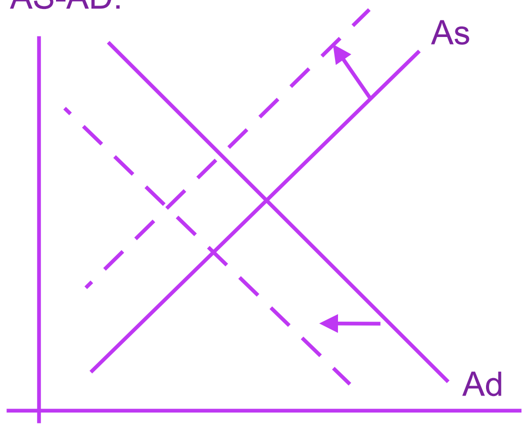
- Strong reduction in output

But we also know that there are going to be

- Countervailing effects on prices

- Consistent with what we observe in the data

AS-AD:



Stippelijn = new equilibrium

Given these shocks …

- Supply expected to eventually restore as economy reopens in full

  Recession is expected to last because there is no vaccine, once there is a vacine (is the only policy we can have, but this is no economic policy) > only after this production is going to pick up

  > US: governement intervention to hasten the creation of the vaccine
- Demand

  Uncertainty > leads to postponing consumption, but once the faccine is there we will consume again
  - Pent-up demand for some sectors
    - Postpone durables (cars, furniture, …) purchases until better or less uncertain times, might overshoot normal levels for a while
  - Not much hope for services

    For serviceses: the pent up demand is absent
    - Non-durables (tourism, restaurants/bars, haircuts, …): not much of a catchup expected, just return to normal level

      The lost consumption will not made up for

Policies

Overarching principles:

These principles were unseen of in the previous recessions

1) Trade-off health vs. econ?
2) Any policy beats no policy

Economic policies

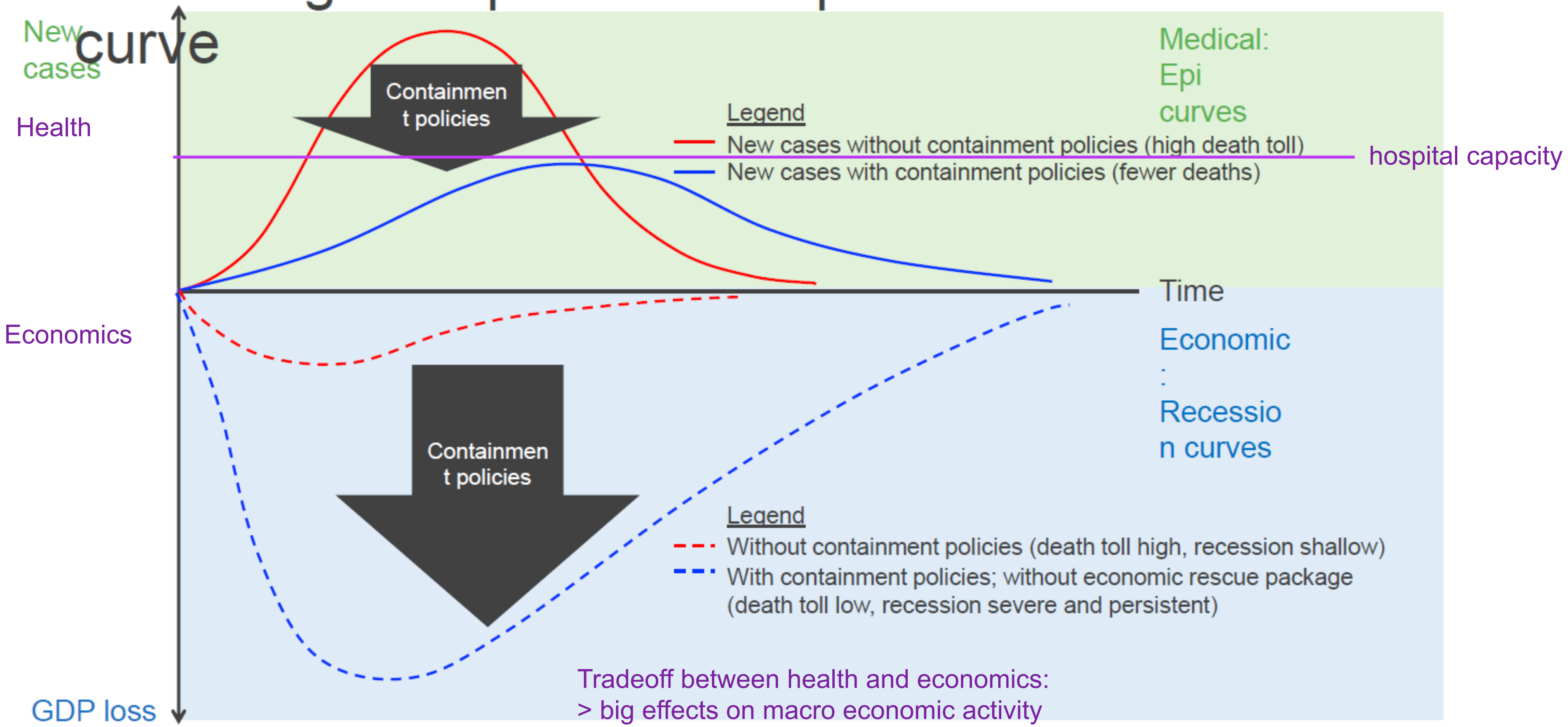
What intervention?

