Chapter No 18

Investment

"The social object of skilled investment should be to defeat the dark forces of time and ignorance which envelope our future."

— John Maynard Keynes

"ہنر مندانہ سرمایہ کاری کا سماجی مقصد وقت اور جستجو کی تاریک قوتوں کو شکست دینا ہے جو ہمارے مستقبل کو لفافہ بنانے ہیں۔"

While spending on consumption goods provides utility to households today, spending on investment goods is aimed at providing a higher standard of living at a later date. Investment is the component of GDP that links the present and the future.

Types of investment

(i) Business fixed investment &

Business fixed investment is one of the largest component of the others. The business fixed investment consists of purchases of newly produced plants and equipments, which are used in production.

(ii) Residential investment &

Residential investment includes the new housing that people buy to live in and that landlords buy to rent out.

(iii) Inventory investment &

Inventory investment includes those goods that businesses put aside in storage, including materials and supplies, work in process, and finished goods.

" Goods purchased but not sold are added to the inventory.

Inventories may be positive or negative, such as.

→ If contomer buy less then expected, inventories unexpectedly build up and unintended inventory inuestment turns out to have been positive [+ive].

→ If customers buys more then expected, inventories unexpec-tedly decline and unintended inventory inuestment turns out to have been negative (-ive).

⇒ Economists study inuestment to better understand the fluctuations ( ) in the economy's output of goods and services.

The simple inuestment function relating inuestment to the real interest : $I = I(r)$.
The function states that

an increase in the real interest rate reduces investment.

When expenditure on goods and services falls during a recession, much of the decline is usually due to a drop in investment.

So, In book figure 18.1 plots total investment and its three components in the united states between 1970 - 2008. You can see that all types of investment usually fall during recession, which are shown as shaded areas in the figure.

The three components of Investment
The figure 18.1 in book (page 526) shows total investment, business fixed investment, residential investment, and inventory investment in

the United States from 1970 to 2008. Notice that all types of investment usually fall during recession, which are indicated here by the shaded areas.

In this Chapter we build models of each type of investment to explain these fluctuations. The models will shed light on the following questions.

Q1) Why is investment negatively related to the interest rate?

Q2) What causes the investment function to shift?

Q3) Why does investment rise during booms and fall during recessions?

Business fixed investment
The largest piece of investment spending, accounting for about Three quarters

of the total, is business fixed investment. The term "business" means that these investment goods are bought by firms for use in future production. The term "fixed" means that this spending is for capital that will stay put for a while, as opposed to inventory investment, which will be used or sold within a short time. Business fixed investment includes everything from office furniture to factories, computers to company cars.

→ The standard model of business fixed investment is called the neoclassical model of investment.
The neoclassical model examines the benefits and costs to firms of owning capital goods. The neoclassical theory explains that at a particular time how much capital

stock a firm desires to achieve.

The model shows how the level of investment — the addition to the stock of capital — is related to the marginal product of capital, the interest rate, and the tax rules affecting firms.

To develop the model, imagine that there are two kinds of firms in the economy.

i) Production firms:
Production firms produce goods and services using capital that they rent.

ii) Rental firms:
Rental firms make all the investments in the economy; they buy capital and rent it out to the production firms.

⇒ The Rental price of Capital &

Lets consider the typical production firm decides how much of capital to rent by comparing the cost and benefit of each unit of capital.

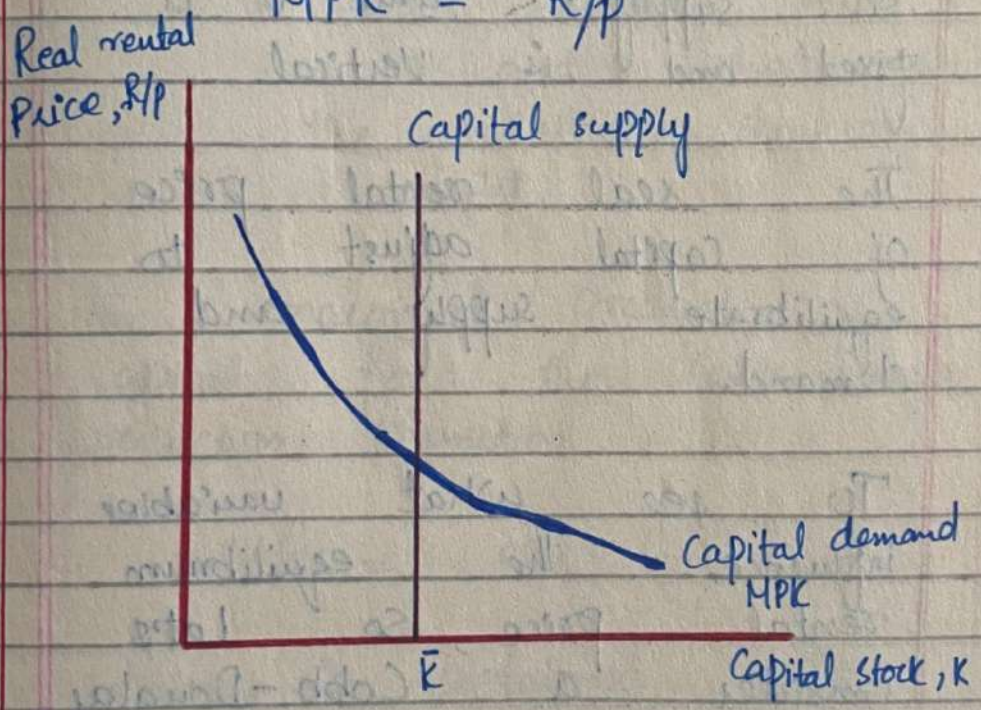
The firm rents capital at a rental rate R and sells its output at a price P. So, the real cost of a unit of capital to the production firm is R/P.

The real benefit of a unit of a capital is the marginal product of Capital (MPK). (the extra output produced with one more unit of capital).
The MPK (marginal product of capital) falls as the amount of capital rises: the more capital

the firm has, the less an additional unit of capital will add to its output.

So, to maximize profit, the firms rents capital until the MPK fall to.

$$MPK = R/P$$



In the above graph shows the equilibrium in the rental market for capital.

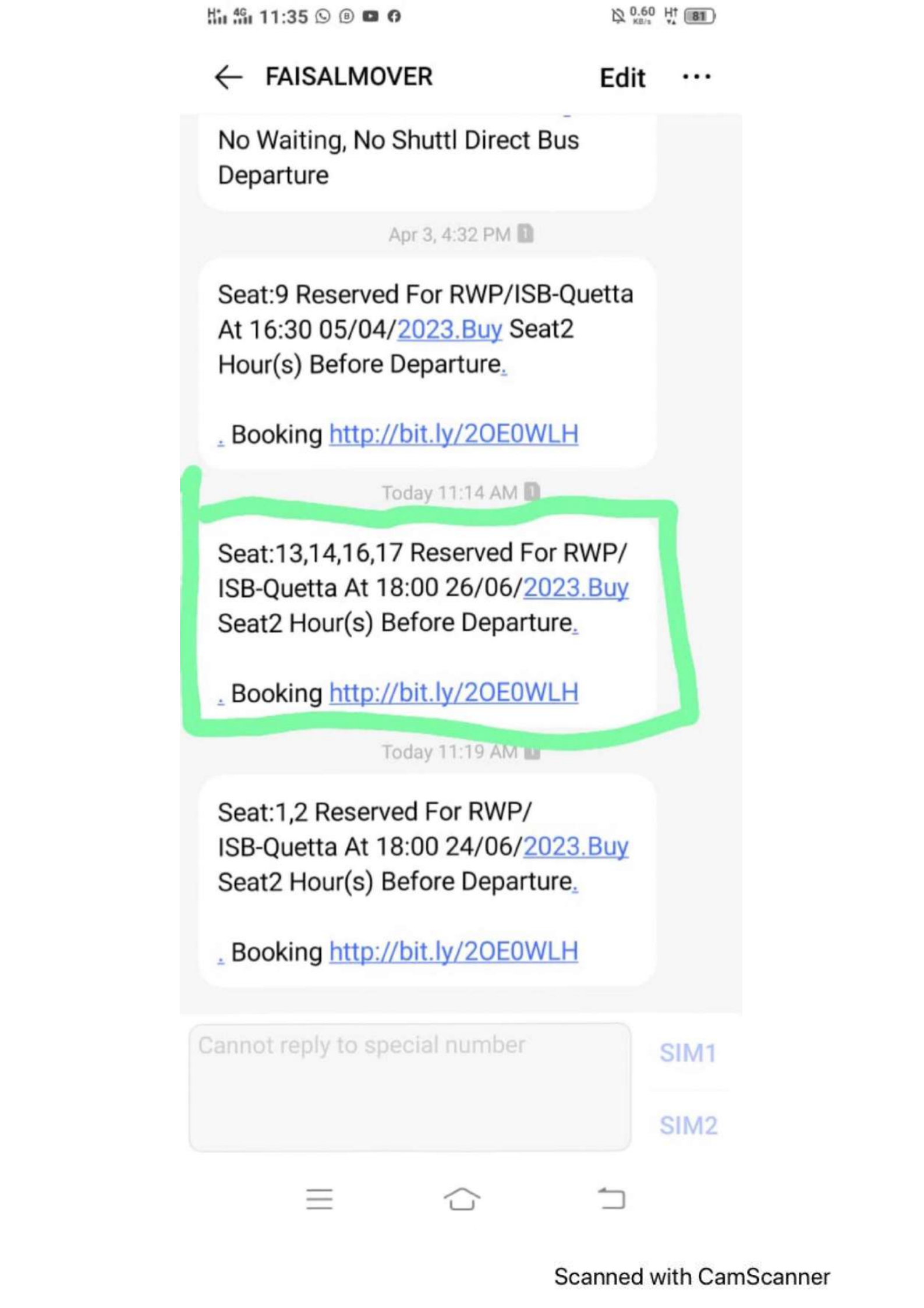
Hence Marginal product of capital determines the demand curve for capital

for a firm. The demand curve slopes downward because the marginal product of capital is low when the level of capital is high.

While at point in time, the amount of capital in the economy is fixed, so supply curve is fixed and is vertical.

The real rental price of capital adjust to equilibrate supply and demand.

To see what variables influence the equilibrium rental price, so Let's Consider a Cobb-Douglas production function which is a good approximation of how the actual economy turns capital and labor into goods and services the Cobb-Douglas production function is



فیس بک پر دوستی، اٹالین لڑکی پاکستانی محبوب سے ملنے پشین پہنچ گئی

$$Y = AK^{\alpha} L^{1-\alpha}$$

Where

$Y \Rightarrow$ is output

$K \Rightarrow$ Capital

$L \Rightarrow$ Labor

$A \Rightarrow$ a perameter measuring the level of technology.

$\alpha \Rightarrow$ A parameter b/w 0 and 1 that measures the capital's share of output.

The marginal product of capital for the Cobb-Douglas production function is.

$$MPK = \alpha A \left(\frac{L}{K}\right)^{1-\alpha}$$

Which is obtained simply taking the derivative of $Y = AK^{\alpha} L^{1-\alpha}$.

Because the real rental price (R/P) equals MPK in equilibrium, we can write as

$$R/P = \alpha A(L/K)^{1-\alpha}$$

This expression identifies the variables that determine the real rental price.

It shows the following:

i) The lower the stock of capital means K which is in inverse relation to R/P so the higher the real rental price of capital.

ii) The greater the amount of labor employed, the higher the real rental price of capital.

iii) The better the technology, the higher the real rental price of capital.

The Cost of Capital

Next consider the rental firms. These firms, like car-rental companies, merely buy capital goods and rent them out. Because our goal is to explain the investments made by the rental firms, we begin by considering the benefit and cost of owning capital.

The benefit of owning capital is the revenue earned by renting it to the production firms. The rental firm receives the real rental price of capital R/P for each unit of capital it owns and rents out.

The cost of owning capital is more complex. For each period of time that it rents out a unit of capital, the rental firm bears three costs:

1. When a rental firm borrows to buy a unit of capital, it must pay interest on the loan. If P_K is the purchase price of a unit of capital and i is the nominal interest rate, then iP_K is the interest cost. Notice that this interest cost would be the same even if the rental firm did not have to borrow: if the rental firm buys a unit of capital using cash on hand, it loses out on the interest it could have earned by depositing this cash in the bank. In either case, the interest cost equals iP_K.
2. While the rental firm is renting out the capital, the price of capital can change. If the price of capital falls, the firm loses, because the firm's asset has fallen in value. If the price of capital rises, the firm gains, because the firm's asset has risen in value. The cost of this loss or gain is $-\Delta P_K$. (The minus sign is here because we are measuring costs, not benefits.)
3. While the capital is rented out, it suffers wear and tear, called **depreciation.** If δ is the rate of depreciation—the fraction of capital's value lost per period because of wear and tear—then the dollar cost of depreciation is δP_K.

The total cost of renting out a unit of capital for one period is therefore

$$\text{Cost of Capital} = iP_K - \Delta P_K + \delta P_K$$

$$= P_K(i - \Delta P_K/P_K + \delta).$$

The cost of capital depends on the price of capital, the interest rate, the rate at which capital prices are changing, and the depreciation rate.

For example, consider the cost of capital to a car-rental company. The company buys cars for \$10,000 each and rents them out to other businesses. The company faces an interest rate i of 10 percent per year, so the interest cost iP_K is \$1,000 per year for each car the company owns. Car prices are rising at 6 percent per year, so, excluding wear and tear, the firm gets a capital gain ΔP_K of \$600 per year. Cars depreciate at 20 percent per year, so the loss due to wear and tear δP_K is \$2,000 per year. Therefore, the company's cost of capital is

$$\text{Cost of Capital} = \$1{,}000 - \$600 + \$2{,}000$$

$$= \$2{,}400.$$

The cost to the car-rental company of keeping a car in its capital stock is \$2,400 per year.

