CHAPTER 11

The Neo-Keynesian Model

Sasan Fayazmanesh

Summary

This chapter deals with the Keynesian (neo-Keynesian) model of the equilibrium output.

It covers: 1) the consumption function, including marginal propensity to consume; 2) saving function, including marginal propensity to save; 3) investment function; 4) government expenditure function; 4) aggregate expenditure function; and 5) equilibrium level of output.

It also covers the concept of Keynesian or "expenditure multiplier."

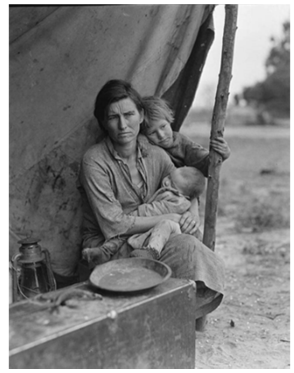
Introduction to neo-Keynesian Economics

Neoclassicals' laissez faire theories of the labor market and loanable funds market made no sense during the Great Depression of 1929-1939.

The theories and pictures did not match!

- Wages fell, but there was no increase in employment
- Interest rates fell, but there was no new investment
- Supply did not create its own demand (Say's Law)

"Work is what I want, not charity.
Who will help me get a job?
7 years in Detroit, no money, sent away.
Furnish best of references, phone . ."

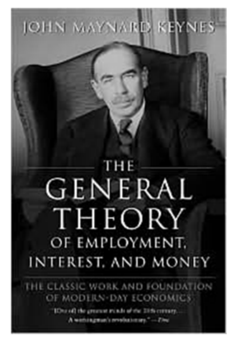


Dorothea Lange's *Migrant Mother* Nipomo, California, March 1936.

See more images of the Great Depression

In *The General Theory of Employment, Interest and Money* (1936), Keynes challenged some aspects of these theories, as well as the Say's Law.

See: General Theory



Keynes went on to develop new theories of:

1) How **outpu**t and **employment** are determined.
2) How **interest rate** is determined.
3) What is the role of **money** in the economy.

Soon after, however, Keynes's ideas were simplified and incorporated into the neoclassical models.

This was the beginning of the "**neoclassical synthesis**" or "**neo-Keynesian**" model.

The Basic Neo-Keynesian Model

We start with the GNP (Y) identity:

$$Y = C + I_g + G + (X–M)$$

These assumption also make **output** (GNP) and **disposable personal income equal**:

NNI = Y – ~~Depreciation~~ – ~~IBTs~~

PI = NNI + ~~Transfer payments~~

DPI = PI – ~~Direct taxes~~

Y = DPI

Simplifying assumptions

1) Economy is “closed”: No X – M

$$Y = C + I_g + G$$

2) Economy is “private”: No G

$$Y = C + I_g$$

3) There is no depreciation:
Gross investment = Net investment

$$Y= C + I$$

Since

Y= DPI = Consumption + Savings

Then :

1) Y = C+S (income side)

2) Y = C+ I (output side)

1 and 2 imply:

3) S = I

Since C+S = C+ I

These assumption also make **output** (GNP) and **income** (disposable personal income) **equal**:

NNI = Y – Depreciation – IBTs

PI = NNI + Transfer payments

DPI = PI – Direct taxes

Note: S = I is just an accounting identity.

As we will see, S = I does not imply economic stability, since I is actual investment (I_a) as opposed to planned investment (I_p):

$$\mathbf{I_a = I_p + \Delta\ Inventories}$$

Stable economy implies:

Δ Inventories = 0 and

$$\mathbf{S = I_p}$$

Consumption Function

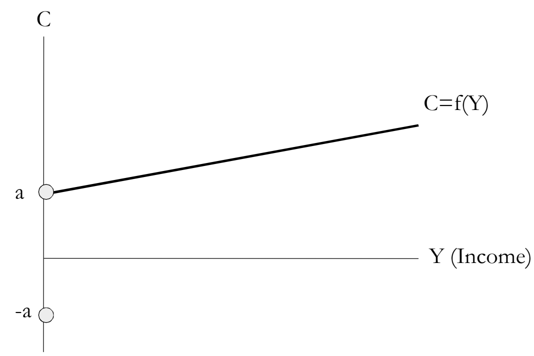
Keynes hypothesized that consumption spending is a function of disposable personal income:

C= f(Y).

