Chapter 21

The Simplest Short-Run Macro Model

Desired Expenditure

Total **desired** expenditure (Aggregate Expenditure, or **AE**):

what **would** be spent, given **Y**, on domestically produced g&s.

AE is divided into four categories:

- desired consumption (**C**),
- desired investment (**I**),
- desired government purchases (**G**),
- desired net exports (**NX = X - IM**).

Aggregate Expenditure (AE):

$$AE = C + I + G + X - IM$$

I, **G** and **X**: **autonomous expenditures**

- do not change with changes in national income (**Y**)

C and **IM**: **induced expenditures**

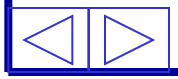
- change with changes in national income (**Y**)

Simple case:
- only at **C and I**
- no government
- no foreign sector

AE = C + I

[C] Keynesian **consumption function**:
- relationship between C and variables that influence it

In simple case:
- **C** is influenced by **disposable income**



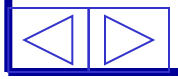
Desired Consumption Expenditure (C)

Disposable income:

- either consumed (**C**) or saved (**S**)

Consumption:

- determined by current **real** disposable income ($\mathbf{Y_D}$)
- ceteris paribus



Simple (Keynesian) consumption function:

$$C = \overline{a} + bY_D$$

where “a” is **autonomous** consumption expenditure

- “b”Y_D is **induced** consumption expenditure

Example: $C = 40 + 0.8\ Y_D$

If Y_D is 100: $C = 40 + 0.8(100)$

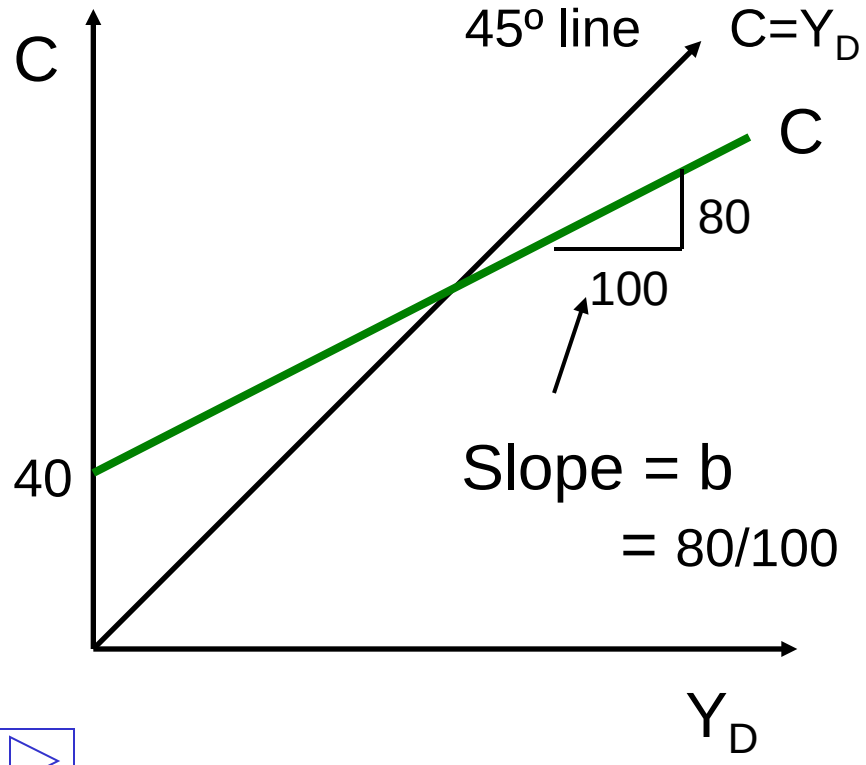
$C = \$40 + \$80 = \$120$

$C = 40 + 0.8\ Y_D$

Y_D	C
0	$40
$100	$120
$200	$200
$300	$280

$C = 40 + 0.8\ Y_D$

- Slope of 45º line is 1
- Slope of consumption function = 0.8



Marginal Propensity to Consume (**MPC**):

- **change** in desired consumption divided by **change** in disposable income
- slope of the consumption function

$$MPC_{YD} = \Delta C / \Delta Y_D$$

This case:

- $\mathbf{MPC_{YD}}$ = 80/100 = 0.8
- $\mathbf{Y_D}$ increases by $100
- **C** increases by $80

$C = 40 + 0.8\ Y_D$

Y_D	C	ΔY_D	ΔC	$\frac{\Delta C}{\Delta Y_D}$
0	$40			
$100	$120	$100	$80	0.8
$200	$200	$100	$80	0.8
$300	$280	$100	$80	0.8

MPC_{YD} (0.8) is **constant** since **slope** of line is **constant**.

Average propensity to consume ($\mathbf{APC_{YD}}$):

- **total** consumption divided by **total** disposable income

$$APC_{YD} = C / Y_D$$

$\mathbf{APC_{YD}}$ falls as level of income rises:

Y_D	C	C / Y_D
0	40	
100	120	1.20
200	200	1.00
300	280	0.93

Savings Function:

Marginal propensity to save (MPS_{YD}):

- **change** in desired saving divided by **change** in disposable income

$$MPS_{YD} = \Delta S / \Delta Y_D$$

Average propensity to save (APS_{YD}):