To make the expression for the cost of capital simpler and easier to interpret, we assume that the price of capital goods rises with the prices of other goods. In this case, $\Delta P_K/P_K$ equals the overall rate of inflation π. Because $i - \pi$ equals the real interest rate r, we can write the cost of capital as

$$\text{Cost of Capital} = P_K(r + \delta).$$

This equation states that the cost of capital depends on the price of capital, the real interest rate, and the depreciation rate.

Finally, we want to express the cost of capital relative to other goods in the economy. The **real cost of capital**—the cost of buying and renting out a unit of capital measured in units of the economy's output—is

$$\text{Real Cost of Capital} = (P_K/P)(r + \delta).$$

This equation states that the real cost of capital depends on the relative price of a capital good P_K/P, the real interest rate r, and the depreciation rate δ.

→ The Determinents of Investments

Rental firm's decision about whether to increase or decrease its capital stock depends on its profit rate. In simple words the firm's net inuestment depends on its profit rate. For each unit of capital, the firms earns real revanue R/p and bears the real cost $(PK/p)(r+\delta)$. So, the real profit per unit of capital is

Profit Rate = Revanue - Cost of capital

$$= R/p - (PK/p)(r+\delta)$$

Because R/P in equilibrium equal MPK so.

$$\text{Profit rate} = MPK - [PK/P](r + \delta)$$

→ If Profit rate > 0 then increasing K is profitable.

→ If Profit rate < 0 then the firm increases profit by reducing its capital stock.

⇒ The rental firms make a profit if the MPK (marginal product of capital) is greater than the cost of capital. It incurs a loss if the marginal product is less than the cost of capital.

⇒ The Investment functions We can now see the economic incentives that lie behind the rental firm's investment decision. The firms decision regarding its

Capital stock - that is whether to add to it or to let it depreciate - depends on whether owning and renting out capital is profitable. The change in capital stock called net investment, depends on ~~whether~~ the difference between the marginal product of Capital and the cost of capital.

→ If the marginal product of capital exceeds the cost of capital firms find it profitable to add to their capital stock.

→ But if the marginal product of capital falls short of the cost of capital, they let their capital stock shrink.

Like a firm that owns and rent out capital, this firm adds to

MA

McCall MacBain Scholars... Yesterday

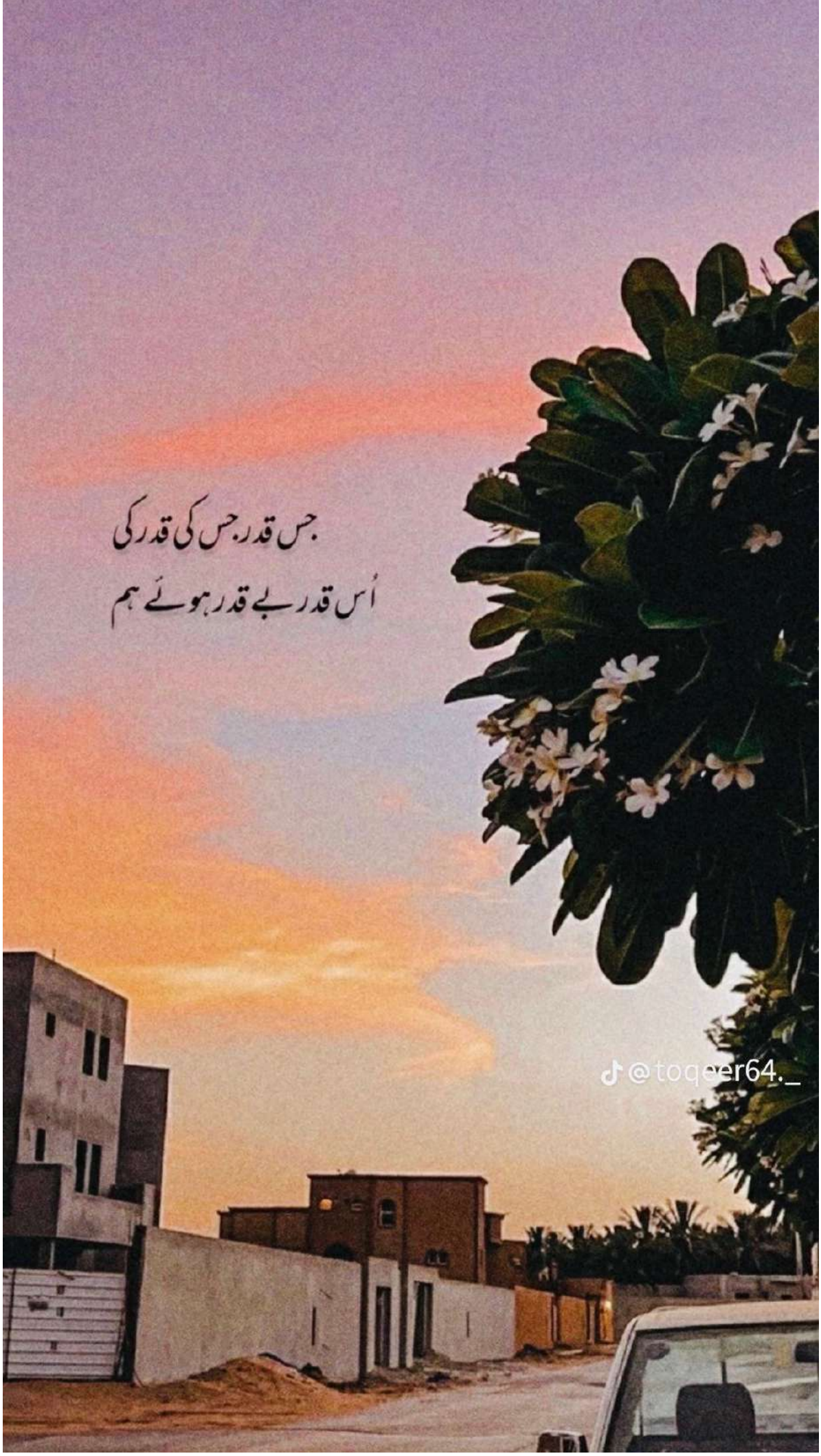
To: syednaseerqau@gmail.com >

More opportunities to connect

BOURSIERS
McCall
MacBain
SCHOLARS

Applying as an international candidate? August 24, 2023 at 4:00 PM Eastern Time is the deadline to apply for the 2024 cohort! This includes completion of the two reference forms. Don't miss your chance!

Connect with Scholars and

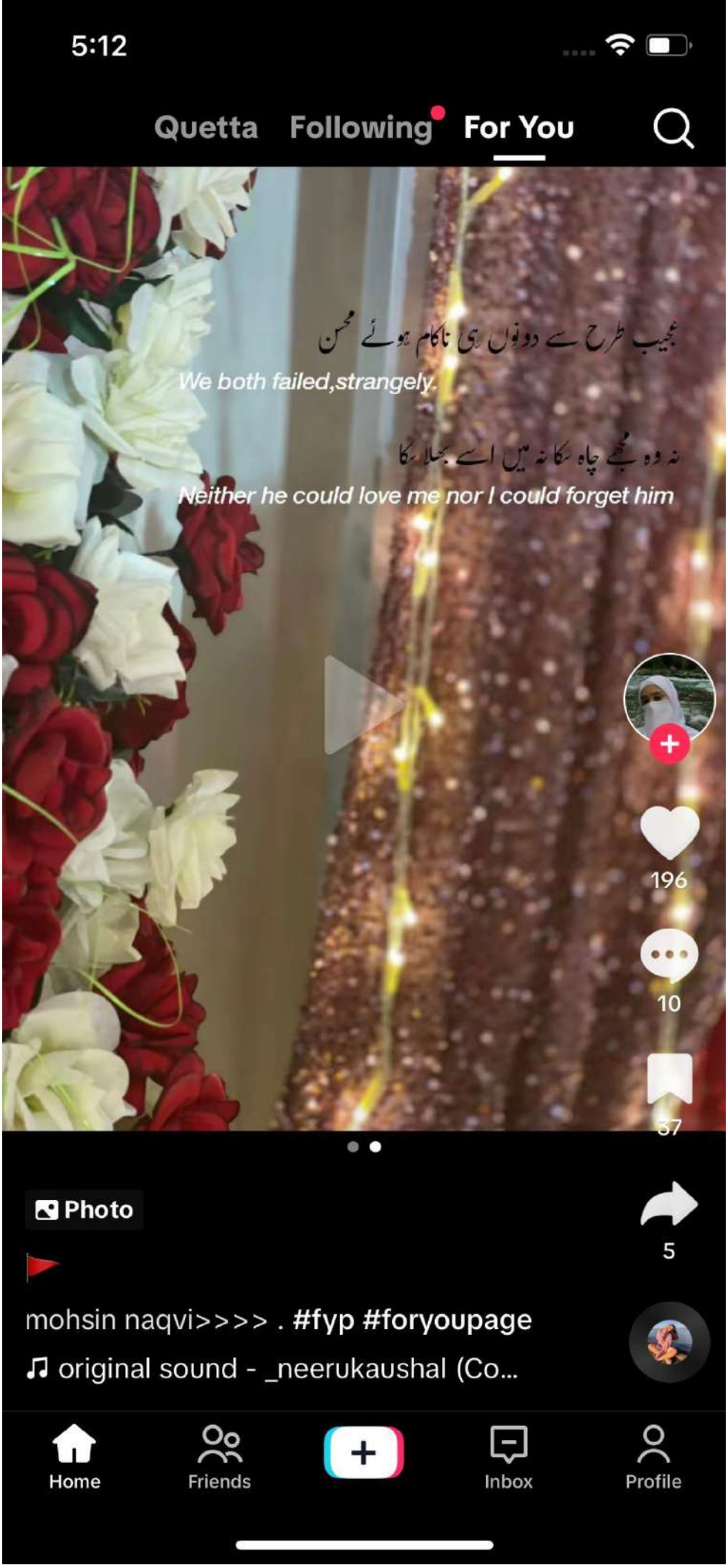


Application Deadline:

The last date to apply for the MEXT Japanese Government Scholarship 2024 is **15th November 2023** for **September 2024** Enrollment.

How to Apply for MEXT Asia Pacific University Japanese Government Scholarship?

There is an Online Application System to apply for **MEXT Asia Pacific University Japanese Government Scholarship 2024**. Visit "**Apply Now**" link and make your account on the website and start your application. Also the link to Official Advertisement is given below:



its capital stock if the marginal production/product exceeds the cost of capital, thus, we can write as.

$$\Delta K = In\left[MPK - (PK/P)(r+\delta)\right]$$

Where In is the function showing how much net investment responds to the incentive to invest.

We can know derive the investment function. Total spending on business fixed investment is the sum of the net investment and the replacement of depreciated capital.

The Investment function is

$$I = In\left[MPK - (PK/P)(r+\delta)\right] + \delta K$$

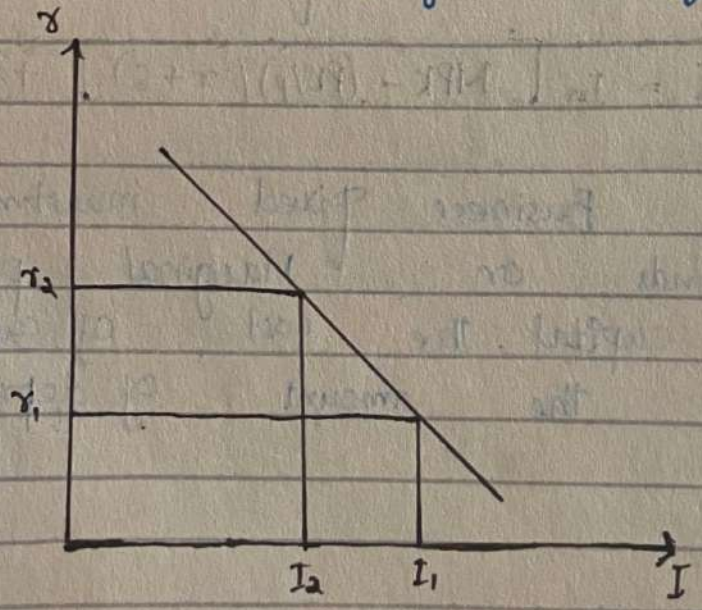
The Business fixed investment depends on Marginal product of capital, the cost of capital, and the amount of depreciation.

→ Investment and the Real interest rate:

A decrease in the real interest rate lowers the cost of capital and due to which the amount of profit rises from owning a capital and which increase the incentive to accumulate more capital. Similarly an increase in real interest rate (r) raises the cost of capital which reduces the profit rate and reduces investment.

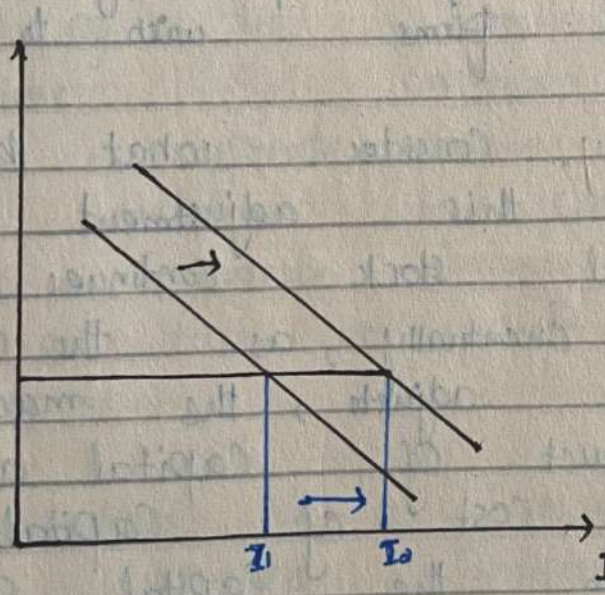
Graphically:

(a) A downward-sloping investment function:



Panel (a) shows that business fixed investment increases when the interest rate falls. This is because a lower interest rate reduces the cost of capital and therefor makes owning a capital more profitable.

