Management of Fixed Income Securities
Prof. Jitendra Mahakud
Department of Humanities and Social Science
Indian Institute of Technology, Kharagpur

Lecture - 55
Mortgage-Backed Securities - V

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Welcome back, so in the previous class we started the discussion on the commercial mortgages. So, today we will continue with that particular same discussion and these are the different concepts what we are going to cover in today's session. These are basically what exactly the commercial mortgages are, the concept of the asset packed security then within that particular asset back security.

We have different kind of asset backed security like automobile loan backed security, home equity loan backed security, and credit card receivables backed security. Then after that we will discuss briefly about the collateralized debt obligations, then finally we will discuss about how basically we can do the valuation of the mortgage-backed securities. So, these are the different concepts what we are going to discuss in today's session.

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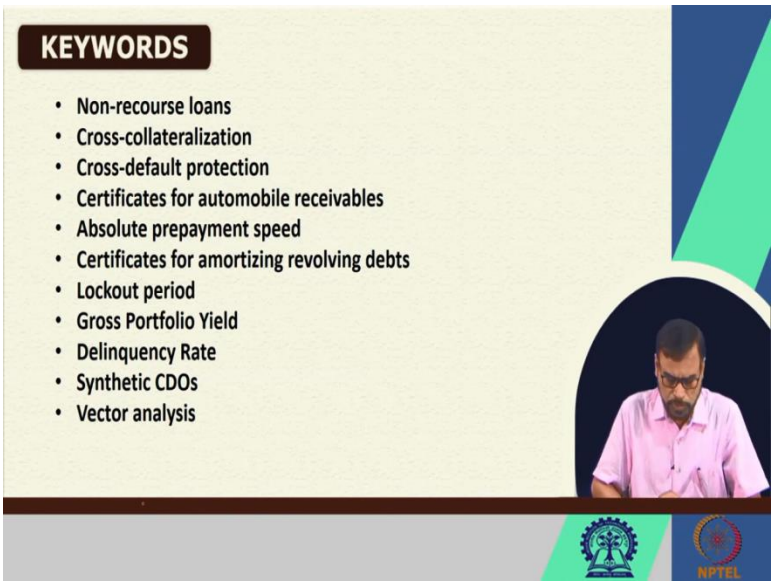

So, these are the different keywords that will come across while discussing about these issues or about these topics, one is non-recourse loans, cross collateralization, cross default protection, certificates of automobile receivables, absolute repayment speed, certificate for the amortizing revolving debts, lockout period, gross portfolio yield, delinquency rate, synthetic CDOs, vector analysis and all these things.

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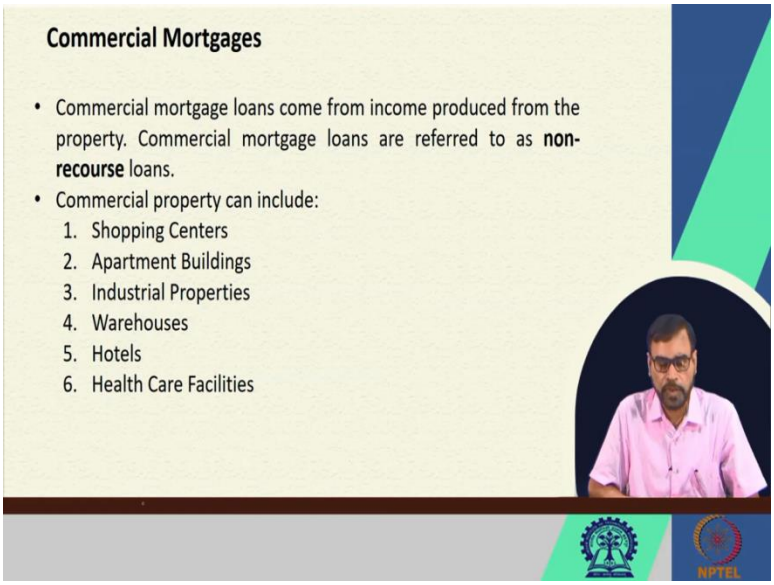

So, let us start the discussion on the commercial mortgages, so already we have started this discussion in the previous session that what exactly the commercial mortgages are. Generally, the commercial mortgage loans come from the income which are produced from the property and

the loans are basically given for some kind of commercial establishment. So, therefore the commercial mortgage loans are generally called as the non-resource loans.

So, there it is not that the value of that particular shop or the value of that particular type of asset which has been taken into account for that particular loan it is the income or the future cash flow what we are going to generate from that particular asset. These are basically considered in this particular context. So, if you talk about the different type of the commercial property against which this kind of loans are taken.

Maybe it is because of the shopping centers, apartments, buildings, industrial properties, warehouses, hotels, health care facilities. So, to establish this kind of set offs generally the loans are provided. So, therefore the particular cash flow what basically we consider for the calculation that depends upon the revenue or the income which are expected to be raised from this kind of resources or this kind of properties. So, this is what basically the commercial mortgage is.

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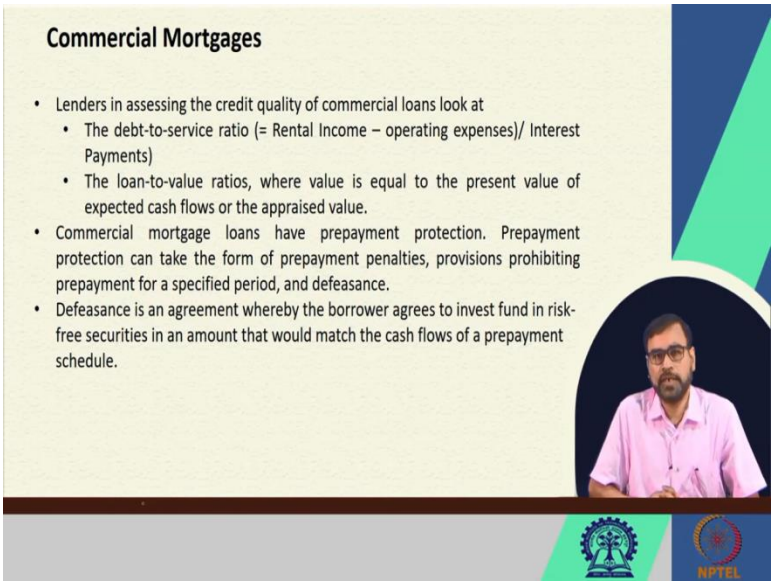

So, then if you see that whenever we talk about the commercial mortgage and the lender is trying to give the loan against that particular type of commercial mortgage then how they basically assess the credit quality of the commercial loans. Generally, lender always looks at two major ratios while assessing this particular loan or while providing this particular loan. One is your debt to service ratio another one is the loan to value ratio.

Then what exactly the debt to service ratio is? It is the rental income what this particular property is able to generate minus your operating expenses divided by the interest payments. Because the interest payments this particular borrower has to pay and this part the rental income minus operating expenses that is the total net income what this particular borrower is able to generate.

Whether the interest payments are what they are supposed to pay or this particular net income is sufficient enough to pay the interest or not that basically the lender is trying to judge. Then another one is loan to value ratio, here the value is basically equal to the present value of the expected cash flows or the appraised value. How much expected cash flow the particular borrower is able to generate from that. And accordingly, they calculate the present value of that and then finally they find the ratio of the loan to value received.

So, another thing also you can you can observe about the commercial mortgages they have the prepayment protection. There is a prepayment protection against this commercial mortgage loans which were very much there whenever you talk about the residential mortgages.

So, this prepayment protection how basically they make this protection, this protection may be in the form of the prepayment penalties or the provisions the prohibiting the prepayment for a specified period or there is a provision they can also have that is called the defeasance. So, what basically the defeasance is? It is basically an agreement where the borrower basically agrees to invest the fund in risk-free securities in an amount that would match the cash flows of the prepayment schedule.

So, they have to invest that much kind of money in the risk-free securities by that if there is a requirement then that money can be recovered from that. So, these are the ways through which lender is try to assess or try to protect that risk of the prepayment.

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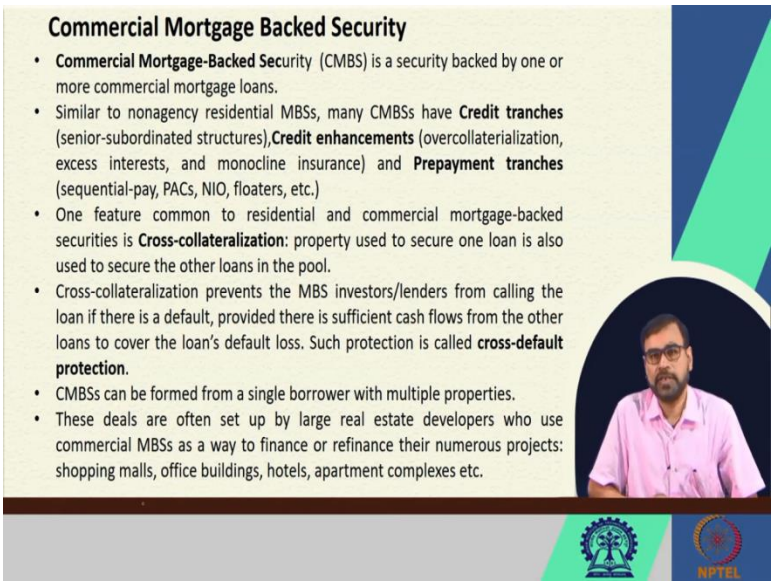

So, then on that particular commercial mortgage, the commercial mortgage-backed securities are formed. So, that's why this security is backed by one or more commercial market loans. So, whenever we talk about the non-agency residential mortgage-backed securities similar to that this particular commercial mortgage-backed securities also have the credit tranches. That means they have a senior subordinated structures already we have discussed that part in the previous class.

They also have the credit enhancement options like your over collateralization, access interest or the insurance kind of thing, then they also have the prepayment rankings like sequential pay, PAC's, NIO, floaters etc. So, these kinds of things also available with respect to that. So, then one feature which are very much common to the residential and the commercial mortgage-backed security is basically the cross collateralization.

So, this insurance thing whenever you talk about sometimes also the in case of the non-agency residential mortgages sometimes the loans are also insured. In that case we talk about this insurance part. So, what do you mean by this cross collateralization? Cross collateralization is nothing but the property which is used to secure the one loan is also used to secure the other loan in that particular pool. So, in that case we call it the cross collateralization.

So, the cross collateralization generally prevents this mortgage-backed security investors from calling the loan if there is a default. Provided there is a sufficient cash flow from the other loans to cover the loans default loss. Such protection general is called the cross-default protection, such

protections are basically called the cross-default protection. And also, the commercial back mortgage-backed securities can be formed with a single borrower with multiple properties.

That possibility is also there. Generally, these kinds of deals are set up by the large real estate developers who generally use this commercial mortgage back securities as a way to finance or refinance their number of projects like shopping malls, office buildings, hotels, apartment, complexes all these things. So, these mortgages are basically generally used by them.

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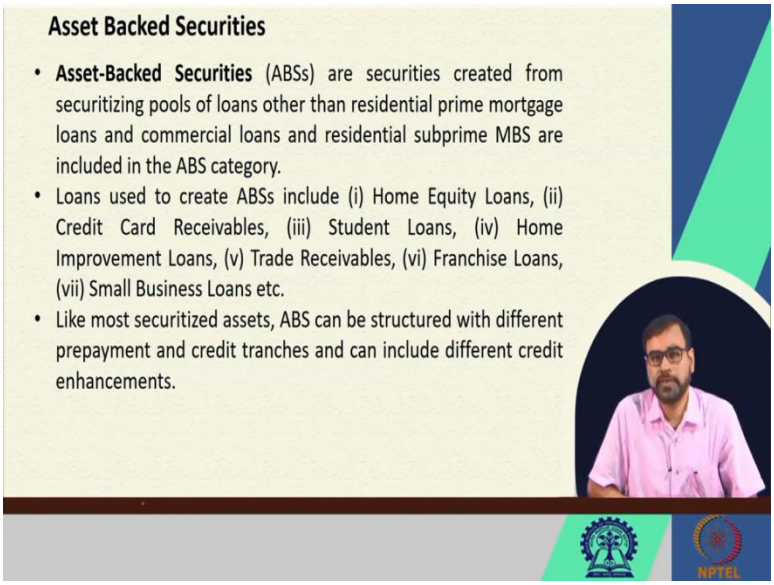

So, in this case if you look at there are different type of the asset backed securities and this asset backed securities are generally created from the securitizing pool of loans other than the residential prime mortgage loans and the commercial loans. And they are basically included even the residential subprime mortgage-backed securities also included in this asset back security category.

