Macroeconomics – Political Science Forlì

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 Website of the course: http://macroeconomics-forli.weebly.com/

Password: macroSID2019

Exercise Lesson:	Mid-term exams:
5 March	19 March
12 March	11 April
9 April	16 May
30 April	
14 May	
28 May	

Macroeconomics
Exercise 6
## (Ch.s 14, 15, 16 and 17)

- Aggregate Supply and the short-run trade-off between Inflation and Unemployment (Ch. 14)

- Stabilization Policy (Ch. 15)

- Government Debt (Ch. 16)

- Common Currency Areas and the European Economic and Monetary Union (Ch. 17)

Ch. 14: Aggregate Supply

Key- concepts

- Aggregate supply in the short run (see Ch. 10)

- Phillips curve (the original curve and its re-formulation)

- Short-run trade-off between Inflation and Unemployment

- Adaptive expectations vs. rational expectations

- Disinflation

SRAS: Exercise 4 – Exercise 7 (b)
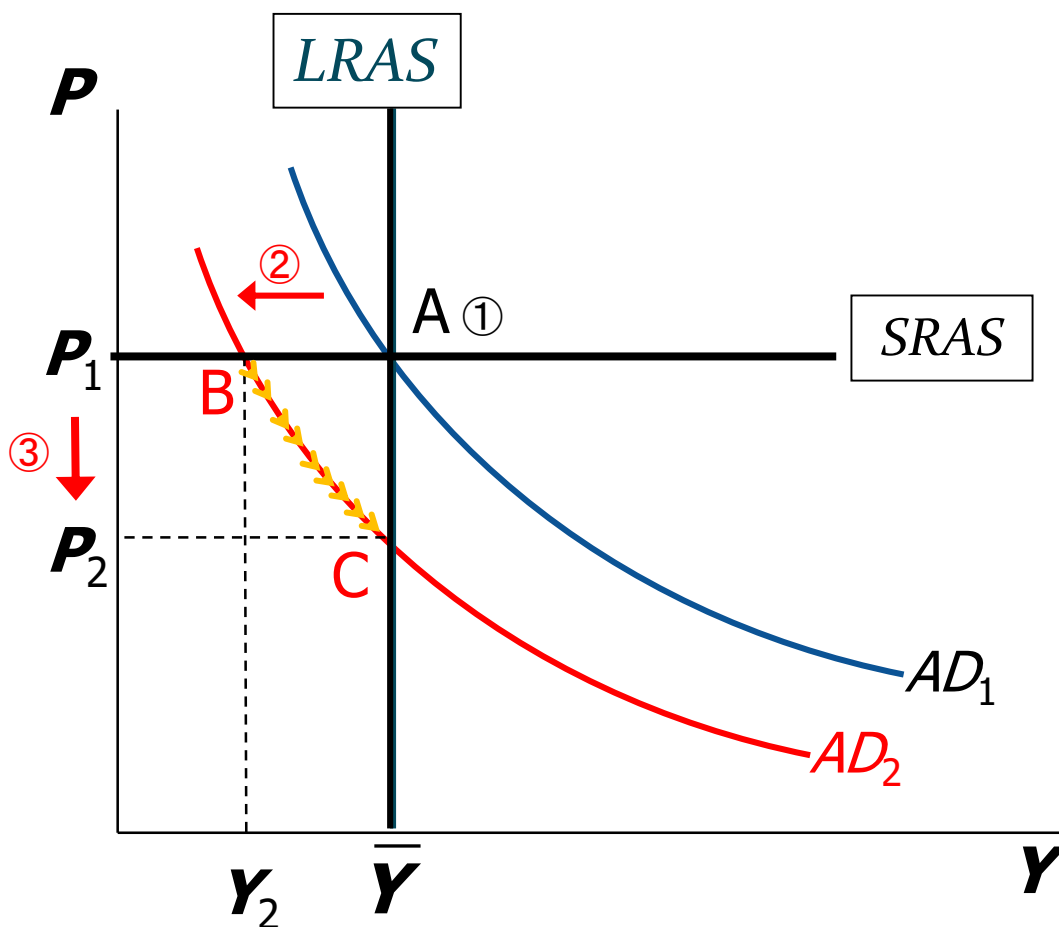
The original equilibrium point is A; if consumer confidence declines, aggregate demand will fall (the AD curve shifts towards left).

In the **SHORT-RUN**: as prices are sticky, the equilibrium moves to point B, with a new level of production (and income), namely Y_2, which is lower than the level of full employment.

In the **LONG-RUN**: the economy tends to go back to the level of production of full employment, by meand of a reduction in prices (the new equilibrium is point C).