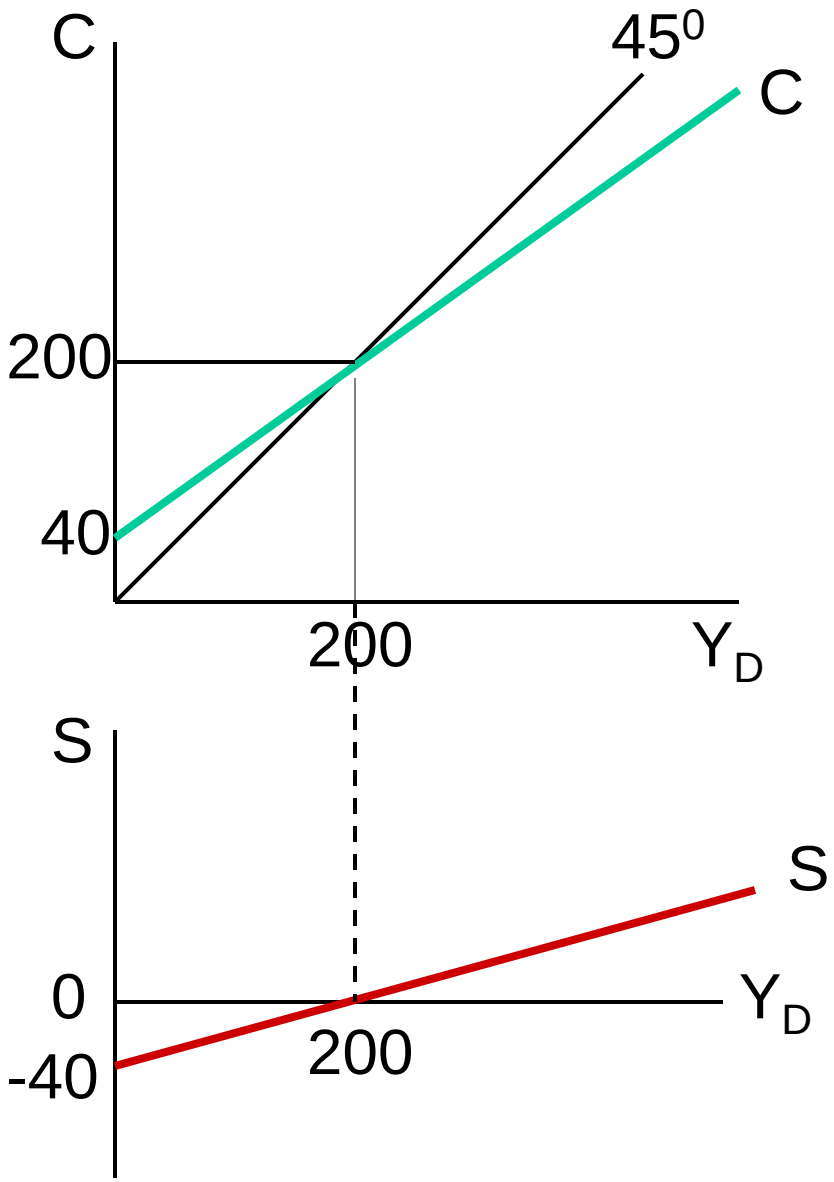
- **total** desired saving divided by **total** disposable income

$$APS_{YD} = S/Y_D$$

Y_D	C	MPC	APC	S	MPS	APS
0	40			-40		
100	120	0.8	1.20	-20	0.2	-0.20
200	200	0.8	1.00	0	0.2	0.00
300	280	0.8	0.93	20	0.2	0.07

Y_D is either consumed or saved:

- **APC + APS = 1**
- **MPC + MPS = 1**



Slope of C = 0.8
Slope of S = 0.2

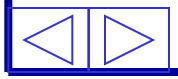
Where Y_D = 200:
C = 200
S = 0

When $\mathbf{Y_D}$ changes
- **C** changes
- **Move along** line

All other changes affecting **C**
- **shifts** the consumption function

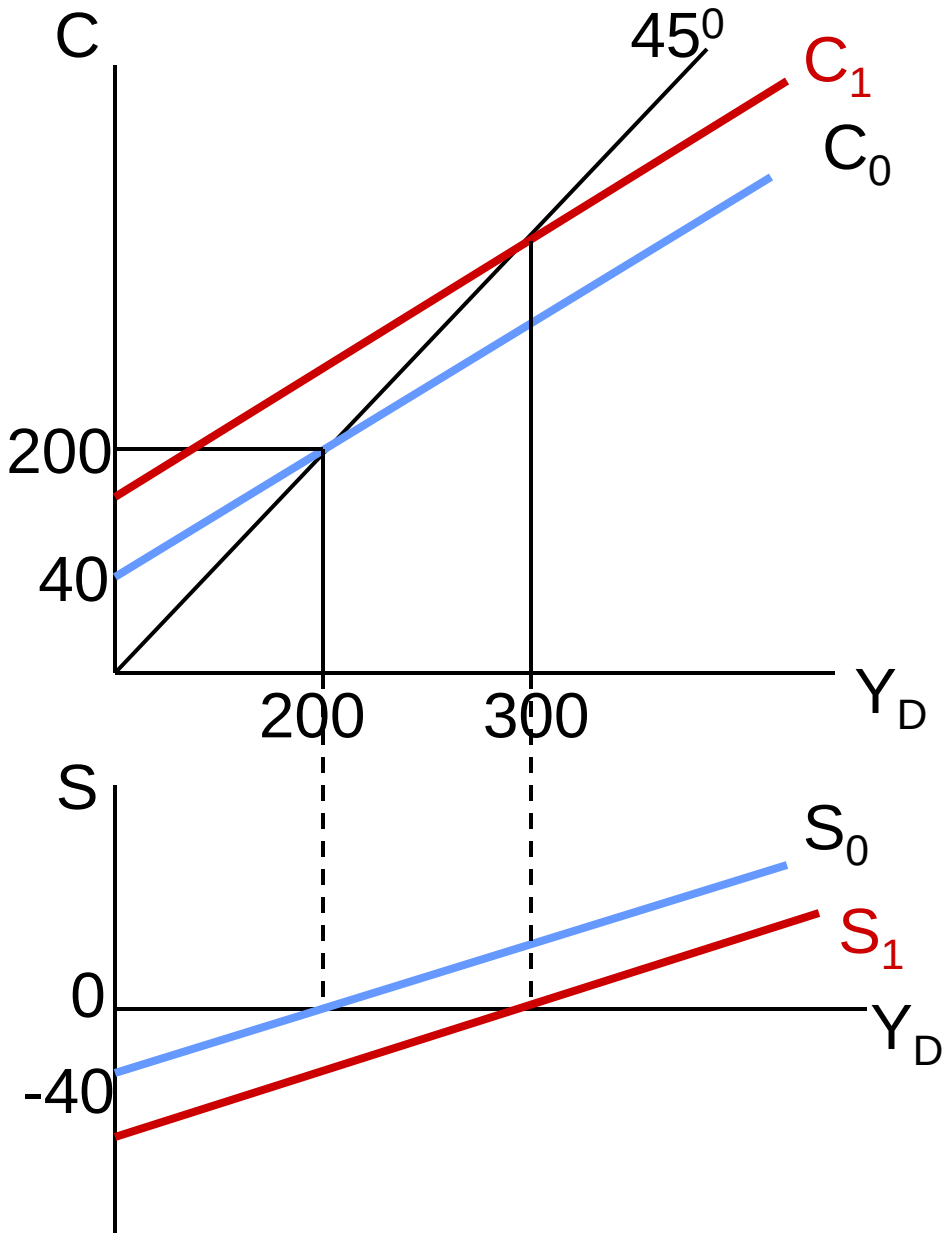
If wealth unexpectedly increases:

- spend more at every income level
- shift consumption function



e.g. wealth increases:

- C shifts up
- S shifts down
- to C_1 and S_1



C function may also **shift** when:

Interest rates change:

1. Many **durable goods** bought on credit
    - E.g., Cars
    - Cost rises when interest rates rise
    - C shifts down

- Does not affect **non-durables**
- e.g. Kraft Dinner

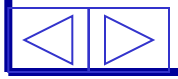
2. **Expectations change:**
    - Expectations about future economy affect spending
    - e.g. expect good times
    - C shifts up

Desired Investment Expenditure [I]

Aggregate investment [I]:

- New plant and equipment
- New residential housing
- New accumulations to Inventory

Gross I = Depreciation + Net I



Autonomous investment [**I**]

- most volatile component of GDP
- changes often occur with economic fluctuations

- [**I**] is autonomous
- does not change automatically with GDP

Three main determinants of [**I**] are:

1. **real** interest rate
2. **changes** in inventories (sales)
3. business confidence

1. The real interest rate & I

Real interest rate:

- **opportunity cost** of using money (either borrowed or retained earnings) for investment

A rise in real interest rate affects:

a. Opportunity cost of holding an **inventory** rises

b. **Residential construction** – higher mortgage costs

c. Investment in **plant and equipment** – cost rises

    - desired [**I**] falls

2. Changes in sales

• **Higher** levels of production and sales lead to larger desired stock of inventories

• **Changes** in production and sales cause changes in investment (or disinvestment) in inventories

3. Business confidence

• If business confidence is high, firms invest **now** to earn **future** profits

• Business confidence and consumer confidence may rise and fall together

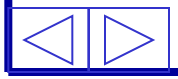
• [**I**] is autonomous – does not change with **Y**

The Aggregate Expenditure Function

Aggregate expenditure function (**AE**):

• level of **desired** aggregate expenditure (**AE**) at each level of **actual** national income (**Y**)

$$AE = C + I$$



Consumption function:

$$C = \$40 + (0.8)Y$$

Investment function:

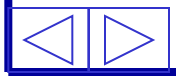
$$I = \$20$$

AE function:

$$AE = C + I$$

$$= \$40 + 0.8Y + \$20$$

$$\text{and } AE = \$60 + 0.8Y$$



Suppose Y = 100:

$$C = \$40 + 0.8Y$$

$$= \$40 + (0.8 \times \$100)$$

$$= 120$$

And **I = $20**

Thus, $AE = C + I$

$$= \$120 + \$20 = \$140$$

or, use $AE = \$40 + \$20 + 0.8Y$

$$= \$60 + (0.8 \times \$100)$$

$$= \$60 + \$80$$

$$= \$140$$

Equation of AE line:

$$AE = 60 + 0.8Y$$

Slope of AE line is **Marginal Propensity to Spend**

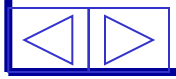
- extra spending when national income rises by $1.00

When national income rises by $1.00, spending rises by $0.80

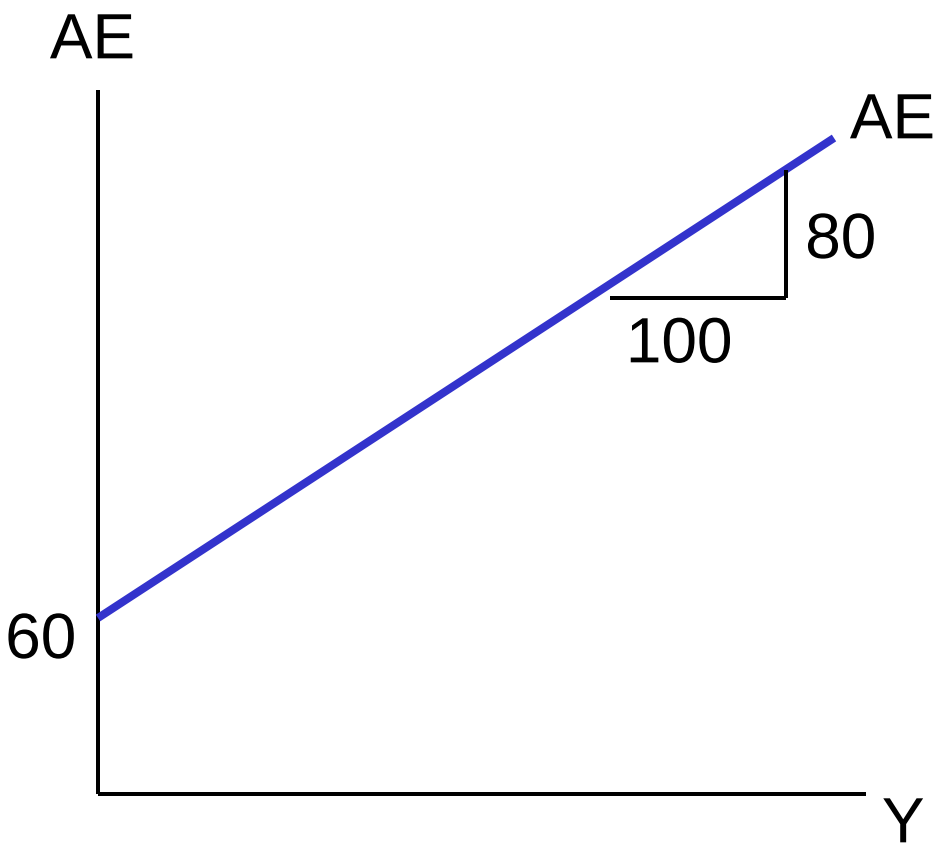
MP to spend = Z = 0.8.

