Macroeconomics Theory and Stabilization Policy
Prof. Dr. Suraj Sinha
Department of Humanities and Social Sciences
Indian Institute of Technology, Kanpur

Lecture – 16

First we discuss the Keynesian cross model, then we talk about the I S I model elaborately. That is the most popular model, now we would close the Keynesian model. If you recall what I told you right in the beginning that the macro model has two parts. The complete macro model one is the demand side of the model one describes the supply side of the model, the all throughout the Keynesian cross model I S L A model. These are all talking about the demand side of the model. I did not speak at all of the Keynesian supply side in the classical model. I have the complete model both the demand and the apply side and the demand side, then we talk about markets. So, the demand side we have two markets, which we study a macro models. One is the goods market, the other one is money market.

Now, in the kens ion model, since we were talking about the demand side. We did talk about the goods market, as well as the money market. That model is the I S L A model both the markets are there, but if I S L M represents the demand side of the Keynesian model, where is the demand curve a normal question will come. Sir, where is the demand curve? Because, they describe the demand side of the economy.

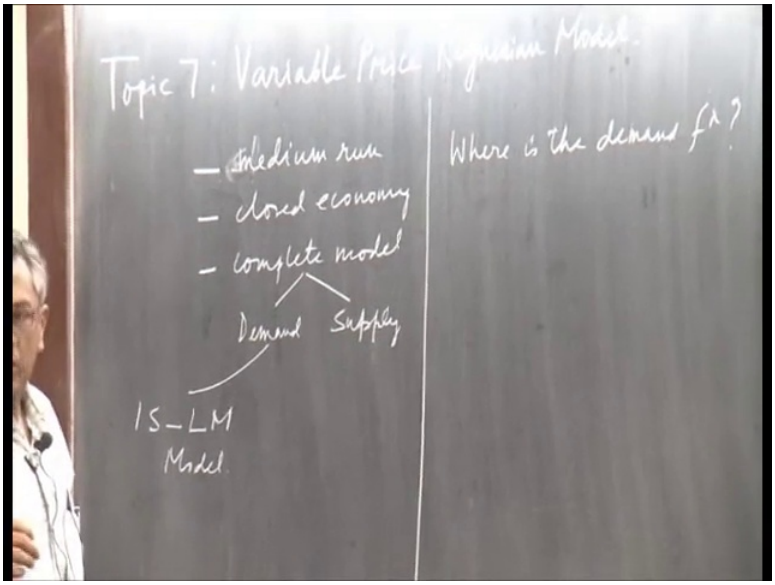
The demand side of the economy should have a demand curve. Similarly, when we talk about the supply side having spoken about the given the descriptions of the supply side. They should be supply curve in the classical model, there was the demand curve. Remember, there was the supply curve now in the Keynesian model, where we spoke about the I S L M model. We talked about the cross model also were is the demand function. Since, we have both the markets the demand side, that is the goods market and the money market.

Now, in our notes I should be in the position to tell you what the Keynesian demand function is like. So, that is the thing that I would do first now this discussion. Now, from today on wards we under a new topic, the new topic is topic number seven is called the variable price Keynesian model. This is the medium term model, this is the complete Keynesian model medium term model. Earlier, I S L M and Keynesian model these two

models were a short term model, where prices were fixed. If you open the notes you will see the prices were fixed the supply curve was horizontal.

Now, go into medium term model the prices can be variable. That means in simple word there will be an upward sloping subject. There will be downward sloping demand curve. Normally, what happens in a market that would also happen in a economy. So, that if supply or demand changes is not just output, which is going to response. The price is going to change all now. When we talk about price is changing we go in to a medium term model, this variable price Keynesian model variable price. You can see that title is a medium term model, which will have both the demand side, as well as the supply side. This is what I am calling I will close the prescription. The discussion on Keynesian models with this topic, so topic seven today.

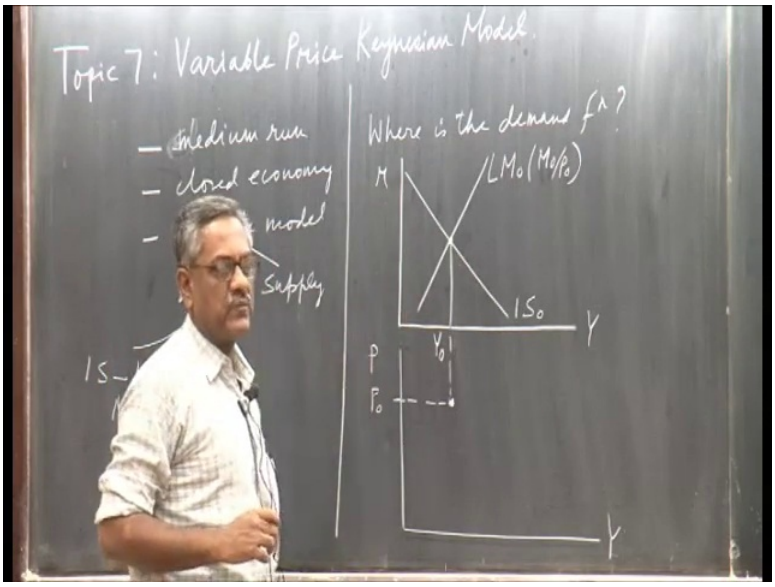
(Refer Slide Time: 04:43)



So, let us begin the final Keynesian term topic the closed economy model is topic seven variable price Keynesian model. This is the medium term model variable price Keynesian model. Now, it is a complete model short run module short run. Either it will be a medium run closed economy model. That means no export and imports. It is a complete model complete model in a the sense. It will have the demand side and the supply side. Both the sides will be present demand and supply. Now, the demand side is the I S L M model. Now, where is the demand function. Now, what I would do is I will not be in the demand function, but I will tell you demand function exist. Because, these

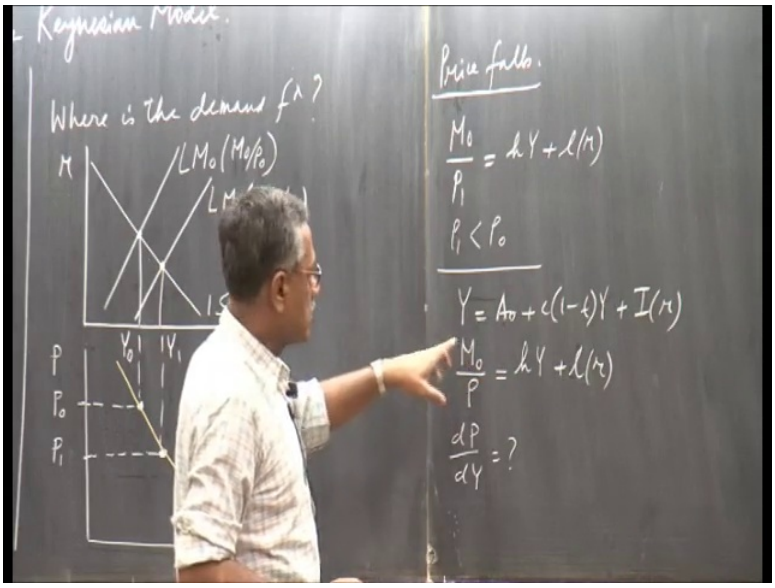
are demand side equations I S L M demand function exist. I would derive the slope of the demand function.

