Management of Fixed Income Securities
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Module No # 05
Lecture No # 25
Default Risk

Welcome back! So, in the previous class, we discussed about two important concepts with respect to the bond risk management strategy. one is your duration and other one is the convexity and other most important risk also the investors always is exposed to whenever they try to invest in the bond market, that is basically your default risk or the credit risk. So, the credit evaluation models and other kind of advance techniques with respect to the credit risk that we will discuss further.

But we will just introduce the concept of the credit risk and what exactly the credit risk is and what are the basic concepts that are linked to that particular credit risk? That basically we can discuss today.

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So, using this concept of the credit risks which; is largely has a strong association with this bond investment. We will discuss about broadly different concepts related to that like what exactly the default risk or credit risk is? And the concept of the credit spread. And throughout this particular discussion you will come across certain keywords.

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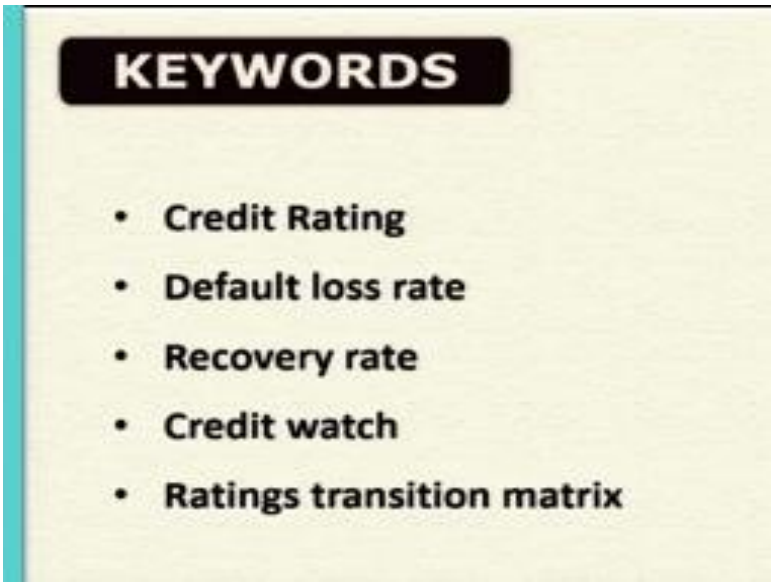

Like credit rating, the concept of default loss rate, recovery rate, the concept of credit watch then, ratings transition matrix. So, these are the different concepts what generally we use whenever we try to always discuss about the default risk or the credit risk in the bond investment.

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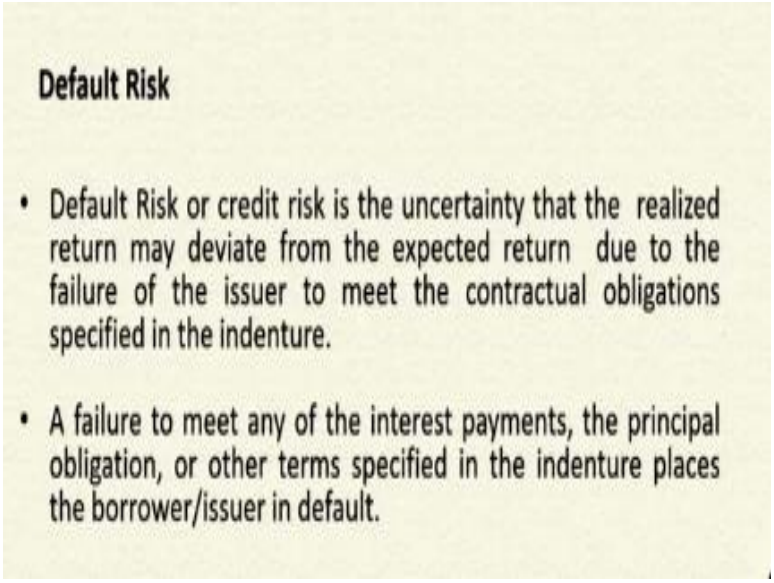

Let us see that what exactly the default risk is? The default risk or the credit risk is basically a kind of uncertainty. Which is arises or which basically always we are facing and because of this the realized return may deviate from the expected return. Due to the failure of the issuer to meet the contractual obligations specified in the bonds indenture provisions.

So for any reason if the issuer is not able to pay the interest or the principal or any other thing which are specified in the indenture provision, then that means the bond investor or bond holder is exposed to the default risk. Like market risk it is a common type of risk always we face whenever we invest in the bond market. So, whenever we invest in the bond market credit risk is inevitable.

So that is why we always give lot of emphasis on the credit risk, whenever we try to invest in the bond market or always we try to assess the credit risk whenever at any point of time we try to invest in the bond market. So, then we will see that how somebody will come to know about the credit risk as a bond investor, if I want to go and invest in the bond market. What are the things I will look at or how i can get the information about the credit risk with respect to that particular bond? So that is the fundamental question always we should try to answer.

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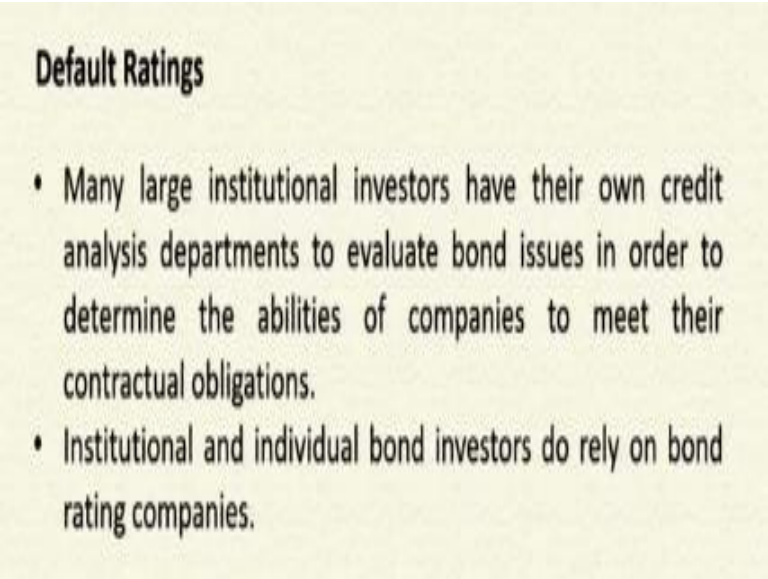

So, because of this, in practical sense if you look at many large institutional investors have their own credit analysis department. They evaluate the bond issues. Any corporate or any other bonds which are issued in the market they look at that particular company they consider certain factors into the constitution and they try to determine the abilities of the companies to meet their contractual obligations.

Whether the company which issuing the bond in the future they will be really able to repay their required cash flows to them or not in terms of the interest or in terms of the principal and all.

They will evaluate and accordingly. They decide whether they will be interested to invest in that particular bond or not but it is not possible for everybody. So, because of that some of the institutional investors and if it is a retail or individual bond investor, they largely rely on the rating companies.

The credit rating agencies, whose primary job is to rate this particular companies in terms of their ability to fulfill the certain requirements in terms of the payment of the regular payment of the cash flows to the bond holders so they rely upon them.

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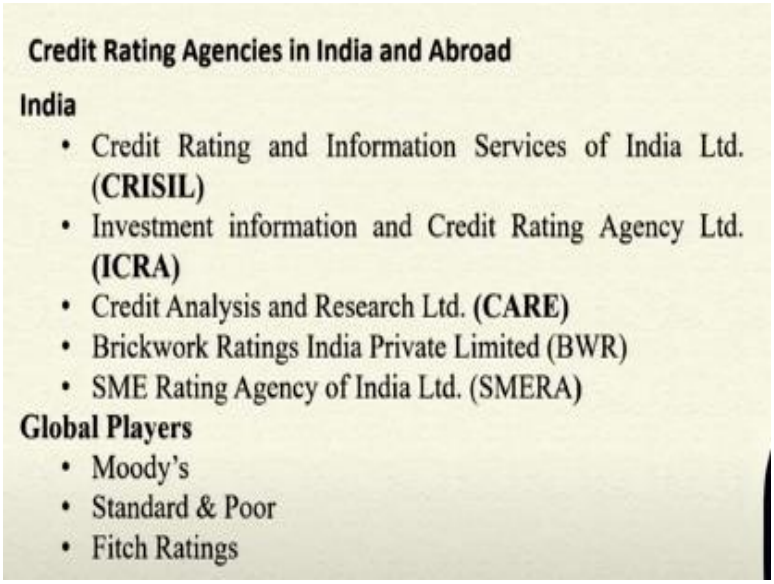

So, what are those credit rating agencies there are many credit rating agencies you might have come across. We have in India if you look at, we have CRISIL, the credit rating and information services of India limited, Who is a larger organization or very prominent organization who gives the rating to the different companies? Investment information and credit rating agency limited ICRA that is another body.

We have a CARE called credit analysis and research limited. We have also a kind of organization called brickwork ratings India private Limited, and then we have SMERA, SME rating agency of India limited. But CRISIL is more prominent or more popular people always refer to the CRISIL'S ratings, whenever they try to invest in the market. That is in a common word for common kind of organization always comes to our mind.

If you look at the global players, we have Moody's, we have Standard and Poor, we have the Fitch ratings. So, they are the rating agencies very popular rating agencies who, basically gives the rating to the different bond investors to the different bonds. And whenever the bond investors try to invest in this kind of companies or the companies who are issuing the bond, then they always look at the ratings of these agencies.