> we need to intervene however we can

> imperfectoins are possible, but waiting is not an option

Tradeoff between health and economics
> t=0: beginning of covid = increase in new infection cases (upwards sloping infection curve)
> as people get sick: loss in GDP
> so no intervention is no option: we do not want people getting infected an dying + we have little hospital capacity = governements didn't want to have a fast peak in infections because the health system can't cope with it > so rather than a big spike they tried to keep the infections below capacity (this was done by lockdowns)

Flattening the epi-curve deepens the recession curve



Source: CORE Covid lecture

Tradeoff between health and economics:
> big effects on macro economic activity
> intervening on health will cause higher GDP losses
= the tradeoff
> governements realised that the red GDP line isn't the best case of what is going to happen: if we don't intervene in economic activity, that red line is going to keep apprearing, so red line is underestimate of how economic activity would fluctuate
> blue line: deeper but hopfully shorter recession than the red line (because red line was wrong). So trade off wasn't really there > every economist agreed on intervention

Trade-off between economy and health?

- Obviously, keeping the health situation in check has (strong) economic consequences
  - Red vs. blue
- Is sometimes construed as if there is a conflict or trade-off between health and economic concerns
  - If we stop the economy / fight pandemic => people suffer through lack of income
  - If we don’t halt the economy / don’t fight pandemic => people suffer through the virus
- Is not true:
  - Economists across the spectrum agree: Intervene! Fix health first!
  - Reason (not well depicted in previous figure):
    - Containment will lead to a deep recession, but as health is fixed first, it will be short-lasting.
    - Not addressing the health crisis might hurt the economy a bit less in the short run (as e.g. people still go into work), but will lead to a long protracted recession
- Is different in typical recession: strong divide between:
  - interventionist/left/democrat/Labour/… and
  - laissez-faire/right/republican/Tory/…

Given that we intervene: which policys?
> economist agreed: whatever way out - we need to fix the situation - we can’t do nothing (otherwise covid will keeping popping up > lot of uncertainty > bad for economics > we need to be it fixed)

Which policy?