SRAS: Exercise 4 – Exercise 8 (b)
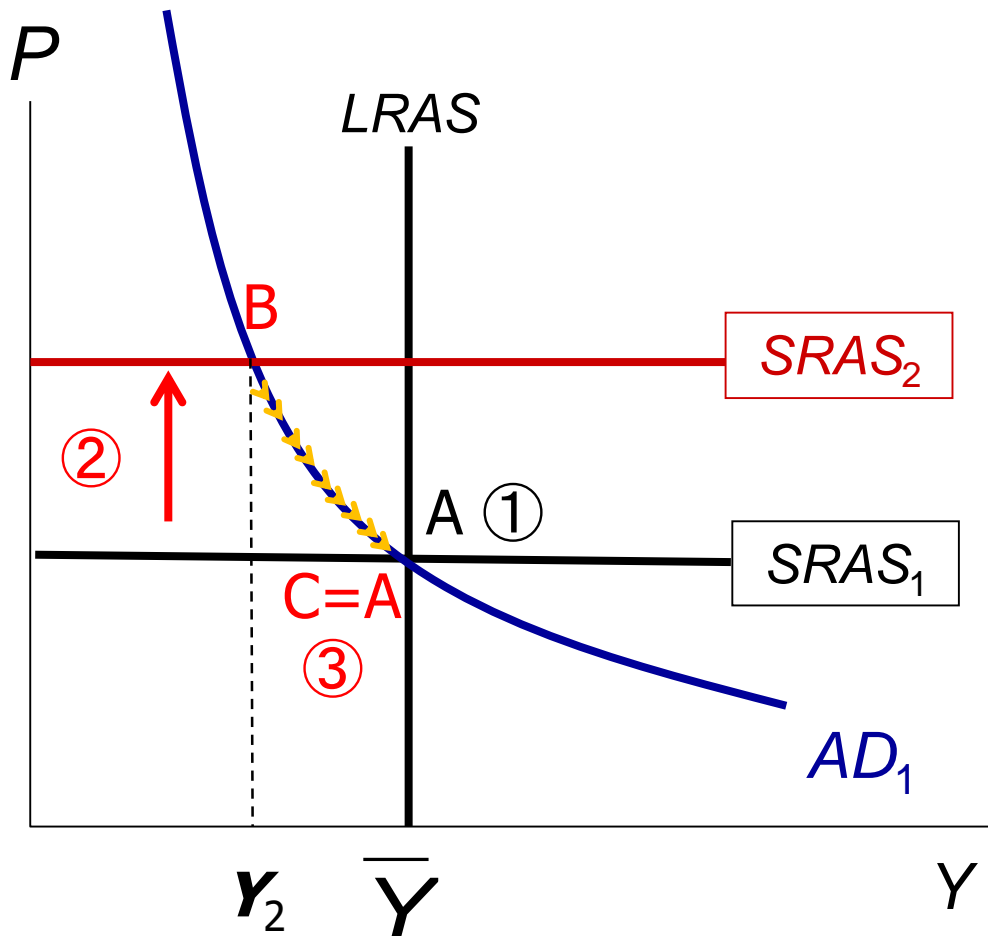
The original equilibium is represented by point A; the crop destruction (temporary, negative supply shock) gives rise to an excess demand and prices therefore increase. The SRAS shifts upwards and the new short-run equilibrium moves to B (the economy enters a recession).

In the long-run, agricultural production is restored and, gradually, both prices and production come back to their original equilibrium levels (indeed, C=A)

The new SRAS: the Phillips curve

In the baseline AS-AD model, the **SRAS** is typically represented **as a prefectly horizontal line**, which implies the assumption of no relationship between prices and production in the short-run

Actually, the **reality is much more complicated**!

In his study on the UK labor market, in 1958 the economist A.W. Phillips figured out the existence (in the short-run) of an inverse relationship between wages and employment levels, which can be simplified as follows:

$$\Delta w = a - b\,u,$$

where Δw is the percentage variation in nominal wages, while $u = U/L$ is the current unemployment rate.

The new SRAS: the Phillips curve

- Given: $\Delta w = a - b\,u$, if we assume that:

  - $\Delta w = \Delta P$ (notice that $\Delta P = \pi$, i.e. the inflation rate);
  - $a = b\,u^*$ (where u^* is the natural rate of unemployment);

  then we get:

  $$\Delta w = b\,(u^* - u)$$

The gap between u^* and u can be related to the gap beween the actual and the full employment level of production, i.e. $b\,(u^* - u) = \beta\,(Y - Y^*)$

Hence, the relationship can be re-expressed in macroeconomic terms, establishing a relationship betwenn the general level of prices and the level of production

$$\Delta P = \beta\,(Y - Y^*) \implies Y - Y^* = b/\beta\,(u^* - u) \quad \text{(obtained by imposing } \Delta P = \Delta w)$$

The Phillips curve: two formulations

- **New-keynesian re-formulation**: the traditional formulation, given by $\Delta P = \beta\,(Y - Y^*)$, gives origin to a new one: $\Delta P = \Delta P^e + \beta\,(Y - Y^*) + v$

  The latter can be re-expressed as: $\pi = \pi^e + \beta\,(Y - Y^*) + v$

  Expected inflation
  THIS EXPLAINS PERSISTENT INFLATION

  Production gap
  (demand shock)

  Supply shock

- **New-classical re-formulation**: re-arranging the above equation, one gets: $Y = Y^* + (1/\beta)\,(\pi - \pi^e) - (1/\beta)\,v$, which implies a new theory of AS...

  $$Y = Y^* + \alpha\,(\pi - \pi^e) - z \quad \textit{where } \alpha = 1/\beta \textit{ and } z = (1/\beta)v$$

  Under rational expectations, $\pi = \pi^e$, thus monetary policy is ineffective unless it is unexpected!

Interpretations

|	NEW-CLASSIC	NEW-KEYNESIAN
Equations	$Y = Y^* + \alpha\,(\pi - \pi^e) - z$	$\pi = \pi^a + \beta\,(Y - Y^*) + v$
Underlying assumption	Initial situation: full employment	Initial situation: there is unemployment
SHORT-RUN effect of an expansionary policy	Temporary increase in production, <u>ONLY</u> if policy generates unexpected inflation or unexpected aggregate demand shocks	Production increases, provided that there are unemployed workers in the economy
LONG-RUN effect of an expansionary policy	Expected inflation OFFSETS any increase in Y above its full employment level Y*	Expansionary effects, even in case the policy is announced and expected
Cost of disinflation (cost of a restrictive monetary policy)	Very large cost, as disinflation requires a persistent restrictive policy in order to reduce the expected inflation	No cost <u>ONLY IF</u> this policy is announced and effective in modifying expectations

The sacrifice ratio

- The sacrifice ratio measures the percentage change in production (and income) levels that must be forgone to reduce inflation by 1 percentage point:

$$\Delta Y / \Delta \pi$$

- The sacrifice ratio will be:
  - **HIGH** if the restrictive monetary policy aimed at reducing inflation <u>is NOT credible</u> (economic agents do not reduce their expectations of future inflation)
  - **LOW** (or even zero) if the restrictive monetary aimed at reducing inflation is <u>credible</u> (economic agents adjust their expectations, and lower the expected level of prices)