(Refer Slide Time: 05:59)



Now, before I do that diagrammatically can obtain the demand function. That will be the first equation how the I S L M model enables you to obtain the function. So, I need two diagrams you take the price level P naught. suppose ,it is L M function, which depends on some money supply and prices. Say, the P naught price that is the equilibrium point. That is the amount of output produce, we get the coordinate for that level of output y naught. Suppose, some price at which the L M function as been obtained. Using that price look at that L M equation M over P some M is given naught P naught. Now, if we say price is falling if price fall. What will happen? N R equation in the L M function?

(Refer Slide Time: 07:49)

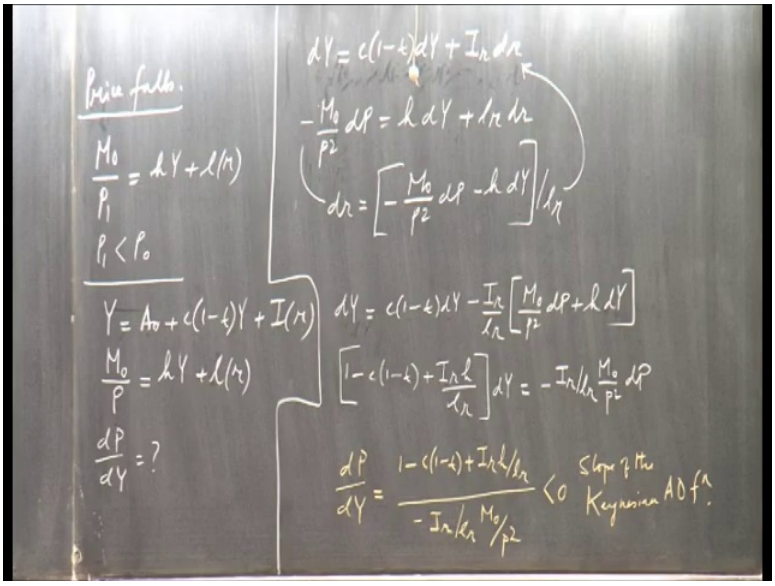


Suppose, price is fall a price falls what will happen? It will become M naught is equal say P 1 is equal to h Y plus L r. Now, were P 1 is less than P naught. Suppose, price is fall P 1 is less than P naught, what will happen? The left hand side value will increase. So, the right hand side value will increase, which means this line shift to the right. It requires a high level of Y. If left hand side increases right hand side can increase either high level of I or with the high level of L high level of L requires lower r. All this indicates that is the line will shift to the right. So, the L M function will shift to the right. It will become L M 1, which has the same money supply and prices P 1. You can see that suppose the price has fallen P 1. So, this output level this is Y 1, so at the lower price higher output level.

Now, you have two coordinates all you have to do, you just get a locals of such point. You can see what is coming out the Keynesian means. The demand function as prices fall more output will be produce in the economy or demanded is the demand function more output will be demand. Now, if you get the demand function coming from the I S L M model. Now, if you are interested algebraically best thing would be slope of the demand function. So, algebraically what you get is you write the I S L M equation call money supply, but I make P variable I am going to variable the price model P will change.

Now, in the model in a variable I am coming out of the I S M model. I am using the equations, but dropping the assumption of x price can now change. Now, all you have to do obtain the d P d y. Here, how much will be d P d y you will see some negative term. So, if you differentiate the first equation put this equal to zero differentiate the second equation put M naught is equal to zero d m naught 0 d m naught 0. Then you have this algebra. That you can do the first equation will give you b y is equal to C into one minus t d y plus I r d r. The second equation is N 0, d m is 0.

(Refer Slide Time: 10:51)



So, it will be m naught over P square d P is equal to h d y plus L R d r. Now, from this equation you can get r. So, d r is equal to minus m naught over P square d P minus h d y divided by L R put this d r in this equation. So, what you have is d y is equal to c into 1 minus t d y minus. If you take the minus out minus I r over L R into bracket M naught P square d P plus h d y. So, you can take this terms you can gather this terms together y terms. So, you have one minus c into 1 minus t plus I r h over L R this is d y is equal to minus I r over L R m naught over P square d p. So, d P d y how much is d P d y is equal to 1 minus c into 1 minus t. That multiplier denominator I r h over L R divided by minus I r divided by L R m naught over P square. So, this is your d P d y you can see this is the negative term this will be less than 0.

So, that is the slope this is the slope of the demand function of the Keynesian aggregate demand function. So, this is the slope of the Keynesian aggregate demand function.

Now, you can clearly see one thing a few things those efficiency stuff that i talked about. How, policy become effective? The more effective how physical policy can become less effective. How monetary policy become more effective policy become less effective, the things that I talked about. You can clearly see one thing that those parameter restrictions i r L R you remember those things I was talking about. Restriction i r L R will affect the aggregate demand function slope is very clear. For instant one thing I mentioned that L R liquidity trap L R becomes infinite minus infinite.

Now, if you multiply numerator and denominator by L R what do you have here by L r. You have numerator L R multiplied and denominator, it cancels it out. So, L R into that L R goes d P device slope comes infinite. Also, it becomes a vertical line you see that aggregate demand function. If L R goes to minus infinity the liquidity trap when monetary policy become completely in effective only the I S I curve determines output L M curve is horizontal. Open your notes last notes you will see that their L M is horizontal i s curve determines output. Look, what happens to the demand function, you get a perfectly in demand function. You see that d P d y similarly i r 0. No, I was talking about the effectiveness of physical no out i r becomes zero, then what happens? My goodness same result, hello are you at all with me.

If i r is 0 what happens to the slope d P d y? Same result, you get the same result, if i r becomes 0. See its very effectiveness physical policy on slope of the demand function. Because, the demand function is obtained from I S L M module. The effectiveness and ineffective of physical policy monetary policy, all that I discuss in that. So, naturally that is going to demand function, because the demand function is obtained from the I S L M equations. So, the I S L M curve become very interesting. I mean I S L M curve also slope changes and the demand curve very interesting, but the question is is macroeconomic demand function even the medium run perfectly in elastic.

These are empirical issues these are the issue, which one as to collect data watch economy and come to the conclusion. Since, this is theory macroeconomics theory I am just telling out the possibilities. That is the possibility that demand curve are might become perfectly in elastic under certain parameter restrictions. Under those parameter restrictions, the physical policy of effectiveness is increasing and monetary effectiveness is falling. So, do you see the demand function has some complication possibility of some complications or significant is that, the effectiveness of physical monetary policy is also

associated with particular shape of the demand curve. It is normally down wards sloping, but it is can become, now when it will become, what will happen is extreme classical position.