So, the loans which are used to create this asset backed securities these are home equity loan, credit card receivables, auto loan, student loan, trade receivables, franchise loans, small business loan and all these things. There are different kinds of loans which can be used to create this asset backed securities. So, like your most of the securitized asset, the asset backed securities also can be structured with different repayment and credit tranches. And can include the different credit enhancements that possibility also there.

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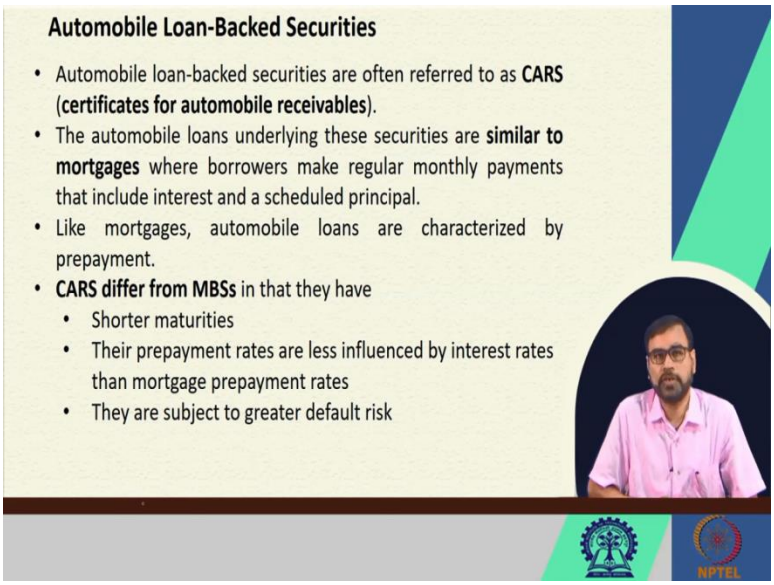

So, whenever we look at the automobile loan backed securities what exactly the automobile loan backed securities are. The automobile loan backed securities are generally called as the CARS that mean the certificate of automobile receivables. So, the automobile loans underlying these securities are generally similar to the mortgages where the borrower can make the regular payments which include their interest and as well as the scheduled principal.

Like your mortgages there is a possibility of the prepayment also whenever you talk about the automobile loans. But there are some differences between your certificate of automobile receivables and the mortgage-backed securities. What are those differences? Differences are generally the automobile loans are shorter in maturities and the prepayment rates are less influenced by the interest rates than the mortgage prepayment rates. Because, most of the automobile loans are generally fixed in nature but they are also subject to greater default risk. There is a possibility that there is a greater default risk because if the revenue or the income which are expected to generate from that particular automobile loan, if this is not basically realized then there is a possibility that the credit risk or the default risk may increase. So, that's why they are subject to the greater default risk.

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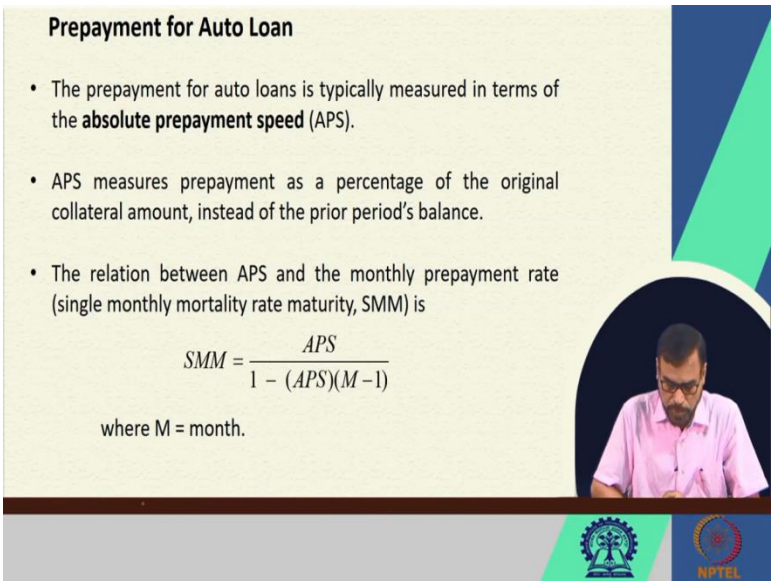

If you talk about the prepayment for an automobile loan, then it is generally measured in terms of the absolute prepayment speed. So, this absolute prepayment speed basically measures the prepayment as a percentage of the original collateral amount instead of the prior period's balance that we have discussed in case of the mortgage-backed securities. So, if you talk about this how we can the relation between this APS and the monthly prepayment rate if you see.

Then, already we have discussed about this SMM that single monthly mortality rate maturity.

$$\text{SMM} = \frac{APS}{1-(APS)(M-1)}$$

Where, M=month and APS=Absolute prepayment speed

That is basically nothing but the APS divided by 1 - APS into M - 1 and M is basically the month.

What is the month or the maturity of that particular loan? That basically we consider in that particular context. So, this is the way the single monthly mortality rate maturity of the automobile loans can be calculated.

And after that you already know that how to calculate the principals which are associated with this particular kind of repayment part.

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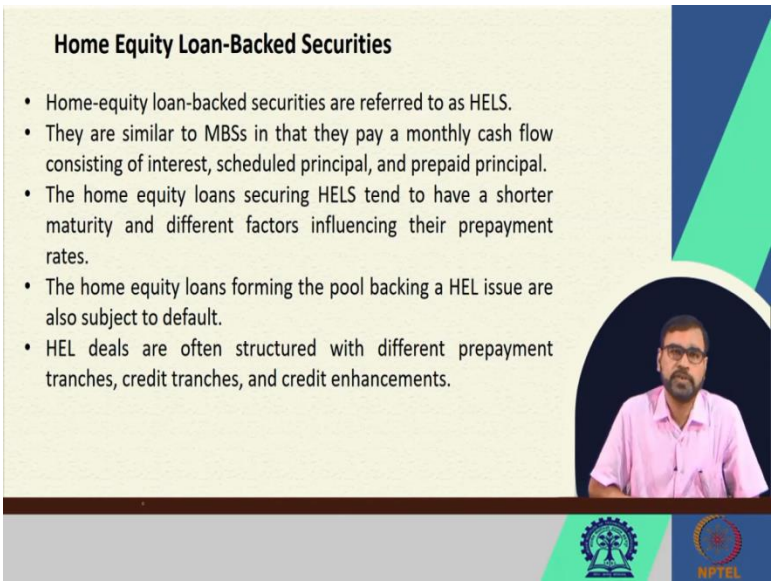

Then other type of loan which is considered as asset backed security that is called the home equity loan. So, that is generally called as the HELS home equity loan securities. They are also similar to mortgage-backed securities because they pay monthly cash flow which is include your interest, scheduled principal and the prepaid principal. And another thing also you can see that the home equity loans generally tend to have a shorter maturity.

And there are other different factors which generally influence their repayment rates and they are also subject to the default risk. Therefore, the HEL deals generally structured with different prepayment tranches, credit tranches and credit enhancement it is more or less similar with the mortgage-backed securities what already we have discussed and how do different type of tranches generally we create. In the same way basically the home equity loan backed securities also work out.

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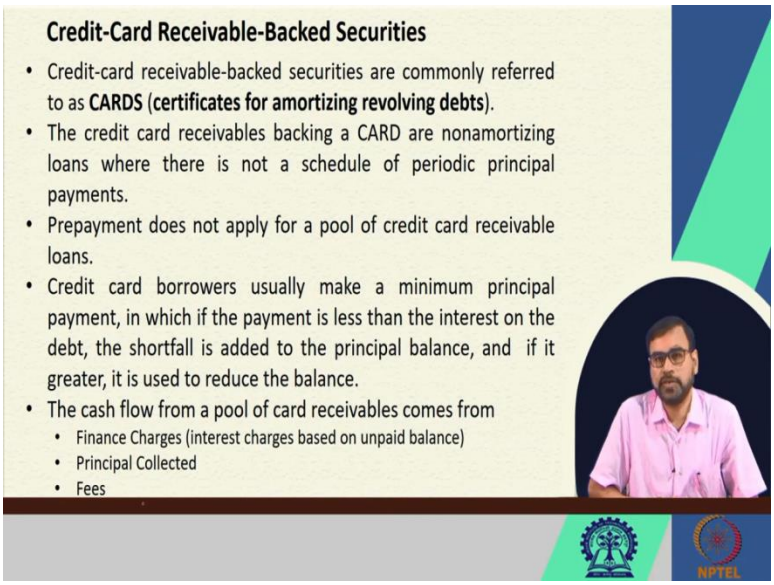

So, another most important part is credit card receivable backed security which is little bit different than the other type of asset backed securities. And what is the basic difference, how basically this is different than the others? If you see that the credit card receivable backed securities are generally called as the CARDs that means certificate for amortizing revolving debts.

So, here one particular characteristic or feature you can if you observe so the credit card receivables which is backing a CARD because generally credit card receivables is the underlying asset and on that basis the cards are created. These are non-amortizing loans and there is not a schedule of periodic principal payments. In case of the credit card receivables there is no particular schedule for the payment of the principals.

So, that's why the prepayment also another thing which does not apply for a full of credit card receivable loans because the prepayment option also it is not that way available in that particular case or the prepayment risk also does not influence the cash flow of the cards. Generally, what happens it is not always applicable but there are certain cases the credit card borrowers usually make a minimum principal payment.

In which the payment is less than the interest on the debt, then the shortfall is added to the principal balance and if it is greater, then it is generally used to reduce the balance. So, whatever basically whatever way you have used the card and whatever receivables are there if the

minimum principal whatever you have already paid if the minimum principal payment whatever you have already made for this.

If the prepayment is less than the interest on the debt then the shortfall is added to the balance and if it is greater, then it is used to reduce the balance. Then what are those cash flows which generally comes from the pool of the card receivables. These are basically the finance charges which include the interest charges based on the unpaid balance, then your principal which are collected, then the fees.

So, these are the different cash flows which can available with respect to the credit card receivables.

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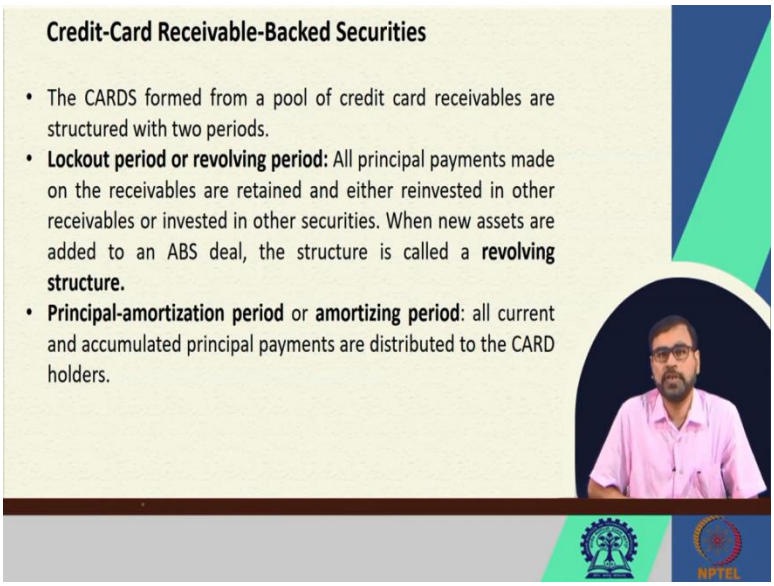

So, then what happens in this particular case? The CARDS generally formed from a pool of credit card receivables and they are structured with two periods, generally credit card receivables as the underlying asset and from that we create these cards and generally they are structured with two periods. What are those two periods? One period is lockout period or the revolving period.

And here in this period all principal payments made on the receivables are returned and either reinvested in other receivables or invested in the other securities. And when the new assets are added to this asset back security deal the structure general is called the revolving structure. So, one is your lockout period. So, here all the principal payments are made on the receivables are retained or either reinvested in other receivables or invested in the other securities.

And another one is the principal amortization period or amortizing period in short, we can call it. So, here what happens all current and accumulated principal payments are distributed to the CARD holder? All accumulated principal payments are distributed to the CARD holders. So, these are the two periods in which the credit card receivables are structured.

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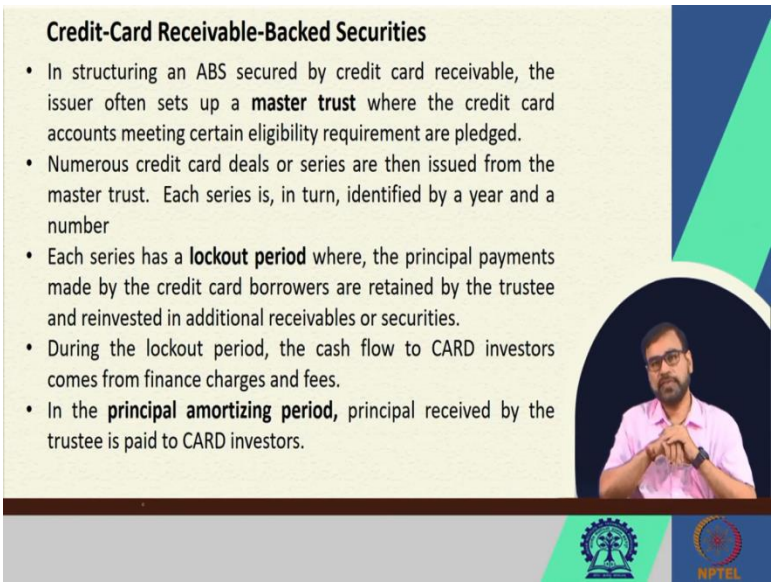

Then if you see that what generally the practical process we follow in this particular case? Whenever we structured an asset backed security by the credit card receivable the issuer generally set off a master trust. When the credit card accounts basically meet certain eligibility requirements are placed. That means generally they get the fund from the various sources of the various credit card receivables which are available with certain kind of characteristics.

So, numerous credit card deals or series are then issued from the master trust and each series is basically identified by a year and a number like 2007-1, 2007-2 like that then 2021, 2022, 2021-1, 2021-2 like that to identify particular receivables which is coming from the which source. Then each series has a lockout period where the principal payments made by the credit card borrowers are retained by the trustee and reinvested in additional receivables or the securities.

So, during this lockout period the cash flow to the CARD members comes from the finance charges and the fees. Whatever finance charge and fees are there? That is basically used to pay the CARD holders because the card is basically nothing but the asset backed security which is created or which is constructed on the basis of the credit card receivables. Then when the

principal amortizing period will start the principal generally reset by the trustee is paid basically to the CARD investors.

So, this is the way the payments are made to the CARD holders or the particular securities which are created against the particular credit card receivables whatever we are using.

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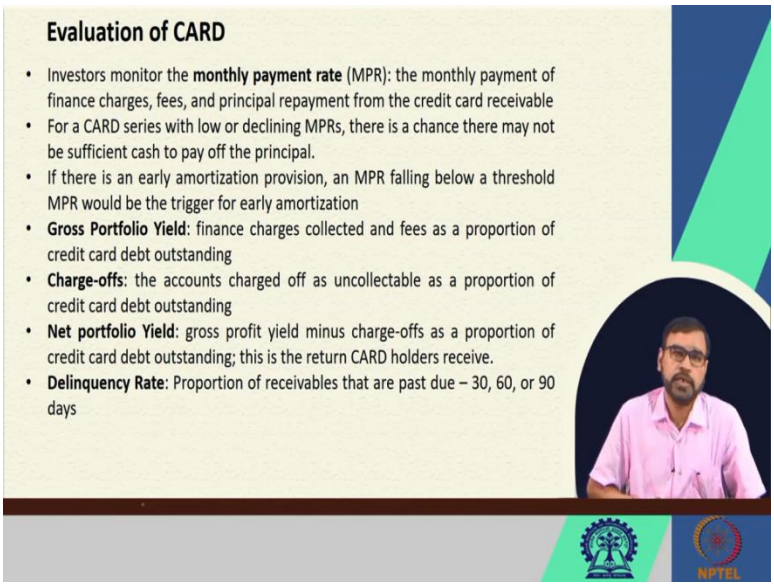

So, how generally we go for evaluation of this CARD? Investors generally monitor the monthly payment rate. And what do we mean by this monthly payment rate? The monthly payment rate is nothing but the monthly payment of finance charges, fees and principal repayment from the credit card receivables. So, for the CARD series with low or declining the monthly payment rate there is a chance that they may not be sufficient cash to pay of the principal.

And if there is an early amortization provision then the MPR or the monthly payment rate falling below a threshold MPR would be the trigger for the early amortization. So, generally we evaluate these things on the basis of certain parameters. What are those parameters we look at? We look at the gross portfolio yield, charge offs, net portfolio yield and the delinquency rate that whether the sufficient funds are generated out of this to pay this card holders.

