



# **EE 212 PRINCIPLES OF MACROECONOMICS (SECTION 046402)**

Lecture #8

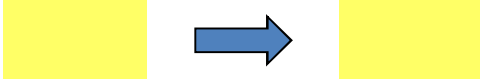





9 February 2012

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## 3.2.2 Desired Aggregate Investment (**I**)

- Desired (Planned) Aggregate Investment (**I**)
- Desired (Planned) Investment in building, machine, inventory investment, and residential investment
- **Purchasing bond** is not included in investment (in this definition) because it does not directly contribute to production of G&S

# Factors determining investment

- 1) Real interest rate 
- 2) National Income 
- 3) Changes in technology 
- 4) Existing level of capital stock 
- 5) Government policy 
- 6) Economic stability 



# Factors determining investment

## 7) Investment expectation



# Investment Function

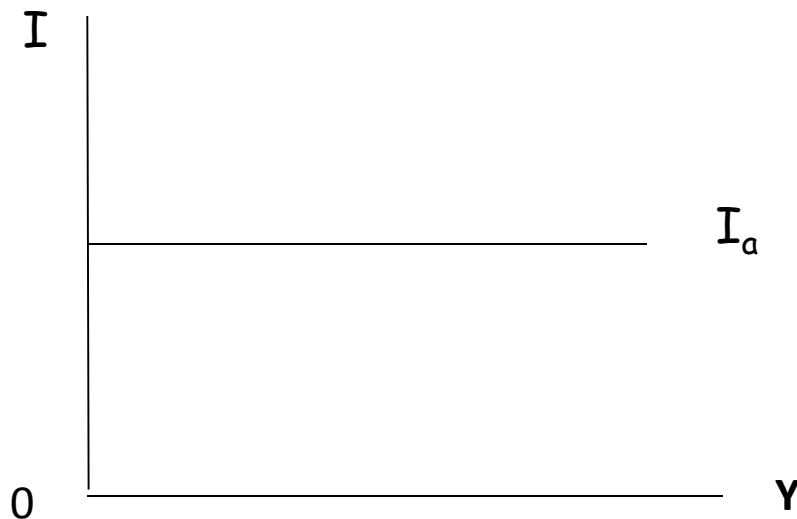
- Main factors determining investment are  $r$ ,  $Y$
- **Investment Function**

$$I = f(r, Y, B_1, B_2, B_3, \dots)$$

# Investment and National Income

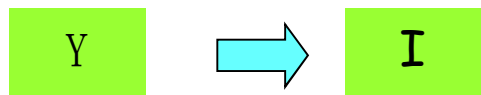
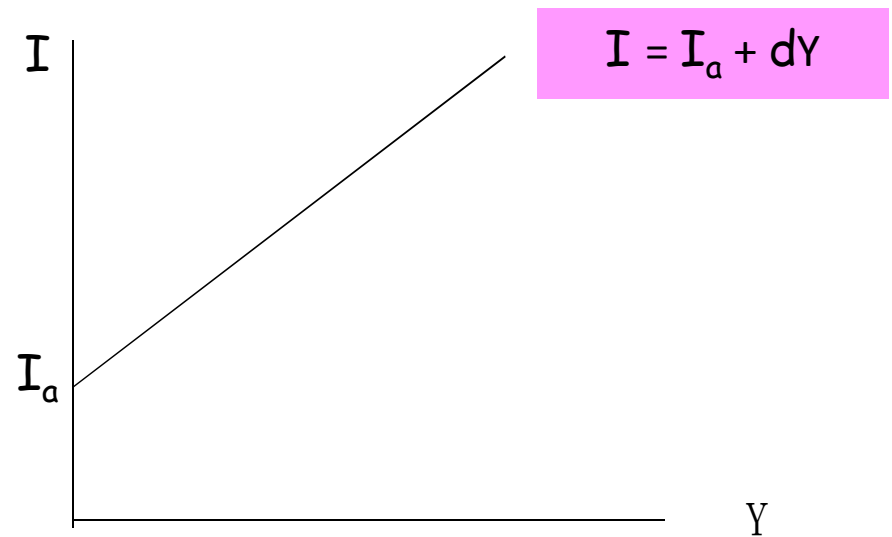
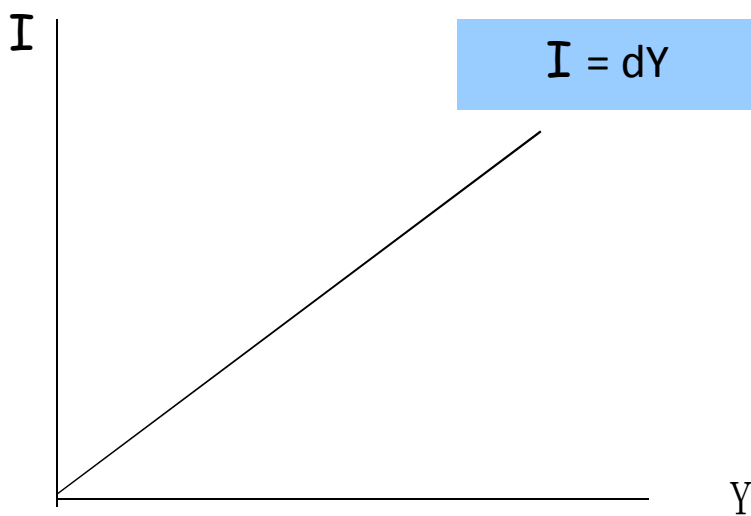
- **Autonomous Investment** -----  $I_a$

