Macroeconomic Theory and Stabilization Policy

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Lecture – 7

I started macro model in the previous class. The first model that we plane to consider is the classical model. The classical model given assumption it has considered to be long run macro model what happens in the long run. The usual feature of a long run macroeconomic model is economy as a at10d full employment which means most of the resources employed. They may be some of the frictional unemployment, because there have so many opportunities people some of them preferred to quick a job which is not to the best of the liking. So, they would we looking for a better job frictional un employment so longer macroeconomic model as the feature that economic is full employment.

Now, given our description of macro model in topic one there should be 3 sectors that should be model one; the goods market, two; the money market, 3; the labour market what essentially mean is we have to model demand side of the economy. We got model the supply side of the economy the demand side of economy consist of the goods market and the money market. The supplier side of the economy contain a labour market by in the previous class I told you given some identity or identical relationships in a macro economy in a very over simplify macro economy. There is no government, because the reason is why it is convenient and also appropriate to do so is classical a macroeconomic never believes the government can do good for the country.

So, government should not be part of any a macroeconomic model and also we decide to drop government in this economy We can think about in identity is the matter of think any economy think about identity where the total income will two items consumption and savings. Whatever you have there is no government no taxes in this model; whatever you earned are part you consume and part you say. So that is an income identity it is an identical relationship income should be equal to by definition consumption plus savings. Similarly, in the simple economy they can be as of output identity where output of the goods of the services in the economy consist of 2 types of goods consumer goods and investments goods there is no government goods; no public goods. So, there is only

government there is only private goods, some privates goods are 2 types. Once that we consumer consumes which are called final goods bread, butter, jam, jelly, automobiles, scooters, whatever bags, shirts, pants everything. And which conform consumes consume in the sense use to produce goods for us these are intermediary goods. And these investment goods are also called capital goods which are essentially machines tools implement etcetera.

Now, we talk about investment later its very broad topic given this background. Therefore, the outputs identity are say that the total output get economy consis10t divided in to 2 parts, no problem consumer goods output investment goods. It add them up no add them up we used base period prices all right or if we say current prices we divide by nominal value by the price level. And a price level in our country I told you there are at least 3 measure level GDP reflector consumer price index or some index. You take any one of them which is available divide the nominal value by the price level you get the real level value and add them up.

Now, having said that I am giving the fact, that the demand for goods just like the income identity. And the output identity would tell you reduce the demand for goods should also be consist of is also an identical relationship the consumer demand and investment demand. Now, if we make an assumption the consumption demand always equal consumer goods output. You get a very simple relationship coming out you will see the saving has to match the investment demand I told you savings has to match the investment demand. So, I begin from this point, because I need to complete the classical model if I can today all right.

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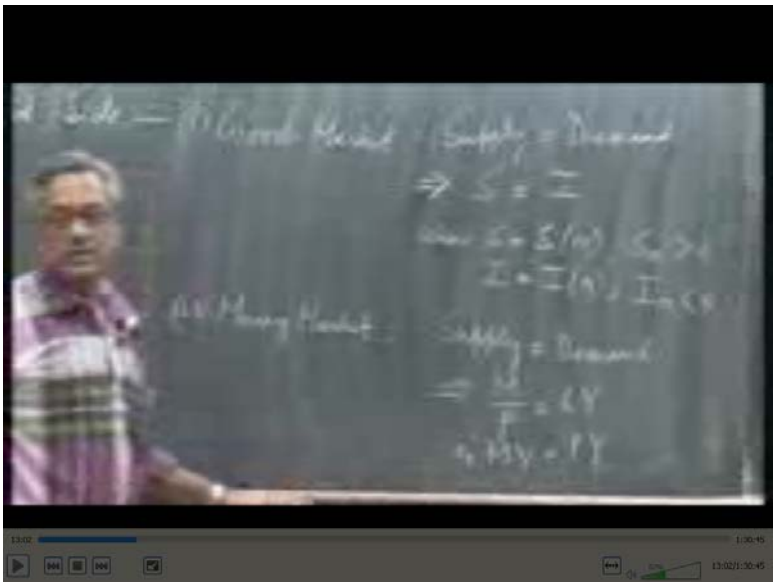

So, in the classical model, that I am first going to map demand side and I am going to model the goods market and giving all identities. We found that goods market conditions which supply of goods equal to the demand for goods essentially means supply equal to demand essentially devise s is equal to I where S is the function of real interest rate which I assumed i is the function of the real interest rate and the partial derivative is r is positive. And the partial derivative here i r this we have done the relationship S is equal to i. You can look up your previous see identities tell you that if consumes of output is equal to consumer demand investment output goods is equal to investment goods demand and there is a income identity output identity etcetera. Then saving should be equal to investment if supply is equals to demand that equilibrium conditions has to hold.

Now, this r is the real investment also quite, explain why there is real interest rate? The reason simple reason is that the nominal interstate according to our fixtures consist of real investment equal to fixture rate this kind of static model. First of all there is no inflation prices can change once twice, but no persons can changing price be model there is no dynamic variable of price possible these are static models. Then inflation can be dropped move over there is economic reason why real interest rate even in the dynamic model matters for investment some people say for saving may be something else. But anyway presume it also matter the saving, because the interest you earn from the bank as saver one period later if you put money today you do not get interest right. You get 1 year later interest income when if there is inflation the value of that money income

fallen. Because of inflation reduces, the purchases power that means you can buy few more goods with the same money 100 rupees because the prices goods are gone up.

So, essentially the return to you is the real interest rate or real return not the nominal interest rate not the 14 10 percent or 9 percent. But 8 percent minus 5 percent 3 percent will be return. So, can I ask you simple question can the real return be negative they can be nominal interest rate can never be negative. But the real interest rate can be negative with the inflation is too high. If inflation is too high then the real rate can be negative say nominal rate is 8 percent to few year back; 1 year back inflation was 12 percent. So, what was the real interest rate in the economy negative simple arithmetic consumes. So, that is also something we talk about later do not think that real interest cannot be nominal interest rate cannot be negative bank; cannot be paying bank; cannot tell you if you deposit money today you will lose money tomorrow

Then you either keep money at home so the nominal interest rate they cannot say the negative. We are going to cut your money reduce the value we cannot say that but it can fool you it can tell you where going to pay 6 percent interest rate. And you get very attractive one commercial on TV, some bank is offering 6 percent or something one point is more to 2 percent was more. This fellow comes in fact fellow that bollywood actor says a array that means 50 percent more he says instead of 4 percent 6 percent savings account. That means 50 percent more do not say two percent more that means 50 percent more income you have. But they are not telling you real retaining it should may be that time what is the real return negative by the time you receive the income gone up right now gone up by 8 percent average prices.

