Macroeconomics

4. The IS Curve and Aggregate Demand

Bachelor's Degrees in Management and in Finance and Accounting

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The components of aggregate expenditure / aggregate demand

- Private consumption:

$$C = \bar{C} + cY_D - br$$

- Investment:

$$I = \bar{I} - dr_i \Leftrightarrow I = \bar{I} - d(r + \bar{f})$$

- Government spending:

$$G = \bar{G}$$

- Taxes:

$$T = \bar{T}$$

- Net exports:

$$NX = \bar{NX} - xr$$

Identity equations in the goods and services market

- Equilibrium in aggregate demand (expenditure):

$$D \equiv C + I + G + NX$$

- Equilibrium between output (income) and aggregate demand (expenditure):

$$Y \equiv D$$

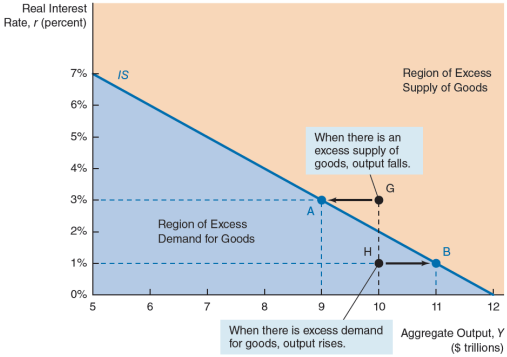
- Definition of disposable income:

$$Y_D \equiv Y - T$$

The IS curve

Definition and graphical representation

- **IS curve**: the relationship between aggregate output (Y) and the real interest rate (r), for a given level of autonomous demand $(\bar{A})$, at which the goods and services market is in equilibrium.



The IS curve

Derivation

- The identity equations together with the expressions defining the expenditure components are used:

$$
\begin{aligned}
& Y \equiv D \equiv C + I + G + NX \Rightarrow \\
& \Rightarrow Y = \bar{C} + cY_D - br + \bar{I} - d(r + \bar{f}) + \bar{G} + N\bar{X} - xr \Leftrightarrow \\
& \Leftrightarrow Y = \bar{C} + c(Y - T) - br + \bar{I} - d(r + \bar{f}) + \bar{G} + N\bar{X} - xr \Leftrightarrow \\
& \Leftrightarrow Y = \bar{C} + c(Y - \bar{T}) - br + \bar{I} - d(r + \bar{f}) + \bar{G} + N\bar{X} - xr \Leftrightarrow \\
& \Leftrightarrow Y = \bar{C} + cY - c\bar{T} - br + \bar{I} - dr - d\bar{f} + \bar{G} + N\bar{X} - xr \Leftrightarrow \\
& \Leftrightarrow Y - cY = \bar{C} - c\bar{T} - br + \bar{I} - dr - d\bar{f} + \bar{G} + N\bar{X} - xr \Leftrightarrow \\
& \Leftrightarrow (1 - c)Y = \bar{C} - c\bar{T} - br + \bar{I} - dr - d\bar{f} + \bar{G} + N\bar{X} - xr \Leftrightarrow \\
& \Leftrightarrow Y = \frac{1}{1 - c}(\bar{C} + \bar{I} - c\bar{T} - d\bar{f} + \bar{G} + N\bar{X}) - \frac{(b + d + x)}{1 - c}r \Leftrightarrow \\
& \Leftrightarrow Y = \frac{1}{1 - c}\bar{A} - \frac{(b + d + x)}{1 - c}r
\end{aligned}
$$

The IS curve

Compact formula

$$Y = m \times \bar{A} - m \times \phi \times r,$$

where

$$m = \frac{1}{1-c},\ \bar{A} = (\bar{C} + \bar{I} - c\bar{T} - d\bar{f} + \bar{G} + N\bar{X}) \text{ and } \phi = b + d + x$$

The Keynesian multiplier

Economic and mathematical concepts

- **Economic concept**: an increase/decrease in autonomous demand leads to an increase/decrease in equilibrium output by a greater amount than the initial change – i.e., a shock to aggregate demand is amplified (multiplied) by the effects it has on the expenditure components.
- **Mathematical concept**:

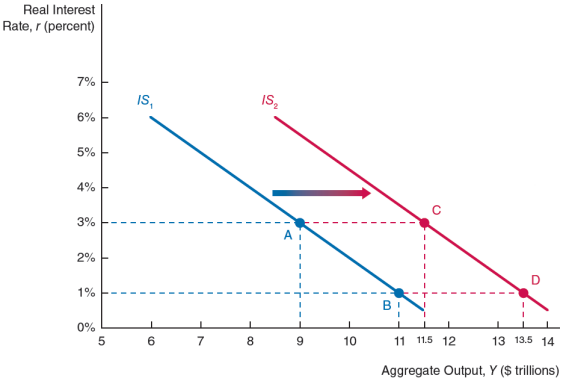
$$\Delta Y = \frac{1}{1-c} \times \Delta \bar{A}, \text{ with } m = \frac{1}{1-c} > 1 \text{ , because } 0 < c < 1$$

- When autonomous demand changes because one of its components changes, the IS curve shifts, which means that **for the same real interest rate GDP increases or decreases**.

The Keynesian multiplier

Shifts in the IS curve

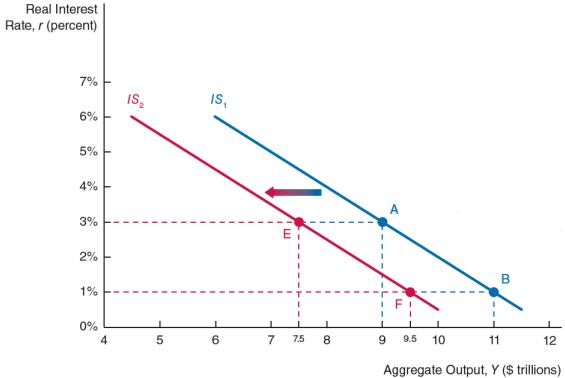
- Graphical representation of an **increase** in autonomous demand $(\bar{A})$ in the IS curve:



The Keynesian multiplier

Shifts in the IS curve

- Graphical representation of a **decrease** in autonomous demand $(\bar{A})$ in the IS curve:



Quantifying $\Delta\bar{A}$ given a target ΔY

- **Recall:** when autonomous demand changes because one of its components changes, the IS curve shifts, which means that **for the same real interest rate GDP increases or decreases**.
- We can quantify the change in autonomous demand required to obtain a given change in GDP, considering that GDP varies for the same real interest rate:

$$\Delta\bar{A} = \frac{\Delta Y}{m}$$

  - We choose one point on the initial curve and another on the final curve for which the real interest rate is the same. We then look at the change in GDP observed at that same interest rate and quantify $\Delta\bar{A}$.

References

- Mishkin, F. S. (2014), *Macroeconomics: Policy and Practice*, 2nd Edition, Pearson, Addison-Wesley, New York.