

R42 Introduction to Asset-Backed Securities

1. Introduction: Benefits of Securitization	4
1.1 Benefits of Securitization for Economies and Financial Markets	4
2. How Securitization Works	5
2.1 An Example of a Securitization.....	5
2.2 Parties to a Securitization and Their Roles	6
3. Structure of a Securitization	7
3.1 Key Role of the Special Purpose Entity.....	8
4. Residential Mortgage Loans	9
4.1 Maturity	10
4.2 Interest Rate Determination.....	10
4.3 Amortization Schedule	10
4.4 Prepayment Options and Prepayment Penalties.....	11
4.5 Rights of the Lender in a Foreclosure	11
5. Mortgage Pass-Through Securities.....	12
5.1 Mortgage Pass-Through Securities.....	13
6. Collateralized Mortgage Obligation and Non-Agency RMBS.....	16
6.1 Sequential-Pay CMO Structures	17
6.2 CMO Structures Including Planned Amortization Class and Support Tranches.....	18
6.3 Other CMO Structures	19
6.4 Non-agency Residential Mortgage-Backed Securities.....	19
7. Commercial Mortgage-Backed Securities.....	20
7.1 Credit Risk.....	20
7.2 CMBS Structure	21
8. Non-Mortgage Asset-Backed Securities	22
8.1 Auto Loan ABS.....	22
8.2 Credit Card Receivable ABS	23
9. Collateralized Debt Obligations	24
9.1 CDO Structure	24
9.2 An Example of a CDO Transaction	25
10. Covered Bonds	26
Summary	27
Practice Questions	32

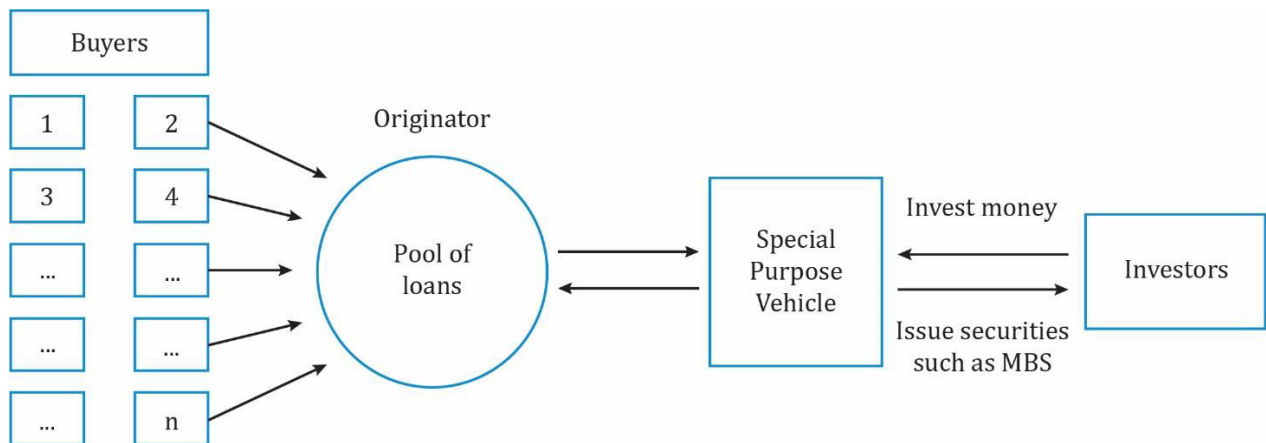
This document should be read in conjunction with the corresponding reading in the 2022 Level I CFA® Program curriculum. Some of the graphs, charts, tables, examples, and figures are copyright 2021, CFA Institute. Reproduced and republished with permission from CFA Institute. All rights reserved.

Required disclaimer: CFA Institute does not endorse, promote, or warrant the accuracy or quality of the products or services offered by IFT. CFA Institute, CFA®, and Chartered Financial Analyst® are trademarks owned by CFA Institute.

Version 1.0

1. Introduction: Benefits of Securitization

Asset-backed securities (ABS) are based on a principle called **securitization**. The securitization process involves pooling relatively straightforward debt obligations, such as loans or bonds, and using the cash flows from the pool of debt obligations to pay off the bonds created in the securitization process. The instruments which become part of the pool are called securitized assets. A simple securitization process is illustrated in the figure below:



In this illustration, a mortgage bank sells mortgage loans to thousands of homeowners. The mortgage bank bundles the individual loans into a pool which is sold to a separate legal entity generally referred to as a special purpose vehicle (SPV). The special purpose vehicle issues bonds to investors. The collateral for the bonds is the pool of mortgage loans.

The term **mortgage-backed security** (MBS) is commonly used for securities which are backed by high quality real estate mortgages. The term “asset-backed securities,” or ABS, is a broader concept that refers to securities backed by other types of assets. In the example above, we can say that the SPV issues MBS.

1.1 Benefits of Securitization for Economies and Financial Markets

In this section, we look at the benefits from the perspective of the three parties involved in the securitization process: borrowers who are the homeowners, investors who want to buy mortgages, and the intermediary connecting these two parties which is a commercial bank/financial institution. Investors cannot lend directly to homeowners because they may be willing to lend/invest only a small amount of money, say \$10,000, whereas the homeowner may require \$100,000 as a mortgage loan. Second, the investor may not have all the information needed to assess the risk of the property.

Benefits to investors are as follows:

- Securitization converts an illiquid asset into a liquid security.
- It gives investors direct access to the payment streams of the underlying mortgage loans that would otherwise be unattainable.
- There are higher risk-adjusted returns to investors: pooling loans results in

diversification and lower risk for investors.

- It gives investors an opportunity to buy a small part of the home buyers' mortgage in the form of a security issued by the SPV.
- It gives exposure to the market, real estate in this example, without directly investing in it.

Benefits to the bank or loan originator are as follows:

- It enables banks to increase loan origination, monitoring, and collections.
- It reduces the role of the intermediaries (known as disintermediation) like the bank. However, note that an intermediary is still required to package and distribute securities.
- Banks have the ability to lend more money if the demand for ABS and MBS is high relative to if the money was self-financed (from deposits, debt, equity, etc.).
- There is greater efficiency and profitability for the banking sector: the mortgage-backed securities, at least in the US market, trade actively in the secondary market which improves the efficiency and liquidity of the financial market.

Benefits to the borrowers of the loan are as follows:

- It lowers the risk as the pooled loans offer a diversification benefit.
- The lower risk decreases the cost of borrowing for homeowners.

2. How Securitization Works

We look at the securitization process in detail in this section.

2.1 An Example of a Securitization

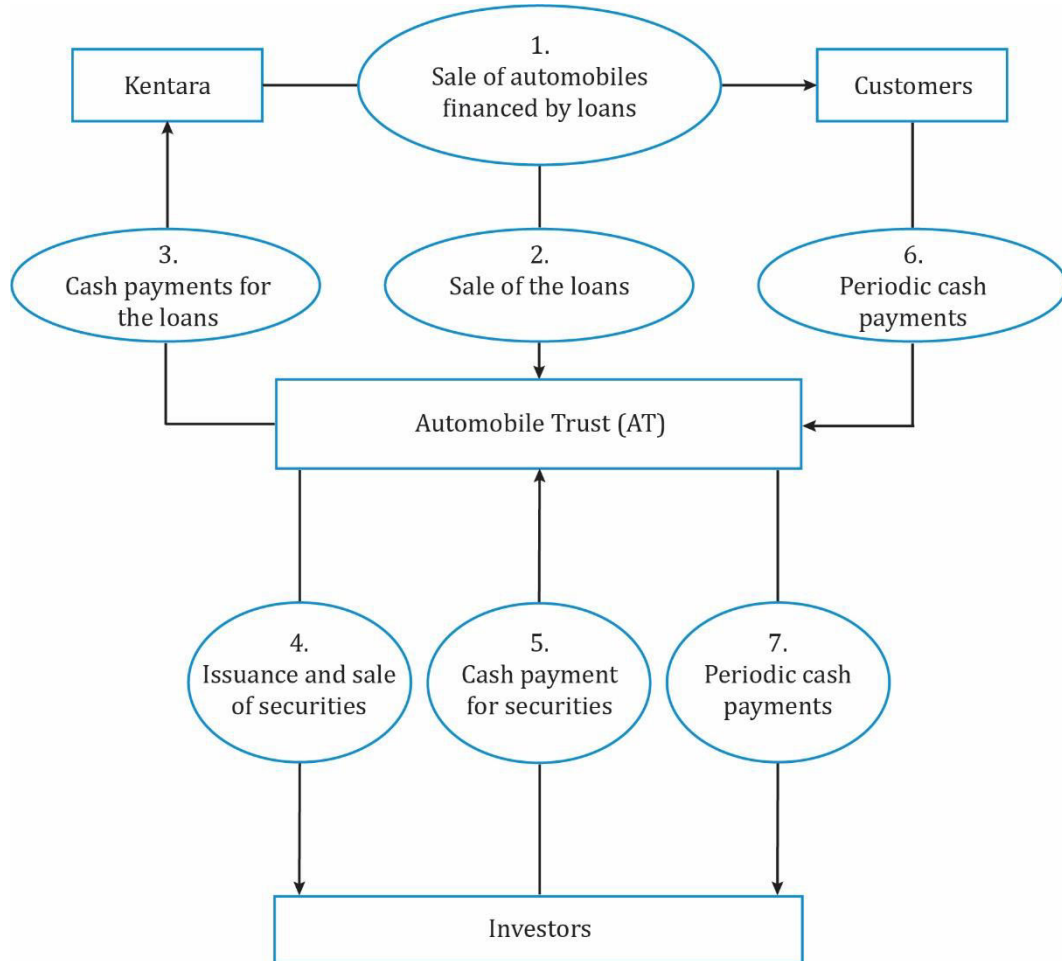
Kentara is a manufacturer of automobiles that range from \$20,000 to \$200,000. The majority of sales are made through loans granted by the company to its customers, and the automobiles serve as collateral for the loans. These loans, which represent an asset to Kentara, have maturities of five years, carry a fixed interest rate and are fully amortizing with monthly payments. Although the servicer of such loans need not be the originator of the loans, the assumption is that Kentara is the servicer.

