

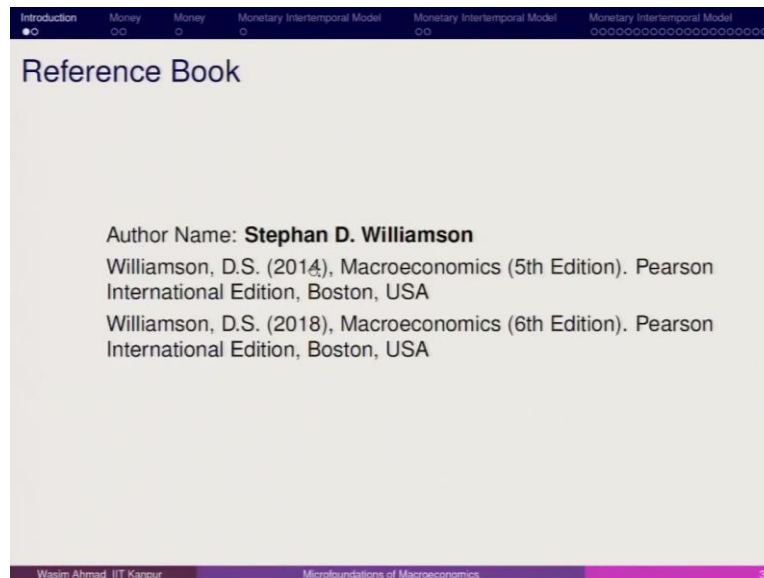
Microfoundations of Macroeconomics
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Lecture – 23
Sticky Prices III

Hi everyone. So, let us start. We are going to start we were talking about the monetary intertemporal model and we were trying to understand that how alternative means of payments facilitate the understanding of macroeconomic. So, we were introducing and discussing about the demand for money wherein in which all situations it can help understand.

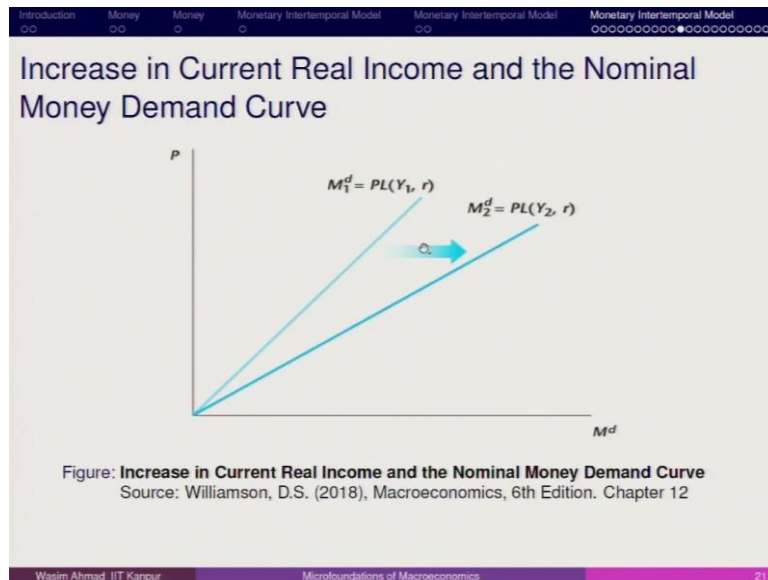
So, we were understanding the direct relationship between demand for money and then the real income and also we were talking about the demand for money and the interest rate that we have. So, now we will be taking forward.

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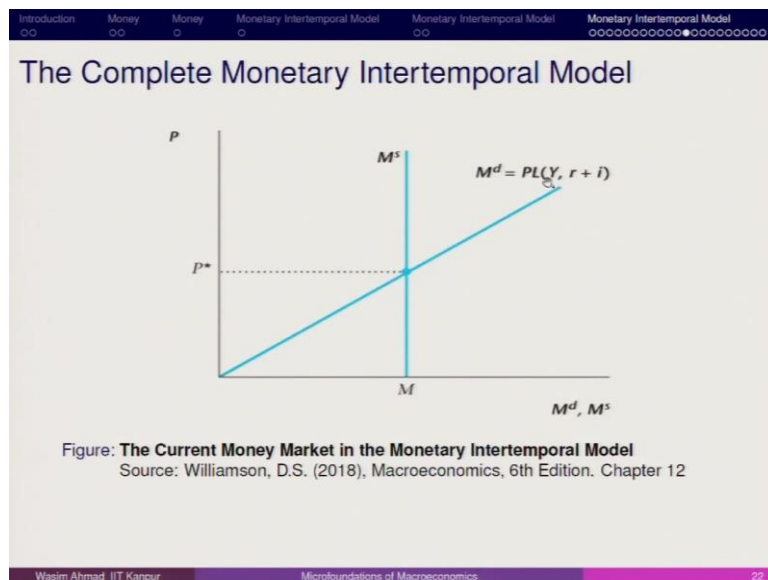
So, for this particular lecture the reference remains same the Williamson and then we were discussing here we were talking about how we can determine the demand.