This idea became known as the consumption function:

Def. **Consumption function** (**C**): a relationship between **consumption spending** and income (disposable personal income).

Consumption function



After Keynes, it was argued that consumption depends on various other factors:

C = f (Y, W, i, E)

Where,

W: is wealth or assets,
i: is interest rate,
E: is expectation of future income.

Shifts or Changes in Consumption

If

C = f (Y, W, i, E),

then any change in W, i, or E will shift the consumption function.

Example,

What happens if **interest rates fall**?

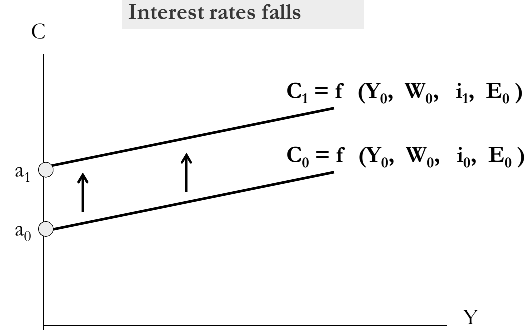
Keynes assumed:

1) There is a **minimum amount of consumption**; i.e., even when national income is zero, there is still some consumption. This is called autonomous consumption.

   Q: Where could this consumption come from?
   A: Past savings.

2) **Consumption rises as national income rises**, but it does **not** rise **as fast.**

Interest rates falls



Linear consumption function:

We assume that consumption function is given by :

C = a + bY

Where "**a**" is the C intercept and "**b**" is the **slope of the consumption function.**

It must be that:

0 < b < 1

MPC = ΔC/ΔY

MPC = (C2 – C1) / (Y2 – Y1)

MPC = ($1000 – $850) / ($1200 – $1000)

MPC = $150/ $200

MPC = 3/4 = .75

Marginal Propensity to Consume

Def. Marginal Propensity to Consume (MPC) : The increase in consumption which results from an increase in income:

MPC = ΔC/ ΔY

This is obviously the same as the slope of the consumption function or "**b**":

MPC = b

Average Propensity to Consume

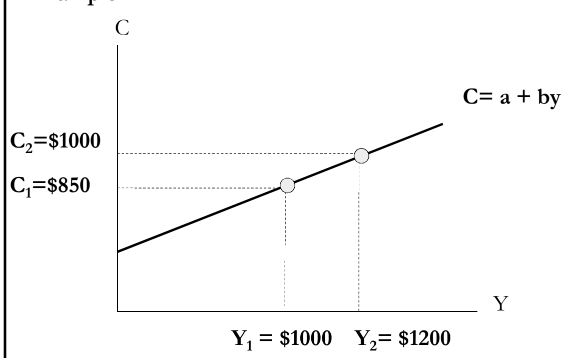
Def. Average Propensity to Consume (APC) :

The level of consumption divided by the level of income:

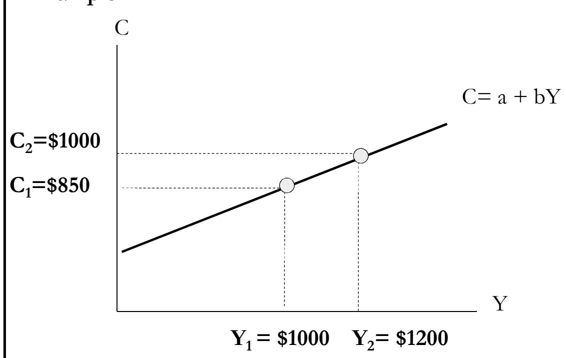
APC = C / Y

APC obviously changes as income changes.

