

**Micro Foundations of Macroeconomics**  
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**Lecture - 29**  
**New Keynesian Sticky Prices III**

Welcome back. So, we were talking about the sticky price model the new Keynesian model and we will continue further in this particular topic. And we will try to understand that how certain dimensions can also be added and can also be understood with the help of certain conditions. For example, what happens when we have the liquidity trap in the last session, we also discussed about what happens when we have the constant productivity increase.

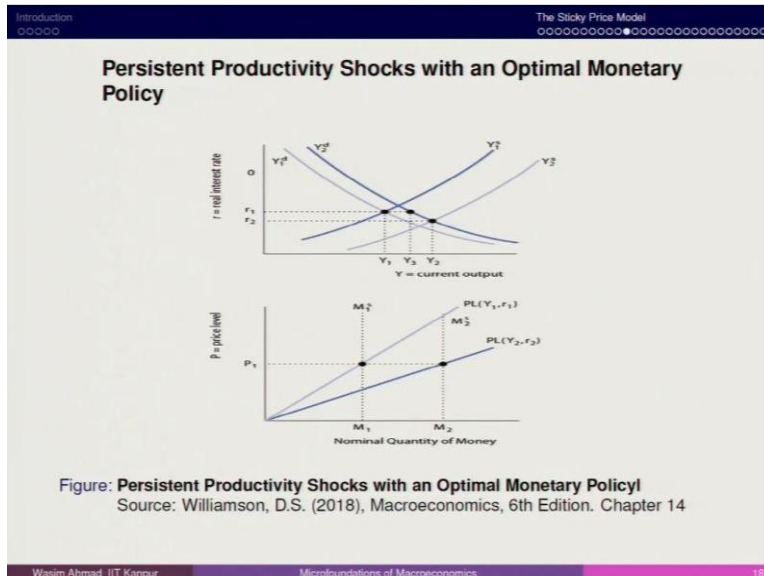
If your persistent productivity increase will be also seeing in today's session. About the further I would say criticisms of the new Keynesian model. So, under that will try to understand that whether the conventional monetary policy or the unconventional monetary policy will help us decide. In this particular context just to recap things we have already discussed that the money is not neutral in the Keynesian setup, which means that monetary policy is evolving within the system.

And it is a very obvious argument that if you have the monetary policy independent. Then it may happen that we are examining the monetary policy independent of the economic output whatever are the economic scenarios. Here in this case as per the new Keynesian school they assume that if you have a monetary policy change. For example, rate of increase or decrease in the policy rate then it happens that the banking sector gets also the boost.

And they also have the good businesses and there is some kind of interlink between the central bank policy rate change and the banking our financial sector outlook. So, if everything is dependent upon each other then we cannot think about making monetary policy as exogenous variable that we have seen in case of neoclassical or even in case of classical. Here, the liquidity trap or the condition in which the money and the government bonds become the substitute perfect substitute.

So, in that situation how the; new Keynesian model will react. In the last session also, we had highlighted about to what extent we can understand the real business cycle analysis. And how





It looks very smooth in the sense that when we assume certain aspects about the economy then, it works like if you have money supply increase then this it means that it leads to decrease in rate of interest. Once you decrease in rate of interest then it creates a better investment scenario, as a result you have the consumption scenarios also boosting because individuals will be looking for more consumption as compared to future.

Or if the rate of interest is lower than then the individuals will not be trying to save more. So, which means that it also creates the demand immediately in the economy and everything comes on track. So, in terms of economic recovery one of the major advantages is this. Second thing is that if you are having the stabilization scheme through fiscal policy which means that either you have decrease in taxes.

Or some kind of subsidies being offered or the government is taking a stand through some transfers. So, if you have that kind of transfer then it matters a lot that how you have the revival of the economy taking place how the government is trying to take forward the growth and progress in the economy. So, stabilization in the sense that if you have any shock the unexpected shock coming into the system and it disturbs the whole equilibrium pattern in labour market in money market in goods market.

Then how we can bring back towards equilibrium. So, the idea is that the fiscal policy alone will not be efficient enough to bring equilibrium in the economy. You will have to combine with the monetary policy. So, if you are just relying on the government then it may happen that

you will have the rate of interest increase the price will also shoot up. So, if price is going to shoot up then of course the central bank will also react.

And then if you have the government expenditure only participating through the higher borrowing then that will also create further trouble. So, that may be linked with the borrowing scenario that we had that previous period bond issued will have some carry forward for the future period. So, in that context it becomes important. Here the idea is that if you have no change in monetary policy which means that if government is not intervening anything.

So, productivity shock creates a very good scenario so there will be a rightward shift in aggregate demand this will also create a scenario where you will be at the aggregate supply shifting rightward. Now, this aggregate supply shifting rightward so, if you have the fixed prices which means that price is fixed. So, money supply here you have  $M_1^s$   $M_1$  and here you have  $M_2$ .

So, this shift that you have so, the output gap that we have created without taking any major. So, your output is just moving from  $Y_1$  which is the initial equilibrium point  $M_1$  and  $P_1$ . It is moving to  $Y_3$  without any interference in the policy. But if government if the central bank takes the decision if the government takes the decision about the increase in money supply, then this brings the output. So, rate of interest will be lower output will increase.

So, the output gap without any policy stand is  $Y_3$ . So,  $Y_3 - Y_2$  is the output gap and this can be only filled when you have the monetary policy stand taking place. So, more or less if you think from the new Keynesian and new classical perspective it remains same, not much change the adjustment scenarios are more or less same and that is why in the textbook when you read.

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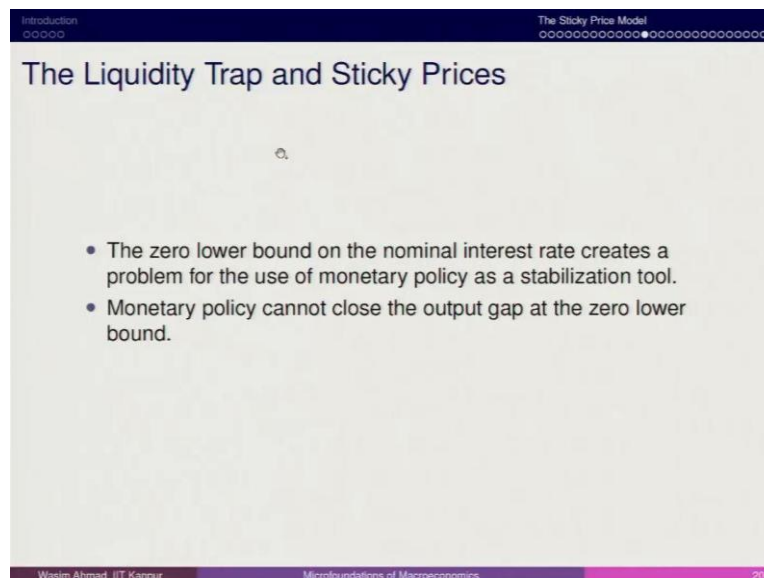


Or I would say better technology availability has decreased the chances of not changing the price quickly so you have every time. So, the menu cost example that I think I discussed also in the last session that in case of menu cost example when we are assuming that if a price change, then the restaurant owner may not be liking to increase because he or she is facing some kind of uncertainty.

That whether the cost involved in printing of the; new menu when they will be able to recover. So, all those dimensions are well accepted. But when we are talking about the technological change the market acceptance then most of the restaurant or food chains, they all often go for regular change in their menu. So, they have to update every time not with just pricing but also with their items they sell.

So, those are the conditions under which we can always think about having some kind of very ambiguous understanding about stickiness. So, maybe for a very short period this could be an example. But even in the short run we find that it is not very likely that the price will be fixed for a longer period. There will be a chance that prices will be changing quite quickly and this will bring about equilibrium.

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The slide is titled "The Liquidity Trap and Sticky Prices". It features a dark blue header with "Introduction" on the left and "The Sticky Price Model" on the right. The main content area is light gray and contains two bullet points:

- The zero lower bound on the nominal interest rate creates a problem for the use of monetary policy as a stabilization tool.
- Monetary policy cannot close the output gap at the zero lower bound.