(b) A shift in the investment functions



The panel (b) shows a shift in investment function which is because of an increase in MPK (marginal product of capital) or decrease in PK/P → which increase the profit rate, increase the investment at any given interest rate

which shifts "I" curve to the right.

For example:

A technological innovation that increases the production function parameter A raises the marginal product of capital and, for any given interest rate, increases the amount of capital goods that rental firms wish to buy.

Finally, consider what happens as this adjustment of capital stock continues over time. Eventually, as the capital stock adjusts, the marginal product of capital approaches the cost of capital. When the capital stock reaches a steady-state level, we can write

$$MPK = (PK/P)(r + \delta)$$

→ Taxes and Inuestment :

Tax laws influence firms incentives to accumulate capital in many ways. Sometimes policymakers change the tax code to shift the inuestment function and influence aggregate demand.

Here we consider two of the most important provisions of corporate taxation: the corporate Income tax and the inuestment tax credit.

→ The Corporate Income tax is a tax on corporate profits.

If there is a reduction in Corporate Income tax then it encourages the Inuestors to inuest and If there is an increase in the Corporate Income tax then it will discourage the inuestors to inuest.

When the Corporate Income tax is high then the policy makers often change the rules governing the Corporate income tax in an attempt to encourage inuestment or at least reduce the disincentive the tax prouides. One Example is inuestment tax credit, a tax prouision that reduces a firm's taxes by a certain amount for each dollor spent on Capital goods. Because a firm regains part of its expenditure on Capital goods in lower taxes. Thus the inuestment tax credit reduces the cost of Capital and raises inuestment.

For examples

When any

company in Pakistan during Covid-19 imported sanitizers the gouernment gave inuestment tax credit to them because to encourage them to inuest more and to raise their inuestment.
or who manufactured sanitizers in Pakistan the gouernment gave inuestment tax credit to those aswell just to encourage them to inuest more.

→ The stock market and Tobin's q

Many economists see a link between fluctuation in investment and fluctuations in the stock market. The term stock means to shares in the ownership of corporations, and the stock market is the market in which these shares are traded.

Stock prices tends to be high when firms have many opportunities for profitable investment, because these profit opportunities mean higher future income for the share holders, Thus the stock ~~market~~ price reflect the incentive to invest.

The economists James Tobin proposed that firms base their investment decision on the following ratio, which is

called Tobin's q:

$$q = \frac{\text{Market value of installed capital.}}{\text{Replacement cost of installed capital.}}$$

The numerator of Tobin's q is the value of economy's capital as determined by the stock market.
The Denomerater is the price of that capital if it were purchased today.

Tobin reasoned that net investment should depend on whether q is greater or less then 1.

→ If q is greater then 1, then the stock market values installed capital at more then its replacement cost. In this case the managers can raise the market value of their firms stock by buying more capital.

→ Conversly, if q is less then 1, the stock market capital

values at less then its replacement cost, In this case, managers will not replace capital as it wears out.

Note that Tobin's q depends on current and future expected profits from installed capital. If MPK > Cost of capital then the firms are earning profits on their installed capital. These profits make the firms more desirable to own, which raises the market value of these firms stock, implying a high value of q. Similarly, if MPK < cost of capital, then firms are incurring losses on their installed capital, implying a low market value and a low value of q.

The advantage of the Tobins q as a measure of the incentive to invest is that it

reflects the expected future profitability of capital as well as the current profitability. eg: if the govt reduce the corporate income tax begining next year, due to which there will be greater profit for the owners of capital. These higher expected profits raise the value of the stock today. raise Tobin's q and encourage investment today.

So, The Tobin's q theory shows that the investment decision depends not only on current economic policies but also on policies expected to prevail in the future.

→ The stock market as an Economic indicator :

Reasons for a relationship between stock market and GDP

1) A wave of pessimism about future profitability of a capital would → (متوقع)

* Cause stock prices to fall.
* Cause Tobin's q to fall.
* Shift the inuestment function down
* Cause a negative aggregate demand shock.

2) A fall in the stock prices would :→

* Reduce household wealth.
* Shift the consumption function down.
* Cause a negative aggregate demand shock.

3) A fall in stock prices might reflect bad news about technological progress and long-run economic growth.

This implies that aggregate supply and full-employment output will be expanding more slowly that

People had expected.

Figure 18.4 shows that changes in the stock market often reflect changes in real GDP. Whenever the stock maget experiance a substantial decline, there is a reason to fear that a recession may be araind the corner.

→ Alternative Views of the Stock market: The Efficient markets Hypothesis Versus Keynes's Beauty Contest.

Efficient market hypothesis &

→ The market price of a Company's stock is the fully rational valuation of a company, given current information about the company's business prospect.

کسی بھی Company کا اس کا Market Stock Price سارا احوال بتا دیتی ہے۔

means that the market price of a Company gives us the information about the company's condition. if the market price of a company's stock is increasing so it means that the company market value is also increasing.

→ Stock market is Informationally efficient: each stock price reflects all available information about the stock.

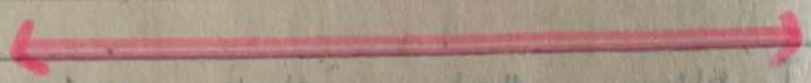
→ Implies that stock prices should follow a random walk (be unpredictable), and should only change as new information arrives.

⇒ The effecient-market hypothesis (EMH) is a hypothesis in financial economics that states that asset prices fully reflect all available information.

→ A direct implication is that it is impossible to "beat the market" consistently on a risk-adjusted basis since market prices should only react to new information.

The only way an inuestor can possibly obtain

higher returns is by chance or by purchasing riskier investment.



Chapter NO 17

Consumption

In economics, the consumption function describes the relationship between consumption and disposable income. The concept is believed to have been introduced into macroeconomics by John Maynard Keynes in 1936.

How do households decide how much of their income to consume today and how much to save for the future? This is a microeconomics question because it addresses the behavior of individual decision makers. Yet its answers has important macroeconomics consequences.

→ The consumption function is crucial for the long run analysis because of its role in economic growth.

→ The consumption decision is crucial for short run analysis because of its role in determining aggregate demand.

(1) → John Maynard Keynes and the Consumption functions

Keynes's Conjectures (Believes) outlines

1) $0 < MPC < 1$

2) Average propensity to consume (APC) falls as income rises.

$$\left(APC = \frac{C}{Y}\right)$$

3) Income is the main determinant of Consumptions

Explainations

First of most important,

Keynes conjectured that the marginal propensity to consume (MPC) — (the amount consumed out of an additional dollar of income) — is between 0 and one. That is, when a person earns an extra dollar, he typically spends some of it and saves some of it.

The MPC of the rich and poor both is between 0 – 1. When the marginal propensity to consume is 0 it means that he saves all of his income and if the MPC is 1 it means he consume all of his income and saves 0.

Second, Keynes posited that the ratio of Consumption to income $\left(\frac{C}{Y}\right)$ is called Average propensity to Consume, (APC) falls as income rises. He believed that

Saving was luxury, so he expected the rich to save a higher proportion of their income than the poor. Means that if a person's selery is 1 million so he will consume 3-4 lac and saues the remaining and if a person who have a salery of 50,000 so he will consume 40,000 and saues 10,000.

The postualate that the APC (average propensity to consume) falls as income rises became a central part of early keynesian economics.

Third, keynes thought that income is the primary determinent of consumption and that the interest rate does not have an important role.
This believe stook in exactly opposite to the believe

of the classical economists who proceded him. The classical economists held that a higher interest rate encourages saving and discourages Consumption. Keynes admitted that the interest rate could influence consumption as a matter of theory. Yet he write that "the main conclusion suggested by experience, I think, is that the short period influence of the rate of interest on individual spending out of a given income is secondary and relatively unimportant

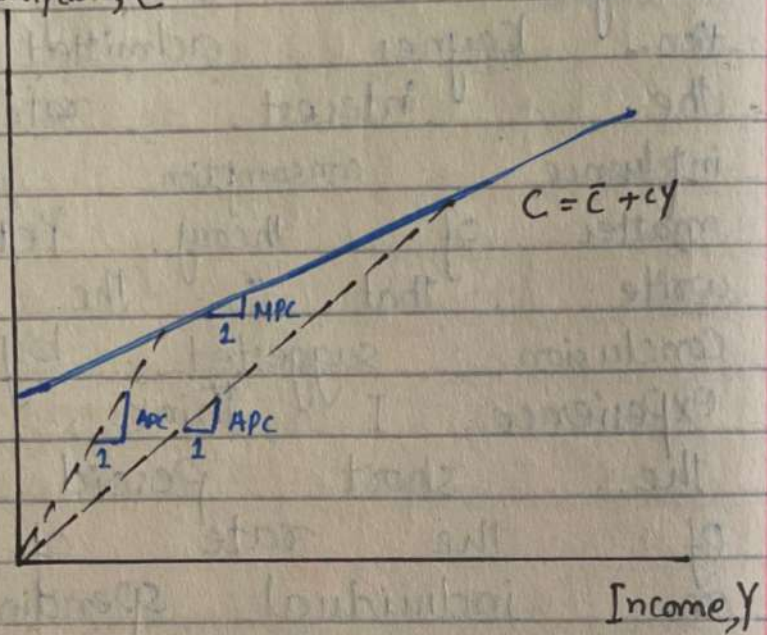
On the basis of these three conjecture, the keynesian consumption function is often written as

$$C = \bar{C} + cY \quad , \quad \bar{C} > 0, \; 0 < c < 1,$$

Where C is consumption,
Y is disposable income,
$\bar{C}$ is constant, and

c is the marginal propensity to consume.

Graphically;



Note: The MPC is the slope of the consumption function. The APC = C/y equals the slope of a line drawn from the origin to the point on the consumption function.

This consumption function shown in Graph is a straight line

Notice that this consumption function exhibits the three properties that Keynes posited, It satisfys Keynes 1st property because the marginal propensity to consume "c" is between 0 and 1, so the higher income leads

to higher consumption and also a higher saving. This consumption function satisfies Keynes 2nd property because the average propensity to consume APC is

$$APC = \frac{C}{Y} = \frac{\bar{C}}{Y} + c$$

As Y rises, $\frac{\bar{C}}{Y}$ falls, and so the average propensity to consume $\frac{C}{Y}$ falls. And finally, this consumption function satisfies Keynes third property because the interest rate is not included in this equation as a determinent of consumption.

→ The Early Emperical Successes

Soon after Keynes proposed the consumption function, economists began collecting and examing data to test his conjectures. So earliest studies found that the Keynes consumption function was a good approximation of how consumers behave.

In some of these studies, researchers surveyed households and collected data on consumption function and income.

And they found the following results:

i) Households with higher incomes:

* Consume more
  ⇒ MPC > 0

* Save more
  ⇒ MPC < 1

* Saves a larger income/fraction of their income.
  ⇒ APC ↓ as Y ↑

ii) As discussed when Y ↑ APC ↓ and during Great Depression the income was low, the ratio of consumption APC to Income $(\frac{C}{Y})$ was high Confirming Keynes 2nd

Conjecture.

iii) Very strong correlation between income and consumption

⇒ Income seemed to be the main determinant of consumption.

→ Secular Stagnation, Simon Kuznets, and the Consumption Puzzle :

Although the Keynesian Consumption function met with early successes, but two anomalies soon arose. Both concern Keynes conjecture that the average propensity to consume falls as income ~~falls~~ rises.

The first anomaly became apparent after some economist made a dire-and, it turned out, erroneous - prediction during WW II. On the basis of the consumption function,

these economist reasoned that as income in the economy grew up over time, households would consume a smaller and smaller fraction of their incomes. They feared that there might not be enough profitable inuestment projects to absorb all this saving. If so, the low consumption would lead to an inadequate (ईष्ट) demand for goods and services, resulting in a depression.

In the other words, on the basis of the Keynesian consumption function, these economists predicted that the economy would experiance what they called Secular Stagnation - a long depression of indefinite duration - unless the gouernment used fiscal policy to expand aggregate demand.

Fortunately for the

economy, but unfortunately for the Keynesian consumption function, the end of the WWII didn't throw the country into another depression. Although income were much higher after the war than before, these higher income didn't lead to decrease in APC

The second anomaly arose when economist Simon Kuznets constructed new aggregate data on consumption and income dating back to 1869. Kuznets assumbled these data in the 1940.

→ He discovered that the ratio of consumption to income $\left(\frac{C}{Y}\right)$ was remarkably stable from decade to decade, despite large increase in income over the period he studied.

Again Keynes's conjecture that the average propensity

to consume APC would fall as income rises appeared not to hold.

The failure of the secular-stagnation hypothesis and the finding of the Kuznets both indicated that the average propensity to consume (APC) is fairly constant over long period of time.