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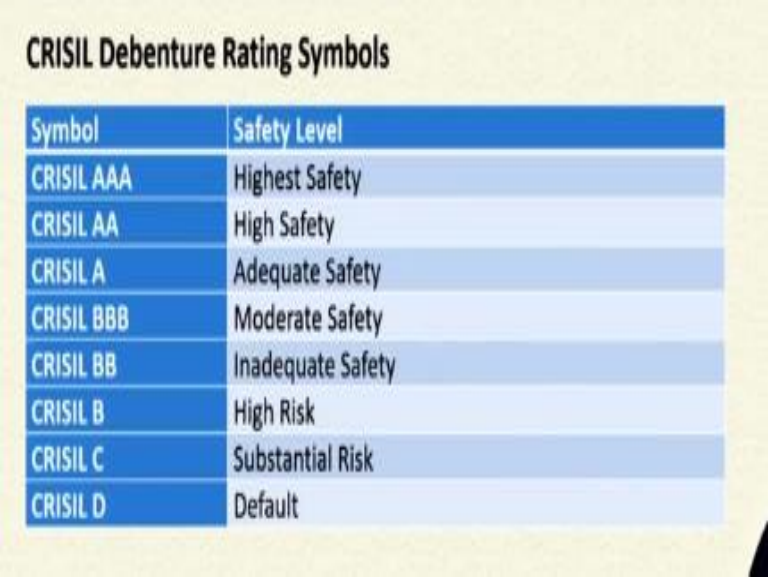

So little bit let us see that, what are the different type of rating symbols? the CRISIL basically gives, CRISIL has a different category, we have triple A rated bond which is called the highest safety the safety level. Then, we have double A rated bond high safety, A rated bond adequately safety, BBB moderately safety, BB inadequate safety, B is highly risky bonds, C is substantial risk and D is default bonds.

So, these are the different rating symbols you can always find whenever you are trying to invest in the bond market. In India these are the different ratings what CRISIL basically gives to the different kind of bonds which are issued by the different companies.

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Moody's and Standard & Poor's Rating Symbols

Moody's (Symbols)	Standard & Poor (Symbols)	Safety Level
Aaa, Aa	AAA, AA	Very high quality
A, Baa	A, BBB	High Quality
Ba, B, Caa, Ca	BB, B, CCC, CC	Speculative
C, D	C, D	Very poor

If you look at the Moody's and standard force rating symbol, they have classified it broadly in four category; very high quality, high quality, speculative bonds and very poor bonds. Only the symbols are little bit different more or less same, but only the symbol different rating agencies use the different ratings. If you go by Moody's let Moody uses Aaa or Aa. But in the same case standard and poor basically uses AAA and AA.

So, these types of bonds are very high quality bonds. That means regularly they are fulfilling all those requirements, they are paying the interest periodically, they are paying the principals at the time of requirement. So, all type of bond characteristics which are mentioned in the indentured provision, they are completely fulfilled by this particular rated companies.

So, if you go by A and Baa by the Moody's and A, BBB by the standard and poor, they are high quality bonds but not like the AAA or the AA rated bonds. So, in that case they have certain restrictions, certain things they may not fulfill but this is very minor. That is not very important in that particular or very much prominent in terms of the investment point of view, but they are considered as the high quality bonds.

But this Ba, B, Caa, Ca in terms of Moody's and BB, B, CCC, CC by standard & poor, these are called the speculative bonds. And Caa, Ca, CCC, CC, these are highly speculative bonds and the Ba, BB; theese are the least speculative bonds. And D is a default bond in same case what the CRISIL uses for India. The D is basically a default bond. if any kind of rating any company is

getting D, then that means it is a default company, who are not basically able to pay the interest or principal adequately at a specific time period. So, these are called the D rated bonds.

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So, then what are those factors generally companies look at whenever they give the ratings to or the rating agencies always look at whenever they give the ratings? There are many factors and that factors also vary on the basis of the types of the companies. Like if you are giving a rating to a manufacturing company or you are giving a rating to a finance company about a bank, the rating parameters are not different.

But more or less there are certain common variables or common kind of factors they consider they go for a business analysis of the company. They look at the sales, the volatility of the sales, period of time how they are basically utilizing their resources. So those things come under the business analysis part. Then they do the financial analysis. Financial analysis means mostly it is very important they consider the financial risk like what is the leverage ratio and they give more importance to the interest coverage ratio.

Whether it is adequate enough the companies are really generating that much profit to fulfill their debt requirements or interest payments whatever they really need. So financial analysis what they do they evaluate the management, the corporate governance part and this intangible asset , what the company is holding, what is the company's vision, mission and all kinds of things. The

management evaluation they do whether the company is properly audited or not who are the auditors.

So, there are different aspects they look at also from the management perspective and accordingly they decide whether the company is a good company or not. Who has the adequate ability to fulfill their desired requirements? Geographical analysis, where the company is placed, whether there is political stability and other things is quite good in that particular country or not or particular region or not so those things they look at.

Competition like regulatory and competitive environment, they look at the market competition, threats opportunities, which are available with respect to that particular business. And who are those competitors, what is the, what kind of market it is whether it is a monopoly market or profit market or monopolistic market. So those things basically they look at what is the scope of that particular business, what the company is trying to do? whether the regulatory environment is very much restrictive in that particular country or not?

