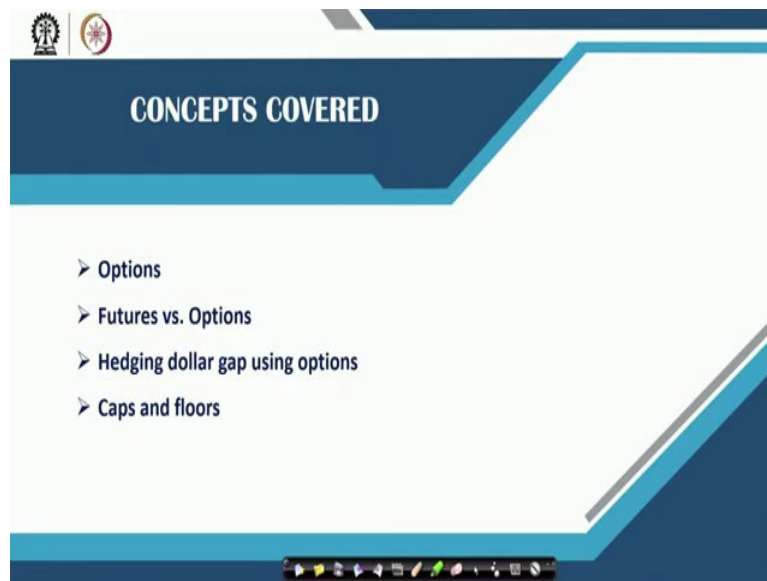


Management of Commercial Banking
Professor Jitendra Mahakud
Department of Humanities and Social Sciences
Indian Institute of Technology, Kharagpur
Lecture 28
Use of Derivatives in ALM - III

Good morning. So, in the previous class we discussed about the use of the future instruments for the hedging. So, depending upon the dollar gap situations or the duration gap situations of the commercial banks, the commercial banks can use these future instruments for hedging the interest rate risk in the market.

So, then other type of derivatives instruments which are also popularly used in the market for hedging the interest rate risks and other type of risks, those are basically the options and the futures that already in the introduction of this particular sessions we have discussed. So, today we will be discussing about the, what do we mean by these options.

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Already although we have discussed these different concepts related to options, we will be discussing about how the options are used to hedge these interest rate risks in the market and also what is the basic difference between futures and options, and there are two types of typical or may be, we can say that specific options what the commercial banks use for managing the interest rate risks in the market that is caps and floors.

So, these are the four things what we are going to discuss today. So, one is what basically exactly the option is and how it is used? Second is, what is the basic difference between

futures and options. Then we have the caps and floors which are the specific types of options for the commercial banks always use for managing the interest rate risks in the market.

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The slide is titled "Interest Rate Options" and features a background with various icons including gears, a tree, a lightbulb, and a molecular structure. The text on the slide is as follows:

- Interest rate option grants a holder of securities the right to either :
 - a. Sell (put) those instruments with another investor at a pre-specified exercise price before the option expires
 - b. Buy securities (call) from another investor at a pre-specified price before the option's expiration date

At the bottom of the slide, there is a logo for NPTEL (National Programme on Technology Enhanced Learning) and the text "NPTEL Online Certification Course".

So, let us see that, what are those different type of options, what the commercial banks use. Already you know, on the basis of the underlying asset what we are using for making that kind of option contract, accordingly the name of the options are defined. So, the most used options which are used in the financial market by the commercial banks to manage the interest rate risks, that the interest rate options.

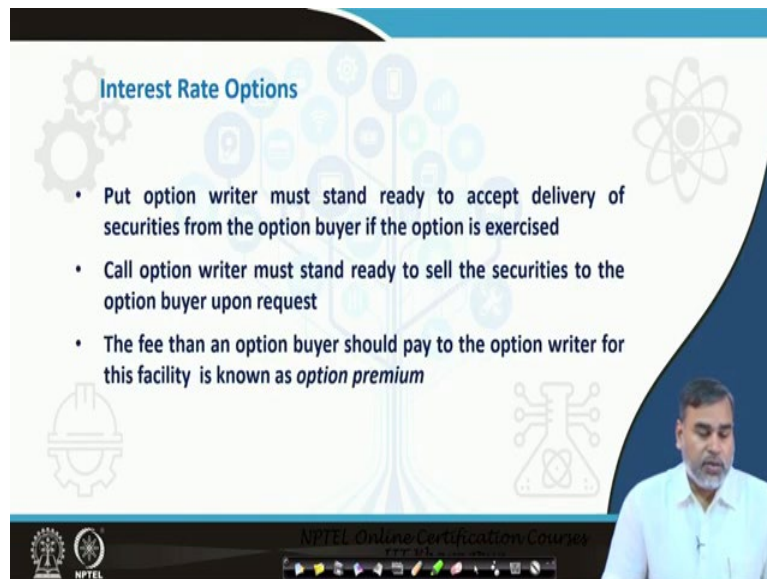
So, what basically, exactly the interest rate options are? So, if you ask this particular question then already you know that we have two things. We have call options and we have ,. Then we have American options then we have the European options. There are different ways the options are defined.

But whenever we are talking about the interest rate options, the interest rate option basically grants the holder of the securities the right, what kind of right it gives? Either if it is a put option then it gives this particular right like sell those instrument with another investor at a pre-specified exercised price before the option expires. So, if it is a call option, if you are going for buying the securities then from another investor at a pre-specified price before the options expiration date.

So, either you can sell these securities or sell these instruments at a predefined prices or you can buy these particular instruments at predefined prices on the basis of the nature of this

particular option this particular option can be defined, and here you remember the underlying asset is basically the interest rate.

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The slide is titled "Interest Rate Options" and features a list of three bullet points. The background is white with blue accents and icons. A video inset in the bottom right corner shows a man in a light blue shirt speaking. The NPTEL logo is visible in the bottom left corner of the slide.