Example



Example



$APC_1 = C_1/Y_1$

$APC_1 = \$850/\$1000$

$APC_1 = .85$

$APC_2 = C_2/Y_2$

$APC_2 = \$1000/ \$1200$

$APC_2 = .83333$

Marginal Propensity to Save

Def. Marginal Propensity to Save (MPS) : The increase in saving which results from an increase in income:

MPS = ΔS/ ΔY

This is the same as the slope of the savings function or "1−**b**"

MPS = 1 − b

Saving Function

Y = S +C, Therefore,

S = Y− C

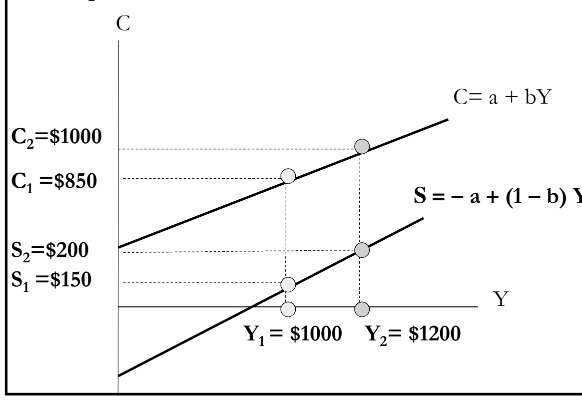
If **C = a + bY, then**

S = Y – (**a + bY)**

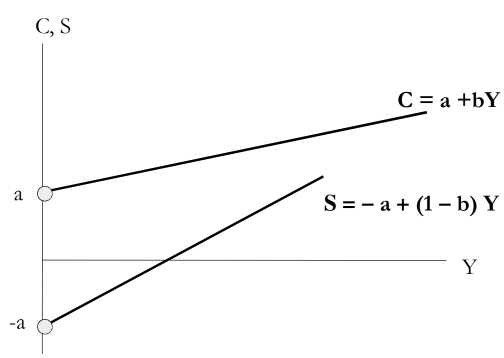
S = Y – **a – bY**

S = – a + (1 – b) Y

Example



Saving function



MPS = ΔS/ΔY

MPS = (S2 – S1) / (Y2 – Y1)

MPS = (\$200 – \$150) / (\$1200 – \$1000)

MPS = \$50/ \$200

MPS = 1/4 = .25

Q: What do we get when we add MPC and MPS?

A: One!

Our example:

MPC =.75
MPS =.25

MPC +MPS =.75 +.25 = 1

Q: What do we get when we add APC and APS?

A: One, again!

Our example:

APC =.85
APS =.15

APC +APS =.85 +.15 = 1

MPC + MPS = 1 is true by definition:

MPC = b
MPS = 1-b
MPC +MPS =b + 1- b = 1

APC +APS = 1 is also true by definition:

Y = C +S

Divide both sides by Y:

Y/Y = C/Y + S/Y

1 = APC +APS

Similarly

Y= C +S

Δ Y= Δ C + Δ S

Divide both sides by Δ Y

Δ Y/ Δ Y = Δ C/ Δ Y + Δ S / Δ Y

1 = MPC + MPS

Investment Function

Remember that **actual investment** (**I**) has 3 components:

1) Structures and equipment
2) Residential structures
3) Changes in inventories

Also remember the relation between actual investment (I_a) and planned investment (I_p):

$$I_a \; = \; I_p + \Delta \text{ Inventories}$$

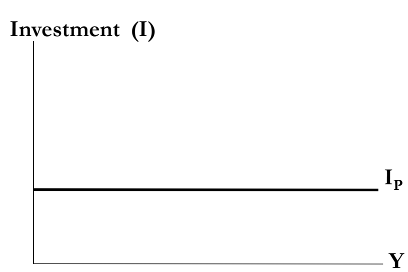
Def. **Planned investment** (**Ip**) is what firms wish or plan to invest.

Keynes assumed that **planned investment**:

1) Is independent of the level of national income.

2) Depends on **interest rate**, as we shall see later.

Planned investment function



Equilibrium Level of GNP (Y)

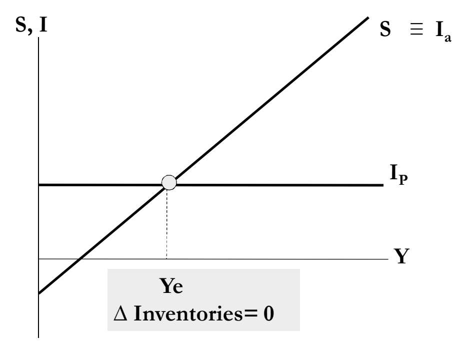
Q: At what level of consumption, saving and investment will the GNP be in equilibrium, i.e., it is neither expanding nor contracting?