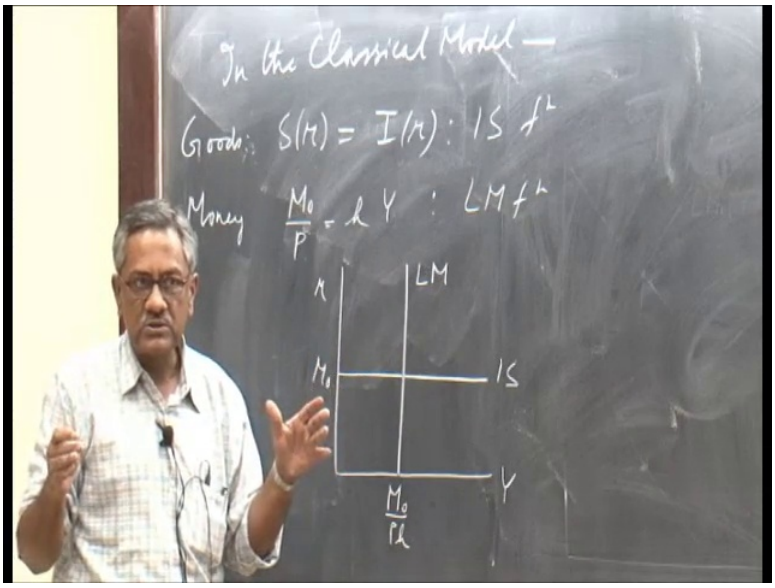
If L R is zero classical macro economics was their demand for money. If L R become 0 what will happen i r h what happens to d p d i r h divided by minus i r. So, i r minus i r goes way. So, h over P square over m naught is the quanta theory classical demand function. That was the classical demand function open classical macro economics. That topic that is the classical macric topic function it becomes.

So, these things you practice you check alright, it is clear, very clear from that equation there from that equation. There that as L R becomes the classically L r, which is what classical economy though L R the L R is zero. You clearly have the quantity theorem result if L R is zero you multiply first by that L R cancels out here L R this term is zero. Then i r cancels out you get a minus h over n naught into P square h P square over M naught. It is a classical demand function.

So, the Keynesian demand function is very general in some sense. Because, if you put the parameter restrictions according to the classical model, you do get the classical model coming out from this, you see that. Now, before I go over to the supply side I ask you very simple question, which usually text book do not do the fact is, that this slope or this demand function embody is the classical demand function. In the sense that if you put the functions you get variant of this demand becoming the classical demand.

Otherwise demand function also tells you that I L S module should also be general enough to embody the classical model. It should say that I S L model should be general enough to contain the classical model. So, let me ask you this question just like a tutorial its good thing for you to think, what was the classical demand and money market and goods market goods, market and money market.

(Refer Slide Time: 20:52)



So, in the classical model what do we have, the goods market saving function of interest is equal to investment function rate of interest goods market clearing condition. The money market was m naught over P is equal to h Y. If this is the goods market and this is the money market. So, this should give me I S function this should give me L M function. So, if you draw this classical I S function, what it will be, there is no y value. This equation solve for the single r. So, this line this should be horizontal, in the this is the classical I S function no y value there. When you come to the money market equation, there is no r value y is equal to m naught over some value of p.

So, into h no r value, so how it will be? This and this value here is m naught over some value of P into h, if P changes this line shifts, but at equilibrium P cannot change. So, P would also become one value from this equation, because y was given in the classical model. So, it will be unique value of P. So, you can call that P naught may be, but do not call P naught doest equilibrium value of P.

So, this is the structure of the I L S M in the classical model, but classical macro economics. They were add the I S L M, this is the paper that was written after a paper was written. Then you have a I S L model, what I am trying to say the I S N function, that you delta with there is, because of contribution, but one think you can see that function is a very general function I S L A model. Very general model under parameter

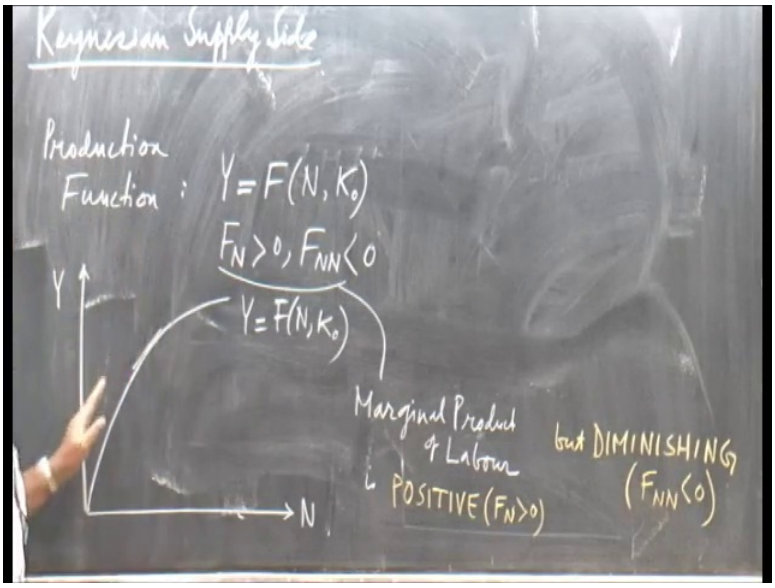
restrictions, you can go back to the classical result. From there you can get the classical demand function.

There I just showed you put the L R is equal to 0, you get the classical demand function. It is a very general function but, you can get the classical results from there kens never said L R is equal to 0 class classical macro economics are descendent, like monetary would say that, for instant famous a monetarist economist a monitories Milton Feedman. If you read the Feedmen's articles is typically arguing for an L N curve, which is vertical all the time, what does it mean? L M curve vertical L R is 0, then L M curve vertical because of the slop of the L M is minus h over L R.

So, L M vertical means a L R is 0, then minus h over L R is infinite, which is alright. Zero slop would be horizontal line perfectly in the elastic, that is called and perfectly elastic, the zero slope strain this. These are the two words used in the economics a vertical line is perfectly in elastic line it is said. The horizontal line with zero slope zero slope, but it is called perfectly elastic. These are the words used zero slope is perfectly elastic vertical line, which is infinite slop is perfectly in elastic, because any change in price doest change the x axis value and horizontal line. Any small change in price can change a huge amount of change, either in front or very small amount zero amount of x axis value the variable.

Now, so this is the demand side of the story. It is a very general story, it is a very powerful model. Next, what we have is the we have the Keynesian supply side. So, that is the complex story again. Because, he wanted to make it very realistic or he did many contribution. So, Keynesian the apply side is again quite complicated. Now, what I begin today is to start talking about the supply side. Then I will conclude that after the break Keynesian supply function.

