

# FIN 472

## