ECON 202 - MACROECONOMIC PRINCIPLES

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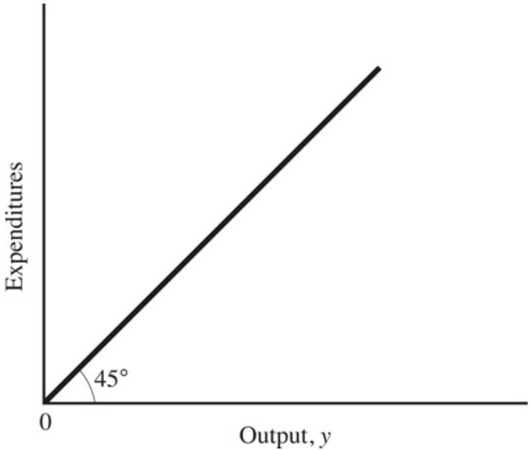
Chapter 11 - The Income-Expenditure Model

The Income-Expenditure Model - Topics

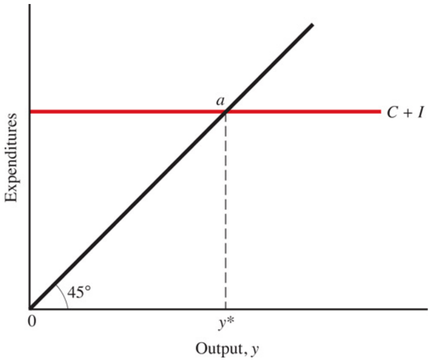
1. Discuss the income-expenditure model
2. Identify the two key components of the consumption function
3. Calculate equilibrium income in a simple model
4. Explain how government spending and taxes affect equilibrium income
5. Discuss the role of exports and imports in determining equilibrium income
6. Explain how the aggregate demand curve is related to the income-expenditure model

Income Expenditure Model

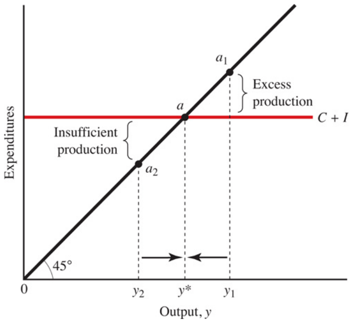


- At any point on the 45 degree line, the distance to the horizontal axis is the same as the distance to the vertical axis

Equilibrium Output



Adjustment to Equilibrium Output



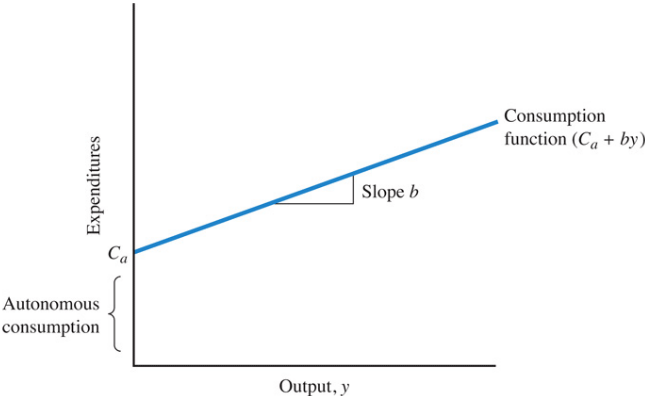
Consumption Function

The Consumption Function

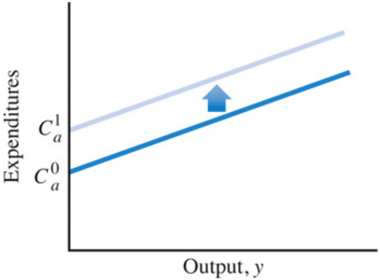
- The consumption function shows the relationship between desired spending and the level of income

$$C = C_a + b \times y$$

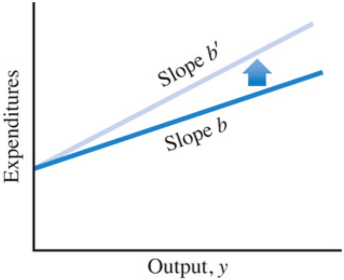
The Consumption Function



Changes in the Consumption Function

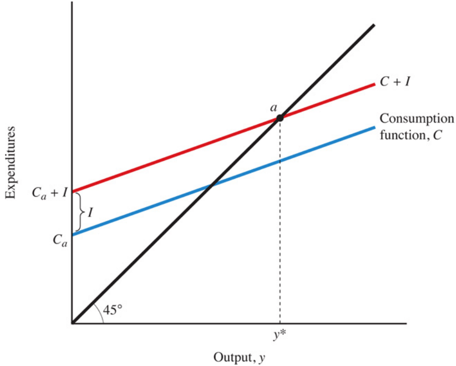


(A) An increase in autonomous consumption from C_a^0 to C_a^1 shifts up the entire consumption function.