Steps in the securitization transaction:

- Now assume that Kentara has \$100 million of loans, shown on its balance sheet as an asset, and Kentara wants to raise another \$100 million.
- Kentara can do this by securitizing the loans and sells them to a special purpose entity (SPE), Automobile Trust (AT).
- The SPE is a separate legal entity and is also called a special purpose vehicle (SPV) or a special purpose company. The legal form of the SPE varies by jurisdiction but, in almost all cases, the ultimate owner of the loans - AT - is legally independent and considered bankruptcy remote from the seller of the loans.
- AT gets \$100 million in cash from investors by selling asset-backed securities, which it pays to Kentara.

- The customers who bought the automobiles on loan make monthly payments. AT uses this cash flow to pay investors of the ABS.
- Setting up a separate legal entity ensures that if Kentara files for bankruptcy, the loans backing the ABS that are issued by AT are secure within the SPE and creditors of Kentara have no claim on the loan.

The exhibit below illustrates the steps involved in the securitization transaction for Kentara:



Source: Adapted from CFA Program Curriculum, Introduction to Asset-Backed Securities

2.2 Parties to a Securitization and Their Roles

Let us look at the parties involved in a securitization transaction.

Party	Role	Party in our example
Seller of pool of securities	Originates the loans and sells to a special purpose entity (SPE).	Kentara
SPE or trust or issuer	Buys the loans from the seller and issues ABS.	Automobile Trust (AT)

Servicer	Services loans such as collecting payments from borrowers, notifying borrowers who may be delinquent and, if necessary, seizing automobiles from borrowers who do not make payments on time.	Kentara
----------	--	---------

Note that a third party or the issuer may act as a servicer.

Other parties involved include independent accountants, underwriters, trustees, rating agencies, and guarantors.

- Lawyers: Responsible for creating the legal documentation.
- Underwriters: Facilitate bond issuance.
- Rating agencies: Rate the securities issued.

Trustee: Safeguards the assets placed in the trust, and hold funds to be paid to bondholders.

3. Structure of a Securitization

In the Kentara example, assume 100,000 securities of Bond Class A were issued with a par value of \$1,000 per security to raise \$100 million. All the certificate holders in this case are treated equal because there is just one class of bondholders and there is no distinction between bondholders with respect to payment time or credit risk.

However, in reality not all bond issues are created with a similar structure. The motivation for the creation of different types of structures is to redistribute prepayment risk and credit risk efficiently among different bond classes in the securitization.

Prepayment risk is the uncertainty that the actual cash flows will be different from the scheduled cash flows, as set forth in the loan agreements, because borrowers may alter payments to take advantage of interest rate movements.

Instructor's Note

Prepayment risk cannot be eliminated, but can be redistributed.

In the Kentara example, assume the buyers of automobiles are scheduled to make monthly payments towards the loan over 5 years. Instead, they prepay it in two years, perhaps because the interest rates decline, or due to any other reason. Since the loan is prepaid quicker than planned, the investors of ABS will also be paid quickly thereby reducing their interest income.

Time tranching: Creation of bond classes to distribute the prepayment risk is called time tranching. Cash flow received from customers is distributed among the tranches based on certain parameters. For example, assume AT issued the following four bond classes, with a total par value of \$100 million, instead of one bond class:

- A1 (\$30 million)
- A2 (\$20 million)

- A3 (\$30 million)
- A4 (\$20 million)

Since the motive is to distribute prepayment risk, the A1 class may have a lower prepayment risk than A4. If customers prepay, then A4 bond-holders will get prepaid before A1.

Subordination and credit tranching: Subordination is another layering structure in securitization. The bond classes differ in their exposure to credit risk, i.e., how they share losses if the borrowers of the original loans default. An ABS is made up of a pool of loans. So, any default in payment will have a cascading effect on the investors. Here, several tranches of senior and subordinated classes are created and the credit risk is distributed to each class in a disproportionate manner based on the investor's choice.

Bond class	Par Value (\$ millions)
A (senior)	80
B (subordinated)	14
C (subordinated)	6
Total	100

In this example, all the losses are first absorbed by class C, then class B, and then class A. However, class C can accept a loss of up to \$6 million. Beyond that, it is absorbed by class B. The risk is highest for class C and lowest for class A, in this example. Based on the high risk high return rule, the expected return of class C bondholders will be higher than that of class A bondholders.

3.1 Key Role of the Special Purpose Entity

The securitization of a company's assets may include some bond classes that have better credit ratings than the company itself or its corporate bonds. Thus, in the aggregate, the company's funding cost is often lower when raising funds through securitization than by issuing corporate bonds.

To understand why the funding cost is lower, we will go back to the Kentara example and consider two scenarios for raising \$100 million: one in which Kentara issues a corporate bond, and another in which it issues ABS by securitizing loans/receivable.

Corporate bond scenario: Kentara issues corporate bonds for \$100 million with auto loans as collateral. Assume credit-rating agencies such as Moody's assign Kentara a credit-rating of BB (below investment-grade). The corporate bond rating will also be based on the company's credit rating as it reflects the creditworthiness of debt securities. Kentara's credit spread depends on the following two factors:

- Primarily, credit rating (BB, in this case).
- Collateral, to a lesser extent.

The cost of funding for Kentara will be higher if it issues a corporate bond, and not an ABS, for the following reasons:

- Higher risk: Investors perceive a higher risk given the company's creditworthiness. In case the company goes bankrupt or is reorganized, their claim to assets will follow the absolute priority rule (defined in the next section). Though, in reality the absolute priority rule has not been upheld in case of reorganizations. This means that it is not necessary for the bondholders to be paid off before the other parties (equity holders, other creditors). Hence, the credit spread for a corporate bond backed by a collateral does not decrease substantially.
- Higher return: To compensate for the high risk, investors expect a high return.
- Higher credit spread: Credit spread is the difference between the interest rate the issuer has to pay on the corporate bond and the benchmark interest rate. The riskier the bonds, the larger the spread demanded by investors as compensation for risk.

Securitization Scenario

- Funding cost is low: The collateral (loans/receivable) is legally an asset of AT. Any cash flow from the pool of loans will be paid to the investors of ABS. When an investor buys a bond class, he has to evaluate the credit risk of the class he is investing in. The credit rating of the bond class will depend on the quality of the collateral and capital structure of the SPV, and not the credit rating of the company as in the corporate bond.
- The lower the risk, the lower the funding cost: The assets belong to the SPV. If the company goes bankrupt, the absolute priority rule is followed. The principle is that senior creditors are paid in full before subordinate bondholders are paid anything. So investors demand a lower return than a corporate bond. Lower return means lower funding cost for the issuer.
- The SPV is a bankruptcy-remote vehicle unlike corporate bonds. It means bankruptcy has no effect on an SPV. If the company goes bankrupt, the loans/receivable do not belong to Kentara anymore and the investors will be paid based on the securitization structure.

4. Residential Mortgage Loans

A mortgage loan is a loan secured by the collateral of some specified real estate property which obliges the borrower to make a predetermined series of payments to the lender. In simple words, it is a loan a buyer takes for buying a real estate property (land, apartment, house, etc.); the collateral is the property being bought. If the buyer defaults on mortgage payments, then it gives the lender the right to foreclose on the loan, take possession of the property, and sell it to recover funds given as debt.