(Refer Slide Time: 26:36)



Now, one thing, which is common with classical between a classical model and a Keynesian supply side, the equations supply model is that both of them had a production function, which is very well behaved, that is the normal assumption. So, they have a very well behaved production function well behaved in the sense well the production function is written as Y F N. I think the variable i use for labor n labor and then fixed amount of capital and well behavior.

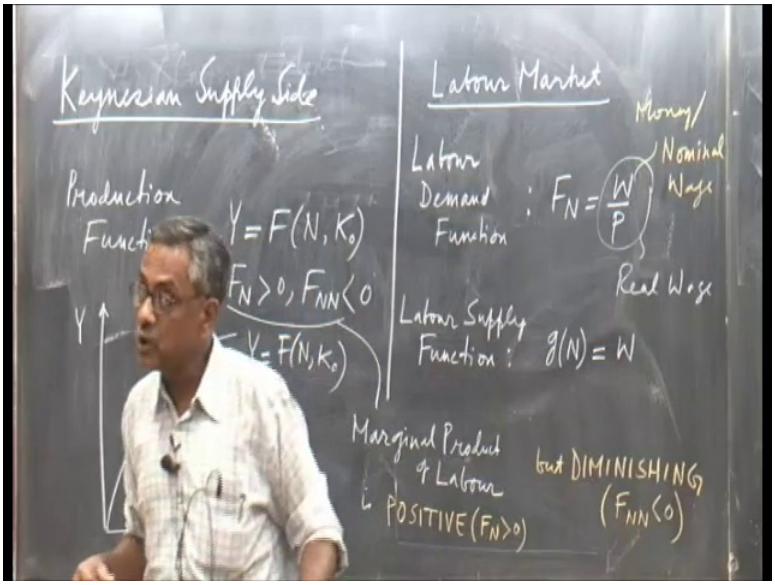
Basically, means the partial derivatives f N is positive and F N N is negative. This is normally what they have in a macro model. In fact any macro model, these are short run macro models or long run macro models are growth models. Usually, they have this assumption is called a well behaved production function, where the partial derivates are defined. They have proper science, what it does the diagrammatically? If you recall the diagram of the production function diagrammatically the production function look like this.

You had probably I think I had n here I had Y here and F N greater than zero F N N less than zero means the slope is positive. Is it upper sloping line but, falling slope is falling f n m less than zero. So, that is the production function y is equal to F N naught. So, this tangent essentially measures F N. So, f n is falling the tangent is becoming flatter. So, F N is falling first derivative is falling the value of first derivative. So, the second derivative is negative. This is which is inwards it is known as this F N. In words they are

called marginal product of the labor marginal product of the labor, which is positive marginal labor product is positive, which is F N greater than zero, but diminishing, which is F N N less than zero, margin of labor is positive for diminishing. That what is means the well behave product function, this line I am talking about.

So, this part is same as the classical model. If you open your notes you will see at the production function exactly like this, but when it comes to the labor market, the Keynesian labour market is very different. The Keynesian labor market is different it as the bundle of assumptions here the labor market.

(Refer Slide Time: 30:28)



Now, let us see how the labor market looks like Keynesian labor market in a labor market, there should be labor demand function. There should be labor supply function, the labor demand function amazing. It is the same thing, it comes from the profit maximizing hypothesis of the firm. It will remember, I did the profit function a firm, which sells a goods at the price highest labor. Other factors produce it the first set of maximizing condition was marginal part of labor is equal to W over P the wage. It pays to the labor divided by the price of the product.

So, the labor demand function is exactly the same. So, what you have is F N at the macro level, also you have F N is equal to W over P, where W over P I called this is real wage. W over P is real wage and W is the sometimes they use the word money. Some time they

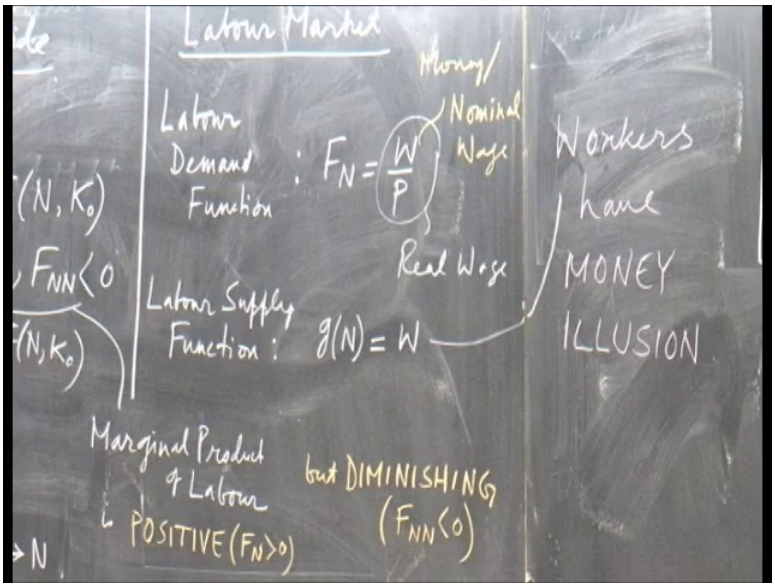
use the word nominal wage. Text books use these words money wage and nominal wage labor demand function.

However, here comes a the story the labor supply function is very funny. The labor supply function the labor supply function the labor supply function is equal to only G N is equal to W no P. What is so ever there is no p, this is the interpretation of K N. often, this models the way they exist today are have been thought in class or return in text books described. In text books can very well be a post Keynesian description of what did you say. Sometimes, these books say things in a very difficult manner. So, it it a it develops into various interpretations. Now, this is broadly speaking. The consensus on what the kens ion labor supply function would look like.

It will be G N is equal to W, you know P that means labor supply is works for somebody by not looking at real wage, but by looking at nominal wage is a very important difference. So, when I get the job some company ask to me work. I look at how many money they give me. Not how much I can buy with the money. They would give me, which is real wage. That means I do not look at the classical matrix economist's. I do not look at the goods amount of goods, that i can buy with the money. So, I in that case I have to take into the consideration the price in the Keynesian model. The labor supply function clearly says the way that exist. It has been interpreted is that the labor looks at the money they give you.

He agrees to work for some numbers of hours a day a week a month whatever, which means it ignores the purchasing power of money. It seems to be right this is not there this has come to be known, this kind of the supply function were the prices is ignored. Only the money wage a money income thousand rupees and a ten thousand rupees or one lakh rupees is important to me. Not one lakh rupees divided by prices, they as come to be known as worker, as. These are the interesting expression, the expression is that the worker as this was one is said the worker has money elusion. This N called the worker as money elusion, elusion means, if I am paid this year 10,000 rupees and last year. I was paid 9000 rupees, I am very happy.

(Refer Slide Time: 35:09)



I get one thousand rupee more, but a small traitor would see from last year to this year. How much price has gone up is that one thousand rupees extra that the boss is given me good enough to buy all the goods. That I would bought last year plus something more. Because, it looks like haven increased income, but W when I take price into consideration, I realize my goodness with one thousand rupee extra. This year forget about me having more money my pocket. In the sense I buy more goods I am not in the position to buy even the amount I bought last year, because the price have gone up, so much.