Note: The MP to Spend is not the same as MPC

- MPC is extra **consumption** spending when $\mathbf{Y_D}$ rises by $1.00



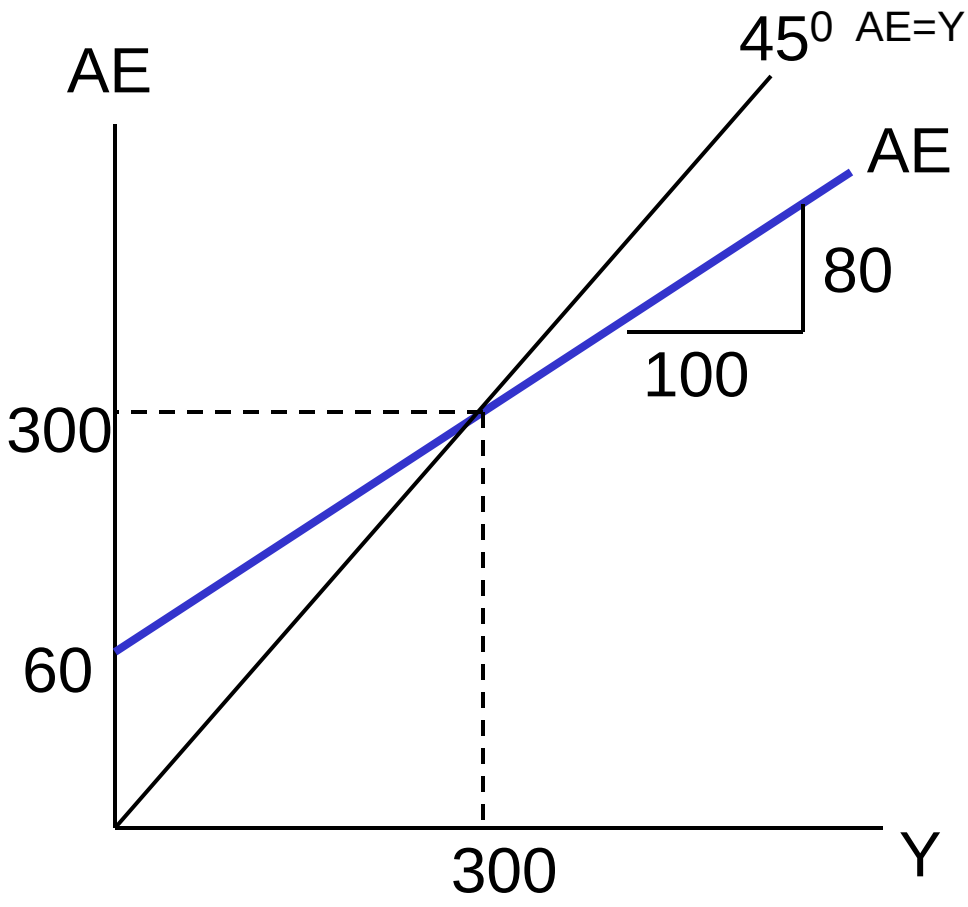
Y	C	I	AE
0	40	20	60
100	120	20	140
200	200	20	220
300	280	20	300
400	360	20	380



- Slope of AE line (0.8) is **MP to Spend (Z)**
- no taxes or trade: MP to Spend = MPC_{YD}

  [MPC_{YD} = MPC_Y]

Y	C	I	AE
0	40	20	60
100	120	20	140
200	200	20	220
300	280	20	**300**
400	360	20	380



Equilibrium is where Y = AE, or at Y = 300.

Equilibrium is where 45^0 line cuts AE line.

Equilibrium National Income

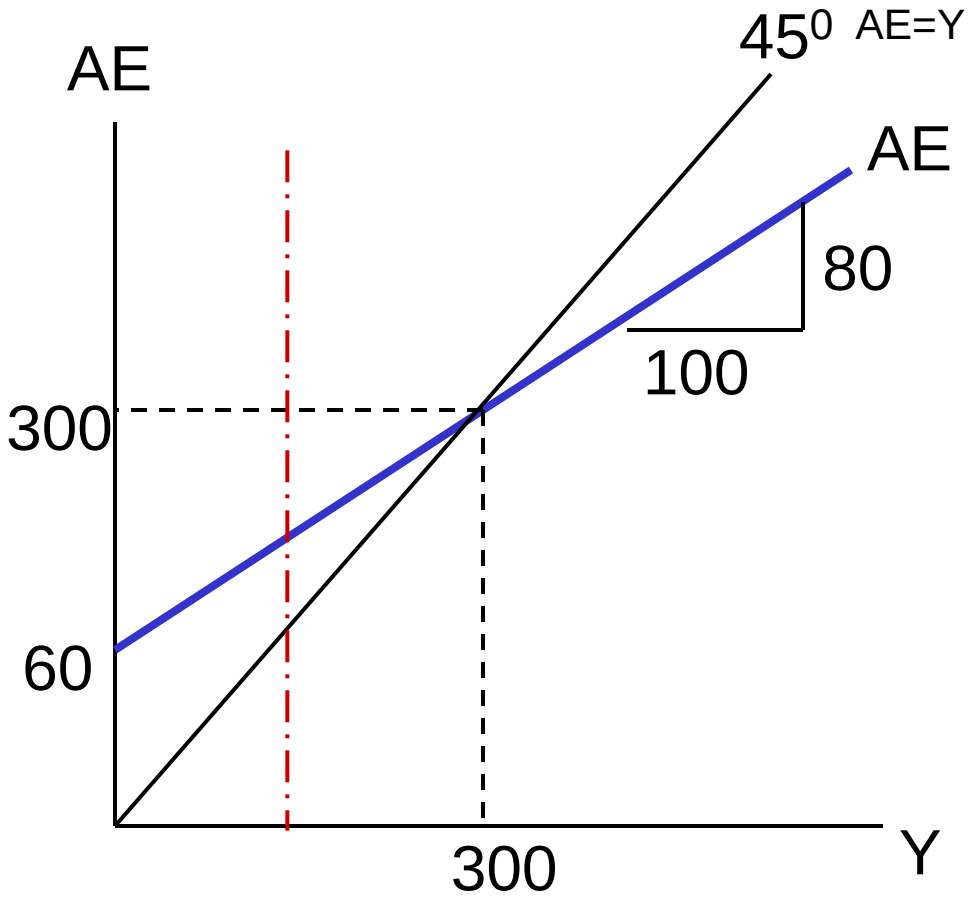
- Equilibrium is state of balance
- No pressure to change

- Equilibrium occurs when AE = Y

- Desired AE = Actual AE = Production

- Desired spending (C + I) = production in economy (Y)

Y	C	I	AE
0	40	20	60
100	120	20	140
200	200	20	220
300	280	20	300
400	360	20	380



AE > Y, inventories fall, pressure for output (Y) to increase.