A: We can answer this question in 2 ways:

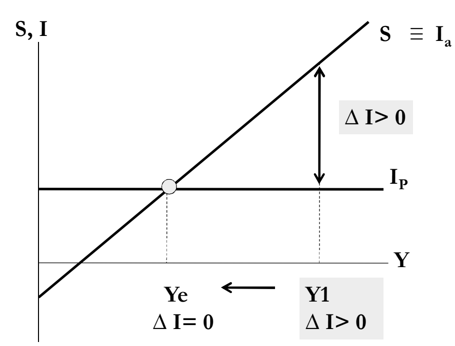
1) By looking at the relationship between savings and investment, or

2) By looking at the relation between expenditures (C and I) and national income.

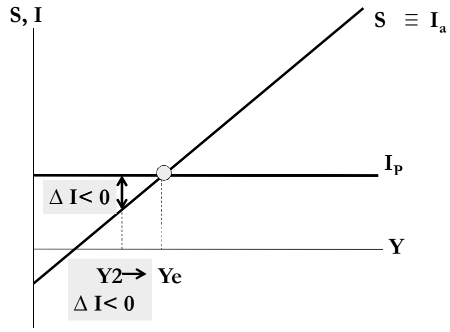
Savings and Investment: Equilibrium level of GNP



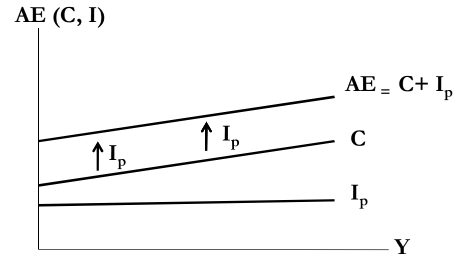
Savings and Investment: Equilibrium level of GNP



Savings and Investment: Equilibrium level of GDP



Aggregate Expenditure



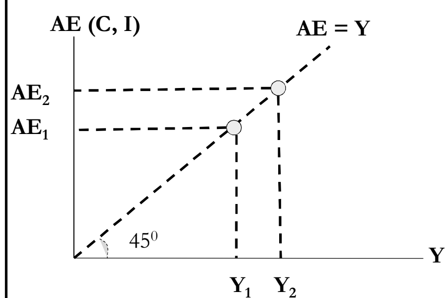
Aggregate Expenditure

We can also look at the level of equilibrium GDP by looking at where **aggregate expenditure** is equal to income.

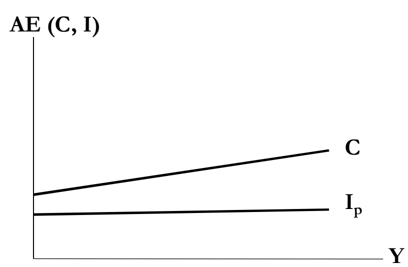
Def. **Aggregate Expenditure** (**AE**): Is the sum of the spending. So far we have:

AE = C+I

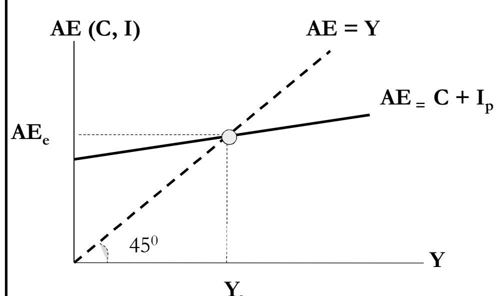
The 45^0 line



Aggregate Expenditure



Equilibrium level of GDP



"Keynesian Cross"

Note: **At equilibrium level of output, Ye, all income is spent.**

Economy is neither expanding not contacting.

It is stable and **ΔI = 0**.

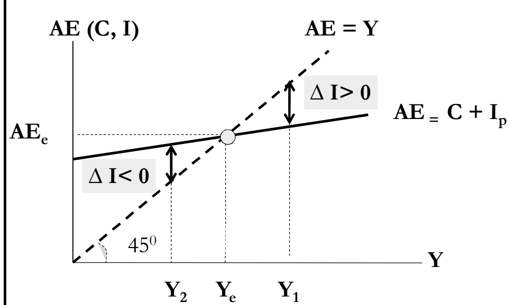
Government expenditure

Suppose the equilibrium level of output is achieved at a low level of employment.