So, smart fellow would look at real wage and compare the increase in money in real value terms. What he realizes ten thousand rupees is not good enough for me to buy that all I did with nine thousand rupees last year, but person having the money elusion is like me. You know kind of a silly person does not understand the value of money, so high that the fellow last year.

So, savings can get effected person who as money elusion gets a over excited emotionally thinking that I have more money, because boss give me more income. I start spending without realizing was the prices as become finally, when I did spend all that I wanted to do, I realize I have less savings. It can I happen, because got enough this what happens in real life. So, in recession are in times of inflation particularly savings go down in an economy. You see that money elusion is very important assumption.

Now, I tell you the last assumption the labor market requires. Probably, there are now the entire picture will be clear. What thinks add in mind the last assumption is that why wage and money elusion is there. Because, this W that exist in Keynesian labor market, which we thing give rise to money elusion assumptions is actually forced up on the workers. Because, in the modern system wage does not change every day every hour depending on the supply and demand, which we say in perfect competition happens in free market.

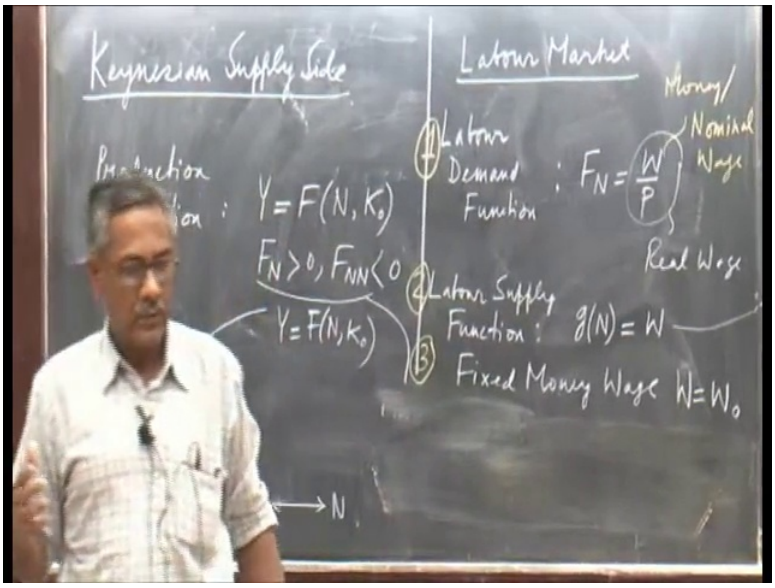
As soon as a excises demand prices would go up as soon as, excises supply go down do not change that quickly, at least in the labor market. At least in the labor market the price is the wage rate wage rate does not change quickly, wage is do not move up and down the way free market model say is very difficult to take wages move up and down.

So, frequently to clear the label market, so what Keynesian was saying, which is very realistic are at least what people thought post Keynesian start post Keynesian saying is, That the money elusion merges more show. Because, W is the contractual wage, which means every year. This is how it happens on every two years in case of I I T every five or six years the government or the employer. The worker seat together across the table negotiate a hate wage say the trade unions.

The employer the firm seat together negotiate a wage. Once it has been negotiated at the time of negotiation, there is no money illusion. Of course, workers scream. So, we need this wage and the company mange and owners usually say. They finally, reach a wage, which is a agreed wage, which is the contractual wage once the contractual wage, it is set. This kind of the model the contractual wage remains here over the medium term period, whatever that length of the time one year one and a half year two years. In case of I I T it is usually a five six years then again government goes for, what is known as pay revision.

So, contractual wages are a common phenomena in this world. It is not a free market wage that clears every day, every year even, every month even. It is usually a contractual wage that is agreed upon between the workers, which are the trade union to represent them and the bosses of the company, owners of the company. So, what you have in the Keynesian model a very important thing is that this labor supply labor demand. Then another assumption comes fixed money wage. So, essentially you have the labor demand function the labor supply function.

(Refer Slide Time: 41:42)



The fix money wage three b labor market related items three labor market related items. Three labor market related item you have labor demand function labor supply function and a fixed money wage, because of the contractual nature of wage over the medium term, which means you have W is equal to say. What you have is w becomes equal to W naught the ones W is equal to W naught. Any worker who works for the company does not pay any heed to prices, because this is contractually agreed upon wage. Now, if I have to work for the company, I will accept that wage. So, one outsider can look at it and look at this kind of the equation labor supply function only money wage entering. Because, this is the contractual wage that they will have agreed to get it becomes.

It look like workers have money elusion workers in real life do not have money elusion, but they have no choice they have to accept the agreed wage. Do you see what I am saying here? Why money elusion becomes interpretation in some sense? Because, workers when they go and work for somebody. Look at the packet they do not have any forward influences. It has already been decided that for two thousand eleven and twelve. This will be the wage that company would pay to particular type of labor. So, if you are particular type of labor want to work for the company, you have to accept that wage. So, it is look like he does not require, the prices is the wage good bad to him compare to what he gets now, will think about it, but in a for us for the general public, it is not important.

Well, the company is not important for us, if you have to work for us this is what you will get. Because, this had been agreed it has been legalized it has been agreed between the company and the workers which is quite realistic some sense. It this actually happens you do not get a job you do not have in the wage. If you want to go deep in to you how that wage offer to you will realize, that this kind of the wage will be paid large. The company decide, but also the unions I have coming to the picture.

So, where there are taking in to the consideration. So, that you know company will owners also fear the unions. If they call of strike they huge loss, but essentially we have wages of contractual wages, so the Keynesian labor market realistic, but becoming complicated. Now, I have to show you with these assumptions, what kind of supply function you will get.

So, what I said is the Keynesian labor market is quite complicated. There is some similarity with a conventional labor market description, but not all that well. If you go to the major story here the supply function. The supply function has two components one is the labor market descriptions. One the production function the production function is the same. Because, this is the new classical production function kind of the production function. You have seen in a the classical model there is no difference here. This is alright, but when it comes to the labor market, you realize that there are some differences labor demand function was exactly. This in a classical model, but labor supply function wasn't. This it was W over P, so what is the significance of having only W.

Suppose, to W over P I told of the story money elusion the interpretation one gave, but when you look at the wage rigidity assumption is called wage rigidity. Rigid means fixed it does not change opposite of rigid would be in school. They would teach you alright the opposite mode you know flexible exactly in school. We used to learn antinomian and cinenoniam.