The cash flow of a mortgage consists of the following three components:

- Interest
- Scheduled principal payments
- Prepayments (any principal repaid in excess of the scheduled principal)

The amount lent as loan towards the purchase of the property is always less than the purchase price. It is equal to the purchase price minus the down payment made by the buyer. The buyer's initial equity is equal to the down payment made.

The ratio of the mortgage loan amount to the property's purchase price is called the loan-to-value (LTV) ratio. From a lender's perspective, lower the LTV, the less likely the borrower is to default. Also, if the borrower does default, the lender will have better chances of recovering the amount loaned by repossessing and selling the property.

We will now look at the following characteristics of residential mortgage loans in detail:

- Maturity
- Mortgage rate
- Amortization schedule
- Prepayments and prepayment penalties
- Rights of the lender in a foreclosure

4.1 Maturity

Maturity: The term of a mortgage is the number of years to maturity. It varies from country to country. For example, in the United States it ranges from 15 to 30 years.

4.2 Interest Rate Determination

The interest rate on the mortgage loan is called the mortgage rate or contract rate. How the mortgage rate is calculated varies across countries.

The four basic methods for calculating mortgage rate are:

- Fixed rate: The rate remains fixed during the life of the mortgage.
- Adjustable or variable rate: The adjustable-rate mortgage (ARM) is like a floating rate. Here, the mortgage rate is reset periodically based on some reference rate or index.
- Initial period fixed rate: The mortgage rate is fixed for some initial period and then it is adjusted for either a new fixed rate or variable rate. If the mortgage rate is fixed for an initial period and then set to a new fixed rate, then it is called rollover or renegotiable mortgage. If the mortgage rate is fixed for an initial period and then it becomes adjustable, then it is called a hybrid mortgage.
- Convertible: The mortgage is initially either a fixed or an adjustable rate. Later, the borrower may either convert it into a fixed or adjustable mortgage for the remainder of the mortgage's life.

4.3 Amortization Schedule

Residential mortgages are usually amortizing loans. The amount borrowed reduces gradually over time as periodic mortgage payments are made. Mortgage payments consist of interest payments and scheduled principal repayments. Let's take the example of the Smiths who borrow \$100,000 to purchase a house, assume the terms of the loan are as follows:

Loan amount = \$100,000; mortgage rate = 6%; maturity term = 30 years.

The periodic mortgage payment can be computed as:

PV = -100,000; N = 360 (=12 * 30); I = 0.5 = (6 / 12); FV = 0; CPT PMT

PMT = -599.95

Interest = $0.005 * 100,000 = \$500$. But, the monthly payment is \$599.95. During the first month, \$99.95 goes towards reduction of principal. As time goes by, the amount of the monthly mortgage payment towards principal reduction increases and that toward interest decreases.

Since the outstanding mortgage balance of \$100,000 reduces over time, it is called amortization.

There are two types of amortizing loans:

- Fully amortizing loans: There is no outstanding balance at the end of the mortgage's life. The loan is fully repaid with the last mortgage payment.
- Partially amortizing loans: The sum of all the scheduled mortgage repayments is less than borrowed amount. A last payment, called the balloon payment, is made equal to the unpaid mortgage balance.

Based on interest/scheduled principal repayments, there are two types of mortgages:

- Interest-only mortgage: No scheduled principal repayment for a certain number of years.
- Bullet mortgage: No scheduled principal repayment over the entire life of the loan. The last payment is equal to the original loan amount.

4.4 Prepayment Options and Prepayment Penalties

Prepayment is a payment made in excess of the scheduled principal repayment. Assume 10 months after taking the loan, the interest rates fall. The Smiths choose to refinance by taking a new loan and closing the existing one by prepaying. Another scenario is part prepayment, where, let us say, in the first month the Smiths pay \$1,000 instead of the scheduled \$599.95 mortgage payment. \$1,000 is broken down into three parts: \$500 towards interest, \$99.95 for scheduled principal payment, and \$400.05 towards prepayment.

In some countries, there may be a penalty for prepayment as it hurts the lender (recall 'prepayment risk'). The objective of imposing a penalty is to compensate the lender for the difference in the contract rate and the prevailing mortgage rate when the borrower prepays as rates decline.

4.5 Rights of the Lender in a Foreclosure

Recourse and non-recourse mortgage loans: If the borrower of a loan defaults on payments, then the lender can seize the property and sell it. The proceeds from the sale may be less than the outstanding mortgage balance, and not enough to recoup the losses. There are two

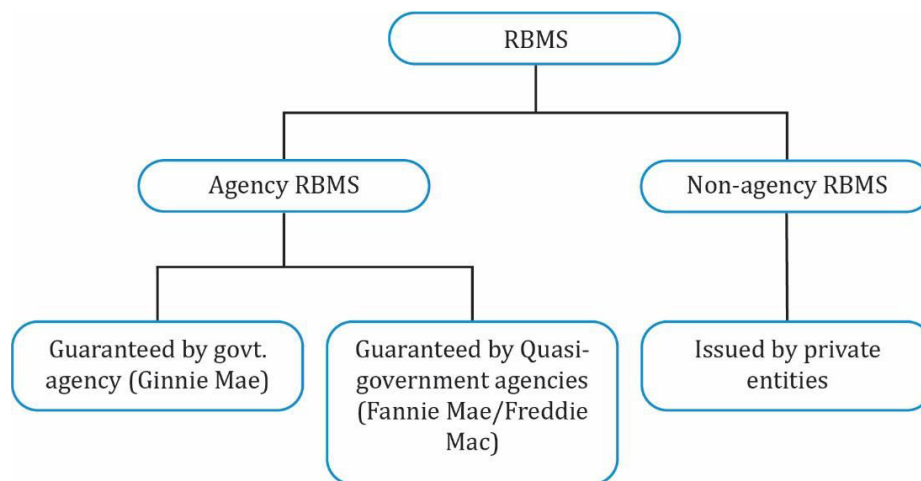
types of mortgage loans in such cases:

- **Recourse loans:** The lender can claim the shortfall (outstanding mortgage balance – after the property is sold) from the borrower. For instance, if the borrower has other properties or possessions such as an expensive car, or valuable art, then these could be sold to fulfill the shortfall.
- **Non-recourse loans:** Most mortgage loans are non-recourse. The lender may sell the property in case of a default and keep the proceeds. But, unlike a recourse loan, the bank/lender cannot claim other assets of the borrower to fulfill the shortfall in the outstanding mortgage balance.

5. Mortgage Pass-Through Securities

Residential mortgage-backed securities are bonds created from the securitization of residential mortgage loans. In the U.S., residential mortgage-backed securities are divided into the following three sectors:

1. Those guaranteed by a federal agency (Ginnie Mae) whose securities are backed by the full faith and credit of the U.S. government.
2. Those guaranteed by either of the two government-sponsored enterprises or GSEs (Fannie Mae and Freddie Mac) but not by the U.S. government. They do not carry the full faith and credit of the U.S. government.
3. Those issued by private entities that are not guaranteed by a federal agency or a GSE.



The first two sectors (guaranteed by the government or a quasi-government entity) are called the **agency RMBS**. The third sector is called **non-agency RMBS**.

Examples of agency RMBS include:

- Mortgage pass-through securities
- Collateralized mortgage obligations

The two differences between agency RMBS issued by GSEs and non-agency RMBS are as follows:

- Non-agency RMBS use credit enhancements to reduce credit risk, while agency RMBS

issued by the GSEs are guaranteed by the GSEs themselves.

- For a loan to be included in a pool of loans backed by an agency RMBS, it must satisfy the underwriting standards of the government agencies.

5.1 Mortgage Pass-Through Securities

A mortgage pass-through security is created when one or more holders of mortgages form a pool of mortgages and sell shares or participation certificates in the pool. The investors receive a share of cash flows from the underlying pool of mortgage loans.

Cash Flow Characteristics

- Monthly mortgage payments consist of interest, scheduled principal repayment, prepayments.
- Payments are made to security holders each month.
- The servicer collects monthly payments, sends payment notices to borrowers, sends reminders if payments are overdue, maintains records of principal balances, etc.
- The servicing fee is part of the mortgage rate.
- The amount of cash flow from mortgage loans is not equal to that received by the investors. Similarly, there is a delay in passing the cash flow from mortgage loans to the security holders.
- Monthly cash flow of a mortgage pass-through security = monthly cash flow of the underlying pool of mortgages - servicing and other fees. In other words, investors of the mortgage pass-through security receive less than the cash flow coming in from the mortgage loans because a servicing fee is collected by the servicer.

How is the rate and maturity of a mortgage loan calculated?

- Pass-through rate: A mortgage pass-through security's coupon rate is called the pass-through rate. For example, if the mortgage rate for a pool of mortgages is 8%, the annualized servicing fee is 0.6%, then the investors receive an average return of around 7.4%.
- Weighted average coupon (WAC): Each of the mortgage loans in the securitized pool may not have the same mortgage rate. The WAC is found by weighting the rate of each mortgage loan in the pool by the percentage of the mortgage outstanding relative to the outstanding amount of all mortgages in the pool.
- Weighted average maturity (WAM): Similarly, not all the loans in the pool will have the same maturity. WAM is found by weighting the remaining number of months to maturity for each mortgage loan in the pool by the amount of the outstanding mortgage balance.

