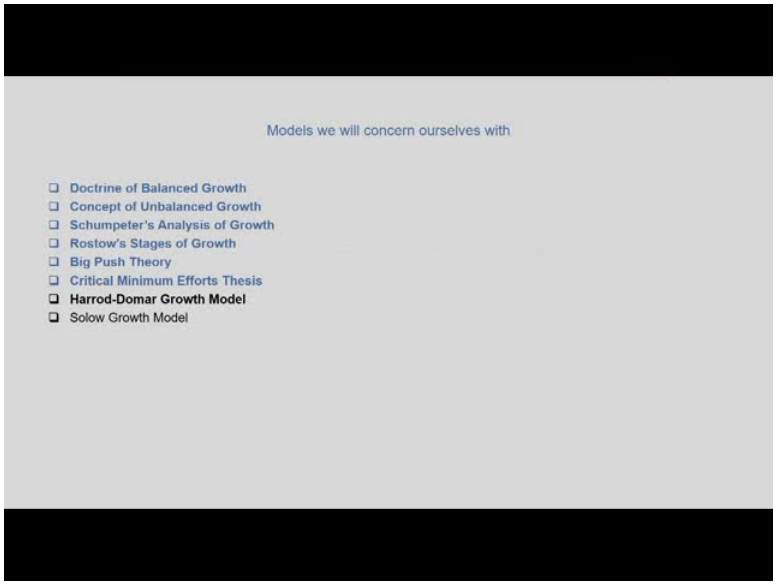
Economic Growth and Development
Dr. Rajshree Bedamatta
Department of Humanities & Social Sciences
Indian Institute of Technology, Guwahati

Lecture-10
Strategies of Economic Development & Growth – V

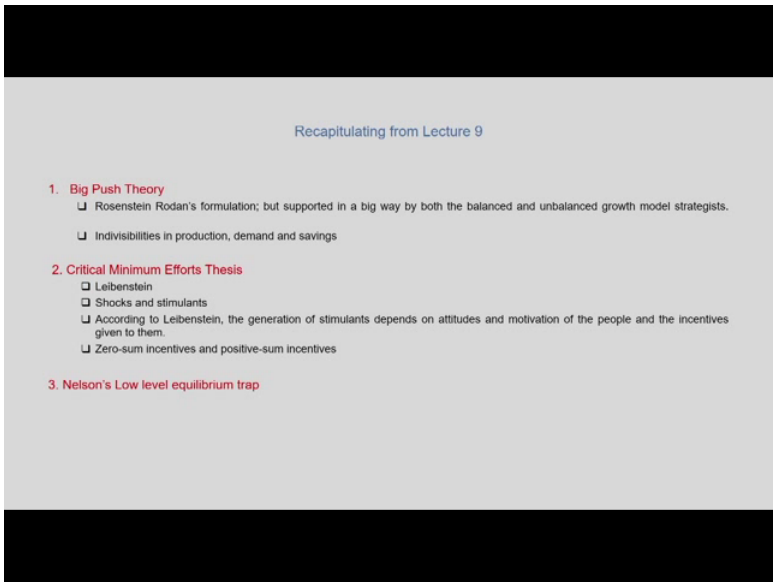
Hello and welcome to lecture 10 of the NPTEL MOOCS course on Economic Growth and Development. We are continuing with our discussion on Strategies of Development and Growth.

(Refer Slide Time: 00:41)



So far we have covered the following; we have done Balanced and Unbalanced Growth models. We also discussed Schumpeter's Analysis of Growth, Rostow's Stages of Growth. In the last lecture, we also looked that the Big Push Theory and the Critical Minimum Efforts Thesis. In this lecture, we will be focusing on one of the very important growth models in the post Keynesian era which is known as the Harrod-Domar Growth Model. As like the other classes let us begin with a recapitulation of a last class.

(Refer Slide Time: 01:11)



In the last class, we looked that Rosenstein Rodan's formulation of the Big Push Theory which was supported in a big way by both the balanced and unbalanced growth model strategists.

We also looked at Critical Minimum Efforts Thesis of Professor Harvel Leibenstein and Professor Harvel Leibenstein incidentally was also a very big supporter of the Big Push Theory of investment. Rosenstein Rodan formulation basically said that there needs to be an increase in massive investment in certain identified sectors of the economy which has larger which can create large external economies and in his thesis of unbalanced growth model. He emphasized that these sectors should necessarily be those which deal with social overhead capital or infrastructure Rosenstein Rodan in his formulation of Big Push Theory focused on 3 kinds of indivisibilities.

Indivisibilities of production, demand and savings and essentially what he was saying is that sectors such as the infrastructural sector which require has is indivisible in nature or the or the benefits deriving the nature of these the projects are such that they cannot be divided into small units. And therefore, the investment requirement for these kinds of sectors is huge.

Similarly, he was talking about complementarities in demand or indivisibilities in demand and savings which essentially means that if you are making investments in one sector and the nature of demand is such that related sectors products or goods are also

required, then there needs to be investment made in related sectors as well. Because there are there exist complementarities of demand, investments need to be made in related sectors. So, Rodan's formulation was that because these indivisibilities in production, demand and savings exist and these indivisibilities if not dealt with adequately may lead to obstacles of economic growth of the developing countries.

Therefore, they requires to be a big push in investment as far as these indivisibilities are concerned and then, these indivisibilities can then be transformed into creation of external economies of scale which can then be taken advantage of by the private entities for the creation of directly productive activities. Now, incidentally the Big Push Theory also had a lot of support from both the balanced and unbalanced growth strategies and the High Development Theory that we have been discussing so far also supported the Big Push Theory in its various in its variants at different points of time.

In the Critical Minimum Efforts Thesis that of a Professor Leibenstein that we studied, we saw that he was talking about mainly shocks and stimulants that exist within the economy. And there needs to be a generation of stimulates within the economy for economic growth take place and he also said that the generation of stimulants will depend on the attitudes and motivation of people and the incentives given to them.

He was interestingly talking about 2 kinds of incentives; zero-sum incentives and positive-sum incentives. By zero-sum incentives, he meant those kinds of policies which lead towards more of distribution and redistribution within the economy. But, does not necessarily lead to capital accumulation or growth in the capital stock of the economy; whereas, positive sum incentives are those that necessarily lead to increase in capital stock of the economy.

So, he was saying that while zero-sum incentive will have positive distribution effects. They need not necessarily lead to economic growth within the economy. And certain critical minimum effort has to be given by the government in providing positive-sum incentives to entrepreneurs within the economy which will then transformed themselves into stimulants and will ultimately lead to growth and development.

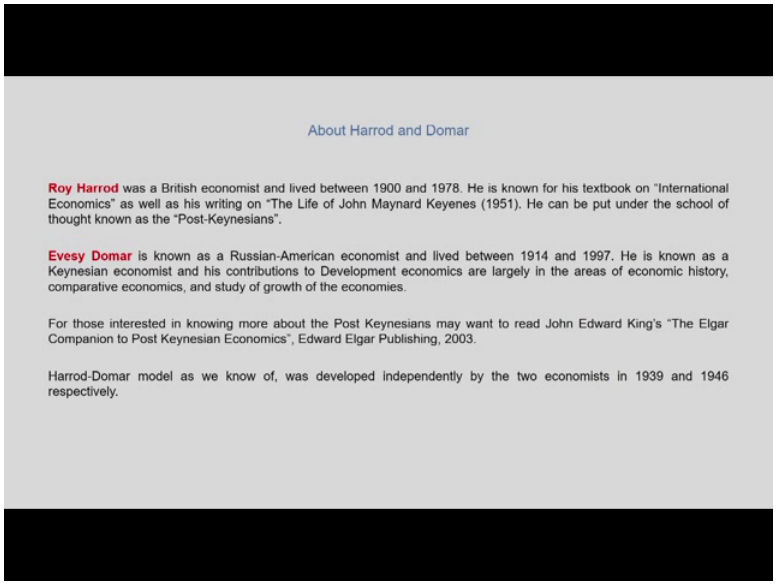
In this context, I also mentioned in passing Richard Nelson's Low level equilibrium trap and while I did not going to the details of Nelson's model of the low level equilibrium trap; but the basic idea of his formulation is important for us to give a context to the High

Development Theory surrounding balanced growth and unbalanced growth or portion critical minimum efforts.

