Learning Module 19: Mortgage Backed Security (MBS) Instrument and Market Features

LOS 19a: define prepayment risk and describe time tranching structures in securitizations and their purpose.

Prepayment Risk

Prepayment risk pertains to the possibility that the borrower repays the principal differently than the agreed schedule. It includes two facets: contraction risk and extension risk. Borrowers might change their repayment patterns based on changing interest rates. In a falling interest rate environment, borrowers are more likely to refinance their mortgages to capitalize on the lower rates. This is typical in places like the United States, where there are minimal penalties for early repayment. This implies that investors receive their principal back sooner than expected, shortening the term of the MBS. This forces them to invest at the lower, less favorable interest rates. This phenomenon is termed as **contractual risk.**

Conversely, in a rising interest rate environment, borrowers tend to hold onto their existing mortgages, avoiding refinancing. This situation, known as **extension risk**, prolongs the repayment period, causing investors to wait longer for their returns. Moreover, the longer duration combined with higher interest rates can diminish the present value of these future cash flows.

Time Tranching

Time tranching in securitizations is a method designed to manage the unpredictability associated with prepayment risk, which arises when borrowers change their repayment patterns. This approach involves creating bond classes with distinct expected maturities to redistribute the prepayment risk among them. For example, using sequential tranching, a securitization pool can be designed such that principal repayments flow to one tranche first until its principal is fully paid off, then move on to the next tranche, and so forth.

Question

Which of the following best describes prepayment risk?

A. The risk that the borrower will pay higher interest than the contractually agreed rate.
B. The risk that the borrower will pay back the principal at a different pace from the contractually agreed schedule.
C. The risk that the borrower will default on the repayments of their loan.

The correct answer is B:

Prepayment risk is the possibility that the borrower repays the principal or a portion of the principal at a different pace than the contractually agreed schedule, either sooner or later than expected.

A is incorrect: Prepayment risk does not deal with interest rates but rather the pace of principal repayments.

C is incorrect: Prepayment risk does not pertain to defaults but to early or delayed principal repayments.

LOS 19b: describe fundamental features of residential mortgage loans that are securitized.

Mortgage Loans

Mortgage loans are secured loans where repayments are linked to a specific real estate asset. The lending entity can take possession of this asset due to the rights provided by the first lien and security interest on the property if a borrower defaults. The process, known as **foreclosure**, helps the lender recover the outstanding debt by selling the property.

Loan-to-Value Ratio (LTV)

The loan-to-value ratio is the ratio of the loan amount to the property's valuation. The difference between the mortgage and the property's buying price is the down payment (the buying price is higher). A lower LTV means increased equity for the borrower. For the lender, this means the borrower has a reduced likelihood of a default. The LTV changes over time as the loan's outstanding balance decreases due to repayments, and the property's market value fluctuates.

$$\text{LTV} = \frac{\text{Loan amount}}{\text{House price}}$$

Debt-to-Income Ratio (DTI)

Debt-to-Income ratio is an individual's monthly debt payments ratio to their pre-tax income. A lower DTI shows that a borrower can manage their monthly payments and can manage more debt. A higher DTI could alarm lenders as it may mean the borrower is overly leveraged.

$$\text{DTI} = \frac{\text{Monthly debt payment}}{\text{Pre-tax income}}$$

Classification of Mortgages Based on Credit Quality

In nations like the United States, **prime loans** represent borrowers with solid credit backgrounds, lower DTIs, lower LTVs, and first lien on the property. **Subprime loans** are riskier with attributes like high DTIs or elevated LTVs.

Agency vs. Non-Agency Residential Mortgage-Backed Securities (RMBS)

Mortgages in MBS can be residential or commercial. RMBS arise from bonds backed by residential mortgages. In some countries, there is a difference between government-backed RMBS and those without this backing.

Agency RMBS

These RMBS come with a certain guarantee level regarding the punctual payment of interest and principal repayment. Agency RMBS can further be divided into two categories:

i. **Guaranteed by a Federal Agency**: The government guarantees timely interest payment and principal repayment. It is a firm assurance that the securities will fulfill their promised cash flows.
ii. **Guaranteed by Government-Sponsored Enterprises (GSEs)**: This category includes RMBS issued by GSEs. They do not have the full backing of the federal government. Instead, they offer guarantees for the punctual payment of interest and principal on the securities. As a service, GSEs typically charge a fee for this guarantee. It's a promise based on the credibility and financial strength of the GSE rather than the government itself.