- Put option writer must stand ready to accept delivery of securities from the option buyer if the option is exercised
- Call option writer must stand ready to sell the securities to the option buyer upon request
- The fee than an option buyer should pay to the option writer for this facility is known as *option premium*

Then other thing if you see, the put option writer that means, writer means we are talking about the seller, the put option writer must stand ready to accept the delivery of the securities from the option buyer if the option is exercised, because the option buyer has the right to exercise the option but they have no obligations.

But the option seller has the obligations to sell that particular security or this would be ready to deliver that particular security, deliver that particular instrument if option buyer at any point of time wants to exercise that particular option at pre-specified price whatever you have decided from the beginning. And the call options buyer or call options writer basically, must stand ready to sell the securities to the option buyer if the option buyer generally goes for requesting for that particular instrument and that particular contract at that particular point of time.

So, whenever the buying and selling activities takes place in this options market, the options buyer always gives this options seller the premium. So, the particular fee what the options buyer should pay to the option writer to facilitate this particular kind of process then we basically pay particular kind of premium which is called the option premium. If the option buyer is not going to exercise that particular option then he has to forego that particular premium.

So, in this context the option premium whenever we are getting the payoff; the payoff minus this option premium that is the profit what this particular investor can generate if the call option or the put option are in the money. That in the money, out of the money concept already we had discussed.

If the option is in the money but the profit what the option holder is trying to generate, that basically depends upon the difference between the market price and the strike price and as well as the premium what the option buyer has already paid to the option seller. So, that is the basic notion of the option and this is the way the option contract is designed.

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The slide is titled "Futures Versus Options" and features a list of bullet points. The background is white with blue accents and icons of gears, a tree, and a molecular structure. A video feed of a man in a white shirt is visible in the bottom right corner. The NPTEL logo is in the bottom left corner.

- Unlike futures, options do not obligate any party to deliver securities and require a smaller initial outlay
- The option buyer can
 1. Exercise the option
 2. Sell the option to another buyer
 3. Allow the option to expire
- Interest rate options are traded mostly over the counter markets where the exercise date and price can be tailored to the needs of the option buyer

If you make the difference between options and futures then what kind of differences we are finding? That whenever we talk about the futures, futures there is obligation that from both the parties that this particular contract or particular kind of agreement has to be exercised and both the parties have the obligations to exercise that particular kind of contract what already they have agreed upon to exercise in the future.

But whenever you talk about the options, in the options we do not have, we do not obligate the party to deliver the securities and require a smaller initial outlay. So, if you remember in the futures there is no such kind of premium involved. But whenever we talk about the options then we have certain concepts like premium which is involved where the buyer pays that particular premium to the seller.

So, the buyer has the right but they do not have the obligation to exercise that which is not the case in the context of the futures. This is number 1, and here in this context the option buyer

has different options. They can exercise the options. They may sell the option to another buyer, or they can allow the option to expire at the time of the maturity.

So, there are different options which are available to the option buyer. But in the context of future those kind of options are not available, or the option investor, option holder is able to exercise those kind of options but in the future holder basically is not entitled for this kind of process or this kind of options is not available for them.

So, generally there are two types of market we have. One is over the counter market, we have exchange traded market but the interest rate options are mostly traded in the over the counter market where the exercised date and price can be always tailored to the needs of the option buyer. So, whatever needs option buyer has, accordingly the exercised rate and prices are already mentioned or already available in that particular kind of market, like over the counter market.

On the basis of the requirement the investor can take a particular position to hedge that particular risk what they are going to face in the future depending upon the microeconomic fundamentals, how the interest rate is going to fluctuate, accordingly if they can take the positions, by that the interest rate risks can be minimized in that particular market. So, these are the basic difference between options and futures.

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Futures Options Market

- A futures options contract is an option contract in which the deliverable is a futures contract, such as the Treasury bill futures contract. For standardized exchange traded interest rate option most activities happen using the *futures option market*
- Buyer of call futures option has the right, but not the obligation, to take a long position in the futures market at the exercise (strike) price any time prior to expiration of the options contract
- Buyer of put futures option has the right, but not the obligation to take a short position in the future market at the exercise (strike) price anytime prior to expiration of option

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Then whenever you talk about another market that is called the future options market. So, what do we mean by the futures options market? The futures options contract is basically

option contract in which the deliverable, whatever things are, whatever instrument is going to be delivered, is a future contract itself.

So, thus you can have the Treasury bill futures, you have any kind of interest rate futures which are available or maybe traded in the market. That basically can be delivered in the particular time period or particular period. So, here the underlying asset is not basically delivered. Here the future contract is delivered.

So, for standardized exchange traded option if you see, most activities basically happen using the futures options market. Mostly wherever the developed derivatives markets are there, so there people are mostly using this futures options market for the transactions or to minimize the interest rate risk in the market.

So, in this context the buyers of the call future options like the same logic whatever we have used, if you see in the same way, the buyers of call futures options has the right but not the obligation to take a long position in the future market at the exercise price or the strike price any time prior to expiration of the options contract.

The same way if you want to define the put futures then the buyer of your put futures has the right but not the obligation to take a short positions that means the selling position in the future market at the exercised price any time prior to the expiration of the option. So, that means here the concept of call option and put option whatever already we know, the same concept you can use it here also.

If somebody is buying the call options future so they have the right but not the obligation to take a long position in the future market at the predefined exercised price before the expiration of the option contract and if this particular buyer or investor is going for put future options they have also the right but not the obligation to sell this future market instrument at a particular strike price or exercise price before the expiration date. So, this is what basically the futures options market can be defined whenever we are using the derivatives in the interest rate management process.

