

AGGREGATE EXPENDITURE AND EQUILIBRIUM INCOME 1

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Semester 1/2018
EE212
Introductory to macroeconomics

UP TO THIS POINT

- We discussed about the concepts for measuring the GDP – i.e. aggregate output.
- One common approach is the expenditure-based calculation.

$$Y \text{ (income = output)} = C + I + G + X - M \text{ (= Total spending/expenditure)}$$

- To understand how **“Y” is determined**, we need to first understand **what drive/determine the total expenditure!**
- This lecture discusses about the theory widely used to explain the **behavior of spending – i.e. desired expenditure.**

AGENDA

- **Theory of aggregate consumption (C)**
- Theory of aggregate investment (I)
- Government expenditure (G)
- Theory of net exports ($NX = X - M$)

AGGREGATE CONSUMPTION

- Aggregate consumption = private expenditure by the households – e.g. **consumption for all households combined!**
- Aggregate consumption, (aka private consumption), accounts for almost 50% in Thailand's GDP, and about 2/3 of GDP in most industrialized countries.
 - Consumption on non-durable goods – e.g. fresh food / clothes / gas
 - Consumption on durable goods – e.g. cars / motorcycles / household appliances
 - Consumption on services – e.g. concert / legal services

THEORY OF AGGREGATE CONSUMPTION

- Economists usually think about describing the behavior of private consumption by referring to some theories – i.e. the **theory of aggregate consumption**.
 - **Theory:** Concept that summarizes some key results of the analysis.
- **Competing theories**
 - Absolute income hypothesis
 - Permanent income hypothesis
 - Life-cycle hypothesis

THEORY OF AGGREGATE CONSUMPTION: ABSOLUTE INCOME HYPOTHESIS

➤ **Absolute income hypothesis:**

- Keynes believed that **private consumption is explained by the level of current aggregate income (y)**
- Private consumption should be **positively determined** by the level of current aggregate income.
 - As aggregate income is high, households earn a lot of income.
 - Households can afford to spend more on goods and services.
 - Total (aggregate consumption) should rise!

THEORY OF AGGREGATE CONSUMPTION: PERMANENT INCOME HYPOTHESIS

- **Permanent income hypothesis (Milton Friedman):**
 - Households live for *long period of time*, and are *forward-looking* – i.e. looking into future and making the best decision.
 - They care both *current-period* and *future-period* consumption
 - Ideally, they make sure that they can maintain “*stable*” *consumption choice* - i.e. equally high today consumption as future consumption
 - Households then **save for future**, and **borrow against their future income**.
- Consumption is determined by the level of **permanent income**, which depends on **current income, all future income streams, and interest rate**.

THEORY OF AGGREGATE CONSUMPTION: LIFE CYCLE HYPOTHESIS

➤ Life-cycle hypothesis (Franco Modigliani):

- Three-period life: Young, Working-age, Retire
 - **Young period:** “Family support” / accumulate “human” capital
 - **Working-age period:** most productive period! → generate (high) income to support parents / their own consumption / **saving some assets for future retirement’s plant.**
 - **Retirement:** No earning income, only income from the saving accumulated during the working-age period.
- Consumption depends on *the level of wealth* – i.e. **accumulated stock of assets held during the earlier period of their life.**

THEORY OF AGGREGATE CONSUMPTION: THE AGGREGATE CONSUMPTION FUNCTION

- Combining the theories together, economists usually think about describing the behavior of private consumption using the so called “(Aggregate) consumption function”
- Consumption function relates the level of private consumption to **its determinants** – e.g. consumption function: $c = f(determinants)$
 - **Determinant:** *variable that determine the dependent variable.*

THEORY OF AGGREGATE CONSUMPTION: DETERMINANTS

- Backed by the theories, economists believe that there are many **variables that determine** the level of aggregate consumption.
 - Level of disposable income (Income after net-tax) : $Y_d (= Y - T + R)$
 - Expected level of future income: **Y_d -future**
 - Interest rate : **r**
 - Wealth: **Wealth**
 - Consumer's Confidence : **CCI**
 - Weather : **Weather**
 - **Others etc...**

THEORY OF CONSUMPTION: LINEAR CONSUMPTION FUNCTION

- Economists simplify the analysis using **linear relationship/function** so as to illustrate the main idea and derive the key results.

- Linear consumption function :

$$C = c_0 + c_1 Y_d + c_2 Y_d^{future} + c_3 r + c_4 Wealth + c_5 CCI + c_6 Weather + c_7 others$$

$c_0, c_1, c_2 \dots =$ coefficients / parameters

coefficients: “number” used to describe the relationship between the determinant and dependent variable.

THEORY OF CONSUMPTION: CONSUMPTION AND DISPOSABLE INCOME

➤ **Keynesian consumption function:**

- John Meynard Keynes believed that private consumption is largely determined by income earnings – i.e. **Absolute income hypothesis**.
- We then need to have our deeper look into the relationship between “income and consumption”

➤ **Ceteris paribus:** keeping all others fixed, except the one in consideration

- Treating others as given.

THEORY OF CONSUMPTION: CONSUMPTION AND DISPOSABLE INCOME

- Assuming others to be fixed (with “bar” on the top), except the level of disposable income.

$$C = \left\{ c_0 + c_2 \overline{Y_d^{future}} + c_3 \bar{r} + c_4 \overline{Wealth} + c_5 \overline{CCI} + c_6 \overline{Weather} + c_7 \overline{others} \right\} + c_1 Y_d$$
$$C = \bar{C} + c_1 Y_d$$

THEORY OF CONSUMPTION: KEYNESIAN CONSUMPTION FUNCTION

➤ What is $\bar{C}$?

- $\bar{C}$: the level of consumption when disposable income is equal to zero
- Keynes called “*autonomous consumption* -e.g. consumption level that is independent of income.”
- The level of autonomous consumption is pre-determined by many consumption determinants that are kept fixed.

THEORY OF CONSUMPTION: KEYNESIAN CONSUMPTION FUNCTION

➤ What is c_1 ?

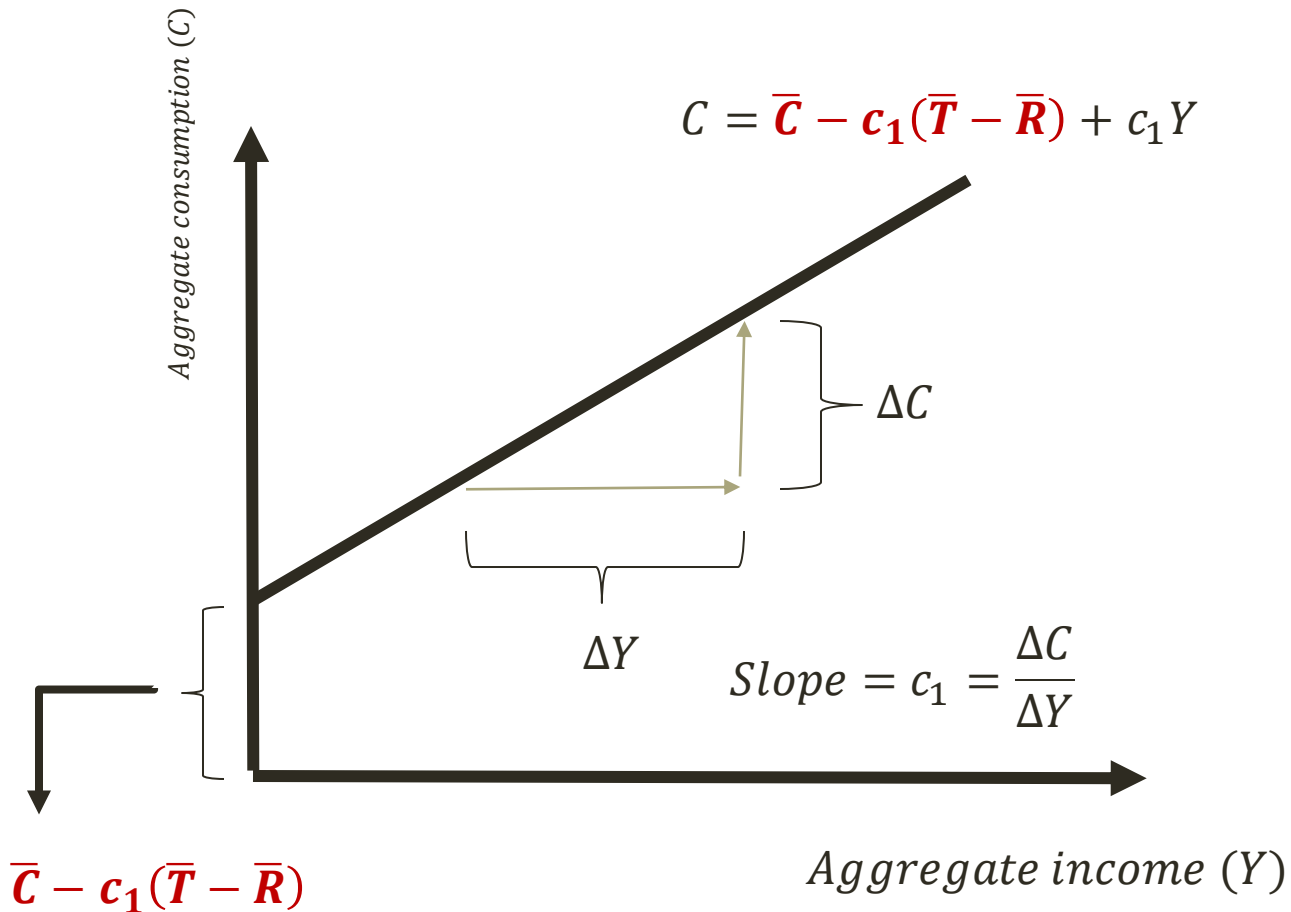
- Mathematically, $c_1 = \frac{\Delta C}{\Delta y_d}$ - e.g. change in consumption with respect to change in disposable income.
- Keynes called “**marginal propensity to consumer (MPC)**”
 - MPC: out of an “additional” increase in disposable income by \$1, how much do we consumer?
 - Fraction of the \$1 increase that we spend on consumption.
- Keynes believe that *the MPC* should be greater than 0, but strictly less than 1.

THEORY OF CONSUMPTION: GRAPHICAL ILLUSTRATION OF KEYNESIAN CONSUMPTION FUNCTION

- **Graphical illustration:** plots “Aggregate consumption” (vertical) v.s. “Aggregate income” (horizontal)
- Notice: $C = \bar{C} + c_1 Y_d$ where $Y_d = Y - (T - R)$
 - T = HH tax payments / R = HH transfer payments
 - $(T - R)$ = net tax
- Need some modifications: We simply assume that “tax/transfer” is fixed and independent of income – i.e. autonomous tax / autonomous transfer.

$$C = \bar{C} + c_1(Y - \bar{T} + \bar{R}) = \bar{C} - c_1(\bar{T} - \bar{R}) + c_1 Y$$

THEORY OF CONSUMPTION: GRAPHICAL ILLUSTRATION OF KEYNESIAN CONSUMPTION FUNCTION



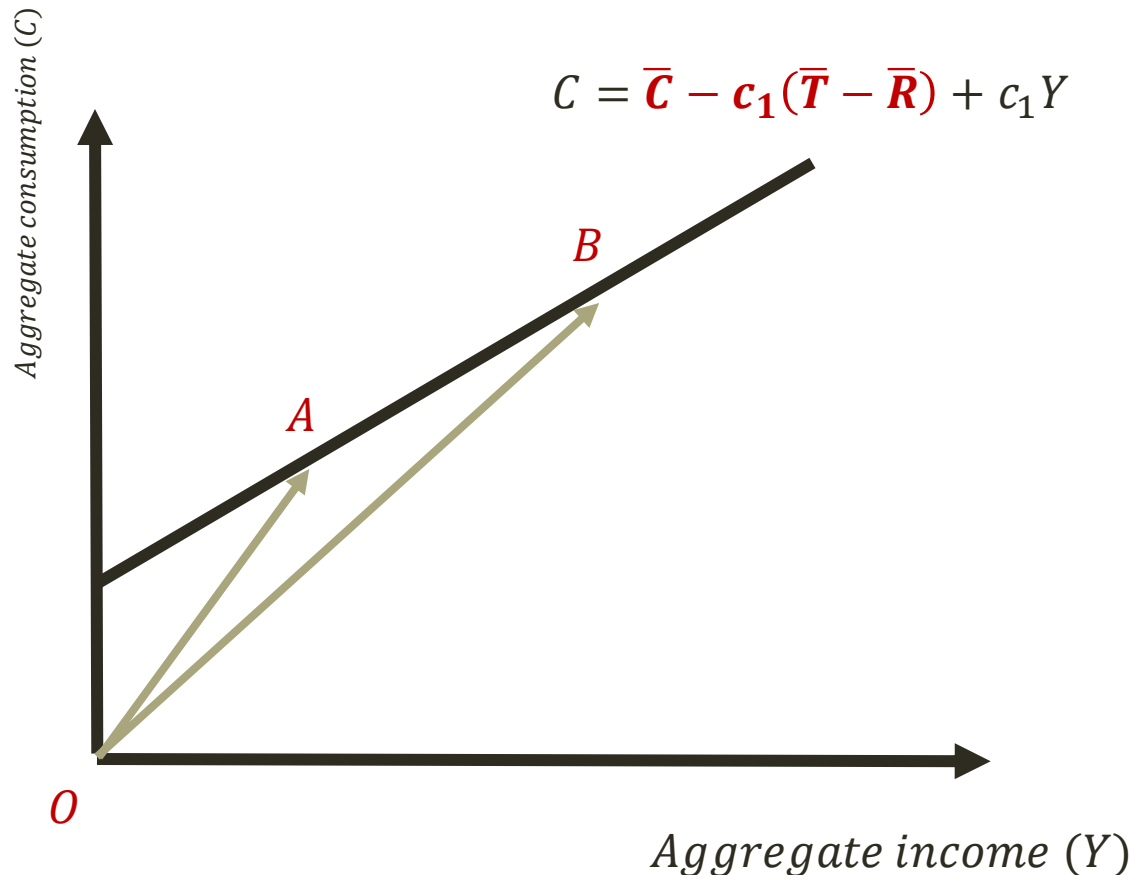
Intercept: $\bar{C} - c_1(\bar{T} - \bar{R})$ (autonomous consumption netted out by net-tax)

Slope: MPC (c_1)

Note:

1. Constant MPC: Out of every increase in \$1 of income, consumption constantly rises by $\$c_1$
2. Consumption-to-income is not. The average consumption declines as the aggregate income increases.

THEORY OF CONSUMPTION: GRAPHICAL ILLUSTRATION OF KEYNESIAN CONSUMPTION FUNCTION



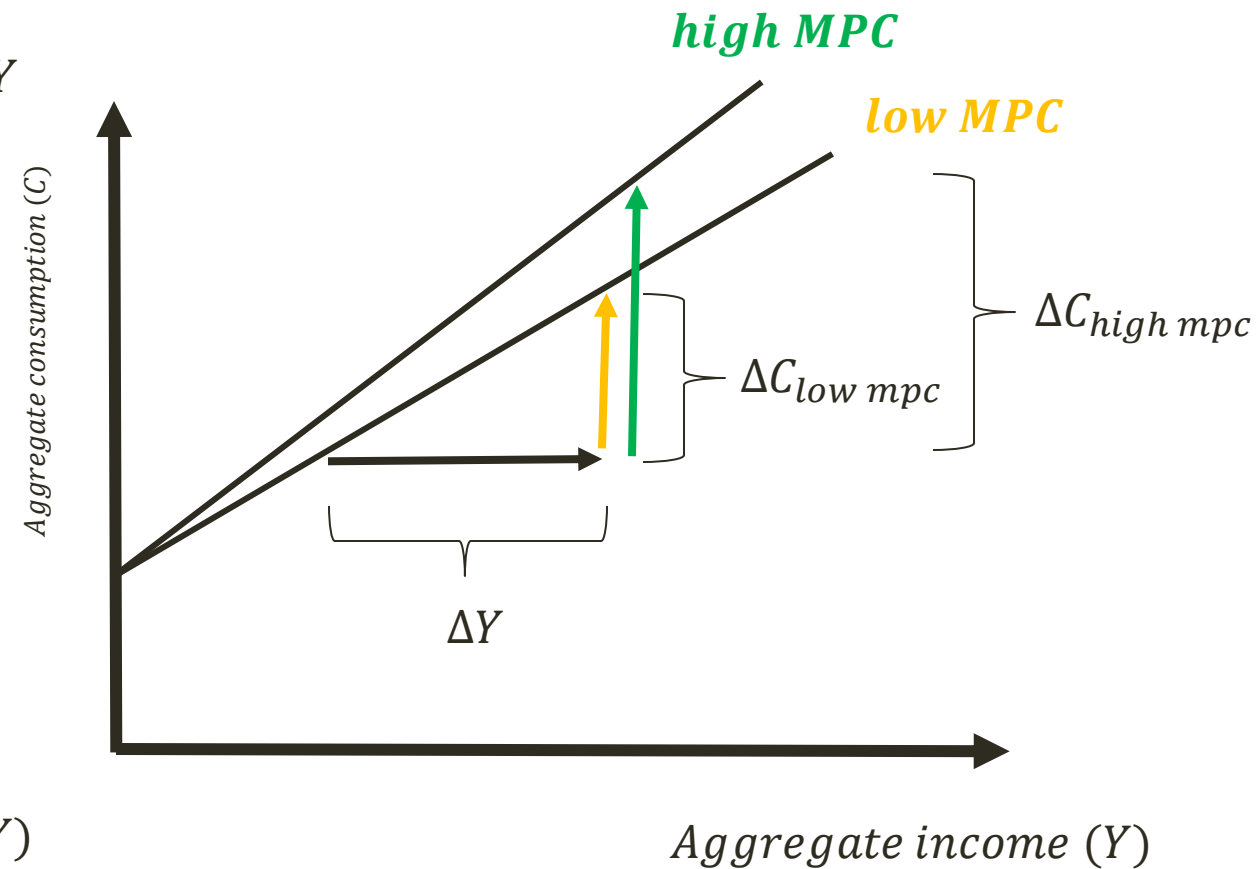
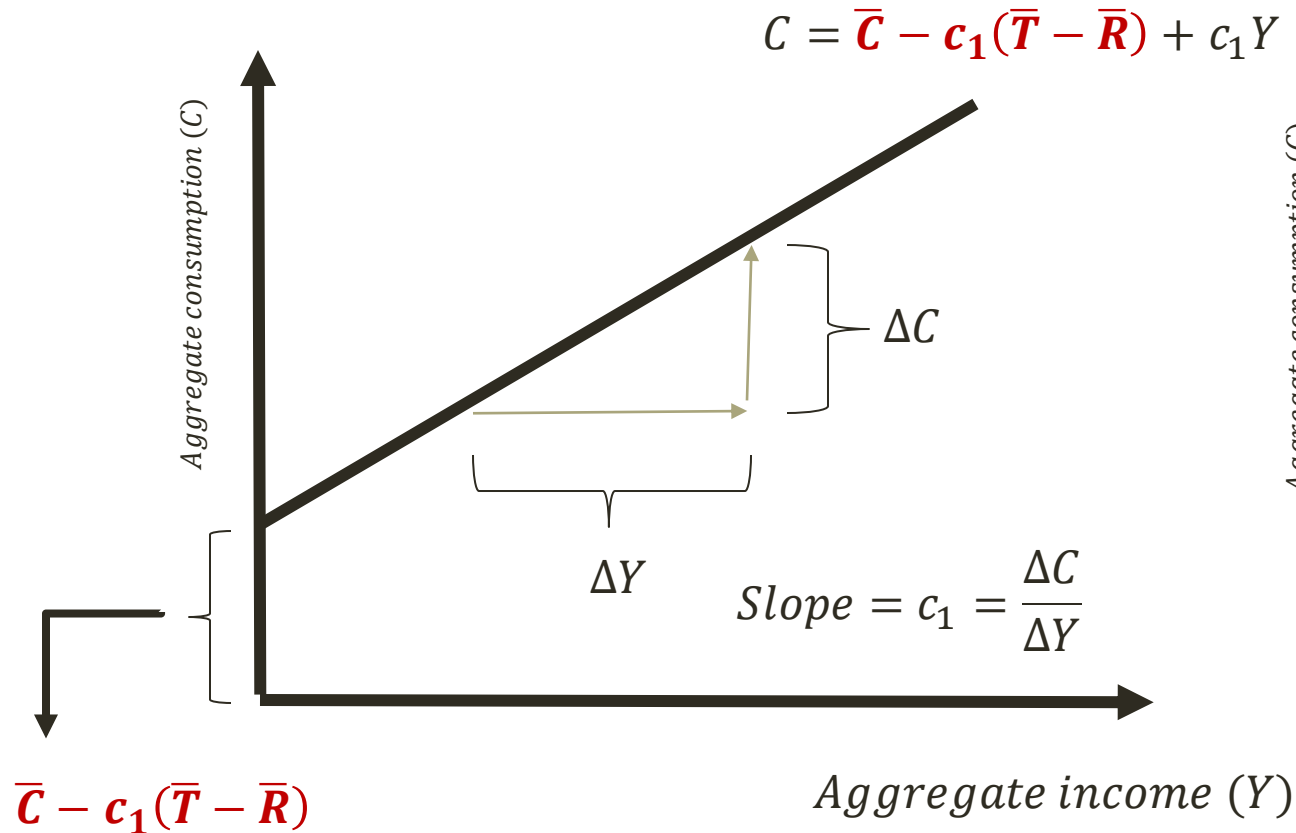
$$\text{Average consumption} = \frac{C}{Y}$$

Graphically measured by slope of the original ray (OA and OB)

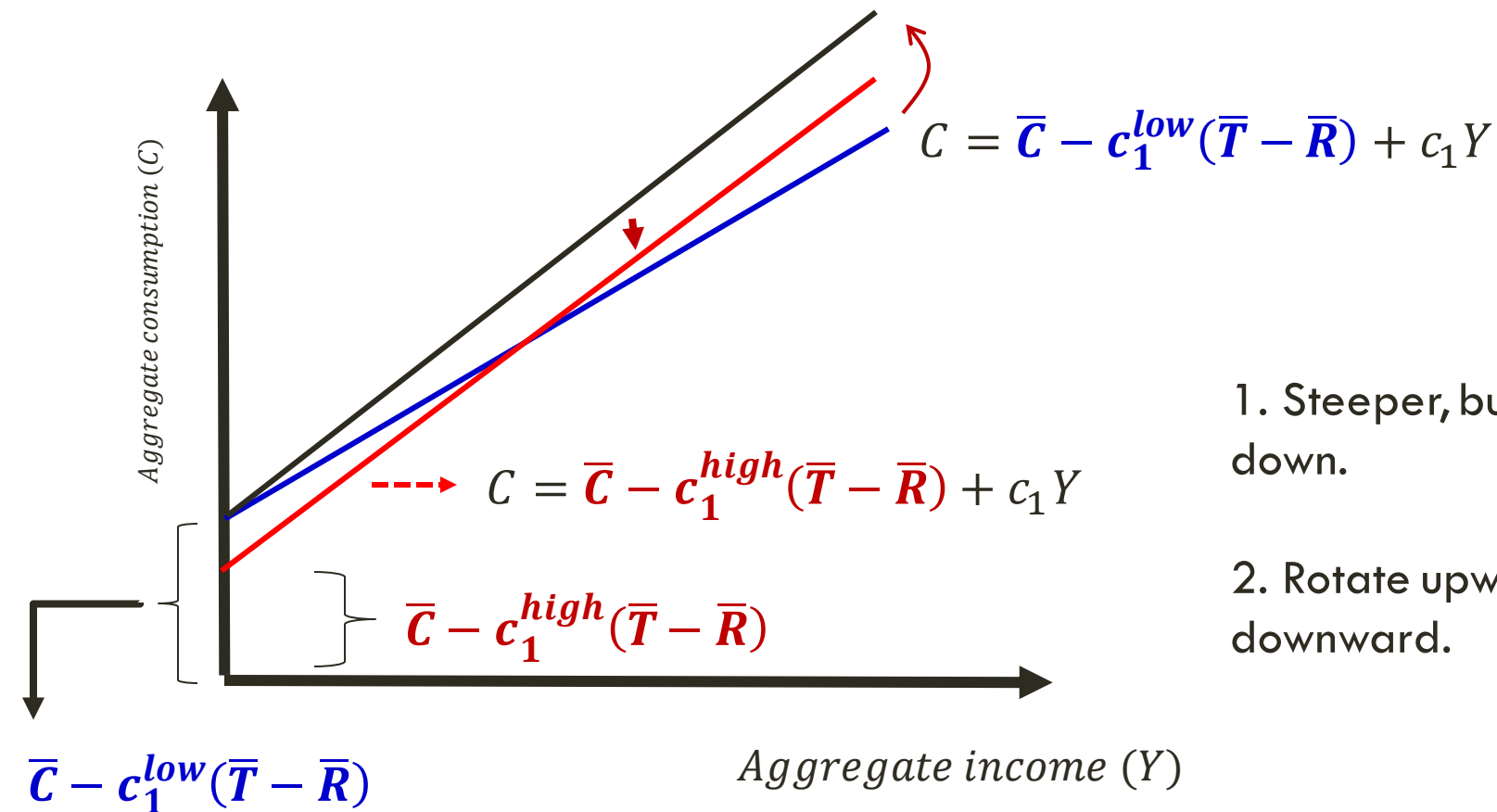
Average consumption declines as aggregate income increases.