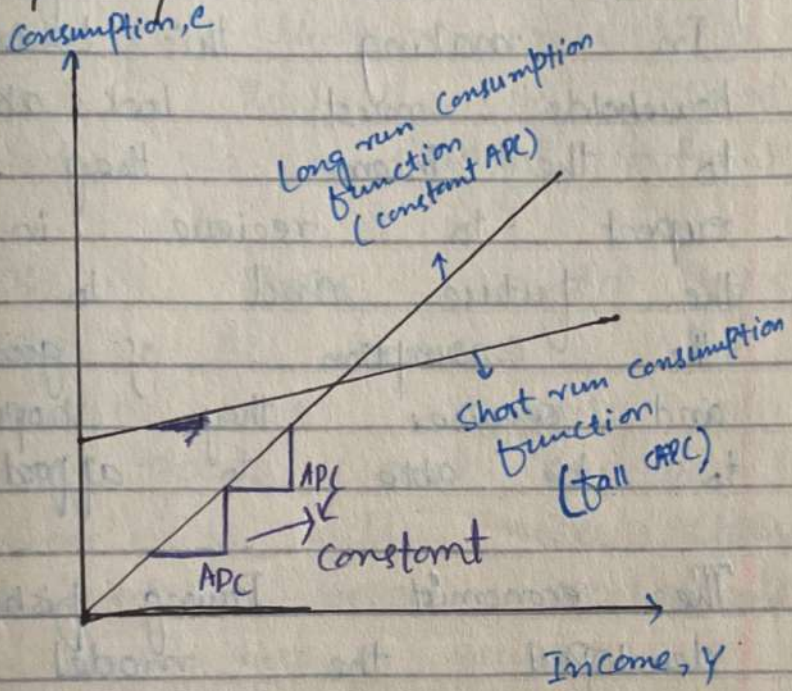
Economists wanted to know why some studies confirmed Keynes conjecture and other refuted them.

The evidence suggests that there were two consumption functions.

For the households data and for the short-time series, the Keynesian function appread to work well. Yet for the long-time series, the

Consumption function appeared to exhibit a constant average propensity to consume:

Graphically &



This motivated more research on Consumption:

(2) → Irving Fisher and Intertemporal Choice &

The consumption function introduced by Keynes relates current consumption to current income. This relationship is however is incomplete at best.

When people decide how much to consume and how much to save, they consider both the present and the future. In making this tradeoff, households must look ahead to the income they expect to recieve in the future and to the consumption of goods and services they hope to be able to afford.

The economist Irving Fisher developed the model with which economists analyze how rational, forward-looking consumers make intertemporal choices involving different period of time.

The intertemporal Budget Constraint :

" Intertemporal choices is an economic term describing how current decision

affect what options become available in the future."

"Budget Constraint"

When consumers face a limit on how much they can spend, called a budget constraint.

Most people would refer/ prefer to increase the quantity or quality of the goods and services they consume - to wear nicer clothes, eat at a better restaurants, or see more movies.

The reason that they consume less than desire is that their consumption is constrained by their income (Budget constraint)

When they are deciding how much to consume today and save for future they face intertemporal Choice budget Constraint.

For Explaination we use two periods Consumer Youth

and consumer old age.

C_1 (Period 1 Consumption) Present
Y_1 (Period 1 Income) Present

Similarly

C_2 (Period 2 Consumption) Future
Y_2 (Period 2 Income) Future.

[All variables are real – that is, adjusted for inflation]

Consumer has the opportunity to borrow and save, Consumption in any single period can be either greater or less than Income in that period.

Considering the constraint into two periods.

In the first period.

$$S = Y_1 - C_1$$

Here saving equals income minus consumption

- Second period C_2

$$C_2 = (1+r)S + Y_2$$

Where r is the real interest rate. For example if the real interest rate is 5% then for every $1 of saving in period 1, the consumer enjoys an extra $1.05 of consumption in period 2. Because there is no third period, the consumer does not save in the 2nd period.

Note: that the variable S can represent either saving or borrowing and that these equation hold in both cases

if $C_1 < Y_1$ (consumer is saving) $S > 0$

if $C_1 > Y_1$ (consumer is borrowing) $S < 0$

For simplicity, we assume that the interest rate for borrowing is the same for the interest rate of saving.

To derive the consumers budget constraint, combine the two preceding equations. Substitute the first equation for S into the 2nd equation to obtain.

$$C_2 = (1+r)S + Y_2$$
$$C_2 = (1+r)(Y_1 - C_1) + Y_2$$

Rearrange to put C terms on one side and Y terms on the other side.

$$(1+r)C_1 + C_2 = Y_2 + (1+r)Y_2$$

Divide both side by: $(1+r)$ we get.

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}$$

↓ Present value of lifetime Consumption

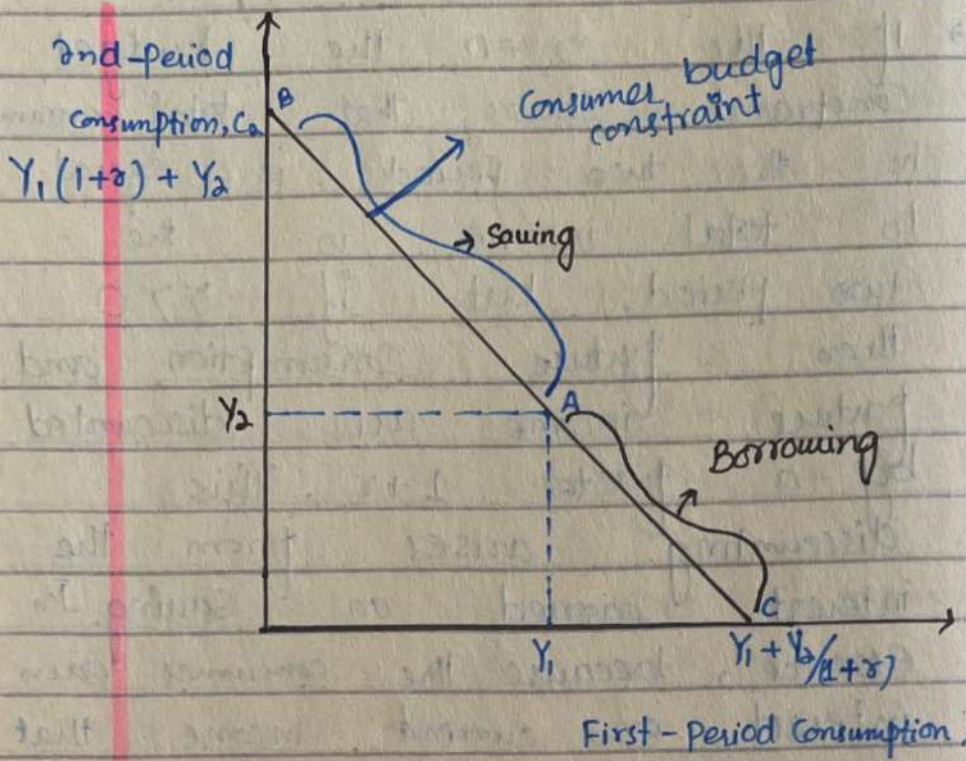
↓ Present value of lifetime income

Now it is easy to interpret the Consumers budget constraints.

→ If the $r = 0$, the budget constraint shows that total consumption in the two period is equal to total income in the two period. but if $r > 0$ then future consumption and future income are discounted by a factor $1 + r$. This discounting arises from the interest earned on saving. In essence, because the consumer earn interest on current income that is saved, the future income is worth less then the current income. Similarly future consumption costs less then current consumption.

The factor $\frac{1}{1+r}$ is the price of 2nd period consumption measured in terms of 1st period consumption. It is the amount of 1st period consumption that a consumer must go to obtain 1 unit of 2nd-period consumption.

Graphically,



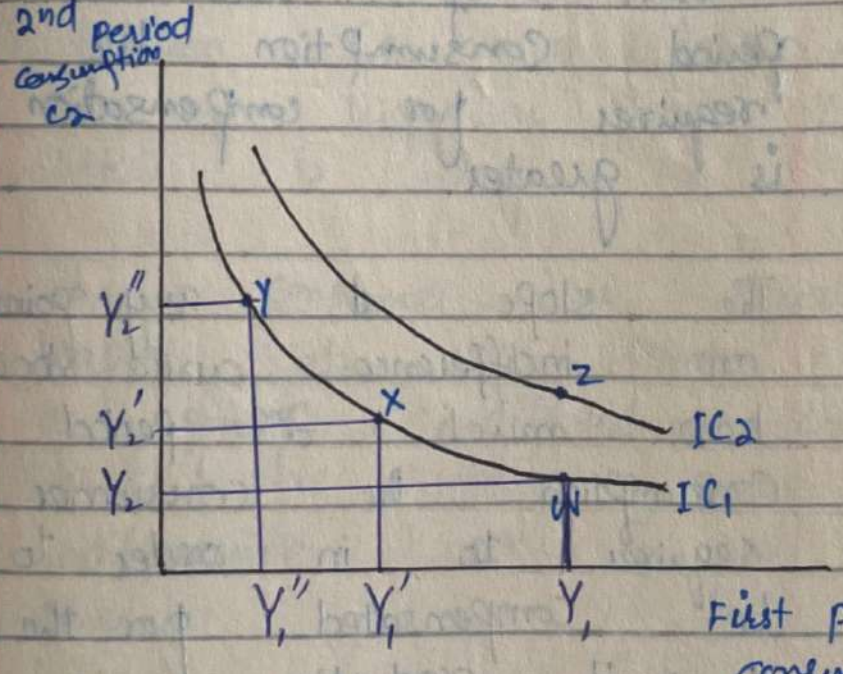
This graph shows the combination of 1st period and second period consumption the consumer can choose. If he chooses point b/w A & B, he consumes less then his income in the 1st period and saves the rest for the 2nd period. If he chooses points b/w A and C, he consumes more then his income in the 1st period and borrows to make up a difference.

→ Consumer preferences

Consumer's preference (ꕥ) regarding consumption in the two periods can be represented by indifference curve.

An indifference curve shows the combinations of 1st period and 2nd period consumption that make the consumer equally happy.

Graphically:



The Graph shows two of the many consumer's indifference curves. The

consumer is indifferent among combinations of W, X and Y, because they are all on the same curve.

The graph shows that if the consumer 1st period consumption is reduced from W to X, 2nd period consumption must increase to keep him equally happy. If 1st p° is reduced again from X - Y, the amount of extra 2nd period consumption he requires for compensation is greater.

The slope at any point on indifference curve shows how much 2nd period consumption the consumer requires to in order to be compensated for the 1 unit reduction in the 1st - period consumption

important point ⇒ The slope is the marginal rate of substitution

between 1st period consumption and 2nd period consumption

Notice that the indifference curve in graph is not a straight line, so the marginal rate of substitution (MRS) depends on the levels of consumption in the two periods.

i) When C_1 is high and C_2 is low, as at point W the MRS is low.

ii) When C_1 is low and C_2 is high, as point Y, the MRS is high.

⇒ The consumer is equally happy at all points on a given indifference curve, but he refer some indifference curve to others.

As we know that the higher indifference curve represents higher satisfaction (higher level of happiness).

So he prefers higher indifference curve to lower ones. On Graph the consumer prefers any of the point on IC_2 to any of the point on IC_1

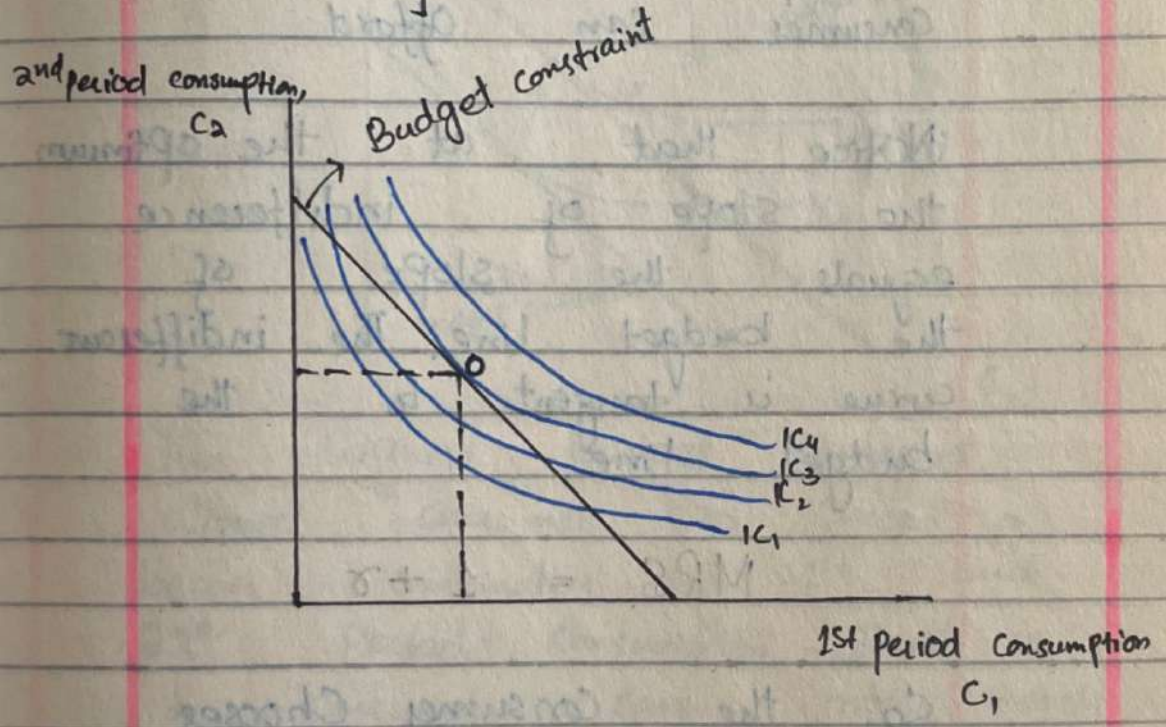
Hence, we can use the set of indifference curves to rank any combination of 1st period and second period consumption.

→ **Optimization**

Having discussed the consumers budget constraint and preferences, we can consider the decision about how much to consume and in each period of time. The consumer would like to end up with the best possible combination of consumption in the two period – that is on the highest possible indifference curve. But the budget

constraint requires that a consumer also end up on or below the budget line, because the budget line measures the total resources available to him.