(B) An increase in the MPC from b to b' increases the slope of the consumption function.

Equilibrium Output and the Consumption Function in a Closed Economy



Formula for Equilibrium Output

- output=planned expenditures$\rightarrow y = C + I$
- $C = (C_a + b \times y)$, so that
- $y = (C_a + b \times y) + I$. Rearranging
- $y - by = C_a + I$, so that
- $y^* = \frac{C_a + I}{1 - b}$

Savings and Investment

Savings and Investment in a Closed Economy without a Government

- Savings equals output minus consumption

$$S = y - C$$

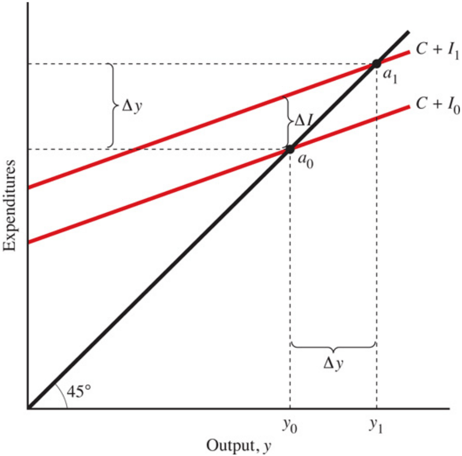
$$\rightarrow S = I$$

Investment Divided into 3 Components

- Remember that with a foreign sector (open economy) and a government we had:

$$I = S + (T - G) + (Im - Ex),$$

Understanding the Multiplier



Multiplier for Investment

- For the original level of investment at I_0we have

$$y_0 = \frac{C_a + I_0}{1 - b}$$

- For the new level of investment I_1we have

$$y_1 = \frac{C_a + I_1}{1 - b}$$

- The difference in output is then

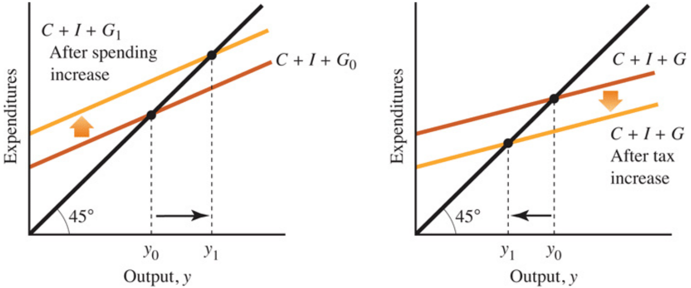
$$\begin{aligned}
\Delta y &= y_1 - y_0, \\
\rightarrow \quad \Delta y &= \frac{C_a + I_1}{1 - b} - \frac{C_a + I_0}{1 - b}, \\
\rightarrow \quad \Delta y &= \frac{I_1 - I_0}{1 - b}, \\
\rightarrow \quad \Delta y &= \frac{1}{1 - b}\Delta I,
\end{aligned}$$

Alternative Derivation of Multiplier

- $\Delta y = \$1 + (\$1 \times b) + (\$1 \times b^2) + (\$1 \times b^3) + ...$ or
- $\Delta y = \$1 \times (1 + b + b^2 + b^3 + ...)$
- This is an infinite series which can be written as

$$\Delta y = \$1 \times \frac{1}{1 - b}$$

Government Spending and Taxation



(A) An increase in government spending leads to an increase in output.

(B) An increase in taxes leads to a decrease in output.

Fiscal Multipliers

- Multiplier for government spending

$$\Delta Y = \left(\frac{1}{1-b}\right) \times \Delta G$$

- Investment multiplier

$$\Delta Y = \left(\frac{1}{1-b}\right) \times \Delta I$$

- Consumption multiplier

$$\Delta Y = \left(\frac{1}{1-b}\right) \times \Delta C$$

- Tax multiplier

$$\Delta Y = \left(\frac{-b}{1-b} \times\right) \times \Delta T$$

Government Spending and Taxes

- $C_a + b \times (y - T)$
- output = planned expenditures or

$$
\begin{aligned}
y &= C + I + G, \\
&\rightarrow y = (C_a + b \times (y - T)) + I + G, \\
&\rightarrow y - by = (C_a - bT) + I + G, \\
&\quad y^* = \frac{C_a - bT + I + G,}{1 - b}
\end{aligned}
$$

- Using this formula and the method just outlined, we can find the multiplier for changes in government spending and the multiplier for changes in taxes

Proof

Government spending multiplier:

$$y_0^* = \frac{C_a - bT + I + G_0,}{1 - b}$$

$$y_1^* = \frac{C_a - bT + I + G_1,}{1 - b}$$

Then

$$\begin{aligned} \Delta y = y_1 - y_0 &= \frac{C_a - bT + I + G_1}{1 - b} - \frac{C_a - bT + I + G_0,}{1 - b}, \\ &= \frac{G_1 - G_0}{1 - b}, \\ \rightarrow \Delta y &= \left(\frac{1}{1 - b}\right) \times \Delta G. \end{aligned}$$

Proof (cont.)

