MACROECONOMICS

Exercise 1

A

According to the article, countries all over the world have kept increasing their debt ever since the financial crisis in 2008. However, since then, new crises continue to emerge and finding the funds to reboot the economy proves difficult, which is why a high debt-to-GDP ratio is unsustainable. The article proposes to raise taxes instead of taking on more debt, which will stagnate the economy in the short-run, but ultimately necessary to avoid a debt crisis.

B

$Y = 2.5\ [c0 + b0 - c1T + G - b2r]$.

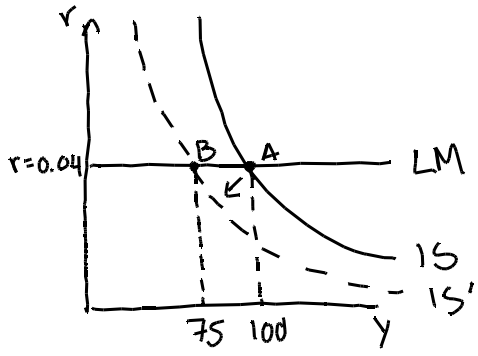
$Y = 2.5\ [12 + 10 - 0.4(20) + 20 - 100(0.04)]$

Y = 2.5[22-8+20-4]

Y = 2.5 [30] = 75

The new level of output is 75

C



D

$$100 = 2.5\left[12 + 10 - 0.4(20) + G - 100(0.04)\right]$$
$$100 = 2.5\left[22 - 8 - 4 + G\right]$$
$$100 = 2.5\left[10 + G\right]$$
$$100 = 2.5\left[10 + 30\right]$$

$$100 = 2.5 \cdot 10 + 2.5G$$
$$100 - 25 = 2.5G$$
$$G = \frac{75}{2.5} = 30$$

G thus has to be 30 if the government wants to keep Y = 100.

The debt-to-GDP ratio is given by

$$\frac{B_t}{Y_t} = (1 + r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

Inserting the values provided we get

$$\frac{B_t}{Y_t} = (1 + 0.04)\frac{200}{100} + \frac{30 - 20}{100}$$
$$= (1.04)2 + 0.1$$
$$= 3.08$$

The debt-to-GDP ratio is 3.08

E

The primary deficit is G – T. since G = 30, **T = 30** to run a primary deficit of 0. This will affect the debt-to-GDP ratio in the following way:

$$\frac{B_t}{Y_t} = (1 + 0.04)\frac{200}{100} + \frac{0}{100}$$
$$= 2.08$$

F

When the government decide to increase its spending and financing it by increasing taxes, the population will have a smaller propensity to consume (c1) because of an increase in taxes. And if the goal of the spending was to get output back at its original level, it will have to

increase spending more than what they originally intended to make up for the decrease in consumption through taxes.

G

If the government wants to keep the debt-to-GDP ratio stable while wanting to maintain Y = 100, then it needs to run a primary deficit of 10 as before:

G – T = 10

30 – 20 = 10

G = 30 and T = 20

Exercise 2

A

$$\text{GDP deflator} = P_t = \frac{\text{nominal GDP}}{\text{Real GDP}}$$

$$P_{2020} = \frac{90}{100} = 0.9$$
$$P_{2021} = \frac{102}{106} = 0.96$$
$$P_{2022} = \frac{126}{110} = 1.09$$

The GDP deflator for the years are

2020 = 0.9

2021 = 0.96

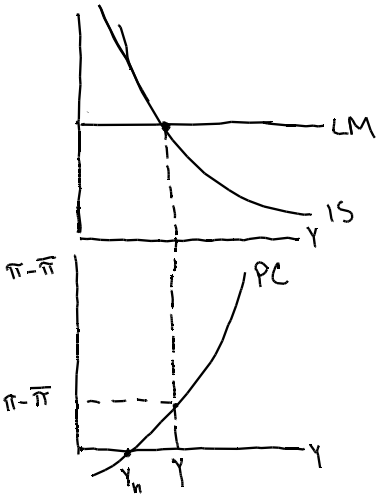
2022 = 1.09

$$\text{Inflation rate} = \pi_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

$$2021: \quad \pi_t = \frac{0.96 - 0.9}{0.9} = 0.07 = 7\%$$
$$2022: \quad \pi_t = \frac{1.09 - 0.96}{0.96} = 0.14 = 14\%$$