Aggregate Supply

P

$LRAS$

$Y = Y^* + \alpha (P - P^e)$

$P > P^e$

$P = P^e$

$SRAS$

$P < P^e$

Y

$Y < Y^*$ | $Y = Y^*$ | $Y > Y^*$
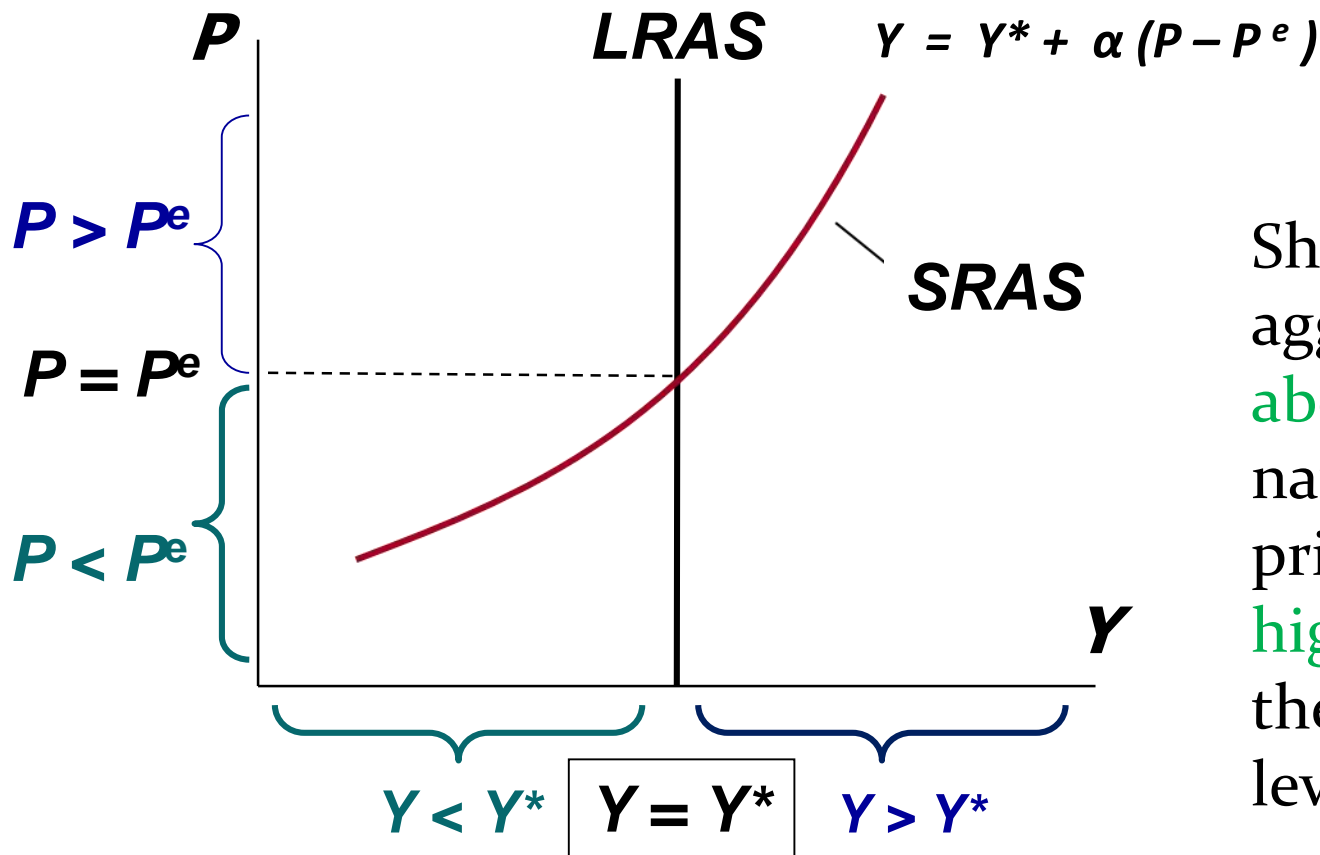
Short-run aggregate supply is above/below its natural level if prices are higher/lower than their expected level

Exercise 1

Consider the AS-AD model, and suppose that an unexpected fall in aggregate demand occurs.

a) What happens in the short-run to aggregate demand, to prices and to production?

b) What happens in the long-run?