Tax multiplier:

$$y_0^* = \frac{C_a - bT_0 + I + G,}{1 - b}$$

$$y_1^* = \frac{C_a - bT_1 + I + G,}{1 - b}$$

Then

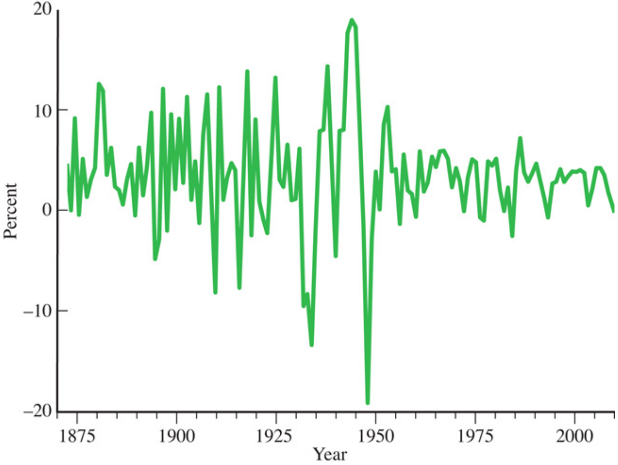
$$\begin{aligned}\Delta y = y_1 - y_0 &= \frac{C_a - bT_1 + I + G}{1 - b} - \frac{C_a - bT_0 + I + G,}{1 - b}, \\ &= \frac{-bT_1 - (-bT_0)}{1 - b}, \\ &= \frac{-b \times (T_1 - T_0)}{1 - b}, \\ \rightarrow \Delta y &= \left(\frac{-b}{1 - b}\right) \times \Delta T.\end{aligned}$$

Balanced Budget Multiplier

- Increasing T and G by equal amounts will $\uparrow Y$
- G has larger multiplier than taxes T
- Increase of y due to $\uparrow G$ outweighs the decrease of y due to $T \uparrow$
- Balanced budget multiplier

$$\begin{aligned} BBM &= \frac{1}{1-b} + \frac{-b}{1-b}, \\ &\rightarrow \quad BBM = \frac{1-b}{1-b}, \\ &\rightarrow \quad BBM = 1 \end{aligned}$$

Growth Rates of U.S. GDP, 1871–2011

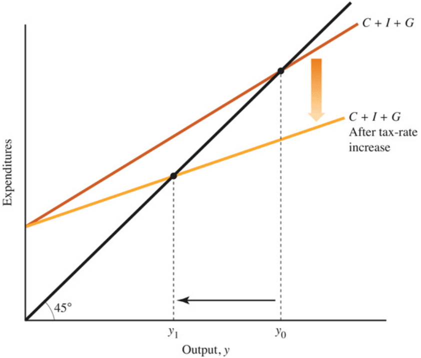


Automatic Stabilizers

Understanding Automatic Stabilizers

- Automatic stabilizers are taxes and transfer payments that stabilize GDP without requiring policymakers to take explicit actions
  - When income is high, the government collects more taxes and pays out less transfer payments $\rightarrow C \downarrow$
  - When output is low, the government collects less taxes and pays out more in transfer payments $\rightarrow C \uparrow$
- Automatic stabilizers prevent
  - C from falling as much in bad times (reduce multiplier when y is low)
  - C from rising as much in good times (reduce multiplier when y is high)
  - Automatic stabilizers reduce the multiplier!

Understanding Automatic Stabilizers



Understanding Automatic Stabilizers

- If consumption depends on after-tax income, we have the following consumption function:

$$C = C_a + \overbrace{b \times (1 - \tau)}^{\text{slope}} \times y$$

- Adjusted $MPC = b \times (1 - \tau)$
- An increase in tax rates decreases the slope of the $C + I + G$ line
- The tax lowers output and **reduces** the multiplier
- New Multiplier: $\frac{1}{1 - b \times (1 - \tau)}$ is smaller than $\frac{1}{1 - b}$

Exports and Imports

- Consumers will import more goods as income rises

$$M = m \times y$$

- The fraction m is known as the marginal propensity to import
- We subtract this fraction from b, the overall marginal propensity to consume, to obtain the *MPC* for spending on domestic goods, b–m