So those things they look and also, they look at the fundamental analysis so they are basically they look at the liquidity aspects of the company. And the asset liability management aspects of the company. whether the companies are able to manage their assets and liabilities properly or not? And whether the liquidity is properly maintained by the companies or not? So, those things basically they look at and finally they give a rating score or they give a score to that particular company and on the basis of that score the rating can be assigned to that.

So, these are the different factors what the company or the credit rating agencies always look at whenever they assign any kind of rating to any kind of companies who are issuing the bonds.

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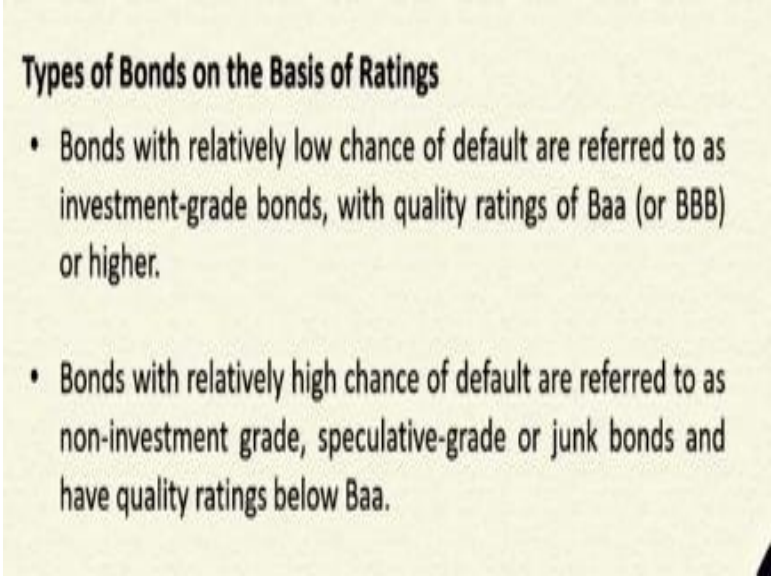

So, whenever you talk about the ratings, you see in terms of the ratings there are 2 types of the bonds we can come across. One is bond with relatively low chance of default and another one is bonds with relatively high chance of default. And bonds which are having the low chance of default, these are called the investment grade bonds. If you talk about us the quality ratings of Baa or BBB, because the symbols are varying across the rating agencies or higher.

So, these are basically the investment grade bonds and the bonds which are relatively high chance of default generally called the non-investment grade bonds or we call them the speculative grade bonds or junk bonds and where the ratings are below the Baa, or BBB. So, Baa, BBB, A, AA, AAA so all those bonds are basically investment-grade bonds. Then below that whichever bonds are available, these are basically called the non-investment grade bonds.

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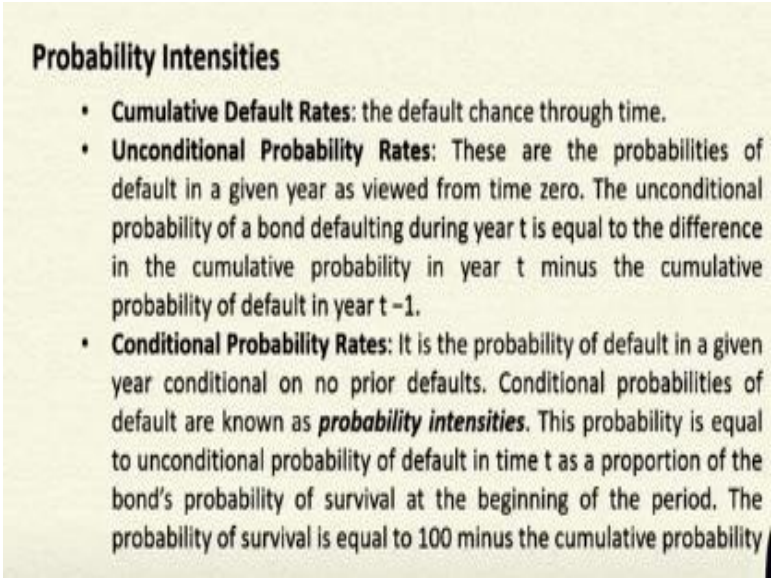

So, here one thing always the rating agencies or the analysts who are trying to assess the company's ability, they try to always understand or try to measure three things. They try to understand from this one is your cumulative default rates, the unconditional probability rates and the conditional probability rates. These are the 3 things always the rating agencies basically try to measure. What do you mean by the cumulative default rate?

These are basically the default chance through time. what is the probability of default basically through time? how the default rate is changing over the time, that is basically called the cumulative default rates. Unconditional probability rate means, these are the probabilities of default in a given year as viewed from time zero.

That means the unconditional probability of a bond defaulting during the year t is nothing but the difference between the cumulative probabilities in the year t minus the cumulative probabilities of default in the year t - 1. It is only the difference between the 2 different periods of the cumulative default rates. And the conditional probability is it is basically the probability of a default in a given year conditional on no prior defaults.

And the conditional probabilities of default generally known as the probability intensities. It is generally known as the probability intensity. How we can measure it? this is basically equal to the unconditional probability of default in time t as a proportion of the bonds probability of survival at the beginning of the period.