So, what he was saying is that the underdeveloped countries have certain characteristics social and technological conditions that are very conducive to trapping the economy in a condition of low level equilibrium trap. And these are unnecessarily low per capita incomes, low propensity to direct additional per capita income to increasing per capita investment, scarcity of an uncultivable arable land and inefficient methods of production.

However, in his formulation he was also very importantly pointing out that in spite of the existence of these technological conditions, low level technology conditions, these conditions of underdevelopment, the is the attitude of the government and it is the social environment created by the government which can take the country out of this low level equilibrium trap. He was necessarily referring to this term called cultural inertia; that how cultural inertia leads to economic inertia and if cultural inertia can be suitable dealt with by the government, then economic development will also take place.

(Refer Slide Time: 06:43)



Now, let us move on to the topic of our discussion today which is the Harrod-Domar model and as like the other thinkers have been giving an introduction to the other thinkers, let us also slightly get introduced to who was Harrod and Domar.

Roy Harrod was a British economist and he lived between 1900 and 1978. He is known for his textbook on international economics and he is also written on Keyenes, one of the most influential economics of our times John Maynard Keyenes. His book "The Life of John Maynard Keyenes" came out in 1951 and we can safely put Roy Harrod under the school of thought known as the post Keynesians. Evesy Domar is known as a Russian economist and he lived between 1914 and 1977 and he is also known as a Keynesian economist and his contributions to development economics are largely in the areas of economic history, comparative economics, and study of growth of the economies.

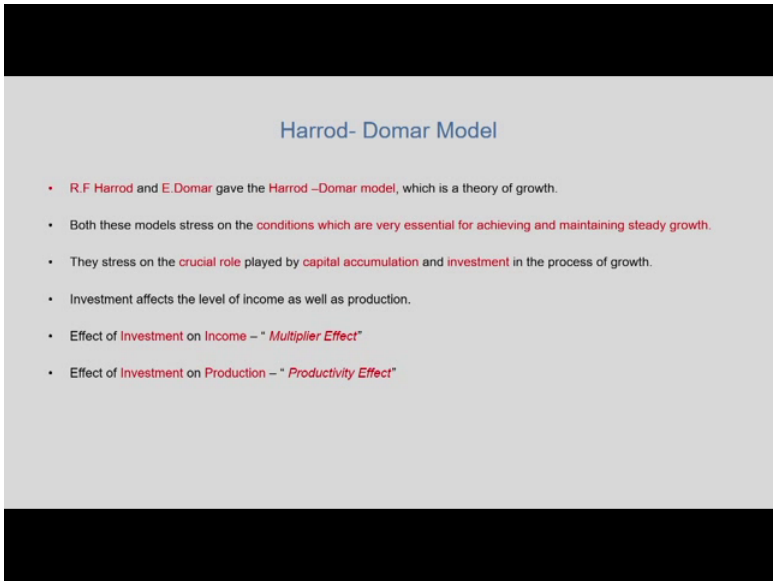
Domar was primarily educated in the then Russia, but he move to America for his research in a development economics and Harrod-Domar model as we know of was actually developed independently by these two economists in 1939 and 1946 respectively. Because there are certain commonalities with respect to both of these models, they are put together as one of the most classical models of growth and known as the Harrod-Domar model. A little about because I am referring to Keynesians and Post Keynesians here, for those interested in research and knowing more about the post Keynesians may want to read John Edward Kings, "The Elgar Companion to Post Keynesian Economics".

Let me tell you a little about Keynesian economics here as well. Although the design of this course does not allow us go into the details of Keynesian economics. However, these models Harrod Domar model, the growth models some of these growth models take Keynesian economics as a starting point and we can understand Keynesian economics as an economic theory of total spending in the economy and its effects on output and inflation. Keynesian economics was developed by the British economist John Maynard Kings during the 1930's in an attempt to understand the great depression and he advocated increasing government expenditures and lowering taxes to stimulate demand and pull the economy out of depression.

And subsequently Keynesian economics has also been used to refer to the concept of optimal economic performance; how it can be achieved and preventing economics slums and depressions and recessions within the economy by influencing aggregate demand through active stabilization policies. So, Keynesian economics is calling for active intervention of the government for maintaining the level of aggregate effective demand

within the economy. Short introduction will suffice for us to understand the Harrod and Domar, the basic idea of the Harrod and Domar model.

(Refer Slide Time: 09:44)



Harrod and Domar Model is considered to be one of the greatest contributions to dynamic models which looks at the changing conditions of an economy and both of these models are very similar to each other. Although, they are referring to different conditions under which is it operates. Both of these models stress on the conditions which are very essential for achieving and maintaining a steady growth rate and this concept of steady growth rate is very important in Harrod and Domar model.

This is basically talking about a situation when all the variables such as output, population, capital, stock ratio, savings rate, investment and technical progress; either they are growing at a constant exponential rate or are constant. And the basic idea behind the Harrod-Domar model is the achievement of the steady state growth and the conditions under which the steady state growth rate can be maintained and this is the overall context within which they are discussing the growth of the economies. They as I have already stated, they both of these models stress on the conditions which are very essential for achieving and maintaining steady growth rate.

Capital accumulation and investment play a very crucial role in the process of growth and in their model investment plays very crucial role. It actually plays a double roll it increases, it generates income through investment and in other words, investment

generates income through the multiplier effect and investment also gives raise to or increases the productive capacity of the economy by enlarging the capital stock.

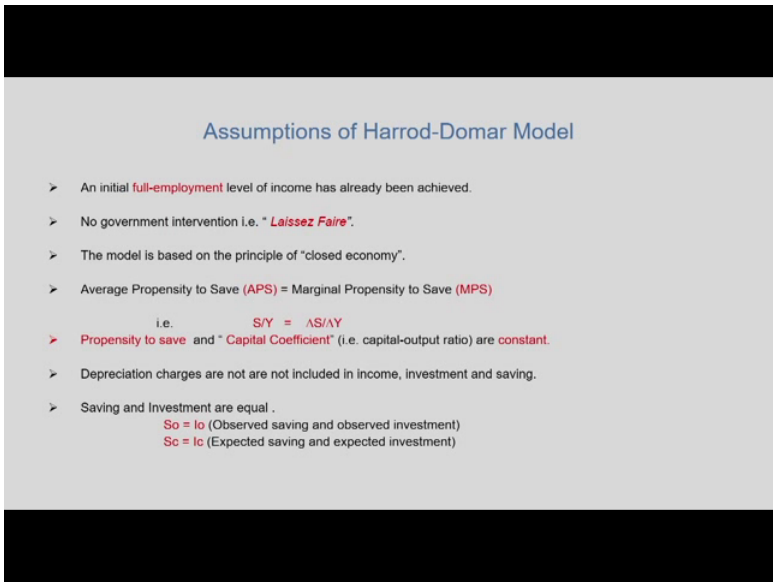
And this is referred to as the productivity effect. So, these are the two important effects that Harrod-Domar model is supposed to be trying to convey that these 2 effects are extremely important for an economy to achieve a steady state growth; the multiplier effect and the productivity effect. Multiplier effect concept is the contribution of Keynesian economics to the growth theories and productivity effect is the contribution or the classical economist to growth models.

So, what they are essentially trying to say is that investment is very important. Investment creates multiplier effect as a result of which it gives raise to increases in income and investment also through the productivity effect gives raise to increase of production. And so you can say that the multiplier effect is the Keynesian tool and productivity effect is a Classical tool and the Harrod-Domar analysis takes into consideration both of these tools.

