Essentials of Economics II
Chapter 4: The Keynesian cross (45-degree line), Income – expenditure model

Essentials of Economics II

Ferdowsi University of Mashhad

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45° degree line and the circular flow of income

- **Definition:** The 45-degree line, also known as the Keynesian cross, is a graph where the horizontal axis represents national income or GDP, and the vertical axis represents total expenditures.

- Importance: The 45-degree line is a key concept in macroeconomics, as it helps to understand the equilibrium level of national income in the short run.

- Reminder: Remember that in previous chapter we reached the following equation:

$$GNP = Y = C + I + G + X - M$$

Now we want to go inside that equation deeply and step by step.

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- **Aggregate expenditure:** This is the total amount of spending on goods and services in an economy in a given period of time.
- **Output:** This refers to the total value of goods and services produced in the economy in a given period of time.
- **Relationship to the 45-degree line:** The 45-degree line represents all points where aggregate expenditure is equal to output.
- **Equilibrium:** occurs when the level of aggregate expenditure is equal to the level of output.
- **Intersection:** This occurs at the point where the aggregate expenditure schedule intersects with the 45-degree line, representing equilibrium in the economy.

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Business Inventories and Future GDP

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- If aggregate expenditure is less than output, businesses will have **excess inventory**, leading them to reduce **production** and decrease **future GDP**.

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❑ **Two sector model** with **exogenous** investment:

- Keynes believes that the consumer consumes more with an increase in her income, but the **increase in consumption is less than the increase in income**. The coefficient of these changes is called the marginal propensity to consume (MPC), which is equal to the ratio of changes in consumption to changes in national income (Y). Thus we have:

$$C = C_0 + cy$$

In which: C_0 is independent consumption and c is the MPC.

45° degree line and the circular flow of income

❑ **Two sector model** with **exogenous** investment:

- Now in combination with two sector model we have:

$$y^d = C + I = C_0 + cy + I_0$$

In which y^d is the aggregate demand (expenditure)

- Here we assumed that the national income (y) is equal to aggregate demand (y^d).
- But when can it be true?
- The 45° **degree line** will answer that.

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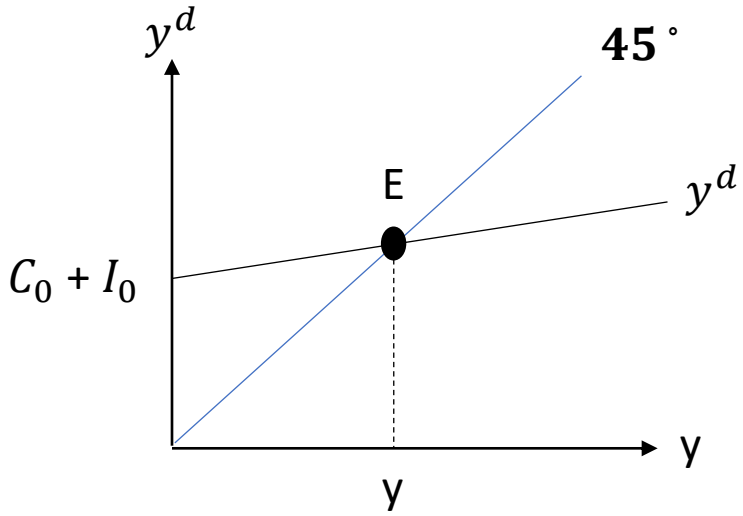

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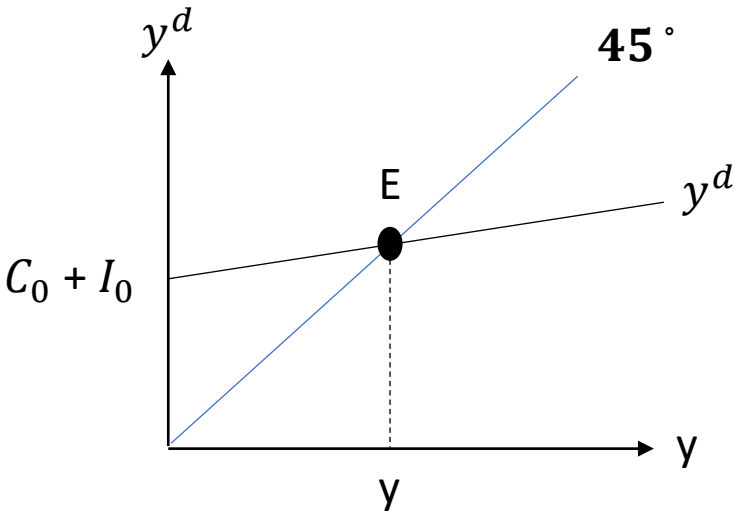
❑ **Two sector model** with **exogenous** investment:

- In equilibrium (E) the aggregate supply (national income (y)) is equal to the aggregate demand.