(Refer Slide Time: 01:00)



So this is what we are talking about the rightward shift. So, if I am here I have this much demand the moment. So, here I have this much demand, but the moment we have the rightward shift then I see that we have the higher increase in money demand. So, this is directly linked with the price. So, if the increase; if you have the increase in prices then you can understand the relationship how it is moving forward.

(Refer Slide Time: 01:33)



Now let us understand the intertemporal model monetary intertemporal model what typically happening is that here we are seeing that here you have the demand for money. Here you have $PL(Y, r + i)$ we are assuming i at 0. So, it is just $PL(Y, r)$ the money supply it is coming from the equation that we use just now for the government. So, I am talking about here that money supply rate of growth in money supply.

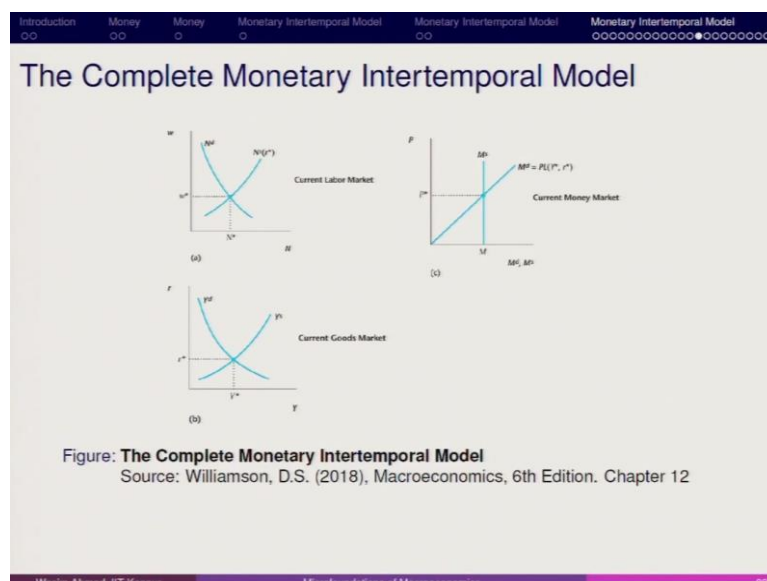
If this is the money supply then the intersection of this decides about the equilibrium prices in the economy. Any shift in the money supply will lead to rise in prices and then here again the money supply will increase. Any decrease in money supply will also reduce the prices. So, here if you have decreasing scenarios then you are seeing that price is decreasing. If you have increase in money supply so price and money supply have the direct relationship.

So, that is why we see that whenever we have inflationary pressure in the economy we have the Central Bank coming into picture. So, whenever you have the rise in inflation we see that if the economy function normally not the abnormal situation that we are facing right now the pandemic, but we have normal functioning economy in that whenever we see rise in inflation the rate of interest also increases and that is what I am trying to explain here.

But if you try to understand the monetary intertemporal model then you have to introduce two more agents one is about how is the aggregate economy functioning second is how the labour market is reacting. So, in the setup if you want to understand the monetary model so you will have to understand the output, the role of the government then we will have to also understand about the labour market and then we will be superimposing this condition.

And then we will be further deriving the neutrality context that I was talking about. So, in most of the situations this is what happens.

(Refer Slide Time: 03:42)



Now in this setup what we are trying to see is that here we have the demand and supply of output so here in most of the situation so here we are talking about goods market, labour market

and money market and these are all in the current period. So, what you have is that the intersection of this deciding about the aggregate or the equilibrium real interest rate and corresponding output.

Here we are also seeing that labour market clearing and this labour market clearing is deciding about determining the wage rate and the labour supply so this is how we have the labour N. In the money market we are seeing that the equilibrium price it is decided by the demand and supply intersection. So, overall it looks very clean that how this monetary intertemporal model works.

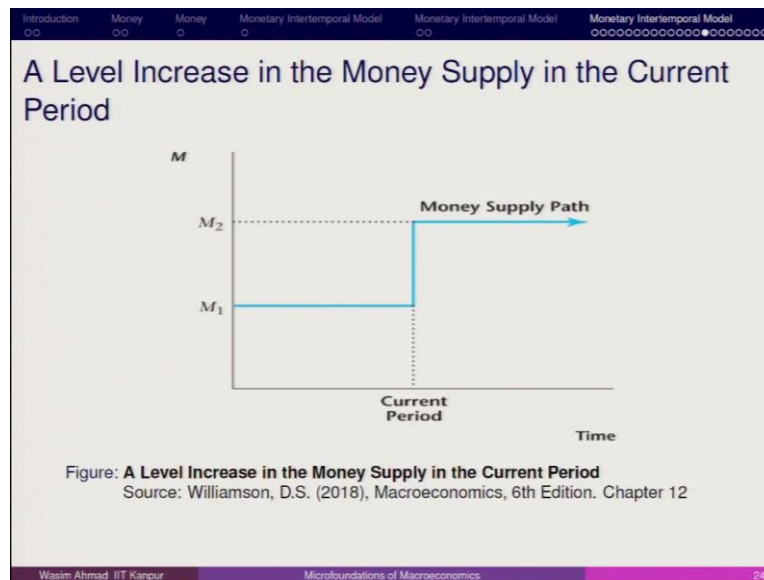
But here it would be good to see that when we are going to change this scenario M supply then whether this is leading to the change in the market of what we call it the goods market or the labour market. If it is not then this brings to the controversy of what I just mentioned the neutrality of money which means that it goes with the Milton Friedman idea that inflation is everywhere in the monetary phenomena.

So, if you are going to pump the money supply in the economy this is going to increase the price. So, this increase in price may not be reflected in all your real variables it will be only with the nominal variable. So, any increase in money supply has the nominal effect, but real variables like for example employment and labour this may not change immediately. As the example could be that if overnight the Central Bank is going to put excess money in the account of everyone which means that it is going to increase the money supply.

But this does not mean that the output in the economy has increased it may translate into that if the prices are also going to be in the same way because everyone will be asking the amount of goods and services then the price is going to shoot up. So, if you have a money supply increase by 10% then it is always expected that the price will also rise by the same amount considering the bottleneck or structural transformation which is required in most of the economies may not be assumed here.

But in direct sense this is what the macroeconomist often assume. So how if I am saying about the money supply so let us first we have introduced the money supply here the exogenous it is fixed because it is decided by some agencies by the Central Bank or the government so it is not coming from the model as such.

(Refer Slide Time: 06:37)



So, here if I am mentioning about the money supply. So, money supply in the sense that if we have a two period so current and future periods are having the money supply growth increasing then M_1 M_2 scenerio so here we have this is the point one if everyone is expecting about the increase in the money supply or everyone expect that the money supply forever.

So, this money supply can be augmented in two ways either by you go by simple by giving the since you are assuming both the money supply and the monetary policy and fiscal policy then this could be because of the government intervention or it could be simply seigniorage or it could be either the bond issued in the previous period it is going to be mature in the current period.

So, whatever amount of money that individuals are going to get by maturing the bond that will also lead to increase in money supply. So, the path of money supply looks like this. It also require some kind of dynamic system to understand, but in the simple context we can put it in this way and level increase in price in the current period so this is how it looks like.

(Refer Slide Time: 07:54)

Introduction Money Money Monetary Intertemporal Model Monetary Intertemporal Model Monetary Intertemporal Model

The Neutrality of Money

- In the monetary intertemporal model, a level increase in the money supply increases the price level and the nominal wage in proportion to the money supply increase but has no effect on any real macroeconomic variable.

Wasim Ahmad IIT Kanpur Microfoundations of Macroeconomics 25

So, neutrality of money that we are going to introduce now what it says that it says that a level increase in the money supply increases the price level and the nominal wage in proportion to money supply increase, but has no effect on any real macroeconomic variables. This we will be trying to understand through the next chart that we are going to have.