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The slide is titled "Principal Uses of Option Contracts" and features a blue and white color scheme with decorative icons of gears, a tree, and a molecular structure. It lists two main uses of option contracts:

1. Protecting a security portfolio through the use of put options to insulate against falling security prices (rising interest rates)
2. Hedging against positive or negative gaps between interest-sensitive assets and interest-sensitive liabilities

A video feed of a presenter is visible in the bottom right corner of the slide. The NPTEL logo is in the bottom left, and a navigation bar is at the bottom center.

So, whenever we are talking about the uses, how basically the option contracts are used by the banks or any other financial institutions to minimize interest rate risk. In this context there are two things specifically always we can come across.

That the basic use of options contracts are to protect the security portfolio through the use of the put options, to insulate against the falling the security prices and once the security prices will fall, the security prices will fall whenever there is a interest rate rise because already you know that $P = D1 / r - c$.

If you talk about the bond price then also the interest rate is the discounting factor. So, if the interest rate will increase then the price of the bond will decline or we can say that the price of the stock also will decline.

Using the normal discount flow models we can already explain that particular thing so in this context if there is a rising interest rate scenario then the put options should be used to insulate the particular loss what this investor or the bank is going to make in the market due to the rising interest rate scenario. So, another way also we can use it. We can also use this put option as a hedging instrument against the positive and negative gap between the interest-sensitive assets and interest-sensitive liabilities.

So, whenever there is a negative gap or positive gap on that particular time what kind of contract or what kind of options should be used to minimize the interest rate risk, whatever way we have discussed it for the future, the same way also it can be used for the options market that how the options can be basically used to hedge out the particular losses, what are

the interest rate risks what these particular banks are going to face due to the change in the interest rate in the market.

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The slide is titled "Hedging Interest Rate and Futures Options Contract". It contains the following text:

- Future price is highly correlated with the underlying cash price
→ **futures on option can be used to hedge interest rate risk**
- Example: Buyer of a T-bond future option at exchange is granted the right call or short position in a T-bond futures contract at the exercise price until option expires
 - i. If interest rate rise, put(sell) options are most likely to be exercised
 - ii. If interest rate falls, holders of call options will be more inclined to exercise their option

The slide also features a presenter in the bottom right corner and the NPTEL logo in the bottom left corner.

So, let us see that how basically it works. As we know that the future prices are highly correlated with the underlying cash price so in this context the futures and options can be used to hedge the interest rate risk. So, if you take example in this context what kind of example you can say? You see that buyers of a treasury bond future option at exchange is granted the right, call or the short position in a treasury bond futures contract at the exercise price until the option expires. That already we know.

So, if the interest rise there are two scenarios, either interest rate can rise or the interest rate can fall. If the interest rate will rise then put options are most likely to be exercised because they can generate the profit in one market in that particular scenario and they can lose in another market so the net gain will be loss or not, there will be no loss, no gain. So, the investor can hedge out the total risk in that particular point of time.

So, if the interest rate falls, then the, what these investor basically in this, or the particular financial institutions or the banks can do? If they are holding a call option that will be more inclined to exercise their options. That means if the interest rate falls, the market price increases. If the market price increases then obviously the call option will be in the money.

If the call option is in the money then that will be exercised in the market and in that particular point of time they can generate the profit because the premium whatever they have already paid and this particular option is in the money means they can generate some positive

payoff and that positive payoff minus premium, the rest of the money basically they can generate the profit.

So, even if that particular premium will be equal to this payoff basically what they are getting still this particular loss they can hedge out whenever this kind of scenario arises. So, because of that, depending upon the interest rate changes the commercial banks can use this particular kind of options to hedge the risk in the market.

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Example:

- Suppose that your bank has a commitment to make a fixed rate loan in three months at the existing rate. In order to hedge against the prospect of rising interest rates, the bank takes a position in the futures options markets. What position should it take? The relevant information is as follows: T-bill futures prices:89; Put option:90; Premium Rs.2500. What will be the net gain to the bank if T-bill futures prices fall to 85? Increase to 93?
- If T-bill futures prices fall to 85, the put option could be exercised at 90 for a gain of 5, or Rs. 50,000. After paying the premium, the net gain would be Rs. 47,500.
- If T-bill futures prices rise to 93, the put option would not be exercised. The loss would equal the premium paid for the option, or Rs. 2,500.

So, another example if you see. Suppose, your bank has a commitment to make a fixed rate loan in 3 months at the existing rate, that is the fixed rate loan which is, the interest rate is not going to be changed due to the change in the market interest rate. So, that means if the interest rate is will rise then what will happen, this bank may lose the, bank may incur a loss because notional loss can be incurred, because if it is a floating rate loan if the bank could have earned more interest from that.

So, in order to hedge against the prospect of rising interest rates, the bank takes a position in the futures options market. Then what positions should it take? The information are given like this. Let there is T bill futures whose price is 89 and there is a put option whose price is 90 and the premium the bank has paid that is 2500. So, if this is the data then what will be the net gain to the bank if the T bill futures prices fall to 85 or it can increase to 93, whatever scenario it may be.