So, these are the savings from this pick up from this course are some practical and usefulness of this particular. You know this relationship that we use but the real inflation important that the saver as well as investor, because investor also gain from inflation if borrow money today. And I have to pay the interest later 1 year later but the cost of production is 1 year earlier today they bought the goods producing and bringing to the market. One year later they get a premium of high prices on the same product all those are cost for previous inflation. So, the inflation premium reduces the interest burden of the company who borrowing money from the bank am I clear all right.

So, you have to be interested matter so that is what the goods market. Second market that we talked about is the classical model at a very simple money market. One can say is there is the writing of ambiguity economist like fishers essentially I gave you money market equilibrium supply to demand employ. Here supply is equal to demand implied that real supply of money over P is equals to transaction demand for money h y or I grow the another equation from this M V is equal to P y where V is the velocity of money M V is equal to P y. This is aloes that the total effective supply of money total effective supply of money is the money supply that the result and circulated in the economy times. The velocity of money I told you why the velocity money is exis10ce I spend 100 rupees in the evening I found my note somebody is using our so the note is circulating.

So, the velocity of money currency is just use once when you withdraw money from the bank suspending. It is just not using once that prefer note first in the shop keeper in the shop see from their it goes to somebody trouble to coming market coming market it is left output gone somewhere else. So, there is the velocity of money so total effectives supply money is equal to nominal income. Because this y is real income into price is nominal income now which is g d P and something like that that can in market prices remember one thing. Therefore, the money that is require the transact the total value of goods is less than P y less than P y m into V then V is to greater than 1 if that equal to P y note. Therefore, money M is required to value some goods and services the currency requirement is much less than the total value of goods produced. Then the simple reason the currency will keep on travelling and do the job for you for the country all right. So, this is the money market now this the whole thing is the demand side I will come to the demand function etcetera later this is the demand side.

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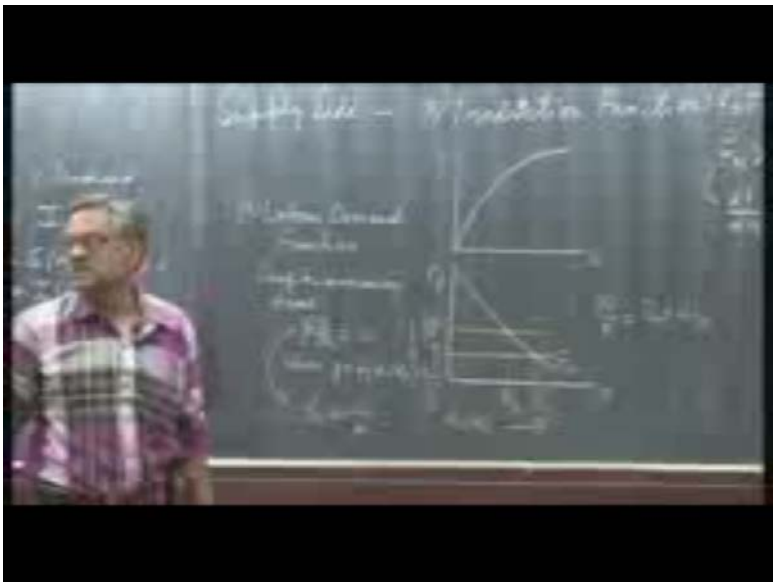

Now, I come to the supply side on the supply side there are essentially 3 items supply side. One you have the production function the macro production function aggregate production function which I told you is a something like y is equal to F N K naught y is equal to F N K naught where F N is greater than 0 and F N n is less than 0. What F N means is margin product of labour, why is marginal product of labour, because F N is essentially d y d N n is the name of production. So, d y d N means as N increases in this economy more people are higher more reduced you consume the, you can look it the point of the company. As a company has more people it is there is going to be high production the question is how much extra output d d in calculate d is very small amount. So, actually d does not relevance match the production in the economics, but we still use the calculation. Because it convenient we use the rules of calculate; we can use the mathematics and economics.

But d does not an economy is very small change in calculate d y d N of a function y function of y is actually slope. Slope is measure by the tangent and tangent is measuring a slope at a very small slope of the very small point on the curve it is continuously changing's slope situations. So, these the really convince the economy when we talking about millions of tons of goods 100s of labour lacks of people being higher all right. But this, the homographic we have higher in order to enjoy the convenience of using mathematics like calculus in economics. We use this rotation essentially to be honest they should be features in delta delta y delta N something. Anyway this things this kinds

of things short coming they are in the basically line anyway the d y d N is the margin product of labour. As you hard work people what you get extra output, what you hard more, what is now the extra what you see extra for the same amount of high ring extra time is not giving arise same amount increase the output.

But you will be different amounts first time it was 20y more extra K g s next time it was 18 more extra K g s next time the following period. It may be 15 tons 15 extra outputs 15 K g s 15 tons whatever so this is essentially the marginal product of labour. This is the very important variable a marginal product of labour which is N I have introduce labour is l, because the capital l I keep aside later for that also get for some other notations. So, margin for the labour I used l and naught is the fix amount of capital and also this production function is used the technology to be given is not going to change for the long run. It has reach some stable point whether technology of solve some that economic aggregated whatever aggregated technology reducing where using aggregation is the problem in macroeconomic. How do we aggregate any way I am not going to get into that.

So, this margin product labour usually if I draw the function production; you will see the down slopping line, because the production function F N greater than 0 and F N l is negative F N is not 0. So, F N keep changing slope it for changing and F N negative essentially means that margin product labour is falling is remaining. So, this production function looks like a this which has drew last time N and y if you have starts is zero point and it goes like this that it may reach saturation point saturation in the sense. It may peak after reach more people higher output may fall I told you most students here than the room can accommodate the knowledge creation may fall. Because they would be disturbances they would be sitting on the, they would be talking to each other. The disturbance the extra people the readings yesterday not allowed to enter return after retrieved created a stamp like and fully circle use laity charge margin productivity of margin utility started declining.

Because you use when are enjoy and come back to laity charged injured lack some those what is no fun that happen. Because there have too many people enter compare to what it connect decided whatever for yesterday celebration at Eden garden in Kolkata that happen. Similarly, if too many labour is higher by a company margin product may be come negative. So, no rational company would hired to many people that profit

maximize very careful. They would up to the hired where profit maximum that profit maximum hypothesis. Finally, let to me you can see the margin production labour is down load slopping line. You should draw the margin line here it will be down load slopping lines if you draw the F N line here you can see the tangent is getting flatter. So, the margin labour is the down load slopping line right this is called dimensional margin product labour what happen is compare to the inversion to the fixed capital. You can keep on hiring more people all right productivity stars falling the slow longer capital. So, margin product of labour starts following dimensions the question therefore, arise is you can ask me sir how much labour.