And how we calculate this bonds probability of survival? The bonds probability of survival is nothing but it is 100 minus the cumulative probability of that particular year. The cumulative probability of that, particular year that is basically called the bonds probability of survival. Let us see take one example then it will be clearer for you.

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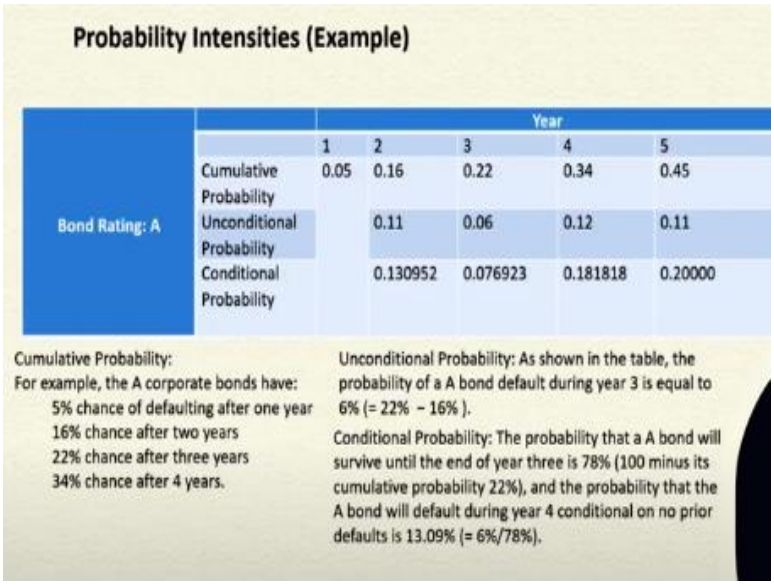

Let there is a bond that is A rated bond. Here, we have given some hypothetical figures. The cumulative probability, unconditional probability and conditional probability let these are the years 1-year bond, 2-year bond, 3 years bond, 4 years bond, 5 years bond. Right? 1, 2, 3, 4, 5 these are the years. The cumulative probability of a bond which has the rating of A in the first year it is 0.05, second year it is 0.16, third year it is 0.22, 4 year be 0.34, fifth year 0.45. these are all hypothetical numbers which are given to you.

Then what is the unconditional probability that means if you are trying to interpret this cumulative probability then it is 5% chance of defaulting after 1 year. Cumulative probability basically measures that there is a 5% chance of defaulting after 1 year, there is 16% chance after 2 years. The bond is going to be default 22% chance after 3 years, 34% of chance after 4 years and 45% of the chance after 5 years. so that is the way the cumulative probabilities are defined.

Now, you come to the unconditional probability. what is unconditional probability? If you see the table let you are trying to find out unconditional probability of bond default during the year

three. That is this basically the conditional probability. Sorry! this cumulative probability of the year three that is 22% , the cumulative probability of the year 2 that is 16%, then 22% minus 16% that will be 6%. If you are trying to measure the unconditional probability of year 2 that is 16% minus 5% that is 11%.

That year 5, that is 45% minus 34%, that is 11%. is it clear? So, that is the way we call it the unconditional probability of that particular bond. Then what is conditional probability? we have said let you take the example, the probability that a bond will survive until the end of year 3 that is how much that is 78%. That means how got 78%? that is 100 minus 22%, 22% chance this is going to be defaulted, then the probability of survival is 78%, that is 100 minus 22%, that will give you 78%.

And the probability that **t**he bond basically will default, the A rated bond during default during the year 4 conditional on no prior default that is basically 13.09% that means it is 6% divided by 78% that will give you 13.09%. So, that is the way the conditional probability is measured. you can measure for other bonds like that. Not other bond like in the different other years what is the conditional probability of default of that particular bond is it ok? That is the way basically the three concepts always we use.

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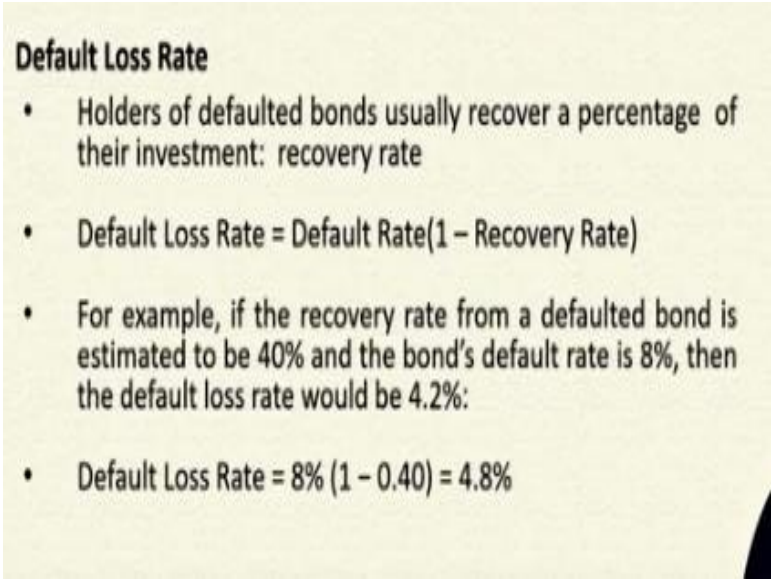

Now let us see the concept called the default loss rate. you see the holders of defaulted bonds generally recover a percentage of their investment. It not that the completely one is defaulted

they can recover something from that, so that is called basically recovery rate. So, your default loss rate is nothing but the default rate(1 - recovery rate) .