c) Suppose that, given the short-run effects of this shock, the Government decides to react by implementing a stabilization policy. What kind of policy could be implemented? What would the results be?
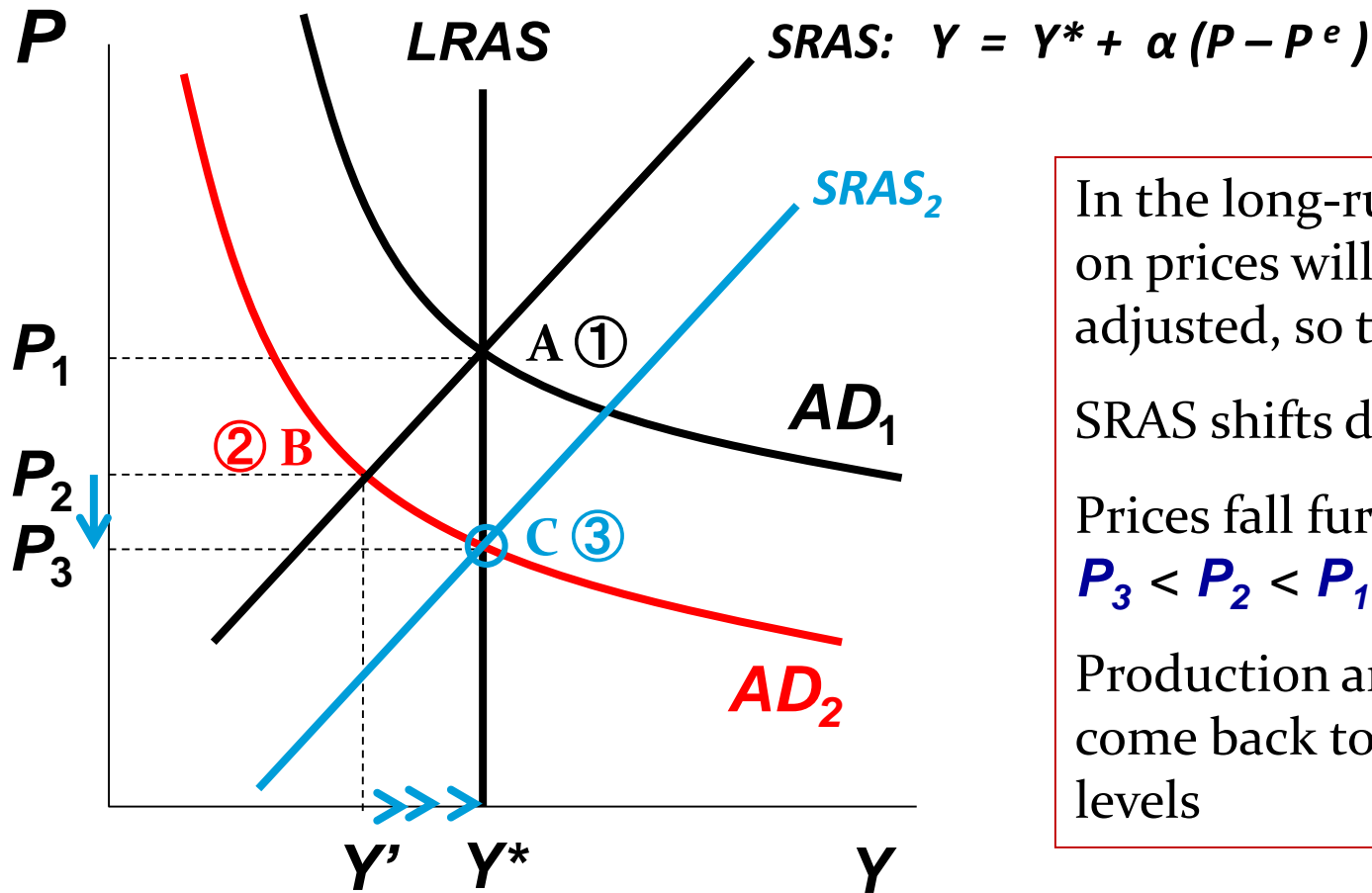
Ex. 1 – (a)
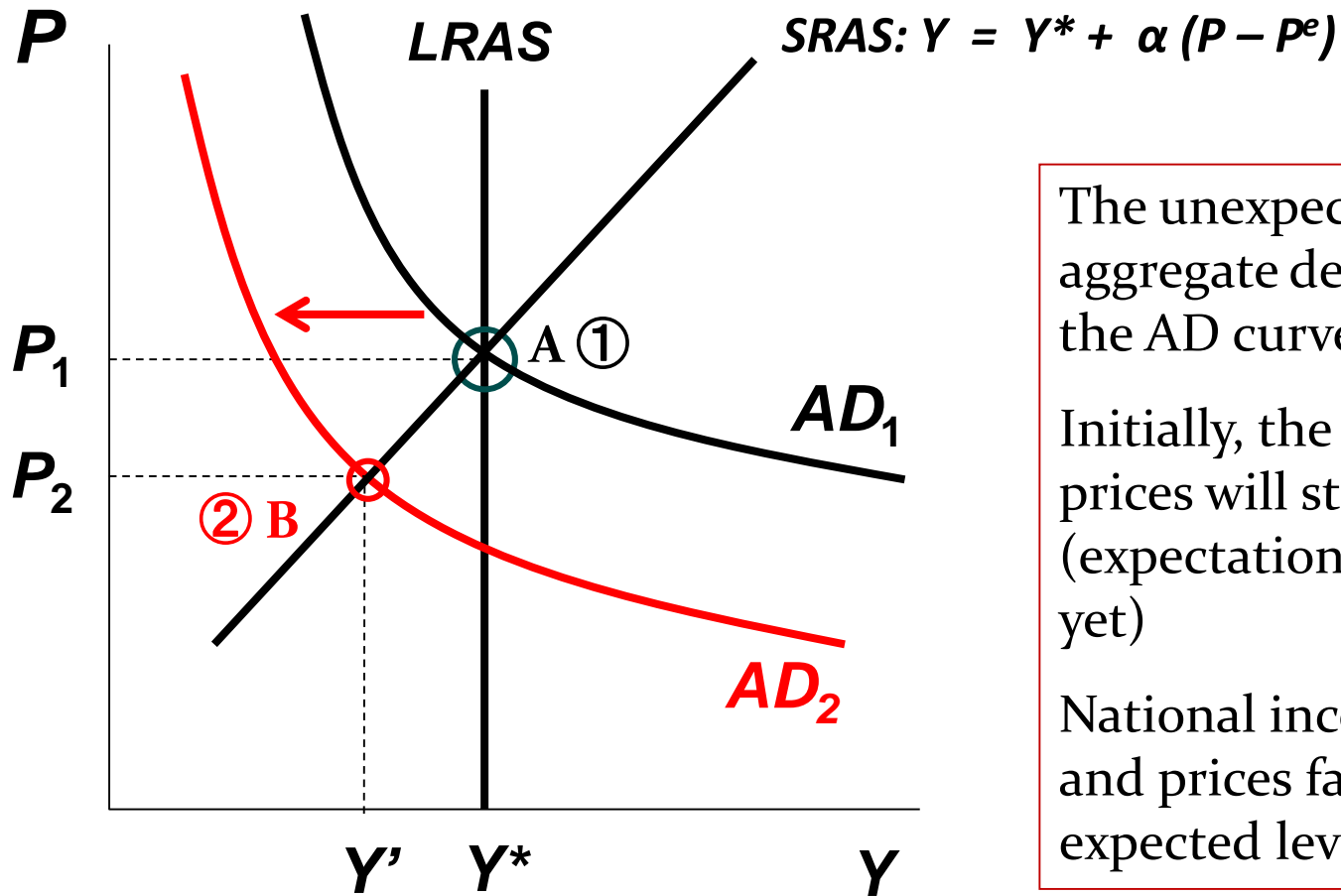
The unexpected fall in aggregate demand will shift the AD curve towards the left.

