Exercise Class 2

Solutions

BESS - FOUNDATIONS OF ECONOMICS - 30453

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Note: This document contains exercises relative to the program of Macroeconomics by Blanchard-Amighini-Giavazzi (ch. 5, 6). The program relies on the 3th edition of the book. Exercises are written by the author of the document or completely extrapolated from Ferraguto exercise textbook (5th edition).

Ch.5 - Financial Markets: IS-LM Model

Exercise 1

Consider an economy and its equilibrium point in the IS-LM model (equilibrium in A).

(a) Suppose local consumers suddenly increase their marginal propensity to consume (c_1). Denote by A' the new equilibrium. Represent everything on a graph and explain the effects of change in c_1 on output Y in its composition.

   Suppose that:

$$Y = C + I + G$$
$$C = c_0 + c_1(Y - T)$$
$$I = \bar{I} + d_1 Y - d_2 i$$
$$i = \bar{i}$$

   Follow the instructions below when you are solving these kind of exercises:

   1. See how and if IS, LM equations are analytically interested by the changes of the variables.

   2. Study how these changes affect graphically the equilibrium, i.e. draw it in a graph.

   3. Describe in words what happens economically.

   ### Solution

   1. c_1 affects IS relation only.

$$\text{IS:} \quad Y = c_0 + c_1(Y - T) + \bar{I} + d_1 Y - d_2 i + G$$
$$\text{LM:} \quad i = \bar{i}$$

   How? Note that c_1 affects both the constant term and the slope of the curve. Indeed, if you rewrite the IS in explicit form, what you get is

$$i = \frac{1}{d_2}(c_0 - c_1 T + \bar{I} + G) + \frac{1}{d_2}(c_1 + d_1 - 1)Y$$

   Moreover, if you compute the derivative, you get magnitude and sign.

$$\frac{\partial \bar{i}}{\partial c_1} = \underbrace{-\frac{1}{d_2}T}_{\text{Effect on constant}} + \underbrace{\frac{1}{d_2}Y}_{\text{Effect on slope}} \quad > 0$$

With a positive change in c_1 the curve will show a negative shift (the constant of the new curve will be lower) and a positive rotation (the slope of the new curve will be greater). As a reminder, when the variable change is negative, the effect studied through the derivative is of the inverse sign.
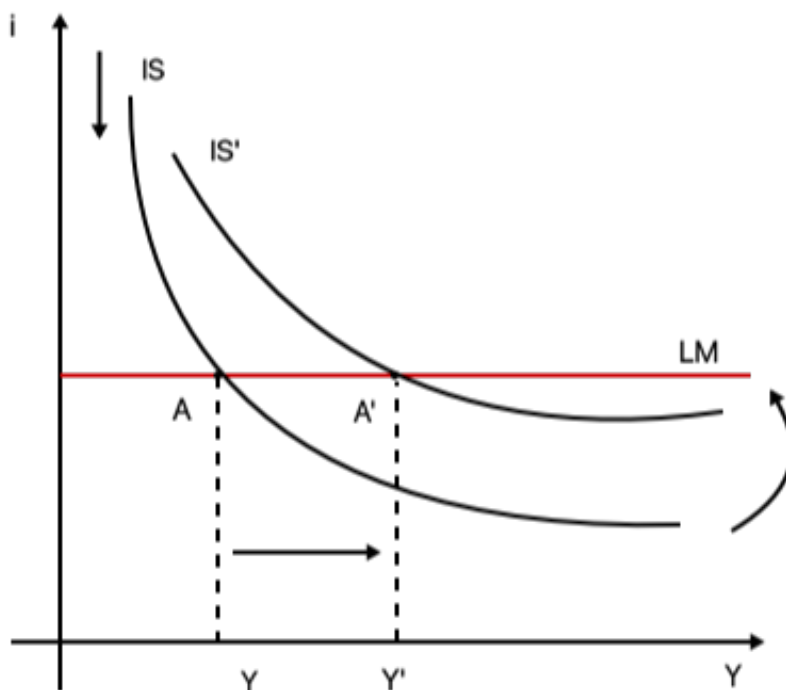
2. Graphical representation.

Figure 1: Graphical representation of c_1 change in IS-LM.

3. Economically, an increase in the propensity to consume c_1 have a double effect on the IS relation, while null on LM. A minor negative effect is given by increase in taxes: for higher disposable income tax absorption will be higher. However, this negative part is more than offset by a positive boost on income. The channel of transmission starts with a higher consumption, which require a rise in production. Income grows accordingly, which through the multiplier makes increase consumption and production again.