- There is much to be said about every individual economic policy, but the overarching principles are:
- 1) The absolute best policy for the economy is to fix the health crisis
- 2) Governments, act, and fast to insulate against the economic consequences
  - Reading material: Reis (the Guardian)

> Economy as a whole = a set of relations, we do not want to severe all these relaitons (we do not want everybody loose there job> they would have to look for new jobs = would be to costly)
> we tried to shield the relationships
> the more firms go bankrupt: the more firms will need to look for new suppliers (we want to prevent that)

Policies

- Broad ideas behind many policies:

Economic relations take time & costs to set up, changing them is costly

- Shock hitting us is a natural disaster, void of economic rationale
- Try to shield economic relations as much as possible:

=> maintain firm-worker relation (e.g. furlough)

=> prevent firms from going bankrupt (e.g. courts won't let firms)

=> prevent households from defaulting/foreclosing (e.g. moratoria)

Great recession in the housing market > g

+

- Reduce the macroeconomic impact by supporting income (e.g. increase/lengthen unemployment benefits)

Recall labor market policies US vs. EU

- Furlough schemes, unemployment benefits, EPL, …
- => loss of income, jobs, …
- => not just about individual worker security, also feeds back to macroeconomy
- Reading material: Saez and Zucman NYT article

Rescuing firms?

- A general principle: Rescue fundamentally sound firms, don't save bad ones

- Stems from research on financial institutions:
  - The financial sector as a whole performs a desirable function in an economy:
    - Maturity transformation, savings allocation
    - Generally supported by the literature on growth and finance
    - (in technical terms: the financial sector overcomes certain frictions. Without government intervention, the sector could not exist, and the frictions would reduce welfare)
  - Implied policy:
    - Sound (financial) firms are efficient & necessary => if they fail for non-fundamental reasons (coordination failures) they are worth rescuing
    - Save illiquid (financial) firms only if they drag down the system as a whole

- Not clear this principle applies for firms in general:
  - 1) not clear non-bank firms/sectors overcome frictions that generally require government intervention
  - 2) not clear letting bad firms go will drag down the sector as a whole

Yes: maintaining these ties, but less relevant for the overarching arguments: having htem go bust will save the econmy as a whole

Rescuing firms?

Should the government rescue firms?

- Pro:
  - Don't want fundamentally sound firms (i.e. absent Covid) to go bust
  - They face a liquidity problem (not a solvency problem), which the government can help with
- Con:
  - The strong view: Covid is a shock like others. Can't cope? Tough luck.
  - Schumpeter's creative destruction implies bad firms going bust is efficient
  - Less strong: government cannot distinguish between good and bad firms => Intervening implies keeping zombie firms alive

Most of these policies were unconditional

- Yes we want policies to be unconditional: don't discriminate between firms > this creates riskyer behaviour down the road > more frequent crisis

Rescuing how?

- Different policies tried in different countries, e.g.:
  - Furlough schemes
  - Credit moratorium
  - …
- Policies are often rather unconditional, i.e. for all firms
  - Rationale: "Crisis is not a time to dwell on fringe disadvantages of policy", e.g.
    - Reis on Corona
    - Caballero on moral hazard during GFC
  - Counterargument:
    - GFC & Too Big To Fail (ample moral hazard pre-crisis)
- Bailouts?
  - E.g. automotive sector in US during GFC
  - See Cochrane

    Airlines

- From John Cochrane's blog:
- **Bailouts v Bankruptcy**
- Bailouts are back. It's all 2008 all over again.

is rescuing stockholders

Bankruptcy of a large corporation does not leave a crater behind. Bankruptcy is reorganization and protection, not liquidation. The point of bankruptcy is precisely to keep the business going. When a corporation files for bankruptcy, the stockholders are wiped out, bondholders lose a lot and become the new stockholders. The company rewrites a lot of contracts -- union contracts requiring a plane to fly even with empty seats, contracts to buy fuel at high prices, gate leases, and so forth.

Bailouts are bailouts to stockholders, bondholders, creditors, unions. The first three all basically signed up to write insurance, and got a fee for doing so. Bailouts are not bailouts to "the corporation" which isn't a thing. Maybe maybe there was a case in 2008 that big banks were "systemic" and their creditors could not take the losses that they had signed up to take. Not so industrial companies.

Airlines and similar companies are in this mess because they took on way too much debt. If the government does bail out their stockholders and creditors, it makes a lot of sense not to let them take on so much debt again. Repurchases per se are not the villain, as companies can borrow and pay big dividends. We might also start by finally, finally, removing the huge *subsidies* to debt.