So, what do you mean by the gross portfolio yield? This is basically nothing but the finance charges which are collected and fees which are collected as a proportion of the credit card debt outstanding that is called the gross portfolio yield. Then what are those charge offs? The charge

offs basically the accounts charge offs as uncollectible as a proportion of the credit card debt outstanding.

Because sometimes also there are certain credit card holders though do not pay that particular money in the periodical basis. So, accordingly what is the percentage of the charge offs from the total debt which are there against the credit card that is also measure which can give you the idea that whether the sufficient cash flows are generated out of the credit card receivables or not.

Then your net portfolio yield. It is nothing but the gross portfolio yield minus charge offs as a proportion of the credit card debt outstanding. Then we have the delinquency rate. The delinquency rate is the proportion of the receivables that are past due like 30 days, 60 days,90 days and all these things. So, these are the parameters which are generally used to evaluate the CARD.

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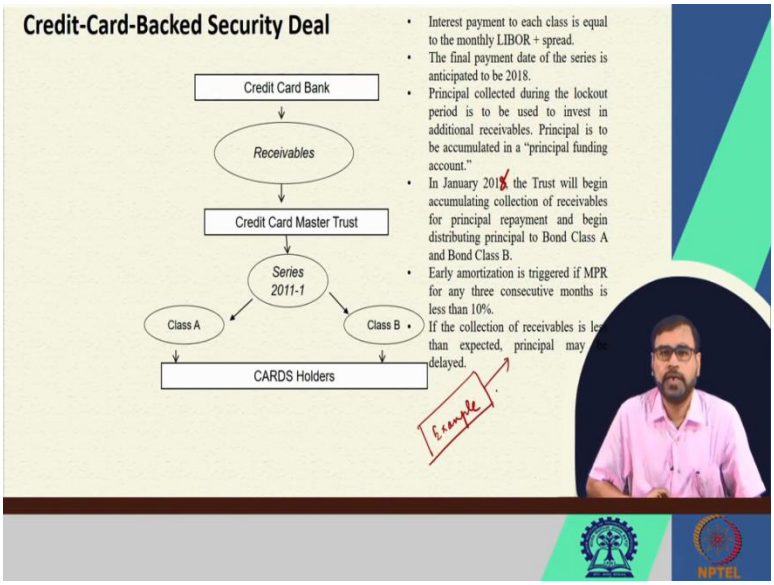

So, this is basically the credit card backed security deal looks like. First one is the credit card bank the bank which is issuing the credit card then they get the receivables. Then those things are given to the credit card master trust and master trust basically makes the different type of security from that and they are numbered let here it is written 2011-1. That means this year is 2011 and this particular number is 1.

Then from there they make the different type of cards or the asset backed security that class A, class B and all these things and finally these are given to the CARDS holders or the investors. So, interest payment to each class is equal to the monthly LIBOR plus spread. Let the final payment date if the series is anticipated to be 2018 and principal collected during the lockout period is to be used to invest in the additional receivables.

Principal is to be accumulated in a principal funding account, then let in January 2018 the trust will begin accumulating the collection of receivables for principal payment. And begin distributing the principal to bond class A and bond class B and the early amortization is triggered if your MPR for any three consecutive months is less than 10%.

And if the collection of receivables is less than the expected then the principle might be delayed. So, these are the different conditions basically this is an example. So, this is the way the structures generally look like this credit card receivable deal or the credit card backed security deal generally looks like.So, these are the different conditions which are mentioned and accordingly this particular deal will work out.

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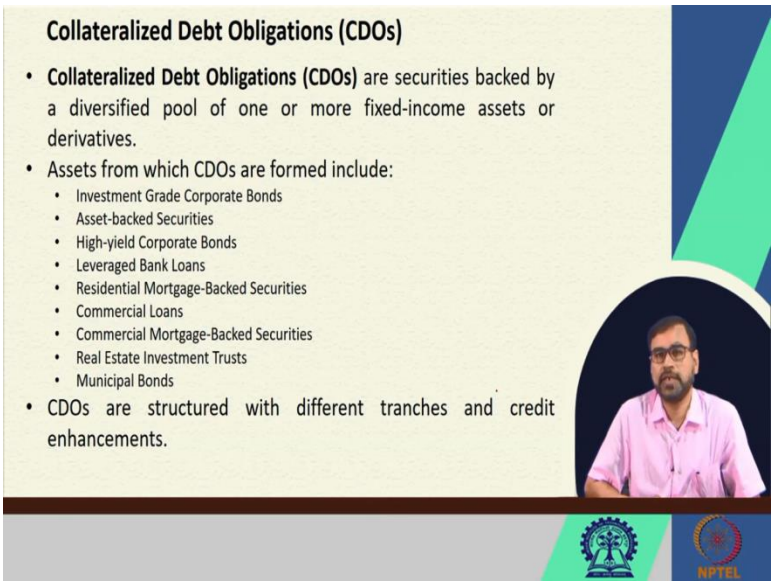

So, then we have another asset called the collateralized debt obligations. So, here these are generally backed by the diversified pool of one or more fixed income assets or the derivatives. So, the asset from which the collateralized debt obligations are formed they can be an investment

grade corporate bonds, they can be asset backed securities, they can be high-yield corporate bonds, they can be leveraged bank loans.

They can be resident cell mortgage-backed security, they can be commercial loans, they can be commercial mortgage-backed security, they can be real estate investment trust, they can be municipal bonds and so on any of the fixed income securities and as well as fixed income derivatives what we are going to discuss in the forthcoming sessions. So, those all these things can be used to create these collateralized obligations.

And these collateralized debt obligations also structured with different tranches and the credit enhancement schemes that possibility is also there.