THEORY OF CONSUMPTION: GRAPHICAL ILLUSTRATION OF KEYNESIAN CONSUMPTION FUNCTION

Effect of changing MPC



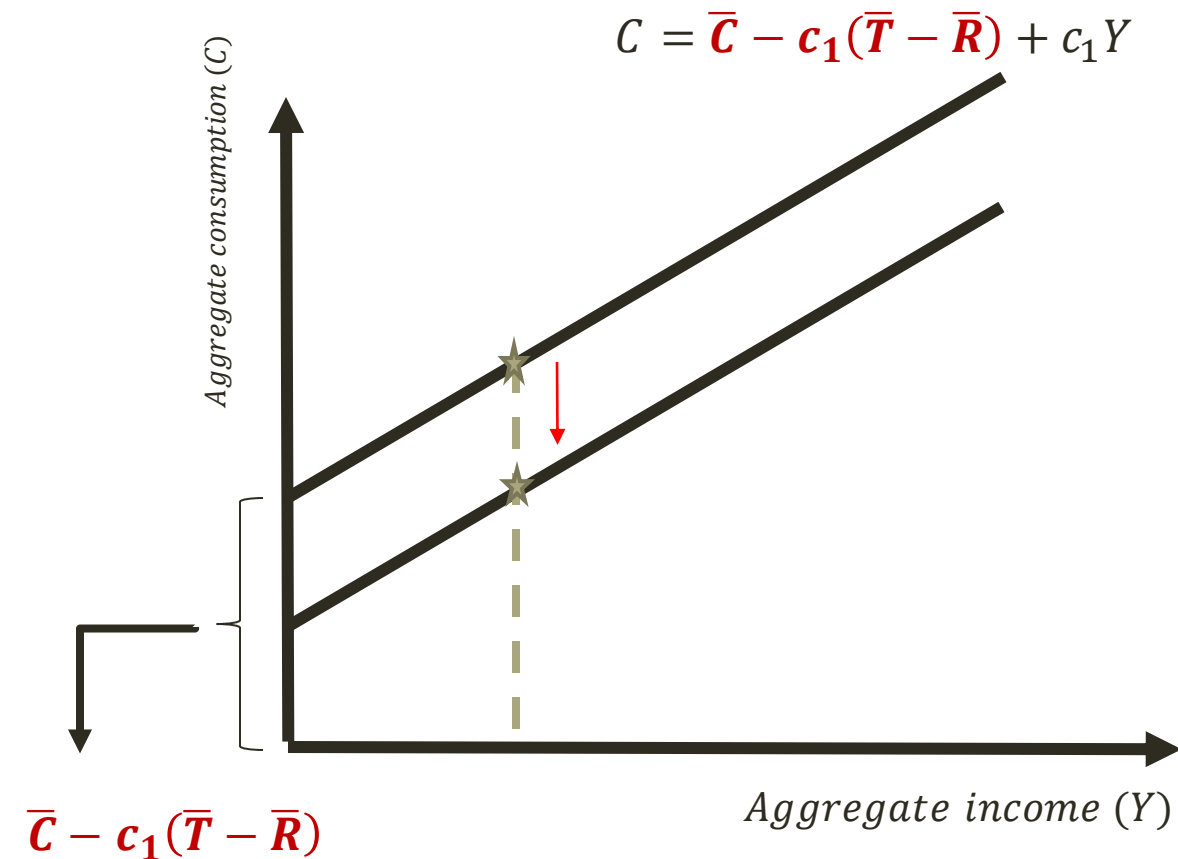
THEORY OF CONSUMPTION: GRAPHICAL ILLUSTRATION OF KEYNESIAN CONSUMPTION FUNCTION



1. Steeper, but the intercept is going down.

2. Rotate upward and parallel shift downward.

THEORY OF CONSUMPTION: GRAPHICAL ILLUSTRATION OF KEYNESIAN CONSUMPTION FUNCTION



- How do we capture the effect of other factors on consumption?
- We use the concept of **change in the Keynesian consumption function**.
 - Change in the Keynesian consumption function represents change in the consumption, **not due to the income, but other factors that were previously kept fixed**.
- **Shifting up (positive) / Shift down (negative).**

Example: An increase in the interest rate, bad economic outlooks, stock price collapse, rumors about product's quality, expectations on being laid-off

THEORY OF CONSUMPTION: SAVING...

- The opposite of consumption is **saving!**
- Saving (S) = Income – Consumption = $Y - C$
- Saving function : $S = Y - [\bar{C} - c_1(\bar{T} - \bar{R}) + c_1Y] = -(\bar{C} - c_1(\bar{T} - \bar{R})) + (1 - c_1)Y$
- Keynes called “ $(1 - c_1)$ ” as the **marginal propensity to save!**
- Notice that $MPC + MPS = 1$ (**Identity:** always true)