Conforming and Non-conforming Loans

A mortgage loan must meet certain criteria to be included in a pool of loans backing an RMBS. Listed below are some of the underwriting standards of an agency they must conform to:

- Maximum loan-to-value ratio: It should be below the maximum LTV to conform.
- Maximum size of the loan
- Loan documentation

If a loan meets the underwriting standards, then it is called a conforming loan.

Non-conforming mortgages that serve as collateral for mortgage pass-through securities do not meet the underwriting standards and are privately issued by thrift institutions, commercial banks, etc.

Example

Assume that a pool includes four mortgages with the following characteristics:

Mortgage	Outstanding Balance	Coupon Rate	Time to Maturity
1	\$1,000	4.50%	28 months
2	\$2,000	4.75%	42 months
3	\$4,000	5.15%	37 months
4	\$3,000	3.80%	60 months

Calculate the weighted average coupon rate and weighted average maturity.

Solution:

The total outstanding amount is \$10,000 and hence, the weights are as follows: Mortgage 1 = 10%, 2 = 20%, 3 = 40% and 4 = 30%.

The weighted average coupon is:

$$0.10 \times 4.50\% + 0.20 \times 4.75\% + 0.40 \times 5.15\% + 0.30 \times 3.80\% = 4.60\%$$

The weighted average maturity (WAM) is:

$$0.10 \times 28 + 0.20 \times 42 + 0.40 \times 37 + 0.30 \times 60 = 44 \text{ months}$$

Prepayment risk: The risk associated with uncertainty in future cash flows because of principal repayments is called prepayment risk. It has two components: contraction risk and extension risk.

- Contraction risk is the risk that when interest rates decline, the security will have a shorter maturity than was anticipated at the time of purchase because homeowners refinance at now-available lower interest rates. For instance, assume the interest rate is 8% when the Smiths take the loan. If two years later it falls to 6%, then they will prepay the loan and refinance at the lower rate.
- Extension risk is the risk that when interest rates rise, fewer prepayments will occur because homeowners are reluctant to give up the benefits of a contractual interest rate that now looks low. From an investor's perspective, the security becomes longer in maturity than it was at the time of purchase.

Instructor's Note

Contraction risk occurs when interest rates decline.

Extension risk occurs when interest rates rise.

Prepayment Rate Measures

To value a mortgage pass-through security, one must be able to forecast its cash flows. But, the cash flows are uncertain because it is not known ahead of time when homeowners may prepay principal during the mortgage's life. The only way to predict future cash flows is by making some assumptions about the prepayment speed/rate.

The two measures of prepayment rate are:

- Single month mortality rate: this is a monthly measure.
- Conditional repayment rate: this is an annual measure.

Single month mortality (SMM) measures prepayments in a month. An SMM of $x\%$ means that $x\%$ of the outstanding mortgage balance at the start of the month minus the scheduled principal repayment, will be repaid that month.

$$\text{SMM} = \frac{\text{Prepayment for a month}}{\text{Beginning mortgage balance for month} - \text{Scheduled principal repayment for month}}$$

Conditional repayment rate (CPR) is an annualized version of SMM.

A CPR of 6%, for example, means that approximately 6% of the outstanding mortgage balance at the beginning of the year is expected to be prepaid by the end of the year.

100 PSA prepayment benchmark: The 100 Public Securities Association (PSA) prepayment benchmark is expressed as a monthly series of CPRs. The benchmark assumes that prepayment rates are low for newer mortgages and increase as time passes. A PSA assumption greater than 100 PSA means that prepayments are assumed to be faster than the benchmark. In contrast, a PSA assumption lower than 100 PSA means that prepayments are assumed to be slower than the benchmark.

Cash Flows

The cash flows associated with a mortgage pass-through security have the following components:

- Scheduled principal repayment
- Principal pre-payment
- Interest payment

The interest payment is based on the principal outstanding at the start of the period and the interest rate. The principal pre-payment can be estimated based on the SMM (or CPR) number. The higher the SMM, the higher the prepayment.

Instructor's Note

The curriculum shows the cash flow calculations for a hypothetical mortgage pass-through security. If you have the time you can study the curriculum example. However, from a testability perspective it is more important that you understand the concept which is

explained here.

Weighted Average Life

Recall that one of the basic characteristics of a bond is its maturity. But, in the case of a MBS the legal maturity date does not reveal much about the characteristics of the security because of prepayments.

The weighted average life (average life) gives investors an indicator of how long investors can expect to hold the MBS before it is paid off. The table below shows the average life at different prepayment rates. For instance, at a prepayment rate of 125 PSA, the average time for principal repayment is 10.1 years. Notice that the average time drops drastically to 3.2 years as the prepayment rates go up to 600 PSA.

PSA assumption	100	125	165	250	400	600
Average life (years)	11.2	10.1	8.6	6.4	4.5	3.2

ESG Risk for RMBS

In recent times, rating agencies have started incorporating ESG factors in their assessments of RMBS. For example:

- The ratings process for a new securitization now includes the potential loss of mortgage principal due to natural disasters.
- Several RMBS backed by subprime mortgages were downgraded because of a potential decline in interest income due to the adverse impact of the COVID-19 pandemic.

6. Collateralized Mortgage Obligation and Non-Agency RMBS

The prepayment risk seen in mortgage pass-through securities can be reduced by distributing the cash flows of these mortgage products to different classes or tranches through a process called structuring.

Collateralized mortgage obligation (CMO) is one such security created based on this principle of structuring where the cash flows (interest and principal) are redistributed to different tranches based on a set of rules. The different classes of bondholders in a CMO have different exposures to prepayment risk. The collateral for a CMO is a pool of mortgage pass-through securities and not a pool of mortgage loans.

Advantages of a CMO

Following are the key benefits of a CMO:

- CMOs can be created to closely satisfy the asset/liability needs of institutional investors, thereby broadening the appeal of mortgage-backed products.
- Some investors may want to increase their exposure to prepayment risk, while some may want to reduce. Based on their individual needs and risk appetite, investors can

choose the CMO.

The most common types of CMO tranches are sequential-pay tranches, planned amortization class (PAC) tranches, support tranches, and floating-rate tranches.

6.1 Sequential-Pay CMO Structures

Each class/tranche of bond in this CMO structure is retired sequentially. Let us consider a CMO with four tranches. Note that this example is for simplicity. The coupon rate usually varies by tranche.

Tranche	Par amount(US \$)	Coupon rate (%)
A	389,000,000	5.5
B	72,000,000	5.5
C	193,000,000	5.5
D	146,000,000	5.5
Total	800,000,000	

The prepayment risk is mitigated in this CMO by following these interest and principal repayment rules:

For payment of monthly coupon interest: Disburse monthly coupon interest to each tranche on the basis of the amount of principal outstanding for each tranche at the beginning of the month.

For disbursement of principal payments:

Disburse principal payments to tranche A until it is completely paid off.

After tranche A is completely paid off, disburse principal payments to tranche B until it is completely paid off.

After tranche B is completely paid off, disburse principal payments to tranche C until it is completely paid off.

After tranche C is completely paid off, disburse principal payments to tranche D until it is completely paid off.

The table below shows the average life of the collateral and different tranches at various prepayment rates. For instance, at a prepayment rate of 165 PSA, the average life of the collateral is 8.6 years, while it is 3.4 years and 19.8 years for tranches A and D respectively. At higher levels of prepayment, the average life of tranche A falls to 1.6 years and to 7 years for tranche D.

PSA	Collateral	Tranche A	Tranche B	Tranche C	Tranche D
100	11.2	4.7	10.4	15.1	24.0
125	10.1	4.1	8.9	13.2	22.4
165	8.6	3.4	7.3	10.9	19.8

250	6.4	2.7	5.3	7.9	15.2
400	4.5	2.0	3.8	5.3	10.3
600	3.2	1.6	2.8	3.8	7.0

- Tranche A has the highest contraction risk while tranche D has the highest extension risk.
- Tranches A and B provide protection against contraction risk for tranches C and D.
- Similarly, tranches C and D provide protection against extension risk for tranches A and B respectively.

6.2 CMO Structures Including Planned Amortization Class and Support Tranches

In a CMO with a sequential pay-structure, there was a great variability in average life/prepayment risk based on the prepayment rate. This is partly overcome with a CMO structure called the planned amortization class (PAC) tranches. PAC tranches offer great predictability as long as the prepayment rate is within a specified band over the collateral's life. PACs offer protection against both extension risk and contraction risk.

