

- Introduction to Asset-Backed Securities

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### Securitization

- Financial assets are purchased by an entity that then issues securities supported by the cash flows from those financial assets

### Securitization Benefits

- Reduce intermediation costs, **lower funding costs** for borrowers and **higher risk-adjusted returns** for lenders
- **Strong legal claim** to mortgages or other loans than a general claim against the bank's overall assets
- Increase the **liquidity** of assets than holding them because they are actively traded
- Can **make more** loans once they receive the proceeds
- Allow investors to invest in securities better match their preferred risk , maturity and return characteristics.

### Securitization Parties

- Mortgager
  - borrower
- Originator / seller
  - Who makes loans
- Servicer
  - Collect cash payment, send out delinquency notices, repossess and disposes of collateral
- issuer – SPE/SPV
  - Buy loans and sell ABS
  - trust or limited partnership
- Investors
  - Investors
- Rating agencies
- Portfolio manager

### Securitization Structures – Tranche 分级结构

- Single-class vs multiple-class structure
- Tranche
  - A tranche is a group of securities of the same **class**
  - assets are structured into **tranches**
  - Each has a different **priority** claim to cash flows
  - Total risk is **unchanged**, they are **redistributed**
  - Examples: Senior > junior/mezzanine > equity
- **Credit tranching** – senior/subordinated – waterfall (违约时的损失)
  - Different **exposures** to the risk of default
  - Also called **senior/subordinated** structure
    - choose between **subordinate and senior bond** classes

- Subordinated tranches **absorb credit losses** as they occur (up to their principal values)
- Also called **waterfall** structure because in liquidation, each subordinated tranche would receive only the “overflow” from more senior tranches
- **Time tranching** (本金分配)
  - The first tranche receives all **principal** repayments, then the second tranche starts to receive principal repayments
- They are both used in the same structure

#### Mortgage-backed securities (MBS)

- Loans are mortgages

#### Residential Mortgage Loan

- Residential mortgage loan
  - A loan whose collateral is the residential real estate
- Loan-to-value (LTV)
  - $$LTV = \frac{\text{loan}}{\text{collateral}}$$
  - Lower value means borrower has more equity and less risky
- Prime loans
  - Mortgages with **higher** LTV ratios, made to borrowers with **good** credit
- Subprime loans
  - Mortgages to borrowers of **lower** credit quality, or that have a lower-priority claim to the collateral in event of default
- Maturity 期限
  - Term of a loan
  - US: 15-30 years
  - EU: 20-40 years
  - Japan: may have 100 years
- Interest rate 利率
  - Fixed-rate mortgage 固定
    - interest rate that is unchanged
  - Adjustable-rate mortgage (ARM) – variable-rate mortgage (VRM) 可变
    - Interest change over time
  - Index-referenced mortgage 指数基准利率
    - Interest rate changes based on market determined reference rate
    - Such as Libor or one-year US T-bill
  - Hybrid mortgage (fixed -> adjustable) 固定->可变
    - Fixed in the initial period and then change to adjustable
  - Rollover or **renegotiable** mortgage (fixed -> fixed with different rate) 固定->固定 (不同的利率)
    - fixed in the initial period and then changes to a **different fixed** rate
  - **convertible** mortgage (fixed (adjustable) -> adjustable (fixed)) 改变类型
    - initial rate term (fixed or adjustable) can be changed at the **option** of the borrower to another type (adjustable or fixed)
- Amortization of principal 本金的摊销

- Fully amortizing 完全摊销
  - each payment includes interest and principal
  - no principal at the last payment
  - interest: decrease over time
  - principal: increase over time
- Partially amortizing 部分摊销
  - Balloon payment: a lump sum of principal at the last payment
- Interest-only mortgage 早期部分或者全部利息
  - No principal for either an **initial** period or **the life** of the loan
  - Interest-only **lifetime** mortgage 全部利息
    - Only pay interest and pay all the principal at the last payment
  - Other interest-only mortgages pay interest-only over some initial period, then change to full/partially amortization
- Prepayment provisions 提前还款
  - Prepayment
    - **Partial or full** repayment of principals in excess of **scheduled** principal repayments
  - **Situations**
    - Sell home (very common)
    - refinance when interest rate drops
    - pay more to reduce interest
  - prepayment penalty 惩罚
    - penalty is **additional payment** in addition to repayment of principal
    - benefit **lender** by providing compensation
- Foreclosure
  - **Non-recourse loan** 无追索权
    - Lender can **only claim the collateral** but no other assets of borrowers
    - **Strategic** default
      - If home value fall, outstanding loan is larger than home value, borrowers voluntarily return the property to the lender
  - **Recourse loan** 追索权
    - Lender can claim an amount equal to the outstanding loan – collateral
    - Europe, most are recourse loans

