**International Economics**
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Lecture No. # 15

Good afternoon. Today we are going to talk about the forward markets and also discuss the covered interest parity. Now, this forward markets are a part of the derivative markets. And these derivative markets exist because you wish to hedge against the market risk. The market risks happen, if there are fluctuations and changes which exist in commodity prices, in stock prices and in the foreign exchange markets. Because, this is a course on international trade, so we will discuss these derivative markets and concentrate on the forward markets and how forward markets function and how forward prices are determined.

So, let us start with the covered interest parity. The covered interest parity is the counter part of the open interest parity that we saw while we were dealing with the spot markets. The open interest parity said that the expected rate of depreciation is a function of the differential interest rates. Now, this covered interest parity, relates the forward premiums and the forward discounts to the differential interest rates. The foreign currency is at forward premium if the forward rate is greater than the spot rate. The foreign currency is in discount forward discount if the forward rate is less than the spot rates. So, let us see what covered interest parity says.

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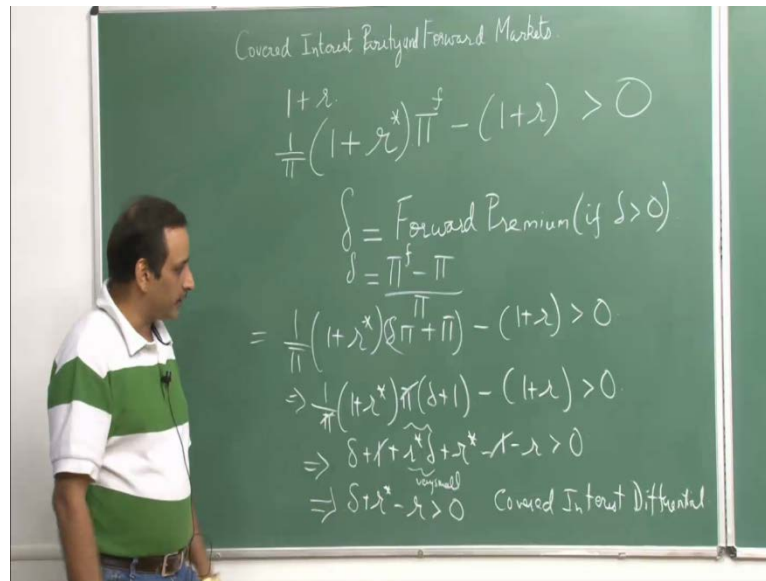
So, again if you have a rupee to invest you would get a return of 1 plus r at the end of the year if you invested in your own country. The other option is that you take this 1 rupee outside by converting it into the foreign currency using the exchange rate.

So, 1 by pi is the corresponding value of one rupee in terms of the foreign currency. If you invest it in their banks then, the return that you would get is 1 by pi 1 plus r star. Now, this is the return that you would get at the end of the year in the foreign country. Now, you want to bring it back. Now, instead of using the pi e that we did when we were discussing the open interest differential, we use the forward rate to convert the foreign currency into the local currency. Now, if this is greater than 0 then it is worthwhile to invest it in the foreign bonds. Now, what you need to define is delta which is the forward premium if delta is greater than 0 so, this is equal to pi f. So, then 1 by pi 1 plus r star; pi F is delta pi plus pi.
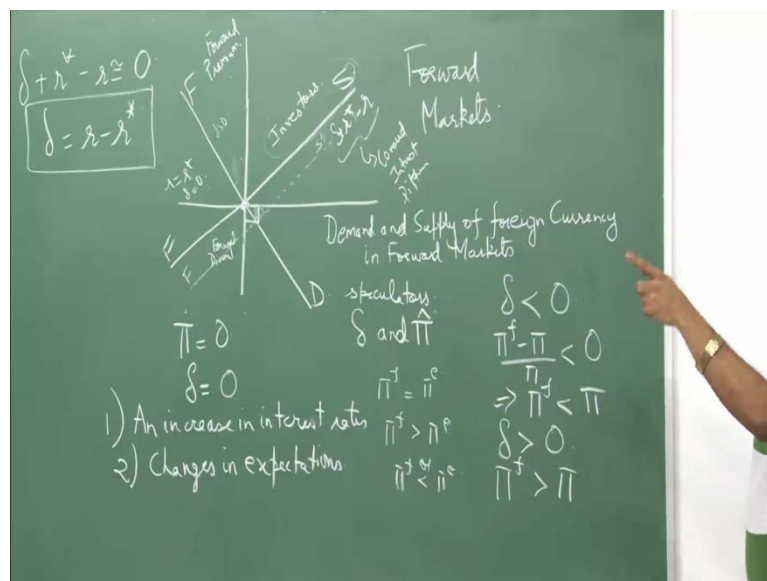
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So, what the covered interest differential is saying, this is the covered interest differential; that even though in the foreign country the interest rates may be lower, but, you may still be prompted to invest your money in the foreign bonds. If you expect that the foreign currency is been sold at premium, which is delta greater than 0. If this is greater than 0, then the return that you would expect is delta plus r star.