Two PSA prepayment rates must be specified to create a PAC tranche. The two prepayment speeds used to create a PAC bond is called the PAC collar. The lower and upper PSA prepayment assumptions are called the "initial PAC collar", or the "initial PAC bond".

The greater certainty of the cash flow for the PAC tranches comes at the expense of the non-PAC tranches (called *support tranches*). The support tranches provide protection against both contraction and extension risk by absorbing excess principal paid or forgoing principal payment, if the collateral payments are slow.

The table below illustrates the life of PAC and support tranches at various prepayment rates. As you can see, for a prepayment rate between 100 PSA and 250 PSA, the average life of the PAC tranche is 7.7 years. Whereas, the average life of support tranche varies from 20 years to 3.3 years. The prepayment speeds of 100 PSA and 250 PSA create the initial PAC collar.

PSA	Life of PAC	Life of Support
50	10.2	24.9
75	8.6	22.7
100	7.7	20.0
165	7.7	10.7
250	7.7	3.3
400	5.5	1.9
600	4.0	1.4

The support tranches defer principal payments to the PAC tranches if the collateral prepayments are slow; support tranches do not receive any principal until the PAC tranches receive their scheduled principal repayment.

Support tranches absorb any principal prepayments in excess of the scheduled principal

repayments that are made. This rule reduces the contraction risk of the PAC tranches. If the support tranches are paid off quickly because of faster-than-expected prepayments, they no longer provide any protection for the PAC tranches.

For example, a mortgage pass-through security has a greater average life variability than a PAC tranche, but lesser than that of a support tranche. The bond classes in a CMO can either be riskier or less risky than a mortgage pass-through security.

6.3 Other CMO Structures

Although the collateral pays a fixed rate, we can create tranches that pay floating rates. To do this a floater and an inverse floater combination is constructed from any of the fixed-rate tranches in the CMO structure. These tranches are sold to separate sets of investors with opposing views on interest rate movements. If interest rates go up, the floating rate tranche will pay a higher rate but the inverse floater tranche will pay a lower rate. Thus, the two tranches offset each other and the effective rate paid will be equal to rate on original fixed rate tranche.

6.4 Non-agency Residential Mortgage-Backed Securities

Unlike agency residential mortgage-backed securities (RMBS), non-agency RMBS is not backed by the government or a by a GSE; so, credit risk is a major concern for investors. For agency RMBS, when the principal will be repaid (prepayment risk) was a major concern. For non-agency RMBS, if and when (credit risk + prepayment risk) the principal will be paid is a concern.

Based on the credit quality of the mortgage loans in the pool, the securities can be classified into two:

- Prime loans: Borrower has high credit quality, strong credit history, sufficient income to service the loan, and equity in the underlying property.
- Subprime loan: Borrower has low credit quality.

The two complementary mechanisms required in structuring a non-agency RMBS are:

1. The cash flows are distributed by rules, such as the waterfall, that dictate the allocation of interest payments and principal repayments to different tranches with various degrees of seniority/priority. Each tranche has a varying exposure to prepayment and credit risk.
2. There are rules for the allocation of realized losses, which specify that subordinated bond classes have lower payment priority than senior classes.

Two factors to consider when forecasting the future cash flows of a non-agency RMBS:

- Default rate for the collateral.
- Recovery rate. Since some part of the mortgage may be seized and sold, the recovery rate is considered.

In order to obtain a favorable credit rating and to ensure some protection against losses in

the pool, non-agency RMBS and non-mortgage ABS often require one or more credit enhancements.

- Internal credit enhancements include senior/subordinated structures, cash reserve funds, overcollateralization, and excess spread accounts.
- External credit enhancements include third party guarantee, such as a monoline insurance company.

7. Commercial Mortgage-Backed Securities

Commercial mortgage-backed securities (CMBS) are backed by a pool of commercial mortgage loans on income-producing property. Important features of a CMBS are as follows:

- The underlying are loans to purchase or refinance a commercial property such as a warehouse, apartment building, office building, hotels, health care facilities, etc.
- Commercial mortgage loans are non-recourse loans. Lenders can only stake a claim to the income-producing property backing the loan in case of a default and not on any other asset of the borrower. Therefore, analysis of CMBS securities focus on the credit risk of the property and not on the credit risk of the borrower.
- It is important to study the cash flows from the underlying properties for credit analysis.
- There are two key indicators to assess the potential credit performance of a commercial mortgage loan: 1) debt-to-service coverage ratio and 2) the loan-to-value ratio (covered in Sec 4).

$$\text{Debt-to-service coverage ratio} = \frac{\text{Annual net operating income}}{\text{Debt service}}$$

where:

Debt service = annual interest payment and principal repayment

Net operating income = rental income – cash operating expenses – a non-cash replacement reserve

If DSC > 1.0, then cash flows from property are sufficient to service debt.

How to interpret DSC and LTV ratios:

- The higher the DSC ratio, the lower the credit risk and the better is the borrower's ability to service debt.
- A low loan-to-value ratio implies lower credit risk.
- Note: to memorize this formula, draw a parallel with interest coverage ratio from FRA.

7.1 Credit Risk

The role of a credit-rating agency in the CMBS market is to give an opinion on the credit-quality of the bond and provide any enhancement to achieve a desired credit rating. For example, if specific DSC and LTV ratios are needed and those ratios cannot be met at the loan

level, then subordination is used to achieve the desired credit rating.

7.2 CMBS Structure

Interest and principal repayments in a CMBS are structured as follows:

- Interest on principal outstanding is paid to all tranches.
- The highest-rated bonds are paid off first in the CMBS structure.
- Losses arising from loan defaults are charged against the principal balance of the lowest priority CMBS tranche outstanding. These tranches may be unrated by credit-rating agencies and are called the “first-loss piece”, “residual tranche”, or “equity tranche”.

Characteristics of a CMBS Structure

In this section, we look at two important characteristics of a CMBS structure: call protection and balloon risk.

Call Protection

RMBS investors are exposed to prepayment risk since the borrowers have a right to prepay and are not penalized for prepayment; they have an incentive to prepay. CMBS has considerable call protection, which is protection against early prepayment of mortgage principal. The call protection comes in two forms: at the structure level and at the loan level.

Call protection at the structural level:

Call protection at the structural level comes by structuring CMBS into sequential-pay tranches, by credit rating. A lower-rated tranche cannot be paid off until the higher-rated tranches are retired. But, in the case of a default, the losses must be charged to the lowest-rated tranche first and last to the highest-rated tranche.

Call protection at the loan level:

There are four mechanisms that offer investors call protection at the loan level:

1. *Prepayment lockouts*: The borrower is prohibited from any prepayments during a specific period of time.
2. *Prepayment penalty points*: The borrower must pay a fixed percentage of the outstanding loan balance as prepayment penalty if he wishes to refinance.
3. *Yield maintenance charges*: Also known as “make-whole charge”. The borrower must pay a penalty to the lender that makes refinancing uneconomical if the sole objective was to get a lower mortgage rate.
4. *Defeasance*: Defeasance is a protection at the loan level that requires the borrower to provide sufficient funds that can be invested in a portfolio of government securities to replicate the cash flows in the absence of prepayments.

Balloon Risk

Residential mortgages are fully-amortizing loans that are fully amortized over a long period

of time. Usually, there is no principal outstanding after the last mortgage payment. But, many commercial loans backing CMBS transactions are balloon loans which require a substantial principal payment on the final maturity date. If the borrower is not able to make the lump sum payment, he may ask for an extension of the loan over a period of time called the “workout period”.

Balloon risk is a type of extension risk. The risk that a borrower will not be able to make the balloon payment either because the borrower cannot arrange for refinancing or cannot sell the property to generate sufficient funds to pay off the balloon balance is called “balloon risk”.

8. Non-Mortgage Asset-Backed Securities

A wide range of assets apart from mortgage loans are used as collateral for asset-backed securities. The most popular non-mortgage ABS are auto loan receivable-backed securities and credit card receivable-backed securities. Based on the way the collateral pays, ABS can be categorized into two types: amortizing and non-amortizing.

Examples of amortizing loans backing an ABS: mortgage loans and automobile loans.

An example of non-amortizing loans backing an ABS: credit card receivables.

ABS must offer credit enhancement to be appealing to investors.

8.1 Auto Loan ABS

Cash flows consist of interest payment, scheduled principal repayments and any prepayments. For securities backed by auto loan receivables, prepayments result from any of the following:

- Sales and trade-ins requiring full payoff of the loan.
- Repossession and subsequent resale of vehicles.
- Insurance proceeds received upon loss or destruction of vehicles.
- Payoff of the loan with cash to save on the interest cost.
- Refinancing of the loan at a lower interest rate.