The inflation rate is thus 7% for 2021 and 14% for 2022

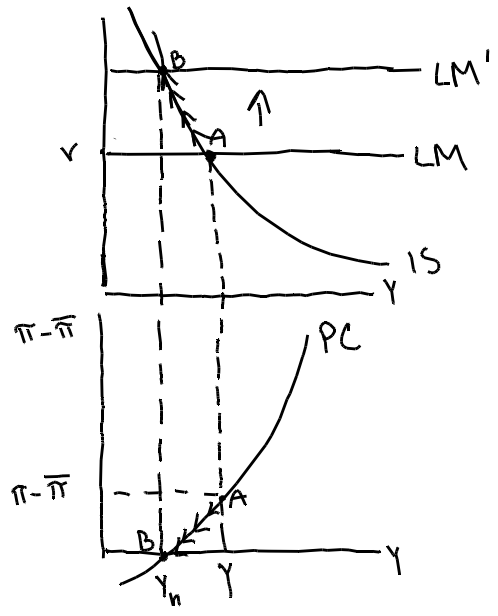
B



The graph shows that while the short-run is in equilibrium, the medium run is not. The inflation is too high.

C

The central bank should intervene and carry out a contractionary monetary policy and raise the interest rate, which makes the real interest rate rise as well. This can be illustrated as follows:



By raising the interest rate, investment and demand will decrease which will result in lower output and a decrease in inflation, which means the economy will go back to its medium-run equilibrium with its target inflation of 2%.

D

The real interest rate is given by:

$$r = i - \bar{\pi}$$

In the medium run, people expect the interest rate to be 2% thus if i = 0.02 the real interest rate is

$$r = 0.02 - 0.02 = 0$$

If the central bank is restricted by the zero-lower bound, it cannot lower the interest to more than 0, and if the economy is in a recession, that is what it would normally do. But in this case, the economy is overheating and we have the opposite issue of a too high inflation. Thus, the zero-lower bound is no obstacle in this scenario. It will not stop the central bank from carrying out a contractionary monetary policy.

E

Because it takes time for the economy to convert to its medium-run equilibrium, we are in a situation where output is decreasing and the inflation is above target level. This situation is called stagflation. When the central bank raises the interest rate output decreases and is slowly decreasing inflation, but it is still at a higher level than intended until the equilibrium is reached and inflation is once again at 2%.

F

Because the ECB is responsible for setting the interest rate in the entire Eurozone, it is difficult to determine which rate it should choose so it benefits all Eurozone countries. Because the inflation levels differ significantly between the countries, the ECB will have to set the interest rate such that most countries have the option to return to their medium-run equilibrium. If the ECB where to lower the interest rate, consumption, demand, and output would increase. In the Baltic countries the government would have to implement

contractionary fiscal policy by lowering taxes or government expenditure to decrease consumption again to avoid further increase in inflation (most likely, they will have to do both). Because Spain has a lower inflation it would not have to take as drastic measures as the Baltic countries, but a contractionary fiscal policy might be beneficial as well, depending on what their target inflation is.

Exercise 3

A

For there to be a constant return to scale, output should increase at the same amount as the increase in input.

$$F(aAN, aK) = (aAN)^{\frac{2}{3}} \cdot (aK)^{\frac{1}{3}} = a^{\frac{2}{3}} AN^{\frac{2}{3}} a^{\frac{1}{3}} K^{\frac{1}{3}} = aAN^{\frac{2}{3}} K^{\frac{1}{3}} = aF(AN, K)$$

It can by the calculations be seen that with an increase in inputs by a, output will also increase by a. Thus, the function exhibits a constant return to scale.

B

$$f(K, AN) = 3K^{\frac{1}{3}} (AN)^{\frac{2}{3}}$$

$$\frac{Y}{AN} = \frac{3K^{\frac{1}{3}}(AN)^{\frac{2}{3}}}{AN} = \frac{3K^{\frac{1}{3}}(AN)^{\frac{2}{3}}}{AN^{\frac{1}{3}} AN^{\frac{2}{3}}} = \frac{3K^{\frac{1}{3}}}{AN^{\frac{1}{3}}} = 3\left(\frac{K}{AN}\right)^{\frac{1}{3}}$$

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C

In the steady state,

$$sf\left(\frac{K}{AN}\right) = (\delta + g_A)\left(\frac{K}{AN}\right)$$

and $f\left(\frac{K}{AN}\right) = \frac{Y}{AN}$

$$s3\left(\frac{K}{AN}\right)^{\frac{1}{3}} = (\delta + g)\frac{K}{AN}$$

$$\frac{s3}{(\delta+g)} = \left(\frac{K}{AN}\right)^{\frac{2}{3}}$$

$$\frac{K}{AN} = \left(\frac{s3}{(\delta+g)}\right)^{\frac{3}{2}}$$

Insert the values we given we get the value of capital per effective worker

$$\frac{K}{AN} = \left(\frac{0.3 \cdot 2}{0.1 + 0.05}\right)^{\frac{3}{2}} = \left(\frac{0.6}{0.15}\right)^{\frac{2}{2}} = 6$$