Initially, the _expected_ level of prices will stay unchanged at P_1 (expectations are not revised yet)

National income lowers at Y' and prices fall below their expected level: $P_2 < P_1$

Ex. 1 – (b)

In the long-run, expectations on prices will be revised and adjusted, so that P^e falls.
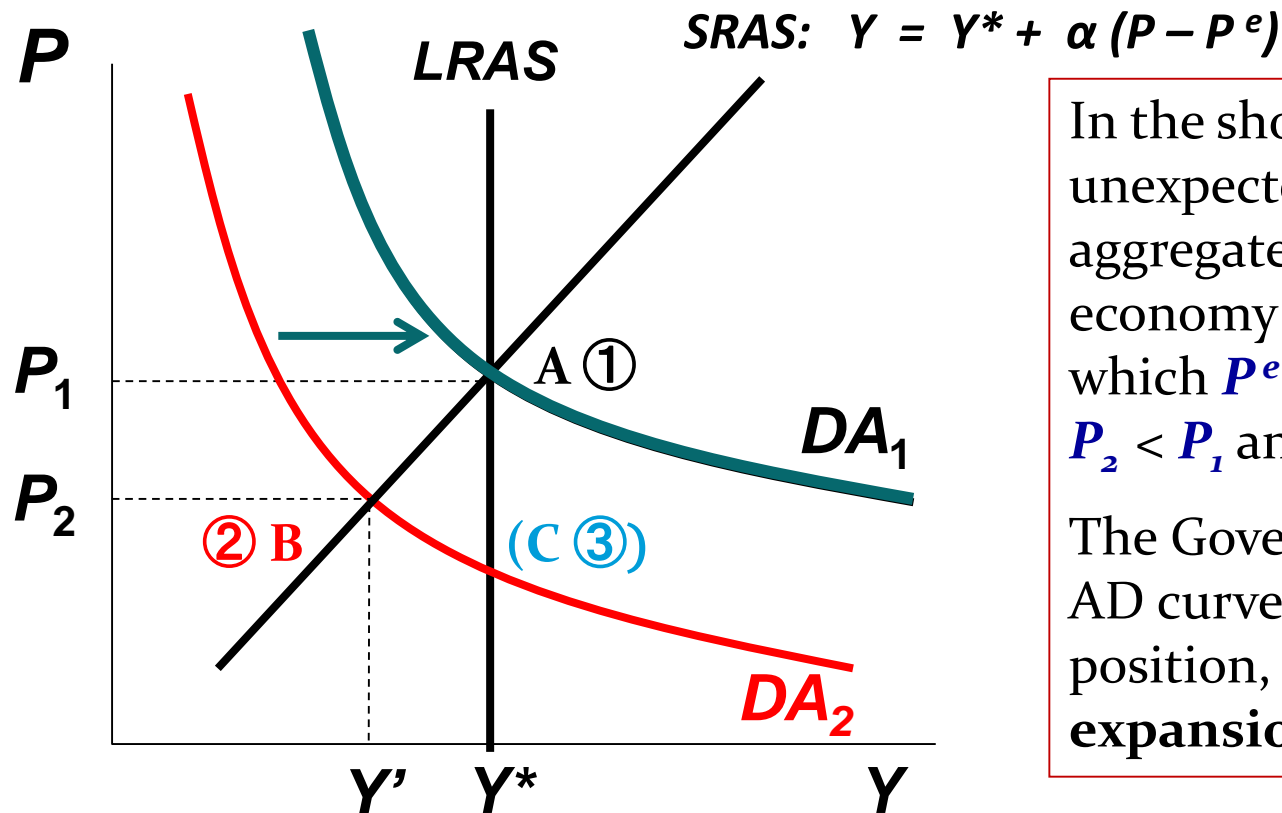
SRAS shifts downwards.

Prices fall further:
$P_3 < P_2 < P_1$

Production and income come back to their original levels

Ex. 1 – (c)

SRAS: $Y = Y^* + \alpha (P - P^e)$

P

LRAS

P_1 ---- A ①

DA_1

P_2 ----

② B   (C ③)

DA_2

Y'   Y*   Y

In the short-run, the unexpected reduction in aggregate demand drives the economy towards point B, in which P^e is unchanged, $P_2 < P_1$ and $Y < Y^*$

The Government can bring the AD curve back to its original position, by means of an **expansionary policy**

Notice: Given Y, the final effect of the expansionary policy will depend on
- *Credibility of the policymakers*
- *Velocity of the process of adjustment of the expectations*

Ex. 1 – (c)

If Y<Y* (as in this exercise)

- **In case the announced policy is NOT credible...**
  Expectations will slowly adjust and the overall adjustment process will take a lot of time

- **In case the announced policy is credible...**
  Expectations will quickly adjust, bringing the economy back to the original equilibrium level of production relatively soon

If Y=Y*

- **In case the announced (expansionary) policy is NOT credible...**
  The policy will have an expansionary effect but will also generate inflation, at least until expectations will not be fully adjusted

- **In case the announced (expansionary) policy is credible...**
  The policy will simply result in higher inflation