In the open interest differential, you would expected that even though you are getting the lower interest rate, but, if you expected the foreign currency to appreciate then the returns that you get would be pi hat plus r star. Here, if you expect that the foreign currency would be sold at a premium; premium would mean that the forward rate is greater than the spot rate. Then the returns that you would get would be delta plus r star minus r greater than 0.

Now, the covered interest parity follows in this case, you do not even have to assume that the investors are risk neutral. Even if you find this then, there will be incentive to invest in foreign bonds. What will happen? Eventually, will be that because the money goes to the foreign country. So, the r star goes down, r increases and delta which is pi F minus pi by pi. If pi goes up then, the delta goes down. Delta goes down, r star goes down, and r goes up.

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Eventually, even for a risk averse person you are you will find that delta plus r star minus r is equal to 0, approximately equal to 0. So, delta is equal to r minus r star. So, you are forward premium is determined by the differential interest rates.

Now, so, we need to have a closer look at the forward markets. To understand when you would have delta greater than 0, when will you have forward premiums, when will you have forward discounts, when will be foreign currency be in forward premium, when will it be in the discount. So, then let us relook at let us look at the forward markets.

Here, on the y axis you have the forward premium. So, now, we are looking at the forward markets. This is demand and supply of foreign currency.

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You have a counter part of the supply curve which is, the F s curve and you have a counterpart of the demand curve which is the F d curve.

Now, here in the forward markets now you need to distinguish between investors and speculators. Investors are driven by the covered interest differential which is delta plus r star minus r. They are ready to put money in the forward markets provided, there is covered interest differential, but, then there are speculators, who are in demand for foreign currency, who are speculating about the changes in the foreign exchange markets. And they also demand foreign currency in the forward markets.

They are driven by the delta and the expected rate of change in the exchange rates. Initially, at this point at 0 you have pi hat equal to 0, you have delta equal to 0. It is a situation of equilibrium where the forward demand is equal to the forward supply and you do not see any changes.

Now, again like when we were discussing the spot markets, we will assume one, an increase in interest rates and second, changes in the expectations. Now, before discussing these changes, which will shift the F s and the F d curves, we should first understand why is the F s curve upward sloping and y is the F d curve downward sloping? Now, think of this F d curve. If you find that delta is less than 0, so, delta is pi F minus pi by pi this is less than 0. So, pi F is less than pi.

Now, you are a speculator, pi dot is 0, this pi hat is 0, but, delta is less than 0; that means, the foreign currency is been sold at discount. So, pi F is less than pi. Now, see what speculators would do they would buy foreign currency at the forward markets and select at a higher rate in the spot markets later on. Remember the forward markets; forward markets are those where wherein you decide about the price today for a transaction which will be done at some future date.

So, look how speculators will make profits as soon as they find that the foreign currency is being sold at a discount where, pi F is less than pi they would buy foreign currency at

the forward markets and then select at a future date at a higher price in this spot in the spot markets. Now, think that so, you see this F d curve this is the demand for the foreign currency in the forward markets. So, as soon as delta is less than 0. So, if this is forward premium anything which is less than 0 would be forward discount.

So, when delta becomes less than 0, there will be a demand for the foreign currency in the forward markets. What would have happened if delta would have been greater than 0? Foreign currency is now being sold at a premium. So, in that case pi F is greater than pi e then pi e. So, then what will the speculators do? They will buy foreign currency in the spot markets and then select at the forward markets right. So, in that case the excess demand the sorry the demand for the foreign currency in the forward markets would be negative.

So, that is the reason that the F d curve is downward sloping and because speculators like earlier we had assumed, that they are not risk neutral they are also risk averse. So, if they are risk averse, the F d curve is downward sloping. Had it been a case that they were risk neutral, any differential they would have completely switched from one asset to another asset, but, they are hesitant to do it. Because, they are risk neutral. So, F d curve is downward sloping, it is not horizontal.