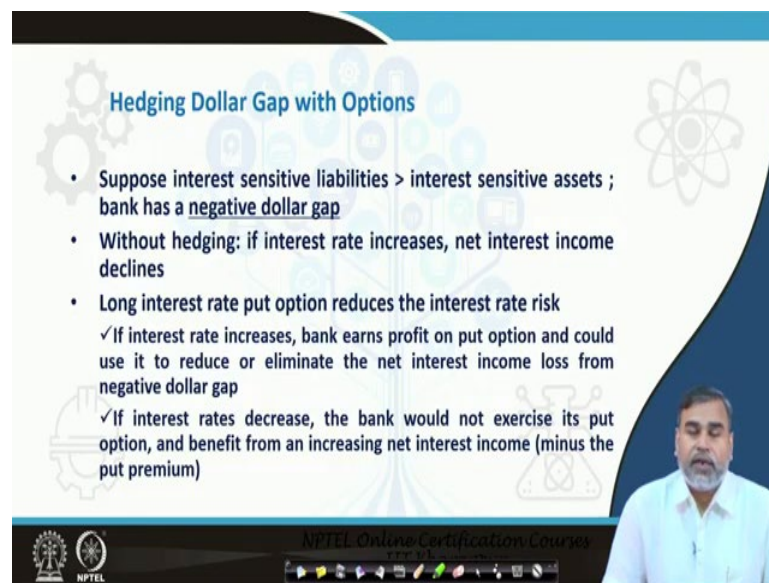
If this kind of options are given then how basically it will work out? If the T bill prices, future prices fall to 85, then the put option will be exercised at 90 for a gain of 5 Rs and obviously

the total gain they can make of 50000. After paying the premium the net gain would be 47500. So, another thing is, if the T bill future prices rise to 93 then the put option will not be exercised. The loss would be equal to the premium paid which is 2500.

So, if total transactions whatever you are making that is, that amount is 50000 or the particular amount then per transactions there gain of 5 Rs if the interest rate basically or the future price is fall to 85 and you are exercising this put option, and because already 2500 premium you have paid. So, then your gain will be 47400.

So, if it is going up to the 93, then the option will not be exercised because it is a put option. It will not be exercised. So, in that context you are losing this basically the 2500 and the 2500 that already we have got. So, this is the way basically this particular contract can be used to hedge the risk.

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Hedging Dollar Gap with Options

- Suppose interest sensitive liabilities > interest sensitive assets ; bank has a negative dollar gap
- Without hedging: if interest rate increases, net interest income declines
- Long interest rate put option reduces the interest rate risk
 - ✓ If interest rate increases, bank earns profit on put option and could use it to reduce or eliminate the net interest income loss from negative dollar gap
 - ✓ If interest rates decrease, the bank would not exercise its put option, and benefit from an increasing net interest income (minus the put premium)

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So, then we can see how the options are used to hedge the dollar gap positions. Suppose there is the interest-sensitive liabilities which is more than the interest-sensitive assets then obviously already you know that if the interest-sensitive RSL will be more than RSA then we have a negative dollar gap.

So, there is a negative dollar gap and the bank is not going to hedge that position then what will happen? If there is a change in interest rate and let that interest rate has increased. Then your net interest income declines. That already you know because your interest-sensitive liabilities are more than the interest-sensitive assets.

So, in that condition what the bank should do? If the bank wants to hedge that particular loss or hedge that particular risk then what the bank would do? The bank would go for a long interest rate put option. They can buy for an interest rate put option. So, in that context what will happen?

If the interest rate will increase the bank earns profit on the put option and could use it to reduce or eliminate the risk what basically they are incurring in the spot market in terms of losing the net interest income. So, if the interest rate decrease the bank would not exercise this put option because the price will be high in that particular point of time and the benefit from an increasing net interest income, basically they can generate out of this minus the put premium whatever they have paid.

So, according to the sensitive, rate-sensitive assets and rate-sensitive liabilities, they can use a particular option to hedge that particular risk or a particular loss what they are going to incur if there is a change in the interest rate which is not basically expected to generate any kind of profit in the spot market.

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Hedging Dollar Gap with Options Cont...

- Conversely interest sensitive assets > interest sensitive liabilities ; bank has a **positive dollar gap**
- Banks buy interest rate call option hedge the interest rate risk
 - ✓ If interest rate fall, bank would lose on its cash or spot market portfolio, but gain from its options position would partially or completely offset that loss
 - ✓ If interest rate rise, the gain from net interest income would only be partially offset by option cost (premium)

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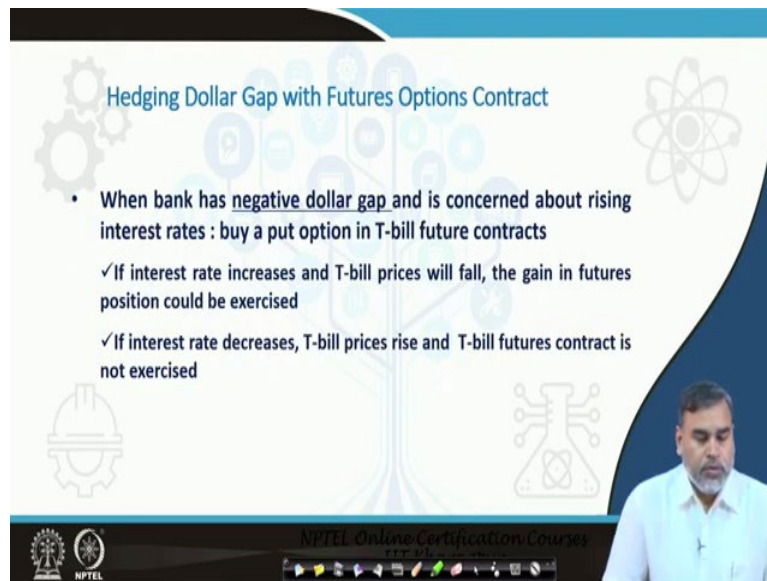
So, let opposite thing, that there is positive dollar gap, your rate-sensitive assets are more than the rate-sensitive liabilities. So, in that case the bank can go for a call option, they can buy call option.

So, if they will go for a call option, if the interest rate falls, so the bank would loss on its cash at the spot market portfolio but gain in the options positions and if the interest rate rise, the

gain from the net interest income would only be partially offset by the option cost or the premium whatever they have paid.

So, in either of these conditions, if they have used this particular kind of options for hedging that particular risk, so they can able to manage that particular interest rate risk in that particular scenario.