A NUMERICAL EXAMPLE

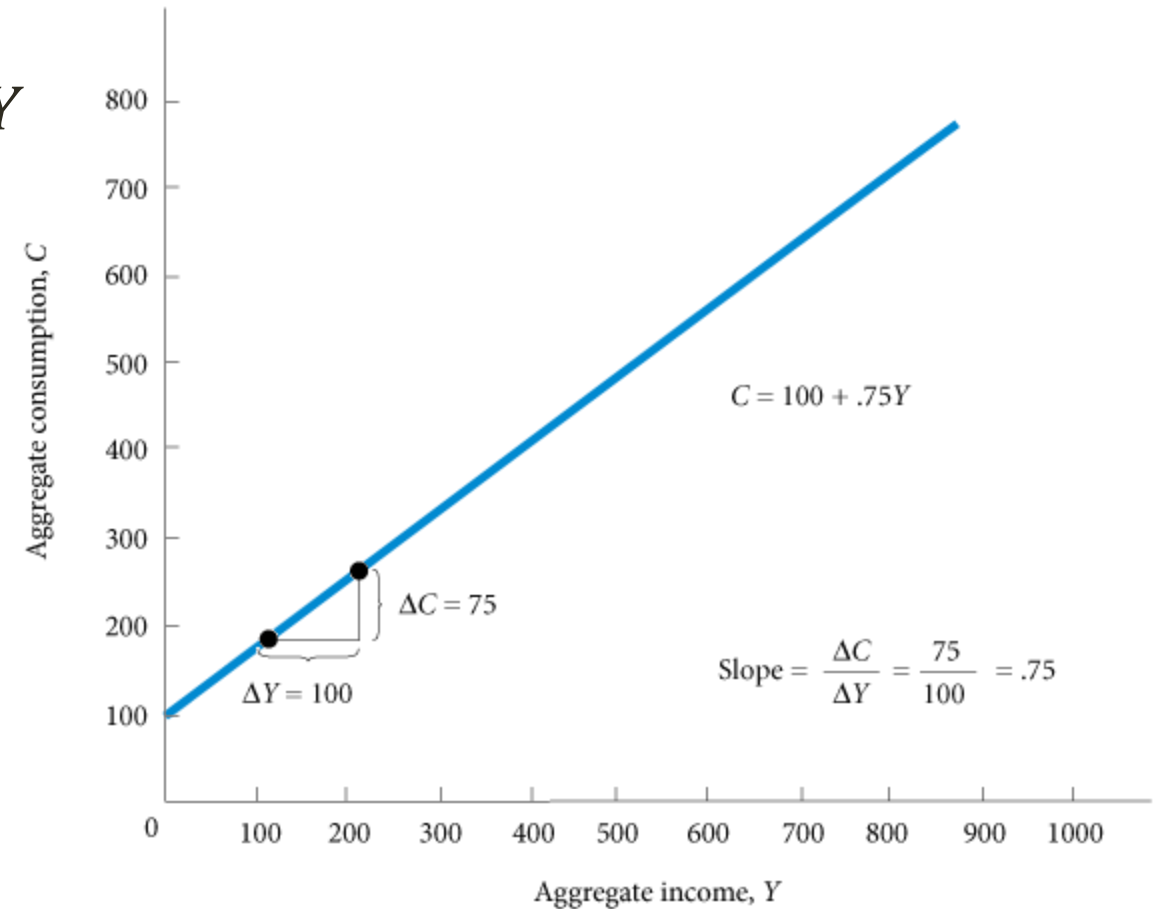
➤ Example Suppose that $C = 100 + 0.75Y$

In this simple consumption function, consumption is 100 at an income of zero.

As income rises, so does consumption. For every 100 increase in income, consumption rises by 75.

The slope of the line is .75.

Aggregate Income, Y	Aggregate Consumption, C
0	100
80	160
100	175
200	250
400	400
600	550
800	700
1,000	850

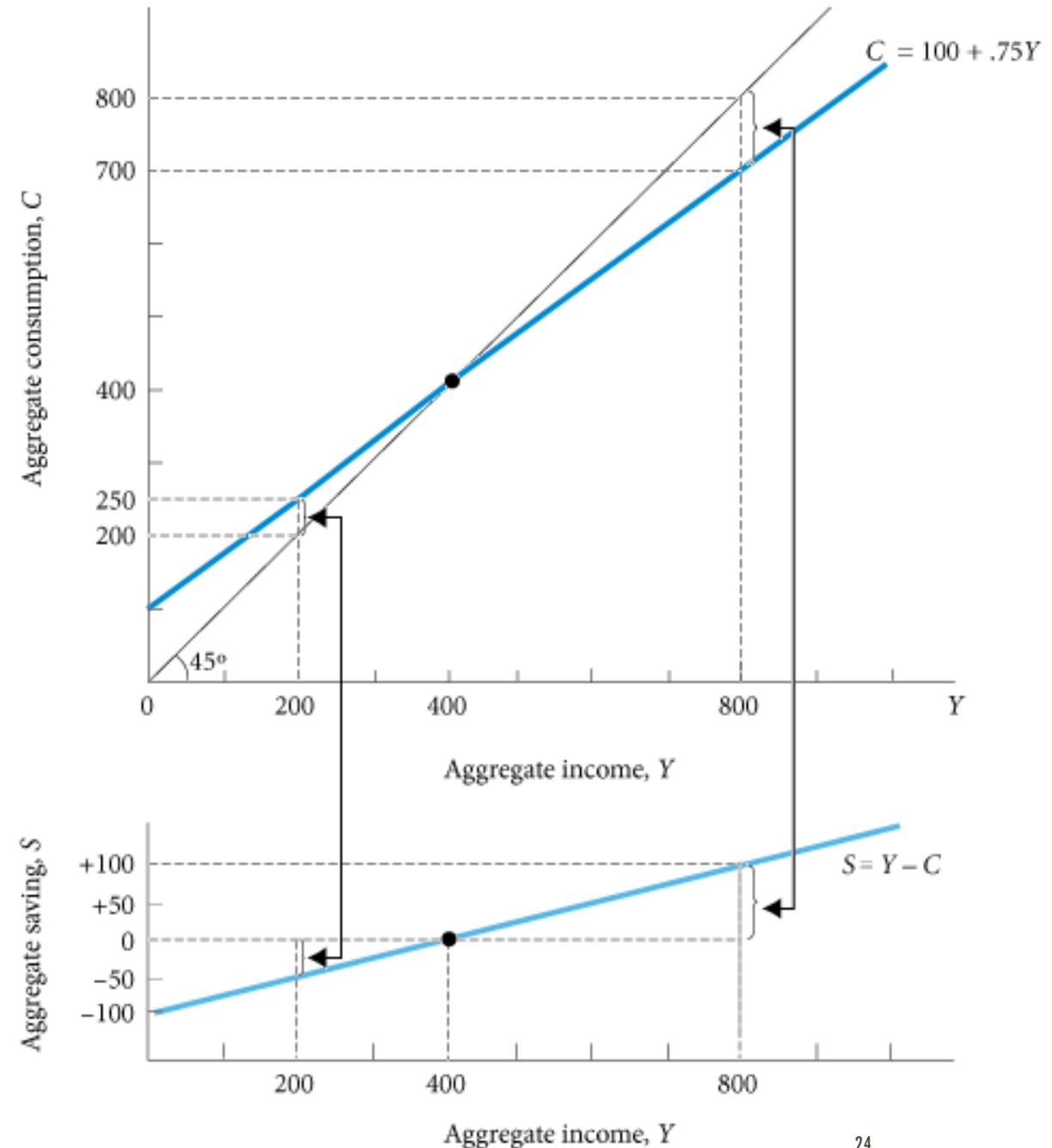


A NUMERICAL EXAMPLE

➤ Example Suppose that $C = 100 + 0.75Y$

A 45° line drawn from the origin can be used as a convenient tool to compare consumption and income graphically. The line indicates that $Y = C$

Y AGGREGATE INCOME	- C AGGREGATE CONSUMPTION	= S AGGREGATE SAVING
0	100	-100
80	160	-80
100	175	-75
200	250	-50
400	400	0
600	550	50
800	700	100
1,000	850	150



AGENDA

- Theory of aggregate consumption (C)
- **Theory of aggregate investment (I)**
- Government expenditure (G)
- Theory of net exports ($NX = X - M$)

THEORY OF PRIVATE INVESTMENT

- What is the private investment?
 - Purchase of goods / construction of fixed tangible asset by business sector – e.g. machines, tools, computers / plants, buildings
- Why firms invest?
 - Help improving the capacity of business's production in the future.
- Investment also includes “firm's inventories goods”.
 - Firms don't put their shelves empty; keeps stock of their product for incoming demand.

THEORY OF PRIVATE INVESTMENT: INVESTMENT FUNCTION

- Similar to the consumption, investment function relates the level of private investment to its determinants.

$$I = f(\textit{determinants})$$

Question: what drives the level of aggregate (private) investment? And, how does it drive?

THEORY OF INVESTMENT: DETERMINANTS

➤ Economists believe that there are many **variables that determine** the level of private investment.