Then the company would hire what will be labour demand functions so to the question that comes first is b, what is the labour demand function. Well, it is very simple given the marginal production diminishing marginal production of labour compare to fix capital in long run if labour is hire from the profit maximization hypothesis. We obtained in the previous class that profit maximizing firms profit maximizing firms decide that get this following condition what was the condition we got? We got P F N it was small F small P I guess for firms P F is equal to mega W where what we obtained was that some small y. The company produces using small N amount of labour and some fix capital small K naught and given the profit maximizing hypothesis in the previous class we showed you that this P F is equal to W was the first condition of profit maximization. So, how much labour would be hired is a very simple thing if you know the value of P N w.

Then you can compare F N with P N W which is F N is equal to W over P this one essentially means that F N has to be equated with omega word P for a company. So for the macro economy it could be capital F N is equal to capital W over capital P. So, we need the capital W over capital P number once we have that number suppose the number is something suppose this is the line which measure capital W over capital P some value is given. Now, you ask how much labour in the economy hired what the labour would hired given the profit maximization equation we have from the company level at the aggregate level if you follow that. Then it will be capital F N is equal to capital W over capital P which is at this point this is the amount of labour that economy would be hirely if there is some W naught and some P naught value given to me.

Now, sir if W naught and P naught changes does economy hire more less people. Yes it shows W naught and P naught not to change so that say W 1 and P 1 both has follow and

the number issues also falling of course,, the W has been falling P naught. So suppose you have a situation where you have draw line where it is some W over o P naught where W 1 is less than W naught. So, the labour is low way company will hire low range of the level say they are feeling very good so cost shut down price are remain the same the company feel happy. So, the company is immediately responds at the macroeconomic at the macro by hiring more amount of people. So, the labour employment goes up where as the wages formed call which has called real wage remember W over pis real range W over P is equal to real wage W is nominal wage P is price which is of course,, nominal.

So, you can see that the labour demand function emerged how does economy is labour demand change when labour is demanded by company if we assume companies for maximization profit. Then the profit maximization hypotheses leaders to a company demands follow labour as well as the macroeconomic functions. And what it is essentially that it will come what will be labour demand function for the macro economy it would be F N is equal to W over P or P F N equal to W which we going to arise it you arise F N as F N is equal to W over P. And that is the demand function which I call initially marginal product curve is like a demand function for labour because we move along that line as W over P changes is something shift F n. Then when we move around the new as F N suppose technology is improved labour is more productive.

So, same amount a labour is producing more giving more, because the technology is improved micro soft has the new software so everybody wants to know that all right then we move around that and that becomes the labour demand. So, F N is the essentially labour demand function and the equilibrium and the how much labour is remanded. I need one more information I need the information on W over P, because the first set of condition says it has to be F nm going to W over. If I know F N is good from the production function I know very well or all I need W over F N all have the information that is real wage.

And I compare the real wage and I demand when F N margined product F N margined product equal to real wage W over P any problem any problem with the labour demand function. It comes from the production function except I introduced the profit maximization hypotheses of the companies I guess what is called in a macroeconomics. A macro under meaning a macroeconomics that is I used macro theory to understand

what may be going on at the macro level then I aggregate that that is all. So for macro theory comfort I used small from P small F small N small w has notations for the macro economy I am using capitals P capital F capital W these notations. So, the labour demands function is essentially therefore, what did means therefore, labour demands function is macro labour demand function is essentially F N is equal to W over P macro.

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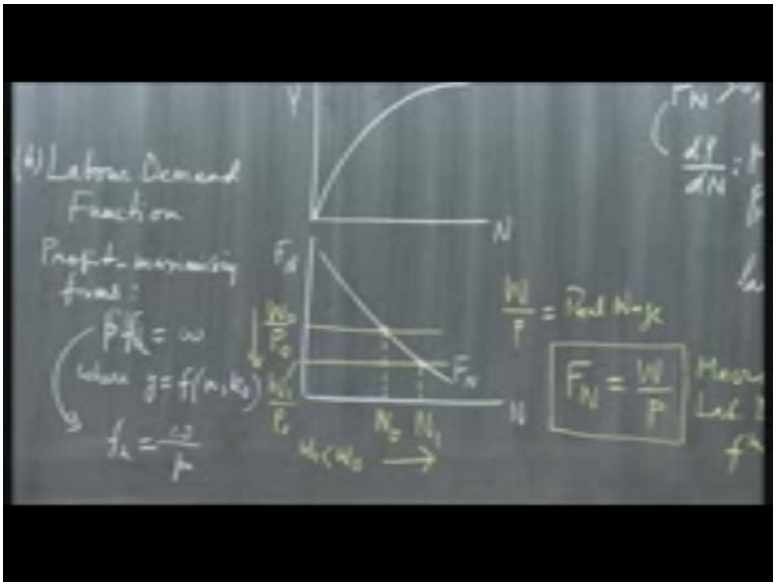

Labour demand function; this is macro labour demand function which itried demonstrate with the help of some macro theory. If you want to learn macro theory you have can open a macro texts all right macro theory is that clear. Now, our supply side story is not over because we do not have the labour supply function how we can, how can we talked about the equilibrium if we do not have the supply function. Because equilibrium concept it was supply to demand in the labour margin I have to the labour demand function for I have to the production function when I have to have the macro theory of a firm to get some inculcation.

Then I have the macro equilibrium function in that yellow color. Now, I required the labour supply function if comfortable with this I can got labour supply second go to the supply function again uses how to obtained that we must supply. Again that is another macroeconomic so given that you guys are know about the macroeconomic will still have to take this course in you what we have to learn this. What we have to do is I will give you a very simple exploitation of macro theory by labour supply function I gave you

a simple exploitation of macroeconomic theory. So, I going to give you a very simple question of macro theory economic supply function now who supply labour can I erase this part of the board the who supply the labour. I will write the entire classical model latter this is what I am developing who supplies labour well how supplies labour is you remember that full of diagram.

I have topic 2 when I started measurement an aggregate of economic variables you know that how zones supply labour to companies. So, the question is like the demand and the supply function both an drawn again spices who can imprecise the labour demand function is against W over P will be drawn. You will see essentially you can call elaborate function or again W P you would like the labour supply function also to be drawn against W P. So, can we think about some macro economic theory to explain how labour supply to change W over P that is the question we have so part c a b.