Multiple choice

1. The Phillips curve represents the negative relationship between:

a)   Actual inflation and expected inflation

b)   National income and unemployment

c)   Current inflation and unemployment

d)   Expected inflation and level of production

2. The re-formulated Phillips curve states that the inflation rate depends on three elements. Which one of following is not included among these three?

a)   Money supply

b)   Expected inflation

c)   The gap between the unemployment rate and its natural level

d)   Supply shocks

Multiple choice

3. Consider an economy in which the Central Bank is particularly concerned about inflation, and wants to reduce the inflation rate, from 7% to 3%. If the sacrifice ratio is currently equal to 5, what is the percentage change in production that is needed to achieve the targeted inflation?

   a) -0.8%

   b) -1.25 %

   c) -20 %

   d) -25 %

Ch. 15: Stabilization Policy

Key concepts:

- Active or passive policy? (*delays in policy implementation, effects of the policy, the role of expectations, Lucas critique...*)

- Discretionality vs. Rules in the policy design (*time inconsistency, Taylor rule,...*)

- Inflation targeting and independence of the monetary policy authority

Aggregate supply and demand

- Any attempt to stimulate production above its level of full employment is futile and will simply result in higher inflation

- The question is: in case a negative *shock* occurs, is the economic system able to self-stabilize?
  Put it differenty… are prices and wages flexible enough to quickly adjust to the new economic conditions (so that the economy can quickly recover to full employment) or is it really necessary to have a policy intervention?

- A fiscal policy is mostly effective when prices are rigid, whereas it has no effect when prices are fully flexible

Policy and credibility

- Monetary policy typically aims **at preserving price stability in the long-run** (control of the inflation rate)

- If the Central Bank wants to reduce the **inflation rate**, it is crucial that this goal is annouced and trusted by people, so that expectations will quickly adjust, lowering the real cost of disinflation

- If the Central Bank **is NOT trusted**, than the policy will reduce aggregate demand and income ($Y < Y^*$), and only at that point disinflation will actually occur, but with **a high cost for people (unemployment)**

Lucas critique

- Even if we think that the policy intervention is really necessary, are we sure that policy-makers will have full information on the nature, the effects and the duration of the shocks?

  What span of time is needed in order to decide the policy intervention?

  What span of time is needed in order to evaluate the effects of the shocks?

- **Lucas critique**: if policy changes, individual behavior will subsequently modify, and this will change the economic relationships described by the economic model used to set up the policy

- To build reliable economic models, it is crucial to understand the way according to which expectations tend to be formed !

Rules vs. discretionality

- The excessive use of active stabilization policies (or "discretionary" policies) is likely to generate persistent costs in terms of:
  - ❖ **too high and persistent inflation**
  - ❖ **high public debt** (risk of no sustainability)

- **Rules** can make a policy intervention «automatic», by predetermining the use and the size of the intervention (that will be linked to the occurence of given conditions, in ways that restrict the degree of discretionality of policy makers)

  E.g. *Taylor rule for monetary policy; Fiscal Compact for fiscal policy*

Taylor rule

- Rule: $i = \pi + 0.02 + 0.5\,(Y\text{-}Y^*) + 0.5\,(\pi - \pi^*)$

- What is the difference between this rule and Friedman's rule? Why one is said to be an active-type policy, while the other is defined as a passive-type policy?

- Is the Taylor rule applied in the reality? Is it more appropriate to consider this rule as a guideline or as a mechanical rule?

Fiscal Compact

Request: government budget balance equal to zero in the medium-run:

$T^*- G^*= 0$, where T^* and G^* are the levels of taxation and public spending when production is at the full employment level, namely Y^*

- Why do fiscal revenues tend to increase, while public spending tend to fall, when national income rises?

- Why does a recession tend to generate government budget deficits, while an economic boom tends to generate supluses?

- What are the automatic stabilizers and what is their role?

- Why has the Fiscal Compact been adopted?

Multiple Choice

4. Consider the Taylor rule: $i = \pi + 0.02 + 0.5\,(Y\text{-}Y^*) + 0.5\,(\pi - \pi^*)$; according to this rule, the interest rate i must be increased:

    a) everytime the output gap (i.e. Y-Y*) increases.

    b) everytime the output gap (i.e. Y-Y*) decreases.

    c) everytime the output gap (i.e. Y-Y*) increases, even in the case the difference $(\pi - \pi^*)$ changes in the opposite direction, by the same amount.

    d) in none of the cases listed above.

5. Even in the presence of automatic stabilizers…

    a) The public deficit is anti-cyclical.

    b) The public deficit is pro-cyclical.

    c) The public deficit is forced to be zero.

    d) The public deficit is no longer affected by the economic cycle.

Ch. 16: Public debt

Key concepts

o Public debt and public deficit

o Public debt as a source of funding for the Government

o The Government bond markets (primary and secondary market) and debt neutrality (Ricardian equivalence)

o Size and sustainability of the public debt

o Policies for public debt reduction; debt monetization and debt restructuring

Primary budget deficits

(Net) public spending, namely G' (net of interests paid on the former debt stock), can be financed by means of taxes or goverment bond issuance

- T - G' = 0 ← government budget balances
- T - G' > 0 ← government budget surplus
- T - G' < 0 ← government budget deficit

Budget deficits must be financed by issuing goverment bonds, that will be reimbursed by the due date and that pay interest payments in the next period

Public debt stock (D) corresponds to the sum over time of budget deficits and budget surplus. In any period, the change in D is given by:

$$\Delta D = (G' + i\,D) - T = G - T$$

Budget balance and primary budget

- **Primary budget balance**: $A = T - G' > 0 \text{ or } = 0 \text{ or } < 0$

It is the bugdet balance, net of the spending for interest payments (on the pre-existing debt stock)

- **Total budget balance**: $T - (G' + i\,D) = T - G = A - i\,D > 0 \text{ or } = 0 \text{ or } < 0$

It is the bugdet balance, inclusive of the spending for interest payments (on the pre-existing debt stock)

To prevent the public debt to blow up, it is necessary to record a primary budget surplus, otherwise every year new debt will have to be issued (both to finance the new budget deficits and to pay interest on the formerly issued bonds).