Graphically:



This Graph shows that many indifference curves cross the budget line, but the consumer achieves the highest level of satisfaction by choosing the point on the budget constraint that is on the highest indifference curve. At the optimum, the indifference curve is tanget

to the budget constraint

The point at which the curve and cline touches - point O, for "optimum" - is the best combination of the consumption in the two periods that the consumer can afford

Notice that, at the optimum the slope of indifference equals the slope of the budget line. The indifference curve is tangent to the budget line.

$$MRS = 1 + r,$$

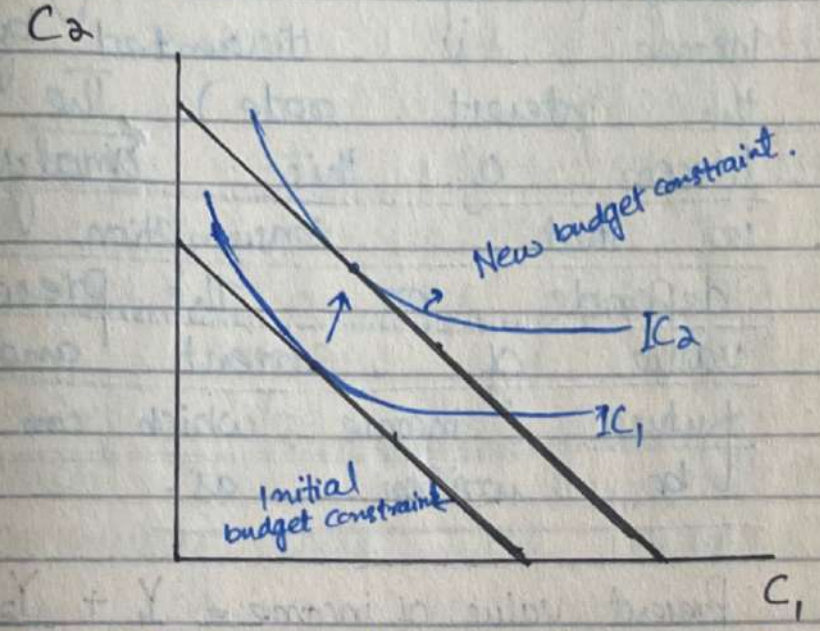
So, the consumer chooses consumption in the two periods such that $MRS = 1 + r$.

→ How changes in income affect consumption?

Let's examine how consumption responds to an increase in income. An increase

in either Y_1 or Y_2 shifts the budget constraint outward.

Graphically:



The highest budget constraint allows consumer to choose a better combination of 1st and 2nd period consumption - that is a consumer can now reach a higher indifference curve.

⇒ The key conclusion is that whether Y_1 increases or Y_2 increases, the consumer spreads his consumption in both periods. This behavior is called **Consumption Smoothing**. Because the consumer can borrow

important point

and lend between periods, the timing of income is irrelevent (غير مهم) to how much is consumed today (except that future income is discounted by the interest rate) The lesson of this analysis is that consumption depends on the present value of current and future income, which can be written as.

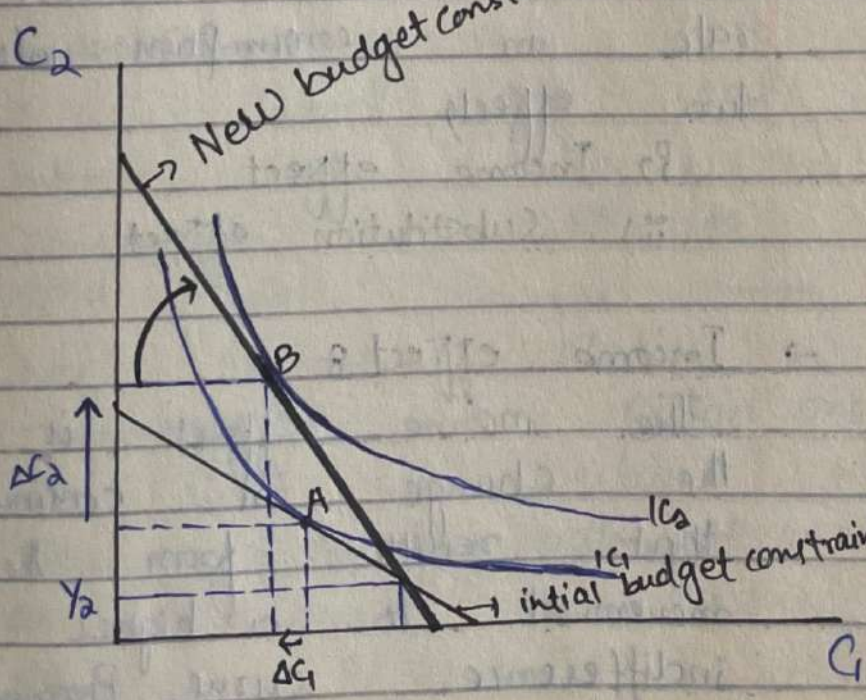
$$\text{Present value of income} = Y_1 + \frac{Y_2}{1+r}$$

Keynes model	Fisher's model
Keynes posited that a person's current consumption depends largely on his income.	Fisher's model says, instead, that consumption is based on the income the income consumer expects over his entire lifetime.
Current consumption = Current Income.	Consumption depends on lifetime income.

→ How changes in the interest rate affect consumptions

Lets now use fisher's model to consider how a change in the real interest changes the consumers chooses. There are two cases to consider: the case in which the consumer is initally saving and the case in which the he is initially boorowing. Here we discuss the saving case.

Graphically:



The graph shows that an increase in the real interest rate rotates the consumer budget line around the point (Y_1, Y_2) and, thereby, alters the amount of consumption he chooses in both periods. Here the consumer moves from point A to B, so we can see that 1st period consumption falls and 2nd period consumption rises

Economists decompose the impact of an increase in the real interest rate on consumption into two effects.

i) Income effect.
ii) Substitution effect.

→ Income effect :

The income effect is the change in consumption that results from the movement to a higher indifference curve. Because

the consumer is saver rather than a borrower (as indicated by a fact that first period consumption is less then the first period income), the increase in the interest rate makes him better off. If C_1 and C_2 are both normal good, the consumer will want to spread this improvement in his welfare over both periods

The income effect tends to make the consumer want more consumption in both periods

→ Substitution effects

When the real interest rate rises the consumption in 2nd period becomes less expensive relative to consumption in period one. That is because the real interest rate earned on saving is higher, so, the consumer must

grow up less 1st period consumption to obtain an extra unit of consumption in 2nd period.

This substitution effect tends to make the consumer choose more consumption in 2nd period and less consumption in 1st period.

The consumers choose depends on both income and substitution effect. Because both acts to increase the amount of 2nd period consumption, but two effects have opposite impacts on first period consumption so the increase in real interest rate could either lower or raise it. Hence, depending on the relative size of income and substitution effects, an increase in the real interest rate could either stimulate or depress saving.

(outline)

→ income effects

If consumer is a saver, the rise in r makes him better off, which tends to increase consumption in both periods.

→ Substitution effects

The rise in r increases the opportunity cost of current consumption, which tends to reduce C_1 and increase C_2.

→ Both effects ⇒ $C_2 \uparrow$ (Increases)

Whether C_1 rises or falls depends on the relative size of the income and substitution effect.

→ Constraints on Borrowings

Fisher's model assumes that the consumer can borrow as well as save. The ability to borrow allows current consumption to exceed current income. Yet for many people, such borrowing

is impossible, means they face borrowing constraint.

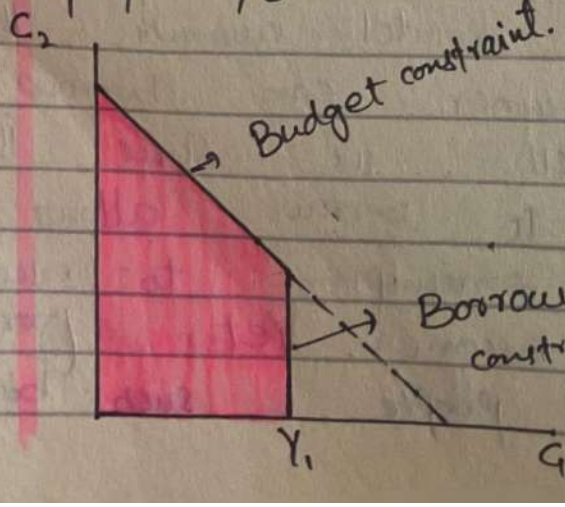
Let's examine how Fisher's analysis changes if the consumer cannot borrow.

The inability to borrow prevents current consumption from exceeding current income. A constraint on borrowing can therefor be expressed as

$$C_1 \leq Y_1$$

The inability states that consumption in period 1 must be less or equal to the income in period 1. This additional constraint on consumer is called a Borrowing Constraint.

Graphically,



A borrowing constraint If the consumer cannot borrow, he faces the additional constraint that first period consumption cannot exceed first period income. The shaded area represents the combination of 1st period consumption and 2nd period consumption the consumer can choose.

⇒ Two possibilities.

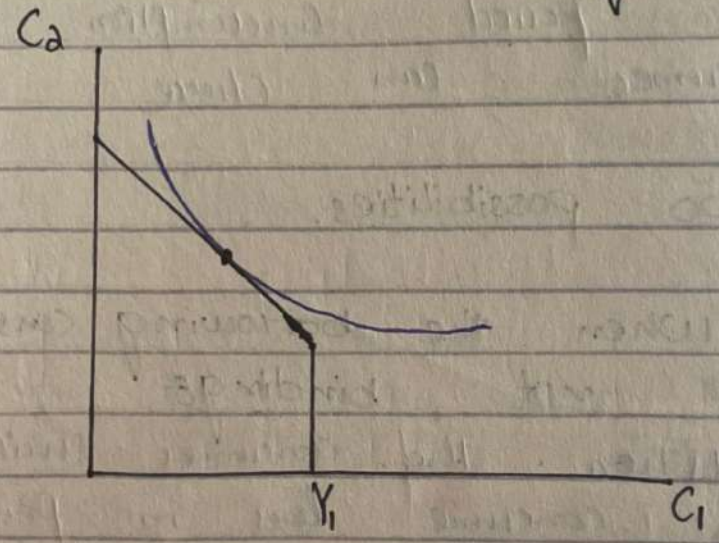
→ i) When the borrowing constraint is not binding
When the consumer wishes to consume less in period 1 then he earns. The borrowing constraint, is not binding and therefor, does not effect consumption.

→ ii) When the borrowing contraint is binding
When the consumer like to borrow / to consume more in 1st period but he faces a borrowing constraint, so the best

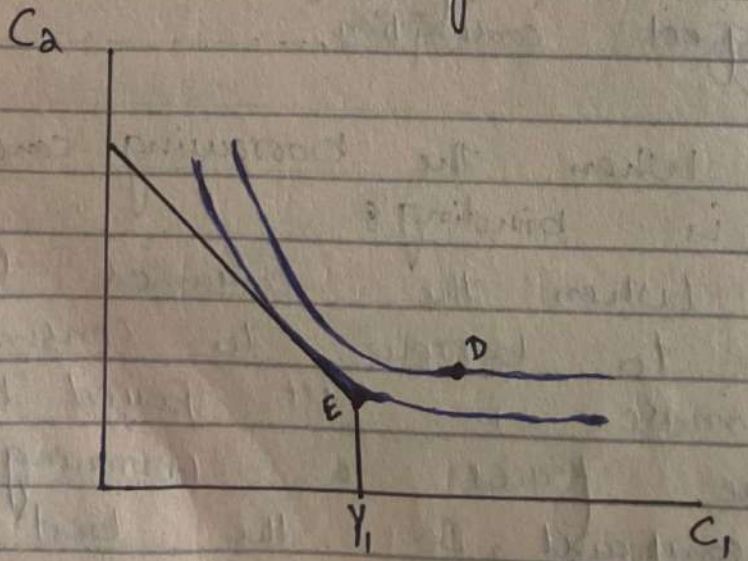
Consumer can do is to Consume all of his first Period income.

Graphically:

(a) The Borrowing constraint is not binding.



(b) The Borrowing Constraint is Binding.



When a consumer faces a borrowing constraint, there are two possible situations. In panel (a), the consumer chooses 1st period consumption to be less than 1st period income, so the borrowing constraint is not binding, and does not effect consumption in either period.

In panel (b), the borrowing constraint is binding the consumer would like to borrow and choose point D, but borrowing is not allowed, so the best available choice is point E. When the borrowing constraint is binding, first period consumption is equal to 1st period income.

(ii) When the borrowing constraint is not binding, and consumption in both periods depends on the present value of lifetime income, $Y_1 + \frac{Y_2}{1+r}$.

ii) When the borrowing constraint is binding, the consumption function is $C_1 = Y_1$ and $C_2 = Y_2$. Hence, for those who would like to borrow but cannot, consumption depends only on current income.

(3) → Franco Modigliani and the life cycle hypothesis

This concept was developed in 1950 by Franco Modigliani and his collaborators Albert Ando and Richard Brumberg.

The Theory is that the individuals seek to smoth consumption throughout their lifetime by borrowing when their income is low and saving when their income is high. This behavior of consumer found the bases of life cycle-hypothesis. One of their goals was to solve the consumption puzzle - that is to explain the apparently

conflicting pieces of evidence that come to light when Keynes's consumption ~~was depends~~ confronted with the data.

→ The Hypothesis

One important reason that income varies over a person's life is retirement. Most people plan to stop working at the age of 65, and they expect their incomes to fall when they retire. Yet they don't want a large drop in their standard of living, as measured by their consumption. To maintain their level of consumption after retirement, people must save during their working years. Let's see what this motive for saving implies for the consumption function.

Consider a consumer who expects to live another T years, has wealth of W, and expects to earn

income Y unit she retires R years from now. What level of consumption will the consumer choose if she wishes to maintain a smooth level of consumption over her life?