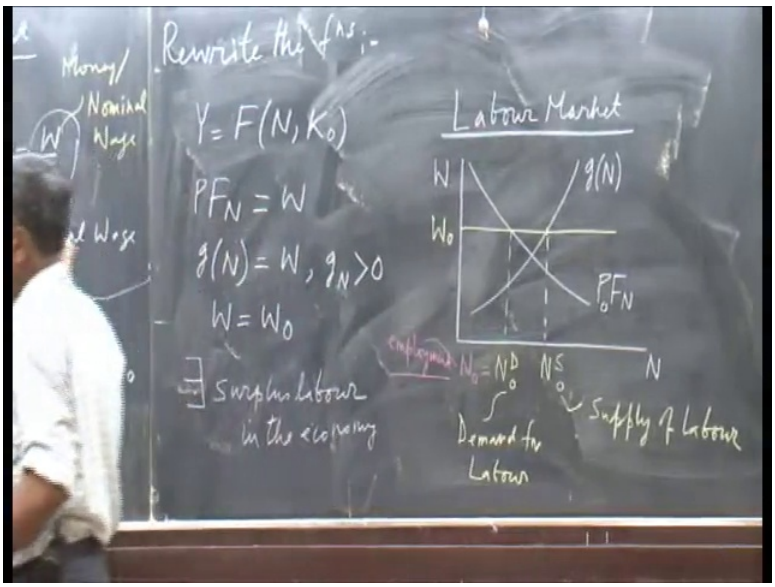
So, flexible that what I mean rigid of flexible, that what I mean rigid in the sense is fixed. It is predetermine I go to a company, I want to work. They say your qualification suites as you can work here from tomorrow, but this is the wage. The bargaining is already taken place and it fits for you alright. So, this is fix money wage, which is called as rigid money wage, because of this assumption essentially the labor supply function.

I think as a situation a work as a money elusion, because the worker cannot pay attention to price changes. Can tell the company due thing, I have a worker would agree. So, this flexibility assumption in both way is that the wages can go up and down, which is the market. The catalyst market explains that is the demand and supply to excess supply price will fall. Excess demand may price will go up and clear the market may not be true.

For all the markets in goods market it can happen, by up's price is going up and price is going down. I have seen that, apple price is going up apple price is going down vegetable price is going up, vegetable price is going down. Even consumer durable I have seen going up I have seen that going down. I have seen that consumer durables, but you tell me a labor market price is going up and price is going down. Workers do not expect that, if I tell my car price, if I tell my money tomorrow. Next, month I will pay lesser amount of the salary. He will not agree I do not think, so there is the problem.

So, anyway the rigid way the assumption make slide simpler. Therefore, with these assumptions, let us now go into the labor supply function at the Keynesian aggregate supply function. If you the Keynesian supply function you can see one thing, there are some equations, which will become redundant.

(Refer Slide Time: 48:55)



So, now rewrite the equations the functions or whatever you have the production function. You have the labor demand function you have the labor supply function. You have the rigid wave assumption. Now, if I draw the labor market what will happen? I

will have to draw differently. Because, one function does not have P 1 function have P labor. Demand function is P labor supply function does not have P you have to draw a differently. I could draw I put the wage on the y axis and labor on the x axis.

The labor demand function I will not draw F N. I would draw that for a specific price P F N, I take a price some P. Then I draw it labor demand function and the labor supply function with the usual assumptions. I draw that as G N labor supply function. If you remember G sub stripes M, which means first passion derivative is positive. I told you the story the labor design model how labor supply function increase, as wage is increase. So, that is still used here, now the question is W is equal to W naught, where there are two possibility W is equal to W naught can create at are this equilibrium.

Accidently, it may hit the point, but then as soon as the any of the line shift, you have this equilibrium. Suppose, you does not hit the point what you have is W is equal to W naught can the above equilibrium point. It can be below the equilibrium point the question is which one did can say, where is w is equal to W naught. Now, kens wrote his book was writing the book. The book was published after although that particular period, but he was writing that book in the period of great depression.

There is lot of unemployment in the entire economy in the western word Germany, France, England, Canada, United states. The entire western world was in the grape of depression, which is known has the great depression, which started roughly in twenty nineteen twenty nine and roughly ended in 1923. It lasted the book was published in 1936. So, he wrote it around that time or the depression or the employment. So, kens also had one more thing in mind, which we use in our mach description of Keynesian model, which was very important. There was surplus there exists surplus labor in the economy, there exist surplus labor in the economy.

How can surplus labor exist in economy? You can clearly see that if I make W naught negotiated, which here then there will be a surplus labor. Because, the supply of labor is here at that wage call that n s naught supply of labor N S naught. For a given price call that P naught for the given price P naught. The labor demand function is P naught F N, which says that the demand, for the labor is here N D N D naught. If you agree with Keynesian assumption that the economy is at under full employment level, where there is surplus labor people are waiting for jobs, that kind of the situation, then technically

speaking the wage rate that the negotiated must be above the equilibrium point. Because, only up of the equilibrium point, you can have surplus labor means unutilized labor. You can have unutilized labor people are unemployed.

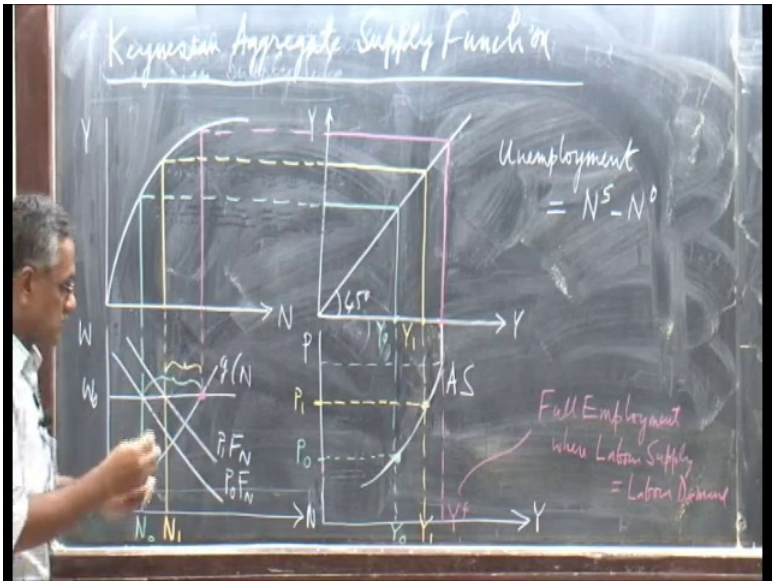
Now, in this kind of the economy were you have dis equilibrium. People can ask you sir there are two values of N coming in coming out here. One is N F naught according to the wage and the function which is supply of labor. One is N D naught, this is the demand for the labor. So, what is the employment level sir in the economy. You can ask me how, how many people they are. Therefore, are employed we say in economics, when you have disequilibrium in the economy. That the demand is less or the supply is less one of them is less. The one is more than the short size of the market decides the value the short size of the market is one, which has a lesser number here the demand, for labor is less than supply of labor. So, the short size of the market, which is demand for the labor decides how many people would be higher.

