The Keynesian model of general equilibrium

Important: This file is only a summary of the axis and the details are studied in class
هذا الملف يعتبر ملخصا فقط والتفاصيل تمت دراستها أثناء الحصص، انظر لكل ما يتعلق بالتوازن ضمن حلول السلسلة الرابعة.

A. Some of the salient features of Keynesian economics :

- The imperfet competition.
- The real sector is closely related to the money sector.
- The wages and prices are rigid, they are not flexible.
- The nomial wage is the main variable in the labour market, the people or firms does not decide according to the variation of real wages as shown with the classical theory.
- The government intervention and state regulation of the economy are necessary, because the expenditures of the private sector (households and firms) can not provide the amount of aggregate demand required to achieve the potential level of aggregate supply.
- The effective demand: the aggregate demand determine the aggregate supply, not the opposite. Firms are ready to produce as many goods as consumers are ready to buy from them. Therefore, the Keynesian model studies the behavior of the economy from the side of aggregate demand (the demand-side model).
- The equilibrium does not have to be achieved at full employment.

B. The consumption function:

According to Keynes, the level of employment is determined by effective demand which, in turn, is determined by aggregate demand price and aggregate supply price.

1. Keynes' Psychological Law of Consumption :

The Keynesian concept of consumption function come from the fundamental **psychological law of consumption** which states that people are disposed, on an average, to increase their consumption as their income increases, but not by as much as the increase in their income, because a part of the income is also saved. The fundamental psychological law of consumption is based on three propositions with respect to consumption behaviour.

2. Average and marginal propensity to consume :

If we denote income by letter Y, and consumption by the letter C, then propensity to consume can be expressed as: $C = f(Y)$.

The schedule 4.1 below is prepared based on the Keynes' law of consumption, considering Y the independent, ad C as the dependent variable. The column 2 indicates various levels of C corresponding to various levels of income.

When the level of income rises from 100 units to 120 units, consumption increases from 90 units to 106 units. This means that an icrease of 20 units in icome leads to an increase of 16 uits only in consumption. The increase in consumption is less than the increase in income, that means that the rest of icrease(4 units) are saved. **The increase in icome is distributed between consumption and savings.**

The **A**verage **P**ropensity to **C**onsume **APC** is the ratio of aggregate consumption to the aggregate income, it can be expressed as: $\frac{C}{Y}$.

On the other hand, the **M**arginal **P**ropensity to **C**onsume **MPC** states how an increase in income can be divided between consumption and saving. It is defined as the ratio of chage in consumption to the change in icome: $\frac{\Delta C}{\Delta Y}$.

According to the schedule above, any increase in income will be distributed between consumption, at rate of 0.9, and saving with the remaining portion:0.1.

What is the relationship between APC and MPC?

As shown above, APC=$\frac{C}{Y}$ and MPC= $\frac{\Delta C}{\Delta Y}$, the relationship can be explain mathematically as:

C = a+ bY $\Rightarrow \frac{C}{Y} = \frac{a}{Y} + b\frac{Y}{Y} \quad \Rightarrow \quad \frac{C}{Y} = \frac{a}{Y} + b \quad \Rightarrow \quad \mathbf{APC} = \frac{a}{Y} + \mathbf{MPC}$

Since a > 0, $\frac{a}{Y}$ > 0**,** then: **APC > MPC**

3. **The shape of the consumption function:**

The Keynes' consumption function can be expressed in the following form:

$$C = a + bY_d$$

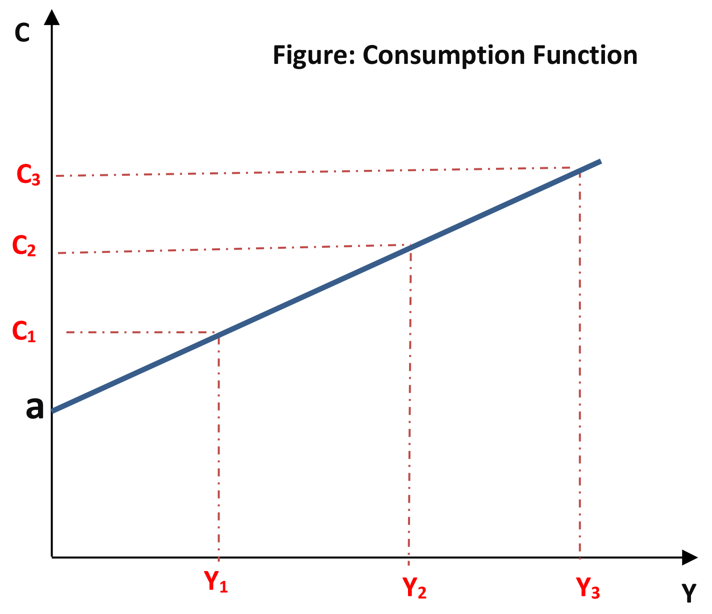
Where :