The consumer's lifetime resources are composed of initial wealth "W" and lifetime earnings of R x Y (for simplicity we are assuming an interest rate of Zero;

So the consumer's person's Consumption function is

$$C = W + RY$$

The Consumer can divide up her lifetime resources among her T remaining years of life.

As she wishes to achieve the smoothest consumption over her

lifetime. Therefor, she divides this total of $W + RY$ equally among the T years and each year consumes

$$C = \frac{(W + RY)}{T}$$

we can also write as.

$$C = \frac{1}{T} W + \frac{R}{T} Y$$

For example if the consumer expects to live for 50 more years and work for 30 of them then $T = 50$ and $R = 30, 50$; her consumption function is

$$C = 0.02 W + 0.6 Y$$

This equation says that consumption depends on both income and wealth. An extra $1 of income per year rises consumption by $0.60 per year, and an extra $1 of wealth rises consumption by $0.02 per year.

In particular, aggregate

Consumption depends on both wealth and income. That is, the economy's consumption function is $C = \alpha W + \beta Y$

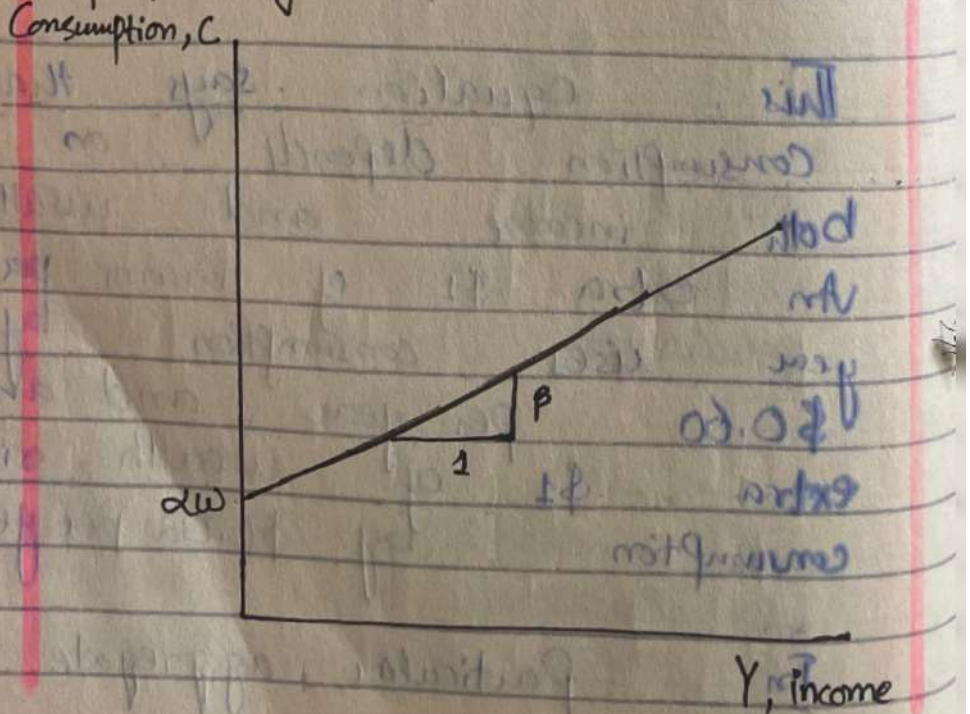
Where :

$\alpha = (1/T)$ is the marginal propensity to consume out of wealth.

$\beta = \left(\frac{R}{T}\right)$ is the marginal Propensity to consume out of Income.

→ Implications &

Graphically &



The graph shows the relationship between consumption and income predicted by the life cycle model. For any given model of wealth W, the model yeilds a conventional (كلاسيكي) consumption function similar to the one shown in the graph of Keynes's conjectures.

Notice, however, that the intercept of the consumption function, which shows what would happen to consumption if income ever fell to zero, is not a fixed value as it was shown in Keynes's conjecture graph. Instead, the intercept here is αW and, thus, depends on the level of wealth.

This life-cycle model of consumer behavior can solve the consumption puzzle.

According to the life cycle consumption function, the average propensity to consume is

$$\frac{C}{Y} = \alpha\left(\frac{W}{Y}\right) + \beta$$

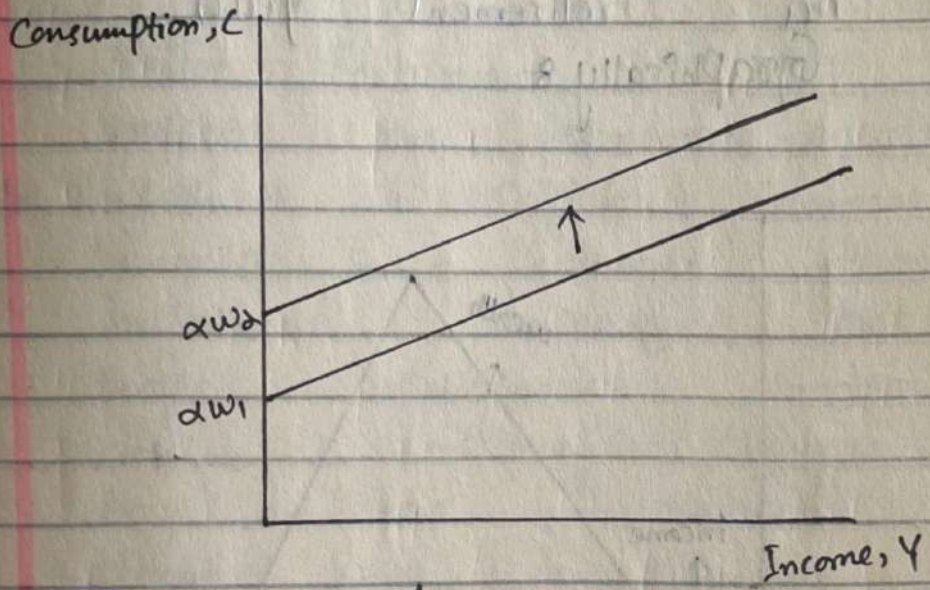
Because wealth does not vary proportionately with income from person to person or from year to year. We should find that high income crossponds to a low average propensity to consume when looking data across individuals or over short period of time.

But over long period of time, wealth and income grow together, resulting in a constant ratio $\frac{W}{Y}$ and thus a constant average propensity to consume.

→ This graph simply states that for any given level of wealth, the life cycle consumption function look like the ones Keynes suggested, but this function holds only in the short run when wealth is constant.

But, in the long run, as wealth increases, the consumption function shifts upward.

Graphically:

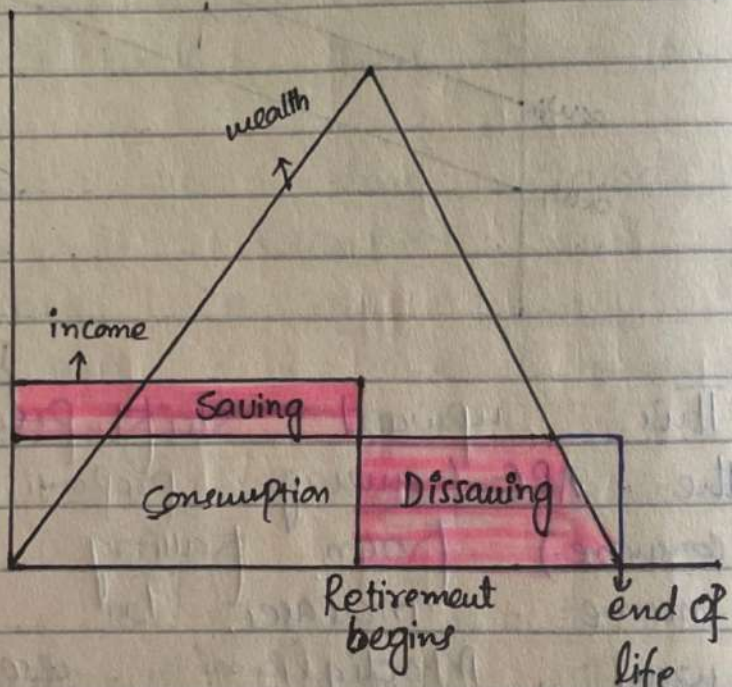


This upward shift prevents ( ) the APC (average propensity to consume) from falling as income increases. In this way, Modigliani resolved the consumption ~~function~~ puzzle posed by Simon Kuznets.

The life-cycle model makes many other predictions as well. Most importantly, it predicts that saving varies over a person's lifetime. If a person begins

adulthood with no wealth, She will accumulate wealth during her working years and then run down her wealth during her retirement years.

Graphically :



This graph illustrates the consumer's income, consumption, and wealth over her adult life. According to the life cycle hypothesis, because people want to smooth consumption over their lives, youth who are working save,

While the Old who are retired dissave.

4] → Milton Friedman and the permanent - Income Hypothesis

Milton Friedman in 1957 proposed the permanent - income hypothesis to explain Consumer behavior. The Permanent income hypothesis emphasizes that people experiance random and temporary changes in their incomes from year to year.

The Hypothesis

Friedman suggested that we view current income Y as the sum of two components, Permanent income Y^P and transitory income Y^T. That is,

$$Y = Y^P + Y^T$$

Permanent income is the part of income that

people expect to persist into the future. Transitory income is the part of income that people donot expect to persist. Put differently, Permanent income is average income, and transitory income is the random deviation from that average.

The examples in book (page 514) shows different form of income have different degrees of persistance, A good education provides a permanently higher income, whereas good wheather provides only higher transitory income to those whoes crop suits that wheather.

Although, one can imagine intermediate cases, it is useful to keep things simple by supposing that there are only two kinds

of income : Permanent and transitory

Friedman reasoned that consumption should depend primarily on permanent income, because consumers use saving and borrowing to smooth consumption in response to transitory changes in income. For example, if a person recieved a permanent rise of $10,000 per year, his consumption would rise by about as much. Yet if a person won $10,000 in a lottery, he would not consume consume it all in one year. Instead, he would spread the extra consumption over the rest of his life; assuming an interest rate of zero and remaining life span of 50 years, consumption would rise by only $200 per year

in response to the $10,000 prize. Thus consumers spand their parmanent income, but they save rather than spand most of their transitory income.

Friedman concluded that we should view the consumption function as.

$$C = \alpha Y^P$$

Where α is a constant that measures the fraction of permanent income consumed. The permanent income hypothesis, as expressed by this equation, states that consumption is proportional to parmanent income.

→ Implications:-

The permanent income hypothesis solved the consumption puzzle by suggesting that the

Standard Keynesian consumption function uses the wrong variables.

Let's see what Friedman's hypothesis implies for the average propensity to consume (APC)

Divide both sides of his consumption function by Y to obtain.

$$APC = \frac{C}{Y} = \alpha \frac{Y^P}{Y}$$ → current income

According to the permanent income hypothesis, the APC depends on the ratio of permanent income to current income.

* When current income temporarily rises above permanent income, the Average propensity to consume temporarily falls.
* When current income temporarily falls below permanent income, the APC temporarily rises.

Now Consider the studies of households data. Friedman reasoned that these data reflect a combination of permanent and temporaily income.

* Households with high permanent income have proportionaty higher consumption. If all variations in current income came from the permanent component, the average propensity to consume would be the same in all house holds

* But some of the variation in income comes from the transitory component, and households with higher transitory component/income donot have higher consumption, therefor, researchers find that high-income households have, on average, lower average propensity to consume.

Similarly, consider the studies of time-series data. Friedman reasoned that year to year fluctuations in income are dominated by transitory income. Therefore, years of high income should be years of low APC.

But over long period of time - say, from decade to decade, the variation from income comes from the permanent income, Hence in long time run/series, one should observe a constant APC, as in fact Kuznets found.

5) → Robert Hall and the Random walk hypothesis &

The Permanent-income hypothesis is based on Fisher's model of intertemporal choices. It builds on the idea that forward-looking consumers base their

consumption decision not only on their current income but also on the income that they expect to recieve in the future, Thus, the Permanent-income hypothesis highlights that consumption depends on People's expectation.

Recent research on consumption has combined this view of the consumer with the assumption of rational expectation. The rational-expectation assumption states that people use all available resources / information to make optimal forecasts about the future.

→ The Hypothesis :

The economist Robert Hall was the first to derive the implications of rational expectation for consumption. He showed

that if the Permanent income hypothesis is correct, and if consumer have rational expectations, then changes in consumption over time should be unpredictable. When changes in variable are unpredictable, the variable is said to follow a Random Walk.

According to Hall, the combination of the permanent income hypothesis and rational expectations implies that the consumption follows a random walk.

Hall reasoned as follows.

According to the permanent income hypothesis, consumers face fluctuating income and they try their best to smooth their consumption over time. At any moment, consumer choose consumption based on their current expectation of their lifetime incomes, over time they change their consumption because they recieve news that

causes them to revise their expectations. for example

Corona, Accidents, Change in Policy etc.

If consumers are optimally using all available information, then they should be surprised only by events that they were entirely unpredictable. Therefor changes in their consumption should be unpredictable as well.

→ Implications

The rational-expectations approach to consumption has implications not only for forecasting but also for the analysis of economic policies. If the consumer obey the permanent income hypothesis and have rational expectations, then only unexpected policy changes influence consumption.

" If consumers obey PIH and have rational expectations, then policy changes will effect consumption only if they are unpredictable."

These policy changes take effect when they change expectations. For example a consumer that is unexpectedly fired or demoted will decrease consumption, whereas a consumer that gets unexpectedly promotion at work will de increase consumption.

Increase in tax policy unexpectedly decrease the consumption of a consumer so fiscal policy also take effect.

This model implies that changes in consumption are unpredictable because consumer change their consumption only when they recieve news about their life time resources.

6) → David Laibson and the Pull of Instant Gratification

Theories from Fisher and Hall assume that consumers are rational and act to maximize lifetime

utility.