And the Harrod-Domar model basically tries to strike a synthesis between the multiplier effect and the productivity effect and the simultaneous operation of these two effects, the multiplier effect in the productivity effect gives raise to and dynamic equilibrium which leads to steady state equilibrium within the economy. Like all models the Harrod-Domar model also has certain assumptions.

Let us have a look at the assumptions of the Harrod-Domar model. One of the first assumptions is the that the economy is already operating at a full employment level of income or full employment level of income has already been achieved for the Harrod Domar model to work.

(Refer Slide Time: 12:54)



Now, there have been various definitions of what is full employment in economics and there are divergent views with regard to this. The classical economists come up with full employment; the Keynesian come up with a different view of full employment.

But for the purpose of our model here because we are looking at the Post Keynesian or a we assuming functioning within the Keynesian setup. Let us say that full employment basically means that there is no involuntary unemployment in the economy. In other words, it basically means that those who are seeking employment or those who want employment are definitely employed within the economy and the aggregate level of employment or the aggregate level of output is inelastic when compared to the level of effective demand.

It means that the effect, if the effective demand increases, then there may not be a responsive change in the aggregate level of output and employment and that is the definition given by Keynes with regard to a full employment. So, some employment voluntary unemployment might exist, but there is no situation of involuntary unemployment in this full employment equilibrium condition.

The second assumption is that which is a very standard assumption for most of this models. There is no government intervention. It is a closed model which means that foreign trade does not take place. There are no exogenous factors or forces influencing the growth variables of the economy in this model and you can also say that the

government restrictions on trade and complications caused by international trade are ruled out here.

Another assumption is that the propensity to save or the average propensity to save and the marginal propensity to save are equal to each other. There is the absolute change in savings is equal to the relative change in saving and we will presently see that how savings rate is one of the important parameters of the Harrod-Domar model along with the capital output ratio.

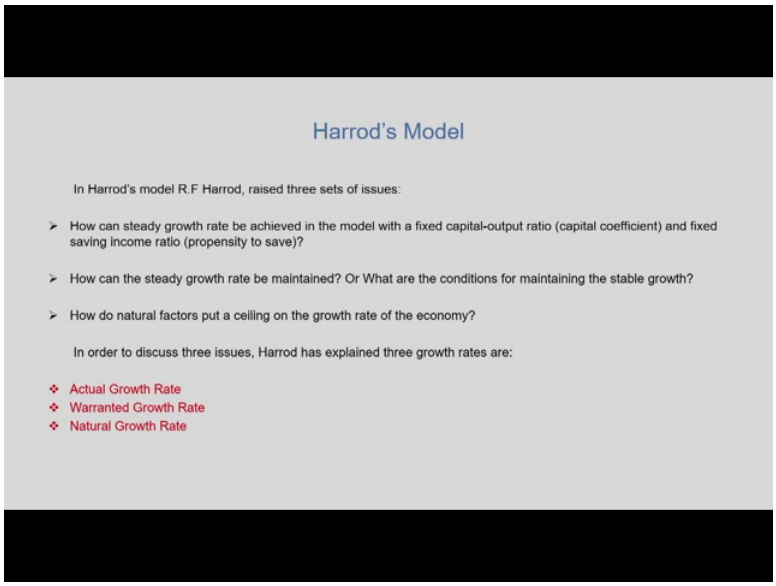
The propensity to save and capital coefficient are constant. The capital output ratio is constant, savings rate is constant, capital output ratio is constant. In this context, a very important thing to remember which is that there are no lags in adjustment in economic variables such as saving, investment, income and expenditure; they all adjust themselves in the same period of time.

So, we can say that change in savings brings about the corresponding changes in level of investment in the same period of time and all these variables relate to the same period. And this is a very important assumption of the Harrod-Domar model that these changes are taking place in the same period of time which means that investment is nothing but the change in capital stock; that is one of the identities of or assumptions of this model.

The next assumption is that income and savings are all defined in the net sense which means that they are all over and above depreciation and depreciation charges are not included in income investment and saving and finally, that ex (Refer Time: 16:01) savings and investment, savings is equal to ex-post savings and investment. There is functional and accounting equality between savings and investment.

There is a concept referred to as observed savings and investment and expected savings and investment which is basically ex ante and ex-post savings and investment and in these kinds of model the observed saving is equal to observed investment and expected savings is equal to expected investment. Now, given the assumptions of the Harrod-Domar model Professor Harrod was the raising 3 sets of issues with regard to understanding the growth of the economy.

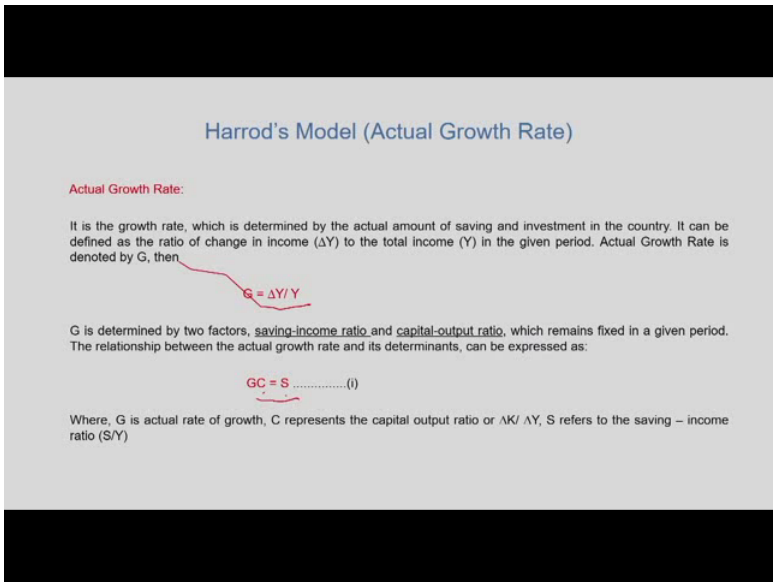
(Refer Slide Time: 16:37)



The first question that he was raising is that how can study growth be achieved in the model with a fixed capital output ratio and fixed saving income ratio or the propensity to save. The second question that he was posing is how can the steady growth rate be maintained or what are the conditions for maintaining the stable growth rate and the third question was how do natural factors put a ceiling on the growth rate of the economy.

And in order to be able to discuss these issues, Harrod explained 3 concepts of growth rates which is highly used in the literature of development economics. They are Actual Growth Rate, Warranted Growth Rate and Natural Growth Rate. Now, let us look at each of these concepts one by one.

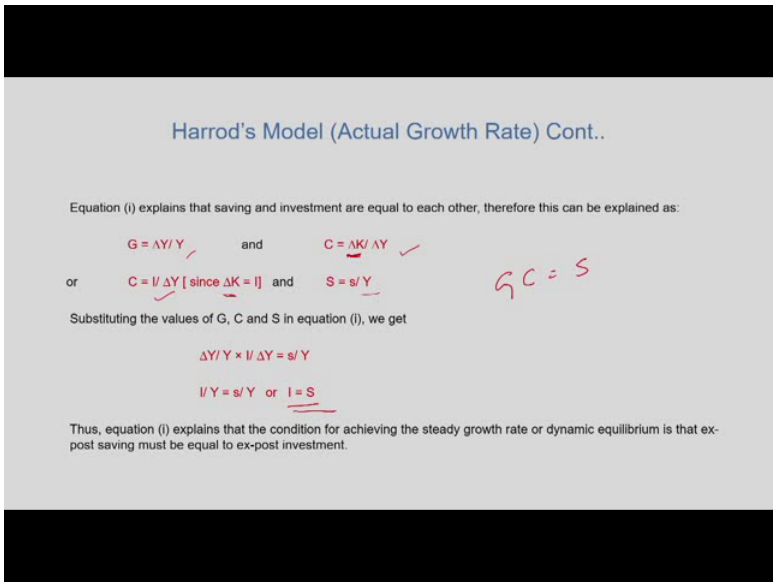
(Refer Slide Time: 17:21)



Let us begin with Actual Growth Rate here. Actual growth rate is determined by the actual amount of savings and investment in the country. In other words, it can be defined as the ratio of change in income to the total income. So, here actual growth rate is given by the change in income to the change in ratio of change in income to income. According to Harrod a growth rate G is determined by two factors, the saving-income ratio and capital-output ratio, which remains fixed in a given period.