The government bond market

The government can issue bonds for many reasons (such as financing public investment or stabilization policy interventions, etc...)

At any new issuance (aimed at financing new budget deficits), governement bonds can be subscribed by:
- national private savers/investors
- foreign savers/investors, incurring a trade deficit

GDP in the open economy: $Y = C + I + G + NX$

Private saving: $S_{PR} = Y - T - C = (I + G + NX) - T$

$\Rightarrow (S_{PR} - I) - NX = G - T$

Exercise 2

Consider an economy in which the interest rate is i=4%; the GDP is 700 billion euros, while the marginal propensity to consume is 0.8

Suppose the government engages in a facility investment plan corresponding to 150 billion euros in the next 2 years (G=75 in each year)

a) If the Goverment chooses to finance this plan by raising taxes, what will the private wealth be at the end of the second year?

b) What if the Goverment choose to finance the plan by means of Goverment bonds (to be reimbursed at the end of the second year)?

Ex. 2 – (a)

The plan is financed by means of taxation: T= 75 in both the two years, so that T=G=75 in every year

Both in year 1 and year 2:

- disposable income is Y-T= 700-75 = 625
- consumption is 0.8 times the disposable income, that means $C_1 = C_2 = 0.8 \cdot 625 = 500$ billion euros, whereas private saving will be the remaning part (i.e. $S_2{}^{pr} = S_1{}^{pr} = 125$ mld)

Private wealth (saving) will be:

- year 1: $S_1{}^{pr} = 125$ billion euros
- year 2: $S_2{}^{pr} + S_1{}^{pr} \cdot (1 + i) = 125 + 125 \cdot (1+0.04) =$

= 125 + 130 = 255 billion euros

Ex. 2 – (b)

Year 1 :

- taxation: $T_1 = 0$
- disposable income: $Y_1 - T_1 = 700-0 = 700$ billion euros
- consumption: $C_1 = 0.8 \cdot 700 = 560$ billion euros
- private saving: $S_1^{pr} = 0.2 \cdot 700 = 140$ billion euros

Year 2 :

- taxation: $T_2 = G_2 + (1+0.04) \cdot G_1 = 75 + 75 \cdot (1.04) = 153$ billion euros
- disposable income: $Y_2 - T_2 = 700 - 153 = 547$ billion euros
- private saving: $S_2^{pr} = 0.2 \cdot 547 = 109.4$ billion euros $(C_2 = 437.6)$
- $\Rightarrow$ private wealth: $S_2^{pr} + S_1^{pr} \cdot (1+i) = 109.4 + 140 \cdot (1+0.04) = 255$ bil.

Ricardian equivalence

If economic agents are rational, they know that their saving (wealth) at the end of the second period will be the same, regardless of the way according to which the plan has been financed

Higher saving today (in case of bond issuance) will be used to pay higher future taxes!

Ricardian equivalence

The theorem applies **only** under these given assumptions:

- perfect information on income and future consumption possibilities
- no redistribution mechanisms implied by the choice on the source of funding
- income is constant over time
- interest rates are constant over time and common to all agents

If this conditions are not fulfilled, agents will prefer to postpone the payment of taxes ⇒ financing the plan (the spending) with debt, rather than taxation, has a larger expansionary effect on aggregate demand!

Debt Sustainability

Public debt is unsustainable when the Goverment cannot control its growth any more, and therefore is forced to issue new debt even only to pay interests on the pre-existing debt stock.

Whether the debt is sustainable or not can be assessed by comparing the stock of public debt (D) with the ability of the debtor-country to pay back its debt, which is measured by the national income (Y, i.e. the GDP)

In any period, the change in the debt-to-GDP ratio is given by:

$$\Delta\left(\frac{D}{Y}\right) = \frac{\Delta D \cdot Y - \Delta Y \cdot D}{Y^2}$$

$\longleftarrow$

$$d\left(\frac{f}{g}\right) = \frac{df \cdot g - dg \cdot f}{g^2}$$

Debt sustainability

$$\Delta\left(\frac{D}{Y}\right) \approx \frac{\Delta D \cdot Y - \Delta Y \cdot D}{Y^2} = \frac{\frac{\Delta D \cdot Y}{Y} - \frac{\Delta Y \cdot D}{Y}}{Y} = \frac{\Delta D - \frac{\Delta Y}{Y} \cdot D}{Y}$$

- ❖ government budget deficit: $\Delta D = i\, D - A$

- ❖ growth rate of the nominal GDP: $\Delta Y / Y = \pi + \gamma$

$$\Rightarrow \Delta\left(\frac{D}{Y}\right) \approx \frac{iD - A - (\pi + \gamma)D}{Y}$$

The debt-to-GDP ratio grows over time if the total budget deficit, namely $[i\, D - A]$, exceeds the product between the growth rate of nominal GDP, i.e. $(\pi + \gamma)$, and the nominal value of the debt stock, D

Exercise 2

Suppose that, at time t, public spending (net of debt interest payments) is equal to G'=50, whereas taxation is T=55. The debt stock inherited from the previous period is D=200.

a) If the interest rate is i=4%, does public debt rise or fall at time t? By what extent?

b) What happens to the debt-to-GDP ratio if the inflation rate is π=2% and the real GDP grows at a rate γ=1% ?

c) If nominal GDP is Y=1000, could we say that public debt is sustainable or not? And what if the interst rate were i= 7%, instead of 4%?