(b) There is a central bank in this economy that decides to react to the change in propensity to consume occurred in point (a), bringing the level of output the previous one. Call this "new" equilibrium point A''.

Solution The CB intervenes through the interest rate level, i.e. $\bar{i}$.

1. How does IS and LM are affected by the change in $\bar{i}$?

$$\text{IS:} \quad Y = c_0 + c_1(Y - T) + \bar{I} + d_1 Y - d_2 i + G$$

$$\text{LM:} \quad i = \bar{i}$$

The level of $\bar{i}$ interest first LM. LM is entirely defined as the level of $\bar{i}$, therefore when it changes the straight line shifts up or down. In this case the change aims at implementing a contractionary monetary policy, which requires a higher interest rate level.

As for the IS equation, the level of $\bar{i}$ defines the dependent variable, once substituted from LM. We therefore expect a movement along the curve of the equilibrium point.
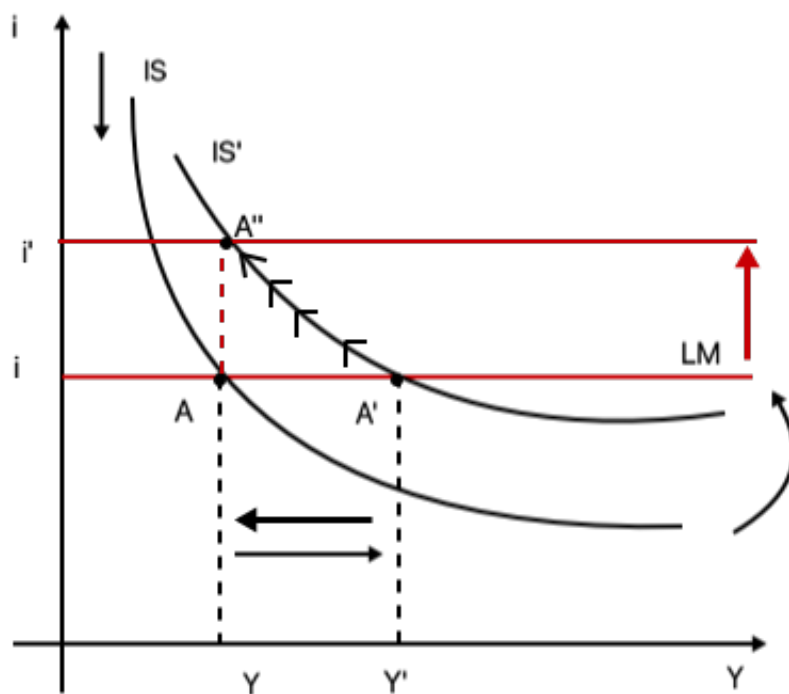
2. Graphically:

Figure 2: Graphical representation of $\bar{i}$ change in IS-LM, as a result of a contractionary monetary policy.

3. Economically, as the interest rate goes up as a result of the CB intervention, firms will find more costly to finance themselves and so investing. As investments decrease, output and income do too, which reduce consumption and again output. The final level of output

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in A'' go back to the initial level, as an objective of the CB. The new equilibrium point will show a higher level of interest rate overall.

Exercise 2

Assume the same functional forms of the previous exercise for equations describing this economy. Suppose a recession occurred yesterday and authorities want to push the overall level of output at a higher level. Specifically, fiscal and monetary authorities provide a fiscal and monetary expansion contemporaneously, i.e. $\Delta G > 0, \Delta \bar{i} < 0$. Describe what happens in the IS-LM model through the steps we used in exercise 1 too.

Solution

1. Look at the equations of the model:

$$\text{IS:} \quad Y = c_0 + c_1(Y - T) + \bar{I} + d_1 Y - d_2 i + G$$
$$\text{LM:} \quad i = \bar{i}$$

   The change in the LM is trivial. For IS, if you write the equation in explicit form, you easily see that any change in G interests the constant of the curve.

$$\bar{i} = \frac{1}{d_2}(c_0 - c_1 T + \bar{I} + G) + \frac{1}{d_2}(c_1 + d_1 - 1)Y$$

   An increase of G makes the IS curve shift upwards, while a decrease in $\bar{i}$ pushes the LM down. As a result, the combined effect move the equilibrium level of output to the right.