So, that is when you are talking of the speculation and when I talk of risk. Risk is about the movement in the in the exchange rate. It is that risk which is involved the changes in the exchange rates. So, and then there is another set of risk which is involved in the forward markets is that at maturity, there may be a default. You may say no I will not I will not give the money. So, there are set of risks which are involved, but, in here you have the case of default risk and you have the risk of the changes in the exchange rates.

(( )) the uncovered interest parity that we saw there the risk is you are you have expectations that is it you are irrationally speculating in the market, but, in the forward markets there is no speculation involved. I mean you set a rate at which you will sell your foreign currency or foreign bonds.

Yeah, but, the riskiness is in terms of the movement of the exchange rates in context with the forward markets.

The spot and the forward rates; so, here your, when I say that the speculators are driven by delta and pi hat, I am worried as a speculator because you are speculating about what would happen to the expected rate of change of exchange rates. So, it is the risk which is involved here and there is also the risk when I say its default risk. At maturity, there is a possibility that the other party refuses to give the money.

Because, it is it is a deal between say a and b and there is no third party which is over looking into this. So, there is always a possibility of a default risk. So, you may be in the business. So, one thing what the speculators are needed to be careful is about the default risk and then these changes which happen in the exchange rates. So, the F d curve is downward sloping. Look at the F s curve these are the forward supply curve of the investors.

So, this is of the investors when we were discussing the open interest parity, the e d curve was for both investors and speculators. And the supply curve, e s curve were the other market participants; that means, that the other countries which would need foreign exchange to buy your own goods that excess supply that supply of foreign currency was coming from the others. And here, in your own country it was the investors speculators who were demanding foreign exchange.

Now, as soon as you talk about the forward markets you need to make a distinction between investors and speculators. These speculators speculate about what is happening in spot and forward markets. And if there is a differential then they want to take an arbitrage opportunity. You can also think it in this manner that if both say, covered interest parity and open interest parity holds.

So, in that case, you would have pi a pi F is equal to pi e. If both covered and open interest parity holds, but, then there is always a possibility that pi F is greater than pi e or pi F is less than pi expected. Now, in this case they would buy at forwards sell at in spot here, they would buy and in the spot and sell in the forward. So, whenever there is differential price between spot and forward, someone has to take that arbitrage opportunity and that is speculators.

And these investors are the ones who would like to invest in foreign bonds. They are driven by the covered interest differential which is del plus r star minus r. So, here where r is equal to r star r is equal to r star delta is 0. There is no incentive to supply the foreign

currency in the forward markets it is like an equilibrium the demand is 0 because pi hates 0 delta is zero.

So, it is like an equilibrium where demand is equal to supply is equal to 0. Now, if this delta becomes greater than 0, then this goes up if this goes up. So, if delta is greater than 0 there is a covered interest differential. So, you would like to invest your money in the in the forward bonds and there is an increase in the supply of foreign exchange for in the forward markets.

So, then given this situation, let us see what happens if there is an increase in interest rates. So, we are here. r is r star, delta is 0 it is an equilibrium situation and then there is an increase in interest rates. If there is an increase in interest rates, look right at the beginning what will happen is these investors you had r is equal to r star and you had delta equal to 0 and now r star goes up. If r star goes up, you would see a right ward shift of the F s curve. (No audio from 23:17 to 23:29).

You see a right ward shift of the F s curve. So, the investors would like to increase the supply of foreign exchange in the forward markets because the covered interest differential has gone up. But, what will happen also is, that at the end, you would see that the forward markets, you would see that in the forward markets the foreign currency is been sold at a price which is lower than the spot market, the spot price.

So, you see a forward discount. Now, when you have a forward discount you would have delta less than 0. So, speculators wish to buy the foreign currency at the forward markets in the hope that they would sell at a higher price in the spot markets. So, there is one party who wish to eventually wish to demand that foreign currency at the forward markets and there is one party which is investors who wish to supply that much of foreign exchange at the forward markets.

How will they do it if they have to supply that much of forward, if they have to supply that much of currency in the forward markets? Look at investors. See, what is happened? This covered interest differential has gone up. So, there is an incentive to put the money in the foreign bonds. So, they would buy the money in the in the spot market by the foreign currency in the spot market to do what to supply it, the supply the foreign currency in the forward markets. So, someone is supplying they will be an excess supply and that is been met by the excess demand in the by the speculators.