All auto-loan backed securities have some form of credit enhancement such as:

- A senior/subordinated structure so the senior tranches have credit enhancement.
- Reserve account, overcollateralization, and excess interest on the receivables.
 - The purpose of a reserve account is to provide credit enhancement. More specifically, the reserve account is a form of internal credit enhancement that will protect the bondholders against losses up to x% of the par value of the entire issue.
 - Overcollateralization means that the aggregate principal balance of the automobile loan contract exceeds the principal balance of the notes. It represents another form of internal credit enhancement. Overcollateralization can be used to absorb losses from the collateral.

8.2 Credit Card Receivable ABS

Credit cards such as Visa and MasterCard are used to finance the purchase of goods and services, as well as for cash advances. When a cardholder makes a purchase using a credit card, he is agreeing to repay the amount borrowed (purchase amount) to the issuer of the card within a certain period, typically a month. If the outstanding amount is not repaid within this grace period, then a finance charge (interest rate) is applied to the balance not paid in full each month.

Credit card receivables are pooled together to act as a collateral for credit card receivable-backed securities. Cash flow, on a pool of credit card receivables consists of:

- Finance charges: These represent the periodic interest the credit card borrower is charged on the unpaid balance after the grace period.
- Fees and principal repayments. Fees include any late payment fees and any annual membership fees.

Characteristics of Credit Card Receivable-backed Securities

Payment Structure

- The security holders are paid an interest periodically (e.g., monthly, quarterly, or semiannually). The interest rate may be fixed or floating.
- The principal payments made by borrowers do not flow through to investors during a period known as the lockout period. Instead, the repayments are reinvested to issue new loans. As a result, credit card receivables increase during the lockout period. During this period, the cash flow to security holders comes from finance charges and fees.

Amortization Provision

- Credit card receivable-backed securities are non-amortizing loans. The principal is not amortized during the lockout period.
- Certain provisions in credit card receivable-backed securities require early amortization of the principal if certain events occur. Such provisions are referred to as “early amortization” or “rapid amortization” provisions and are included to safeguard the credit quality of the issue. The only way the principal cash flows can be altered is by triggering the early amortization provision. For example, if issuers believe there may be a default in credit card repayments, then the principal repayments will be used to pay security holders (investors) instead of reinvesting to issue new loans.

There are two differences between credit card receivable-backed securities and auto loan receivable-backed securities:

- Collateral for credit card receivable-backed securities are non-amortizing loans, while the collateral for auto loan receivable-backed securities are fully amortizing loans.
- For auto loan receivable-backed securities, outstanding principal balance declines as

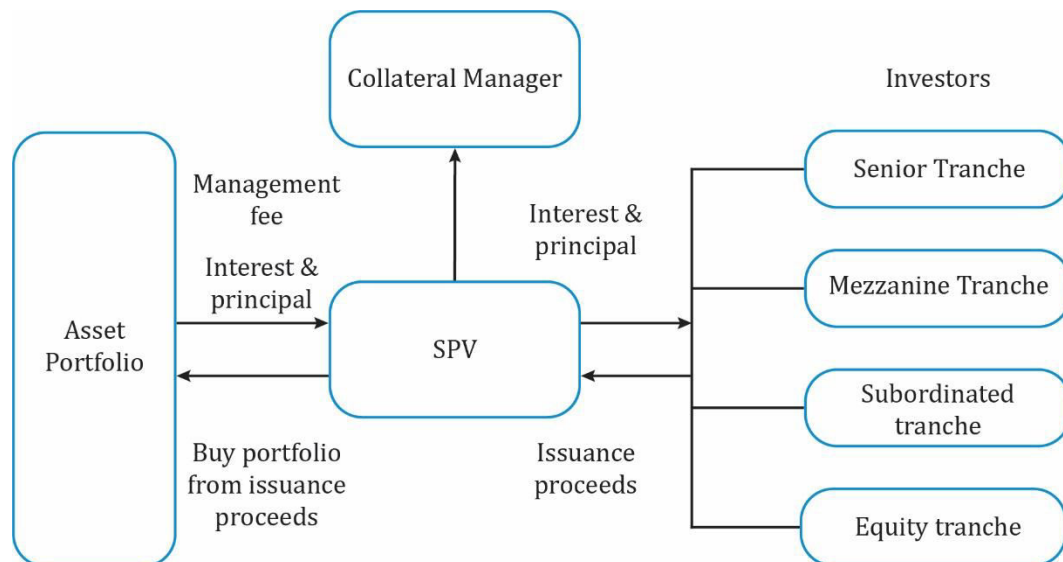
principal is distributed to bond classes each month. But, for credit card receivable-backed securities the principal is reinvested to issue new loans during the lockout period.

9. Collateralized Debt Obligations

A collateralized debt obligation is a generic term used to describe a security backed by a diversified pool of one or more debt obligations (e.g., corporate and emerging market bonds, leveraged bank loans, ABS, RMBS, CMBS, or CDO).

Like an ABS, a CDO involves the creation of a SPV. But, in contrast to an ABS, where the funds necessary to pay the bond classes come from a pool of loans that must be serviced, a CDO requires a collateral manager to buy and sell debt obligations, for and from the CDO's portfolio of assets, to generate sufficient cash flows to meet the obligations of the CDO bondholders, and to generate a fair return for the equity holders.

The structure of a CDO includes senior, mezzanine, and subordinated/equity bond classes. The whole process is illustrated below:



9.1 CDO Structure

The key components of a CDO structure are as follows:

- The CDO raises funds by issuing debt. The debt obligations are structured as bond classes or tranches, such as senior, mezzanine, or subordinated classes with varying risk and return expectations. Investors invest in a particular bond class based on their risk appetite.
- The funds raised from the issuance of bonds are used by the collateral manager to invest in assets. He seeks to earn a higher return from these assets than what is paid to the bondholders.
- The excess spread is used to pay the equity holders and the CDO manager.

- The sources of cash flow to bondholders include interest, principal repayments, and sale of collateral assets.

9.2 An Example of a CDO Transaction

Consider the following \$100 million CDO. The collateral consists of bonds with a par value of \$100 million paying a fixed rate of 11%.

Tranche	Par value (US \$)	Coupon rate
Senior	80,000,000	Libor + 70 bps
Mezzanine	10,000,000	9%
Subordinated/equity	10,000,000	-

Since the senior tranche requires a floating rate payment, the CDO manager enters into an interest rate swap with another party for a notional amount of \$80 million paying a fixed rate of 8% and receiving Libor. This removes any uncertainty with respect to interest rate movements.

Let us now evaluate the cash flows for each party.

Party	Type of cash flow	Amount
Collateral	Pays interest each year. Coupon rate = 11%	$.11 \times 100,000,000 = 11,000,000$
Senior tranche	Interest paid to senior tranche: Libor + 70 bps	$(\text{Libor} + 70\text{bps}) \times 80,000,000 = \text{Libor} \times 80,000,000 + 560,000$
Mezzanine tranche	Interest paid: 9%	$0.09 \times 10,000,000 = 900,000$
Interest rate swap	CDO to swap counterparty: 8%	$0.08 \times 80,000,000 = 6,400,000$
Interest rate swap	From swap counterparty to CDO: Libor	$80,000,000 \times \text{Libor}$
	Total interest received	$11,000,000 + \text{Libor} \times 80,000,000$
	Total interest paid	$\text{Libor} \times 80,000,000 + 560,000 + 900,000 + 6,400,000 = 7,860,000 + \text{Libor} \times 80,000,000$
	Net interest = Interest received – interest paid	3,140,000

From the net interest available, the CDO manager's fees must be paid. If the fees are 640,000, then the cash flow available to the subordinated/equity tranches is $3,140,000 - 640,000 = 2,500,000$. The annual return for this tranche with a par value of \$10 million is $2,500,000/10,000,000 = 25\%$

CDOs: Risks and Motivations

In the case of defaults in the collateral, there is a risk that the manager will fail to earn a return sufficient to pay off the investors in the senior and mezzanine tranches. Investors in the subordinated/equity tranche risk the loss of their entire investment.

10. Covered Bonds

Covered bonds are senior debt obligations issued by a financial institution and backed by a segregated pool of assets that typically consist of commercial or residential mortgages or public sector assets.

Covered bonds are similar to ABS, but they differ because of their:

- **Dual recourse nature:** Investors have claims against both the issuing financial institution and the underlying asset pool.
- **Balance sheet impact:** The underlying asset pool remains on the issuing financial institution's balance sheet. It is not transferred to a separate SPV. The covered pool bondholders retain a top-priority claim against the pool.
- **Dynamic cover pool:** The underlying asset pool is not static. The issuing financial institution must replace any prepaid or non-performing assets in the cover pool to ensure sufficient cash flows until maturity. In contrast, ABS pass through default and prepayment risk to investors.
- **Redemption regimes in the event of sponsor default:** In the event of sponsor default, redemption regimes align the covered bond's cash flows as closely as possible to the original maturity schedule.

