

**Management of Commercial Banking**  
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**Lecture 23**  
**Earnings Sensitivity Analysis**

So in the previous class we discussed about the Dollar Gap analysis. So in the dollar gap analysis what we have seen we are trying to establish a linear relationship between the change in interest rate and the value of the net interest income and how the change in interest rate is affecting the net rate interest income, that basically we are trying to examine through the gap analysis or the dollar gap analysis.

But here what we have observed the relationship is very much straightforward. We have not added any other complexity and the impact of change in interest rate on both those assets and liabilities are simultaneous, immediately there is no kind of lapse or period or time impact on this. So that means there is some kind of idealistic situation without any kind of lapse, without any kind of complexity.

We are basically trying to use the dollar gap analysis which is a traditional analysis always the banks or commercial banks always use whenever they want to manage the interest rate risk in the market, but today in this particular session we will be discussing about the Earning Sensitivity Analysis. So here in the earning sensitivity analysis what basically here we are trying to do. We are assuming that the relationship is not straightforward or it is not linear.

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The slide features a dark blue header with the text "CONCEPTS COVERED" in white. Below the header, there is a list of three items, each preceded by a right-pointing arrowhead. The items are: "Earnings sensitivity", "Exercise of embedded options in assets and liabilities", and "Management of earnings sensitivity risk". The slide also includes two logos in the top left corner and a small portrait of a person in the bottom right corner.

- Earnings sensitivity
- Exercise of embedded options in assets and liabilities
- Management of earnings sensitivity risk

In this context we will be covering up mostly these, three different concepts, major concepts. One is what do you mean by the earning sensitivity and if there is any kind of instrument what the banks basically hold which are some kind of embedded options both assets and liability sides then how those kind of embedded options are going to affect the value of NII whenever there is a change in interest rate.

And how this earning sensitivity risk can be managed, what are those different ways or different kind of process or different kind of instruments or different kind of strategy, what the commercial banks can adopt to manage the earning sensitivity risk in the system. So these are the major discussions what we are going to do today.

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**Earnings Sensitivity Analysis**

- It carries out 'what if' analysis of all factors that affect the NII across a wide range of potential interest rate environments
- It repeats static GAP analysis assuming different interest rate environments and compares expected net interest income between the different environments

The slide features a background with various icons including gears, a tree, a lightbulb, and a person. A small video inset in the bottom right corner shows a man with a beard and glasses speaking.

First of all let us explain or let us see what do you mean by the earning sensitivity. Whenever we talk about earning sensitivity earning sensitivity is nothing but if you refer or if you go back, we are talking about a sensitivity analysis. The sensitivity is a measure of the risk and here in the sensitivity what we do. We are trying to see if one variable will change by 1 percent or a particular unit and how the other variables are going to be changed.

Or what is the percentage of change in the outcome variable that was the sensitivity analysis whatever we have discussed, but in this context what this earning sensitivity analysis basically does. The sensitivity analysis basically carry out the what if analysis of all factors that affect the net interest income across a wide range of potential interest rate environments. Because all of you know that prediction of interest rate is very difficult.

If the prediction of interest rate is very difficult in that particular scenario the accurate prediction of interest rate is really a tedious and very risky task of any financial analyst including the commercial banks also. So in this context a scenario analysis or we can say that a kind of different scenario analysis if you do then that will give the idea if this rate will change by this percent or that percent in the lower side and in the upper side.

Then how the net interest income is going to be changed or going to be affected by that the bank will carry out certain strategy to get rid of any kind of bigger losses what they may get incur in the future due to the change in the interest rate. So that is the basic objective of earning sensitivity analysis. So exactly if you observe though in the earning sensitivity analysis what we are trying to do.

We repeat the static gap analysis assuming the different interest rate environments and compare the expected net interest income between the different environments. If the interest rate will increase by 1 percent decrease by 1 percent then how basically net interest income is going to be changed and another thing also it brings certain kind of other complexity with respect to the different assets and liabilities where the commercial banks hold.

That is also another advantage of the earning sensitivity analysis and this is basically pure extension of the dollar gap analysis. Dollar gap analysis is a traditional approach is a static approach what the commercial banks always use or was using long back, but over the period of time due to the dynamisms of the different types of instruments what the banks are holding and as well as different dynamics of the market in this context what they are trying to do.

They are trying to rely upon more the simulated kind of aspects or simulated kind of analysis whenever they are trying to manage the interest rate risk in the system. So in one part of that thing is the earning sensitivity analysis.