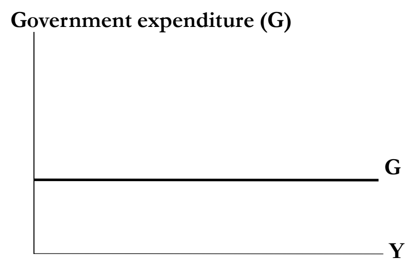
Keynesian economics then advocates government spending money on goods and services.

We assume that government expenditure, **G,** is independent of national income:

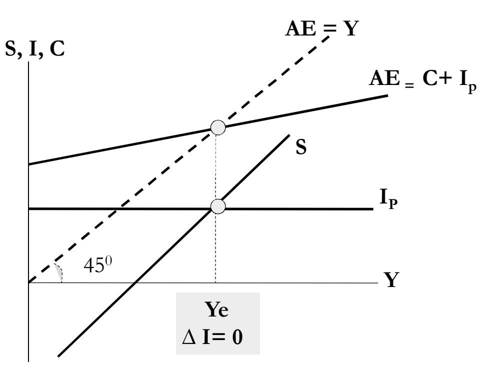
Equilibrium level of GDP



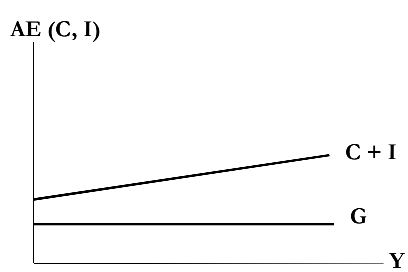
Government expenditure function



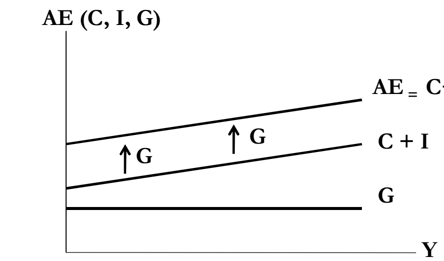
Equilibrium level of GNP: Everything together



Aggregate Expenditure Again



Aggregate Expenditure

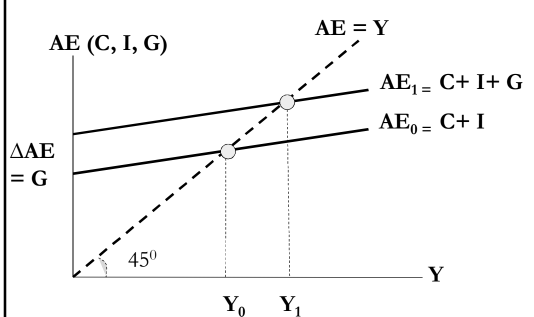


The Multiplier Effect

Def. **Multiplier Effect**: Any change in spending will bring about greater change in income or output:

$\Delta Y > \Delta AE$

Equilibrium level of GNP again

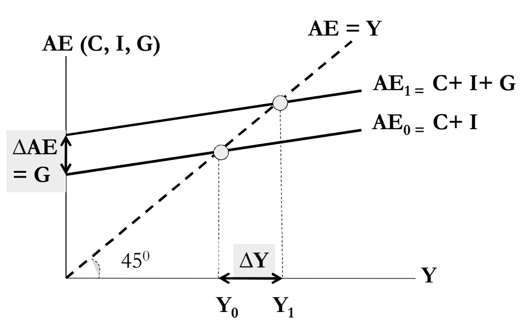


A Numerical Example

Suppose **MPC=1/2** and **investment increases by $1000**, i.e., **ΔI = $1000**.

What happens to he national income?

Note: $\Delta Y > \Delta AE$



Period 1: **ΔI=$1000** $\longrightarrow$ ΔY=$1000

Period 2 ΔC=$500 ΔS=$500

Period 1:	**ΔI=$1000**	$\rightarrow$ ΔY=$1000		
Period 2	ΔC=$500	$\rightarrow$	$500	ΔS=$500
Period 3	$250	$\rightarrow$		$250

Remember the geometric series:

S= a + ar + ar^2+ ar^3 +ar^4+ . . .