Inflation/deflation

- Forces suggesting inflation
  - Supply shortages
    - Supply chain disruptions
    - Run on masks, vaccines
  - Imagined shortages
    - Toilet paper, certain types of food, …
  - Common in many economic theories: e.g. bank runs can occur due to
    - Fundamental reasons, or
    - Panic (self-fulfilling)
- Forces suggesting disinflation or deflation
  - Drop in demand

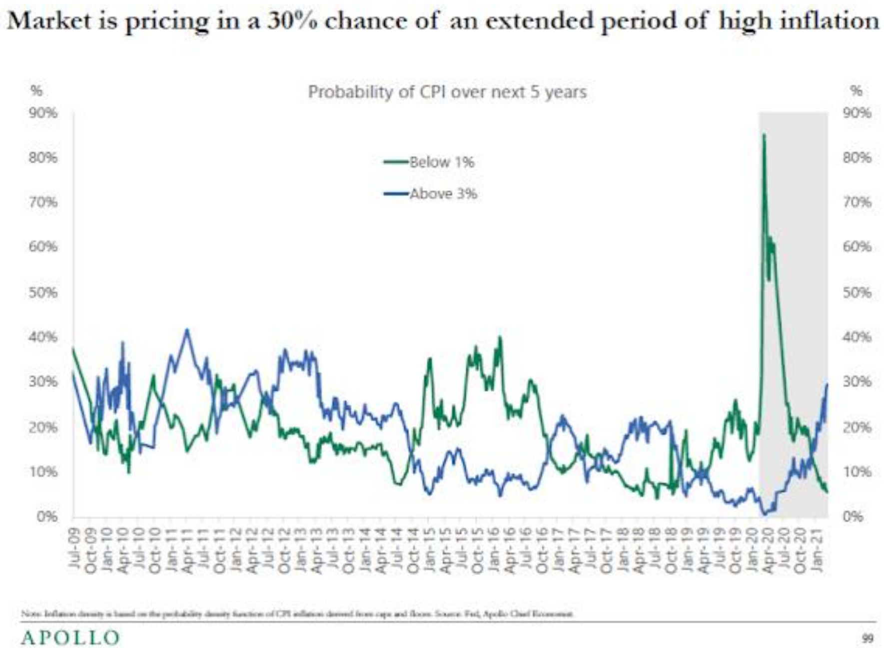
We have inflation expectations + uncertainty of inflation expectations

- Post pandemic inflation?
  - See debate on US Biden 1.9 trillion dollar bill
  - Fiscal theory of the price level

Governement increasing G to much > AD curve will shift to the left > prices will increase

https://johnhcochrane.blogspot.com/
INFLATION OPTIONS

From Torsten Slok at Apollo. Torsten explains
Current pricing for caps and floors shows that the market sees a 30% probability that inflation will be above 3% for the next five years, and a 5% probability that inflation will be below 1%, see chart below. A similar worry about high inflation can be seen in 5-year breakevens, currently trading at 2.5%, the highest level since 2008.
A perpetual inflation worrier, I habitually confront the fact that bond prices don't signal inflation. I am forced to point out that they never do -- interest rates did not forecast the inflations of the 1970s, nor the disinflation of the 1980s. And I say inflation is unforecastable, a risk like a California Earthquake.
But for once there does seem some inflation risk in asset prices.
These are option prices. The main forecast remains subdued inflation. But these option prices are pointing to a larger chance that inflation does break out. More risk, not so much a sure thing. Also, it's not really screaming -- after all, we're about at the prices of July 2018.
In Torsten's view, despite these prices,
Five years of CPI inflation above 2.5% or 3% is in my view extremely unlikely.



Even before inflation went up we have som measures from inflation expectations
> blue line = the probability that financial markets attatch to the situation that inflation would be higher

As time passes …: inflation in 2021

- Inflation starts showing up in the data
- Early 2021: would expect high inflation numbers due to deep recession one year prior (and low prices then)
- … and initial claims of the Fed & co: “inflation is temporary”

- But goes farther: Late 2021
- Inflation is stronger/longer than expected
- Virus lasts longer than anticipated, despite vaccines
- Supply chain problems persist
- Demand is picking up
- Becomes self-fulfilling (Pe => W => P)

Longer horizon changes? Silver linings?