Investment that does not depend on national income but depends on other factors, such as **technology improvement**, **number of population** and **interest rate**.

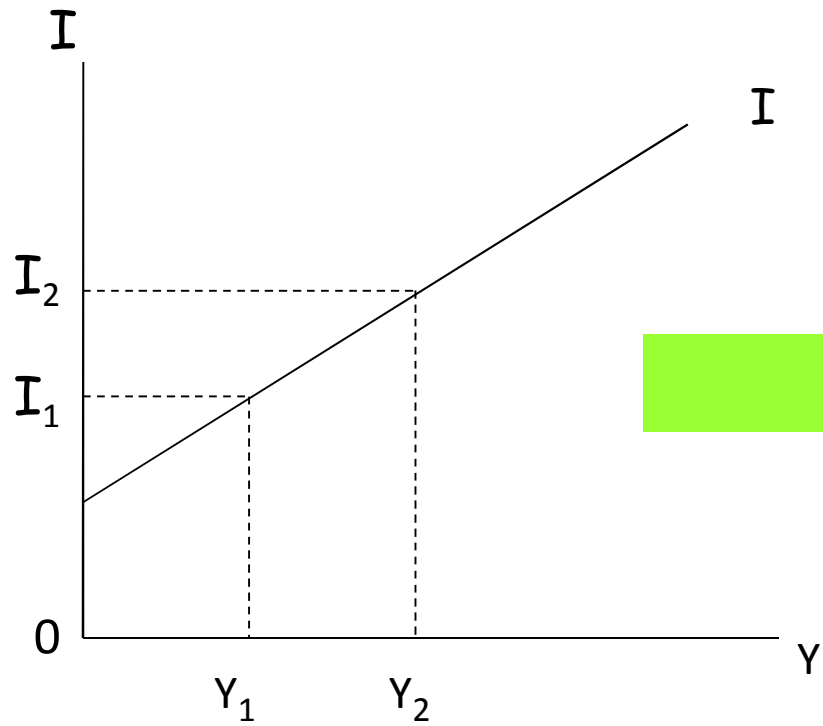


# Investment and National Income

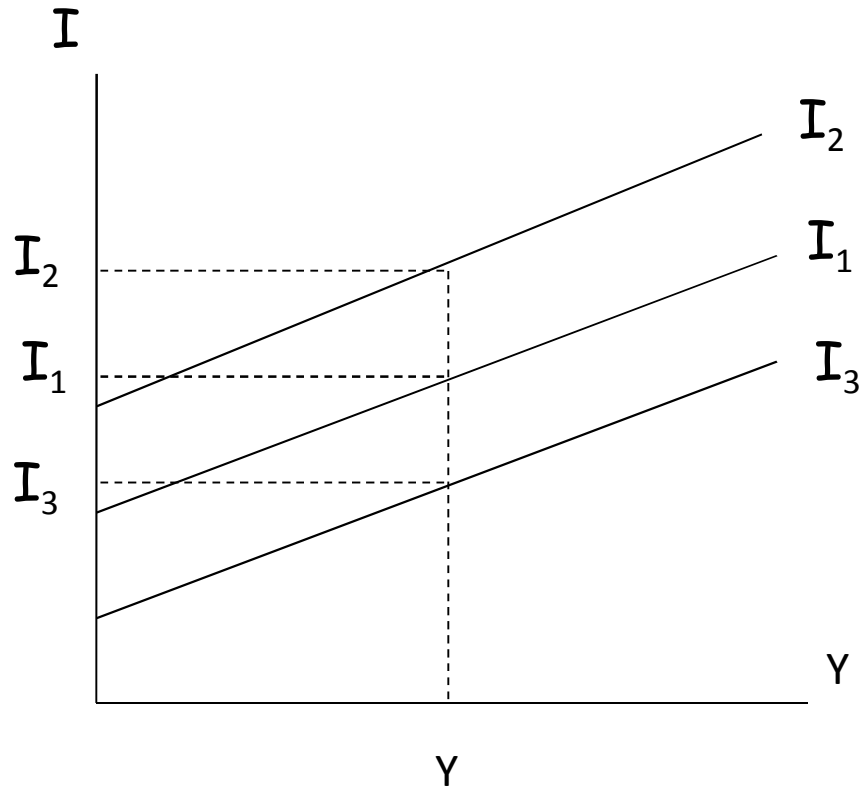
- Induced Investment -----  $I_I$   
Investment that depends on national income



# Move Along Investment Curve



# Example **Shift** of investment line

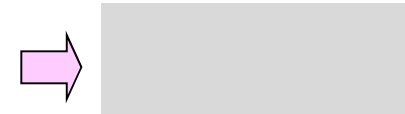


At level of national income  $Y_1$

• Improvement in technology



• Changes in factors except  $Y$  affecting  $I$  (eg. interest rate, technology, population number)



# Other matters in investment

- Present Value (**PV**) and Net Present Value (**NPV**) of Return on Investment
- Marginal Efficiency of Capital (**MEC**) or Internal Rate of Return (**IRR**) of investment
- The Accelerator Principle

# PV and NPV

## **PV and NPV concept**

If  $R_t$  = Return on Investment at year t