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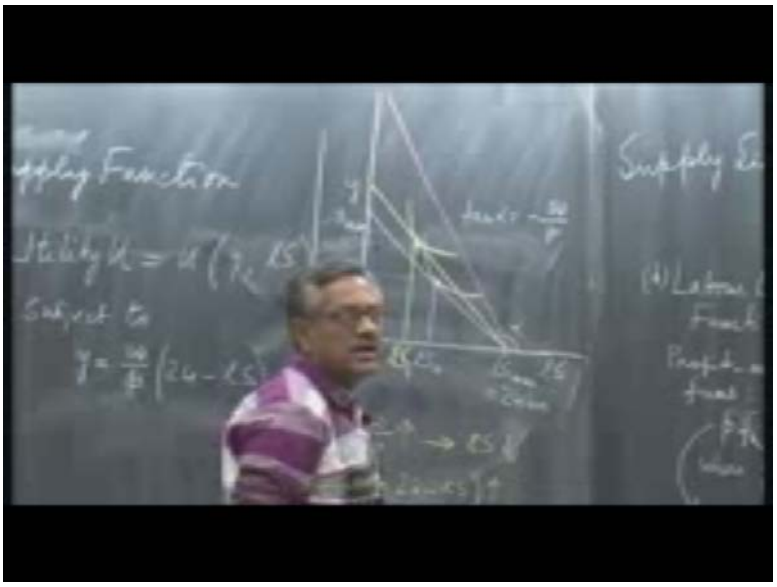

Now, see labour supply function is something that I am going to work upon labour supply function. Now, let me see whether it make sense or not the macro economic theory is the very funny theory. It says any householders maximizes is utility some fraction whatever it is utility is a fraction from though he works and earns income. And he get satisfaction from income, because he can spend the income on goods he can go allow go to race party there provided do not get couch you what happen in I P l game in Bombay. Then it is dissatisfaction utility then it is your having this utility from our good

income you have income but you get this utility. Because you doing a illegal things and where is the fun to go to jail and national TV everybody can see you this famous players more you more famous you are more problem. You can get creates for yourself you are not famous who is this guy.

So many people are saying who they are but you famous so utility you can get from an income you can earn income because you can spend. But utility you can also get I get for instance from measure doing nothing chatting with friends sitting on the longs till 230 or 130 at night till the canteen is open. Let us come back to the story I want and utility maximize is something which rational consumers returns all though the utility may disutility. But we are not going to talk about that so if the maximize the utility you can say a consumer maximize the utility u which is a function of 2 types. One is the income total income and say laser, laser is what you enjoy as a not doing anything not working not watching movies, chatting with friends stay play that night whatever going to days party.

So, maximize utility usually macroeconomic, we say this maximization in particular maximize utility subject to a budget transfer that it cannot maximize it has the budget constraint budget constraint involves spices etcetera. So, it is maximize the utility subject to a budget constraint which is a y is equal to W over P the real wage suppose it is a individual terms W and small P W over P into 24 minus l s. So, here is the budget constraint l s elders is laser your 24 hours a day if you take laser power our W over P as a real wage real income. So, the totally income the number of wages suppose you offering eight hours that is 24 hours laser 24 minus less is 12 hours 12 hours is laser.

Another activity laser also encompasses also some other activities having the part of laser all right. We take somebody part of laser running joking part of laser whatever when you are not working your not earning and you are earning W over P as a some hour so total income will be y so this is the constraint. Now, if you draw the constraint s again the its laser a diagrams suppose draw back if I draw diagram then and how it will be. It will be support your laser and your y on this y 1 laser is from the 2 words utility. How is the budget constraint look like it is a linear line you can see when laser is 0 it is 24 into W over P which is y max maximums y your not sleeping having a bath. You are not eating your working 24 hours which is not possible actually hypothetically nobody works 20 hours the maximum point here that you get all right which is y max.

And then you have all this no income zero income laser I fall when it will be a straight line maximum laser will comes all right l s maximum and this slope alpha 10 alpha is equal to minus W over P 10 also would be manner W over P. So, what the line please check same they are correct or not mathematics my mathematics is stay on this so minus W over P 10 alpha all right. Now, this utility function has some condensate property so for a particular laser of u value against y and l then is convicts in shape. So, maximum utility essentially means, are reaching the maximum point of tangencies, because after that I cannot reach below that satisfaction so, optimum point is at the equilibrium point.

So, when you have that you can draw the line here and you can find the l s value that l s 0 all right what is the l s maximum l s 24 l s maximum here is 24 hours all right l s 0. Now, suppose I given an incentive to the house holder I say you are going to get a high wage the poor fellow has working enough working is nothing but with the higher wage it can very excited and he starts working harder. So, what would happen is that the, that hire wage? This budget line will start increasing. It will become steeper and as say as W over P increases the budget line become steeper and the person involve harder. And suppose he reaches an equilibrium point now where he consume less laser which would will happen to you tomorrow and he what is harder and better income better life is satisfaction levels goes up.

So, suppose at a lower wage whatever I heard working now it the hire wage I get an incentive. This is an assumption I making laser and W over P is like a, the cost of laser W over pcost of laser, because if you take laser you miss W over P earning. It is a cost by telling laser you do not get the W over P if you get W over P it is lower cost. So, W over P I like a cost if cost goes up cost of laser goes up what I am saying has the line becomes the yellow line. Because W over P gone up it has been yellow line the consumer consume are different amongst of laser which is l s 1 on a all different and difference curves which is the yellow different curves all right. Now, note one thing therefore, as W over P goes up. It implies laser fall cost of laser is gone up is very expensive costly high to give up what to other work to earn because laser is become very costly suppose I make marking in question paper stuffer.

So, laser is become costly for you will other work previously at the lower cost when you can enjoy lot of laser and study a little bit before the exam. The night before have seen people doing it get the good marks following modeling and you call them very brilliant

people suddenly that man is goes on the brilliant question papers. That become so stuffer just open in the page night before his not working as see happening to the honest with you this is what I am trying to say all right. So, you have to work harder and that people wife is say suppose he married man saying what did you going to work and more your better life to. So, suddenly with a higher income incentives are working more so when laser falls what happens to the number of hours in works N capital N was total number of people. And total number of hours people are higher so all that what happens small N is 24 minus laser. So as laser falls 24 minus laser goes up this same increases number of hours in works number of people working in a economy as goes up as laser goes up 24 minus l s then s laser firm cost 24 minus will goes up.

So this gives you therefore, the labour supply function if I can sum up this story and can write a labour supply function like this find out is said some g N some functional rotational g g N is equal to W over P. And this relationship is implicit relationship and what I am saying is that is g subscript N with respect to W over P is greater than 0. This labour supply this represents the total supply of function however this g N is positive means in such W over P increases number of hours working increases. But there is a catch this labor laser diagram that fade off is true to up to appoint of increase in wages beyond that the person might says. Now, wages are gone up so much by I can of to work a less number hours is mind full shift to the laser although the cost of laser of the opportunity lost. Because of technique laser that W over P if you do not work if you chit chat with your friends you do not get good marks you spend too much time for friends But now I reach the point that is no longer important to me.