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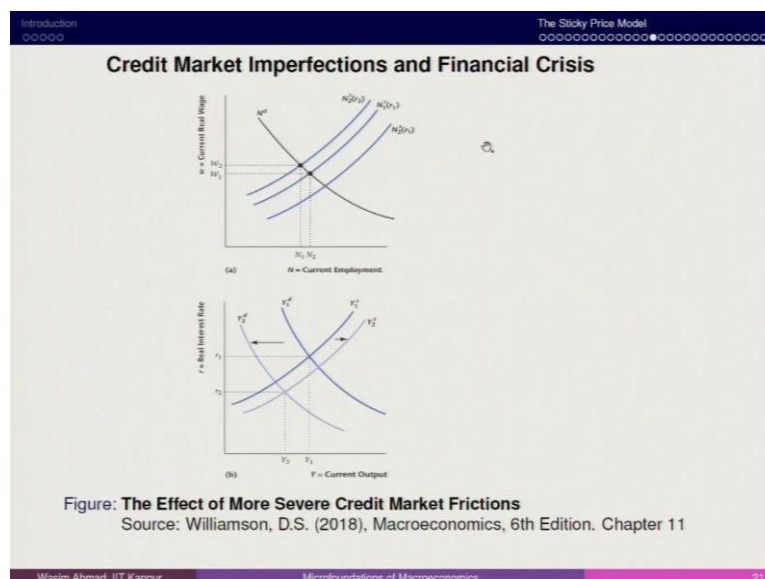
Now, here we have the liquidity trap and the sticky prices. In case of liquid trap we found that when we have the; it is also one of the stabilization tools but in case of liquidity trap, it happens that monetary policy becomes ineffective and then you have the fiscal policy reviving the

economy. So, you should have the combination or you can go for unconventional monetary policy steps.

What are those in unconventional monetary policy steps is? That you go for negative interest rate. You go for quantitative easing that you have. So, if you have that kind of scenario how does so these are the special cases I would say for the new Keynesian school of economic thought and since the Keynesian school of thought propose this idea. So, they cannot deny that they will not be having such type of scenario.

And most of the first world economies are having such scenarios. So, we are looking at those dimensions. So, here monetary policy cannot close the output gap at the 0 lower bound so let us understand that.

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So, before we go for the liquidity trap scenario, we can also see that how we can understand the credit market imperfections. So, if you remember we were talking about credit market imperfections from the perspective of how in the financial market the borrowing and lending rates are different, how we have the default I would say premium charge by the banks from the good borrower and also from the bad borrower.

Then we introduce the concept of credit market asymmetry where the lender is having limited information about the borrower. Then we also introduced the concept of limited commitment. What was the concept in limited commitment we introduced the idea? That when the borrower

is being asked to surrender some of the valuable assets which has the characteristic that the value of that asset will increase in future if the bank is going to hold.

Then the borrowing capacity of the borrower will depend upon the collateral or the asset that the borrower is going to surrender. If the asset price is going to go up the borrower will have higher borrowing capacity. If the asset price is going to come down borrower will have a limited capacity. So, in 2008 when or I would say 2007-08 when we had the global financial crisis and that started with the housing sector in US.

So, at that time the credit market asymmetry was linked to the decline in the prices of the collateral. So, if suppose somebody has borrowed the money from the bank by putting a house or house as collateral. So, at that time the house prices had gone down are quite significantly and this had also reduced the borrowing capacity of most of the borrowers and even the banks were facing uncertainty with regard to the regular payment because the macroeconomic scenarios were not that favourable.

So, during 2007-08 at global financial crisis it came out that even subprime borrowers had a very difficult time and this that is why it is often called as subprime crisis. So, subprime crisis is one of the important avenues to look at. So, credit market imperfections how it leads to financial crisis it works in this way that you have asymmetry of larger default. Larger defaults are further creating uncertainty in the economy.

So, you have more pessimistic scenario so maybe you can link it with the strategy complementarity that we discussed in last session that how you have the strategy complementarity is playing very important role. In what we had the theory of coordination failures so if you have a coordination failure happening in the economy. So, one sector is having higher default in the housing then this is having further repercussions on the consumer then further investment and all other.

So, your economy is completely entrapped if your economy is completely entrapped then that becomes really difficult to revive. So, in typical cases what happens that if you have the credit market asymmetry then what typically happens that you have the lot of pessimism prevailed. And this creates the downward shift in this. So, here you have  $r_1$  and  $Y_1$  as the initial equilibrium point, what we can see is that here you have the leftward shift in demand.