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In this case, there are different steps we follow if any commercial banks is going to use the earning sensitivity analysis then what are those different steps basically they follow for that. First of all they have to forecast the interest rate and whenever they forecast already we know that the forecasting what basically they have to do on the basis of historical data whatever they have.

And as well as they have to forecast the balance sheet size and the composition of the balance sheet. Composition of the balance sheet means how much is the rate sensitivity assets, how much is the rate sensitive liabilities and they consider assumed interest rate environment and on the basis of that they have to see that in the different scenario or different kind of interest rate scenario how these value of asset and liabilities are going to be changed.

Another thing also because already we know that there are the banks are holding certain kind of assets. Which have some kind of option feature maybe some kind of call feature, some kind of put feature there are many features can be involved with respect to the assets or the liabilities what the commercial banks hold. So then the analyst or the banker should also analyze that how that particular embedded options which are there in the assets and liabilities are going to be exercised.

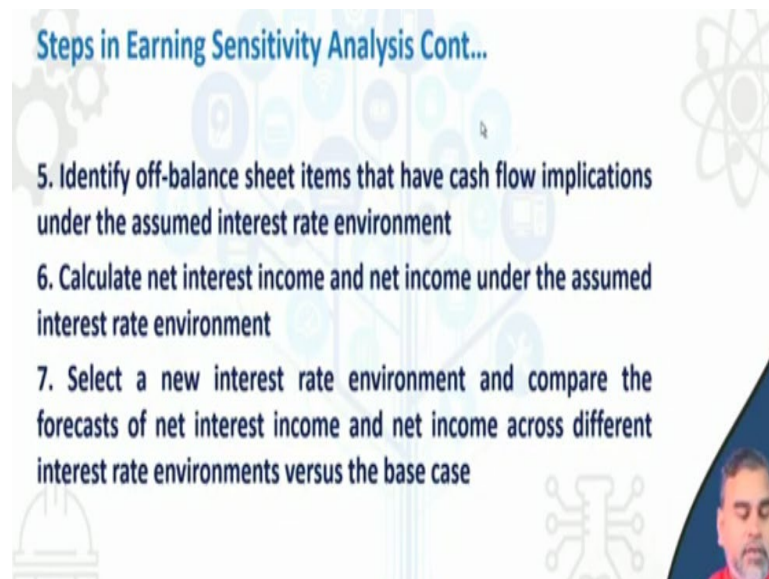
When they are going to be exercised. That means in our language in the derivatives you might have known the concept of the money. For example, in the call option case if you are talking about a call option then when the call option will be exercised then when the call

option is in the money that would be exercised that means the market price should be more than the strike price.

That means instead of buying the things from the market I can buy it or I can take it from that particular contract because the contract price or the strike price of that particular asset is relatively lesser than the actual current market price of that particular assets that we will be discussed in more, about this in the forthcoming session. So, first of all the banker has to predict that one also.

Then they have to identify which assets and liabilities will re-price over different time horizons and by how much under the assumed interest rate environment. Whatever interest rate scenario they are considering, how the assets and liabilities they re-priced for that depending upon their sensitivity towards the interest rate that is basically the next step what they have to consider.

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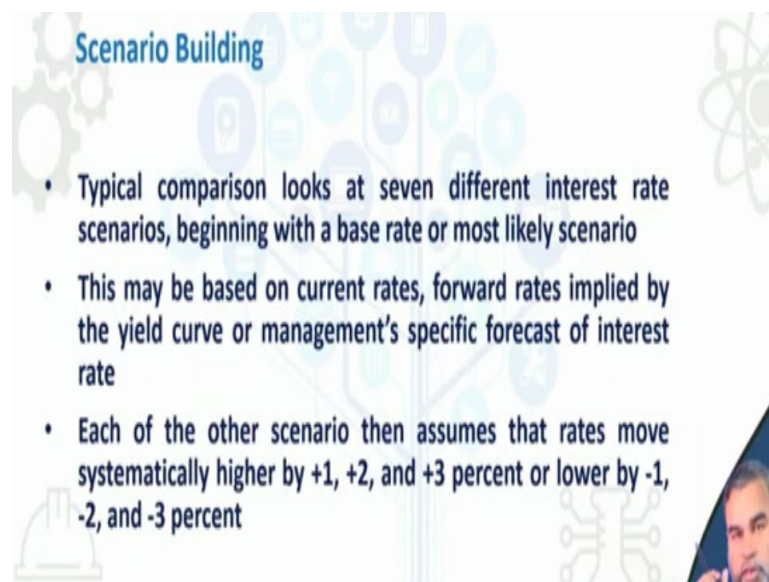