C = consumption expenditure

Y_d =The real income

a =The constant parameter which reflects autonomous consumption, it is the amount of consumption expenditure at zero level of income. That means that the aggregate consumption is never zero, there are always other sources to consume from if there is no income.

b= The constant parameter which reflects the marginal propensity to consume (MPC) which measures the increase in consumption spending in response to per unit increase in disposable income. Mathematically: **b= MPC = ΔC/ΔY**.



Example 4.1:

The following table gives the data on income and consumption:

Table 4.1: propensity to consume.

Y	C	c/y	Δc/Δy
100	90	0.9	
120	106	0.9	0.8
140	122	0.9	0.8
160	138	0.9	0.8
180	154	0.9	0.8

Calculating MPC:

MPC = b = Δc/Δy we can choose any two consumption values and their corresponding income values as follows:

$$\left.\begin{aligned} \Delta c/\Delta y &= \frac{\mathbf{106-90}}{\mathbf{120-100}} = \mathbf{0.8} \\ \Delta c/\Delta y &= \frac{\mathbf{122-106}}{\mathbf{140-120}} = \mathbf{0.8} \\ \Delta c/\Delta y &= \frac{\mathbf{154-90}}{\mathbf{180-100}} = \mathbf{0.8} \end{aligned}\right\} \Rightarrow \mathbf{b = 0.8}$$

Calculating APC:

$\frac{C}{Y} = \frac{154}{180}$ =0.85 ≈ **0.9**

Calculating a:

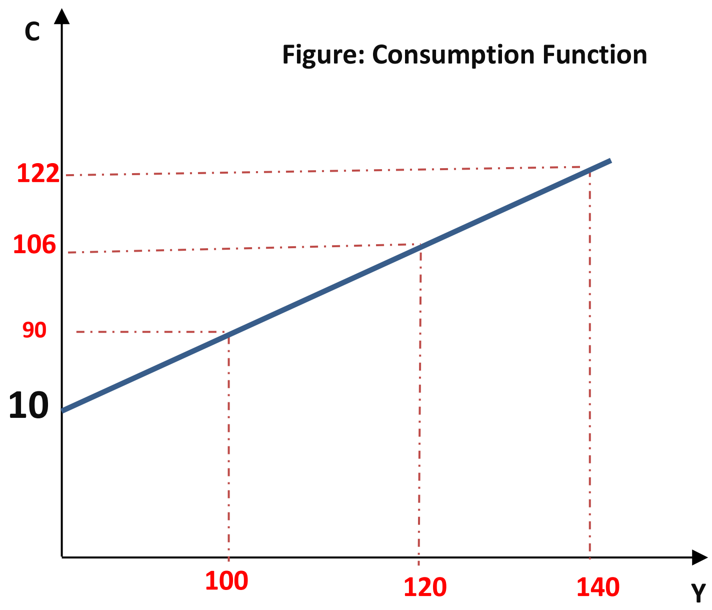
We have that: C = a + b Y $\Rightarrow 90 = a + 0{,}8(100) \Rightarrow a = 90\text{-}80 \Rightarrow$ **a=10**

Derivation of the consumption function:

C = a + b Y we substitute the values of both a and b, and we obtain:

$C = 10 + 0.8\,Y$

Graghic:



C. The savings function:

Savings can be defined as income not spent on consumption.