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The slide is titled "Hedging Dollar Gap with Futures Options Contract". It contains the following text:

- When bank has **negative dollar gap** and is concerned about rising interest rates : buy a put option in T-bill future contracts
 - ✓ If interest rate increases and T-bill prices will fall, the gain in futures position could be exercised
 - ✓ If interest rate decreases, T-bill prices rise and T-bill futures contract is not exercised

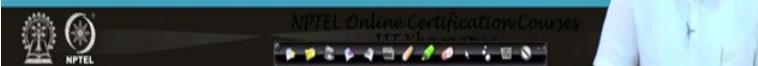
The slide features a blue header and footer. The footer includes the NPTEL logo and the text "NPTEL Online Certification Courses". A presenter is visible in the bottom right corner of the slide.

Then when the bank has the negative dollar gap then, if the same example if they will go for a T bill future contract, if the interest rate increases and the T bill prices will fall and the gain in the future position could be exercised. If the interest rate decreases, then T bill prices rise and then T bill future contract is not exercised. So, here, because we are talking about the interest rate futures and mostly, the popularly these banks can use this T bill futures contract for that.

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Hedging Dollar Gap with Futures Options Contract

- When bank has positive dollar gap and concerned about falling interest rates : buy a call option in T-bill future contracts
 - ✓ As interest rates fall, the call option would earn profits to offset declining net interest income
 - ✓ If interest rate rises, the call option would not be exercised



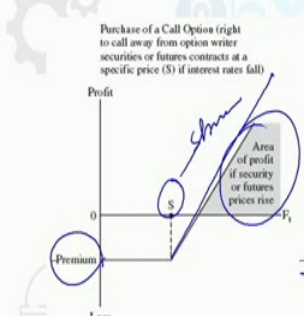
The reverse can happen whenever there is a positive dollar gap. In the positive dollar gap you can buy a call option in the T bill future contract. So, if the interest rate fall the call option would earn the profit to offset the decline in the net interest income. So, if the interest rate rises the call option would not be exercised. So, this is because the market price will be lower. So, in that particular point of time we can use that T bill futures to hedge this interest rate risk in that particular bank.

So this is the way the options are used for hedging in the commercial banks in the different conditions, like negative dollar gap conditions or positive dollar gap conditions. In both the cases the different kinds of instruments can be used to hedge the risk in the market.

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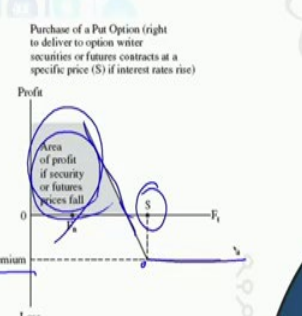
Payoff for Put and Call Options Purchased by Bank

Purchase of a Call Option (right to call away from option writer securities or futures contracts at a specific price (S) if interest rates fall)

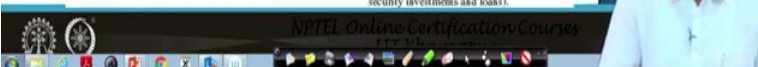


Purpose: Protect against falling yields on assets (such as current and future loans and investments in securities).

Purchase of a Put Option (right to deliver to option writer securities or futures contracts at a specific price (S) if interest rates rise)



Purpose: Protect against rising deposit and other borrowing costs and falling market values of assets (such as security investments and loans).



So, if you talk about the payoff, already we have seen in the payoff for the futures but here whenever you talk about the payoff for the put and call options which is purchased by the bank, so if it is a call option what does it mean? It gives the right to call away from the option, but they do not have the obligation to exercise that particular option.

Let the particular price is S and the interest rate is falling then already the call option investor has paid the premium from where they are buying this or to the seller. So, that is why this is showing negative. So, in this context the premium is basically negative that is why we have started from the negative.

So, your S which is specific price which is the strike price, so once we reach the strike price after that what will happen? If the market price again further go up then the profit basically will be generated. So, the profit will be generated and here the basic objective of using that thing is, you can protect against the falling interest rate on the assets in the particular market.

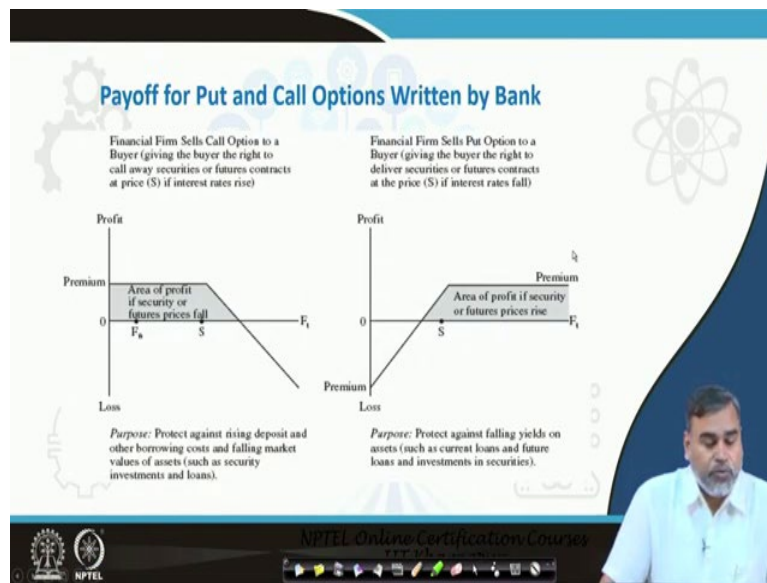
So, if this thing arises, wherever this is the area where the profit basically can be generated if the security prices will rise and already you know that this is the call option. If you are going for a put option, what does it mean?

It gives basically the right to deliver to the option writer, securities are future-contracted at specified price, the specified price means there is the strike price, so if the interest rate rise then what will happen? That, then this S is the strike price. And this is the premium already whatever you have paid.