Famous Studies by David Laibson and others consider the Psychology of consumers.

More recently, economists have started to return to psychology. They have suggested that consumption decisions are not made by the ultrarational Homo economics (extreamly rational economic Person) but by the real human beings whose behavior can be far from rational.
This new subfield infusing psychology into economic is called behavioral economics.

Laibson notes that many consumers judge themselves to be imperfect decision makers. In One survay of the American Public, 76% said they were not saving enough

for retirement. In another survey of the baby-boom generation, respondents were asked the percentage of income that they save and the percentage that they thought they should save. The saving shortfall average 11%.

According to Laibson, the insufficiency of saving is related to another phenomenan: The pull of Instant gratification.

Consider the following two questions:

Q_1: Would you prefer.
(A) a candy today or
(B) two candies tommarow?

Q_2: Would you prefer.
(A) a candy in 100 days or
(B) two candies in 101 days?

Many People Confronted with such choices will answer A to the

first (1st) question and B to the second (2nd)

This raises the possibility that consumers preferences many be time-inconsistant: they may alter their decisions simply because time passes. A Person confronting question 2 may choose B and wait the extra day for the extra candy. But after 100 days pass, he finds himself in a new short run confronting Question 1. The pull of instant gratification may induce him to change his mind.

We see this kind of behavior in many situations in life. A consumer may splurge (An act of spending money freely) at the shopping mall, while promising himself that tomorrow he will cut back his spending

and start saving more for retirement. But when tomorrow arrives, the promises are in the past, and a new self ~~took~~ takes control of the decisionmaking, with its own digire for instant gratification.

To sumup laibson has suggested that psychological effects are important for understanding consumer behavior. In particular, because people have a strong desire for instant gratification, They may exhibit time-incontistancy behavior and end up saving less than they would like.

→ Conclusion:

In the work of the six prominent economists, we have seen a progression of ueiws on consumer behavior.

Keynes proposed that

depends largely on current income. Since then, economists have argued that consumers understands that they face an intertemporal decision. Consumer look ahead to their future resources and needs, implying a more complex consumption function than the one Keynes proposed. Keynes suggested a consumption function of the form...

Consumption = f (current income)

Recend work suggests instead that

Consumption = f (current income, wealth, Expected future income, Interest rate).

Chapter NO 15

Aggregate Supply and the short run tradeoff between inflation and unemployment.

"Probably the single most important macroeconomics relationship is the phillips curve.

— George Akerlof

"There is always a temporary tradeoff between inflation and unemployment; There is no permanent tradeoff. The temperory tradeoff comes not from inflation per se (itself), but from unanticipated inflation, which generally means, from a rising rate of inflation.

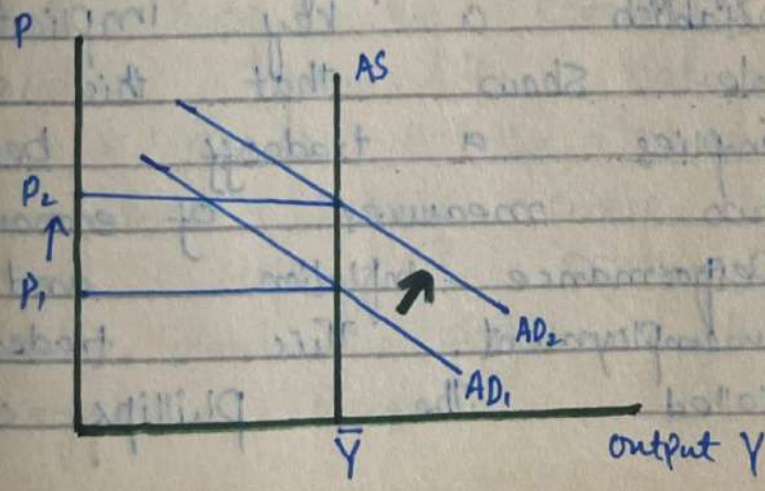
— Milton Friedman

In this chapter, we focus on the aggregate supply and develop theories that explains the position and slope of the aggregate supply curve.

→ The Aggregate supply behaves differently in the short run than in the Long run.

Long run :-

In the long run prices are flexible, and the aggregate supply curve is vertical. When the aggregate supply curve is vertical, shifts in the aggregate demand curve effects the price level, but the output of the economy remains at its natural level.



As proved with the help of graph that the shifts in the demand curve affect the price level, but the output of economy remains at its natural level.

In short run:

In the short run prices are stickey, and the aggregate supply curve is not vertical. In this case, shifts in aggregate demand do cause fluctuations in output.

⇒ After examining the basic theory of the short run aggregate supply curve, we establish a key implication. We show that this curve implies a tradeoff between two measures of economic performance - inflation and unemployment. This tradeoff, called the Phillips curve,

tell us that to reduce the rate of inflation policy makers must temporarily raise inflation, the tradeoff b/w inflation and unemployment is only temporary.

One goal of this chapter is to explain why policymakers face such a tradeoff in the short run and, just as important, why they donot face it in the long run.

→ The basic theory of Aggregate Supply :-

By examing the two prominent models of aggregate supply. In both models, some market imperfection (that is, some type of friction) causes the output of the economy to deviate from its natural level. As a result the short run aggregate supply curve is upwood sloping rather than vertical, and shifts in the aggregate demand curve

cause output to fluctuate. These temporary deviations of output from its natural level represents the booms and busts of the business cycle.

Each of these two models take us down a different theoritical route, but each route ends up in the same place. That final distination in the short run aggregate supply equation of the form

$$Y = \bar{Y} + \alpha (P - EP), \quad \alpha > 0$$

Where

Y = output

$\bar{Y}$ = natural level of output

P = Price level

EP = expected price level

This equation states that output deviates from

its natural level when the price level deviates from the expected price level.
The parameter α indicates how much output responds to unexpected changes in the price level.
$\frac{1}{\alpha}$ is the slope of the aggregate supply curve.

The two models are.

B Sticky price model.

ii) Imperfect + information model.

Each of the model tells a different story about what lies behind this short-run aggregate supply equation. In other words, each model highlights a particular reason why unexpected movements in the price level are associated with fluctuations in aggregate output.

→ The sticky price model.

Outlines

Reasons for sticky prices

i) → long-term contracts between firms and costomers.

ii) → Menu cost.

Menu Cost consists of all costs incurred by a business to change the prices it offers to its customers. The classical example is a restaurant that has to physically print new menus in order to change the prices of its dishes. The main takeaway from menu costs is that prices are sticky.

iii) → Firms not wishing to annoy customers with frequent price changes.

⇒ The most widely accepted explanation for the upward-sloping short-run aggregate supply curve is called the Sticky-price model. This model emphasizes that firms don't instantly adjust the price they charge in response in response to changes in demand, due to following reasons :-

→ i) long-term contract blw firms and costomers

→ ii) Menu cost.

→ iii) Firms may hold prices steady to avoid annoying their regular costomers with frequent price changes.

→ iv) And sometimes sticky prices can be a reflection of sticky wages : firms base their prices on the cost of production, and

∴ wages may depend on social norms and notions of fairness that evolve only slowly over time.

→ To explain an upward-sloping AS curve here we examine an especially simple model. We first consider the pricing decision of individual firms and then add together the decisions of many firms to explain the behavior of the economy as a whole.

To fully understand the model, we have to depart from the assumption of perfect competition. Perfectly competative firms are price takes rather than price setters. If we want to consider how firms set prices, it is natural to assume that these firms have at least some monopolistic control over the prices they

charge.

Now consider we have two types of firms.

→ Flexible firm.

→ Sticky firms.

Consider the pricing decision of the flexible firms. The firms desired price P depends on two macroeconomics variables.

i) **The overall level of prices P.** A higher price level implies that the firms costs are higher. Hence, the higher the overall price level, the more the firm would like to charge for its product.

ii) **The level of aggregate income Y.** A higher level of income rises the demand for the firm's product (b/c the purchasing power increases) Because marginal

Cost increases at higher levels of production, the greater the demand, the higher the firms desired price.

We write the flexible firm's desired price as

$$p = P + a(Y - \bar{Y})$$

This equation says that the desired price 'p' depends on the overall level of prices P and on the level of aggregate output relative to the natural level $(Y - \bar{Y})$. The parameter α (which is greater than zero) measures how much the firm's desired price responds to the level of aggregate output.

So the firms with flexible prices set their prices d/c to this equation.

→ Now consider the pricing decision of the firms with sticky prices. They announce their prices in advance based on what they expect economic conditions to be. Firms with sticky prices set prices according to.

$$P = EP + \alpha(EY - E\bar{Y}).$$

where, as before, E represents the expected value of a variable. For simplicity, assume that these firms expect output to be at its natural level, so that the last term, $\alpha(EY - E\bar{Y})$, is zero. Then these firms set the price.

$$P = EP$$

that is, firms with sticky prices set their prices based on what they expect other firms to charge.

→ We can use the pricing rules of the two groups

of firms to derive the aggregate supply equation. To do this, we find the overall price level in the economy.

If s is the fraction of firms with sticky prices and 1-s is the fraction with flexible prices, then the overall price level is

$$P = \underbrace{sEP}_{\text{sticky price firms}} + \underbrace{(1-s)[P + \alpha(Y - \bar{Y})]}_{\text{Flexible price firms.}}$$

Now subtract $(1-s)P$ from b.s. we get.

$$sP = sEP + (1-s)[\alpha(Y - \bar{Y})]$$

Divide both sides by s to solve for the overall price level.

$$P = EP + [(1-s)\alpha/s](Y - \bar{Y})$$

The two term in this equation are explained as

follows.

i) When firms expect a high price level, they expect a high cost. Those firms that fix prices in advance set their prices high. These high prices cause other firms to set high price, also, hence a **high expected price level EP leads to a high actual price level P.**

ii) When output is high the demand for goods is high. Those firms with flexible prices set their prices high, which leads to a high price level. The effect of output on the price level depends on proportion of firms with flexible prices.

⇒ Hence, the overall price level depends on the expected price level and on the level of output.

The rearrangement of the aggregate pricing equation into a more familiar form.

$$Y = \bar{Y} + \alpha (P - EP),$$

where $\alpha = s / [(1-s)\alpha]$ =

⇒ The sticky price model says that the deviation of output from the natural level is positively associated with the deviation of the price level from the expected price level.

→ **An Alternative theory :**

The imperfect-information Model.

Assumption ⇒ outline :

i) All wages and prices are perfectly flexible, all markets are clear.

ii) Each supplier produces one good, and consumes many goods.

iii) Each supplier knows the nominal price of goods she produces, but doesnot know the overall price level.

iv) Supply of each good depends on its relative price: the nominal price of good divided by the overall price level.

v) Supplier doesnt know price level at the time she makes her prod-- decision, so uses EP.

vi) Suppose P rises but EP doesnot.

→ Supplier thinks her relative price is higher/risen, so she produces more.

→ With many producers thinking this way. Y will rise whenever P rises above EP. So.

$$Y = \bar{Y} + \alpha(P - EP).$$

Output deviates from the natural level when the price level deviates from the expected price level.

→ Explanation:

The basic assumption of the imperfect-information model is that all wages and prices are market determined rather than bargin demand. Wages and prices are free to adjust to balance supply and demand. It also assumes that each supplier in the economy produces a single good and consumes many goods.

As a number of goods is so large, supplier cannot observe all prices at all times and monitors only the price of goods they produce. Because of the imperfect information, they may get confuse in the over all level of prices with change in relative prices. This leads to a positive relation-ship b/w the price level

and the output in the short-run.

For instance, if a farmer produces wheat then his production decision depends on the price of wheat relative to the price of other goods.
As a wheat producer, he monitors the wheat market closely and other markets less closely.

→ Consider, if the overall price in the economy increases, then the farmer may expect this change. So his relative price $\left(\frac{P_W}{P_{All}}\right)$ remains unchanged. So he does not work harder.

→ It may happen that the farmer did not expect this, so he observes only the increase in price of wheat and this leads to a imperfect information about the increase in

relative price, which altimatly motivates farmer to work harder. Not only the farmer, all other suppliers have same confusion. This leads an increase in the output level in the economy.

$$Y = \bar{Y} + \alpha(P - EP)$$

So, output deviates from the natural level when the price level deviates from the expected price level.

⇉ **Implications &**

We have studied two models of aggregate supply and each uses to explain why the short run aggregate supply curve is upwood sloping. One model assumes that the price level of some goods are

sticky ; the second assumes that information about prices is imperfect

The two models of aggregate supply differ in their assumptions and emphases, but their implications for aggregate output are similar. Both can be summerized by the equation

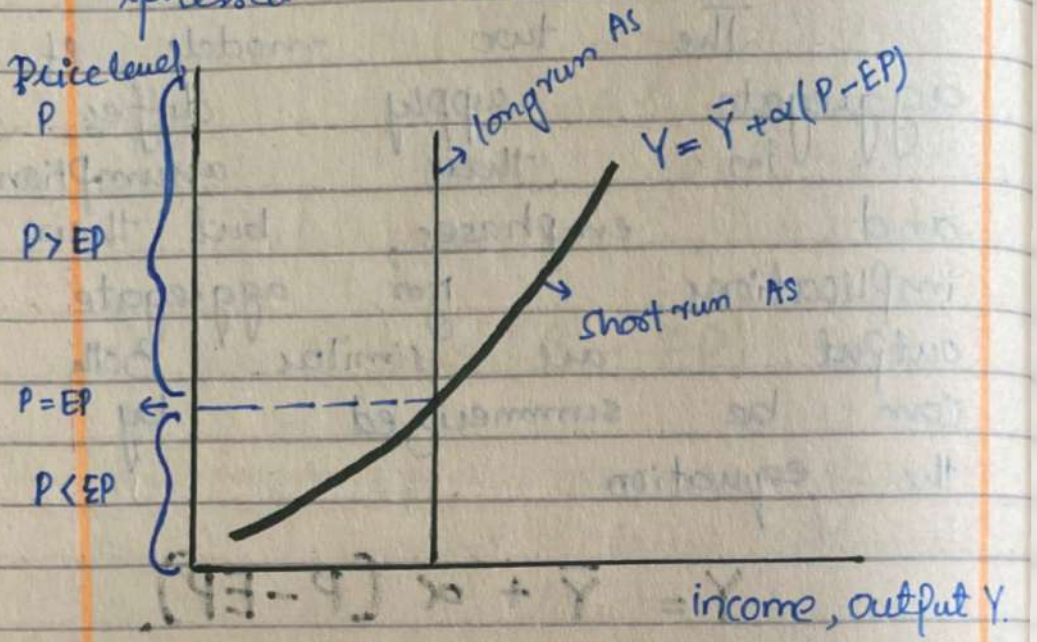
$$Y = \bar{Y} + \alpha (P - EP).$$

This equation states that deviation of output from the natural level are related to deviations of the price level from the expected price level.