### Conforming and Non-conforming loans

- Depend on whether they meet certain criteria or not
- Conforming loan 合格贷款
  - Meet criterion: minimum percentage of down payment, **maximum LTV**, maximum size, minimum document required, insurance purchased by borrower
- Non-conforming loan 非合格贷款
  - Does not meet the criterion

### Agency or Non-agency RMBS

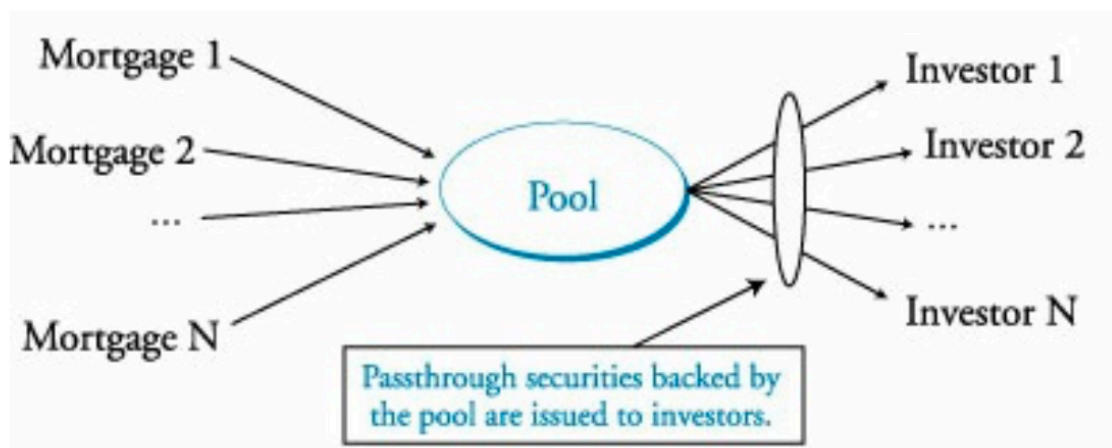
- Depends on the issuer
- **Agency RBMS - government**

- Issued by GNMA, Fannie Mae, Freddie Mac
- GNMA: backed by US **government**
- Fannie Mae and Freddie Mac are backed by government-sponsored enterprises (GSE)
- Include **conforming** loans
- **Non-agency RBMS**
  - Private companies, not the three agencies, not related to government
  - Non-conforming loans

### Mortgage pass-through securities 转手证券

- Securitized mortgage
  - Any number of mortgages, any mortgage
- Weighted average maturity (WAM)
  - The average of maturity of each loan weighted by its **outstanding principal** balance 剩余本金
- Weighted average coupon (WAC)
  - The average of interest rate of each loan weighted by its **outstanding principal** balance 剩余本金
- **Pass-through rates**
  - Coupon rates on MBS, or net interest, net coupon
  - The cash flows generated from the pool – any servicing and guarantee/insurance fees
- Time mismatch
  - Time of cash flow generated does not match cash flows received
  - Delay between service providers **receive** payment and time the cash flows are **passed** through to security holders

**Figure 2: Mortgage Pass-through Cash Flow**



### Prepayment Risk

- One major risk in **pass-through securities**
  - No penalty for prepayment
- Types
  - **Extension** risk

- prepayment will be **slower** than expected
  - when interest rate is **higher**
- **Contraction** risk
  - prepayment will be **higher** than expected
  - when interest rate is **lower**
- Influence
  - cause the timing and amount of cash flow to be uncertain
  - reduce the principal and interest
- rates
  - single month mortality rate (SMM)
    - percentage by which prepayment reduced the month-end principal balances
    - $\text{prepayment} / (\text{beginning balance} - \text{scheduled principal})$
  - conditional prepayment rate (CPR)
    - $1 - \text{CRP} = (1 - \text{SMM})^{12}$
- PSA
  - Prepayment benchmark
  - Assume monthly prepayment rate increase as it ages
  - 100 means the prepayment rate is 100% of PSA benchmark CPR
  - 0.2% for first 30 months, and then 6% for month 30 to 360
- Weighted average life
  - Prepayment reduce average life

### Collateralized Mortgage Obligations (CMO) 抵押按揭凭证

- Securities collateralized by RBMS
- Multiple bond classes (CMO tranches) different exposures to prepayment risk
- CMO tranche mixes contraction and extension risks

### CMO structures

- Sequential-pay tranches
- Planned amortization class tranches (PACs)
- Floating-rate tranches

### Sequential-pay tranches

- Separate cash flows into tranches that are **retired sequentially**
  - Principal is paid tranche after another 本金顺序支付
  - Interests are paid to all tranches 利息同时支付
- A simple two-tranche CMO: Short and long tranche
- Short tranche (本金还得快, 降低 extension risk)
  - Receive schedule payments and prepayment
  - More contraction risks
  - Reduce **extension** risk
- Long tranche (本金还得慢, 降低 contraction risk)
  - More extension risks
  - Reduce **contraction** risk