And this relationship between actual growth rates and its determinants, the capital output ratio and savings can be shown as follow: GC is equal to S; where, C is the capital output ratio and S is the savings-income ratio. And this equation basically explains the simple truism that savings and investment in the exposed sense are equal to each other.

(Refer Slide Time: 18:18)



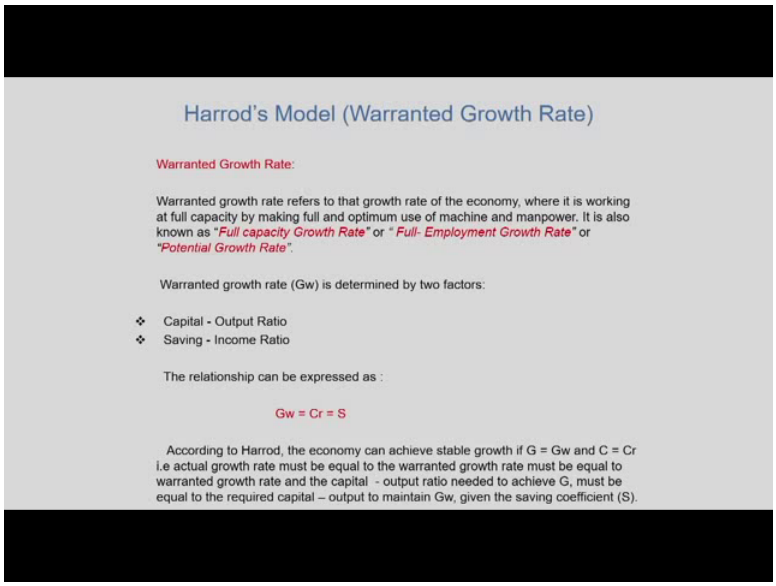
So, it can be shown as follows. Here, we already know that actual growth rate is shown as change in income to total income. The capital output ratio is nothing but the change in capital stock to the change in income or and since the capital stock is nothing but, the change in capital stock is nothing but investment. So, we can also show capital output ratio as investment to the 2 total income since as I said delta.

So, delta K basically shows the change in total capital stock of the economy and that is the capital output ratio and since the based on the assumptions itself because there are no lag in the savings rate and investment taking place in the economy. So, we can also consider change in capital stock as being equivalent to investment.

So, the capital output ratio can also be shown as I by delta Y. Savings is rate shown as ratio of total savings total income and if we substitute all of these values in the equation GC is equal to S in the previous slide 1; then, we get delta Y by Y into I by delta Y is S by Y or investment is equal to saving.

So, this equation basically says that the condition for achieving the steady growth rate or dynamic equilibrium is that ex-post saving must be equal to ex-post investment. In other words, there should be accounting equality between saving and investment if dynamic equilibrium is to be achieved. So that the concept of the actual growth rate that Harrod was talking about. Now let us move on to his concept of Warranted Growth Rate.

(Refer Slide Time: 20:06)



The warranted growth rate refers to the growth rate of the economy when it is working at full capacity by making full and optimum use of machine and man power. And therefore, it is also known as the "Full-Employment Growth Rate". So, G was the actual growth rate of the economy Gw is the warranted growth rate of the economy.

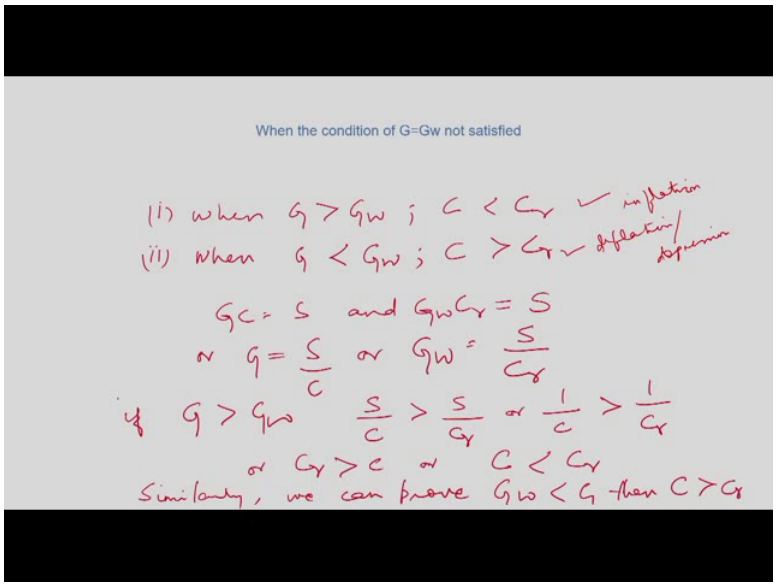
Now, Gw you can interpret it as the rate of income growth required for full utilization of a growing stock of capital so that entrepreneurs will be satisfied with the amount of investment actually made. And like the actual growth rate concept of warranted growth rate is also determined by 2 similar factors; Capital - Output Ratio and Saving - Income Ratio. And according to Harrod, the economic and achieve stable equilibrium stable equilibrium growth rate if actual growth rate is equal to warranted growth rate and the capital output ratio of the warranted growth rate is also equal to the capital output ratio in the actual growth rate.

So, here Gw is equal to C r is equal to S, where Gw refers to the warranted growth rate; C r denotes the amount of capital required to maintain warranted growth rate or the growth rate of output and S is a saving income ratio. Now according to Harrod, the economic and achieved stable growth if G is equal to Gw and C is equal to Cr that is actual growth rate must be equal to warranted growth rate. In other words, growth rate of income must be equal to the growth rate of output. Secondly, the capital output ratio

needed to achieve G must be equal to the required capital output to maintain Gw given the saving coefficient S.

So, that also amounts to saying that actual investment must be equal to expected investment if an economy were to achieve the objectives of stable growth, but what happens if instability occurs or instability of growth take place. Because this type of equality is rarely found in the economies where G is equal to Gw. So, there is a lot of potential how so ever planned an economy maybe it is possible than actual growth rate is not equal to the expected growth rate or the warranted growth rate. So, what happens when these conditions are not satisfied?

(Refer Slide Time: 22:19)



So, there are 2 situations that might arise. First situation is that when actual growth rate is greater than the warranted growth rate, then it will also mean that the capital output ratio actually required for growth of the economy is less than the warranted capital output ratio. And a second situation may might arise where actual growth rate is less than the warranted growth rate and the actual capital output ratio is greater than the required capital output ratio or the warranted capital output ratio.

Now, through arithmetic identities we can actually show that let us say, let us try to prove the first, when G is greater than G w; C will be less than Cr. We know that Gc is equal to S and Gw Cr is equal to S. So, G is savings a rate divided by the capital output ratio and the actual growth rate is equal to savings rate divided by the capital output ratio and the

warranted growth rate is equal to savings rate divided by the warranted capital output ratio.

So, if G is greater than Gw or actual growth rate is greater than warranted growth rate, then S by C will be greater than S by Cr or 1 by C will be greater than 1 by Cr and if we cross multiply, Cr will be greater than C or C will be less than Cr.

Similarly, we can prove that warranted growth rate if warranted growth rate is less than the actual growth rate, then the actual capital output ratio will be greater than the warranted capital output ratio. So, there are essentially 2 situations when instability of growth can take place considering the 2 concepts of actual growth rate and warranted growth rate according to Harrods model.