Because of these additional safety features, covered bonds usually have lower credit risks and therefore lower yields as compared to otherwise similar ABS.

Summary

LO.a: Explain benefits of securitization for economies and financial markets.

The benefits to investors are:

- Securitization converts an illiquid asset into a liquid security.
- It gives investors direct access to the payment streams of the underlying mortgage loans that would otherwise be unattainable.
- There are higher risk-adjusted returns to investors: pooling of loans results in diversification and lower risk for investors.
- It gives investors anywhere an opportunity to buy a small part of homebuyers' mortgage in the form of a security issued by the SPV.
- Exposure to the market, real estate for example, without directly investing in it.

The benefits to the bank or loan originator are:

- It enables banks to increase loan origination, monitoring, and collections.
- It reduces the role of the intermediaries like the bank.
- Banks have the ability to lend more money if the demand for ABS and MBS is high relative to if the money was self-financed.
- There is greater efficiency and profitability for the banking sector.

The borrowers of the loan benefit from securitization in the following ways:

- It lowers the risk as the pooled loans offer a diversification benefit. The lower risk, in turn, decreases the cost of borrowing for homeowners.

LO.b: Describe securitization, including the parties involved in the process and the roles they play.

The parties involved in the securitization process include:

- SPV (Special Purpose Vehicle): It is also called the trust or the issuer.
- Seller of pool of securities: It is also known as the originator or depositor.
- Servicer: Servicing involves collecting payments from borrowers, notifying borrowers who may be delinquent, and if necessary, seizing equipment from borrowers who default.
- Other parties: Independent accountants, underwriters, trustees, rating agencies, and guarantors.

The motivation for the creation of different types of structures is to redistribute prepayment risk and credit risk efficiently among different bond classes in the securitization.

Prepayment risk is the uncertainty that the actual cash flows will be different from the scheduled cash flows.

Time tranching is the creation of bond classes to distribute the prepayment risk.

Subordination is another layering structure in securitization. The bond classes differ in their

exposure to credit risk.

LO.c: Describe typical structures of securitizations, including credit tranching and time tranching.

In credit tranching, any credit losses are first absorbed by the tranche with the lowest priority and after that by any other subordinated tranches.

In time tranching, different classes receive the principal payments from the underlying securities sequentially as each prior tranche is repaid in full.

LO.d: Describe types and characteristics of residential mortgage loans that are typically securitized.

The cash flow of a mortgage consists of the following three components: interest, scheduled principal payments, and prepayments.

Following are the important characteristics of residential mortgage loans:

Maturity: The term of a mortgage is the number of years to maturity. It varies from one country to the other.

Interest rate determination: Interest rate on the mortgage loan is called the mortgage rate or contract rate. The four basic methods for calculating mortgage rate are fixed rate, variable rate, initial period fixed rate, and convertible rate.

Amortization schedule: Residential mortgages are usually amortizing loans. The amount borrowed reduces gradually over time as periodic mortgage payments are made.

There are two types of amortizing loans:

- Fully amortizing loans: There is no outstanding balance at the end of the mortgage's life.
- Partially amortizing loans: The sum of all the scheduled mortgage repayments is less than the borrowed amount. A last payment, called the balloon payment, is made equal to the unpaid mortgage balance.

Based on interest/scheduled principal repayments, there are two types of mortgages:

- Interest-only mortgage: No scheduled principal repayment for a certain number of years.
- Bullet mortgage: No scheduled principal repayment over the entire life of the loan.

Recourse loans: The lender can claim the shortfall (outstanding mortgage balance – after selling the property) from the borrower.

Non-recourse loans: The lender may sell the property in case of a default and keep the proceeds but they cannot claim other assets of the borrower to fulfill the shortfall in outstanding mortgage balance.

LO.e: 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 bonds created from the securitization of residential mortgage loans. Examples of agency RMBS include:

- Mortgage pass-through securities
- Collateralized mortgage obligations
- Non-agency residential mortgage-backed securities

A mortgage pass-through security is created when one or more holders of mortgages form a pool of mortgages and sell shares or participation certificates in the pool. The cash flow of a mortgage pass-through security depends on the cash flow of the underlying pool of mortgages and consists of monthly mortgage payments representing interest, the scheduled repayment of principal, and any prepayments, net of servicing and other fees.

- Market participants measure the prepayment rate using two measures: the single monthly mortality (SMM) rate and its corresponding annualized rate, namely, the conditional prepayment rate (CPR). For MBS, the measure widely used by market participants to assess the sensitivity of the securitized bonds to interest rate movements is the weighted average life (WAL) or simply average life of the MBS, instead of duration.
- Market participants use the Public Securities Association (PSA) prepayment benchmark to describe prepayment rates. A PSA assumption greater than 100 PSA means that prepayments are assumed to be faster than the benchmark, whereas a PSA assumption lower than 100 PSA means that prepayments are assumed to be slower than the benchmark.
- Prepayment risk includes two components: contraction risk and extension risk. The former is the risk when interest rates decline; the security will have a shorter maturity than was anticipated at the time of purchase because homeowners refinance at now-available lower interest rates. The latter is the risk when interest rates rise; fewer prepayments will occur because homeowners are reluctant to give up the benefits of a contractual interest rate that now looks low.

LO.f: Define prepayment risk and describe the prepayment risk of mortgage-backed securities.

Prepayment risk refers to the uncertainty about the timing of the principal component of the cash flows.

Contraction risk is the risk that the loan principal will be repaid earlier than expected.

Extension risk is the risk that the loan principal will be repaid later than expected.

LO.g: Describe the characteristics and risks of commercial mortgage-backed securities.

Two important characteristics of a CMBS structure: call protection and balloon risk.

Call protection

CMBS have considerable call protection, which is protection against early prepayment of mortgage principal. The call protection comes in two forms: at the structure level and at the loan level.

- Call protection at the structural level comes by structuring CMBS into sequential-pay tranches, by credit rating.
- The four mechanisms that offer investors call protection at the loan level are payment knockouts, prepayment penalty points, yield maintenance charges, and defeasance.

Balloon risk

Balloon risk is a type of extension risk. The risk that a borrower will not be able to make the balloon payment, either because the borrower cannot arrange for refinancing or cannot sell the property to generate sufficient funds to pay off the balloon balance, is called “balloon risk”.

LO.h: Describe types and characteristics of non-mortgage asset-backed securities, including the cash flows and credit risk of each type.

The most popular non-mortgage ABS are auto loan receivable-backed securities and credit card receivable-backed securities.

Auto Loan Receivable-Backed Securities

Cash flows consist of interest payment, scheduled principal repayments and any prepayments. All auto-loan backed securities have some form of credit enhancement.

Credit Card Receivable-Backed Securities

The credit card receivables are pooled together to act as a collateral for credit card receivable-backed securities. Cash flow, on a pool of credit card receivables consists of finance charges and fees, and principal repayments.

There are two differences between credit card receivable-backed securities and auto loan receivable-backed securities:

- Collateral for credit card receivable-backed securities are non-amortizing loans, while the collateral for auto loan receivable-backed securities are fully amortizing loans.
- For auto loan receivable-backed securities, outstanding principal balance declines as principal is distributed to bond classes each month. But for credit card receivable-backed securities, principal is reinvested to issue new loans during the lockout period.

LO.i: Describe collateralized debt obligations, including their cash flows and credit risk.

A collateralized debt obligation is a generic term used to describe a security backed by a diversified pool of one or more debt obligations (collateral). The structure of a CDO includes

senior, mezzanine, and subordinated/equity bond classes. In the case of defaults in the collateral, there is a risk that the manager will fail to earn a return sufficient to pay off the investors in the senior and mezzanine tranches. Investors in the subordinated/equity tranche risk the loss of their entire investment.

LO.j: Describe characteristics and risks of covered bonds and how they differ from other asset-backed securities.

Covered bonds are similar to ABS, but they differ because of their:

- Dual recourse nature: Investors have claims against both the issuing financial institution and the underlying asset pool.
- Balance sheet impact: The underlying asset pool remains on the issuing financial institution's balance sheet. It is not transferred to a separate SPV. The covered pool bondholders retain a top-priority claim against the pool.
- Dynamic cover pool: The underlying asset pool is not static. The issuing financial institution must replace any prepaid or non-performing assets in the cover pool to ensure sufficient cash flows until maturity. In contrast, ABS pass through default and prepayment risk to investors.
- Redemption regimes in the event of sponsor default: In the event of sponsor default, redemption regimes align the covered bond's cash flows as closely as possible to the original maturity schedule.