So, that positive relationship is number of hours working with of the inverse relationship between W over P and l s may disappear may get replaced by relationship which becomes positive forget it relationship. So, as W over P increases I increase more laser because I enough earlier I was worked 12 hours. Now, with 8 hours work I earned more than that I do not need to work a 12 hours I have to go back W over P increase go back to enjoy more laser and working lesser number hours. So, the labour supply function may become per mute in less after point of W over P increase. If you have a spectrum W over P something very low to a very high value somebody in between switches in the relationship becomes a different one up to appoint this is true.

So, I heard that the c o and the big babbles of companies actually we earn the maximum to other day some company have to the maximum to some company. Boss refused some 100s of millions of dollars of extra income refused he said I am not going to take it, it was an national TV of BBC I though why did you do. Because one reason is it the company economic has station if I do not take that money that money can be given to shareholders. Because the share person will go up etcetera you can reinvest in economy in the company it decided not to take it who can offered not to take it who already have a lots off that good to its not Gandhiji scarifies.

You already has so much he can afford 50 million dollars give up it does not make any sense is a billionaire somebody c o. It was a news I am I am not joking I just among that working so it refused the dividend extra. Because you also share a company in addition to c o so the dividend income of bonus what they called we refused the bonus all right. So, here is the guy who in fact he will saying earns much more words keyboards number of words replace goals it has does the working replace goals. It travels he meets people socializes that is called as in job instead doing of that work sitting in the office or in the board room yes you wanted a question you had a question.

Student: Sir, why company pays bonus in a recession?

Very good the company may not be have invest economics are in the session the company may be doing well some parts the multinational companies all right. So, in Asia is doing well probably japans Japan not India doing well what may not be doing Newyork. The boss is the one global boss who was offered a bonus and I need a refused let we find the bonus about 2 3 days back old news only not very old. So, what I am trying to say high level of earning per hour per day whatever I did per hour here 24 hours per hour. You will see a person can refuse even in a wages go up they know their sacrificing good amount of income may not working can refused it. They already have a lot a in saturation point has reached in terms of money income so it other enjoy in fact a c o lesser number hour you know.

So, what does it he make phone calls less goals very socialize with other c o s all right. He goes to parties and when you join a office you got you work a hours he may be working for hours; he may be months or weeks. But is earning does reflect that he earns the maximum amount where capital earning in the company. So, what I am saying I

summing up the relationship is a positive relationship the g N greater than 0 which is W over P all right greater than 0. Basically means we have a higher amount of W over P increases it more number of hours you worked. So, this is the labour supply function. Dose indifferences curves changes when W over P changes? W over P has some income curves may change but indifference comes from the utility function. Utility function is continues u is you pick 1 u value and find out the various combinations of arguments which is y and l s that can give you. Will you change the utility function? Utility function can shift as I said the c o utility function will different from you.

So, after particular income giving the surrounding environment it can shift it can become a different one where hire W over P will give you tangency points. What will happen in this utility function when it shifts hired W over P means this budget lines becoming steeper and steeper you agreed with the. If the budget line becoming steeper and steeper if the budget line becoming steeper and steeper what is happening is of course, it is suppose after a point become when it as becomes variedly suggesting color big color line. You do not get a tangency point with l s you may get a tangency point in that started increasing. So, there is a shift in utility function the original utility function does not existing more it would have shown and will gone up o s going towards y axis.

But now the new utility function that same individual, but because is surrounding is life as change so much But he can get precedence from for hired W over P which is a steeper line with more laser look this point is clearly say is the laser amount of increasing now. So, the laser is measuring from this access zero value l s is here it increasing in this relation clear that is the shift in utility macroeconomic is wonderful theory you want to read I will show you books very easy book story. So given this micro theory the macro theory is going to assumed what I am going to do here is that the labour supply function is an upward slopping line against W over P. Another labor demand function is down loop sloping line is against W over P. Now, we can complete the classical macro model.

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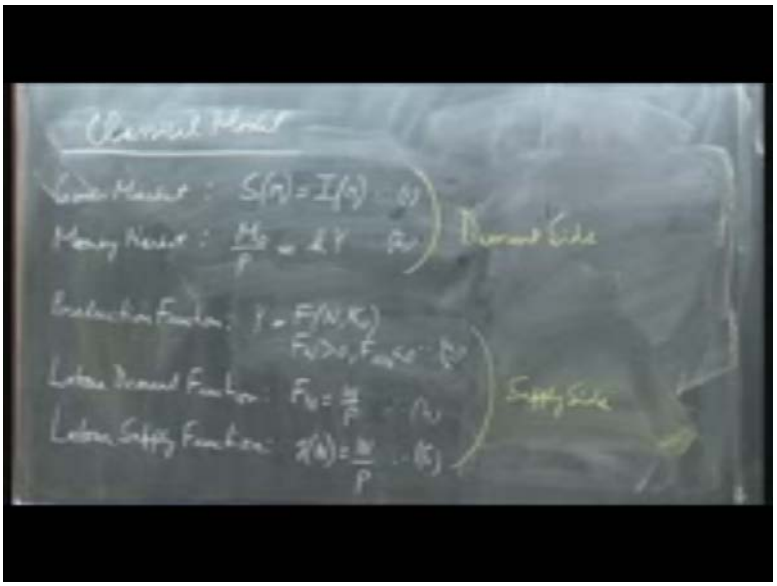

Now I would concentrate the all s d P part of the model and try to solve like a Mathematician. So, the subscription part is over first we will have the goods market and the equations was s r is equal to I r this is the question one number. Then I have the money market which is m over P let us assume money supply to P naught at a given of time is equal to h y money market. Then I have the production function from the supply side which is y is equal to F N K naught F N positive F N N negative this is the third equation. Then I have the labour demand function which is F N is equal to W over P then I have the labour supply function which is g N is equal to W over P this is number 4 this is number 5. So essentially as 5 algebraic relationships to describe the macro model 5 algebraic relationship to describe the macro model. The first two the demands side the last 3 constitute the supply side.

So, I have this macro model in front of view which so far I know this is the algebraic description of the classical macro model in the develop over night develop over period fatter year to develop with the writings of people developed in a simple knowledge of equation equations. We know if there are 5 equations there has to be five variables at least to be solved so that it is the determent in the system. Now, it can the over determine system and under determine system suppose we have 5 equation for one of the variables have more than one solution say to over determines system say to under determine system you can have where you have 5 equations. But you have 6 unknowns notes you have to assume the value of the unknowns to be solved all right to be given. And then

become solved the other unknowns hen become to be given at the, that value. Again the number will change in this case the determinate system of 5 equations 5 unknowns. So, the question that I am going to ask is the following one of the 5 unknowns.