Non-Agency RMBS

These securities are not guaranteed by any federal agency or GSE. They are typically issued by private entities like banks, financial institutions, or other businesses. They have credit enhancements in the form of pool insurance, letters of credit, or subordination to appeal to investors. The mortgages backing non-agency RMBS are often termed as non-conforming mortgages. They might have higher Loan-to-Value (LTV) ratios or be associated with borrowers of lower credit quality.

Mortgage Contingency Features

Borrowers may have a prepayment or early repayment option that allows them to prepay all or part of the outstanding mortgage principal before maturity. This poses a prepayment risk for lenders as the exactness of cash flow timings and amounts become unpredictable. To minimize this uncertainty, lenders often impose prepayment penalties. The penalties compensate for differences between the contract and prevailing mortgage rates.

The mortgage can default if a borrower fails to adhere to the payment schedule. This allows the lender to initiate foreclosure. The amount recovered after the property's sale might be inadequate to cover the losses. In **recourse loans**, lenders can claim the difference between the outstanding amount and sales proceeds from the borrower. **Non-recourse loans** do not permit lenders to make such claims and can only recover the balance through the property. The type of loan, whether recourse or non-recourse, impacts the borrower's default likelihood, especially where the LTVs are higher than 100%. Depending on the mortgage's nature, borrowers may consider a strategic default, where they intentionally default, weighing the consequences against potential benefits.

Underwater Mortgages

Negative equity or underwater mortgages are where the owed amount exceeds the property's value. This situation means the homeowner owes more on the mortgage than the property is currently worth. Strategic default becomes more likely with non-recourse loans when LTV exceeds 100%.

A borrower can make a deliberate decision to stop making payments on a debt despite having the financial ability to make the payments. This is called **strategic default.** Strategic default becomes more likely with non-recourse loans as the borrower’s liability is limited to the property itself. Additionally, when the LTV is greater than 100%, meaning the property value is entirely overshadowed by the owed amount, the likelihood of a strategic default increases. underwater mortgages can be precursors to foreclosures and were prominent during the 2008-09 Global Financial Crisis.

Question

Which of the following best describes a recourse loan?

A. A loan in which the lender can claim only the property in case of default.
B. A loan in which the lender can claim the difference between the outstanding mortgage balance and property sale proceeds from the borrower's other assets or income.
C. A loan that carries a prepayment penalty to compensate the lender if the borrower decides to pay off the loan earlier than the agreed schedule.

The correct answer is **B.**

A recourse loan allows the lender to claim the difference between the outstanding mortgage balance and the sales proceeds from the borrower's other assets and/or income in case of a shortfall after selling the property.

A is incorrect: This describes a non-recourse loan, where the lender can only claim the property as collateral in the case of default and cannot go after the borrower's other assets or income.

C is incorrect: While some loans carry a prepayment penalty, this feature is not specific to recourse loans and does not define the nature of recourse in a loan.

LOS 19c: describe types and characteristics of residential mortgage-backed securities, including mortgage pass-through securities and collateralized mortgage obligations, and explain the cash flows and risks for each type.

Residential Mortgage-backed Securities (RMBS) are securities derived from the pooling of mortgages and their subsequent sale to investors. The section discusses the different types of RMBS, including mortgage pass-through securities, non-agency RMBS, and collateralized mortgage obligations.

Mortgage Pass-through Securities

Mortgage Pass-Through Securities result from lenders combining multiple mortgages and selling these as securities to investors. The arising monthly payments of principal, interest, and prepayments from the mortgage pool are passed to the investors.