Long term effects of the recession

- Government debt
- Possible efficiency gains/losses
- De-globalization
  - An economic process that seemed to have started already prior to Covid
  - But now receives a "national security" angle (think of mask and vaccine production/purchases)

Having your whole production line dependent on china isn't deriable any more

- Changes in longer horizon worldview:
  - increased "belief" in science?
  - fall of demagogues?
  - changes in international cooperation (vaccine development promise and distribution debacle (EU vs. UK, OECD vs. others))
  - …

Efficiency gains/losses

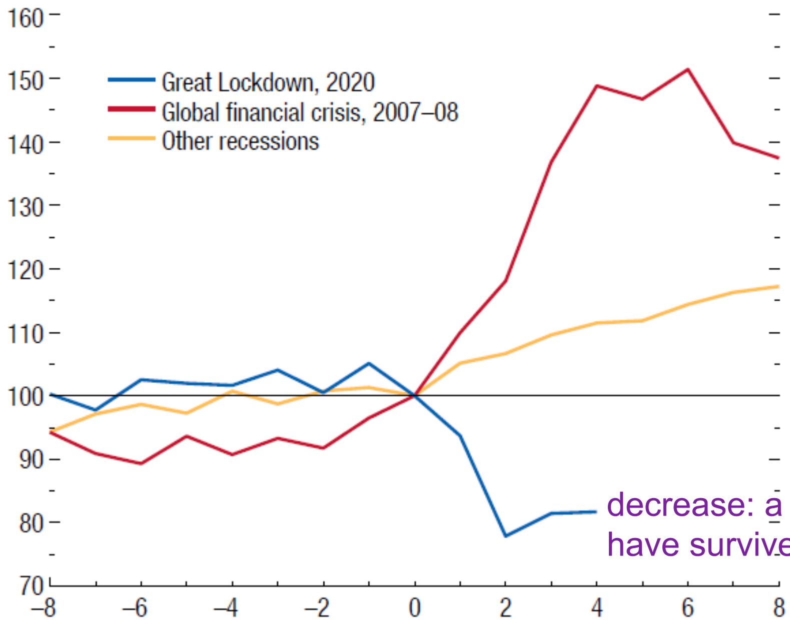
- Possible efficiency gains
  - Boost to teleworking Some innovation in terms of working from home
  - Some industries/jobs discover online
    - And technological innovations follow suit (Zoom, Teams, …)
  - Reduction in business travel
    - Efficient & environmental
- Possible efficiency losses
  - Zombie firms
    - Schumpeter's cleansing effect of recession
    - Doesn't take place with lots of government interventions halting business failure
    - Bad news for future productivity
      - Bad firms occupy input factors that could be allocated better otherwise
      - Wages/credit/… more expensive than they would otherwise be
      - Prevents cheap entry for new and more productive firms
  - Idle labor Labor stuck at home for a wile
    - Human capital deterioration? Similar to hysteresis effects of unemployment
      Short term unemployement is not a problem , turnover in labor market is good. But the more and the longer we stay at home will contribute to deteriation of human capital = hurting the quality of the labour pool

Figure 1.21. Bankruptcies, Current and Past Recessions

(Index, last prerecession quarter = 100; recession quarters on x-axis)

Unlike during previous crises, bankruptcies declined with respect to pre–COVID-19 levels.

How bankrupcies evolve during the recesion



increase of up to 50%

Yellow: if there is a typical recession, by how much will bankrupcy increase?

decrease: a lot of firms which shoudn't have survived, have surived

Sources: CEIC Data Company Limited; national authorities; and IMF staff calculations.
Note: Data are from 13 countries with varying coverage during 1990:Q1–2020:Q3. Lines are averages across recession types, with quarter 0 the last prerecession quarter. For the Great Lockdown, quarter 0 is 2019:Q4 for all countries. For the global financial crisis, quarter 0 is the country specific date of peak real GDP during 2007–08. Other recessions are country specific and identified by two consecutive quarters of negative growth during 1990–2006 and 2009–19.