Where

$0 < r < 1$

The series converges:

S = a/(1– r)

Period 1:	**ΔI=$1000**	$\rightarrow$ ΔY=$1000		
Period 2	ΔC=$500	$\rightarrow$	$500	ΔS=$500
Period 3	$250	$\rightarrow$	$250	$250

Net Result:

ΔY = $1000+ $500+ $250+ $125 + $62.5 + . . .

ΔY = $1000+ $1000 (1/2)+ $1000 (1/2)^2 + . . .

ΔY = $1000/(1-1/2) = $1000/(1/2) = **2** x $1000

ΔY = $2, 000

Period 1:	**ΔI=$1000**	$\rightarrow$ ΔY=$1000		
Period 2	ΔC=$500	$\rightarrow$	$500	ΔS=$500
Period 3	$250	$\rightarrow$	$250	$250
Period 4	$125	$\rightarrow$	$125	$125
Period 5	$62.5	$\rightarrow$	$62.5	$62.5
.	.		.	.
.	.		.	.
	ΔC=$1000		**ΔY=$2000**	**ΔS=$1000**

Algebraic method of calculating multiplier

$$\Delta Y = \Delta AE / (1\text{-}MPC) = \Delta AE / (MPS)$$

We call $\mathbf{k} = \dfrac{\mathbf{1}}{\mathbf{1\text{-}MPC}} = \dfrac{\mathbf{1}}{\mathbf{MPS}}$

the multiplier factor, Keynesian or expenditure multiplier.

Proof (not required)

1) $Y = C+I$

2) $\Delta Y = \Delta C + \Delta I$

3) $\Delta Y - \Delta C = \Delta I$ (divide both sides by ΔY)

4) $(\Delta Y - \Delta C) / \Delta Y = \Delta I / \Delta Y$

5) $1 - MPC = \Delta I / \Delta Y$

6) $\Delta Y = \Delta I / (1 - MPC)$

Does the multiplier work in reality?

Some Keynesians argue that "**automatic stabilizers**" might hinder the effectiveness of multiplier.

Def. **Automatic stabilizers a**re economics forces that try to stabilize economy automatically.

Our previous example :

Investment increased by \$1000 and MPC= 1/2. By how much will national income rise?

$\Delta Y = \Delta AE / (1 - MPC)$

$\boldsymbol{\Delta Y = \Delta I / (1 - MPC)}$

$\Delta Y = \$1000 / (1 - 1/2)$

$\Delta Y = \$1000 / (1/2)$

$\Delta Y = \$2000$

Examples of automatic stabilizers

- **Progressive income tax**: as income goes up, people fall in higher marginal tax rate.
- **Prices**: as economy expands, inflation rises, reducing spending.
- **Interest rate**: also, as economy expands , interest rates rise, slowing expenditures.

Another example of multiplier:

Suppose government expenditure, G, falls by \$150 and MPC = 2/3. By how much will national income fall?

$\Delta Y = \Delta AE / (1 - MPC)$

$\boldsymbol{\Delta Y = \Delta G / (1 - MPC)}$

$\Delta Y = - \$150 / (1 - 2/3)$

$\Delta Y = - \$150 / (1/3)$

$\Delta Y = - \$450$

Note: Consumption depends on disposal income; that is, if T stands for taxes, then:

$C = a + b\,(Y - T)$
$C = a - bT + bY$

Thus reducing taxes will also increase consumption and GDP.

But tax reduction will have less impact on GDP than an increase in government spending.

Indeed, if government increases its expenditures by the same amount as it raises taxes, GDP will still grow by the amount of government expenditures:

$T=G$

The result of tax increase:

$C= a + bY$

$C= a + b\ (Y–T)$

$C= a – bT + bY$

$\Delta C = – bT$

$\Delta Y = \Delta C / (1 - b) = – bT/ (1 - b)$

$= – b G/ (1 - b)$

The result of expenditure increase:

$\Delta Y = G / (1 - b)$

If we add the two results we get a balanced budget multiplier of 1:

$\Delta Y = [G / (1 - b)] – [b G/ (1 - b)]$

$\Delta Y = G (1 - b)/(1 - b)$

$\Delta Y = G (1 - b)/(1 - b)$

$\Delta Y = G$

Next stop: Chapter 13.