(Refer Slide Time: 08:18)

Introduction Money Money Monetary Intertemporal Model Monetary Intertemporal Model Monetary Intertemporal Model

The Effects of a Level Increase in M —The Neutrality of Money

Figure: **The Effects of a Level Increase in M —The Neutrality of Money**
 Source: Williamson, D.S. (2018), *Macroeconomics*, 6th Edition. Chapter 12

Wasim Ahmad IIT Kanpur Microfoundations of Macroeconomics 26

So, what we are seeing is that there is we are putting a scenario here we have the current goods market, here you have the current labour market and here you have the current money market. What we are seeing that because of this money supply increase this is the initial equilibrium point at M_1 and P_1 . Now we are seeing that now we are seeing that because of this rightward shift in the money supply here we have the price level rising.

And this price level rising it is not having any kind of impact on the labour market and also on the money and or I would say goods market. What is happening is that in the current period whenever I see increase in money supply then this is having a direct relationship with the prices only not with all other variables. Now this controversy brings to what we call it the neutrality that money supply is neutral as long as it is not impacting all other variables.

And it has direct bearing with the prices. So, this is how the monetary economist often argue that the money supply increase or decrease should always be linked with the proportional increase in the prices. Now here we are talking about the; so here from supply side we are more or less clear that from supply side we can think about how we can increase or decrease the money supply.

So, money supply is decreasing I see fall in prices, but this fall in price may not be immediately reflected. So, we are dealing in the current period itself not in the future period. So, in future period there might be some adjustment, but in the current period we are seeing that this is having immediate bearing on the prices only and this is one of the reasons that when you try to understand.

So, this could be that the money supply increase that we have this could be because either the maturity of the previous bond or government has given some tax incentive or government has gone through the open market operations that is what we have the maturity of the bond buying and selling or it could be through what we call as the seigniorage process which is the deficit financing that government has gone and borrowed money from the Central Bank.

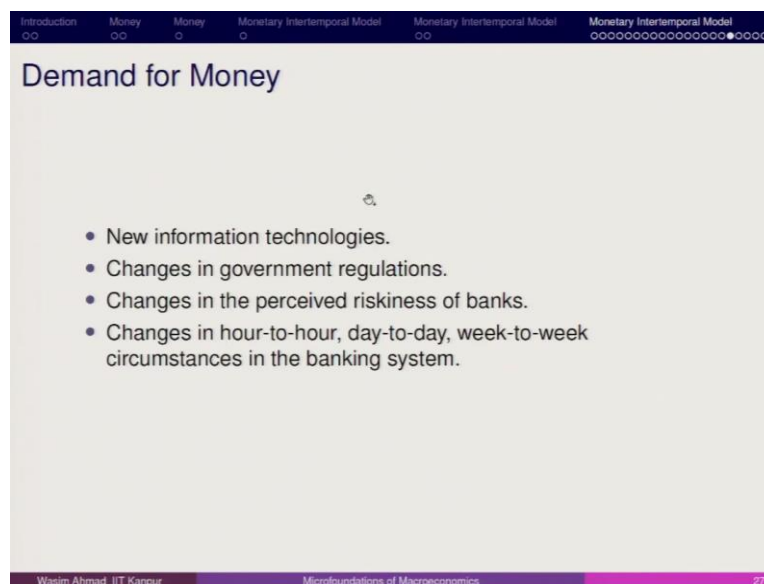
So when the Central Bank gives money to the government then government in turn will simply allow the Central Bank to paying to more currency and it will be simply pumped in the economy. So, deficit financing is also possible in this case. So, I hope it is clear that in the current period when we are trying to understand the monetary intertemporal model then here more or less we are able to understand the neutrality context.

So, classical dichotomy though it is a controversial topic and economist have often disagreed there are still agreement and disagreement on this particular topic, but overall the analysis looks more familiar if we are going to see only in the current period framework because if we think

about the intertemporal then in the intertemporal context in the future period what will happen because of the price increase the labor market will also function.

So, I would say in the very short term this could be one phenomenon, but the economist often argue that in the long term also some of the supporters or monetarist idea they often mention that even in long run this is going to be the same scenario even some argue that this is short term phenomenon if I want to read more about it I think this particular topic gives you an opportunity to explore about the neutrality concept that we have in the macroeconomic context and also in the context of I would say the monetary economics.