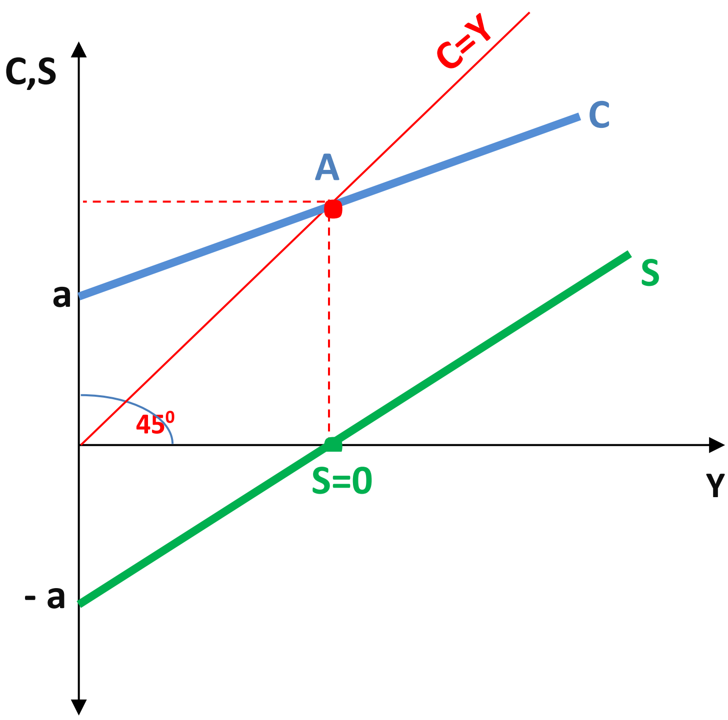
1. **The shape of savigs function:**

If we denote savings with letter S, we can write the savings function as: $S = f(Y)$.

$S = Y - C \Rightarrow S = Y - (a+bY) \Rightarrow S = Y - a - bY \Rightarrow S = -a + (1-b)Y$

$S = -a + (1-b)Y$ this is the form of the savings function, which is derived from the cosumption function.

Figure: Consumption and savings



2. **Average and marginal propensity to save :**

As discussed above, the savings is what remains of income after consumption. Thus, the propensity to save is the remainder of the marginal propensity to consume, this means that the marginal propensity to save **MPS** equal to **1-b.**

It can be proven as follows:

$S_1 = -a + (1-b)Y_1$

$S_2 = -a + (1-b)Y_2$

the change in savings denoted by ΔS, is the difference between S_2 and S_1:

$\Delta S = [-a + (1-b)Y_2] - [-a + (1-b)Y_1]$

Simplifying :

$\Delta S = -a + (1-b)Y_2 + a - (1-b)Y_1 \Rightarrow \Delta S = (1-b)(Y_2 - Y_1) \Rightarrow \frac{\Delta S}{\Delta Y} = \mathbf{(1-b)}$

The average propensity to save **APS** = $\frac{S}{Y}$

What is the relationship between MPC and MPS? And between APC and APS?

1. Since: Y=C+S ⇒ $\Delta Y = \Delta C + \Delta S$, we divide both sides by ΔY , we obtain:

$\frac{\Delta Y}{\Delta Y} = \frac{\Delta C + \Delta S}{\Delta Y} \Rightarrow 1 = \frac{\Delta C}{\Delta Y} + \frac{\Delta S}{\Delta Y}$ since $\frac{\Delta C}{\Delta Y}$ = MPC and $\frac{\Delta S}{\Delta Y}$ = MPS we get $\mathbf{1 = MPC + MPS}$

2. Since: Y=C+S, we divide both sides by Y , we obtain:

$\frac{Y}{Y} = \frac{C+S}{Y} \Rightarrow 1 = \frac{C}{Y} + \frac{S}{Y}$ since $\frac{C}{Y}$ = APC and $\frac{S}{Y}$ = APS we get $\mathbf{1 = APC + APS}$

Example 4.3:

Using the data from example 4.1, derive the savings function, and illustrate it in a graph?