For example, if the recovery rate from a defaulted bond is estimated to be 40% and bonds default rate is 8% then what is the default loss rate? the default loss rate will be 8% (1 – 0.40), that will be 4.8%. The default loss rate is very much important in this perspective, that actually you have to keep in the mind.

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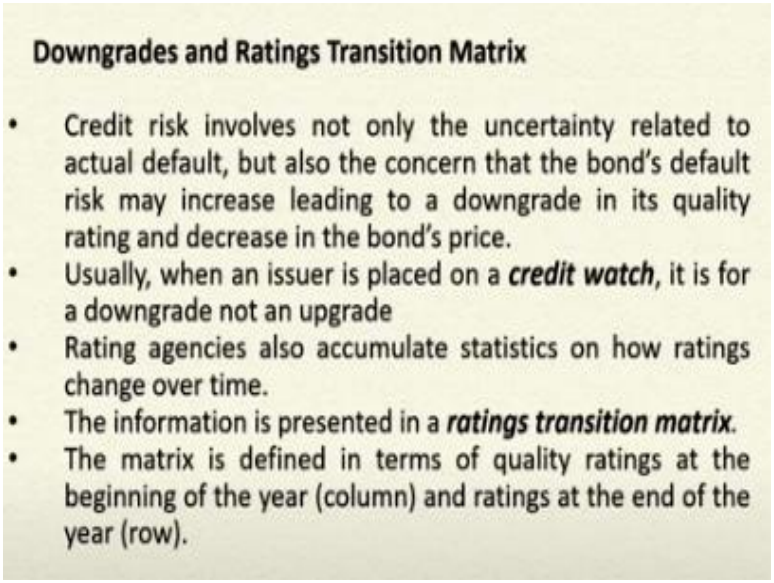

Other thing also you have to keep in the mind. over the time the rating may change. there may be a downgrading or upgrading of the bonds. The credit risk involves not only the uncertainty related to actual default, but also the concern that the bonds default risk may increase leading to a downgrade in its quality rating and decrease in the bond price. So, when the issuer is placed on a credit watch, it is for a downgrade not an upgrade, that means you should watch that particular credit position of the company.

And rating agencies generally accumulate the statistics on how the ratings change over the time and this information is generally presented in the ratings transition matrix. And the matrix is basically defined in terms of the quality ratings at the beginning of the year which is represented in the column wise and ratings at the end of year which is represented in the row. We will see that, how basically the rating transition matrix is presented?

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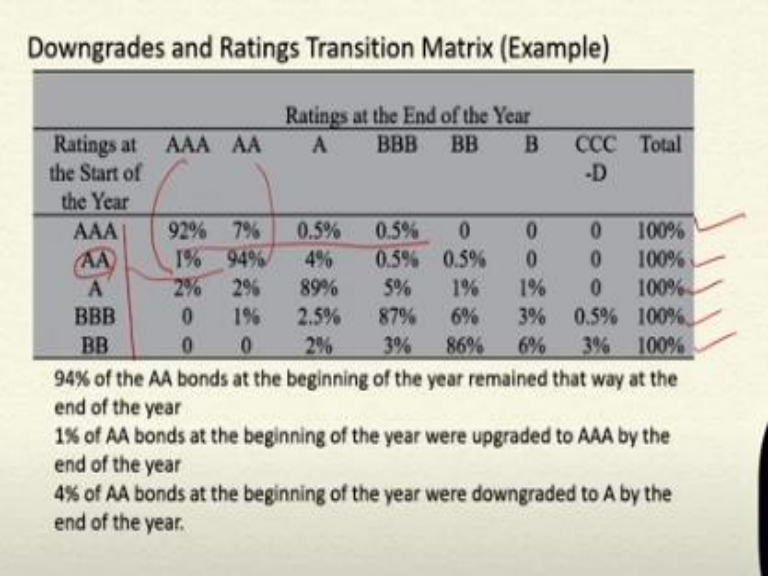

Let this is a rating transition matrix example. So, in the column if you see this column wise if you see this is basically the ratings in the start of the year and row wise if you see these are the ratings which are given in the end of the year. Right? So let you take example of a double a rated bond. if you look at a double rated bond if you want to interpret this particular transition matrix. Then what basically we have seen here there is a 94% of the chance or the 94% of the AA bonds at the beginning of the year remained that way at the end of the year here also it was 94% here also it 94%. Clear?

And 1% of the AA bonds in the beginning of the year are upgraded to AAA rated you know AAA rated bond. And 4% of the AA bonds at the beginning of the year were downgraded to a by the end of the year. And 0.5% has been downgraded to BBB, 0.5% to BB and so on. So, if you add of all these it should be 100%. So, this part basically should be this row wise if you add it then it should be 100%.