$r$  = Discount rate

PV = Present Value of Return on Investment

$n$  = Number of years of the investment project

$C$  = Cost of investment

# PV and NPV

$$PV = \frac{R_1}{1+r} + \frac{R_2}{(1+r)^2} + \frac{R_3}{(1+r)^3} + \dots + \frac{R_n}{(1+r)^n}$$

$$PV = \sum_{t=1}^n \frac{R_t}{(1+r)^t}$$

$$NPV = PV - C$$

$$NPV = \sum_{t=1}^n \frac{R_t}{(1+r)^t} - C$$

# PV and NPV

## Investment Decision

If

$$\text{NPV} > 0$$

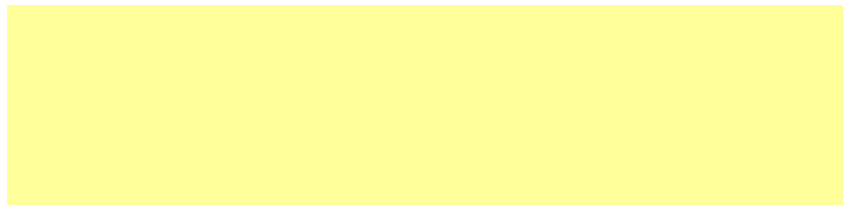


Necessary condition for investment

$$\text{NPV} < 0$$



$$\text{NPV} = 0$$



## Marginal Efficiency of Capital (MEC) or Internal Rate of Return (IRR)

MEC or IRR is the discount rate that make  $NPV = 0$

$$NPV = \sum_{t=1}^n \frac{R_t}{(1 + MEC)^t} - C = 0$$

$$\sum_{t=1}^n \frac{R_t}{(1 + MEC)^t} = C$$

$$C = \frac{R_1}{(1 + MEC)} + \frac{R_2}{(1 + MEC)^2} + \frac{R_3}{(1 + MEC)^3} + \dots + \frac{R_n}{(1 + MEC)^n}$$