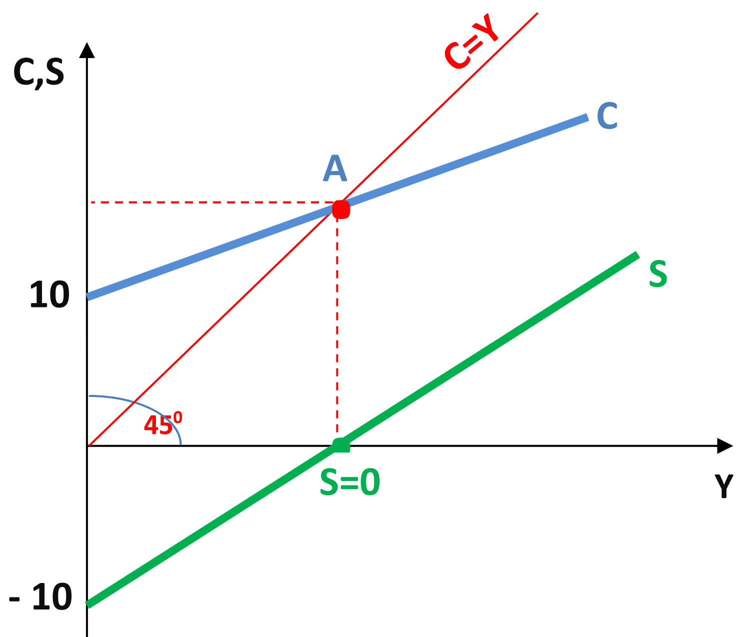
Calculate the income when S =0?

Calculate the income Y when the C line intersects with the 45^0 line?

According to the data from the example 4.1 the consumption function is as follows:

C = 10+0.8Y

Since Y=C+S ⇒ $S = Y - C \Rightarrow S = Y - (10 + 0.8Y) \Rightarrow S = Y - 10 - 0{,}8Y \Rightarrow$ $\mathbf{S = -10 + 0.2Y}$



When S =0 ⇒ **S = -10+0.2Y =0** ⇒ 10 = 0.2 Y ⇒ **Y = 50**

when the C line intersects with the 45^0 line the C = Y, it is the same point when S=0, thus **the income Y when C=Y equal to 50.**

D. The investment function:

The main factors that affect the investment :

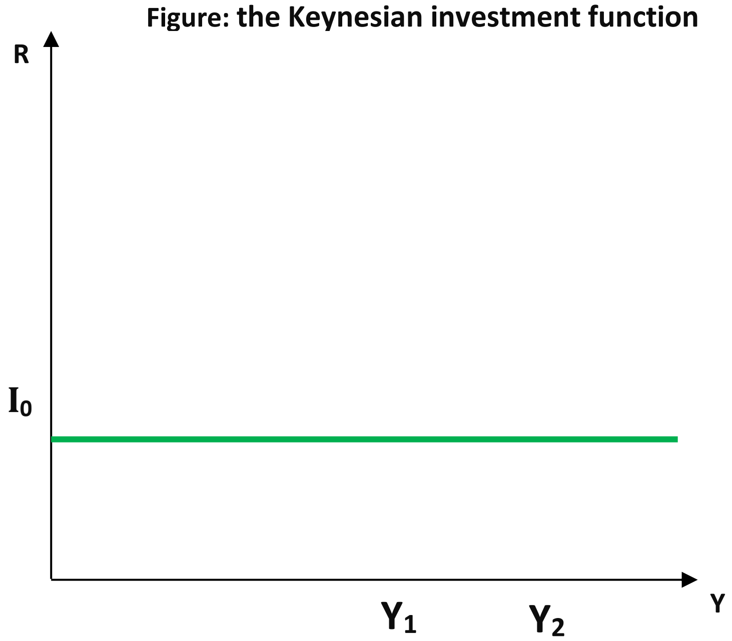
The three important variables which determine the level of investment under Keynesian theory are :

- The supply price of capital goods.
- The Marginal effeciency of capital.
- The Rate of interest.

- **The supply price of capital goods :** it is not the market price of the capital goods, but the price which would just induce manufacturer newly to produce an additional unit of such asset, what is sometimes called it's replacement cost.
- **The Marginal effeciency of capital :**
- **The Rate of interest :** the investment is inversly related to the interest rate. In other words, at lower rate of interest there is greater incentive to invest, and vice versa.

Since the keynesian assumptions stated that investment is independent of the income, i twill be presented as shown in the graphic below :

Figure: the Keynesian investment function



E. The Aggregate Demand AD :

Effective Demand **EF** = National Income =Consumption Demand + Investment Demand

EF = AD= C+I

Looking at the data in the table **4.2** below, when the income equal to 0, the consumption could not equal to zero, it is 100 units, this means that the investment here fills the gap with negative value : -100, since Y=C+I.