So, eventually you would see that that excess supply is been met by the excess demand by the speculators. Further, can you say something about what will happen to the reserves in the foreign current, foreign country? Now as soon as so, I will repeat again see what happened. r was equal to r star delta was 0 this was the equilibrium r star went up. So, investors wanted to put money in the foreign bonds. So, they would buy foreign currency in the spot market to select in the forward markets.

So, here you need to make distinctions spot and forward. So, you buy it in the spot because you want to put the money in the foreign bonds and then you want to utilize this money to supply it in the forward markets. So, there is an excess supply and this excess supply is been met by speculators because speculators are now driven by the fact that the foreign currency is now selling at forward discount. So, whenever you have forward discount there will be an excess demand for foreign currency in the forward markets. So, there is excess supply in the foreign markets.

There is excess demand. It is becoming eventually equal and so, is this is the new equilibrium situation where you had you had excess supply which is being met by excess demand in the. There is something more which is happening when the foreign interest rates went up and you wanted to put money in foreign bonds. You demanded money in the spot markets; you demanded foreign currency in the spot markets. Now, see what will happen when you demand foreign currency in the domestic markets.

The demand for foreign currency would go up, there will be depreciation here and if it is a fixed exchange rate, you would lose reserves. Your own country would lose reserves, but, the foreign country would gain reserves because if its depreciation here, there will be appreciation there.

So, see right at the beginning you would see that the reserves in foreign currency in foreign country going up, but, then there is something happens eventually, when the foreign currency is being sold at a price lower than the spot price. There is an excess demand for the foreign currency in the forward markets. Excess demand in this would mean excess supply in the spot markets.

So, excess supply would mean that they would be appreciation here, but, depreciation in the foreign country. So, that would mean that the reserves which had went up initially

would see a decline in reserves in the foreign country. So, all these do have an impact on the reserves of the foreign currency both here and in the foreign country.

Let me explain this point again. Right at the beginning, see there was a shock the shock was an increase in interest rates. So, when you increase the interest rates this went up covered interest differential. Covered interest differential means that it is worthwhile to put money in foreign bonds. So, the investors would buy bonds from foreign currency.

So, there will be an excess demand for foreign currency in your own country. So, you would lose reserves, they would gain reserves, that is the initial thing. But, then whatever happened because the F s curve shifted down and the foreign currency went into discount, there was then as a result the speculators who want to gain from this arbitrage opportunity would like to buy foreign currency in the forward markets and then select in the spot markets at a later stage. So, when you sell foreign currency in the spot markets at a later stage it means that you; that means, your country would gain reserves the other country would lose reserves.

So, that same that foreign country initially gain reserves and then it lost reserves because of all these things which are happening in the forward markets. So, what I am trying to say is that, in this complex world where one party is trying to gain from arbitrage opportunities, there is another party who wants to put the money because of the differential because of the profitable opportunities. All these tend to have an impact on what is happening in the foreign exchange markets, what is happening with the reserves.

So, that is what happens if there is an increase in interest rates. Let us bring in expectations now. So, think about it that what will happen now if you bring in expectations. Remember how we brought in expectations there when we were discussing the spot markets. We brought in expectations there where, when we said after a year's time, it will be a difficult time for India we would expect that our currency would depreciate.

For various reasons may be because there is global recession or may be because there are there is some war going on may be in future that would have an impact on our foreign exchange market. We would expect our currency to depreciate because there will be an increase or surge in imports because of some war in gulf we are not able to get the oil.

So, the price of oil goes up. There is a surge in the imports of oil because the price has gone up it means losing more foreign exchange.