The first situation is when actual growth rate is greater than warranted growth rate and consequently the actual capital output ratio is less than the warranted capital output ratio; what happens. And second situation is when actual growth rate is less than the warranted growth rate and the actual capital output ratio is greater than the warranted capital output ratio; what happens?

So, in the first situation when C is less than Cr the actual amount of capital fall short of the required amount of capital and this leads to deficiency of capital which in turn according to Harrod would adversely affect the volume of goods to be produced and fall in the level of output will result in scarcity of goods. And hence, inflation and the growth of economy under the inflation can never be stable.

So, this situation G greater than Gw or C less than Cr will lead to a situation of inflation in the economy and this is so because there is deficiency of capital which and it will adversely affect volume of goods. And when there is a fall in the level of output there is scarcity of goods and which means that too much money is chasing too less goods and that will create a situation of inflation.

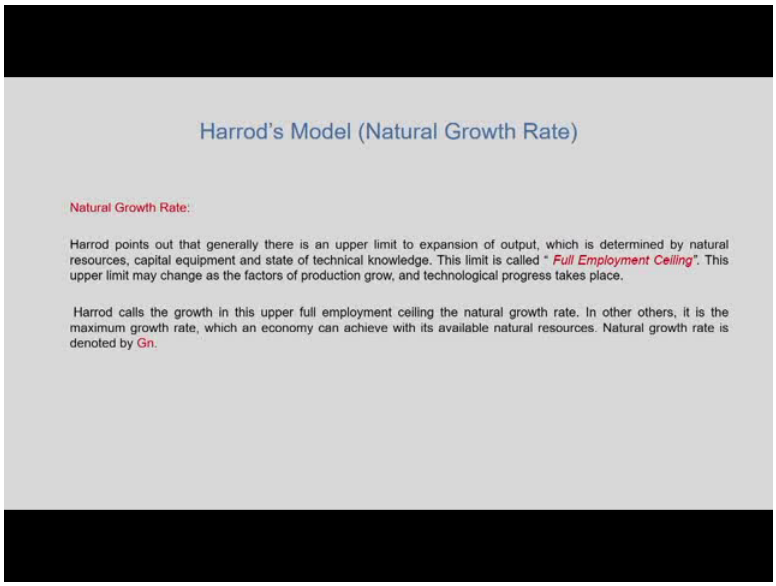
And the opposite will happen when the actual growth rate is less than the warranted growth rate. It will lead to a phase of deflation and if continue if the stage of deflation continuous for a really long period of time, it may cause serious depression retreads within the economy. Now, how does this happen? Under this situation, the actual amount of capital is more than the required amount of capital for investment and when the capital

amount available is more, it would dampen the marginal efficiency of capital and lead to chronic depression and unemployment.

So, the growth of the economy under the situation of chronic depression can never be stable. So, on the basis of this, we can conclude that stable growth or steady state growth can occur only when G is equal to Gw and any deviation of G from Gw will result in cumulative departure from the path of steady growth.

And the economy will be in a state of instability when G and Gw are not equal. So, this condition of G being equal to Gw or actual growth rate being equal to the warranted growth rate is what Harrod is referring to as steady state equilibrium or knife edge equilibrium and any deviations of G from Gw are unstable. There is a third concept of growth rate which Harrod talks about and it is called the Natural Growth Rate.

(Refer Slide Time: 26:43)



So, Harrod says that the actual growth rate and warranted growth rate are all fine, but there is a concept of natural growth rate also. If it is assume that propensity to save or capital output ratio does not change, then what will stop in come from shooting up or down without limit.

So, Harrod points out that generally there is an upper limit to the expansion of output and that is determined by natural conditions such as the availability of labour force, capital equipment, state of technical knowledge and this upper limit is referred to as the full

employment ceiling. And this upper limit may change as the factors of production grow or technological progress takes place and Harrod calls this as the upper full employment ceiling; this upper full employment ceiling as the natural growth rates. In other words, it is the maximum growth rate which an economic can achieve with its available natural resources.

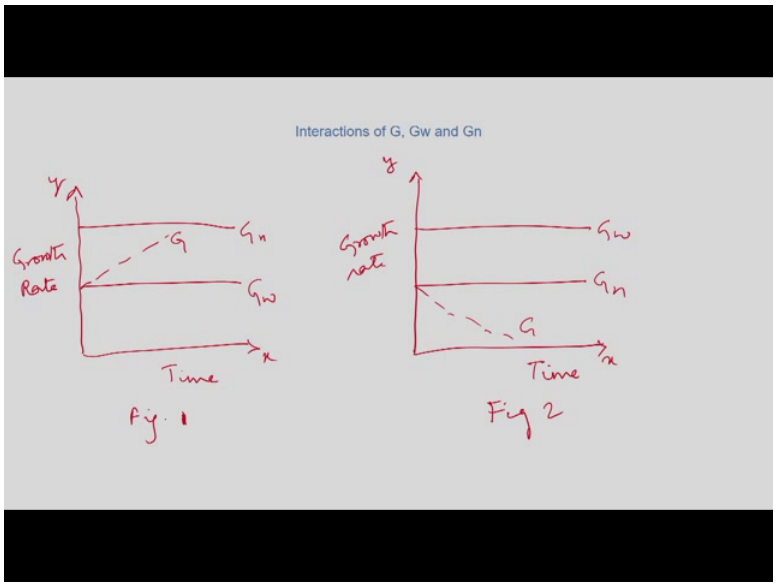
So, that is the definition of natural growth rate. That it is the maximum that an economic can achieve with its available natural resources and it is denoted by the notation Gn here. So, Harrods model is based upon these three concepts of growth rate G, Gw and Gn. The actual growth rate, warranted growth rate and the natural growth rate; the equality between G and Gw or actual growth rate and warranted growth rate is what is considered to be the stable equilibrium point.

It is also to as the knife edge equilibrium. The economic the development conditions within an economy should achieve at maintaining the steady state growth rate of the economy. However, he also says that there is a tendency for the economic to move to natural growth rate. But there is an upper ceiling that is referred to in the context of natural growth rate and that is called the full employment ceiling.

And this, it is the natural growth rate can be defined as the maximum growth rate which an economy can achieve with its available natural resources and then, Harrod also goes on to bring to his formulation a very interesting interaction between G, Gw and Gn and he says that the interactions between actual growth rate, warranted growth rate and natural growth rate will determine business cycles in the economy.

And he says that the because this model is operating within a capitalistic order he is saying that the capitalist, the very inherent nature of capitalist economies are such that business cycles are unavoidable and the interactions between these concepts of growth are also unavoidable. So, economies a capitalist economies will necessarily go into up swings and down swings and he uses the interaction between these 3 concepts of growth to be able to explain that, that is have a look at this in the next slide.

(Refer Slide Time: 29:44)



So, I have drawn here to figures. The first figure plots economic growth rate against time. The x axis shows time and the y axis shows the economic growth rate. Harrod points out that in the years after recession, the actual growth rate maybe higher than the warranted growth rate for a considerable period of time.

But it will not rise indefinitely. So, in other words the excess of expansion cannot go on indefinitely as it is limited by the availability of natural factors. So, Gn here provides the ceiling of full employment and Gw here is the warranted growth rate the required growth rate; G is the actual growth rate. So, he says that after period of recession, there is tendency for the actual growth rate to rise above the warranted growth rate.

But, it cannot raise indefinitely it will see a limit in the form of natural growth rate because there is a certain endowment of natural resources within the economy and that will provide a ceiling to the growth rates. When G touches G n G w cannot lag behind, but it will tend to catch up with it, since the rate of rise of G cannot be maintained Gn will exceed G and then, a down trend will start and this downtrend will result in overproduction which in turn will lead to a cumulative down swing.

So, in figure 2 here, you would see that the warranted growth rate catches up with the actual growth rate. However, because the rise of G cannot be maintained Gn will exceed G and then, a downtrend starts. This downtrend will result in overproduction and the economy will face a problem of secular stagnation and a chronic unemployment.