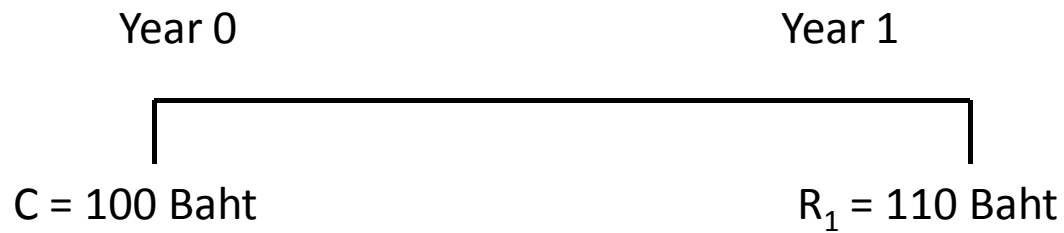
We call this specific discount rate as internal rate of return or marginal efficiency of capital

## Marginal Efficiency of Capital (MEC) or Internal Rate of Return (IRR)

For example,

- You invest by buying machine at Year 0 = 100 Baht
- Suppose your machine last only one year
- At year 1, you have a return = 110 Bahts

Please find IRR or MEC



MEC or IRR is the discount rate where NPV = 0 or where

$$C = \frac{R_1}{(1 + MEC)} + \frac{R_2}{(1 + MEC)^2} + \frac{R_3}{(1 + MEC)^3} + \dots + \frac{R_n}{(1 + MEC)^n}$$

In this case, time horizon is just one period

$$C = \frac{R_1}{(1 + MEC)}$$

$$C + (C * MEC) = R_1$$

$$C * MEC = R_1 - C$$

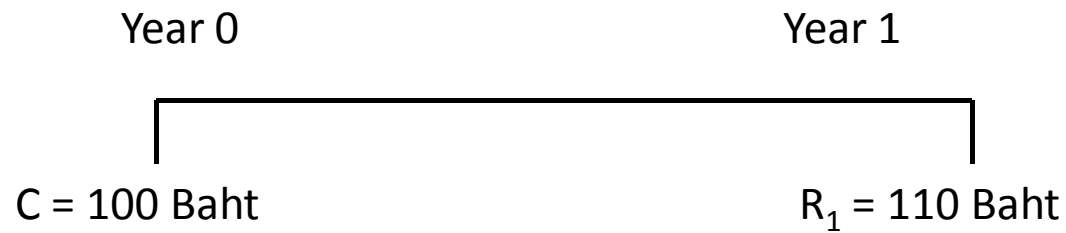
$$MEC = \frac{R_1 - C}{C}$$

$$MEC = \frac{110 - 100}{100}$$

$$MEC = 0.1$$

$$MEC = 10\%$$

We also call this MEC as IRR (Internal Rate of Return) because we use only internal information for our calculation



Think another way

When discount rate = 10%, PV of R<sub>1</sub> = ?

$$PV \text{ of } R_1 = \frac{R_1}{(1 + 0.1)}$$

$$PV \text{ of } R_1 = \frac{110}{1.1}$$

$$PV \text{ of } R_1 = 100$$

We can see that when

$$PV \text{ of } R_1 = 100$$

C = 100 Baht

$$NPV = 0$$

# Marginal Efficiency of Capital (MEC) or Internal Rate of Return (IRR)

## Investment Decision

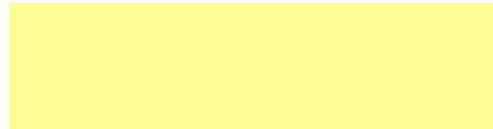
If

$$r > \text{MEC}$$



Necessary condition for  
investment

$$r < \text{MEC}$$



$$r = \text{MEC}$$



# Marginal Efficiency of Capital (MEC) or Internal Rate of Return (IRR)

Investment Decision (also depends on return on other investment)