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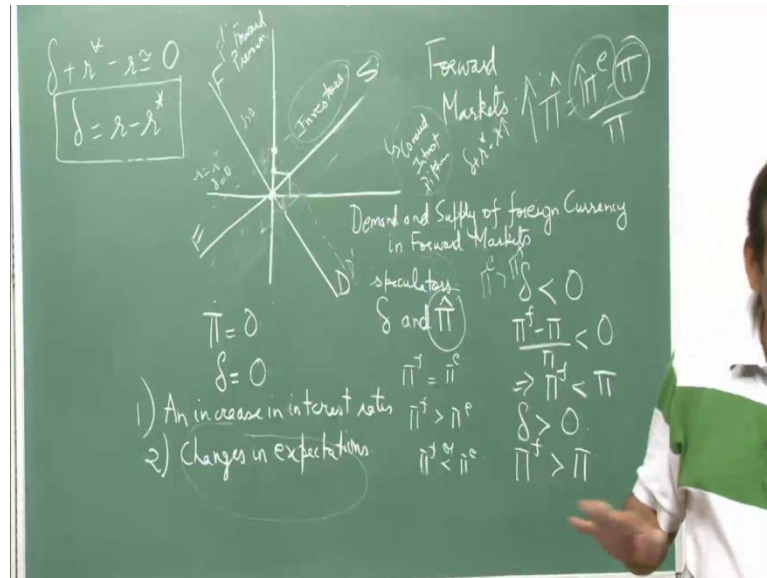
So, this is what was going on in the mind of the market participants. This is what if happens if you expect that your currency would depreciate in future. Now, the same things bring in the same thing here and concentrate on this term which is pi hat, which is pi e minus pi by pi. So, if you have to bring in the same expectations. Now, you would expect that this pi e would go up. So, you expect that the foreign currency would appreciate; your currency would depreciate after a year's time. So, if this goes up, this pi hat goes up. If pi hat goes up see what speculators would do.

Now, there is no change in delta, but, you see that pi hat has gone up. What do you think would the speculators do if they expect that your currency would depreciate? How it will affect the F d curve? The demand curve for the foreign exchange in the forward markets, this has gone up. So, then what do you think will happen to the F d curve? Why would it what do you think will the demand for foreign currency in the forward markets go up why and why and why?

So, remember this delta and pi hat something has happened to pi hat. So, this has gone up. So, if you were comparing delta and pi hat or your comparing pi e and pi F and you expect pi e to be greater than pi F, you know what speculators would do. They would

tend to buy foreign currency in the forward market in the hope that, they would select at a higher rate in the spot markets.

So, that is the reason that the F d curve shifts to the right. And when it shifts to the right, there are speculators who want who are demanding foreign currency in the forward markets. If there has to be an equilibrium condition someone has to supply it. And that someone is none other than the investors, who as soon as they find that the foreign currency is been sold at forward premium, they would supply that foreign currency in the forward markets.

So, there was some imbalance created initially because. pi e was greater than pi f. So, speculators demanded foreign currency in the forward markets in the hope that they would sell it in the spot markets at a later stage. But, this demand is now been met by speculators who find that the foreign currency is been sold at the forward premium.

So, they provide the necessary supply. So, you eventually you will find that the foreign currency is been sold at now the forward premium and this is the new equilibrium. At this point as I said, you have a covered interest differential because you have delta which is greater than 0. It is not this situation. Had it been this situation if the forward premium had gone to this stage, then there be any incentive to put the money.

Because, in that case you would have seen that delta and pi hat would have been same. So, then they would be no covered interest differential. This would be the equilibrium situation, but, because delta has not gone beyond this, delta is still here and it is it is lower than the exchange rates. So, you still see a covered interest differential. Someone is demanding foreign currency in the forward markets; the investors are providing this at this rate this forward premium rate.

So, this is the new equilibrium when you see the changes in the expectations. So, in the spot markets, the changes in the exchange rates were a function of not only the differential interest rates, but, expectations. This shows that this forward premium or forward discount may be due to changes in the interest rates and changes in the expectations. So, as a common man, it is little a difficult you have to pick your mind to understand when a person asks you why do you see a forward premium, why do you see a forward discount?

Or someone can ask you why are forward rates different from spot rates, why are forward rates greater than spot rates, why are forward rates less than spot rates? So, then you need to of course, discuss the forward markets and like in any other market you have a demand curve and a supply curve. So, there is a demand curve, but, this demand curve is by a specific participant, which is speculators who want to gain from the arbitrage opportunities. And there are investors who want to put money for profitability. So, these two participants interact to decide about the forward premium and forward discount. (No audio from 40:13 to 40:24).

We can get the forward premium even from the supply side right. If there is a decrease in interest rate (( )) supply curve (( )).

So, F d curve can change because of the changes in delta and pi hat and then you need to compare. So, so here I brought the change because pi hat I made changes here. So, pi hat is pi e minus pi by pi. So, it could have changed because of the changes here right. If you want to think little more, if there was no full anticipation of the changes in the exchange rates. So, then suddenly you find that this has gone up then what would have happened to pi hat? This would have gone down. So, pi e this pi hat pi e lower than pi f.