### Planned amortization class tranches (PACs)

- One or more planned amortization class (PAC) tranches and **support** tranches
- PAC tranche
  - structured to make **predictable** payments when prepayment rates within a **predetermined** range
  - reduce both **extension and contraction** risks
- **support** tranche 支持层
  - rapid principal payment, **excess** go to support tranche
  - slow principal payment, **reduce** principal to support tranche
  - higher extension and contraction risks, have **higher** interest rate
- **initial** PAC collar (lower and upper bound)
  - **lower and upper** bonds on actual prepayment rates for which support tranches are sufficient to either provide or absorb prepayments in order to keep PAC principal payments on schedule
- **broken** PAC
  - prepayment rates are outside these bounds

**Figure 5: Average Life Variability of PAC I Tranche vs. Support Tranche**

<i>PSA Speed</i>	<i>PAC I Tranche</i>		<i>Support Tranche</i>
0	13.2		24.0
50	8.8		21.2
100	6.5	↑	17.1
150	6.5		13.3
200	6.5	Initial Collar	10.4
250	6.5		5.2
300	6.5	↓	2.9
350	5.9		2.4
400	5.4		1.8
450	4.6		1.5
500	4.2		1.2

### Non-Agency RMBS

- EMBS not issued by GNMA, Fannie Mae, or Freddie Mac
- No guarantee by government, **credit** risk is an important consideration
- To be investment grade, include some credit enhancement
- Credit **tranching** (subordination) is often used to enhance credit quality of senior securities

- **Shifting interest** mechanism 暂停支付
  - Prepayment or credit losses decrease credit enhancement of senior securities, **suspends** payments to subordinated securities for a period of time until the quality is restored

## CMBS

- Backed by income-producing real estate
- **Nonrecourse**
  - Only look to collateral
  - Focus on credit risk of **property** not the credit risk of borrower
- Debt-service-coverage ratio (DSC)
  - $$DSC = \frac{\text{net operating income}}{\text{debt service}}$$
  - NOI is after deduction for real estate taxes but before any relevant income taxes
  - Higher is better
- Loan-to-value ratio
  - $$LTV = \frac{\text{current mortgage amount}}{\text{current appraised value}}$$
  - Lower is better
- Equity tranche
  - First-loss tranche, residual tranche
- Call protection
  - Valuable to bondholder

## CMBS loan-level call protection

- Prepayment lockout 锁定期
  - No prepayment for a period of time
- Defeasance 用于购买政府债券
  - Use prepaid **principal** to purchase a portfolio of government securities
  - defeased loans **increase** the credit quality
- prepayment penalty points 惩罚
  - penalty fee, 1% of prepaid principal
- yield maintenance charges (**make-whole**) 维持收益 (失去的利息)
  - charged by the amount of **interest** lost
  - make whole charge, make it indifferent to prepayment

## CMBS-level call protection

- **tranches**
- **balloon risk -> extension risk**
  - balloon payment at the end of a loan
  - unable to refinance to make this payment
- workout period
  - extend the term and charge a higher interest rate

## Auto loan ABS

- Backed by automobile

- **Fully** amortizing
- Cash flow: interest, scheduled principal, prepayments
- Credit enhancement
  - Senior-subordinated
  - Reserve account, an excess interest spread, or overcollateralization

#### Credit card ABS

- Backed by credit-card receivables
- Not amortizing
- **Revolving** balance
  - Payment is used to **purchase** additional receivables during **lockout period**
  - After that, they are passed through to investors
- Cash flow
  - pay interest periodically
  - but **no** principal during lockout period (prepayment are reinvested)

#### Collateralized debt obligation (CDO) 抵押债务凭证

- A structured security issued by an SPE whose collateral is a pool of **debt** obligations
- Collateralized bond obligation (CBO)
  - **Corporate** and **emerging market** debt
- Collateralized loan obligation (CLO)
  - Leveraged **bank loans**
- Cash
  - ABS use interest
  - CDO: collateral manager who buys and sells **securities** in the collateral pool to generate cash
- **Structured** finance CDO
  - Collateral is ABS, RMBS, other CDOs, and CMBS
- **Synthetic** CODs (CDS)
  - Collateral is a portfolio of **credit default swaps** on structured securities
- Three classes
  - Senior
    - Floating-rate, 70%-80% of total
  - Mezzanine
    - Pay a fixed rate of interest
  - subordinated/equity
    - Leveraged investment
- Arbitrage CDO
  - Funding costs and portfolio return
- Interest rate swap
  - Can use IRW to change fixed interest to floating interest