

Should Do (Ch11): Policy Analysis

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Introduction

The IS curve helps explain how interest rates influence economic output. This report examines how different economic events shift the IS curve and impact GDP in the short run. By changing different parameters we'll analyze several different policies. We'll also adjust the IS curve based on the permanent-income hypothesis to see how it reacts to economic shocks differently from the standard model. The IS curve is defined as:

$$\tilde{Y} = a - b(R - r) \quad (1)$$

Where:

- \tilde{Y} = Short-run output (deviation of actual output from potential output)
- a = Autonomous component of output, independent of the real interest rate
- b = Sensitivity of output to changes in the real interest rate
- R = Real interest rate
- r = Marginal Product Per Capital

1 IS Curve Policy Analysis

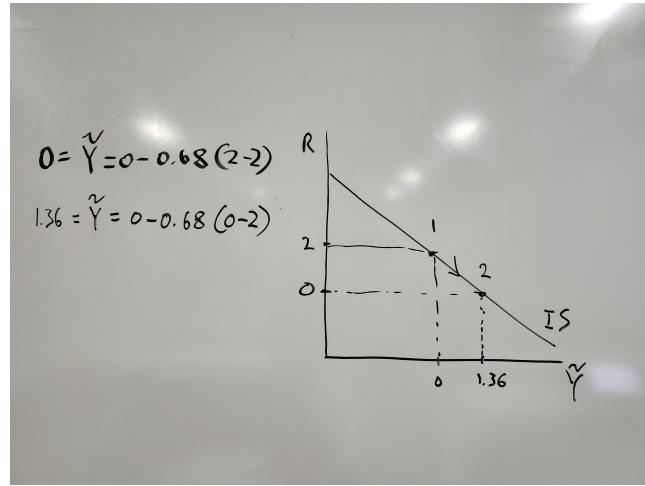
This analysis assumes that the IS curve is defined in table 11.1 in the textbook. The initial parameter values are $a=0$, $b=0.68$, $R=2$, $r=2$.

$$0 = \tilde{Y} = 0 - 0.68(2 - 2) \quad (2)$$

1.1 Change in real interest rates

For the first policy let's say the FED lowers the real interest rate to 0% This makes $\tilde{Y} = 1.36$.

$$1.36 = \tilde{Y} = 0 - 0.68(0 - 2) \quad (3)$$



Lowering the real interest rate causes MPK to raise output. This creates a movement along the IS curve. Borrowing costs are lower allowing more people to invest capital.

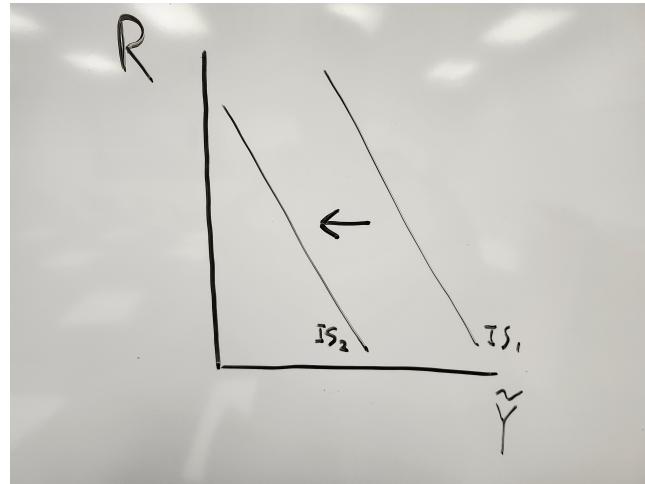
1.2 Change in consumption

Consumers have become less optimistic about the future. They reduce their consumption by 5% of potential output for a year. Consumption in the equation for the IS curve is represented by a portion of a listed as a_c .

$$a = a_c + a_i + a_g + (a_{ex} - a_{im}) - 1 \quad (4)$$

To take 5% of consumption we need to derive the IS curve again with this change.

$$\tilde{Y} = (a - 5\% \text{ of } a_c) - 0.68(2 - 2) \quad (5)$$



After decreasing a by 5% of consumption the IS curve shifts to the left. However, we don't know by how much. a_c wasn't given in the problem.

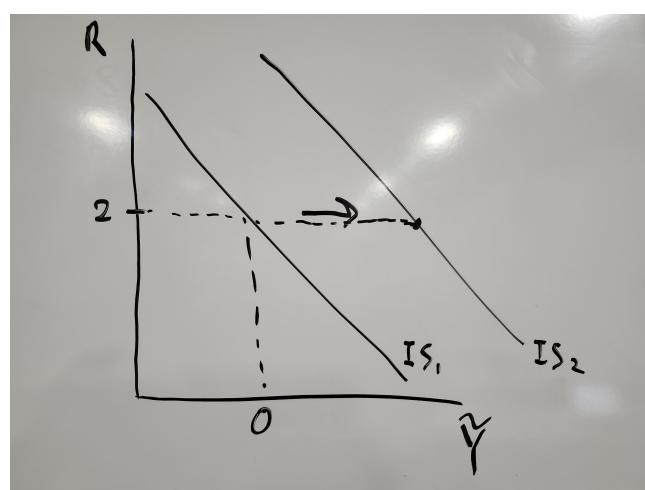
1.3 Improvements in information technology

Improvements in information technology increase productivity and increase the marginal product of capital by 1% for five years. This causes r to change in the IS curve formula.

$$\tilde{Y} = a - b(R_t - (r + 0.01)) \quad (6)$$

$$0.0068 = \tilde{Y} = 0 - 0.68(2 - (2 + 0.01)) \quad (7)$$

The change in technology causes a rightward shift in the IS curve.