Features of Mortgage Pass-through Securities

i. **Cash Flows**: These depend on monthly flows from the underlying mortgage pool. They cover both amounts passed to holders and administrative fees for servicing the pool.
ii. **Administrative Charges:** These arise from tasks such as collecting payments from borrowers, maintaining mortgage records, and initiating foreclosure if necessary. These charges and any guarantee fees from the issuer are a fraction of the mortgage rate.
iii. **Pass-Through Rate:** It is the coupon rate of the mortgage pass-through security. It is lower than the weighted average mortgage rate due to administrative costs.
iv. **Heterogeneous Nature:** Mortgages in the pool differ in outstanding principal, interest rates, and maturities. The formula below calculates the weighted coupon rate (WAC) and the weighted average maturity (WAM) for each security.

WAM represents the average time until the mortgages in a pool are expected to be repaid, while WAC indicates the weighted average interest rate of the mortgages in the pool.

$$\text{WAC} = \sum \left(\frac{\text{Current balance of each mortgage}}{\text{Total current balance of all mortgages}} \times \text{Interest rate of each mortgage}\right)$$

$$\text{WAM} = \sum \left(\frac{\text{Current balance of each mortgage}}{\text{Total current balance of all mortgages}} \times \text{Number of Months to Maturity of each mortgage}\right)$$

The pass-through rate is the interest rate received by the RMBS investors. This is less than the WAC due to administrative charges.

$$\text{Pass} - \text{Through Rate} = \text{WAC} - \text{Administrative Charges}$$

Example: Calculating WAC and WAM

Given the information in the table below, calculate the weighted average coupon rate (WAC) and the weighted average maturity (WAM).

Mortgage	Interest rate	Beginning Balance (EUR)	Current Balance (EUR)	Original Term (months)	Number of Months to Maturity
A	2.8%	$450,000$	$408,000$	360	288
B	3.5%	$370,000$	$340,000$	600	516
C	3.0%	$210,000$	$185,000$	288	216
D	4.1%	$500,000$	$240,000$	480	192
E	3.4%	$270,000$	$252,000$	384	288
		1,800,000	1,425,000		

Solution

Weighted Average Coupon Rate (WAC):

$$\text{WAC}_\text{A} = \left(\frac{408,000}{1,425,000} \times 2.8\%\right) = 0.8017\%$$

$$\text{WAC}_\text{B} = \left(\frac{340,000}{1,425,000} \times 3.5\%\right) = 0.8351\%$$

$$\text{WAC}_\text{C} = \left(\frac{185,000}{1,425,000} \times 3.0\%\right) = 0.3895\%$$

$$\text{WAC}_\text{D} = \left(\frac{240,000}{1,425,000} \times 4.1\%\right) = 0.6905\%$$

$$\text{WAC}_\text{E} = (\frac{252,000}{1,425,000} \times 3.4\%) = 0.6013\%$$

$$\text{Total WAC} = 0.8017\% + 0.8351\% + 0.3895\% + 0.6905\% + 0.6013\% = 3.3180\%$$

Weighted Average Maturity (WAM):

$$\text{WAM}_\text{A} = (\frac{408,000}{1,425,000} \times 288) = 82.46$$

$$\text{WAM}_\text{B} = (\frac{340,000}{1,425,000} \times 516) = 123.12$$

$$\text{WAM}_\text{C} = (\frac{185,000}{1,425,000} \times 216) = 28.04$$

$$\text{WAM}_\text{D} = (\frac{240,000}{1,425,000} \times 192) = 32.34$$

$$\text{WAM}_\text{E} = (\frac{252,000}{1,425,000} \times 288) = 50.93$$

$$\text{Total WAM} = 82.46 + 123.12 + 28.04 + 32.34 + 50.93 = 316.88 \text{ months}$$

The WAC is 3.318%, and the WAM is approximately 317 months.

Risks Associated with Mortgage Pass-Through Securities

i. **Prepayment Risk**: Homeowners may choose to refinance or sell, leading to an earlier-than-expected mortgage payoff, especially in a declining interest rate environment. This can alter the anticipated cash inflows for investors.
ii. **Extension Risk**: In a scenario of rising interest rates, homeowners may postpone refinancing, which can extend the timing of expected cash inflows.
iii. **Administrative Risk**: Costs related to administrative tasks, such as payment collections or initiating legal actions for defaults, can influence the net earnings of investors.