If The price level is higher then the expected price level, output exceeds its natural level. If the price level is lower then the expected price level, Output falls short of

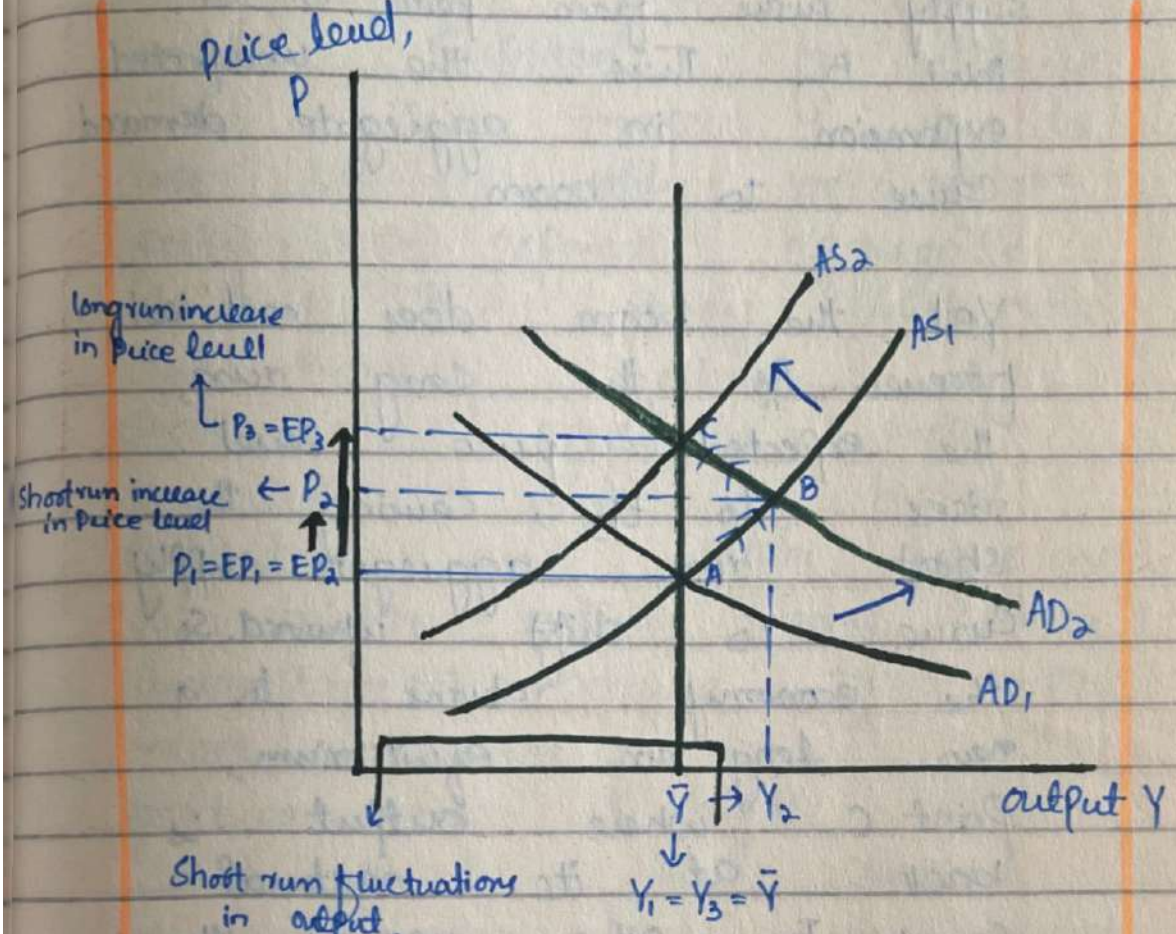
its natural level.

Graphically, it can be expressed as.



The short-run aggregate supply curve. Output deviates from its natural level $\bar{Y}$ if the price level deviates from its expected price level.

We know have a better understanding of aggregate supply, lets put aggregate supply and aggregate demand back together, so graphically:



How Shifts in aggregate demand Lead to short run fluctuation :-

Here the economy begin in the long-run equilibrium, point A, when aggregate demand increases unexpectedly, the price level increases from P_1 to P_2. Because the price level P_2 is about the expected price EP_2, output rises temporarily above the natural level, as the economy moves along the short run aggregate

supply curve from point A to point B. Thus the unexpected expansion in aggregate demand cause to boom.

Yet the boom does not last forever. In the long run, the expected price level rises to EP_3, causing the short run aggregate supply curve to shift upword. So the economy returns to a new long run equilibrium, point C, where output is back at its natural level. In other words, the economy returns to the natural level of output in the long run, but at much higher price level.

→ Inflation, Unemployment, and the phillips curve.

Two goals of economic policymakers are low inflation and low unemployment,

but often these goals conflict. Suppose, for instance, that policy makers were to use monetary or fiscal policy to expand aggregate demand. This policy will move the economy along the short run aggregate supply curve to a point of higher output and higher price level. So, higher output means lower unemployment, because firm employ more workers when they produce more. A higher price level, given the previous years price level, means higher inflation. Thus, when policymakers move the economy up along the short run aggregate supply curve, they reduce the unemployment rate and raise the inflation rate. Conversely, when they contract aggregate demand and move the economy down the short-run aggregate supply curve, unemployment rises and inflation falls. This trade off between inflation

and unemployment, called the phillips curve.

→ **Deriving the Phillips Curve From the Aggregate supply curve.**

The phillips curve in its modern form states that the inflation rate depends on three forces:

i) Expected inflation.

ii) The deviation of unemployment from its natural rate, called cyclical unemployment.
(when the economy is in boom the cyclical unemployment is low and vice versa).

iii) Supply shocks eg: like corona due to which the supply of goods decreases and the price of goods increases.

→ These three forces are

expressed in the following equation.

$$\pi = E\pi - \beta(u - u^n) + v$$

Inflation = Expected Inflation − (β × cyclical Unemployment) + Supply shock.

Where β is a parameter measuring the response of inflation to cyclical unemployment. Notice that there is a minus (−) sign before the cyclical unemployment term, other things remaining same, higher unemployment is associated with lower inflation.

We can derive this equation for the Phillips curve from our equation for aggregate supply.

To see how, write the aggregate supply equation as.

$$P = EP + [1/\alpha](Y - \bar{Y})$$

With one addition, one subtraction and one substitution we can

transform this equation into phillips curve relationship between inflation and unemployment.

⇒ Here are three steps.

i) First, add a supply shock V to represent exogenous event to the right side eg: Corona due to which price ↑ and supply ↓ in the short term.

$$P = EP + (1/\alpha)(Y - \bar{Y}) + V$$

ii) Second, to go from Price level to inflation rates, subtract last year's price level P_{-1} from both side of equation to obtain.

$$(P - P_{-1}) = (EP - P_{-1}) + (1/\alpha)(Y - \bar{Y}) + V$$

→ here $P - P_{-1}$ is the difference between current price level and last year's price level which is inflation π.

→ $EP - P_{-1}$ is the difference b/w expected price level and last years price level, which is expected inflation $E\pi$ so the equation becomes.

$$\pi = E\pi + (1/\alpha)(Y - \bar{Y}) + v.$$

iii) Third, to go from output to unemployment. so when the output is higher than its natural level of output, the unemployment is lower then the natural rate of unemployment. we can write this as.

$$(1/\alpha)(Y - \bar{Y}) = -\beta(u - u^n)$$

So we can substitute $-\beta(u-u^n)$ for $(1/\alpha)(Y-\bar{Y})$ in the previous equation to obtain:

$$\pi = E\pi - \beta(u-u^n) + v.$$

Thus we can derive the Phillips curve equation from the aggregate supply equation.

So, According to the

Short run aggregate supply curve / equation output is related to the unexpected movement in the price level.

According to the phillips curve equation, unemployment is related to unexpected movements in the inflation rate.

→ The aggregate supply curve is more convenient when we are studing output and the price level, whereas the phillips curve is more convenient when we are studing unemployment and inflation.

⇒ **The short-Run trade off between Inflation and Unemployment.**

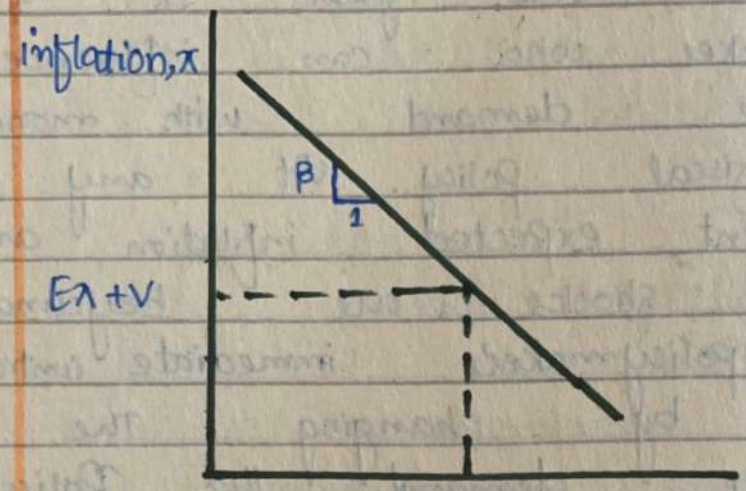
There is a short-run trade off between inflation and unemployment which is known as phillips curve.

Consider the options the phillips curve gives to a policymaker who can influence aggregate demand with monetary or fiscal policy. At any movement, expected inflation and supply shocks are beyond the policymaker's immediate control. But by changing the aggregate demand, the Policy maker can change output, unemployment, and inflation.

→ When the policymaker wants to decrease unemployment so they expand demand and due to which the inflation raises and when they want to lower inflation so they depress aggregate demand due to with output decreases which intern raise unemployment.

With the help of a graph we show the phillips curve equation and shows the short run tradeoff between inflation and unemploy-

-ment



When unemployment is at its natural level ($u = u^n$), inflation depends on expected inflation and the supply shock v ($\pi = E\pi + v$).

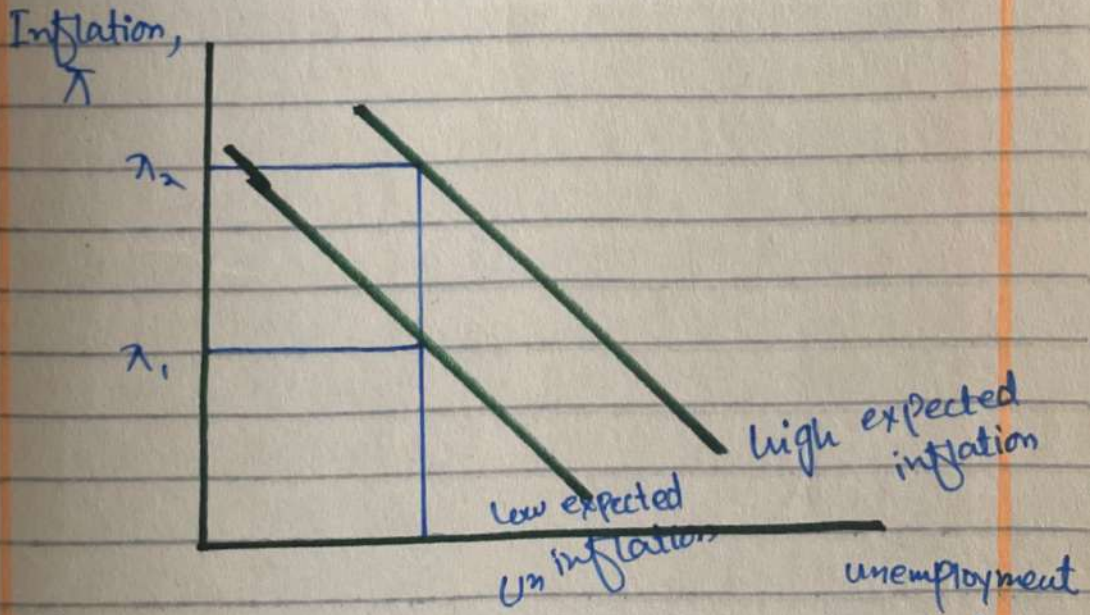
The parameter β determines the slope of the tradeoff between inflation and unemployment.

In the short run inflation and unemployment are negatively related. At any point in time, a policymaker who controls aggregate demand can choose a combination of inflation and unemployment

on this short-run Phillips curve.

⇒ Notice that the position of the short-run Phillips curve depends on the expected rate of inflation.

→ If the expected rate of inflation rises, the curve shifts upward and the policymakers tradeoff becomes less favorable: inflation is higher for any level of unemployment. The Graph shows how the tradeoff depends on expected inflation.



As we can observe that when the expected inflation is higher, the curve shifts upward and the inflation is higher

for any level of unemploy-
-ment.