Aggregate demand = Aggregate supply $\Rightarrow Y^d$ = Y $\Rightarrow C_0$ +cY + $I_0 = Y \Rightarrow Y\,(1-c) = C_0 + I_0 \Rightarrow$ Y = $\frac{C_0 + I_0}{1-c}$

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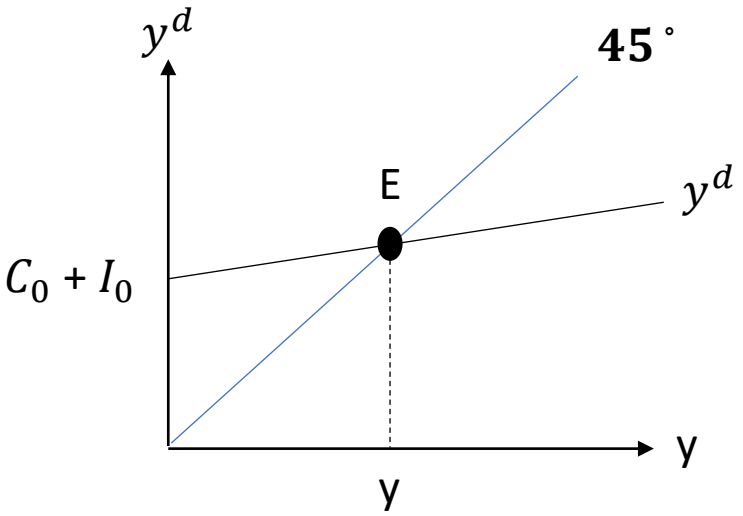
- **Two sector model** with **endogenous** investment (investment a function of national income):
- Here both consumption and investment are functions of national income)



Y^d = C + I = $C_0 + I_0$ + cY + eY where e is the marginal propensity of saving (MPS)

Aggregate demand = Aggregate supply $\Rightarrow Y^d = Y \Rightarrow C_0 + I_0 + (c + e)Y = Y \Rightarrow ((1 - (c + e))Y = C_0 + I_0 \Rightarrow Y = \frac{C_0 + I_0}{1 - (c+e)}$

45° degree line and the circular flow of income

❑ **Three sector model** with **fixed taxes**:

- Fixed taxes are assumed to be equal to T_0 (Also governmental transfers are denoted with TR_0)

NT = T – TR = T_0 - TR_0

C = C_0 + c Y^d = C_0 + c (Y - T_0 + TR_0) = C_0 + c TR_0 - cT_0 + cY => Y^d = C +I + G = C_0 + c TR_0 - c T_0 + I_0 + G_0 + cY

Aggregate demand = Aggregate supply ⇒ Y^d = Y ⇒ Y = C_0 + c TR_0 – c T_0 + I_0 + G_0 + cY ⇒ Y (1-c) = C_0 + c TR_0 – c T_0 +

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❑ **Three sector model** with **variable taxes**:

- Here taxes are a function of national income:

$$T = T_0 + tY$$

C = C_0 + c Y^d = C_0 + c (Y - T_0 + TR_0 -tY) = C_0 + c TR_0 - cT_0 + c(1-t)Y => Y^d = C +I + G = C_0 + c TR_0 - c T_0 + I_0 + G_0 + c(1-t)Y

Aggregate demand = Aggregate supply ⇒ Y^d = Y ⇒ Y - c(1-t)Y = C_0 + c TR_0 − c T_0 + I_0 + G_0 ⇒

$$Y = \frac{C_0 + c\,TR_0 - c\,T_0 + I_0 + G_0}{1 - c\,(1-t)}$$

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❑ **Four sector model** :

- Here taxes are a function of national income:

$Y^d = C + I + G + (X - M)$ *In this model export is exogenous but import and investment are endogenous*

$Y^d = C_0 + c\,(Y - T_0 + TR_0 - tY) + I_0 + G_0 + eY + X_0 - M_0$

Aggregate demand = Aggregate supply $\Rightarrow Y^d = Y \Rightarrow Y(1 - c(1 - t) - e + m) = C_0 + c\,TR_0 - c\,T_0 + I_0 + G_0 + X_0 - M_0 \Rightarrow$

$$Y = \frac{C_0 + I_0 + G_0 + X_0 - M_0}{1 - c(1 - t) - e + m} - \frac{cT_0}{1 - c(1 - t) - e + m} + \frac{cTR_0}{1 - c(1 - t) - e + m}$$