Collateralized Mortgage Obligations (CMOs)

CMOs transform mortgage pass-through securities or various loan pools into securitized forms. They are structured with multiple classes or tranches, each having different priority levels for the receipt of principal and interest payments. Principal and interest payments are directed to the tranches and then released to investors. The **tranching structure** enables prepayment risk to be allocated across the different tranches. This reduces the uncertainty on the amount and timing of payments received by investors. The higher the tranche level, the lower its exposure to prepayment and default risks.

Collateralized Mortgage Obligations Structures

The structures result from the various methods of organizing cash flows from a mortgage pool.

i. **Sequential-Pay CMO Structure**: In this structure, each tranche is settled in order, where one class gets principal payments only after the prior class is fully settled.
ii. **Z-Tranches**: Also known as accrual or accretion bonds. These tranches do not disburse interest until a pre-set date. They accrue interest during an initial period and then start distributing interest and principal payments only after other specified tranches (often referred to as support or companion tranches) have been paid off. They are usually the final tranche in a sequence, making them riskier and more challenging to value.
iii. **Principal-Only (PO) Securities**: Investors receive only principal repayments from the mortgage pool for these securities. This makes their value sensitive to prepayment and interest rates.
iv. **Interest-Only (IO) Securities**: These securities disburse only interest payments from the pool and have no par value. The cash flows to the holders of this security are reduced with increased prepayments.
v. **Floating-Rate Tranches**: These tranches bear variable interest rates tied to an index. They can be structured as inverse floaters, where the interest paid varies inversely with interest rate changes.
vi. **Residual Tranches**: These tranches collect any leftover cash flow after settling other tranches.
vii. **Planned Amortization Class (PAC) Tranches**: They are an evolution of sequential-pay CMOs and provide greater cash flow predictability. They ensure fixed principal payments

over a set period if prepayment rates remain within specified bounds.

Risks Associated with CMOs

i. **Prepayment Risk**: CMOs distribute the prepayment risk across tranches. While they do not eradicate this risk entirely, they can vary its impact across different tranches.
ii. **Default Risk**: The seniority of a tranche in a CMO structure determines its exposure to default risk. More senior tranches have reduced exposure.
iii. **Interest Rate Risk**: Depending on the structure, some tranches might be more susceptible to changes in interest rates, affecting their returns.

Question

Which of the following is the *most accurate* definition of a collateralized mortgage obligation (CMO)?

A. A security that pools together multiple mortgages and is structured to direct interest and principal payments to different classes of bondholders.
B. A debt security issued by banks, backed only by the general creditworthiness of the issuing bank.
C. A mortgage-backed security solely based on commercial real estate loans.

The correct answer is **A.**

A collateralized mortgage obligation (CMO) is a type of mortgage-backed security that pools multiple mortgages and directs bondholders' interest and principal payments to different classes (or tranches) in a predefined order.

B is incorrect: This describes a bank's unsecured debt, not a CMO.

C is incorrect: While mortgage-backed securities are based on commercial real estate loans, this does not accurately describe a CMO's specific structure and nature.

LOS 19d: describe the characteristics and risks of commercial mortgage-backed securities.

CMBS are backed by a pool of commercial mortgages on diverse income-producing properties such as office buildings, multifamily properties, industrial properties, shopping centers, and health care facilities. These securities are repaid from the property's generated revenue. They have collateral generally consisting of commercial loans, whether for property acquisition or refinancing.

CMBS Structure

CMBS and RMBS are similar in their securitization processes. However, CMBS has two distinctive features: call protection and the balloon maturity provision.

Call Protection

CMBS have protection against early repayments, allowing them to trade more like corporate bonds. This protection is either structural or at the loan level.

1. Structural Call Protection: This is done through sequential-pay tranches. This means that principal repayments are directed to the highest-priority tranche until it is fully paid off, after which the next tranche in line starts receiving payments. This structure ensures that higher-rated tranches are paid off before lower-rated tranches, protecting senior investors against prepayments and other risks.
2. Loan Level Call Protection: This relies on three mechanisms, namely, prepayment lockout (prohibits prepayments during a specified period), prepayment penalty points (penalties a borrower must pay if they wish to refinance), and defeasance (allows prepayment but requires the borrower to buy a government securities portfolio replicating the loan's cash flows).