Ways to see some of these effects in our models

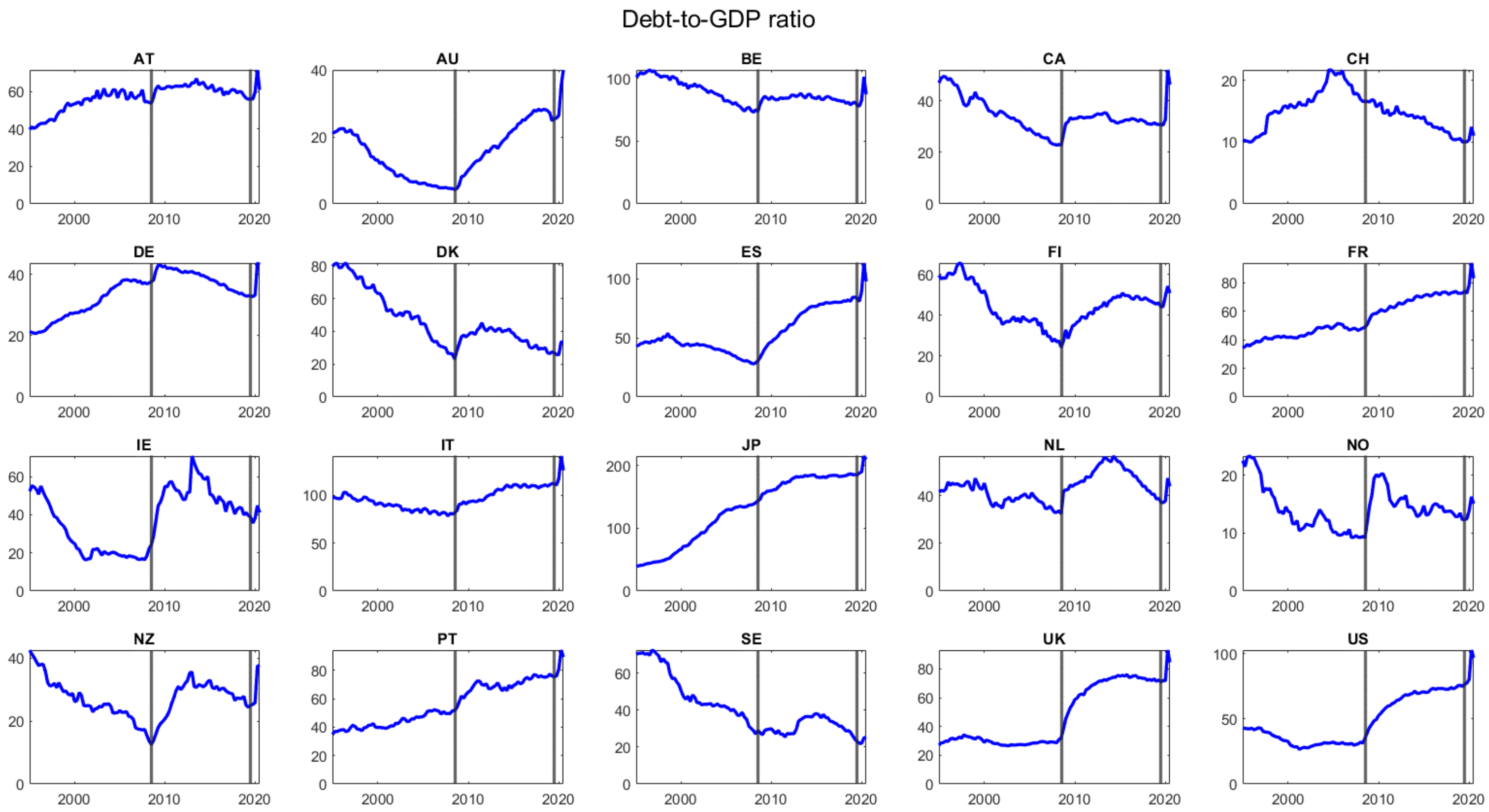
- Heightened uncertainty = bad for consumption and investment
  - Consumers' (precautionary) savings go up: autonomous C
  - Firms' investment is postponed (wait-and-see) : autonomous I
- Financial market:
  - Zombie firms => Higher external finance premium higher intrest rates are going to depress economic activity not in the bad firms but in all firms