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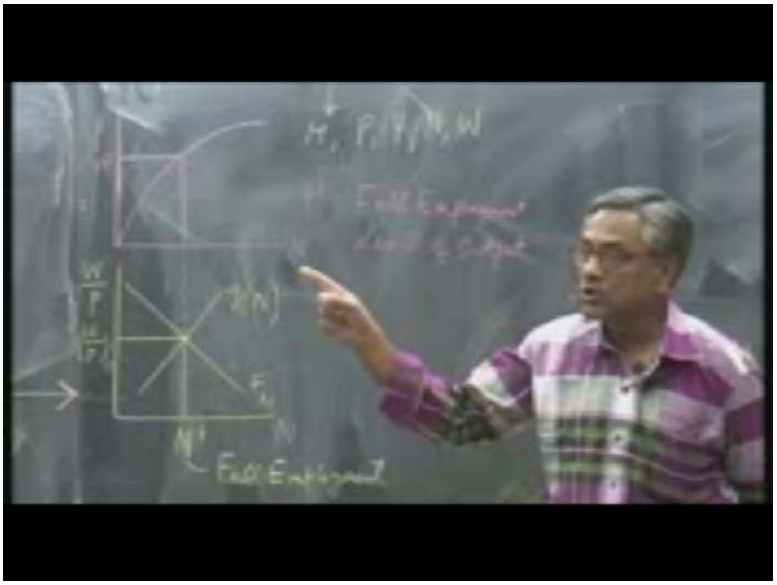

What are the 5 unknowns, 5 equations five unknowns what are they, what are the 5 unknowns that five unknowns that I can see that need to be solved by the model. One is s and I two lines that diagram that drew dissolve t the issue of what the value r? So r I one of them one is r next from this equation I can see there are two unknowns clearly. I do not know the values one is P; one is y I do not know the value so P y to other variables coming P y. What are two modes when I come here I can see to more one is I do not know what the value is N it will be given by the labour demand labour supply function. So, what is the F N I do not know and of course, P is whether I do not know W is. So, I will have the value of 2 N and W if I say so its determinate system determinate system where you have 5 equations and 5 unknowns a question the question is how are we going to solve them all right.

The assumption think about the classical model is very funny look at the supply side first follow l s when the l is solved K value is given and N is here. What is the number that I have gave y once y is there look at the equation 2; y is there that means those at this equation completely independent it only shows for r 2 equation is solved is a simultaneous model called a letter involves once solved the words first. Then the values

are use some other part of the equation it is not a simultaneous equation model s and y 2 x plus 3 y that is x plus y some equal number solve for x and y. Some other equation going to here demand a supply line when we draw this is a simultaneous equation the demand and supply together in case it determine the values of the x and y variable together simultaneous.

So, the demand supplier when we draw I essentially simultaneous equation model in algebraic terms dynamically it is demand line or supply line the interest arrive to automatic. But in mathematical terms the demand and supply the dynamic economic is essentially simultaneous equation terms. So, here in the labour market this is simultaneous equation is somewhat the labour supply and the labour demand would intersects to determine the value of W over P really. It is simultaneous equation, but the rest of the equation is not the entire board is not simultaneous labour supply is simultaneously equation system.

So, this part if I draw a diagram what will the diagram we if I draw a diagram is very simple the diagram it is saying N is here W over P is here a labour demand function F N and the labour supply function g N. It is a simultaneous equation model simultaneously solve the, for W over P some value of 0 and N. What is the, and the N value the labour demand to labour supply what is the name of this N value? The labour; the demand to supply macro economy full employment.

So, this is the very specific N this N value is called N F which is full employment labour of employment this is full employment point this is full employment point. So, this is the simultaneously equation models the supply the demand man together would solve two also variable simultaneously W over P which is real wage that the amount is requirement and N. That is very special employment labour market is clearly is called labour market is clear labour market clear means those no supply no demands for labour. That remains all they matched whatever they wants at that real wage is called full employment level of employment. And then what I say if you have the N W over P value these two equations is goes to once the production function of F and aloes y.

So, essentially what I am trying to say is the if you draw above this the small diagram which is the production function diagram which is N function. And this line is y and you have the production function then this value of N is. Now, I can go to the production falls

here and then obtained the value of y which I can call y F is full employment level of output y F is full employment level of output because I have full employment level of problem.

So, it go to the production function y F which is aid say when four and five has been used go to through same F N also y real wage value. There is the diagram shown you see that is the full employment level of model this is very important. This diagram will see clear and once you have y N and W over P wrote of the individual value W over P. Once you have y N and W over P you can go to number two on the board the money market equation you have to y value. So, what is the value you will get for the number two equation P and you have the value r already from one a single equation r value savings is equal to investment condition in the goods market r value goes up so all that remains r is done y is done N is done and W and P done but I need the single W and P.

So, I need the P from two if I have P from two where would I get the W value how I get the W value any of the equations goods market equations 4 or 5 W is there. I can get the W value of any opposite equations I already solved the 5 unknown numbers I have once I have the functions all right clear or not clear. Have a resolve the issue of solving the issue of classical model yes or no yes there are small section which is simultaneously equation model like a first model savings and investment. It comes those simultaneous equation savings and investments together you remember the, understand the diagram savings and investment diagram in the previous class. Then this labour market equation F N value that demand also simultaneous equation model you have the simultaneous equation model. So, you will determine the W over P and N value, then the production function give to output value.

Then the money market equation gives you price problem solved. But my job is not yet compete I have more things to do I solve the equation I set up the customer and I solved the custom macroeconomic model but Punjabi is also told. So, when I get into the next stage all right I would erase all the I would I required this diagram each diagram even money market and production function it from the on the supply side I have the supply side equation there. So, where is the supply curve you can ask me sir you are writing the supply side equation. But there is no added supply curve for economy where is the supply curve in this problem of the economy you want ask me that question. So, what will be the supply function where one economy supply the function is a relationship

between output supplied and price so sir how do we get output supply and price. Now, the issue is resolved here in the following manner if labour board is clear writers or whatever be the value of W over P you see if here W increases.

We all assuming that P would also increase, because it has to done only by P so W increases does not P increase W increase this function production function. The production function has no P no W function and this labour supply function has also coming from the utility function etcetera for N W over P. If they do not shift they no reason to intersects one it can be change that would be W and P changes what must be occurring in the economic proposed to other variable would also change. So, that the ratio value W over P does not change, because this diagram does not allowed to change this diagram does not allow to N value change if W over P where touches to this function W into g N W into g N. Or something that P into F N if W and P values changes this value can be added. But there is no reason to that question one is coming from the rational function there is not going to change equity modeled that I showed you.

So, what is happening in this modeled therefore, the story where W over P has to become a constant s in this model. The employment has to become constant which is the full employment level define there is nothing but price is not changing will change all right. Then if you any of these variables W over P changes in the other variables must be change in proposal whatever for instance if variable economy doubles. Company will have you to pay higher wages double the wage workers that according to this line. If you reach the employment then the company would also double the price, because where we see the cost are double so that they would also double price. So, that real wage does not change so that their profits are change this is what is happening so essentially this line is say.