We can now calculate output per effective worker

$$\frac{Y}{AN} = 3\left(\frac{K}{AN}\right)^{\frac{1}{3}}$$
$$= 3(6)^{\frac{1}{3}}$$
$$= 3 \cdot 2 = 6$$

In the steady state, investment per effective worker must be equal to the required investment:

In steady state

$$sf\left(\frac{K}{AN}\right) = (\delta + g_A)\frac{K}{AN}$$
$$sf\left(\frac{K}{AN}\right) = (0.1 + 0.05)6 = 0.9$$

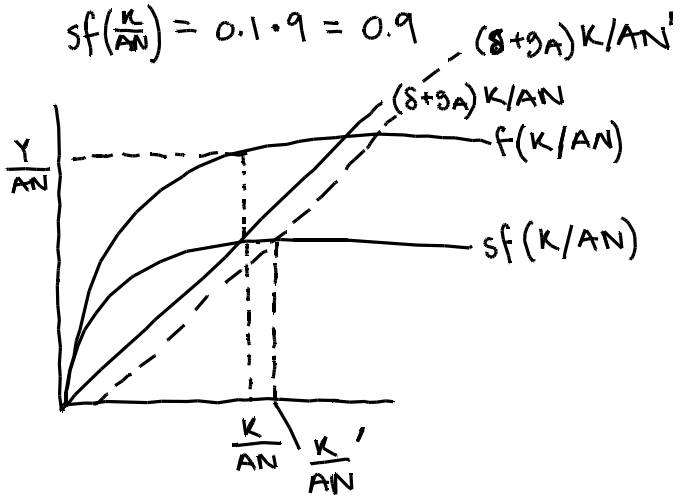
D

$$\frac{K}{AN} = \left(\frac{0.6}{0.1}\right)^{\frac{3}{2}} = 9$$
$$sf\left(\frac{K}{AN}\right) = 0.1 \cdot 9 = 0.9$$

Because depreciation decreases, the economy has become more efficient because machines and other things which have been invested in earlier are still useful. Therefore, capital per

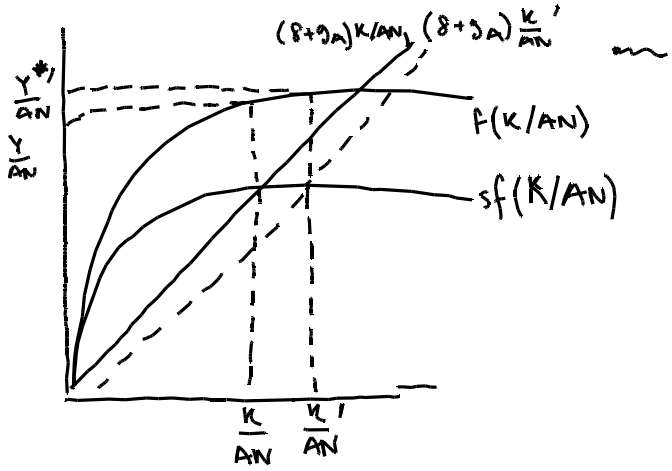
effective worker has increased. Investments stays the same, this is because the growth rate has not either decreased or increased, so the same required investment is needed, despite there being more capital per effective worker

E



F

In a circular economy, recycling is of importance. Because we recycle more, depreciation decrease. However, there are also other ways in which a circular economy affects the balanced growth path. It may also change our investment patterns such that we focus our investment on research and development of the green transition. This could result in new machines, thus increasing the rate of technological growth gA.



Essay question 1

According to the Solow model, the only way a country can achieve sustainable growth is through technological progress. However, short-term, with factories, buildings and machines destroyed, Ukraine will not be able to produce as much as before. This will lead to a decrease in GDP growth. Therefore, the government would have to invest a lot of their tax income into rebuilding their country. This would result in more jobs through e.g. construction work, which will boost income, demand and output through the fiscal multiplier. However, in the long-run the GDP-growth will decrease if the Ukrainian government do not increase their investment areas like research and development, thus ensuring continues technological progress.

Essay question 2

Skill premium refers to the gap between low-skilled and high-skilled workers. It is defined as the additional amount of wage that high-skill workers earn relative to low-skill workers. So far, due to technological growth, machines have been replacing a lot of the low-skilled jobs, increasing the skill premium. Because a lot of low skilled jobs are being replaced, and there has not been an increase in the amount of higher education high enough to offset the gap, the skill premium has continued to increase. But now, if AI where to intervene and replace a lot of high-skilled jobs, it can be argued that this would affect the skill premium in a positive, negative way, meaning it would decrease the skill premium which will result in lower wage inequality. This is because people would now need to educate themselves in more low-paying physical labor jobs which AI cannot replace.