Table 4.2: consumption schedule.

Y	C
0	100
100	180
500	500
700	660
900	820

Table 4.2: relation between consumption, income and investment.

Y=C+I	C	I=Y-C
0	100	**-100**
100	180	**-80**
500	500	**0**
700	660	**+40**
900	820	**+80**

Example 4.4 :

If we have the following consumption function: C=40+0.4Y

- Calculate the level of income if there is no investment.
- If there is an investment whis equals to 80, calculate the income Y ?
- Calculate I if the income equals to 400 ?
- Graphically represent the previous cases?

Calculation of the level of income if there is no investment :

Since Y=C+I ⇒ Y=C ⇒ Y = 40+0.4Y ⇒ Y=40/0.6 ⇒ **66.67=Y**

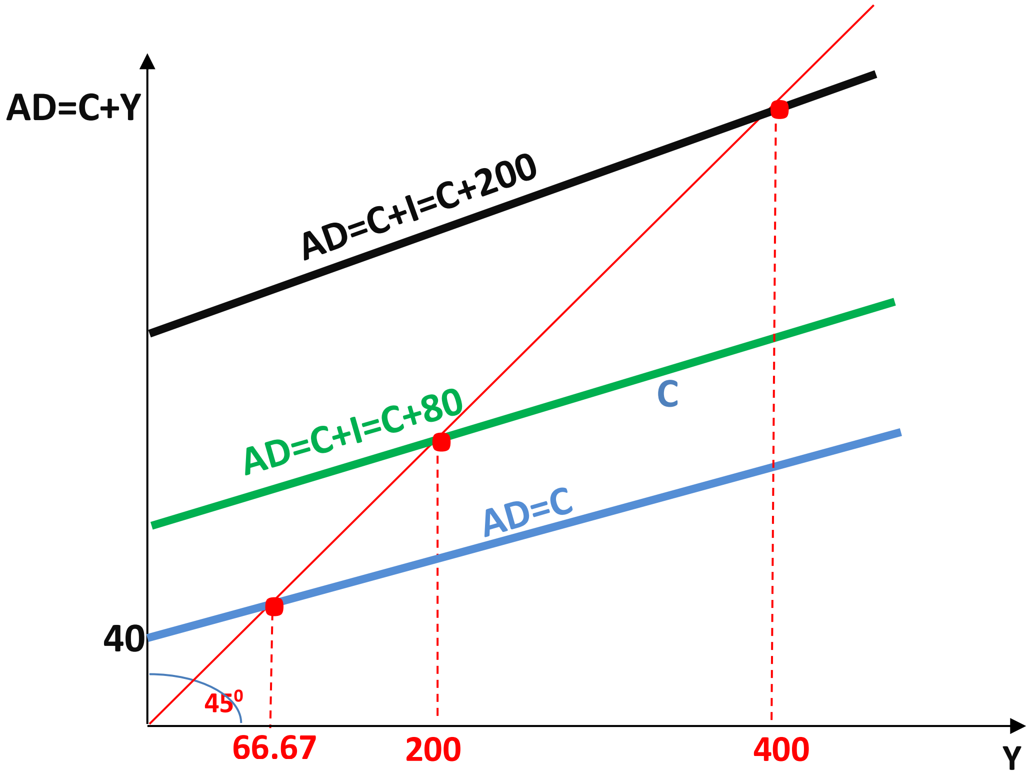
If there is an investment whis equals to 80, calculate the income Y ?

Since Y=C+I ⇒ Y=C+80 ⇒ Y= 40+0.4Y+80 ⇒ Y=120+0.4Y ⇒ Y=120/0.6 ⇒**Y=200**

Calculate I if the income equals to 400 ?

Since Y=C+I ⇒ I=Y-C ⇒ I=Y-(a+bY) ⇒ I = (1-b)Y – a ⇒ I=0.6(400)-40 ⇒ **I=200**

Graphically represent the previous cases?


AD=C+Y
AD=C+I=C+200
AD=C+I=C+80
C
AD=C
40
45⁰
66.67
200
400
Y