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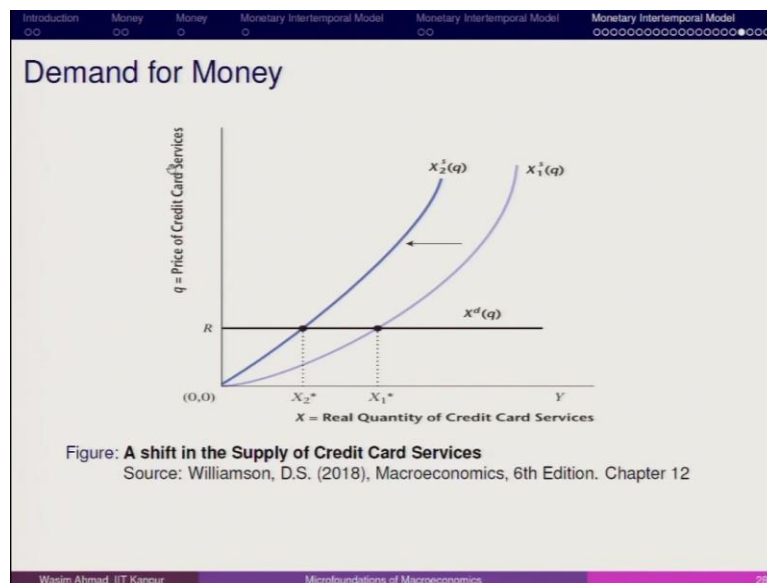


Now let us talk about the demand for money, demand for money can be linked with the scenario you have the new information technology. So you have the Fintech for example financial technologies companies coming into these technologies company also are providing lot of investment opportunities to individuals at the finger tips and there you have the easily available resources to channel your cash holding.

So, that is also linked changes in government regulations, government if it is not allowing for the investment in certain assets which is diverting money towards other for example these days you have the mutual fund becoming more lucrative investment option because it has been given incentive and directed towards having a better income generating scenario so everyone is interested.

Changes in perceived riskiness of banks many individuals do not like to go to the bank rather than simply invest in some other instruments. The stock market functioning is also having a limited role and since the banking system is also improving on its services and these improvements have led to increase in transaction level so that is also having bearing on the demand for money. So, these are the challenges.

(Refer Slide Time: 13:30)



But if you try to look at from the demand for money side so here you have the price of credit card services. We see that if you have a decrease in the demand for money then this how it is leading that here you have the decrease in the demand for credit card services. So, if you have the less of transaction happening because more and more people are now are using debit card or something because of this technological changes.

Then you see you have a limited dependence on the credit card services and this will be further impact the price of credit card so this is how it is linked.

(Refer Slide Time: 14:12)

Introduction Money Money Monetary Intertemporal Model Monetary Intertemporal Model Monetary Intertemporal Model

The Liquidity Trap

- Typically thought that the nominal interest rate cannot go below zero (though in practice, not quite correct).
- There is a zero-lower bound on the nominal interest rate.
- At the zero-lower bound, money M and B become perfect substitutes.
- Liquidity trap: Open market purchases of B by the central bank will not matter.

Wasim Ahmad IIT Kanpur Microfoundations of Macroeconomics 29

Now we will be talking about a scenario or situation in that we are trying to understand that if you have a scenario in which we are superimposing our condition that suppose for example if the Central Bank decides that the rate of interest should be very low and the money should be in the reach of everyone that if the rate of interest is low then everyone will be looking for borrowing from the banks.

So, if the individuals are looking to borrow from the bank then it is really, really important to think about how they are doing it. So, whether in real life it works or not. Since I have two instruments here so here we have a money and the bond and individuals have the option to choose. So, at the zero lower bound here you have the money M and B becoming perfect substitute.

So, if you have a money and bond holding becoming perfect substitutes so it means that the rate of interest on the money offered and the bond offer are same then you have the liquidity trap situation. So, individuals are not having any incentive so if you are having money if we are going to park in a bank it is offering you almost zero rate of interest and if you are having I would say even if you are trying to divert or go for diversification of reinvestment you have no opportunity.

In that case even if you have the pumping of money it is not going to have any kind of impact. So that kind of scenario we often linked with what is called liquidity trap. Liquidity trap is a special case and that is why some of the economist have often argued that in case of fed when

we had 2007-2008 global financial crisis during that the fed had gone for reducing the rate of interest almost to 0%.

Now the idea is that what we have learned from here that if a money supply increasing so if you have a rate of interest lower almost close to zero then this money supply should lead to increase in the price level or rise in the price level, but this is not happening. In most of the first world countries wherever the Central Bank has gone for reducing the significant rate of interest where significant amount of rate of interest decline or if you have the Central Bank decreasing the interest rate almost lowering till 0 or close to 0.