And this downtrend also cannot continue undefinitely and the reason is that the lower limit of depression is set by the minimum consumption level. In other words, this down trend in production cannot take place because autonomous investments will be taking place by the government. So, consumption expenditure cannot go to 0 in the overall macro economics sense and in this way because autonomous investments take place; investor's expectation for the bright future will be generated by actual resources position.

And therefore, there will be recovery within this system. So, given Harrods out interactions of these 3 concepts of actual growth rate, warranted growth rate and natural growth rate; what he is essentially saying is that the process of growth of a capitalist economy is never study because of its inherent characteristics.

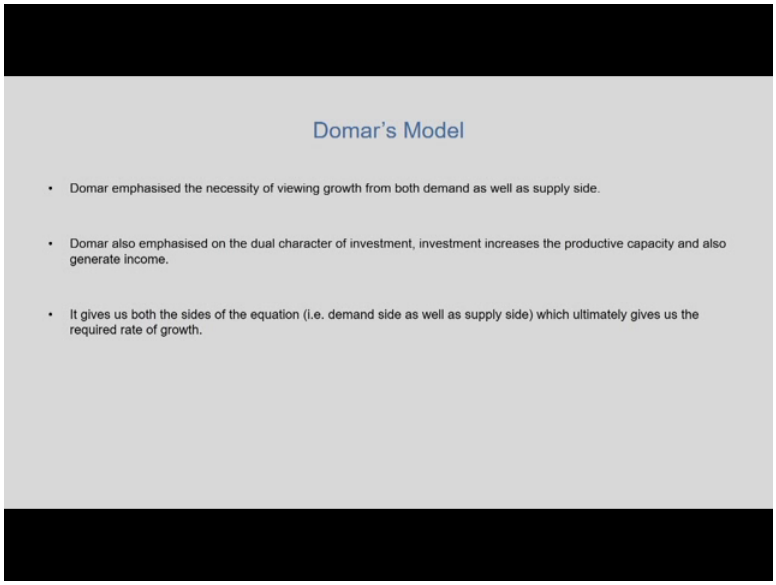
And there cannot be a steady growth of income and output in such an economy. There will always be ups and downs. And therefore, cyclical fluctuations are implicit in the phenomena of growth in such an economy and business cycles are not free to vary without limit in such a system. In upward direction, Gn provides the limit in the form of a full employment ceiling; beyond which real income cannot expand.

In short period because of the shortages of labor and capital and in the downtrend deduction there is also a limit set by the floor of autonomous investments because gross investments cannot be negative. So, this in a nutshell is Harrods model of development. He is talking about, he is trying to talk about 2 important determinants of growth in the economy with the help of the concept of actual growth rate and warranted growth rate. He is saying that savings rate is very important and the growth of an productive capacity is one of the important determinants of the growth of capital stock within the economy.

And here with the help of these 2 concepts; actual growth rate, warranted growth rate, capital output ratio, savings rate and the required capital output ratio and savings rate if the steady state equilibrium will be achieved only actual growth rate is equal to the warranted growth rate and you also brings in the concept of the natural growth rate to explain to us that there is a ceiling with respect to full employment. And all of these 3 concepts, he uses to show how business cycles are inherently or an inherent characteristic of capitalist economies and capitalist economies is necessarily need to go through upswings and downswings.

However, the upswing will have a ceiling in the form of the productive capacity of the economy, the availability of natural resources within the economy and the downswing will also face a ceiling in the form of autonomous investments made by the governments so that gross investments does not become negative in an economy. Now, let us move on to Domar's model of economic growth.

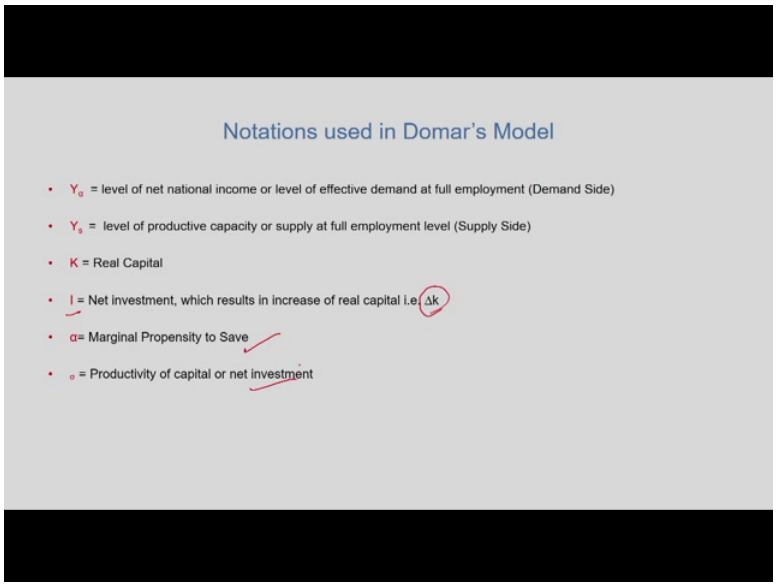
(Refer Slide Time: 34:43)



Domar's model is quite similar to Harrods model of economic growth, in the sense of the conclusions that it was trying to make. However, the way in which Domar's model has been formulated is slightly different from Harrod and it will make it will it is important that we look at this model too. Now, Domar was emphasizing that there is a necessity to look at growth from both the demand and the supply side and he was saying that the Pre-Keynesian for focusing more on the supply side whereas, the Keynesians focus more on the demand side of the problem.

However, to be able to come with a dynamic equilibrium model of growth, it is important that we juxtaposed the demand side in the supply side. Therefore, his focus was on both the demand side and the supply side. So, he was explaining what goes on in the demand side, what goes on in the supply side for the economy to be and what are the conditions that are essential for the economic to be able to achieve steady state growth.

(Refer Slide Time: 35:44)



Let us have a look at some of the notations which will help us understand Domar's model of growth. On the demand side that is Y alpha which tells us what is the level of net national income or level of effective demand at full employment and the definition of full employment here is just the same that we have understood in the case of Harrod model that involuntary unemployment does not exist.

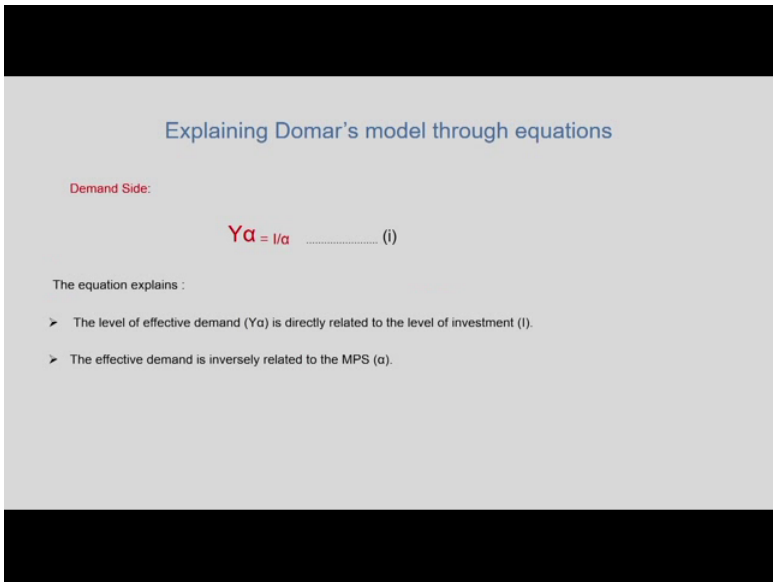
Involuntary unemployment of factors of production does not exist. Although some voluntary employ unemployment may be seen. On the supply side Y s tells us the level of productive capacity or supply of output at full employment level. K is the real capital and I is the net investment, which results in increase of real capital.

So, and here also delta K is basically equal to is because equal to I or investment is nothing but the result of increases in real capital stock of the economy. Another important concept which I have already introduced in one of the earlier classes is Marginal Propensity to Save. In the in Harrods model APS and MPS were just the same.