1.4 Change in Investment

The government offers a temporary investment tax credit: for each dollar of investment that firms undertake, they receive a credit that reduces their corporate income taxes. The policy increases the share investment by 10% for one year.

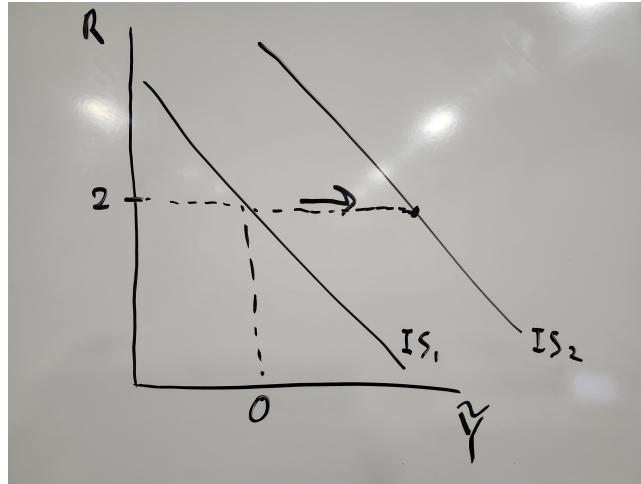
This is very similar to a decrease in consumption. Investment is calculated as a portion of a represented by a_i .

$$a = a_c + a_i + a_g + (a_{ex} - a_{im}) - 1 \quad (8)$$

with the change in policy there is a 10% increase in investment. This positively influences the IS curve.

$$\tilde{Y} = (a + 10\% \text{ of } a_i) - 0.68(2 - 2) \quad (9)$$

This causes a rightward shift of the IS curve.



2 Modifying the IS Curve

To have a more accurate IS curve consumption needs to be adjusted. The consumption function is modified to depend on the real interest rate, reflecting how households adjust spending based on borrowing costs. This change increases the sensitivity of aggregate demand to interest rate fluctuations.

2.1 Deriving the IS Curve with Changes in Consumption

This is the new IS curve that incorporates the changes in consumption.

Consumption is now given by:

$$\frac{C_t}{Y_t} = a_c - b_c(R_t - r) \quad (10)$$

The new IS curve incorporates both b and b_c . Adding in b_c allows the IS curve to adjust the sensitivity of consumption instead of lumping it all into b .

$$\tilde{Y} = a - (b + b_c)(R_t - r) \quad (11)$$

Compared to the original IS curve, where only investment responded to the interest rate, this modification makes the curve steeper. If b_c is positive, an increase in R_t reduces both consumption and investment, leading to a greater contraction in output.

This results in a larger downward slope of the IS curve, meaning interest rate changes now have a stronger effect on economic activity.

2.2 Original IS Curve Compared to New IS Curve

The values for the new IS curve are $a = 0$, $b = 0.68$, $b_c = 0.96$, $R = 2$, and $r = 2$.

Original equation:

$$\tilde{Y} = a - b(R_t - r) \quad (12)$$

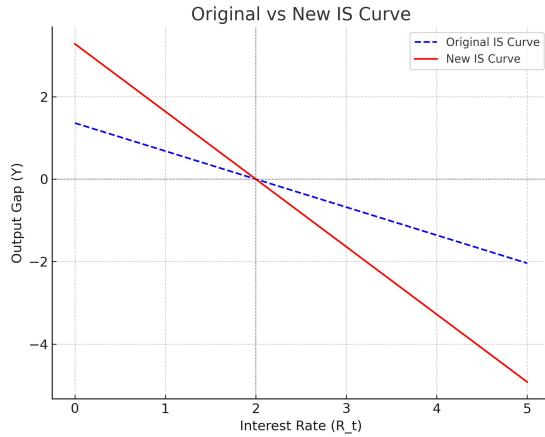
$$0 = \tilde{Y} = 0 - 0.68(2 - 2) \quad (13)$$

New equation:

$$\tilde{Y} = a - (b + b_c)(R_t - r) \quad (14)$$

$$0 = \tilde{Y} = 0 - (0.68 + 0.96)(2 - 2) \quad (15)$$

Graphically this is what the two different curves look like:



2.3 Model Differences in Reaction to Economic Shocks

These models handle economic shocks a little differently from each other. As shown in the graph the newer model is more sensitive to changes in interest rate. It has a steeper slope.

Let's compare the two with an economic shock from section one. What happens to the new model when the real interest rate drops to 0?

$$3.28 = \tilde{Y} = 0 - (0.68 + 0.96)(0 - 2) \quad (16)$$

The change in \tilde{Y} is much stronger. With the original model \tilde{Y} was only 1.68. This difference is caused by the model accounting for a high sensitivity in consumption through the b_c variable.