- Level of aggregate income (production): **Y**
- Interest rate : **r**
- Business confidence / Psychology : **BSI**
- Tax privileges & Government measures : **BOI**
- **Others**

THEORY OF INVESTMENT: LINEAR INVESTMENT FUNCTION

- Once gain, **linear relationship/function** for the private investment.
- Linear investment function:

$$I = I_0 + I_1Y + I_2r + I_3BSI + I_4RISK + I_5BOI + I_6others$$

ACTIVE LEARNING: STATE THE SIGN OF THE COEFFICIENTS

Coefficients	Sign
I_1	
I_2	
I_3	
I_4	
I_5	

THEORY OF INVESTMENT: INVESTMENT AND AGGREGATE INCOME

- **Keynesian investment function:**
 - John Maynard Keynes believed that private investment is largely determined by aggregate income.
- **Ceteris paribus revisited:** to have a deeper look at the relation between investment and aggregate income.

$$I = \underbrace{\{I_0 + I_2 \bar{r} + I_3 \overline{BSI} + I_4 \overline{RISK} + I_5 \overline{BOI} + I_6 \overline{others}\}}_{\bar{I}} + \underbrace{I_1 Y}$$
$$I = \bar{I} + I_1 Y$$

THEORY OF INVESTMENT: KEYNESIAN INVESTMENT FUNCTION

➤ What is $\bar{I}$?

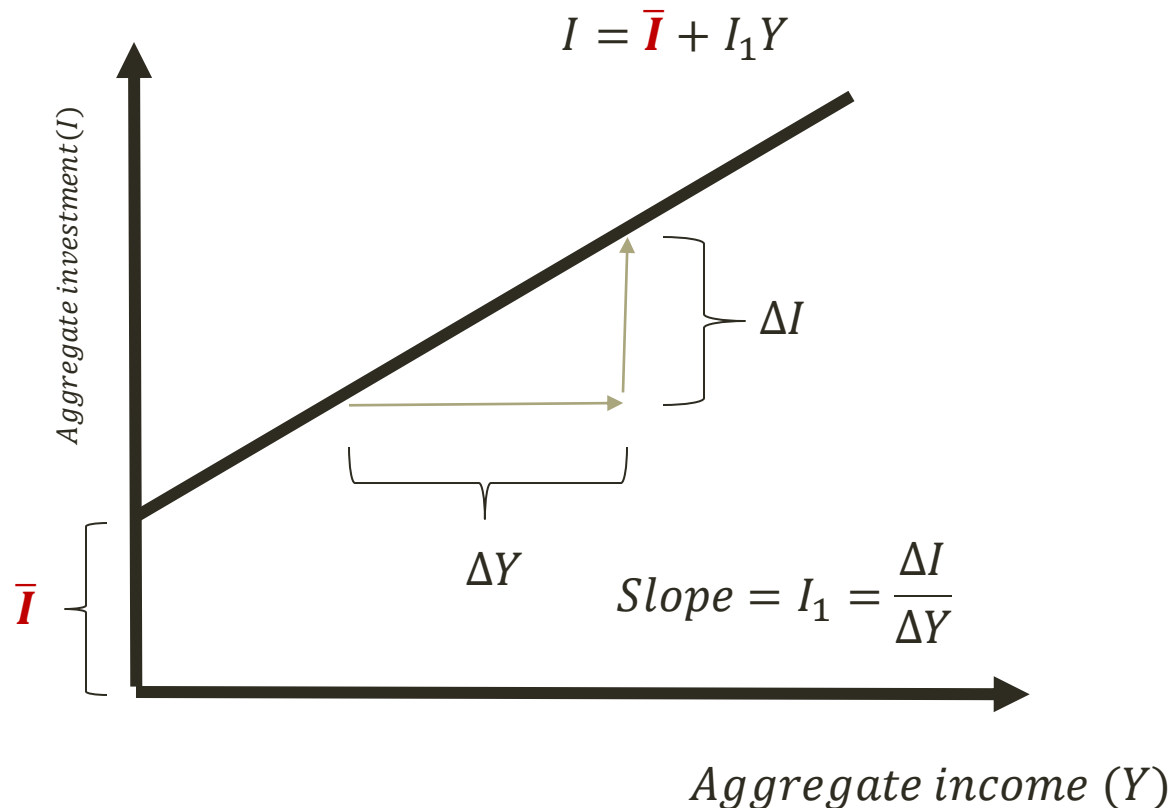
- $\bar{I}$: the level of investment when aggregate income is equal to zero
- Keynes called “autonomous investment-e.g. investment level that is independent of income.”
- The level of autonomous investment is pre-determined by determinants of investment that are being fixed”

THEORY OF INVESTMENT: KEYNESIAN INVESTMENT FUNCTION

➤ What is I_1 ?

- Mathematically, $I_1 = \frac{\Delta I}{\Delta y}$ - e.g. change in investment with respect to change in income.
- Keynes called “**marginal propensity to invest (MPI)**”
 - MPI: out of an “additional” increase in the aggregate income by \$1, how much do firms invest?
- Keynes believe that *the MPI* should be greater than 0, but strictly less than 1.

THEORY OF INVESTMENT: GRAPHICAL ILLUSTRATION OF KEYNESIAN INVESTMENT FUNCTION

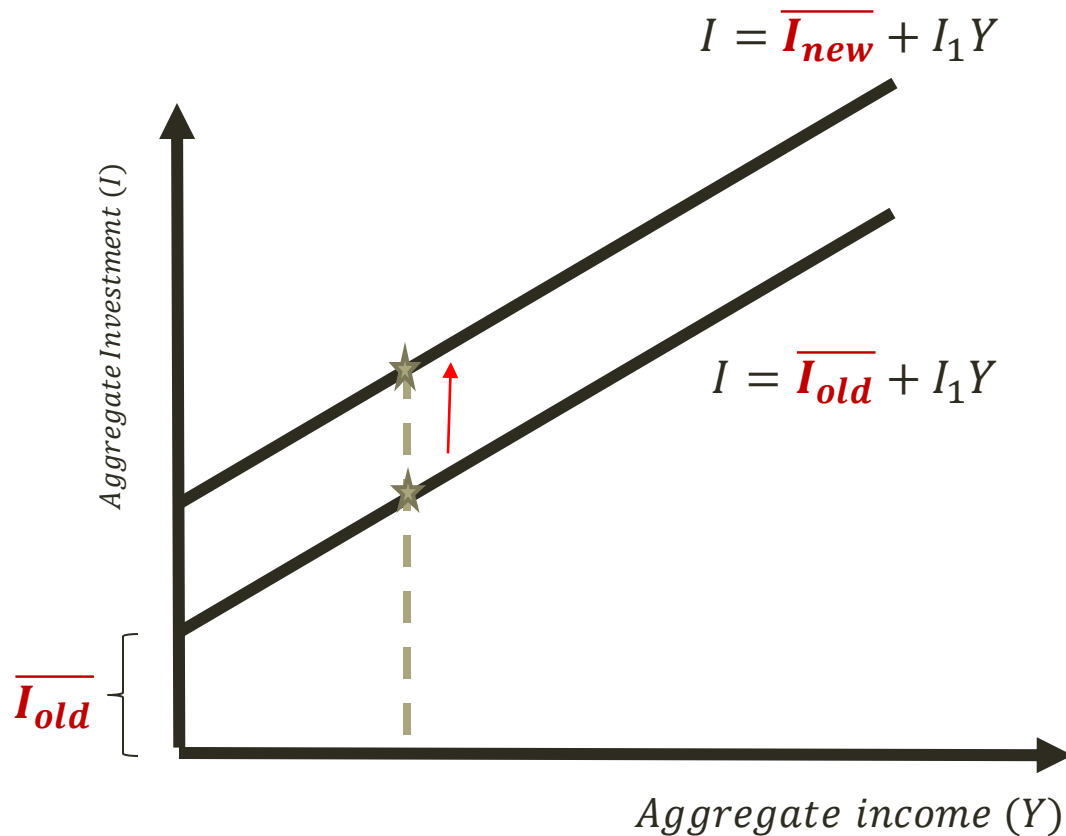


Intercept: $\bar{I}$ (autonomous investment)
Slope: MPI (I_1)

Note:

1. Constant MPI: Out of every increase in \$1 of income, investment constantly rises by $\$I_1$
2. Investment-to-income is not. The average investment declines as the aggregate income increases.