2. Graphically: look at figure 3.

3. Economical interpretation.

   Fiscal policy   An increase in government spending increases demand for goods. As demand increases, investment and production does too and so income ($Y \uparrow$). Increase in income in turn push up consumption again through the multiplier, amplifying the effect of the higher government spending.
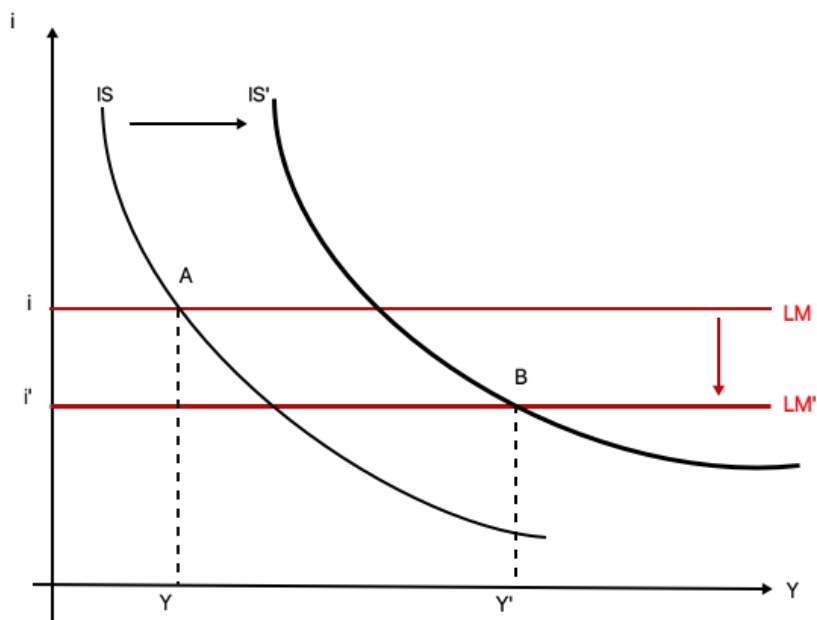
Figure 3: Graphical changes of IS-LM from expansionary policy mix.

Monetary policy A lower interest rate facilitate firms financing. Investment go up, production does too, higher income foster consumption and investments further.

Combined effects bring the economy at a substantially higher level of output.

Ch. 6 - Financial Markets: IS-LM extended

0.1 Exercise 3

Equations of the IS-LM extended model take the following form:

$$\text{IS:} \quad Y = C(Y - T) + I(Y, r + x) + G$$
$$Y = C(Y - T) + \bar{I} + d_1 Y - d_2(r + x) + G$$
$$\text{LM:} \quad r = \bar{r}$$

(a) Suppose there is an increase in risk premium, due to a financial crisis ($\Delta x > 0$). What happens to the IS-LM ext.?

Solution

1. Variables affected by the changes of point (a):

$$\text{IS:} \quad Y = C(Y - T) + \bar{I} + d_1 Y - d_2(r + x) + G$$

$$\text{LM:} \quad r = \bar{r}$$

Bring the IS in explicit form:

$$r = \frac{1}{d_2}[-CT + \bar{I} - d_2 x + G] - \frac{1 - C - d_1}{d_2} Y$$

An increase of risk premium has a negative effect on the curve, which will shift down due to an effect on its constant.