So, now what is happening, because it is a put option, if the interest rate is rising then the market interest rate will go down so in that context we are going to lose in the market. To hedge that particular risk we have taken that particular position. So, accordingly what will happen? That once the price basically goes from these then it will start increasing.

Then this is the area where the profit can be generated or price is basically falling like this. So, in the beginning here we are generating the profit. Then once it reaches the strike price then after that the profit basically will not be realized in that particular context. So, this is the way the payoff basically for the put option can be used.

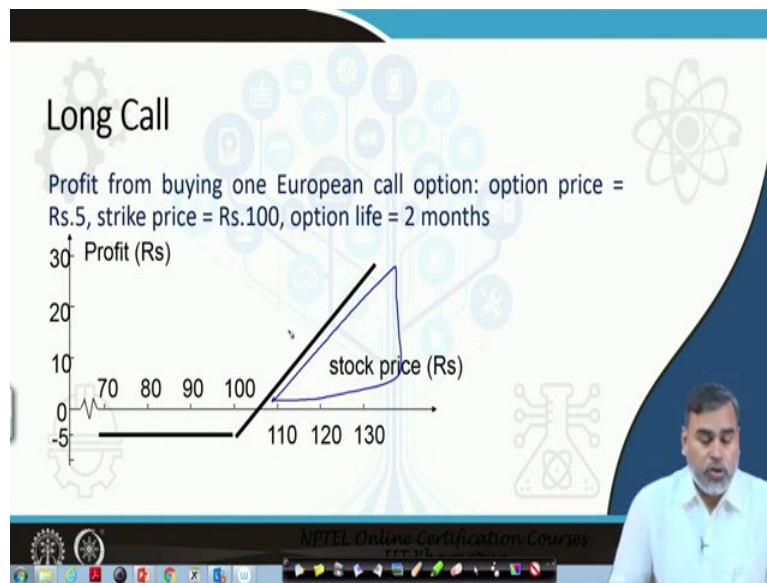
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If you are selling a put option, you are selling a call option the same concept also can be used like in this context. So, if you see this, this particular thing we can take here the, we are basically selling a call option to protect against the rising deposit and other borrowing cost which basically facilitate for falling the market value of the assets and whenever we are basically going for selling the put option our basic objective is to protect against the falling interest rate on the assets so the current loans and future loans and investments in the securities.

So, depending upon the interest rate forecasting we have to take a certain position in one of the particular assets, on particular options which can help us to minimize the risk which is arising out of interest rate fluctuations in the market.

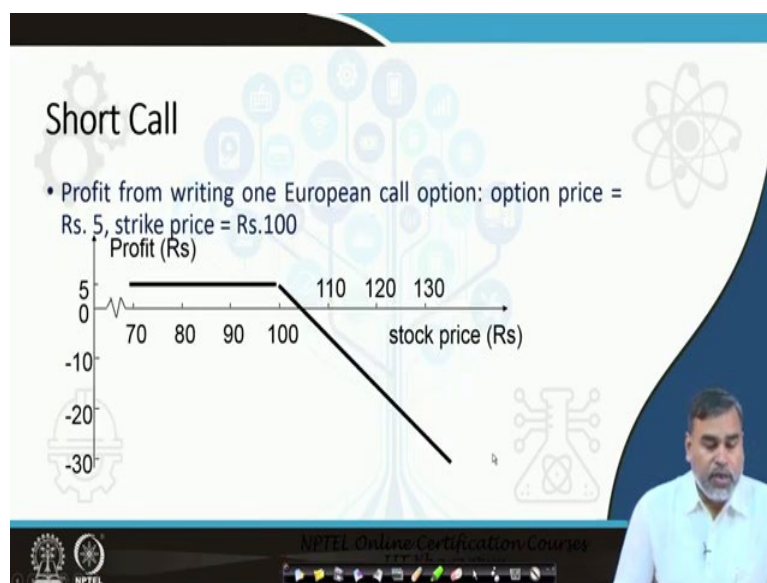
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If you see this numerical example this is the way basically it can work. Let there is a long call; long call means you are buying the call option. Then if your strike price is 100 Rupees and your option price is 5 Rupees then if you see that once this option price is going up and up, we are generating profit here. So, we can hedge the risk whatever we are losing in that particular point of time in other market.

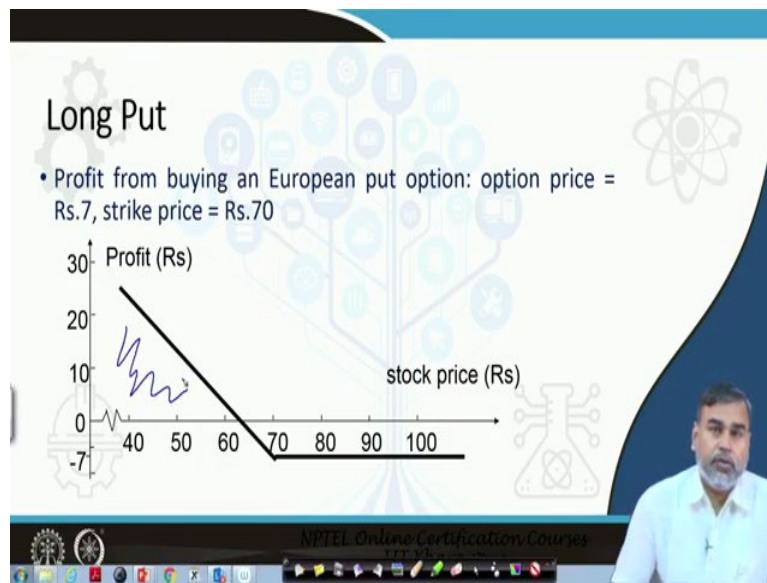
So this is the way the option will be, once it is above the strike price the option will be in the money and the option will be exercised because there is a long call option in this particular context.