So, the how many people are higher is actually N D naught. So, N D naught is essentially equal to N you can call that N naught. N naught is nothing but employment that talks about the number of people hired. N naught is employment the number of people higher. Now, I complicated my life enough you have a labor market, whether is surplus labor or way, money wages are fixed, where workers since have money elusion in the medium run. They cannot renegotiate wages the rigid, they are not flexible. Only thing that we remains from the earlier supply function is that, there is a new classical well behaved production function with is F N greater than 0. F N N less than 0 and the labor demand function, which is the one I have seen before, but many things have changed.

Now, there are many more features of the labor market the Keynesian labor market than we have seen before. Here if I have to incorporate all these do you agree with this diagram or not the short size of the market decides employment. I give you an exercise mental exercise, if this wage are been fixed here, where demand is more than supply, what would have been an employment supply. Because, supply is that is the only amount that is available companies. May be asking for more people may be thousand people, but only six hundred people available. So, six hundred would be employed. So, the employment number is six hundred not thousand. What company wants company do not have that many supply in the market that many workers.

So, short side of the market would decide the value when you have disequilibrium at equilibrium supply is always equal to demand. There is no short side of the market both the sides are matched. That is why it is called equilibrium in some sense. Now, if you agree with this with this. Now, I come to the Keynesian supply function, I come to the Keynesian supply function. Keynesian aggregate supply function, Keynesian aggregate supply function, I will do that first diagrammatically.

(Refer Slide Time: 58:03)



Just wait do not draw the diagram it will be a little bit complicated. Let me draw this first then I would do algebraically and other way I do algebraically I just find that find the slope. Let us suppose, I take a price some P naught do not draw it now, at P naught P naught F N is the labor demand function. Now, because W I put here not W over P. So, with price change, this line will shift at P naught. This is the amount that is higher, because this is the surplus labor, which is not used. So, this is N naught amount of employment. This employment line I take it and find out what is the amount of output produced, that is the amount of output produced.

So, that output level will go from Y axis I translate it through the 45 degree line on to the x axis. So, this is Y naught and therefore, I have a at that price how much output is produced, which is Y naught you can come to this axis. Now, as price is increase to say at a higher price you take another higher price take another color say P 1 as price is increased. The labor demand function will shift to P 1 F N, there will be higher amount

of employment, which is N 1. You can again find out higher amount of employment, which is Y 1. Now, you can see that your true coordinate. There will be this aggregate supply function coming out, as price is increased more output is produced more employment is generated.

So, this is Keynesian aggregate supply function very important diagram. Because, the number of points I want to make again after this output supplied on the X axis. It was on the Y axis, this one I translated that through 45 degree line on this line. So, this is equal to that, so that i can have that on the X axis. Because, supply demand may output or good is amount is one the X axis the production function as in on the Y axis. So, I required the 45 degree line here to translate the Y axis value on to the X axis. So, that it comes on come on it can come on the x axis. Everybody got the diagram little bit left. Now, look one thing few things here very important.

This Keynesian aggregate supply function upward sloping fine, but if price keeps on increasing in the medium term. This line keeps on shifting and one point for a given wage. It may intersect the G N line there the labor supply. You see that after that if it increases further out shorter side of the market, becomes the supply function the demand is more. If it is shifts, shifts more than the demand is more than supply. So, supply this output is struck. Somewhere it cannot increase anymore if prices increase further demand will shift to the right, but people are not there to work. So, the supply shorter side of the market is supply of labor, which respects employment and output to a particular labor.

So, this Keynesian aggregate supply function at that point. If you can draw that point with what kind of a line at that point here, when it keeps on shifting at that point will at some price. When it is increasing at some price, it will become absolutely vertical at that level. Some level this will become that output level is labor supply is equal to labor demand. According to the classical model, what is it the labor supply is equal to labor demand exactly. This is some output level, which is called full employment output level. This is the case, where you have full employment in the medium run, where labor supply is equal to labor demand labor supply is equal to labor demand.

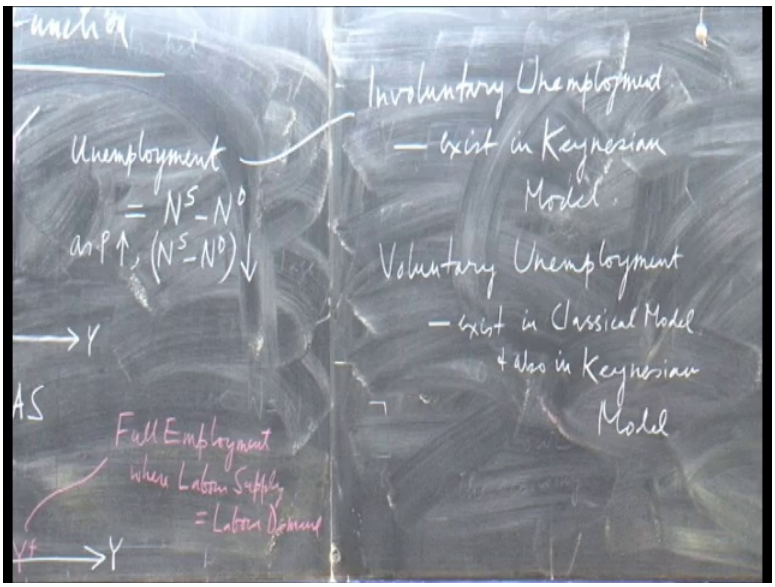
So, the aggregate supply function becomes vertical the aggregate supply function here becomes vertical. Just like the classical aggregate supply function, it will become vertical it cannot change anymore output beyond that. However this can happen at some very

high price level some price level, it can happen. Next point note is next point to note the unemployment in this model the unemployment in this model is equal to N S minus N D unemployment in this model. So, if you want to know the unemployment say initially at price P note the unemployment was this amount. This is the unemployment when price is increased more output is produced unemployment declined. A unemployment became this amount from here to here.

So, it became this amount unemployment the green unemployment was more N S minus N D than N S minus n this frank as price increased. So, that is our employment and unemployment this one as P increased N S minus N D. This amount fell that means unemployment fell more people are high more output is produce is very clear. That is unemployment measurement and at that point pink, there is no unemployment zero unemployment, which is called full unemployment. Because, labor supply is equal to labor demand in the medium run remember is not a long run full unemployment. It is a medium run you will reach the full employment. This unemployment, which a suddenly became visible in a macro model, which was not there in the classical model.

This unemployment acquired a name, this is called this unemployment is called, this business is called in voluntary unemployment. That means true unemployment unemployment matters to many, if it is involuntary. I mean I am not willingly sitting at home and not working.

(Refer Slide Time: 01:10:58)



Then I am not freely unemployed I am willingly sitting at home not looking for not working. So, this unemployment had the another adjective added to it is called the involuntary unemployment not voluntarily involuntarily means against my wish. I am not employed I want to work, but I do not find work true unemployment, the unemployment that full employment level, which I talk to you about in the first topic. Some questions also is the frictional unemployment, that is voluntary unemployment. So, involuntary unemployment this can exist in the Keynesian model like this, but in classical model labor supply is equal to labor demand. So, there is no unemployment labor supply is equal to labor demand, there is no unemployment.