So, if you have leftward shift in demand and here because there is a lot of asymmetry you have lot of uncertainty. If this uncertainty is creating more scenarios, then in terms of your labour, labour will be working for more number of hours. So, in order to if they are working for more number of hours producing more output. You have rightward shift in output supply but the decrease in demand that you have.

Because of uncertainty will be much higher than the aggregate supply shift and what happens that the economy moves to a lower side of the economy. So, here your output shrinks rate of interest also comes down. So, because if the central bank is going to revive but what typically happens is that your employment will also be lower. Because the firm would be willing to supply because they still hope that the economy may come back.

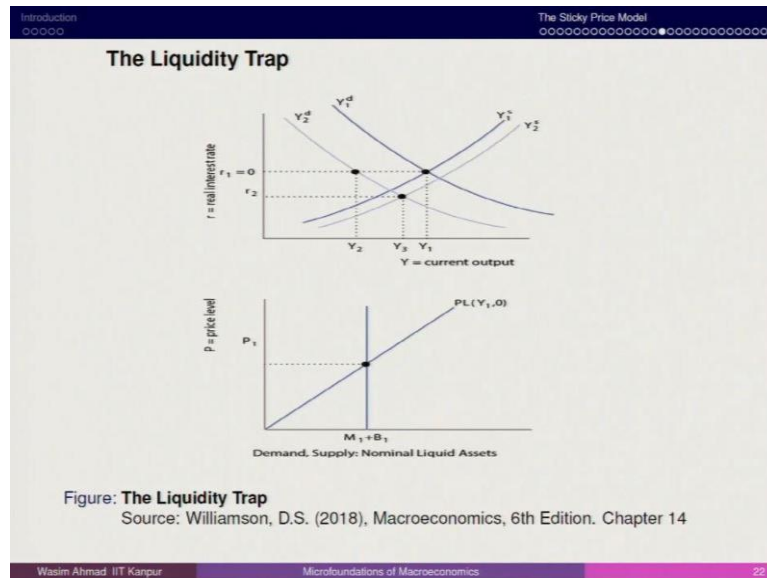
Because this is not because of the real side of the economy it is because of the credit side of the economy. So, maybe the signalling is not passing through easily. So, this could be the reason and here you have  $N_1 N_2$ . Here we can see that the wage rate has gone up but there are certain, I would say unexpected outcomes. In this case that the rate of decrease in output will depend on how the labour is going to anticipate about the future scenarios in the economy.

If labour anticipates that this is going to persist for a more period of time, they may say that they would not like to work or if it persists then you have further decrease in demand. Further decrease in demand bring slowdown in the economy slow down which means that you have lot of inventory or I would say glut kind of scenario over supply price will crash and then this creates a very awkward situation for the economy.

But this the wage rate increase is also very uncertain in this case because wage rate increase may not be directly linked because you are here you have  $N_2^S r_2$ . So, credit market imperfections it is more or less it is linked with the asymmetry with the limited commitment problem and this ultimately impacts the macroeconomic outcome by decreasing output and also decreasing the labour supply which means that employment will be lower wage rate may go up or down.

But in this case, it is up and this could be because the labour is not able to price the fall in the demand due to credit market imperfections. If it is pricing then this will also be this will also not be the same scenario. So, this is what we mentioned about credit mark imperfections. Now, from here with this similar kind of setup we will be putting into the liquidity trap situation.

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So, here is the liquidity trap situation here you have the  $Y_1$ . At this  $Y_1^s$  and  $Y_1^d$ , here you have the equilibrium what we are saying that since it is a liquidity trap situation. So, rate of interest is really low so may be equivalent to 0. So, your real rate of interest is equivalent to 0 which means that since we have already assumed the inflation as 0. In real interest rate so if normal interest rate is also equivalent to 0. So, you have real interest rate becoming 0.

Because real interest rate is nothing but the normal interest rate minus inflation. We have already assumed in monetary inter temporal model that rate of inflation is going to be 0. So, if I am putting a condition that the nominal interest rate is also 0 then it means that real interest rate is going to be 0. So, here you have  $Y_1$  scenario if you have the and this  $Y_1$  scenario since we know that at the liquidity trap situation.