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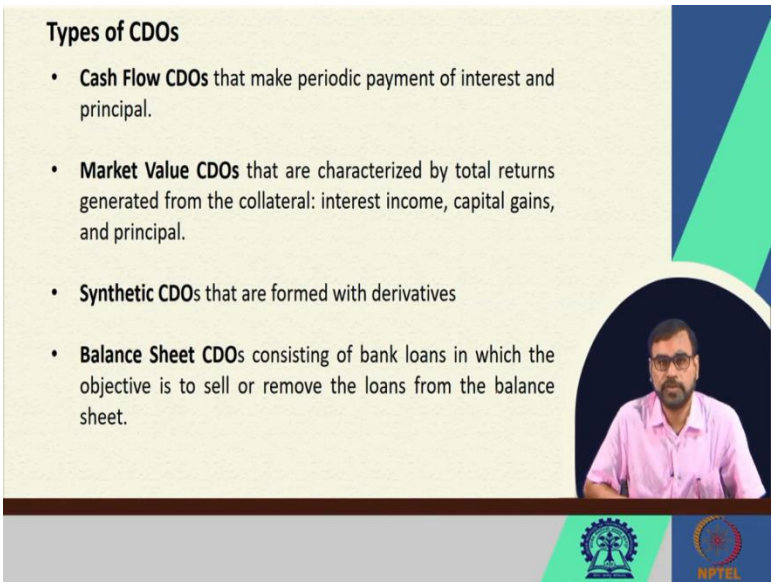

So, there are different type of CDOs or collateralized debt obligations like cash flow CDOs where this particular CDOs make the periodic payment of interest and the principal, then you have the market value CDOs where the these are characterized by the total returns generated from the collateral like interest income, capital gains and principal. Synthetic CDOs they generally formed with different type of derivatives.

Then balanced CDOs they are basically consisting of bank loans in which the objective is to sell or remove the loans from the balance sheet. So, these are the different type of CDOs generally we can form on the basis of the different characteristics.

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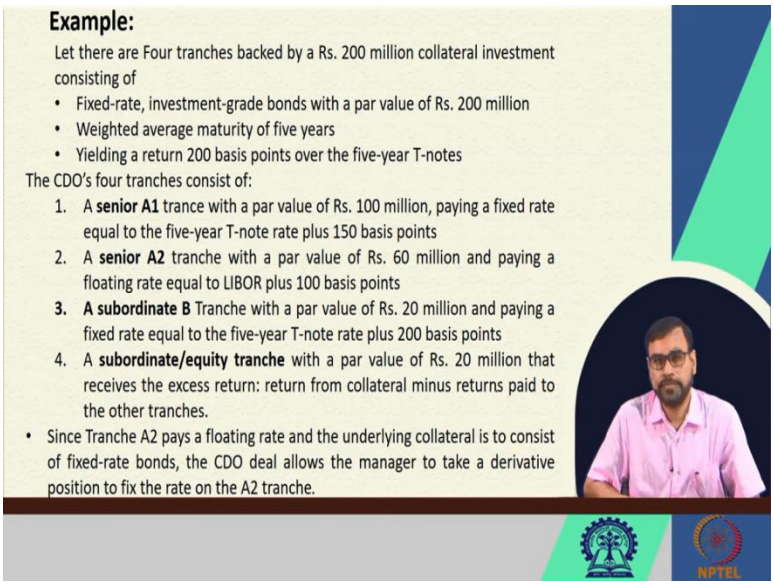

Let us take one example about the CDO let there are four tranches backed by 200 million collateral investments which is consist of the fixed rate investment grade bonds with a par value of 200 million. Then weighted average maturity is 5 years which is yielding return 200 basis points over the 5-year T notes or treasury notes. So, this CDO have let four tranches. What are those four tranches?

These are like on is senior A1 tranches which par value of led 100 million paying a fixed rate equal to 5-year treasury notes rate plus 150 basis points. Then they can have a senior A2 where the power value is 60 million may be paying a floating rate equal to LIBOR plus 100 basis point may be a subordinates B tranches where par value of 20 million paying a fixed rate equal to 5 year-T notes plus the 200-basis point.

Then you have the subordinate or the equity tranches which is a par value of 20 million again that receives the excess the return from the collateral minus the return spread to the other tranches. So, already the different tranches and how the payments are made on the basis of the different tranches that already we have discussed in the previous class. So, here what we have seen since the tranche A2 pays a floating rate and underlying collateral is to consist of the fixed rate bonds.

The CDOs deal allows the manager to take a derivative position also to fix the rate on the A2 tranches, that particular possibility is there.

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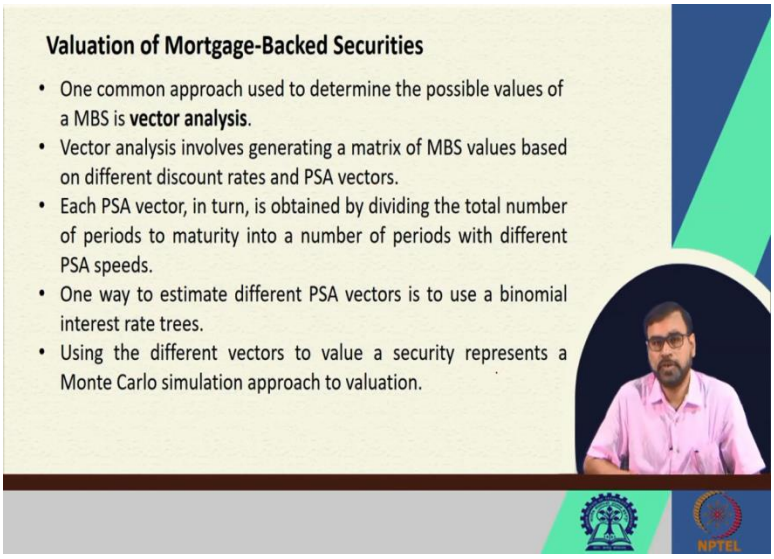

Then how generally we go for valuation of the mortgage back securities.The one of the approaches generally used to determine the possible values of the mortgage back security is a vector analysis. So, vector analysis is what it generally involves generating a matrix of the mortgage back security values based on the different discount rates and the PSA vectors.

So, each PSA vector generally is obtained by dividing the total number of periods to maturity into a number of periods with different PSA speeds. And one way to estimate the PSA vector is to use the binomial interest rate tree and the binomial interest rate tree concept already we have discussed extensively. So, using the different vectors to value the security represents a Monte Carlo simulation approach for the valuation.