Equilibrium Output with Government Spending, Taxes, and the Foreign Sector

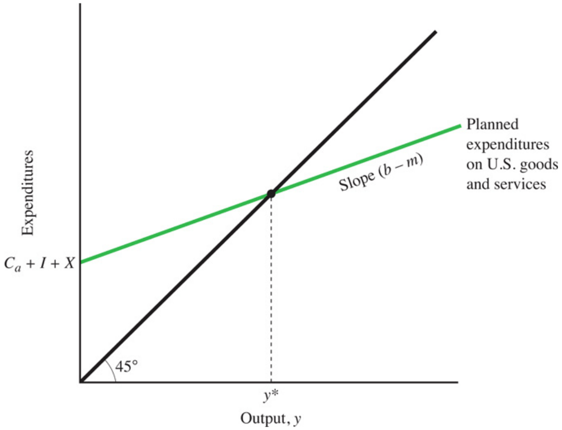
- Output equals planned expenditures

$$y = C + I + G + X - M$$

- Substituting $C = C_a + b(y - T)$ and $M = m \times y$ we get

$$\begin{aligned} y &= (C_a + b(y - T)) + I + G + X - m \times y, \\ &\rightarrow y - by + my = (C_a - bT) + I + G + X, \\ &\rightarrow y^* = \frac{C_a - bT + I + G + X}{1 - b + m}, \\ &\rightarrow y^* = \frac{C_a - bT + I + G + X}{1 - (b - m)}, \end{aligned}$$

U.S. Equilibrium Output in an Open Economy



U.S. Equilibrium Output in an Open Economy

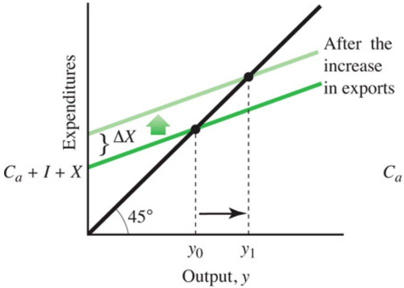
- Output equals planned expenditures: $y = C + I + G + X - M$
- Substituting $C = C_a + b\,(y - T)$ and $M = m \times y$ we get

$$y = C_a + b(y - T) + I + G + X - my$$

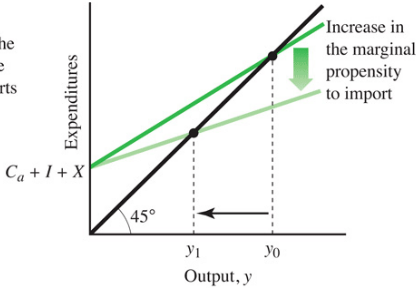
- so that the new expenditure function is:

$$y = \overbrace{C_a + I + G + X - bT}^{\text{intercept}} + \overbrace{(b - m)}^{\text{slope}}y$$

How Increases in Exports and Imports Affect GDP



(A) An increase in exports will increase the level of GDP.



(B) An increase in the marginal propensity to import will decrease the level of GDP.

Fiscal Multipliers in Open Economy are Smaller

- Multiplier for government spending

$$\Delta Y = \left(\frac{1}{1 - (b - m)} \right) \times \Delta G$$

- Investment multiplier

$$\Delta Y = \left(\frac{1}{1 - (b - m)} \right) \times \Delta I$$

- Consumption multiplier

$$\Delta Y = \left(\frac{1}{1 - (b - m)} \right) \times \Delta C$$

- Export multiplier

$$\Delta Y = \left(\frac{1}{1 - (b - m)} \right) \times \Delta X$$

- Tax multiplier

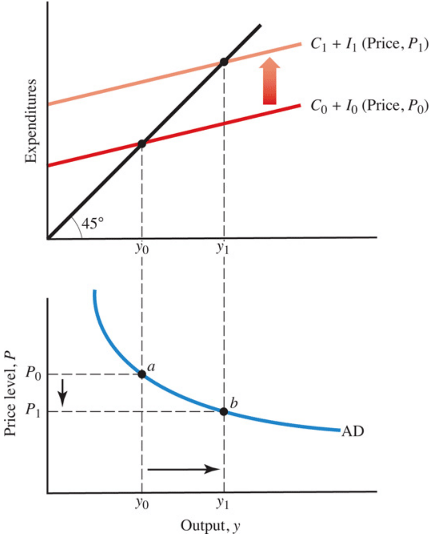
$$\Delta Y = \left(\frac{-b}{1 - (b - m)} \times \right) \times \Delta T$$

Locomotive Effect

- From the early 1990s until quite recently, the United States was what economists term the "locomotive" for global growth
- Our demand for foreign products increased. U.S. imports increased along with output during this period
- The increased demand fueled exports in foreign countries and promoted their growth
- Studies have shown that the increase in demand for foreign goods was actually more pronounced for developing countries than for developed countries
- Conclusion: The United States was truly a locomotive, pulling the developing countries along

Income Expenditure Model and AD Curve

The Income-Expenditure Model and the Aggregate Demand Curve



The Income-Expenditure Model and the Aggregate Demand Curve