Balloon Maturity Provision

Commercial mortgages are not fully amortizing over the life of the loan. They require interest and some principal repayments throughout the loan's life, with a large "balloon" payment at

maturity. The borrower might fail to make the large payment, resulting in balloon risk. This can lead to an extension of the loan term, known as the "workout period." Balloon risk is, therefore, a type of extension risk.

Risk Indicators in Commercial Real Estate Lending

The two critical indicators of credit performance in commercial real estate lending are the Loan-to-Value ratio (LTV) and the Debt Service Coverage ratio (DSCR). LTV determines the ratio of the loan amount to the property value. On the other hand, DSCR is determined by dividing the property’s annual Net Operating Income (NOI) by the debt service. A DSC ratio above 1.0× indicates cash flows from the property can adequately cover the debt service.

$$\text{NOI} = (\text{Rental income} - \text{Cash operating expenses}) - \text{Replacement reserves}$$

$$\text{DSC Ratio} = \frac{\text{Net operating income}}{\text{Debt service}}$$

CMBS Risks

1. Concentration Risk: Unlike RMBS, which is often backed by a large number of residential mortgages, CMBS can be backed by a limited number of commercial mortgages. This limited diversification means that a default on a single mortgage within the CMBS can significantly impact the returns for investors.
2. Balloon Risk (A Form of Extension Risk): Many commercial loans within CMBS are structured as balloon loans. These loans require significant principal repayments at maturity. If a borrower fails to make this balloon payment at the loan's end, it leads to default. In such cases, lenders might extend the loan duration, known as the "workout period," and possibly modify the loan's original terms. Since the loan life gets prolonged, this risk is also seen as a type of extension risk.
3. Call Protection Risks: One distinctive feature of CMBS is the protection against early prepayments. While this might seem beneficial, it comes with its own set of risks. For instance, structural call protection ensures that a lower-rated tranche cannot be paid down until a higher-rated tranche is entirely paid off. This mechanism protects senior tranches but increases the risk for junior tranches. On the individual loan level,

mechanisms such as prepayment lockouts, prepayment penalty points, and defeasance can affect the CMBS's liquidity and yield.

4. Legal Risks (Especially in European CMBS): European CMBS often includes loans originating from different European countries. If a foreclosure or bankruptcy occurs, the property sale has to adhere to local rules, which can differ significantly across European nations. Such variations can introduce uncertainties and complexities, making European CMBS riskier from a legal standpoint.
5. Interest Rate and Prepayment Risks: While CMBS offers protection against prepayments, they are not immune to interest rate risks. European CMBS, for instance, generally have a floating rate that might be capped, making them susceptible to interest rate fluctuations. In the U.S., while CMBS typically have fixed rates, they can sometimes offer a floating rate. The structure of the CMBS, especially regarding the interest rate type, can thus influence its sensitivity to market interest rate changes.
6. Credit Risk: The credit risk in CMBS can vary based on the underlying assets. If a CMBS is backed by a single or a few commercial mortgages, the credit risk might be higher compared to an RMBS backed by many residential mortgages. The creditworthiness of the properties, their owners, and the nature of the commercial mortgages are vital factors determining the CMBS's credit risk.

CMBS vs. RMBS

1. Underlying Assets: CMBS pools might consist of one or a limited number of mortgages, while RMBS usually contains numerous residential mortgages.
2. Issuer: CMBS can be issued by various financial institutions, whereas RMBS can be issued by either government entities or private businesses.
3. Rate: In Europe, CMBS often carry a floating rate (possibly capped), whereas in the US, they typically have a fixed rate. RMBS can be either.
4. Risk Exposure: CMBS is generally more exposed to credit risk due to its potential concentration in a few mortgages. Prepayment risk dynamics differ between CMBS and RMBS, with CMBS having a higher extension risk and RMBS having both high contraction and extension risks.

Question

Which of the following is *most likely* to be a risk associated with the balloon maturity provision in CMBS?

A. Interest rate risk.
B. Prepayment risk.
C. Extension risk.

The correct answer is **C.**

Balloon risk, a form of extension risk, arises when a borrower fails to make the balloon payment at maturity.

A is incorrect: Interest rate risk is associated with fluctuations in interest rates, not balloon payments.

B is incorrect: Prepayment risk is related to early payment, not balloon payments.