So, that is the way basically the rating transition matrix we represent and from there we also can conclude that, whether the bonds should be put on the credit watch or not. And whether there is a downgradation is happening with respect to the bond or not or how the bonds also can be upgraded.

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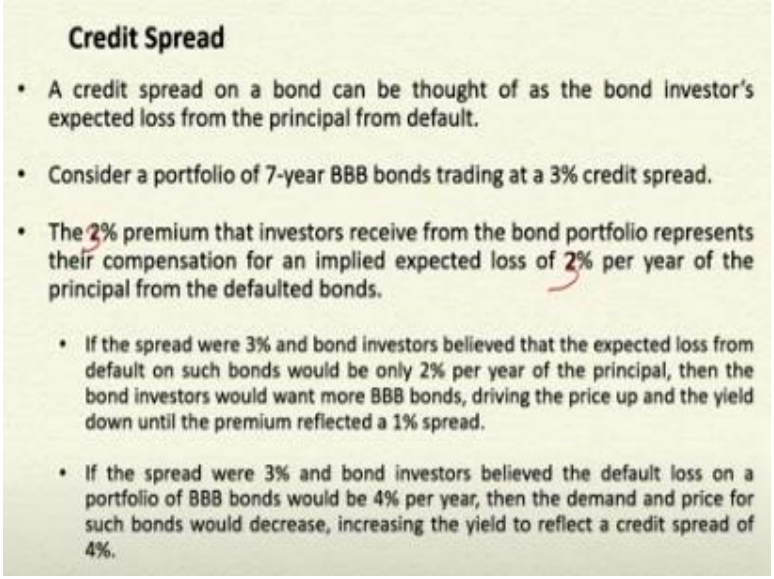

So, another thing also you have to understand that is credit spread. So, the credit spread on a bond can be thought of as investor's expected loss from a principle from default. Let you consider a portfolio of seven-year BBB bonds which is trading at 3% credit spread, that means the 2% premium that the investors receive from the bonds portfolio. sorry it is 3%.

So, the 3% premium that investor received from the bonds portfolio represents their compensation for an implied expected loss of 3% for a year of the principal from the defaulted bonds that actually you have to keep in the mind. So, how you can use it if the spreads were 3% and bond investor believed that the expected loss from the default and such bonds would be only 2% per year of the principle.

Then the bond investor would want more BBB rated bonds. Then, the driving the prices up and the yield will down until the premium reflected a 1% spread. So, if the spread were 3% and bond investor believed that the default loss and a portfolio of the BBB bond should be 4% per year, then the demand and price of the, such bonds should decrease, increasing the yield to reflect the credit spread of the 4%. So, these are the things basically what you can use in terms of the credit spread.

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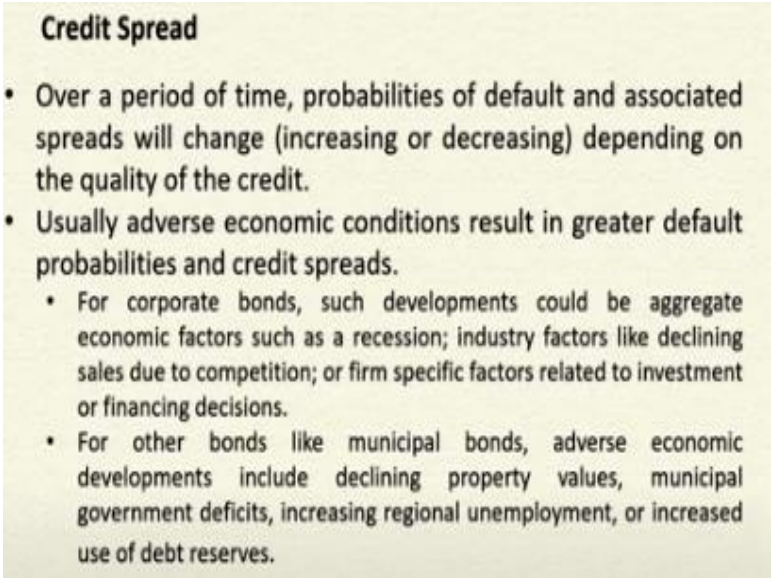

So, over a period of time the probability of default and the spreads will change depending on the quality of the credit. Usually adverse economic conditions result in greater default probability and credit spread. For corporate bonds it is like economic factors like recession, industry factors like declining sales due to the competition, and some specific factors like investment and the financing decisions.

And for other bonds like municipal bonds, adverse economic developments include the declining the property values government deficits, unemployment and the use of the debt services or debt reserves that also will increase or decrease the credit spread.