Then they have to identify the off-balance sheet items. The off-balance sheet item also have cash flow implication whenever there is a change in the interest rate in the market. So they have to consider how the income and all these things which are generating out of the balance sheet items, how they are going to be basically affected whenever there is a change in the interest rate in the market. Then after that what happened they calculate the net interest income and net income under the different environment which are defined on the basis of interest rate.

Then select a new interest rate environment and compare the forecast of the net interest income and net income across different interest rate environments versus the base rate that means the beginning whatever interest rate are prevailed. Accordingly we decide that how basically the net interest income is going to be or how much is the net interest income for that particular data or particular rate.

And if there is a change in the interest rate in the market under this conditions how this particular value is going to be changed then once this is basically known to them then it is easier for them to predict that how this net interest income is going to be affected in the market due to the change in the interest rate. So in this context one by one these are the different major steps, what the commercial banks basically use whenever they go for the earning sensitivity analysis.

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**Scenario Building**

- Typical comparison looks at seven different interest rate scenarios, beginning with a base rate or most likely scenario
- This may be based on current rates, forward rates implied by the yield curve or management's specific forecast of interest rate
- Each of the other scenario then assumes that rates move systematically higher by +1, +2, and +3 percent or lower by -1, -2, and -3 percent

But here if you see that in first objective or the first step if you talk about in the sensitivity analysis the first step is they have to make the different scenarios and the different scenarios means the scenarios in this case are based upon the interest rate. On the basis of the interest rate movements the scenarios has to be build up. So here in general typically which has been observed the banks always look at 7 different interest rate scenarios.

7 interest rate scenarios means, one is rate which is already prevailed and if the interest rate will be changed by certain percentage in the upper side and if the interest rate is going to be changed by certain percent in the lower side, then finally they can see or they can calculate

that how this net interest income is going to be changed with respect to that original positions whatever they have.

So then accordingly they can decide that one, but the question here is that what is the base rate they will consider. So whenever the base rate they want to consider, obviously the base rates are decided on the basis of the forward rates, current market rate which is available and as well as the management specific forecast of the interest rate. You might have already aware about the term structure interest rate theory.

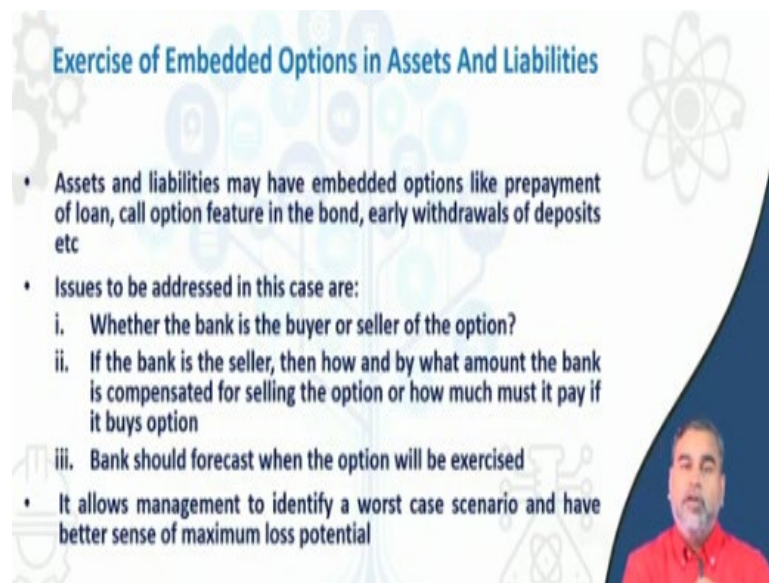
There what we are trying to find out, we are trying to calculate the long term interest rate from the short term interest rate and the first and foremost theory which is used for that it is the pure expectation theory and according to the pure expectation theory, already you know that the long term interest rate is nothing but the arithmetic or geometric mean or the geometric average of the current spot rate and the forward rates, future forward rate basically.

So if you know this forward rate and as well as the spot rate for today then using the arithmetic or geometric average we can calculate that what kind of interest rate is going to be in the future. Accordingly the shape of the yield curve can be determined or from the shape of the yield curve we can find that whether the forward rate will be more than the spot rate or the spot rate will be more than the forward rate.

So in this context first of all they have to decide what is the base rate they want to consider which can be derived either from the yield curve or the management can use some kind of models to forecast this interest rate in the market. Then once this is done then they basically go for already we have discussed that we have different scenarios we have to build up and the different scenarios can be build up both in the upper side or in the lower side.

In the upper side, we are assuming that let the interest rate can go up by 1 percent, 2 percent or 3 percent or it can go down by 1 percent, 2 percent or 3 percent. So different scenarios you have build up and accordingly, now your objective is to find out in this particular different scenario how this net interest income is going to be changed.

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**Exercise of Embedded Options in Assets And Liabilities**

- Assets and liabilities may have embedded options like prepayment of loan, call option feature in the bond, early withdrawals of deposits etc
- Issues to be addressed in this case are:
  - i. Whether the bank is the buyer or seller of the option?
  - ii. If the bank is the seller, then how and by what amount the bank is compensated for selling the option or how much must it pay if it buys option
  - iii. Bank should forecast when the option will be exercised
- It allows management to identify a worst case scenario and have better sense of maximum loss potential

So then basically what we have to do, we have to consider that whatever assets and liabilities the commercial banks are holding is there any kind of options, is there any kind of embedded options is involved in that and whenever you talk about the embedded options it can be mean many ways, either they have some kind of call features or they have some kind of put features and all this things. This is obviously one type of embedded options.

And another option is the loan can be prepaid also. If somebody has taken a loan of 10 lakh rupees if somebody has got some money for some sources. Then they can repay this particular loan before the maturity, but the commercial bank has made the adjustment of their balance sheet on the basis of the particular loan what they have provided for a particular period, but now all of a sudden without the knowledge of the commercial bank, the particular client or particular customer is going to change that particular rate, going to prepay that particular loan they want to close that.

So in that context what happens that the whole structure of the balance sheet or the asset liabilities basically gets changed. Whatever forecasting the commercial banks have made that is not going to be materialized if without the knowledge of the commercial bank this particular customer is now interested to prepay the loan before the maturity.

Another thing is the call option feature so you know what do you mean by call option feature. The call option feature is whenever the particular bond is issued let the commercial bank has issued the bond and we are investing then bond has a call feature if bond has a call feature



then what is the call feature here then after a certain period of time the particular bond can be called back.

And who is going to call back that issuer can call back that particular bond depending upon the situations the particular issuer is ready to or interested to call back that bond from that particular bond holder. So for that we are deciding the prices which is called that call price for that bond instead, whenever we are going for valuation of the callable bonds there instead of using par value.

We always calculate the value of the bond with respect to the call price of that particular bond. But here the question is it can work in two ways the bank can sell, bank can buy the bond also. So from the buyers perspective and from the seller perspective it is different, but if I am a buyer then my obligations, my liabilities and my assets, my calculations should be different than the from the seller perspective.

This is another thing and another also options we have withdrawal of the deposits. When this depositor is going to withdraw the money particularly the savings account deposits we do not know or the bank is not aware that when this money will be withdrawn from that particular account, but whenever we are talking about this sensitivity towards the interest rate accordingly we are managing the assets and liabilities if that is not known from the beginning.

Then what happens that already the early withdrawal can be possible if the early withdrawal is happening then it will also disturb the asset liabilities composition of the commercial bank. So there are many sources through which the composition of the assets and liabilities can be disturbed can be changed. So in this context we have to also ensure those factors should be consider while establishing the relationship between the change in interest rate and the change in the net interest income that actually you can keep in mind.

So in this context what are those issuers we are going to address with respect to this embedded options whatever we have. First of all whether the bank is a buyer or seller of the option. If the buyer of the option if he want he can exercise this option, but if he does not want, for example, if I am the bank is issuing and again bank is going to buyback that particular bond.

Then bank is the buyer so then that time it is not a problem whether the bank wants to buy that particular asset or particular bond or not, but if the bank is not basically buyer, bank is the seller that bank is now holding it and they want to sell it. So then there is a problem because seller get some kind of premium for that.

But it is a larger implication on the total value of this particular asset in the system. So if the bank is the seller then by what amount the bank is compensated for selling this option that also the bank has to predict or how much must it pay if it buys this particular option. So that is why the price determination or the call price determination in that particular context also is very important.