$$\frac{\partial r}{\partial x} = -1 < 0$$

2. Graphically: look at picture 4. Note that the IS-LM is shifting down, due to the negative change of the constant, even if in the graph it looks more as a left-movement.
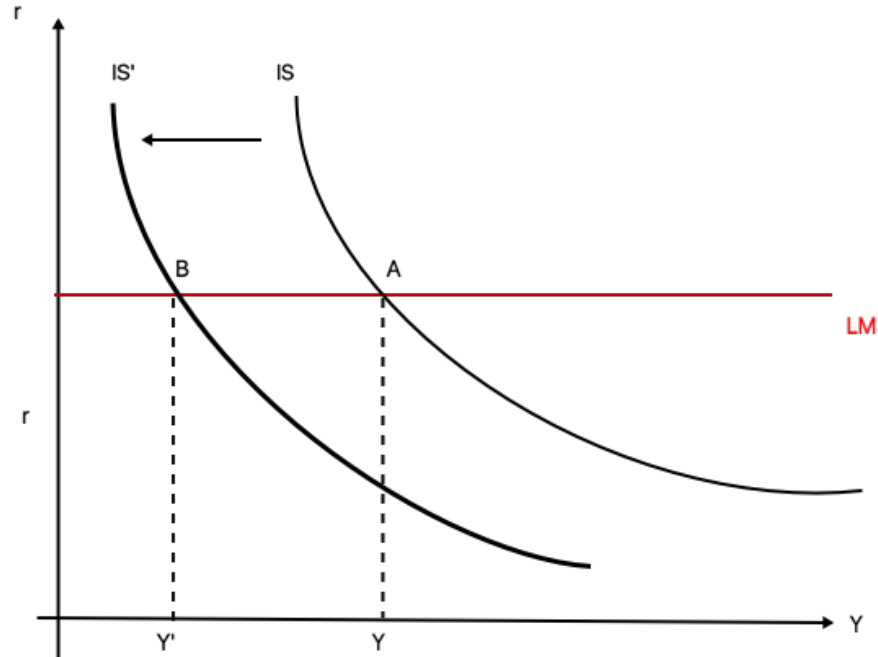

Figure 4: IS-LM extended changes due to increase in risk premium.

3. Economically, higher risk premium level increases the cost of financing for firms, which has a negative impact on investments and so output. Income drops.

(b) The government desires to react to through fiscal policy increasing government spending with public debt. However, indebted position of the country on the markets may lead to a further increase in risk premium. Describe what a potential increase in G and x would cause on the economy.

Solution   An increase in government spending has a positive effect: $\frac{\partial r}{\partial G} = \frac{1}{d_2} > 0$. However, if a higher government spending pushes up the risk premium, as seen before this has a negative impact on the level of output. As a result, the effect of fiscal policy would be offset by a further increase in risk premium, vanishing the aim of the government to bring the output back to the previous level.

(c) Monetary authority intervene in place of the government through a monetary policy expansion, lowering the level of real interest rate $\bar{r}$.

Solution

1.

$$\text{IS:} \quad Y = C(Y - T) + \bar{I} + d_1 Y - d_2(r + x) + G$$
$$\text{LM:} \quad r = \bar{r}$$

2. Graphically: look at fig.5.

3. Economically, the reduction of the interest rate allows to reduce the cost of financing for firms, pushing up investments, production (income) and consumption. The level of output reaches the initial level and the overall interest rate level is now lower than the beginning.
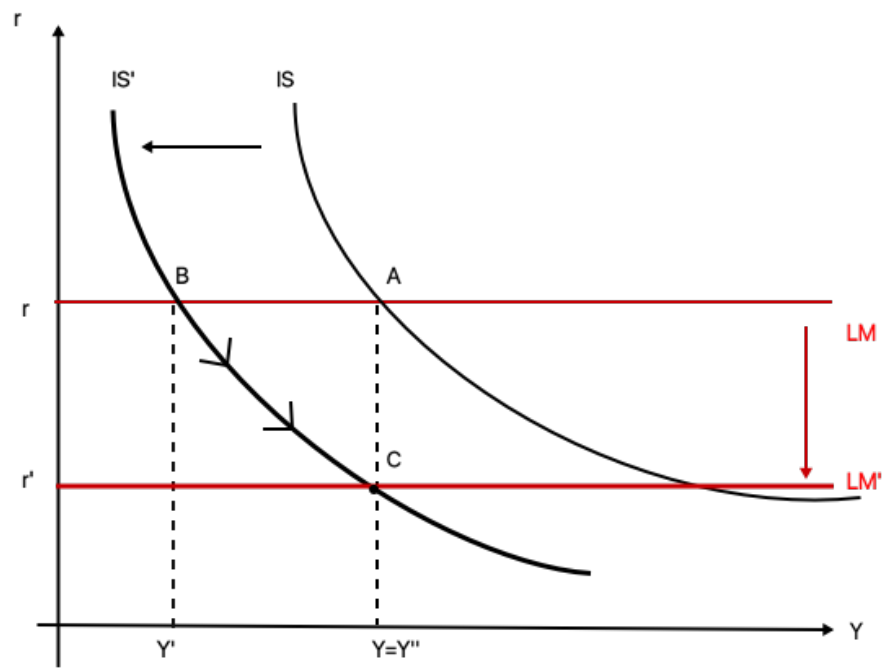
Figure 5: Effect of expansionary monetary policy on IS-LM extended model.