Practice Questions

- Analyst 1: Securitization is beneficial for banks because it allows banks to maintain ownership of their securitized assets.
Analyst 2: Securitization is beneficial for banks because it increases the funds available for banks to lend.
A. Analyst 1 is correct
B. Analyst 2 is correct
C. Both analysts are incorrect
- In a securitization, the loan servicer is *least likely* responsible for the:
 - issuance of the asset-backed securities.
 - collection of payments from the borrowers.
 - recovery of underlying assets for delinquent loans.
- A securitization structure that allows investors to choose between extension risk and contraction risk is *least likely* called:
 - credit tranching.
 - time tranching.
 - prepayment tranching.
- Edward Hall obtains a non-recourse loan for \$300,000. A year later when the outstanding balance of the mortgage is \$285,000, Edward cannot make his mortgage payments and defaults on the loan. The lender forecloses and sells the house for \$250,000. What amount is the lender entitled to claim from Edward?
 - \$0.
 - \$35,000.
 - \$50,000.
- Following is the monthly cash flow of one underlying mortgage pool:

Total principal paid including prepayment	\$3,550,000
Scheduled principal to be paid before prepayment	\$550,000
Gross coupon interest paid	\$4,000,000
Servicing fees	\$152,000
Other fees for guaranteeing the issue	\$75,000

Based on the table above, the total cash flow to be passed through to the investors is *closest* to:

- \$677,000.
- \$6,773,000.
- \$7,323,000.

6. William Brinton obtains a recourse mortgage loan for \$450,000. One year later, when the outstanding balance of the mortgage is \$320,000, Frank cannot make his mortgage payments and defaults on the loan. The lender forecloses the loan and sells the house for \$295,000. What amount is the lender entitled to claim from Frank?
- A. \$0.
 - B. \$155,000.
 - C. \$25,000.
7. A conditional prepayment rate (CPR) of 9% means that approximately 9% of the outstanding mortgage pool balance at the beginning of this year will be prepaid:
- A. in the current month.
 - B. by the end of the year.
 - C. over the life of the mortgages.
8. Suppose there are three mortgages with respective balances of \$150,000, \$270,000, and \$410,000. The mortgage rates are 5%, 8.5%, and 9% respectively. The WAC is *closest* to:
- A. 7.21.
 - B. 7.95.
 - C. 8.11.
9. Which of the following statements about the planned amortization class (PAC) structure is *most* accurate?
- A. Support tranches are exposed to high levels of credit risk.
 - B. Support tranches provide protection against both contraction and extension risk.
 - C. If prepayments are too low to maintain the PAC schedule, the shortfall is provided by the PAC tranche.
10. The principal balance of a pool is 15 million and 125,000 is scheduled to be repaid in a given month. The SMM is 0.88%. The forecasted prepayment amount for the month is *closest* to:
- A. \$1,100.
 - B. \$132,000.
 - C. \$130,900.
11. When interest rate rises:
- A. Contraction risk increases and extension risk increases.
 - B. Contraction risk decreases and extension risk increases.
 - C. Contraction risk decreases and extension risk decreases.
12. Which of the following is *most likely* an internal credit enhancement for an asset backed security?
-

- A. Bond insurance.
 - B. Letter of credit.
 - C. Reserve account.
13. The balloon risk in a CMBS can be best described as a type of:
- A. extension risk.
 - B. contraction risk.
 - C. interest rate risk.
14. Call protection mechanism in which borrower must pay a fixed percentage of the outstanding loan balance as prepayment penalty if he wishes to refinance is called:
- A. Defeasance.
 - B. Prepayment penalty points.
 - C. Prepayment lockouts.
15. Which of the following is *most likely* a key indicator of potential credit performance of a commercial mortgage-backed security (CMBS)?
- A. Loan-to-value ratio.
 - B. Prepayment ratio.
 - C. Weighted average life ratio.
16. If a credit card receivables asset-backed security (ABS) has a lock-out feature:
- A. no investors may sell the ABS for a certain period of time.
 - B. no payments are made to the ABS investor for a certain period of time.
 - C. no principal payments are made to the ABS investor for a certain period of time.
17. A debt security that is collateralized by a pool of bond obligations backed by corporate and emerging market debt is *most likely* a:
- A. CDO.
 - B. CMO.
 - C. CMBS.
18. Which of the following is *least likely* correct about Credit Card receivable-backed securities?
- A. Credit card receivable-backed securities have lockout periods.
 - B. Credit card receivable-backed securities are non-amortizing loans.
 - C. Credit card receivable-backed securities have fixed interest rates.

Solutions

1. B is correct. Securitization allows banks to remove assets from their balance sheet, therefore increasing the pool of available capital that can be loaned out.
2. A is correct. In a securitization, the special purpose vehicle (SPV) is responsible for the issuance of the asset-backed securities. The servicer is responsible for both the collection of payments from the borrowers and the recovery of underlying assets if the borrowers default on their loans.
3. A is correct. Time tranching or prepayment tranching allows investors to choose between extension risk and contraction risk. Credit tranching refers to creating a multi-layered capital structure that has senior and subordinate tranches.
4. A is correct. In a non-recourse loan the lender can only look to the underlying property to recover the outstanding mortgage balance and has no further claim against the borrower.
5. B is correct. The total cash flow to be received by the investors is as follows:
Total principal + gross coupon interest - less servicing and other fees = $\$3,550,000 + \$4,000,000 - \$152,000 - \$75,000 = \$7,323,000$.
6. C is correct. In a recourse loan, the lender is entitled to claim the shortfall between the mortgage balance outstanding and the proceeds received from the sale of the property.
i.e. $320,000 - 295,000 = 25,000$.
7. B is correct. The CPR is an annual prepayment rate.
8. C is correct. The Weighted average coupon or WAC is found by weighting the rate of each mortgage loan in the pool by the percentage of the mortgage outstanding relative to the outstanding amount of all mortgages in the pool. $\text{Weighted average coupon} = (150/830) * 5\% + (270/830) * 8.5\% + (410/830) * 9\% = 0.9036\% + 2.765\% + 4.446\% = 8.1144\%$.
9. B is correct. The support tranches provide protection against both contraction and extension risk by absorbing excess principal paid or forgoing principal payment if the collateral payments are slow. Options A and C are incorrect statements. Support tranches are exposed to high levels of prepayment risk not credit risk. If prepayments are too low to maintain the PAC schedule, the shortfall is provided by the support tranche.
10. C is correct.
Single month mortality (SMM) measures prepayments in a month. An SMM of $x\%$ means that $x\%$ of the outstanding mortgage balance at the start of the month minus the

scheduled principal repayment, will be repaid that month.

$$\text{SMM} = \frac{\text{Prepayment for a month}}{\text{Beginning mortgage balance for month} - \text{Scheduled principal repayment for month}}$$

$$\text{Prepayment} = \text{SMM} * (\text{Beginning balance} - \text{Scheduled principal repayment}) = 0.88\% * (15,000,000 - 125,000) = 130,900.$$

11. B is correct. Contraction risk decreases when interest rates rise and extension risk increases when interest rates rise. Prepayment risk includes two components: contraction risk and extension risk. The former is the risk that when interest rates decline, the security will have a shorter maturity than was anticipated at the time of purchase because homeowners refinance at now-available lower interest rates. The latter is the risk that when interest rates rise, fewer prepayments will occur because homeowners are reluctant to give up the benefits of a contractual interest rate that now looks low.
12. C is correct. A reserve account is an internal credit enhancement. Whereas, A and B are the examples of external credit enhancement.
13. A is correct. Balloon risk refers to the risk that a borrower will not be able to make the balloon payment when due. Since the term of the loan will be extended by the lender during the workout period, balloon risk is a type of extension risk.
14. B is correct. There are four mechanisms that offer investors call protection at the loan level:
 - i. *Prepayment lockouts*: The borrower is prohibited from any prepayments during a specific period of time.
 - ii. *Prepayment penalty points*: The borrower must pay a fixed percentage of the outstanding loan balance as prepayment penalty if he wishes to refinance.
 - iii. *Yield maintenance charges*: Also known as “make-whole charge”. The borrower must pay a penalty to the lender that makes refinancing uneconomical if the sole objective was to get a lower mortgage rate.
 - iv. *Defeasance*: Defeasance is a protection at the loan level that requires the borrower to provide sufficient funds that can be invested in a portfolio of government securities to replicate the cash flows in the absence of prepayments.
15. A is correct. There are two key indicators to assess the potential credit performance of a commercial mortgage loan: 1) debt-to-service coverage ratio and 2) the loan-to-value ratio.
16. C is correct. If a credit card receivables asset backed security (ABS) has a lock-out feature

no principal payments are made to the investor, instead the principal repayments are reinvested in new receivables.

17. A is correct. A CDO is backed by an underlying pool of debt securities which may include corporate and emerging market debt. Both CMO and CMBS have mortgages as collateral.
18. C is correct. The interest rate on Credit card receivable-backed securities may be fixed or floating. Credit card receivable-backed securities are non-amortizing loans. They have lockout periods during which the cash flow that is paid out to security holders is based only on finance charges collected and fees.