So in this case that thing is not captured through the linear static gap analysis because there we are only thinking that once the interest rate changes the value of the assets and liabilities gets changed without considering this kind of complexities. So the earning sensitivity analysis try to capture that one. So keeping that thing in mind the bank should forecast when the option will be exercised.

Some kind of historical simulated analysis has to be carried out to understand when the bank is going to exercise that particular option that also should be known to us. So all these things basically allow the management to identify a worst case scenario and have better sense of maximum loss potential. So in the worst scenarios how much loss is there or how much loss the bank is going to incur or bank is going to face.

If that can be forecasted then the bank will be well prepared that really what is going to happen and whether really I am in a position to hedge my particular interest rate risk to protect my volatility of the interest income or we can reduce the downside risk for that particular net interest income with respect to the change in the interest rates in the market. So this is the first issue what with complex issue what we have to see.

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**Off-Balance Sheet Contracts**

- Recognize the bank's off-balance sheet contracts like future, swaps, options etc
- Each type of contract may have different cash flow effects in different interest rate scenario which ultimately affects bank net interest income and expense
- The effect of these contracts should be included in any forecast of net interest income and net income volatility

The slide features a light blue background with various icons including gears, a lightbulb, a bar chart, a network diagram, and a microscope. A small video inset in the bottom right corner shows a man with a beard and glasses speaking.

Then we have to also see the off-balance sheet contracts. First of all you recognize what are those off-balance sheet items or off-balance sheet contracts the bank has. Mostly the derivative instruments, your fees, commissions all kinds of things which are coming under the off-balance sheet activities. So how much exposures the bank has towards that and another thing you remember each type of contract has a different kind of cash flow effects in different interest rate scenario.

So all the contracts are not equally going to affect the net interest income or the total income of the bank whenever there is a change in interest rate. The impacts are basically different if the impacts are different then ultimately the net interest income and expenses are highly diversified, highly complex and as well as change in the net interest income is always fluctuating largely.

And another thing is that in the previous case we have seen that if interest rate will increase by 1 percent this is the way the value of the assets and liabilities they are going to be changed, but in this case it is not going to be happening, why it is not going to be happening because the cash flow timing and the amount of cash flow from the different off-balance sheet items are different.

So that complexity is not captured through this dollar gap, it can be captured through the sensitivity of that particular assets and liability or earning sensitivity analysis. So all this effect of this contract should be included if any forecast of the net interest income and net

income volatility we are going to measure if there is a change in the interest rate. So that is another dimension always we should keep in the mind.

Whenever we are going to decide the strategy for the commercial banks in terms of assets and liabilities to minimize the interest rate risk in the market or to minimize or to increase the net interest income in the particular market. So that is why the off-balance sheet items, considerations was not there in the dollar gap or it is there in the earnings sensitivity analysis,.

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**Variations in Interest Rate Changes in Different Times**

- Earning sensitivity analysis allows management to incorporate the impact of different competitive markets for various balance sheet accounts with alternative pricing strategies
- Forecasting different spreads between asset yields and liability interest costs when rates change by different amounts
- Example: Banks are quick to increase the base loan rates when interest rates increase but are slow to lower base loan rate when interest rate declining

But another thing you see how this interest rate changes affect this particular assets and liabilities in the different times. If you can observe these things this particular concepts works in the different ways. How basically this works in the different ways? So in this context it is a very much broader analysis of the assets and liabilities to manage the interest rate risk in the system. The earning sensitivity analysis allows the management to incorporate the impact of different competitive markets or various balance sheet accounts with alternative pricing strategies.

This is the first one the sensitivity analysis basically tells the management to do. For example, first of all they have to see they have to forecast the different spreads between the assets and the liability in the different interest rate scenarios that also they have to do. For example, if you see whenever there is a change in the interest rate in the market let the interest rate has increased.

If the interest rate will increase the bank will immediately increase the rates if it is a floating rate loans. For example somebody has taken a house loan for 15 years and it is a floating rate loan if there is a change in the interest rate in the market due to the change in the policy rate of the Central Bank and other issues then what the banks do, the banks immediately will change the loan rates whenever there is an increase in the interest rates.

But if for some reason the interest rate is going to be declining or interest rate has declined then what the banks basically do banks are very much slow to lower the base loan rate when the interest rate is declining. Why anyways this is not allows for the bank. So if for general customer or general people who are doing the business with the bank for them it is a loss for the bank it is not a loss because interest rate is declining.