AE < Y, inventories rise, pressure for output (Y) to fall.

AE = Y is equilibrium, where AE equals Y.

Look at red line: Y = 200 ; AE = 220

AE > Y 220 > 200

Inventories are depleting

Y - AE = 200 - 220 = -20
(production minus sales)

Increase Production

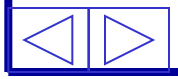
Desired Saving and Desired Investment

Can prove that:

$$Y - AE = S - I$$

In equilibrium, **Y = AE**, **and S = I** :

(Proof in text.)



Recall $S = Y_d - C$.

In this simple case, $S = Y - C$:

Y	C	I	AE	S
0	40	20	60	-40
100	120	20	140	-20
200	200	20	220	0
300	280	**20**	**300**	**20**
400	360	20	380	40

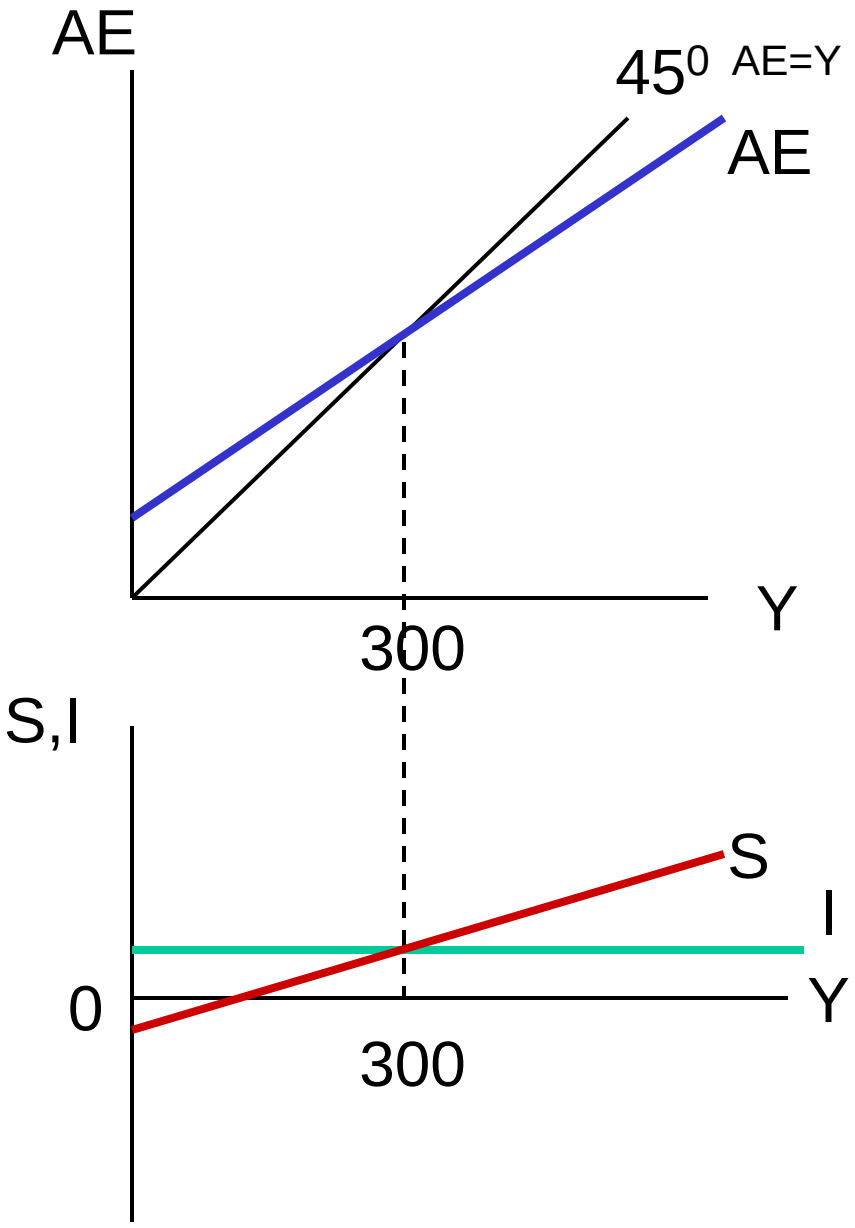
Note:
At every level of Y,
$Y - AE = S - I$

In equilibrium, $Y = AE$ and $S = I$
This occurs when $Y = 300$

At Y = 300:

Y = AE, and

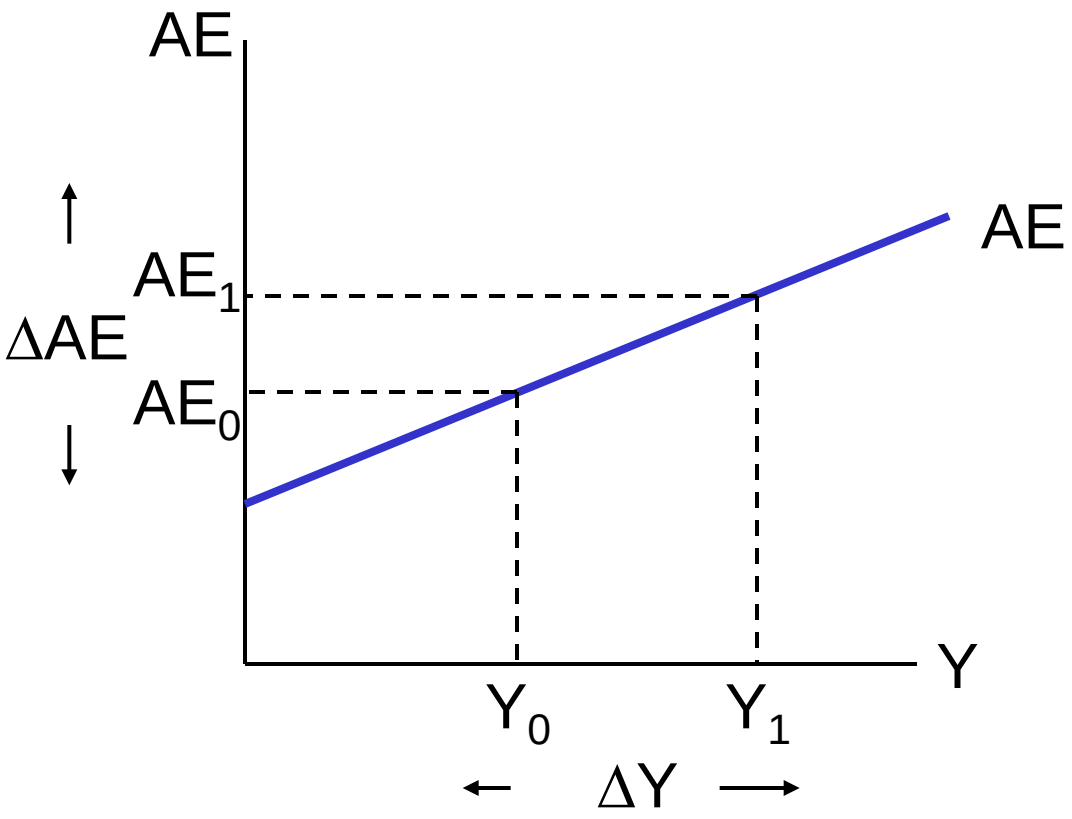
S = I



Changes in Equilibrium National Income

Two types of changes:

1) Y changes, move along AE line:

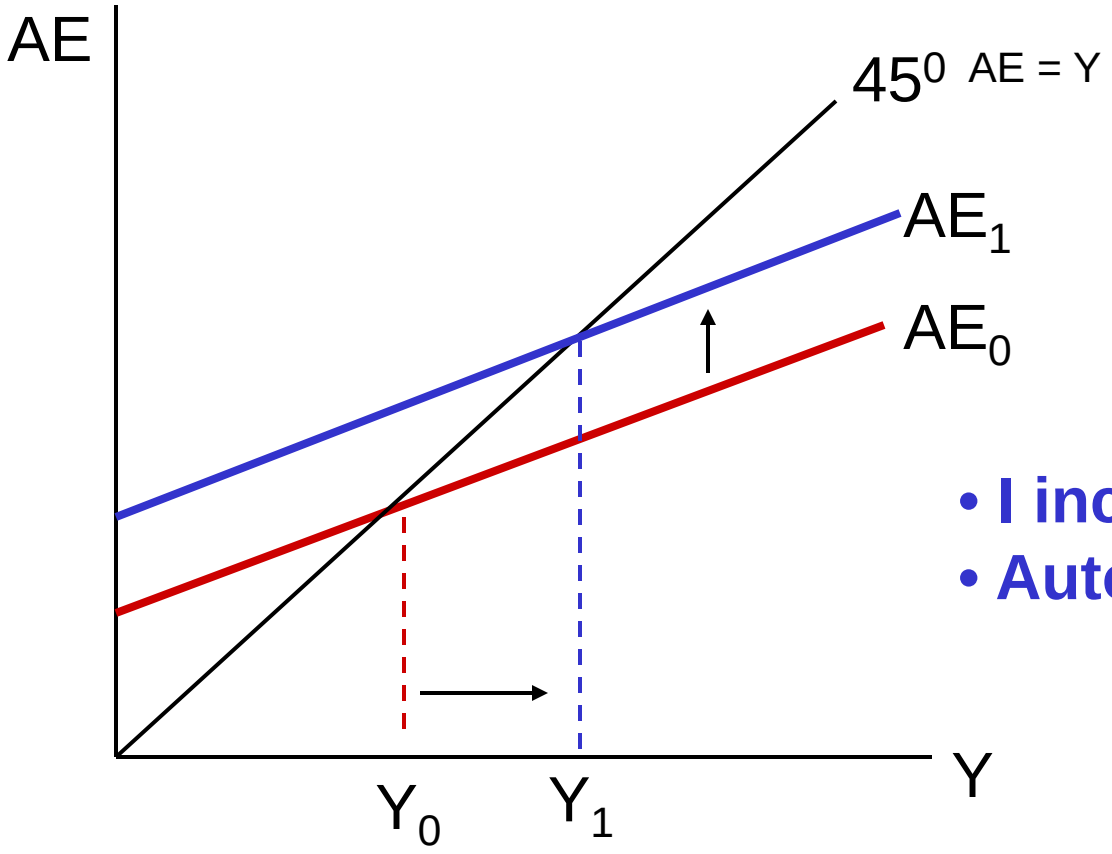


e.g. $Y_0 \longrightarrow Y_1$

$AE_0 \longrightarrow AE_1$

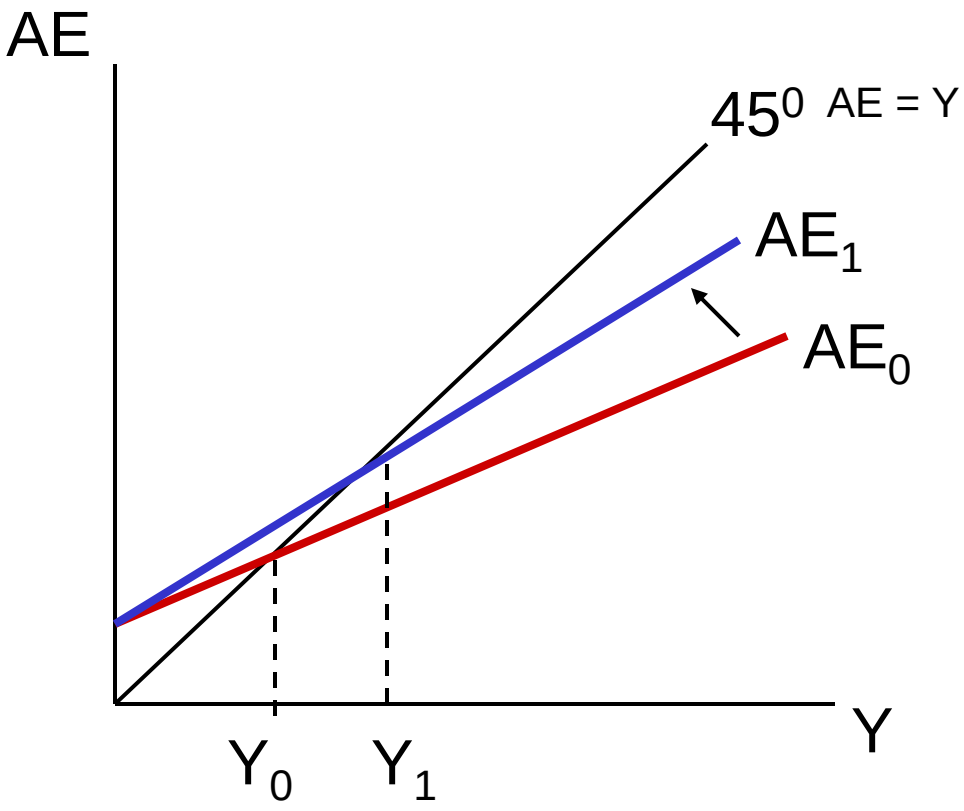
$Z = \Delta AE / \Delta Y$

2) a) AE line shifts parallel to itself



- **I increases**
- **Autonomous change**

b) slope of AE changes



- Induced C increases
- MPC rises
- or, MPS falls
- induced change
- MP to Spend rises
- rotation of AE

Note that in all cases:

If AE rises at each level of Y, equilibrium Y rises.

If AE falls at each level of Y, equilibrium Y falls.

The Multiplier [K]

•measures change in equilibrium Y when autonomous expenditure [A] changes

Definition:

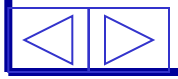
• change in national income divided by change in autonomous expenditure that caused it.

[**K = ΔY / ΔA**]

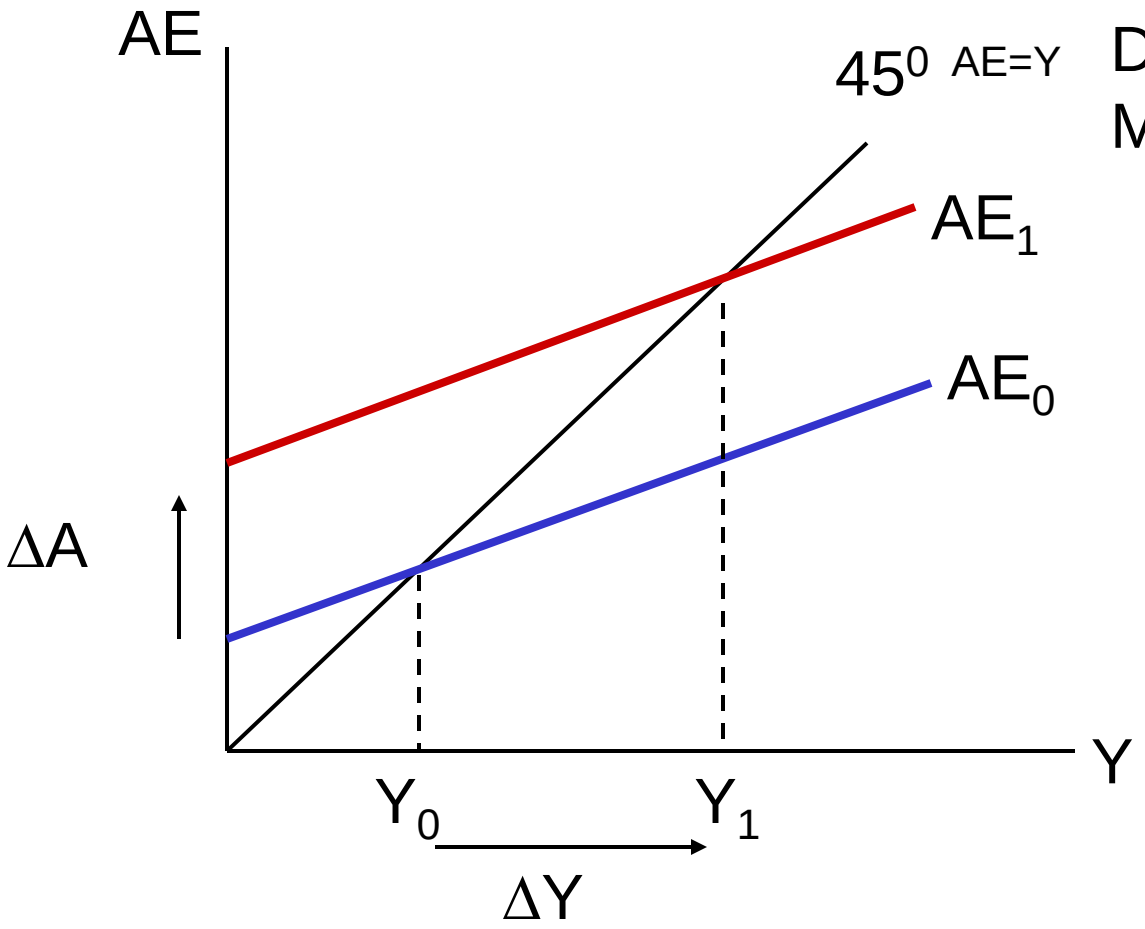
Simple macro model:

• the multiplier is **greater than one**

e.g. $1 billion increase in desired investment expenditure increases equilibrium Y by **more than** $1 billion



Suppose **AE** rises by **ΔA**
e.g. investment increases, and shifts AE line up:



Definition:
Multiplier = ΔY / ΔA

Since ΔY > ΔA,
multiplier > 1

ΔY > ΔI

K > 1

Why is multiplier > 1?

Example:

- assume MP to Spend out of national income = 80%

- Joe pays you $100 for some CDs
- you spend $80 on a shirt

- Shirt maker earns $80
- spends $64 on food

- Food seller earns $64
- spends $51.20 on books ($64 x 0.8)

.

.