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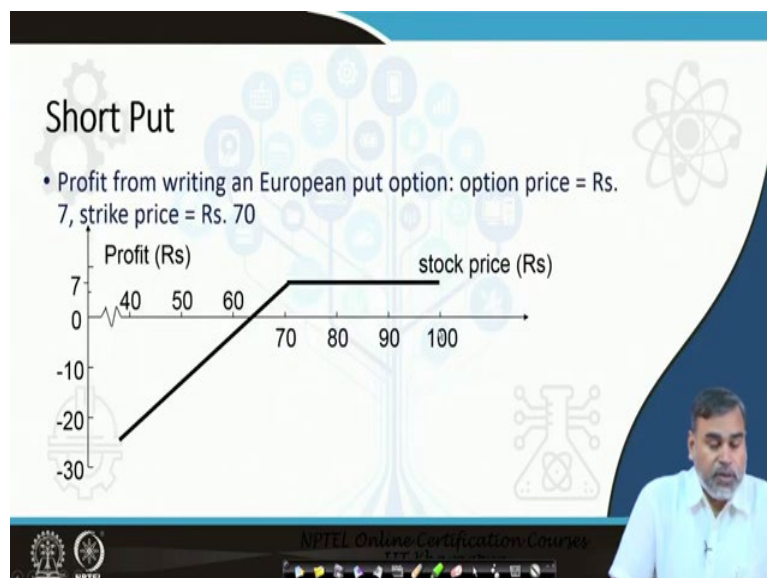
Then we can go for selling the call option. Selling the call option is the same example which you see that 5 Rupees basically whatever you have received and you, whenever the price is going down and here this 100 Rupees is the strike price in this particular case. Then if the option price is going down the market price is below this particular strike price then the option will be exercised and accordingly we can generate the profit out of this.

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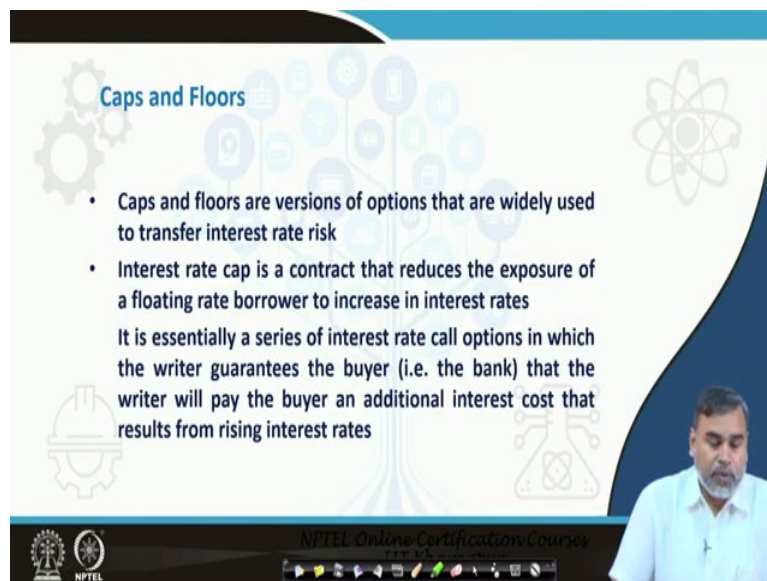
The same thing can happen for selling the put option and you can generate the profit from put option in this case if the price is up and up, if you are going for exercising that particular option then this is the area where you can generate your profit. So, this is the way the investing or buying the put option case we can generate the profit out of this.

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Then this is basically selling a put option. If you are going for selling a put option, you can also generate the profit in this way whenever, let this is your strike price is 70 and further if, depending upon interest rate fluctuations whenever the price will be changed we are able to generate the profit in one market or generate the revenue or the gain in the one market even if you are losing this particular in that context in the other markets. So, this is the way the payoff basically looks like or the profit diagram of this particular option contracts look like.

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The slide is titled "Caps and Floors" and features a background with various icons including gears, a tree, and a molecular structure. The text on the slide is as follows:

- Caps and floors are versions of options that are widely used to transfer interest rate risk
- Interest rate cap is a contract that reduces the exposure of a floating rate borrower to increase in interest rates

It is essentially a series of interest rate call options in which the writer guarantees the buyer (i.e. the bank) that the writer will pay the buyer an additional interest cost that results from rising interest rates

The slide also includes the NPTEL logo and the text "NPTEL Online Certification Courses" at the bottom. A presenter is visible in the bottom right corner of the slide.

Then another two major type of options what we use, that is caps and floors. Caps and floors are the different versions of the options that are widely used to transfer the interest rate risks. The interest rate cap is basically nothing but it is a contract that reduces the exposure of a floating rate borrower to increase in interest rates.

So, it is essentially a series of interest rate call options. The cap is basically nothing but the series of interest rate call options in which the seller basically guarantees the buyer, mostly the bank that the seller will pay the buyer an additional interest cost that result from the rising interest rates in that particular point of time.

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Caps and Floors Cont..

- Interest rate floor is a contract that limits the exposure of the buyer to downward movements in interest rates
- An interest rate floor is a series of interest rate put options by which the writer guarantees the buyer (i.e. the bank) that the writer will pay to the bank an amount that increases as the level of interest rates fall

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So, how basically it works? The interest rate floor is the contract that limits the exposure of the buyer to downward movement in the interest rate. So, interest rate floor is a series of interest rates put options in which the seller basically guarantees the buyer that the writer will pay the bank an amount that increases the level of interest rates that increases as the level of interest rate falls. So, this is the way basically caps and floors are defined in the option market.