In Domar also the Marginal Propensity to Save is one of the important determinants of this model and impact most of the one of the standard assumptions of Keynesian models is that the it is the marginal propensity to save which will determine how much effective demand is taking place in the economy and it is desirable that marginal propensity to save increases.

So, which means that the propensity to consume the and therefore, the marginal propensity to save should decline for effective demand to take place, which means that the individuals within the economy should spend on consumption expenditure; Sigma which shows us productivity of capital or net investment.

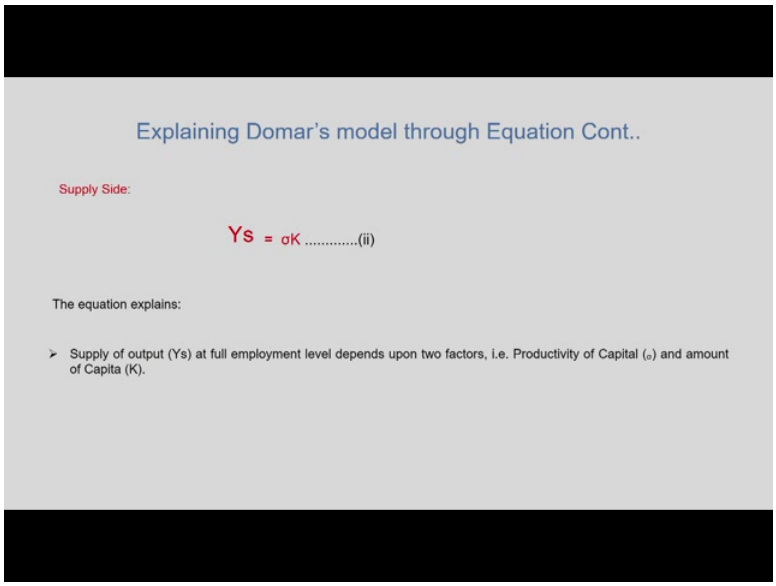
(Refer Slide Time: 37:45)



Let us try to look in to details of the Domar model. On the demand side the question is that the level of effective demand or Y alpha is basically the ratio of investment to marginal propensity to save. In other words, what does means is that the level of effective demand is directly related to level of investment and it is inversely related to marginal propensity to save. So, higher the marginal propensity to save that means, people are not spending enough on consumption expenditure, then the lower will be the effective demand within the economy.

And it is desirable that the level of effective demand is expanding within the economy and for effective demand to increase marginal propensity to save should be low. So, here there is an inverse relationship between effective demand and marginal propensity to save and a direct relationship between effective demand and the level of investment taking place in the economy.

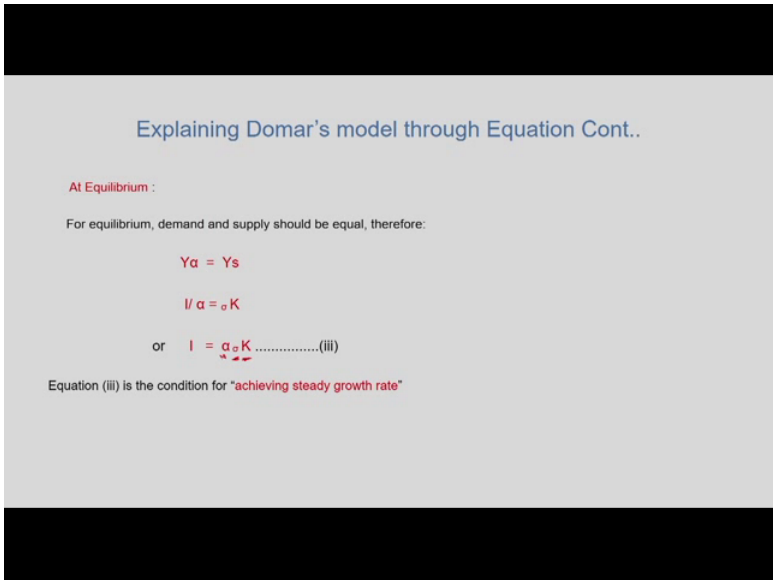
(Refer Slide Time: 38:42)



On the supply side, the equation tells us that the supply of output at full employment or Y s is dependent upon the factors of 2 factors productive capacity of capital sigma and the capital K, the amount of capital. So, this explains the supply side of the equation. On the demand side, effective demand is directly related to the level of investment which means that investments are very important for growth in the economy and a low marginal propensity to save is also important in maintaining the effective demand.

On the supply side, Y s is equal to sigma K. In other words, it is dependent upon the productivity of capital and the amount of capital required for growth of the economy. So, which means that the amount of capital stock should be productive enough to be able to provide supply of output within the economy.

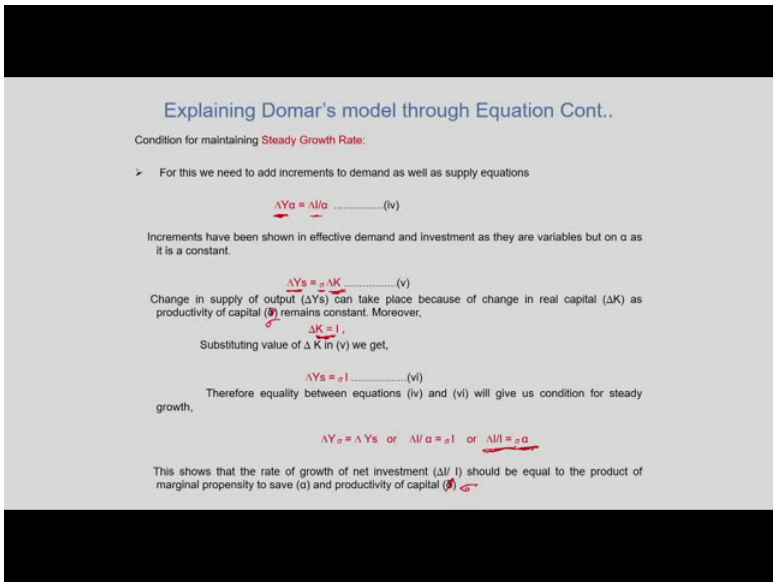
(Refer Slide Time: 39:39)



So, this is a supply side and for equilibrium to take place the demand and supply side should be equal. So, Y alpha equal to Y s and a little rearrangement will show you that investment is alpha sigma K. In other words, it means it's a product of marginal propensity to save the productive capacity of capital and the capital stock within the economy and this is the condition for achieving steady growth rate. So, like Harrod, Domar was also emphasizing on the importance of productive capacity of capital and maintaining investment within the economy to be able to achieve steady growth rate in the economy. So, this is the condition which is required.

Now, this condition can be explained for the by making some changes to the demand and the supply side and you can make, we can make changes the demand and supply side by adding some increments to demand and to the supply in equations. So, we bring out bring about some change in demand and supply conditions.

(Refer Slide Time: 40:44)



So, for this we will need to add increments to demand as well as supply equations. Now, the increments can be shown as follows delta Y. So, this is a change in effective demand within the economy, marginal propensity to and this is a change in capital stock within the economy and the marginal propensity to save is assumed to be constant because it remains constant on the basis of the assumptions that we have employed. And now given this, we can and similarly we bring about some increments in the supply side.

Where, change in supply of output is equal to the productive capacity of capital to the change in capital stock and change in supply of output can take place because of change in real capital as productivity of capital remains constant. So, this notation is sigma. It remains constant now based on the assumptions, we have already seen that change of capital is nothing but investment.

So, if we substitute value of this delta K in a phi with I. So, we get change in the supply is equal to sigma I and the equality between equations 4 and 6 will give us the condition that change in invest ratio of change in investment to investment is equal to productive capacity of capital into the marginal propensity to save.