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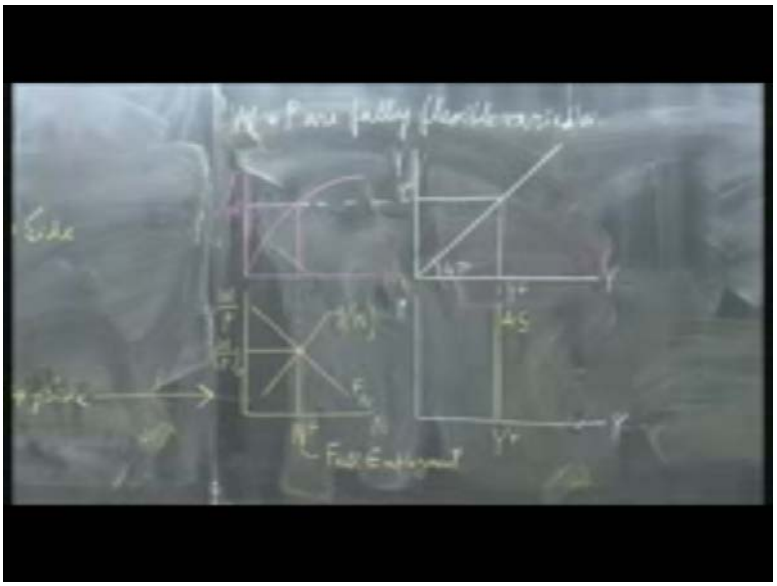

What one very important thing that W over P are fully flexible variable and if W changes P also changes corresponding. Simultaneously P 4 that W also 4 proportionally so the W over P never changes all right if that is the case. Then what will be the against the sub ordinary supply line when added the supply line very simple I draw 2 more diagrams here. I draw 45 degree line I put y and y this output level along the 45 degree line tells the full employment term full employment output. Now, I would have one more diagram here which is the aggregate supply line which I have y to the twice this is my y F. Because the diagram falls y F that also was the y F it is the y access transfer the y F access. It is the y axis translate to the 45 degree line x axis from the x axis y axis there is no prices here.

So, next is come to y F is no condition of twice here whatever be the price so aggregate supply line essentially has become a vertical lines. This is the aggregative supply this I the classical aggregative supply which is output fix that coulomb for a level once. It is reaches for employment what the prices are all right you can remains in the long run the prices double level in the labour market laser also double. So, real wages will change real wages will change then the other variable and the x axis twice N F. So, N F does not change means y F also does not change all this production function change which has not assuming. Now, that equation is given capital is given therefore, I have tangentially supply curve in the classical model to gave vertical line that is independent of price.

Once it is labour market that independent prices whether the price of labour we talking about W or the prices of goods you are talking about P W over P is fixed N gets fixed.

Once they are fix in the macroeconomic model they never change in the W over P are fully flexible if W doubles P would also doubles if P half's W would also half's. So identical supply of vertical line it does not change its not a long run supply term which says as prices changes among the supply in economically also changes if vertical line is perfectly elastic. Therefore, perfectly in elastic it does not change can become perfectly in elastic in our get day to day life for instance I give the example that c s focus whatever be the price or identical differed. So, what you have be the price whatever may be the conclusion of this curve whatever may be the state of appear at home it keeps on away tangentially it perfectly elastic line perfectly elastic curve.

So, added the supply curve in the classical model the perfectly in elastic curve perfectly in elastic curve. Perfectly in elastic curve that we showing change look at this two equation that we solving W over P number is not required you liquid that 2 equitation without taking course. Because is stored to W over P value that means W over P is fixed at a particular number. Now, the question is how does not effect this is the assumption W over P are fully flexible. So, if W over P saying is P also proportion. So, that is the supply curve vertical am I clear or not have you understood this problem now. Now, you are saying sir if the supply curve is demonian. So, what is the demand curve if supply is demonian? What is the demand curve. So, what is the, this diagram now, what is the demand curve that your measure supplies curves what is the demand curve? You tell me from these two equations how would I get a price and y relationship in the first equation there is no P no y.

So, I cannot use that equations together in the second equation there is a possibility of P and y relationship comes in the second equation P and y relationship which can be the demand function. What you think will be the demand function, how it looks like, how would the demand function looks like the second equations. The second equation that gives me this is the demand side equation money market and goods market unfortunately goods market return that it has a P value or it was a W value it would not be useful for you you get it demand function. So, what does we get the demand function what we get the demand function are relationship between P and y of the l m equation. Sorry money

market equation money market equation how would the relationship between P and y you can see here that miss h is constant s so P into y is the constant.

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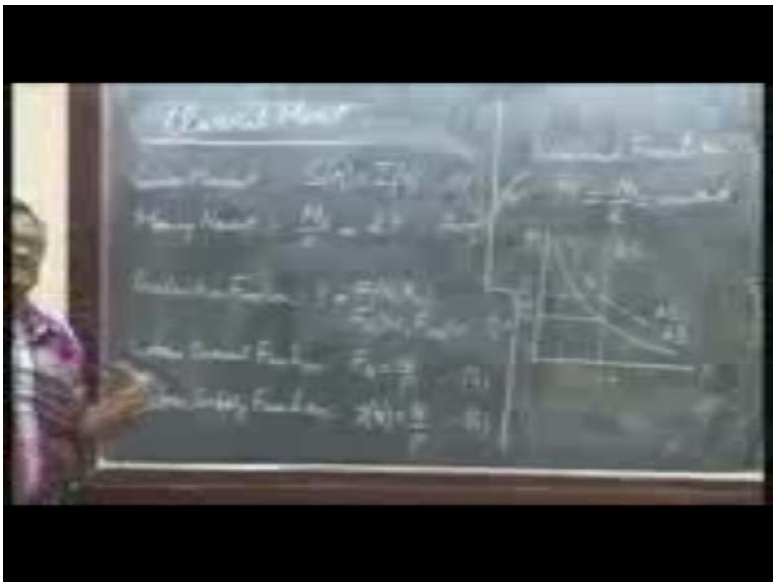

This equation alone demand function I need to see that there is an demand function P y is equal to m naught over h which is the constant. So, what kind of demand function is this a on a P line y N on a P y N? What kind of demand function is this? Am I clear or not is rectangular or what? So, I have demand function like this which is added demand function I s a rectangle I have waiting demand side these are the things where is supply side. What is the demand line? We need the demand line also, but when I looked at the demand equation one is changing not useful because o P and y the second equation is possible it gives the range that there is an demand function possible so it is P one all right. So, what this module said what will I tell you when the supply side solve the lower level and the output level I go the demand function to solve for P.