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Caps and Floors Example:

- Suppose a bank has a portfolio of fixed rate assets that are financed with variable-rate (or very short-term) sources of funds
- Liability-sensitive bank has a Rs.10million negative dollar gap: chooses to purchase an interest rate cap with strike price of 8.0% with a principal of Rs.10 million
- Cap can be purchased with varying maturities: ranging from months to five years
- Writer of the cap could be an investment bank, a large commercial bank, or any other party
- Comparisons are made between market interest rates and strike price- use a reference rate of T-Bill or LIBOR- at regular intervals (six months is common) referred to as *determination date*

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You see this example. Suppose the bank has the portfolio of the fixed assets that are financed with variable rate of the sources of the funds that is the rate of interest is changing for that.

The liability sensitive bank has a 12 million Rupees negative dollar gap, chooses to purchase an interest rate cap with strike price of 8 percent with a principal of 10 million Rupees.

Then the cap can be purchased with varying maturities ranging from 1 to 5 years. Then the writer of the cap could be an investment bank, or a large commercial bank that means they are the seller of the cap, and the comparisons can be made between market interest rate and the strike price and here you can use reference rate either you can take treasury bill rate, you can take LIBOR - London Bank Offer rate at regular intervals which is basically defined as the determination rate. Generally 6 months is the common frequency what we consider whenever we define this.

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Caps and Floors Example:

- If market yield(say 9%) > strike price (8%), the writer of cap would be obligated to pay Rs. 50,000 to the bank:
$$=(9\%-8\%)(Rs. 10,000,000)(0.5) = Rs. 50,000$$
- This payment could offset the increased net interest cost produced by the liability sensitive position of the bank's balance sheet
- If rates do not increase, the bank does not collect on its insurance policy (i.e. cap) but also does not lose from a liability sensitive balance sheet

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So, the market rate in that condition, if market rate increases to 9 percent, strike price already know, that is 8 percent, that is more than that. The writer of the cap would be obligated to pay 50000 to the bank.

How this 50000 has arrived? $(9\% - 8\%) \times 10$ million rupees that will give you 50000 Rupees. This payment could be offset, the increase the net increase cost produced by the liability-sensitive position of the bank in the balance sheet in the cash market. So, if the rates do not increase the bank does not collect on its insurance policy but also does not lose from the liability-sensitive balance sheets. So, they will not go for that particular exercising that option.

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Caps and Floors Example:

- Suppose the bank is asset sensitive : it has short term assets financed with long-term liabilities
- Banks will benefit if rates rise but will be harmed if rates fall
- Purchase a floor with a Rs. 10 million principal, a strike price of 7%, and a six month determination date
- If interest rate on the appropriate market instrument (say, 3 month T-bill) was 6% as of determination date, the bank would be entitled to receive Rs. 50,000 from the writer:
 $(Rs. 10,000,000)(1\%)(0.5) = Rs. 50,000$

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Suppose, the bank is asset-sensitive so it has short term asset financed with long term liabilities, in that case the bank will benefit if the interest rate will rise but it will be harmed if the interest rate falls, so you can purchase the floor with 10 million principal strike price of 7 percent and 6 months determination rate.

So, the interest rate on the appropriate market instrument let be 3 months treasury bill for 6 months percent on determination date, then bank would be entitled to receive 50000 which is $10 \text{ million} \times 1 \% \times 0.5$ that will give you the 50000 Rupees in this particular period. Then you can offset that risk if the interest rate goes in the opposite direction.

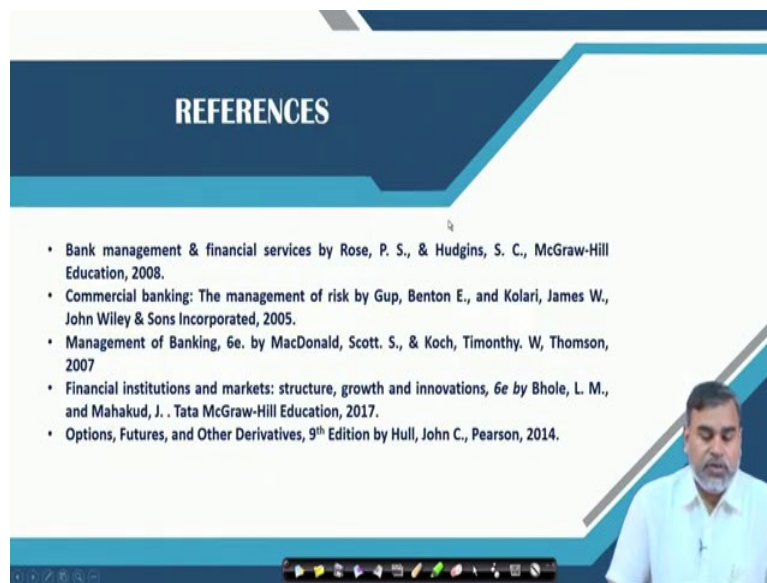
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CONCLUSION

- Buyer of call futures option has the right, but not the obligation, to take a long position in the futures market at the exercise (strike) price any time prior to expiration of the options contract
- Buyer of put futures option has the right, but not the obligation to take a short position in the future market at the exercise (strike) price anytime prior to expiration of option
- For negative dollar gap position, Long interest rate put option reduces the interest rate risk
- For positive dollar gap condition, banks buy interest rate call option hedge the interest rate risk

So, if we see the conclusion. The conclusion is basically the option is different from the futures because the option holder has the right but not the obligation to exercise this. And for a negative dollar gap long interest rate put options reduces the interest rate risks and for the positive dollar gap position banks must buy the interest rate call option which can hedge the interest rate risks in the market. So, this is the way overall the options can be used to minimize the risk in the financial market for the commercial banks.

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So, these are the references you can go through for the detailed discussion on this. Thank you.