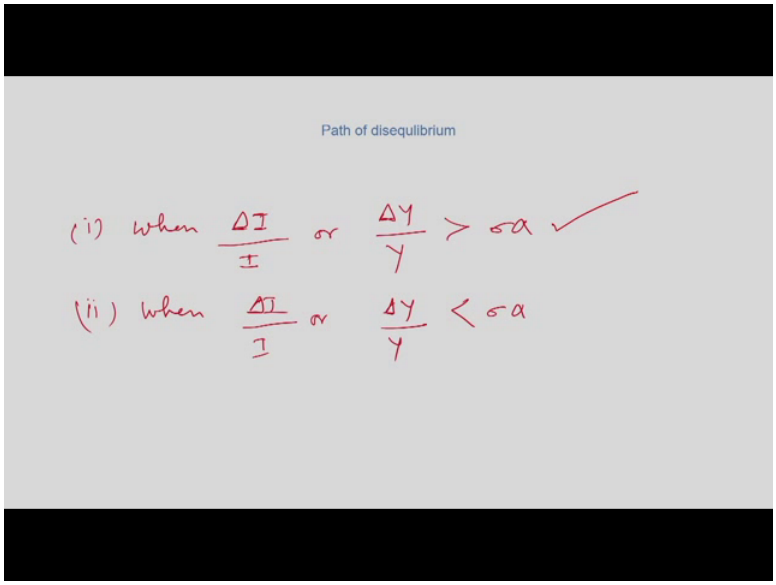
So, this shows that the rate of growth of net investment should be equal to the product of marginal propensity to save and the productivity of capital. So, this is the steady state equilibrium condition that Domar is pointing out and in other words, the answer to the problem of what rate of growth is necessary to maintain a continuous state of full

employment is that investment and real income must grow at a constant annual percentage rate equal to the product of the productivity of average productivity of investment or productive capacity of capital and the marginal propensity to save.

So, there is some kind of a arithmetic or mathematical relationship between how much investments will increase in an economy; how much growth will increase in an economy and that will be shown as a product of propensity to save and productivity within the economy.

Now, Domar also says that, Domar also talks about instability in an economy or what happens when disequilibrium takes place; what happens in the path of disequilibrium and he also talks about inflationary and deflationary conditions within the economy. So, he is talking also about 2 situations. The first situation when the change in investment to investment of the change in income, the ratio of change in income to total income is greater than the product of propensity to save and the productive capacity of the economy.

(Refer Slide Time: 43:44)



Under this first situation, we will see inflation taking place. It will appear inflation will appear in the economy because a higher rate of income will provide greater purchasing part to people and this will result in expansion of demand leading to emergence of inflation as the productive capacity will not cope with the increase level of income or

investment. So, for this therefore, this first situation will necessarily create inflation in the economy.

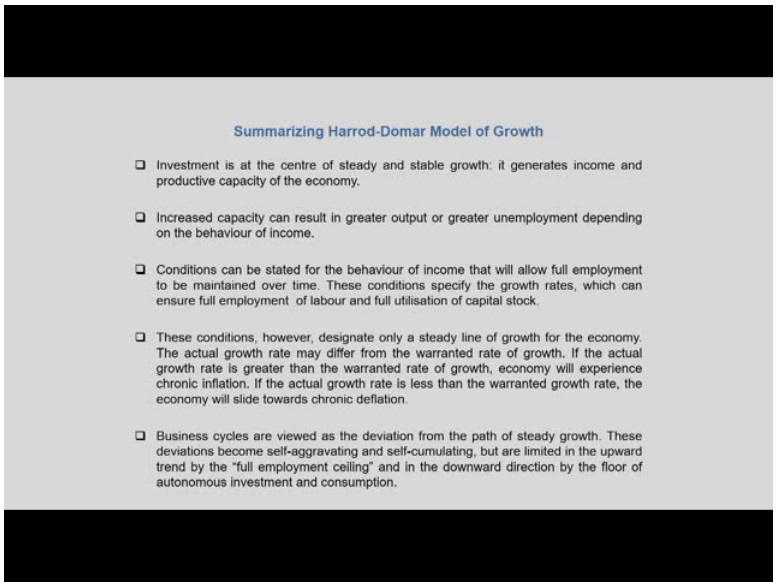
And the second situation, where the ratio of investment change in ratio of change in investment to income of change in income to total income is less than the product of productive capacity of capital and propensity to save will result in overproduction. So, less the growth rate of income will put a constraint on the purchasing power of people. And therefore, reduce the level of demand and result in over production of goods.

So, under these situations the maintenance of stable and steady growth is impossible and economy will be under a constant strain of either inflation or over production and unemployment. So, the most desirable state in the situation based on Domar's model is that the change in investment to income should be equal to the product of productive capacity of capital and the propensity to save. Now, let us sum up our discussion by pointing out what are the main points that Harrod and Domar model are talking about. Although there are certain limitations of this module, we will look at these limitations in the next class, in the next lecture.

Let me summarize the Harrod-Domar model for you, investment plays a very crucial role in maintaining steady and stable growth rate. Because it generates income and productive capacity of the economy and as you might have understood by now that in productive capacity and savings rate plays very important role in the Harrod-Domar model.

Secondly, increased capacity can result in greater output or greater unemployment depending upon the behavior of income. The conditions can be stated for the behavior of income that will allow full employment to be maintained overtime and these conditions specify the growth rates which can ensure full employment of labour and utilization of capital stock. A very important implication of looking at the Harrod-Domar model is to understand business cycles.

(Refer Slide Time: 46:25)



Business cycles are viewed as deviation from the path of steady growth and these deviations become self aggravating and self cumulating; but are limited in the upward trend by full employment ceiling and in the downward direction by the floor of autonomous investment and consumption.

Now, even at the level of aggregative simplicity of the Harrod-Domar model there remains must be understood. The basic Harrod-Domar model tells us that if savings rates, capital output ratio, growth rates and depreciation rates are such and such; then, what will be the resulting growth rate? Then, there or in other words, if the savings rate capital output ratio depreciation population growth rates if include in the model are such and such; then, how then what will be the computed growth rate based upon the Harrod Domar model? And of course, we are entitled to make any such conclusions by using the if then assumption that if these variables are growing by this much what will be the growth rate.

However, this module has one of the important limitations within the context of the nature of the various countries. For example, in the context of developing countries understanding the nature of savings is very important. Now, by now we know that the parameter of savings rate is very important in this model.

So, what it essentially means is that the government or the policy maker should be able to maintain a certain savings rate for capital accumulation to take place within the

economy or savings rate should be maintained as a at a certain level such or savings rate should be generated savings should be generated within the economy at a certain level. So, that investments can take place or capital output ratio can be maintained or productive capacity of the economic can be maintained and if it is maintained then economic growth will take place.

But consider a society in which the on an average the amount of expenditures that you require to maintain a basic minimum standard of living is about 150 dollars. However, the income that you are you have is about 100 dollars. So, in the situation where your expenditures exceed income, it is not possible for you to maintain a savings rate. Then, how is it possible for the government or the policy makers to be able to maintain a certain savings rate within the economy?

And in the and as we by now know that in the absence of the desired amount of savings investment cannot take place and then, how will this growth model function when savings rate is not adequate. And that is where probably this model needs to be opened up for international trade to take place or loans to be taken in by the inter from the international community, credit to be taken in by the international from the international community or dependence of the economy or international credit and foreign aid.

However, the Harrod-Domar model in its base in its simplicity is considering a closed economy and within the closed economy setup and considering that all of these assumptions of full employment are met the steady state equilibrium growth can be maintained, only if these conditions are met. In the next lecture, we will look at the limitations of the Harrod-Domar growth model.

We will also strike out we will also draw some of the most important similarities between these models and what are the points of departure from these models. And based up on the limitations of the Harrod-Domar growth model, we will then look at the solo growth model which has taken off from the Harrod-Domar growth model and is also one of the celebrated growth models in the literature of development and growth. So, see you in the next lecture.

Thank you.