THEORY OF INVESTMENT: GRAPHICAL ILLUSTRATION OF KEYNESIAN INVESTMENT FUNCTION



- How do we capture the effect of other factors on investment?
- We use the concept of **change in the Keynesian investment function**.
 - Change in the Keynesian investment function represents change in the investment, **not due to the income, but other factors that were previously kept fixed.**
- **Shifting up / Shift down.**

Example: A lower in the interest rate, better economic outlooks and etc..

THEORY OF INVESTMENT: WHY DOES INVESTMENT NEGATIVELY RELATE TO INTEREST RATE?

- **Common sense:** borrowing is more costly. Firms should invest less.
- Deeper economic intuition?
 - Benefit of investment?
 - What do firms consider when making choice of investment?
- **Theory of marginal efficiency of capital and investment (MEC and MEI)**

THEORY OF INVESTMENT: CAPITAL STOCK AND INVESTMENT

- Firms purchase more of new capital for **future benefits**.
 - New capital purchased is called the investment.
- What is the benefit for buying new capital or investment?
 - The increased revenue over the life-time of firm's operation.
 - **Example:**
 - Buying more units of machine → more output can be produced, and hence revenue earned in the future!
 - Holding more inventories → goods readily available when customer stops by.

THEORY OF INVESTMENT: CAPITAL STOCK AND INVESTMENT

- However, investment is not free!
- Buying new machine requires financing!
 - **Borrowing (External finance)** → Interest rate charged by lenders in the financial market.
 - **Own money (Internal finance)** → opportunity cost of alternative investments
- Cost of investment is generally captured by the **market interest rate**

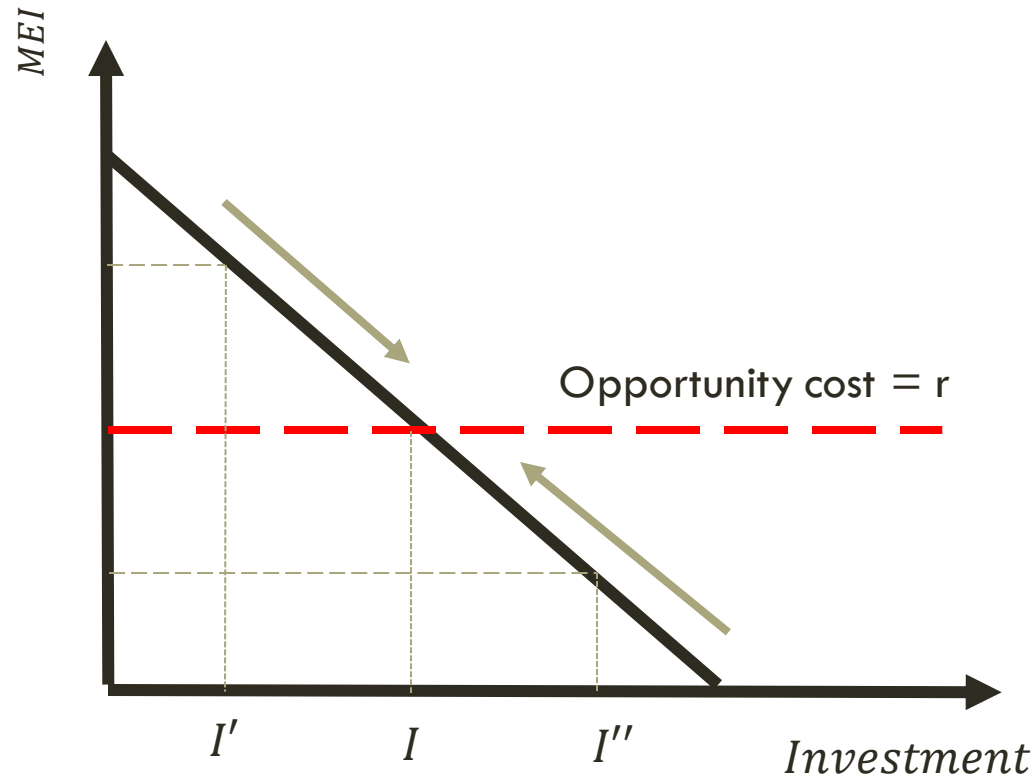
THEORY OF INVESTMENT: CAPITAL STOCK AND INVESTMENT

- As investment increases, firm's revenue should increase, and so as to the cost of investment.
- So, what's the problem? Shouldn't we keep expanding the investment scale?
- No, the **law of diminishing return of investment!**

THEORY OF INVESTMENT: CAPITAL STOCK AND INVESTMENT

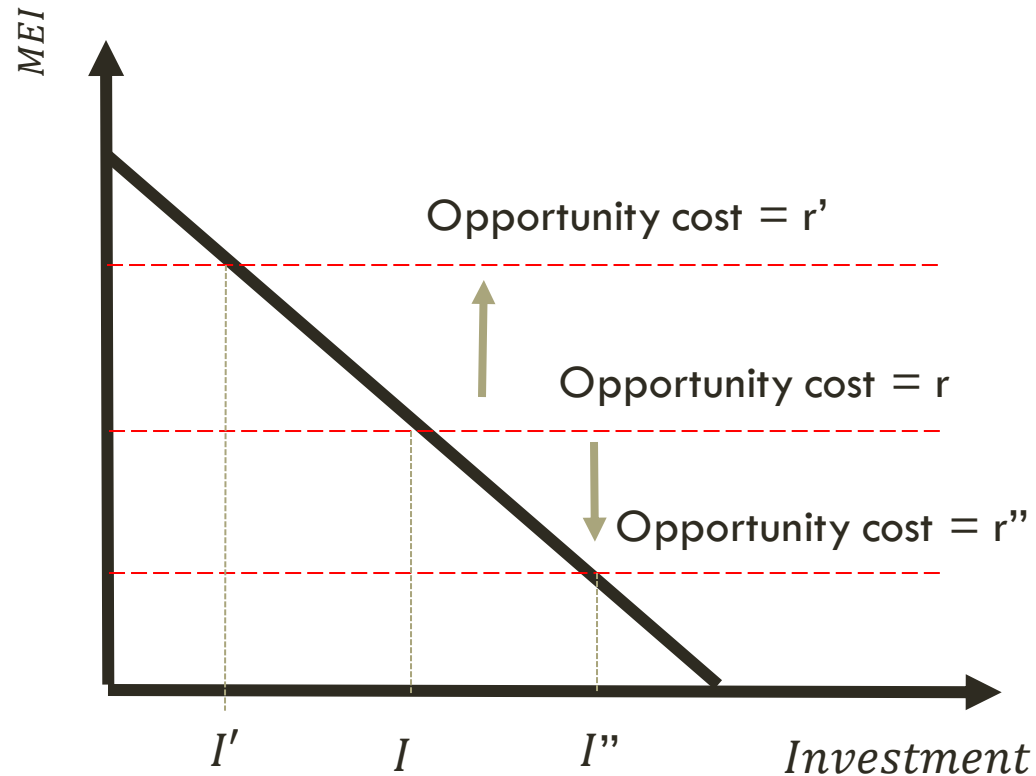
- Keynes believed that, **given other things fixed**, benefit of investment is to obtain more revenue; however, the **incremental revenue/return drops instead**.
 - The incremental profit, due to an additional investment, is called “**marginal benefit of investment**” or “**marginal efficiency of investment**”.
 - **Efficiency**: how investment can productively generate return/revenue/profit!
 - Diminishing marginal efficiency of investment: **downward sloping MEI curve**
- **Example**: Large-scale sky train investment

THEORY OF INVESTMENT: CAPITAL STOCK AND INVESTMENT



- As firms invest more, the marginal efficiency of investment decreases.
- Firms compare between “**marginal benefit**” v.s. “**marginal cost**”.
 - As long as $MEI > r \rightarrow$ firms find a room for an improvement to purchase more investment.
 - When $MEI < r \rightarrow$ firms are overly investing.
- Stopping Rule: $MEI = r$ (**Optimal investment scale**)