Add this up:	$100.00
	$ 80.00
	$ 64.00
	$ 51.20
	.
	.
Total	$ 500

Formula:

$$\textbf{Simple multiplier} = K = \frac{\Delta Y}{\Delta A} = \frac{1}{1 - Z}$$

where Z

- is MP to Spend out of national income
- slope of the AE line

In this case: $z = 0.8$

$$K = \frac{\Delta Y}{\Delta A} = \frac{1}{1 - Z}$$

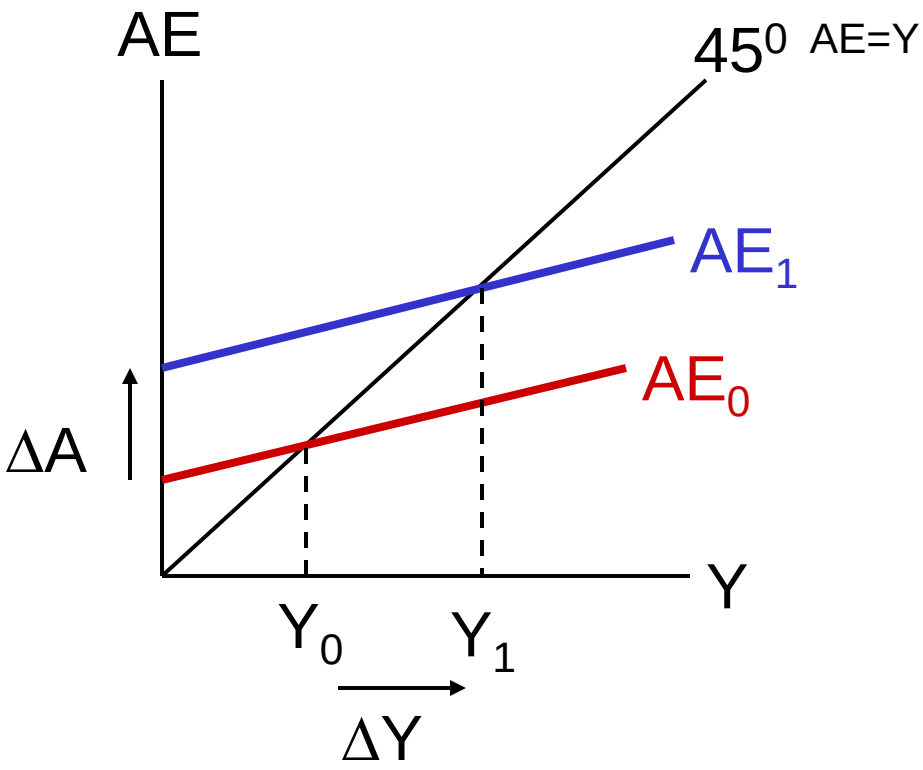
$$= \frac{1}{1 - 0.8} = \frac{1}{0.2} = 5$$

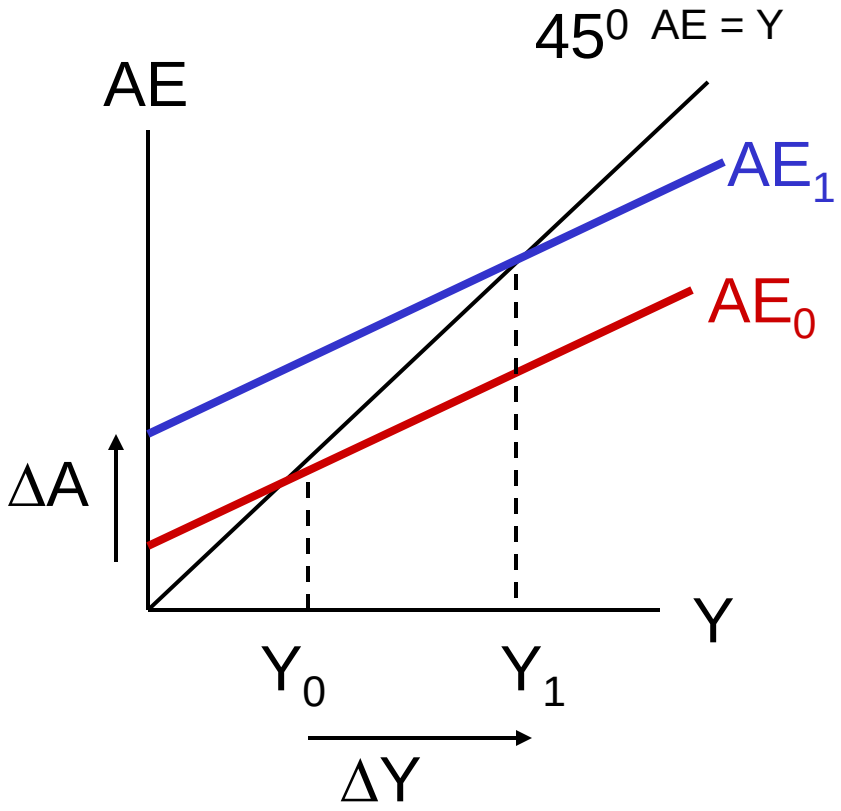
- initial increase in I of $100
- raises total spending [Y] by $500

Note:

- higher MP to Spend out of national income raise multiplier
- [z ↑ ⟶ K ↑]

Diagrammatically:





- AE has shallow slope
- ΔY is small
- Z is small
- multiplier is small

- AE is steep
- ΔY is large
- Z is large
- multiplier is large

Example 1

z = 0.5 (AE has shallow slope)

Multiplier = 1/(1 - Z)
= 1/(1 - 0.5)
= 1/(0.5) = 2

e.g. if Investment increases by $100, Y rises by $200

Example 2

z = 0.8 (AE has steep slope)

Multiplier = 1/(1-Z)
= 1/(1-0.8)
=1/(0.2) = 5

e.g. if investment increases by $100, Y rises by $500.

In Canada:

• AE has shallow slope

Two main reasons:

- Imports are large
- so spending “leaks” out of circular flow of income
- Taxes are also a leakage from circular flow of income
- reducing spending
- slope of AE line (Z) is about 0.2
- multiplier is about 1.25

$$K = 1/(1-z)$$
$$= 1/(1 - 0.2)$$
$$= 1/0.8)$$
$$= 1.25$$

Self-Fulfilling Prophecies

Economic fluctuations can result from expectations.

If businesses expect boom, they invest and increase GDP.

If consumers expect recession, they reduce spending and GDP falls.

Expectations may be self-fulfilling.

The study of economics does not seem to require any specialized gifts of an unusually high order.

John Maynard Keynes

No one in our age was cleverer than Keynes, nor made less effort to conceal it.

Sir Roy Harrod