Suppose  $i$  = interest rate (rate of return) on other investment

Investors normally compare **MEC** with  $i$

If

$$\text{MEC} > i$$



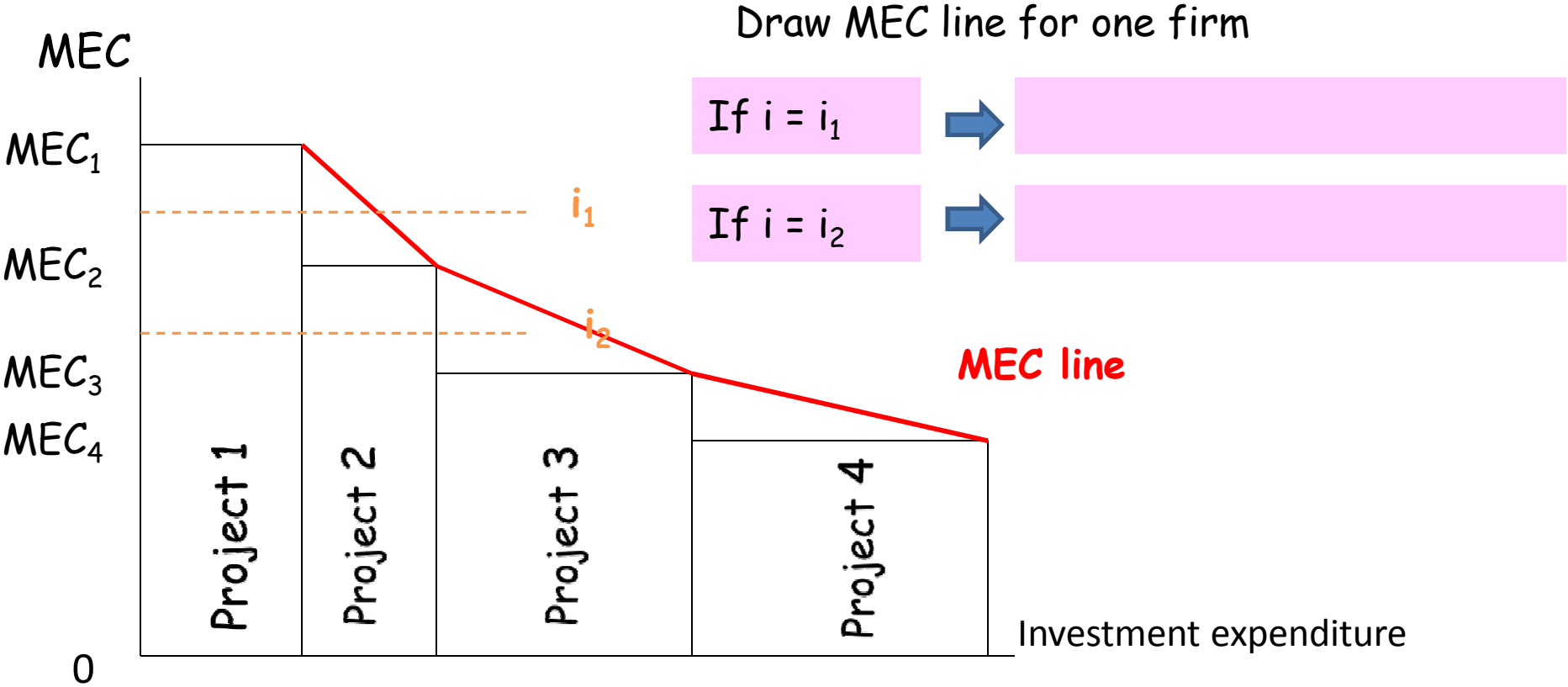
$$\text{MEC} < i$$



$$\text{MEC} = i$$



# Marginal Efficiency of Capital (MEC) or Internal Rate of Return (IRR)



# The Accelerator Principle

The principle is based on the idea that

**demand for investment** is the **derived demand**  
**of demand for output**

If  $K_t^d$  = Desired capital stock at year t

$K_t$  = Actual capital stock at year t

$I_{n,t}$  = Net investment at year t

$Y_t$  = Output at year t

# The Accelerator Principle

## Assumption

1.  $K_t^d = \alpha Y_t$
2.  $K_{t-1} = K_{t-1}^d = \alpha Y_{t-1}$
3.  $K_{t-1} = K_{t-1}^d = \alpha Y_{t-1}$

$\alpha$  is the accelerator.

Then,  $I_{n,t} = K_t^d - K_{t-1}$

That is,  $Y$  accelerates net investment to

$$I_{n,t} = K_t^d - K_{t-1}$$

$$I_{n,t} = \alpha Y_t - \alpha Y_{t-1}$$

$$I_{n,t} = \alpha(Y_t - Y_{t-1})$$

$$I_{n,t} = \alpha \Delta Y_t$$



$$\alpha = \frac{I_{n,t}}{\Delta Y_t} \quad \alpha > 0$$

# The Accelerator Principle

## Problems of the Simple Accelerator Model

- Investment may depend on other factors rather than  $\Delta Y_t$  (such as new technology for new investment opportunity)
- If investors think that changes output (or demand for output) is temporary, they may not change level of investment
- When  $Y_t$  investment may not because firms may have some excess capacity of capital