So, in the classical model, if you can talk about unemployment, it can only be voluntary unemployment, which is not very true, unemployment voluntary unemployment at full employment. The unemployment exist that exist in classical model always in classical model. Also, if you can reach labor supply labor demand, it can also exist in Keynesian model.

So, these over you may come across in text books voluntary involuntary unemployment, these words become just a second. These words become very important these two expressions exist, what we call unemployment in macroeconomics. They have a more sophisticated expression. They call it involuntary unemployment for there can be some unemployment, which is voluntary like frictional I have job, but i do not want to either the wait out two months get a better job.

That is voluntary unemployment, which can exist at full employment. That is a classical model feature, but can also insist Keynesian model is in the short run medium run it can happen. Some voluntary unemployment, but involuntary unemployment cannot exist in classical model, because in classical model we have perfect flexibility of wages and prices.

So, labor market is always in equilibrium labor supply is equal to labor demand always, because you have flexibility in a Keynesian model. You have wage is fixed that rigidity may give rise to this equilibrium in the labor market, which means you can have a unemployment. That is labor supply more than labor demand the labor supply more than labor demand labor supply less than labor demand, cannot happen in the classical model.

This wages are fixed I wages are flexible there. So, they can clear the market anytime. So, the labor supply is equal to labor demand always the labor supply is equal to demand always. So, if you talk about unemployment in a classical model you can only be voluntary or employment. There where people get very angry. So, on earth do you have only voluntary unemployment like what is happening in the western world. Today in U S, in Germany, in France, Canada, Greece, Spain, and Portugal all the you call that voluntary unemployment. Because, classical macro economics only had a voluntary unemployment scope for discussion, but in a Keynesian model you have scope for discussing the true unemployment. What we call when people want job they are qualify, but they are not finding work the involuntary unemployment.

That N S minus N D non zero positive interest non zero call in eight positive. Now, you ask me the question you want if people are not looking for a job, they are not part of the unemployed people absolutely right. Yes, voluntary unemployment is which I talked about in connection with full employment level of unemployment. At full unemployment they can still be some unemployment. Like in U S they said about four to five percent of the labor force, even when the economies when declared at full employment level in the sixties and the seventies. We used to have that is frictional unemployment frictional unemployment is people are looking for a better job.

So, voluntary unemployment is people are looking. I understand what you are saying, voluntary unemployment in some sense is not true unemployment, but voluntary unemployment. In that sense can be interpreted as frictional of unemployment. If people are voluntarily not going to work, when they have work, but looking for a better job even a unemployment data has be is funny. It includes part time work is a fully employed, which is not true. I have a part time job, I am always in the lookout for a better job, but I have no money at home. So, I have expected a part time job the labor senses board the labor board or the labor ministry.

In most countries counting as somebody is employed or my father is a business. I go there I help him out, I will be counted out in unemployment. So, there are problems there are problems my father has a business i go and help him out is natural, but the problem is, so voluntary unemployed in the sense. I am voluntarily sitting at home, but for a temporary period I am still looking for a job. I have this, I have this allowed job, I returned it down. Because, it does not pay me well or I do not like the block profile or

whatever , but one who gives up looking for a job is not part of unemployment number. In a country who are called discouraged workers somebody was unemployed for a long time was looking for a job. You people from Calcutta then they gave up looking for a job.

I am talking out very bad days in sixties and seventies, when I was growing up in Calcutta. I remember people I know people personally to gave up. Now, the unemployment number in a contributes say that fellow given up. He may be discouraged worker, but he will not be counted as one of the unemployed. They also there are issue separate issues, very disturbing very disturbing issues, very separate issues. A guy was been looking for a job got discourage is no longer, counted as unemployed by the state very strange, state extra benefit states just counts him out, have you been following the supply function. So, the aggregate Keynesians supply function can become vertical always normally upward sloping, but if price increase too much, it can become vertical.

You saw that second I want to ask you a question all though, in these kind of a model technological changes or not in cooperated, but suppose I do a combining study exercise of incorporating a technological change. Suppose, the technology to produce the production function improves I say, there is a better technology that the country uses in an aggregate sense. That the many company is have better technology. Now, as they had earlier what do you think will be the effects. This is the last issue will discuss today and will have a half tomorrow is an half day we will meet again on Wednesday.

So, these fellow will have a make up tomorrow. You tell me if you have technology overall improving in a country in terms of this kind of a diagram, what do you think the first impact going to come? Let me see how you have understood economics and use commonly discussions like this T V topics terms of your macro frame work. I am just checking out, this is can is good exam question. Actually, suppose technology is have improved how I labor demand function improvement very good per capital efficiency. So, what will happen for every labor higher? A better will give a higher output. So, at that point merger product will increase, so at that point the marginal product will increase.

So, the margin product for the same price will shift to the right, so more employment more output more production. So, what will happen to the supply function at the same

price you will have a higher output. So, the supply function will entirely shift to the right very good technological improvement. Basically, means per capita efficiency as gone up very individual is more efficiently working. Now, there were contributes to company there were it contributes to a country. So, the production function will shift up wards, so the production function will become something like this. So, any amount the labor will have a steeper tangent, which means margin product has shifted to the right is higher.

So, every price will have higher output, because every employment will have higher output higher output. Because, every employment will have a higher output higher output higher output every price. So, you can see the supply function is shifting to the right very good, very happy. Although, we do not know inoperative improvement there are in models, but we do we can study with the frame work. We have in the company static sense technology will improvements due to country. That is why people talk about two things these days. If you pay attention a country grows or us as grown so much and world largest economy, because of two reasons.

One technological improvements they no other country had you take any measure technology in the world. Starting from computers automobiles anything started their number two there is very good education etcetera. Where do you go for higher studies, still you go for higher study, where you go have you seen the destination tack. For sample, were do people go for higher studies? U S, bulk of them 90 percent goes still to U S, why? Because this is another thing another technology improvement.

If the skill quality improves same labor can produce, more same effect production function shift upwards. Benefit in terms of supply function supply function shifts to the right given a demand function, what will happen to the prices in the economy given the demand function, which I do not have? If supply ships to the right what happens to prices. So, you have wonderful combinations are coming are coming economic growing. In a dynamic sense more output more incremental technological improvement better skill quality, people and prices also falling.

So, what you will call the illness in the economy is not doing well price is going up growth rate is falling illness. So, to count this illness what is the best root to counter is the demand increase or a supply increase shift supply. That is the quick solution the financial minister in India tried. When the dissection set in it has back fired, so badly it

has postponed issues, whether tying to developing so far that overnight. You do not have the solution.

Now, you understand macro economics, how it will helps to understands some other things. Demand management policy are always very in senstionary been giving the supply curve. It demand shifts up to a long term solution long term not short term solution at. This is exactly where there miss managing in the economy in India U P A two and not find to a political is true yourself it has failed.