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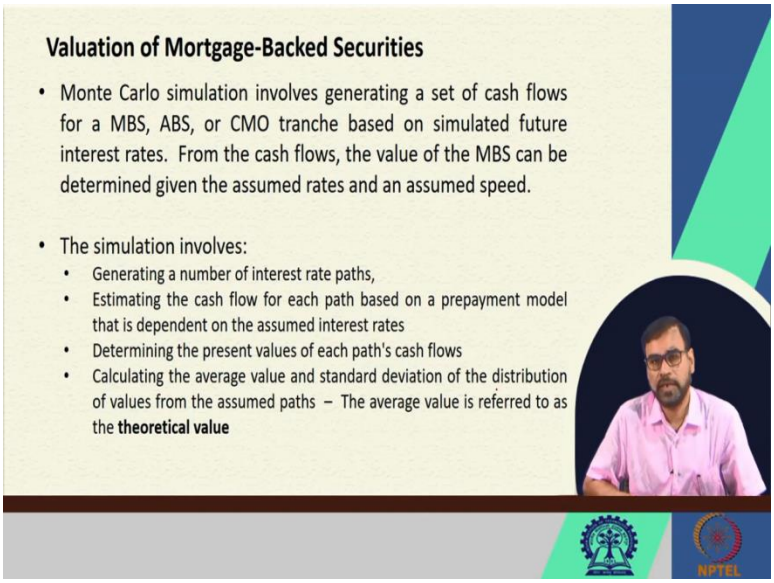

And what basically general we do the Monte Carlo simulation generally involves the generating a set of cash flows for the mortgage back security or asset back security or the commercial or the collateralized assets whatever you are considering. Based on the simulated future interest rates and from the cash flow the value of the mortgage-backed security can be determined given the assumed rates and assumed speed.

So, that's why the simulation basically involves generating a number of interest rate path like your binomial tree whenever we create different path. Estimating the cash flow for each period based on the prepayment model that is dependent on the assumed interest rate. Determining the present value of each paths cash flow, then calculate the average value and the standard deviation of the distribution of the values from the assumed path.

And generally, the average value is called as the theoretical value. So, the same binomial tree we can construct and on the basis of the figure of u & d and from there we find out the expected values in each node. Then after that we calculate the present value, we go for a rollback calculation from that then, finally the value of the mortgage back security can be calculated.

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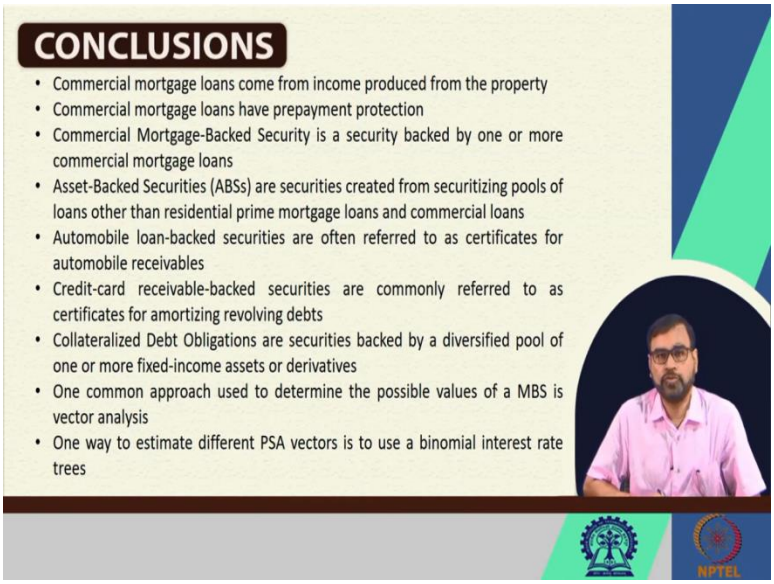

So, what basically we have discussed that commercial mortgage loans generally come from the income produced from the property. And commercial mortgage loans of the prepayment protection and there is commercial mortgage back security generally backed by one or more commercial back loans. Asset backed securities are generally created from the pool of the loans

other than the residential prime mortgage loans on the commercial loans. Automobile loan backed securities are generally referred as the certificate for automobile receivables.

Credit card receivable backed securities are generally called as the certificate of amortizing revolving debt. Then collateralized debt obligations are securities backed by the diversified pool of the one or more fixed income assets and derivatives. And one common approach used to determine the possible values of mortgage-backed security is the vector analysis. And one way to estimate the different PSA vector is to use the binomial interest rate trees.

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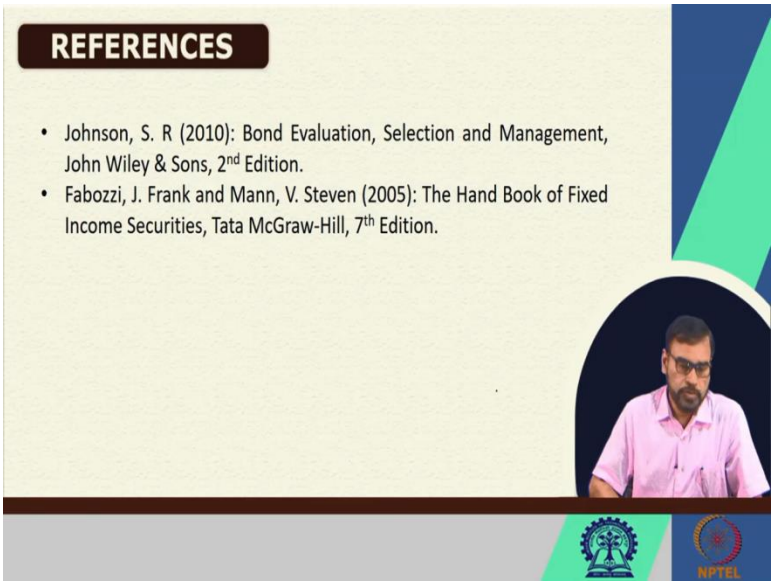

So, these are the references.

Thank you.