If the bank will not decline the interest rate with respect to the other items then what is happening that are the loans particularly then the total amount of interest income from that particular loan will be increasing, but end of the day they will do that, but there is a time gap. So the impact of the increase in the interest rate on the assets and liabilities value is not equal to the decrease in interest rate in the assets and liabilities value.

So the relations basically is not at a time goes. In the same time they do not do that particular analysis, they do not take this kind of steps whenever there is interest rate changes in the market. So because of that the particular issue becomes more complex.

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**Variations in Interest Rate Changes in Different Times Cont..**

- Difference between loan rate and deposit rate at the time of interest rate changes
- The implication is that the impact on the banks net interest income is different due to different timing of rate changes and different magnitude of rate changes
- The impact of interest rate change is not straight forward

The slide features a background with faint icons of a gear, a lightbulb, a brain, and a person. A small video inset in the bottom right corner shows a man with a beard and glasses speaking.

And another thing also if you see some of the other things the difference between the loan rate and deposit rate at the time of interest rate changes. Let the interest rate has gone up by 1 percent sometimes we will observe your loan rate has changed by 0.75 percent, but your deposit rate has changed by only 0.35 percent. Why is it so because deposit is a cost activity it is a liability for the commercial bank.

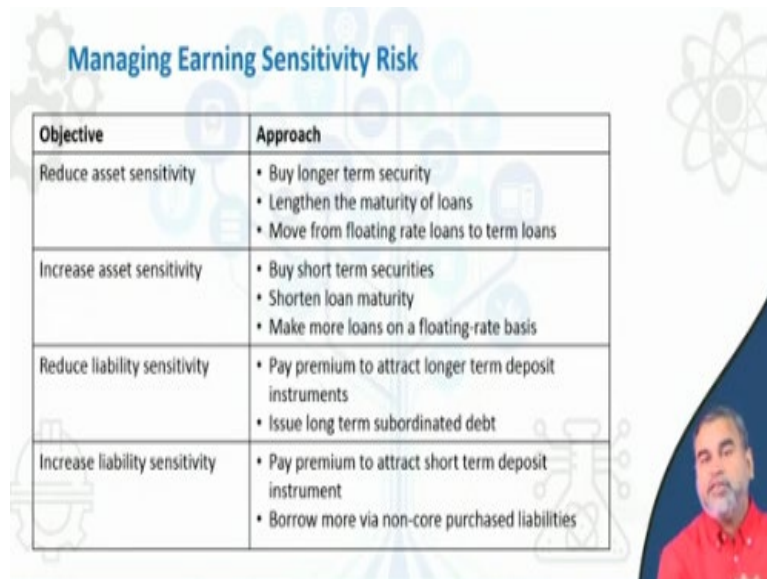
So therefore there is a change you can observe which is different in terms of the assets and liabilities. So whenever the interest rate is increasing or decreasing that has a different impact and across the assets and liabilities also the change in the interest rate basically is different. So if those kind of complexities are there then the linear kind of relationship between the interest rate changes and interest income is not a feasible solution to manage the assets and liabilities for the commercial bank.

Then what is the implication we can draw from this. The impact on the banks and net income is different due to the different timing of the rate changes that already we have seen and different magnitude of the rate changes which happens across the assets and liabilities. So therefore what we can conclude, from here we can conclude the impact of interest rate change is not straight forward.

So there is some kind of non linearity, there is some kind of other complexity has to be considered whenever we are establishing a relationship between the change in interest rate and the change in the net interest income that thing is basically totally missing whenever we

are talking about the dollar gap analysis, but that is reflected through the earning sensitivity analysis.

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Objective	Approach
Reduce asset sensitivity	<ul style="list-style-type: none"><li>• Buy longer term security</li><li>• Lengthen the maturity of loans</li><li>• Move from floating rate loans to term loans</li></ul>
Increase asset sensitivity	<ul style="list-style-type: none"><li>• Buy short term securities</li><li>• Shorten loan maturity</li><li>• Make more loans on a floating-rate basis</li></ul>
Reduce liability sensitivity	<ul style="list-style-type: none"><li>• Pay premium to attract longer term deposit instruments</li><li>• Issue long term subordinated debt</li></ul>
Increase liability sensitivity	<ul style="list-style-type: none"><li>• Pay premium to attract short term deposit instrument</li><li>• Borrow more via non-core purchased liabilities</li></ul>

Then we will see that how this particular sensitivity risk is managed. There are different kind of scenario, different kind of objectives the commercial banks can follow. Let they want to reduce the assets sensitivity, depending upon the interest rate fluctuations, let they want to reduce the asset sensitivity then how the commercial banks can reduce the asset sensitivity. The asset sensitivity can be reduced, they can buy a longer term security.