So, then you would buy in the in the spot markets and sell forward markets. What do you think will happen to the F d curve, a leftward shift? Then there will be a discount. And then there will be discount and then once then if there is a discount and the if there is a discount what will happen to then investors? Rather than putting money in the foreign bonds, foreigners would put money here right in the negative supply and negative demand yeah negative supply and in negative demand.

So, just you can you can think about it this you have the covered interest differential which is delta plus r star minus r. So, what would have happened if this would have gone up? Right then you would have covered interest differential which would have been negative. So, F s curve instead of shifting to the right would shift to the left. Instead of this happening, you could have always saw an F s curve like this. So, this is just a small, I just flagged the issues relating to forward markets.

If this would have been discussed in a management course, you would have gone in to the integrities of how the forward market functions. And they would have a separate set of books for example, they would like to suggest book by Shapiro which is multinational

financial management or you seen Hull's book which is quite good as far as the derivative markets are concerned. Because, then you have options, you have futures and then if you look at the integrities of how the forward contracts work. If you can refer to the handouts that I have given, please see that the exhibit 5.6, hedging a future payment with a forward contract.

So, your home country is US, the foreign country is pound now, what you are expecting is that the pound may appreciate in future. So, as an importer if you expect that your foreign currency will appreciate or your domestic currency would depreciate. Then it would mean that you have to shell out more of foreign currency in future. It is like saying one US dollars was 55, tomorrow if it becomes one U S dollar to be 60; it is the importers who have to hedge against this risk because, for 1 US dollar of thing that they are importing now, tomorrow they have to pay instead of 55 rupee 60.

So, you want to hedge against this risk. So, then you say, let me now decide about the price today for the transaction that we will do after a month's time or two month's time or a six month's time or one month's or after an year. So, you hedge against this by putting your money in the forward markets. That I will deliver this to you, that is to the Britishers. If you are in US, I will deliver this many pounds to you, but, please see that you decide about the price today. That is like entering in the forward contracts. So, say 1.71 and you would have expected that the pound would appreciate to 1.75 and you find that the forward rates are 1.72.

So, pi e is 1.75 to a pound, forward rate is 1.72 dollar 1.72 for a pound and your spot rates today is dollar 1.71. Now, there are two possibilities; the spot rates after a year's time or at the time of the maturity may turn out to be greater than 1.72. In that case, you have gained because you decided about the price that is 1.72, right at the beginning and the spot rates after the maturity, at the time of maturity turned out to be greater. So, you shelled out less of money.

So, you had you would gain the forward contract gain and there is a possibility of a forward contract loss if the spot rate of at the time of the maturity works out to be less than the forward rates. So, that is where you make a forward contract loss. You would see that options are better than this. If the spot rates turn out to be less than the option

rates, you can still trade at a price which is greater than the option prices; greater than equal to the option prices.

So, then there are so many questions which are involved. So, if these derivative markets they are derived from the spot markets that is why, they are called derived a derivative markets. Forwards, futures, options if they are indeed used for hedging then why do not you see lot lots of use of these instruments? And as soon as people talk about these hedging instruments they use it pejoratively they tend to somehow relate this to speculative activities.

So, what you can also think is, if these markets were meant to hedge the risk, why is the market why are the markets not functioning well? Another thing if you have an SBI account now, you can deal in the currency futures. It is like the forward markets right where in there are like you have a maturity period of course, but, then there is a organization like the stock markets body like the NSE or the BSE.

There are organizations which over look the functioning of the future markets. And you can have profits and losses each day. That is how differing between futures and forward markets, but, then from 2008 onwards the government of India has allowed each one of us to trade in currency futures. Of course, it has to be it is not direct it has to be through another body which is over you.

So, you would give your instructions to that body. That body would put the money in the currency futures. So, if you have an account at SBI and you want to see the real functioning. You can you can try that, but, of course, you have all these parameters which will be involved. You have to look at the interest rates here, there and then when you look at the interest rates then which interest rates? In India there are so many interest rates.

It is not or you know the some bank would have some interest rates, lending rate, borrowing rate, the open market rates CRR's so many. So, then there are other set of questions. So, research is another ball game theory is, but, then when it comes to real thing. So, as I said this is not a complete picture of the forward markets. Forwards, futures and derivatives if it was an any other courses in IME, I think you should join that because that will give the entire picture of the derivative markets.