So, the classical model essentially says that output are is the full employment and prices are economically in any where it depends upon the demand function. So, what is essentially saying therefore, if you super infuse adding the supply line hen identical supply also y F? And the demand line depends where it is rectangular formula to solve the hypotheses indicates. That was also the same if demand shifts to a d one all that happen is the prices in economy will also increase or output employment docent change at all output employment change if the production function are fully the distance. So, all

the demand side does in specially decides precise the supply side is the powerful one which decide the employment and output in the labour market and the production function. But once it is decided vertical changes the demand side comes precisely and say and the goods market is the whole slow. It is not interacting at all with l rest of the model and the goods market wholesale determine in one interest real rate of savings.

And of course, savings are investment of course, there is once real wage of slope savings and investments are functional of real rate of interest. So what I really economic savings and investments are also is a very low the rest of the economy. First is the supply side equation that supply the labour market goes up to the production function output lesses once you know that they will go to the demand side a part is more you get the number the you go to the other part later not simultaneously. So, you go to the other part supply side and then all you do is resolve the issue of price what that price level is going to be that is all into in some séance a very interactive role passive role not an active passive role.

And the goods worth is most funny one, the lonely fellow is their does not interactive anybody does not bother anybody only precise and really interested once it is decided the savings and investments are also all right. Now, you tell me before I go to other techniques if money supply is; this in this model what will happen which is the conventional way of talking about model policy government g is not here. But central bank is also consider to be part of the government or policy issues indirectly all right. Suppose central bank pumps and go money to the economy cash somehow bank. In the form of loan more could happen if more money is pumped in to the economic and increases.

Sudent: Prices.

Prices go to grow up proportionately nothing else will happen y is fixed for the supply side velocity of money or existing demand proportion h is fixed velocity money is inverse of that. And all that happens is a money increase prices increase in fact in money supply would double just like a labour market prices double wages would double similar to the money market. What you happening is money market is prices and in the money supply prices would double nothing else could happen the demand function will shift up that is supply curve remains does not change completely independent all right.

So, what you conclude from this is if governance want to influence the real variables like output employment to a policy called monetary policy which essentially means in a very simple words pumping more money or ones to control. Whatever it cannot do that only think it can control to policy with inflation it is so much influences economy in the reduce labour supply a lower the prices. And inflation rate will comes down monastery policy is no as no active role in a influence output and employment in the classical model. The output and employment entire determine by the supply say nothing more than that which is a very damaging a conclusion damaging in the sense in the conclusion is therefore, classical model is completely in effective in effectively constant in a sense prices. It cannot control, but it is in effective in a sense it cannot involves the output level or the employment why it is in effective in effectiveness or effectiveness is judged from the point of view or the output level or the employment level.

So, the classical model is completely in effective, because it either or the employment level can or it can do just added all right in the classical model is it clear? In the classical model or influence right so in effective you have understood not in terms of price column in effectively there is a macro policy which in terms of our policy influence government decision or output and employment. That is most important so this is all right wonders point that mentioned before I close to day. You have seen one thing that the labours market as determine 2 or 3 dual variables is a employment output a prices of variables employment output and real wage W over P it is greater. Then you go to the goods market is another real variable the real interest rate.

The only nominal variable we add in the model prices better demand function number two the question number W to once you have. Then from the laser market you can obtain the value as a reduction obtained the value of. But one thing is very clear to you that wants them real sector of the economy hired been determine numbers in going to be the longer sector. What is the price money supply can only influence prices as prices can influence money labour market real wages are touch employments are untouched employ. Output is untouched even interest rate is untouched this real sector completely independent on the nominal sector like money supply or prices is called the famous proportion is a result hypotheses is a result on the classical model.

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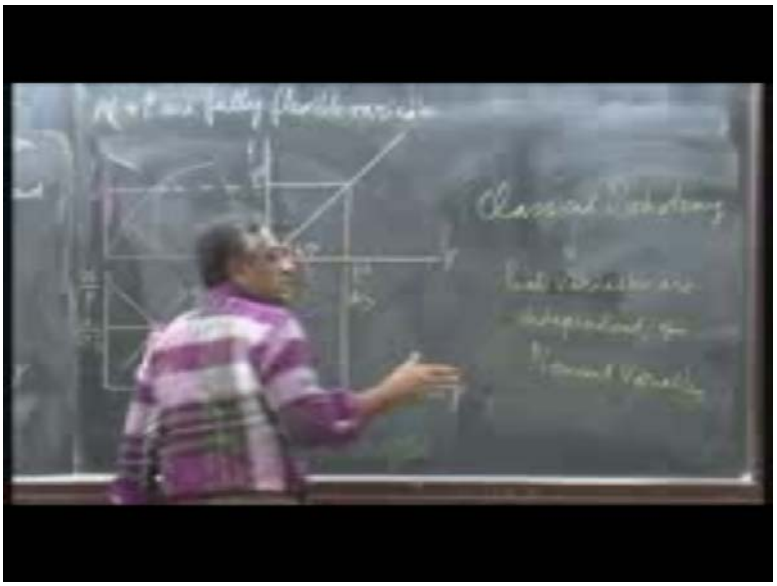

This is called classical dichotomy classical dichotomy essentially says the real variables are independent of nominal variable. This is very important real variables are independent of nominal variable classical dichotomy says real variables are independent of nominal variable you just show that if ordinary. We will say money supply changes does not act really dichotomy what meaning if dictionary meaning of judicial is break up this side of a class and that side of class is completely dichotomy. This type of clasps what will done and also say the other class all right. So, classical dichotomy is highest result which emerges for the classical normal assumption where effect that we discuss. And also very which may final gets round is that is a classical dichotomy in the macro model where real variables completely independent in the nominal variables, but our nominal variables completely independent or real variables.

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Suppose I shift the labour supply function employment will change real wage will change. Suppose I shift this is the last point I shift the labour supply function real wage will come down. Economic employment will increase output will be increases modified are supply to the right demand function is there prices would not fall immediately if the vertical average supply for same reason shift. Suppose the labour supply function shifts was some reason when the economy drops the employment in the economy goes up the output. In the economy goes up you come through the 45 degree line and you find the new function. And suppose you already had a demand functions suppose if you have the demand function if that happens clearly the precise will fall and the output will increase.

So, the nominal variables like wises are not independent or real ways if there is any real change that they are the supply demand function not the interested nominal variables like cries. So, the economy goes from the other way out that if the people do not no the people. So, that is how we solve the problem, first we solve the level market output and then we got prices determine the prices, but nominal changes supply are, is it. So, the classes become very clear real variables those are independent problem. But all the variables are not independent they depend up on the model I told you. So, this is the understanding things for the classical model slightly complicated but not much.