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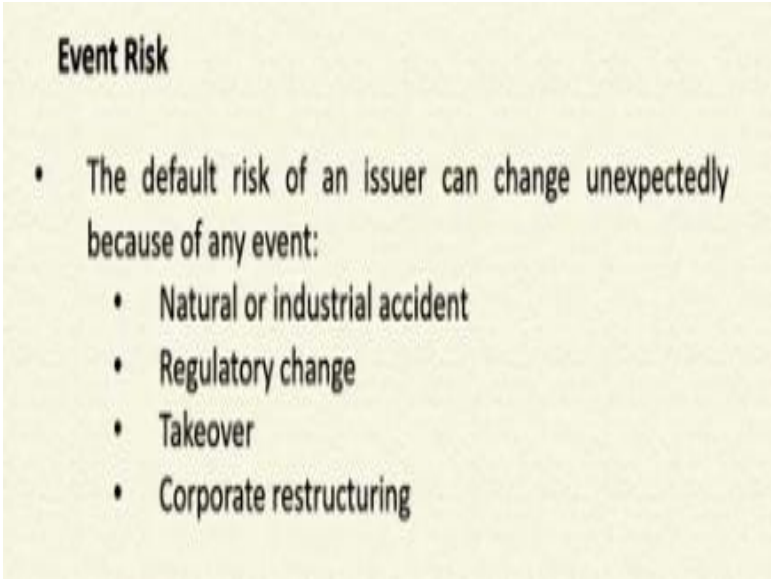

So, event risk also can increase the credit spread if there is a natural disaster or an industrial accident or there is a regulatory change any kind of new regulation or act has come. Or any takeover activities merger activities have taken place or is there any corporate restructuring so those things generally happen. So then also there is a possibility that the event risk can create this default risk of that particular company and finally the bond can be defaulted.

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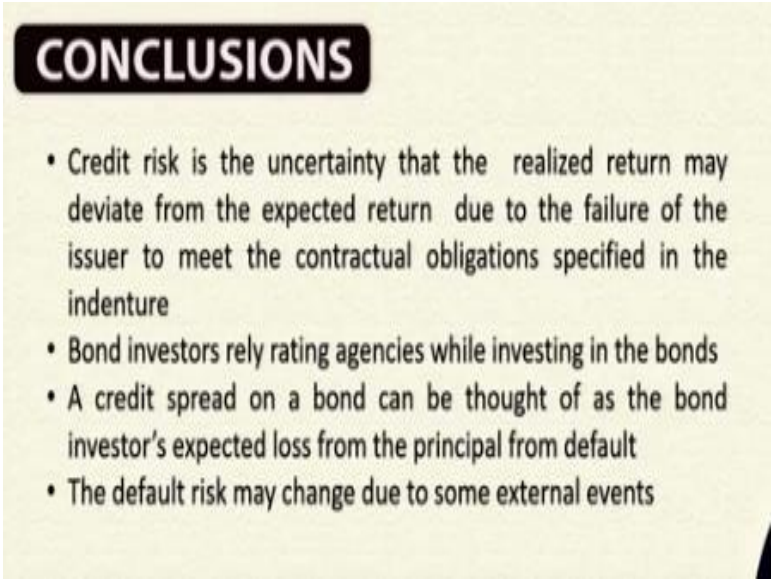

So, what basically we discussed here? the credit risk is the uncertainty where the realized return may deviate from the expected return because of the failure of the issuer to meet their contractual obligations. Bond investors most rely on the rating agencies while they invest in the bond. And credit spread of a bond can be thought of as a bond investors expected loss from the principal from the default.

And default risk also may sense due to some external events like mergers and activities, regulatory activities, natural calamities or industrial accidents and all these things. So, these are the factors which can create also the credit risk of this, particular bonds in the market.

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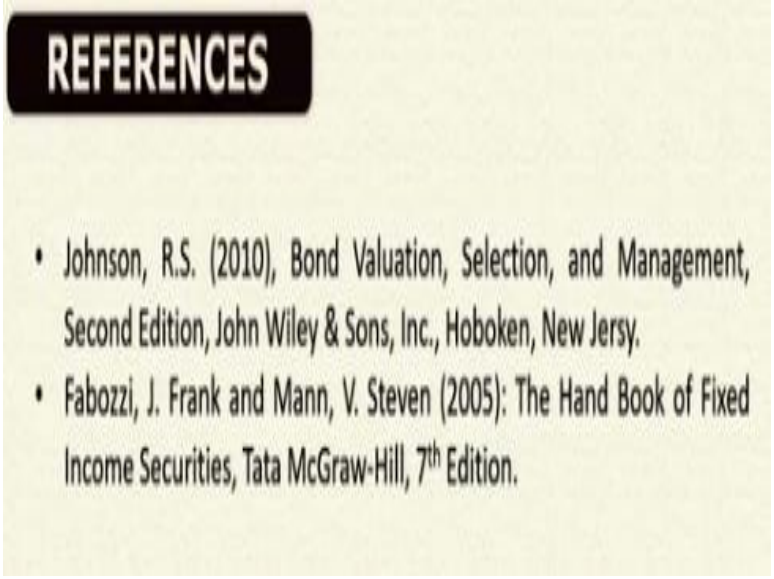

So, these are the references what you can go through for today's discussion. thank you.