In that situations what should have happened actually it should happen that the inflation should have gone beyond control because you have the expansion of money supply, but this has not worked and that is why you have Neo-Fisherism coming into play you have new school of economic thought who are arguing against this that if you think that because of this money supply increase due to reduction in the rate of interest.

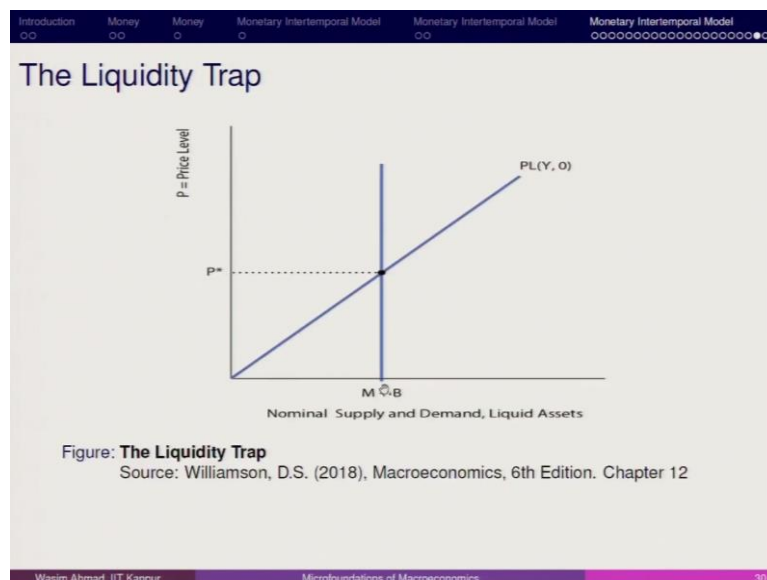
It is going to help you a lot in quicker recovery of the economy, more demand for goods and services, you have more of fundamental factors playing important role and there will be quicker recovery that is not going to take place that most of the economies are having that kind of scenarios to look at where inflation has not gone up much which means that these instruments are not playing important role.

Now, if you have M and B becoming perfect substitutes money supply and bond market becoming perfect substitute then here the open market purchase that you have in open market typically the government will go for increasing or decreasing the money supply through buy and sell of the bond. So, if you have a bond and money supply becoming both perfect substitutes individuals are indifferent.

So even government is trying to increase the liquidity by trying to sell the treasury bill or any kind of instrument in the bond market which in India we have the gilt edge market than individuals are not going to bother about because they will not care anyway the rate of interest offered by holding the cash or if I am keeping in the bank or buying the bond it is having the same scenario.

So, let us not get interested in that so this is the ideal situation and this particular topic I hope it enlightens you to understand the liquidity trap in a much better way rather than simply thinking about the money supply increase and this money supply increase is leading to the liquidity trap. It is also linked with the substitution which is happening between money and bond.

(Refer Slide Time: 19:02)



So, that is what we have $M + B$ and this is intersection of the price. So, $M + B$ even if these two are substitute it is not going to matter much and this is what we always mention about the liquidity trap and here R becomes 0 so here you have the zero lower bound so here you have $PL(Y, 0)$ so this is what it means.

(Refer Slide Time: 19:24)

Unconventional Monetary Policy

Since conventional monetary policy – open market operations – does not work in a liquidity trap, central bank can resort to (among other policies):

- Quantitative easing – purchases of long-maturity government debt and private assets.
- Negative nominal interest rates – going below zero to the effective lower bound, by charging banks fees on reserve accounts with the central bank.

Now here we have the unconventional monetary policy and conventional monetary policy. So, in case of unconventional monetary policy when we talk about two types of I would say measures where we often have a lot of role to play and what are those measures those measures are one is called quantitative easing and another is called negative nominal interest. What is the role of quantitative easing?

In most of the countries wherever you have economy going down or slowing down what will be the immediate rescue measure. Immediate rescue measure will be that we have to think about pumping the money in the economy. So, pumping the money will be that of course you have short term instrument so you can go for, but government also goes and buys the long term asset, long term bond so bonds maturing.

So, once we have the buy of long term bonds which means that the government is going to give you the money because it is buying back the bond. Now this money increase so individuals are suppose investing in your short term and also long term also. So, long term bonds are sovereign bonds maybe the 10 years maturity, 20 years maturity. We will have some kind of rate of or coupon attach.