We are having a scenario in which we are having the fixed prices. At this point where, you have the aggregate demand and aggregate supply moving up and down. So, here you have aggregate demand aggregate supply. So, this is equilibrium point, at this point the real rate of interest is 0 output is  $Y_1$ . Now, here we are saying that if the central bank since the monetary policy is ineffective.

So, even though if the central bank is thinking about doing something it will not have any impact rather it will create output gap. So, economy may move to  $Y_2$  and this is primarily linked to the ineffectiveness of the monetary policy less of demand of the money and since money supply and the bonds both become substitute at the liquid trap. So, people are not so much bothered about the purchasing power of the money.

If the central bank wants to correct this output gap  $Y_2 - Y_1$  then this can be linked this can be done either by two ways; one is that the central bank can perceive the negative interest rate or the unconventional monetary policy. For example, negative interest that I mentioned in most of the first world countries this the government has gone for such type of policies. Second aspect is that they can go by quantitative easing.

So, what is the quantitative easing that you have? In case of quantitative easing the normal scenario is that in the normal set of open market operations when you go for buying and selling of government assets government also purchases the long-term assets which means that the stressed asset it can be also the stressed asset. So, stress asset means that you are holding a long-term bond but you are not sure that whether you will be able to get or you whether this bond will be able to mature or not.

So, central bank purchases that also so which means that you have excess supply of money going into the market. Typically, the case that if you are holding the bond if, you are selling to the central bank central bank will keep the bond pay you the money that you have it which means that you are going to get extra money. Extra money will be further pumped in the economy.

So, in the unconventional monetary policy setup either you go for the zero lower bound that we have, or you go for negative interest rate negative interest scenario may create a possibility here that people will be discouraged to save money and banks and financial institutions will not be allowed and they will be rather charging. So, that kind of situation may help reviving the economy and reducing the output gap between  $Y_2$  and  $Y_1$ .

But in normal scenarios until unless central bank or the government introduces the fiscal policy majors then only the liquid trap can be broken and the economy may move out of liquidity trap.

In most of the situations we do not find that kind of understanding and we often find that when we have liquidity trap situation then the especially after 2008 global financial crisis the conventional unconventional monetary policies have played very important role. So, this is how it looks like that this is how we operate.

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The slide is titled "Unconventional Monetary Policy: Negative Nominal Interest Rates". It features a dark blue header with "Introduction" on the left and "The Sticky Price Model" on the right. The main content area is light gray and contains three bullet points. The footer is purple and includes the name "Wasim Ahmad, IIT Kanpur", the course "Microfoundations of Macroeconomics", and the slide number "23".

- Zero need not be the lower bound on the nominal interest rate.
- Effective lower bound less than zero – experience in Switzerland, Denmark, Euro Area, Sweden, Japan with negative interest rates.
- In New Keynesian model, may be able to eliminate the output gap at a negative nominal interest rate.

So, zero need not be lower bound in the normal interest rate. So, in case of US economy what had happened that during 2007 at global financial crisis when there were a lot of uncertainty central banks had gone for reducing and fed reserve had gone for reducing the rate of interest and it was almost like 0.25%. So, here it is the in most of the countries you will find that for example Switzerland, Denmark, Euro Area, Sweden, Japan has all such type of characteristics with negative.

In the new Keynesian model, maybe eliminate the output with the negative normal interest rate but you can also link it with the fiscal policy scenario if the government is going to take measures if it increases the government expenditure then this will further increase the borrowing in the market and once you have the borrowing in market rate of interest will start going up and the substitution that you have between money and the bond this will break.

And further the liquidity trap situation may not arise and economy will move. And again when it moves out of the trap then there again you have the monetary policy coming into and brings about equilibrium. So, that we always refer it.

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So, these are the dimension, I hope you are able to understand the fresh water and salt water schools of economic thought. So, fresh water belongs to neoclassical you have salt water coming to new Keynesian and these two schools of economic thought bring harmony to the macroeconomic understanding. And you are at least following for you are able to follow the recent development.

So, now we will be moving towards the art of monetary policy making and I will be stopping here. Now, thank you, thank you so much for your attention.