Because the sensitivity is more for short term asset than the long term asset that already we have discussed. Now they can buy a longer term security, they can increase the maturity period of the loans and they can also move from floating rate loans to the fixed term loans. So that is another kind of ways this particular strategy can be made or the approach can be used. Another one is if they want to make the interest increase the asset sensitivity.

Then what they have to they will make the reverse one, buy the short term security, reduce the loan maturity period, make more loans on a floating rate basis, do not give emphasis on a fixed rate basis. Like that if you go for reduction of liability sensitivity then what basically we have to do, pay the premium to attract the longer term deposits why somebody will deposit for a 5 year time or 3 year time then obviously whenever the interest rate is higher.

So pay them good premium by that that person will be depositing that money for a longer term period then the long term deposit instruments maturity period will be increasing that is

number one. Issue the long term subordinate debts. Subordinate debts quality is relatively lower, but it is long term and as well as sometimes it is also not backed by the security. So issue the long term subordinate debts where you do not have to provide any kind of securities.

But still it is a long term in nature because of that sensitivity towards the change in interest rate is relatively lower. Pay the premium if there is an increase in the liability sensitivity then what we have to do, pay the premium to attract the short term deposit instrument and you can also borrow some non-core liabilities which are existing in the banking sectors. So these are the ways through which the earning sensitivity risk can be managed. If there is a change in the interest income or the commercial banks in the different scenarios.

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## CONCLUSION

- Earnings sensitivity analysis carries out 'what if' analysis of all factors that affect the NII across a wide range of potential interest rate environments
- Assets and liabilities may have embedded options like prepayment of loan, call option feature in the bond, early withdrawals of deposits
- Earning sensitivity analysis allows management to incorporate the impact of different competitive markets for various balance sheet accounts with alternative pricing strategies

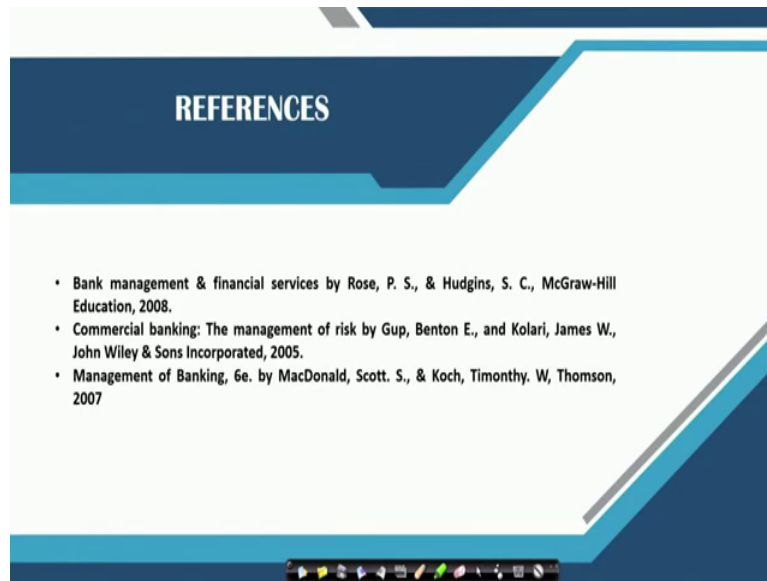
So these are the conclusions if you see what we have seen that the earning sensitivity is basically tries to do a what if analysis across the wide range of interest rate environments. So assets and liabilities may have embedded options like prepayment of the loan, call option feature, early withdrawals and all these things and that has to be considered while examining the relationship between the interest rate changes and the interest income of the commercial bank.

Earning sensitivity analysis basically allows the management to incorporate the impact of the various competitive market for various balance sheet accounts with alternate pricing strategy and they should consider the timing aspect and as well as the particular issues embedded



options which are involved in that particular assets and liabilities while managing the interest rate risk using this particular gap analysis. So this is basically about the gap analysis.

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You can go through this references you can get the idea or maybe comprehensive knowledge about this particular issue. Thank you.