    > less investment down the road
- World economy in dire straits
  - Low foreign income Y*
- Labor market:
  - Quality of the labor force drops: z
- Long term growth:
  - Changes in efficiency: technology (growth)

Government debt

- Numbers

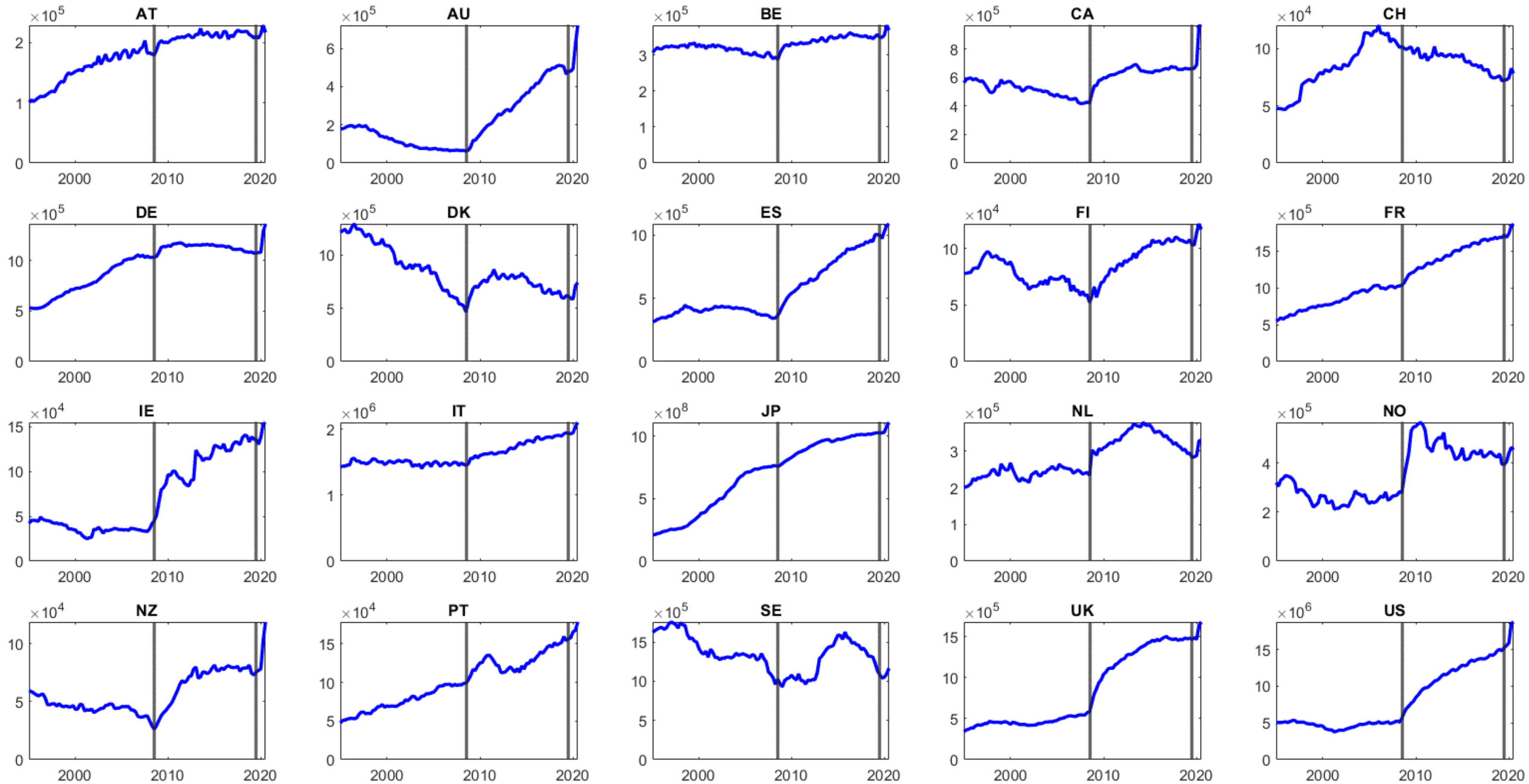
Governement dept is dire > 2 points in time:
1. First vertical line = great financial crisis= increase in dept levels is a first concern. That increase actualy looks small relative do what we are going to now
2. Second line = pandemic