Ex. 2 – (a)

Public debt rises if the primary budget suplus is lower than the cost of debt servicing: $A < i\, D$

In this case, the primary budget is: $A = T\text{-}G' = 55\text{-}50 = +5$

The cost of debt servicing is: $i\, D = 4\% \cdot 200 = 0.04 \cdot 200 = 8$

Hence, public debt increases

Ex. 2 – (b)

The debt-to-GDP ratio evolves over time according to:

$$\Delta\left(\frac{D}{Y}\right) \approx \frac{iD - A - (\pi + \gamma)D}{Y}$$

❖ $\Delta(D/Y) > 0$ if $i\,D - A - (\pi+\gamma)\,D > 0$ (the ratio increases)
❖ $\Delta(D/Y) < 0$ if $i\,D - A - (\pi+\gamma)\,D < 0$ (the ratio decreases)

In this case: $i\,D - A = 8 - 5 = 3$
while: $(\pi+\gamma)\cdot D = (0{,}02 + 0{,}01) \cdot 200 = 6$

$\Rightarrow i\,D - A - (\pi+\gamma)\cdot D = 3 - 6 = -3 < 0$

Hence, the debt-to-GDP ratio decreases

Ex. 2 – (c)

Public debt is sustainable if:

$$\Delta\left(\frac{D}{Y}\right) \approx \frac{(i-\pi-\gamma)D - A}{Y} < 0 \quad \Rightarrow \quad \frac{(i-\pi-\gamma)D}{Y} - \frac{A}{Y} < 0$$

$$\Rightarrow \frac{(i-\pi-\gamma)D}{Y} < \frac{A}{Y}$$

In this case:

- $(i-\pi-\gamma)\cdot D/Y = (0.04-0.02-0.01)\cdot 200/1000 = (0.01)\cdot 0{,}2 = 0.002$
- $A/Y = 5/1000 = 0.005$

Hence, debt is sustainable since: $A/Y > (i-\pi-\gamma)\cdot D/Y$

Ex. 2 – (c)

Public debt is sustainable if:

$$\Delta\left(\frac{D}{Y}\right) \approx \frac{(i-\pi-\gamma)D - A}{Y} < 0 \quad \Rightarrow \quad \frac{(i-\pi-\gamma)D}{Y} - \frac{A}{Y} < 0$$

$$\Rightarrow \frac{(i-\pi-\gamma)D}{Y} < \frac{A}{Y}$$

If the interest rate is i=7%, than:

- $(i-\pi-\gamma)\cdot D/Y = (0.07-0.02-0.01)\cdot200/1000 = (0.04)\cdot0,2 = 0.008$
- $A/Y = 5/1000 = 0.005$

Debt is not sustainable in this case: $A/Y < (i-\pi-\gamma)\cdot D/Y$

Public debt reduction

If the debt-to-GDP ratio is out of control, it might be a problem paying back the debt at its maturity

Subscribers will perceive a higher risk and will demand a higher interest rate, but this further accelerates the growth of public debt

More risk-adverse investors will leave the market: the Goverment will have problems in finding new subscribers for the newly issued bonds

In this case, the Goverment can use **debt monetization**: it will increase money supply and generate inflation, so that people will experience a reduction in their purchasing power, as far as their nominal wages will not be increased proportionally (**inflation tax**)

Public debt reduction

Alternative option: the Government can propose an unilateral debt restructing

o **Total or partial default**: the Goverment does not pay back to the subscribers (no interest payment, possibly no capital reimbursement)

o **Debt restructuring**: the Government proposes a *swap*, i.e. a replacement of the formely issued bonds with newly issued bonds, with longer maturity and/or lower nominal value

Debt restructuring is possible only conditional on having a primary budget surplus and is typically associated with a currency devaluation (which is needed to stimulate aggregate demand)

Multiple Choice

6. If an economy grows at a rate $(\pi + \gamma) = 4.5\%$ and the interest rate is $i=3\%$, what would the government budget balance be in order to keep the debt-to-GDP ratio constant over time and equal to 90%?

a. 8.1% of the GDP.

b. 4.3% of the GDP.

c. -2.5% of the GDP.

d. -1.35% of the GDP.

7. All the following elements play against the fact that Ricardian equivalence holds, but one. Which one?

a. Consumers have rational expectations.

b. Consumers think that the burden of future higher taxation will be on the shoulders of future generations.

c. Consumers might be financially constrained.

d. Consumers are myopic.

Ch. 17: European Monetary Union

Key concepts:

o The European economic and monetary union (the European Union, its rules, ...)

o The main steps in the European integration process

o Goals of the EU and goals of its policies

o The monetary union (the Euro) and the theory of optimal currency areas

o The EU macroeconomic policy, and the EU monetary policy in particular (price stability)

o Entering the Eurozone (admission requirements)

o Main open issues: internal heterogeneity, etc..

Multiple Choice

8. What is the automatic adjustment mechanisms to demand shocks that does not work anymore when a country joins a monetary union?

a) Interest rate changes.

b) Exchange rate movements.

c) Inflation rate changes.

d) None of the former answer is corrrect.

9. What is the main goal of the European System of Central Banks?

a) Preserving price stability.

b) Keeping public debt below 70% of the GDP.

c) Keeping government budget deficit below 3% of the GDP.

d) Keeping the unemployment rate close to its natural level.

Multiple Choice

10. The Maastricht criteria impose…
   a) monetary stability and fiscal discipline, but not real convergence
   b) real convergence, in addition to monetary stability and fiscal discipline
   c) real and financial convergence.
   d) only monetary stability, but not fiscal discipline, as the latter is exclusively delegated to national governments.

11. If monetary institutions are affected by a lack-of-credibility problem:
   a) the cost of joining a monetary union increases with the heterogeneity of the idiosyncratic shocks hitting the economy of the countries involved.
   b) the benefit of joining a monetary union increases with the heterogeneity of the idiosyncratic shocks hitting the economy of the countries involved.
   c) the benefit of joining a monetary union does not depend on the degree of heterogeneity of the idiosyncratic shocks hitting the countries involved.
   d) the cost of joining a monetary union does not depend on the degree of heterogeneity of the idiosyncratic shocks hitting the countries involved.