THEORY OF INVESTMENT: CAPITAL STOCK AND INVESTMENT



- As interest rate **rises** from r to r' , firms **downsize** their investment scale!
- As interest rate **falls** from r to r'' , firms **increase** their investment scale!
- **Investment is then negatively related to interest rate.**

AGENDA

- Theory of private consumption (C)
- Theory of private investment (I)
- **Government expenditure (G)**
- Theory of net exports ($NX = X - M$)

GOVERNMENT EXPENDITURE

- Government expenditure will exclude the **spending that do not include the exchange of G&S** under the transaction – e.g. social transfer payments, subsidies, and etc.
- Government purchase = Government purchase of consumption goods and services + Government investment
- We usually **treat the level of government purchase (G) as given.**

AGENDA

- Theory of private consumption (C)
- Theory of private investment (I)
- Government expenditure (G)
- **Theory of net exports ($NX = X - M$)**

THEORY OF NET EXPORTS

➤ Net exports = Exports – Imports

- Exports are the revenue of a country earned when foreigners buy goods and services from domestic producers.
 - Goods: Vegetables / Processed food / Electronica products / Cars etc.
 - Services: Tourism / Hotel
- Imports are the payments of a country to the ROTW for purchasing goods and services made by foreign producers.
 - Goods: Crude Oil / Material inputs / I-phone / Supercar / Hermes etc.
 - Services: Tourism / International freights

EXPORTS: DETERMINANTS

- Exports are the revenue of a country earned when foreigners buy **goods and services** from domestic producers.
- Exports = demand for Thai product (g&s)
 - Buyer's income – e.g. ROTW income / foreign countries' income
 - Trade barriers – e.g. Tariff barrier v.s. Non-tariff barrier
 - Exchange rate & Domestic prices in Thai baht

EXCHANGE RATE / DOMESTIC PRICES

- **Exchange rate (e):** rate of conversion between two national currencies – e.g. baht/1USD
 - **Example:** $e = 33 \text{ baht} / 1 \text{ USD} \rightarrow 1 \text{ USD can get you 33 baht.}$
- **Currency appreciation:** a currency is gaining more of its value relative to another currency.
- **Currency depreciation:** a currency is loosing of its value relative to another currency.
- **Example:** 1 USD gets more baht; $1 \text{ USD} = 33 \rightarrow 1 \text{ USD} = 35$
 - USD appreciation; THB depreciation

EXCHANGE RATE / DOMESTIC PRICES

- **Domestic price in Thai baht:** prices of Thai product measured in terms of Thai baht
 - **Example:** price per dish of Thai street food is 33 THB.
- **Exports price in terms of foreign currency:** For the same level of domestic price, THB appreciation makes Thai products becoming more expensive.
 - **Example:** 1 USD = 33 THB → \$2 per meal → Buying two dishes!

IMPORTS

- Exports are the revenue of a country earned when foreigners buy **goods and services** from domestic producers.
- Imports = demand for foreign product (g&s)
 - Thailand's income (Y)
 - Trade barriers – e.g. Tariff barrier v.s. Non-tariff barrier.
 - Exchange rate & Foreign prices

EXCHANGE RATE / DOMESTIC PRICES

- **Foreign price in Foreign baht:** prices of Foreign products measured in terms of foreign currency.
 - **Example:** Louis Viton costs you \$10,000.
- **Import price in terms of THB:** For the same level of domestic price, THB appreciation makes Foreign products becoming cheaper.
 - **Example:** Louis Viton in THB costs you THB 33,000.

THEORY OF NET EXPORTS: NET EXPORTS FUNCTION

- Net exports = Exports – Imports
- Exports are considered to be independent of aggregate income!

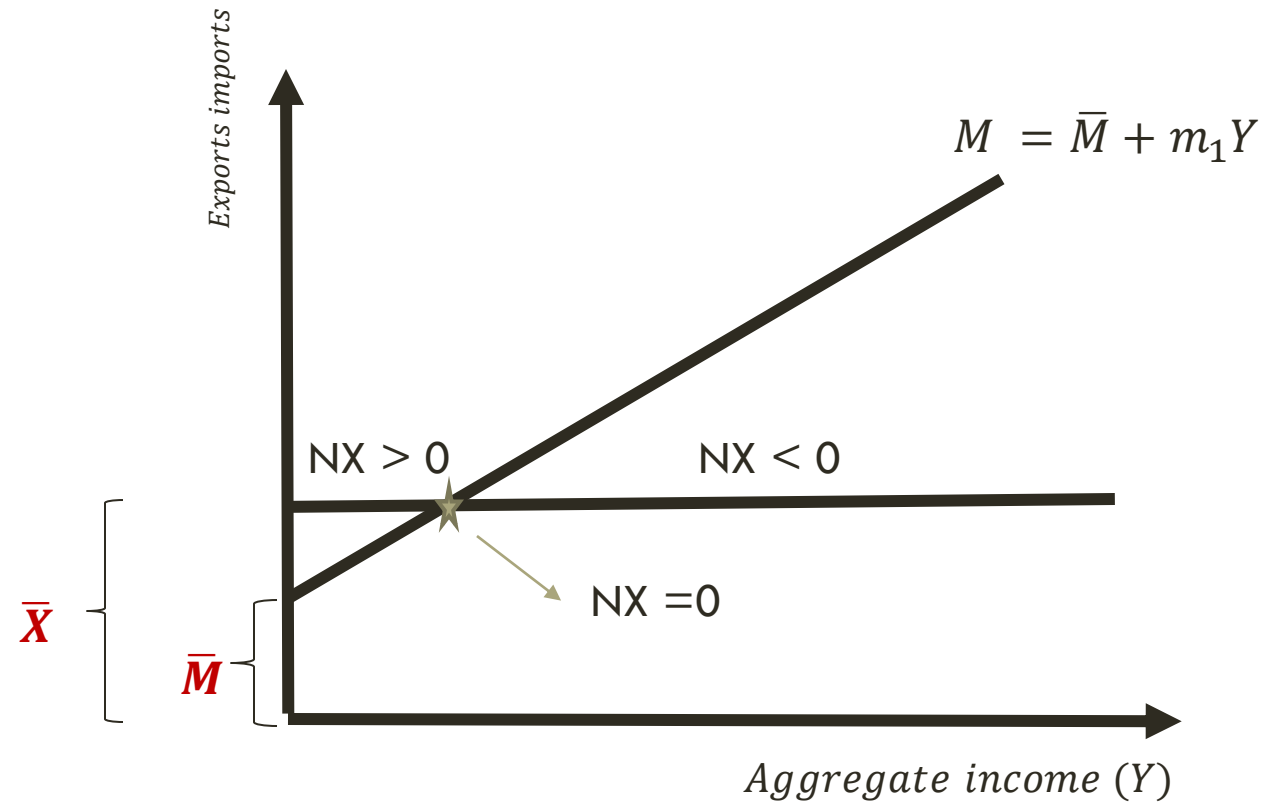
- $X = \bar{X}$

- Imports are considered to be dependent on aggregate income!

$$M = \bar{M} + m_1 Y$$

- $\bar{M}$: **autonomous imports** (the level of imports independent of income, determined by other factors)
- m_1 : **marginal propensity to imports (MPM)**

THEORY OF NET EXPORTS: GRAPHICAL ILLUSTRATION OF NET EXPORTS FUNCTION



1. $NX > 0$; trade surplus
 $NX < 0$; trade deficit
 $NX = 0$; trade under balance

2. NX improves when
 - (i) NX becomes more positive.
 - (ii) NX becomes less negative

3. NX improves as income decreases

ACTIVE LEARNING: HOW DOES IT AFFECT THE NET EXPORTS?

- Global economic slowdown
- USD depreciation
- Exceptionally drought season in Thailand
- Trade sanction imposed by US government on Thailand

SUM UP

- Understanding behavior of components of total spending: C, I, G, X, M
- Determinants of components of total spending
- Keynesian (desired) spending function
 - Autonomous spending (independent of income, but determined by other factors being kept fixed.)
 - Income-induced spending
- Next time, we look into the determination of income – i.e. **equilibrium income analysis**