Cental banks try to get rid of inflation
What is less clear: how are we going to get rid of this massive increase of governement dept?

Note: Central Government debt.

Real debt (Millions of local currency)



Note: Central Government debt. In 2010 units of local currency.

Government debt

- Debt was already at historically high levels due to the GFC
- Covid recession hits
- Low T, high G
  - Both as an intentional policy response to the crisis
  - But also through automatic stabilizers

Sustainability of government debt?

- The relevant metric is the debt-to-GDP ratio
  - Since Y is the tax base from which debt needs to be repaid
  - Debt grows at rate r (=i-π), Y at rate g
- Recall the government budget constraint

$$\frac{B_t}{Y_t} = (1 + r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

- Ways to repay debt? We can't increase G indefinetly, we have to get it down

  What are the options?
  - Future surpluses T-G The governement can start saving: not very succesfull (not many countries did this so far)
  - G-T => Y (short term growth) Spend more so we have gains in economic activity (Y): so far this resulted only in giving more money to the rich who don't spend that much. Results in short term economic growth

    UK: firms didn't believe UK could decrease G > didn't buy governement plicy > increase in intrest rate
  - G-T => g (long term growth) Better: the stronger we grow, in the long term: the less problematic this dept evolution is going to be over time

    - we can observe economic growth over time, but we do not know what g will b over time = lot of uncertainty
  - r-g g has been low for the past decades, it is not clear that r would be smaller then g for the next decades to come
  - Inflation Reducing what the governement needs to pay by making money worth less
  - Default Governements don't pay their debts

Long term growth comes from improvements in tech > if we wat more of this, one good way to spend is to invest in new ideas, new tech

G-T => …

- Which G or T?
  - Wanted: deficits that pay for themselves. I.o.w.: while B increases, spend wisely to keep B/Y low by increasing Y endogenously
    - G↑ or T↓ has some short term merit: Y=C+I+G (mitigating the fall in Y)
    - But medium/long term growth important to get B/Y to fall: boosting I will increase capital stock and technology, leading to a persistent increase in Y
  - Focus on productive investment
    - Why?
      - Low productivity (already long before the crisis)
      - Wish to spur productivity (rather than e.g. pure consumption) in hope of boosting Y for longer (g)
      - Endogenous growth?
        - Basic principle: "technology" is not exogenous. It is a result of investment in R&D. So if you have the choice between:
          - spending in G => Y, a fraction of that will get saved and invested (and partly in R&D)
          - Spending in R&D directly
        - The latter will be more effective at spurring technological progress, which induces long term growth g
  - Temporary vs. permanent
    - Permanent increases in spending not wise (e.g. some proposals for raising pensions)
    - though liked by politicians (popular + costs borne by future legislations/generations)
    - unless they induce better permanent growth prospects

Sustainability of government debt?

- Ways to repay debt:
- Future T-G surpluses
  - Perhaps, but requires political support
- No worries:
  - r < g
    - Secular stagnation (both r and g are low)
    - If r < g then debt repays itself
- Worries:
  - Not clear r low is here to stay
  - Not clear g will remain (relatively) high
- Inflation
  - Always a possibility
    - More so if ample QE? In the long run, m => p
    - Supply chain disruptions (longer lasting than expected)
    - Market power (keeps rising)
    - Central bank credibility (still high?)
- Default/restructuring
  - Historically not common in Western economies (but is elsewhere)