So, if you have such type of thing then it matters a lot, but how these arrangements are immediately increasing the quantum of money in the economy. Once you have the quantum money increasing then this will create a more favorable scenarios for the borrowers because the rate of interest is going to be the lower and once it goes for lowering of the rate of interest if the purchase of bond it is accompanied by the expansion in monetary policy then this is going to benefit the economy in a big way.

But that has not been the case in most of the cases even after quantitative easing. Majority of the countries have been found that they are involved or the firms given opportunities they are involved in certain kind of arbitrage opportunities and that has not created enough opportunity, but the quantitative easing implies that these are countercyclical measures. So, when your economy is going down you look for more of investment and this investment can be financed by buying the long term bonds.

The second important concept in case of first world countries the quantitative easing if you want to read about you can read in case of US 2007-2008, then you had Europe, then in Japan

also you have. The second is the negative nominal interest rate. Interest rate will never; nominal interest rate will never be negative the real interest rate can be, but in order to provide incentives that if individuals are holding the cash.

And if the Central Bank is making a scenario that if you are keeping money in the bank if you are getting positive returns then you would like to hold, but if you are given a scenario in which the rate of interest has been put so low that it is discouraging you to deposit or keep money with the bank then what in turn it implies that the government wants to have more of a transaction demand for money kind of scenario where you have the consumption increase.

If the consumption increasing then this will create further employment in the economy. So, in most of the cases in Western Europe and mostly in the case of European economies we found that the negative interest rate is very common and this is mainly because it is discouraging individuals to save more and more and it is indirectly hinting that you should go for more of consumption and further expansion of the economy.

So, these are the concepts that we discuss, but as I just want to highlight here that quantitative easing is also having a some kind of drawback that as it was found that if the government is going to go for quantitative easing immediately by buying the long term then it may also happen that in the bond market you will have some kind of disequilibrium scenario and the money received by the sellers those who are selling the long term bond.

They may not be able to utilize everything immediately and once if they are not able to utilize then this glut will create extra pressure and which means that the banks and financial institutions will be looking for borrowers to disburse those extra money and it may also happen that from the economic expansion side it has been found also in some cases and that was also the case that majority of the beneficiaries of such schemes are diverting the money somewhere else.

So, if you are diverting the money not using the money for the purpose you had been given you are rather going for either automation or you are investing the stock market in some other locations geographies then that is also not going to benefit in recovery. So, one of the reasons why such type of unconventional measures are not very liked by the economists that such type

of measures have helped to some extent revive the economy, but these measures are not the ultimate ones.

The negative nominal interest rate scenarios are already controversial and especially to those pensioners and to those old age population this is creating a trouble because indirectly if the government is forcing the individual to not save so that is not also very good. In the scenario that we have here just one thing to mention that at the zero lower bound the money M and B become perfect substitute.

So, these two scenarios are again linked with here that it should not be so low that people are not caring about. So, negative nominal interest rate also create that kind of scenario. So, let me now summarize that we have covered in this particular topic so here we have covered about the monetary intertemporal model we understand that apart from the conventional monetary system that we have the certain alternative methods of payment also help us understand about the demand for money.

We then introduce the neutrality of money under neutrality of money we found that in the current period if you are looking at in a very tight context then the money supply increase it is having direct impact on the prices, but rest of the markets are not goods market and labour markets are not impacted then we superimpose the condition that what happens if have the demand or the supply of credit services going down which means that demand is having some kind of adjustment.

Then how we can understand that whether the supply of credit card services will be lower and this has to deal with the nominal interest rate scenario. So the nominal interest rate higher more of credit card usage less of cash. So, cash holdings will increase then we introduce the concept of the liquidity trap wherein we try to understand that if we have the zero lower bound scenario under that there is no difference or the investors are not indifferent.

So, investors are indifferent between the bond and the money. So, then in that scenario if M and B are perfect substitutes then it becomes really difficult to think about. So, either you go for substitution of money or the bond and then here you have the unconventional measures under that we discuss about the quantitative easing and negative interest rate. So, I hope these concept will strengthen your understanding.

We will be further talking about the classical view. So, new classical we will be talking about and then we will move to Keynesians and further dynamics. So, Neo-Fisherism idea will also be discussed. So, I am stopping it here. Thank you so much for your attention.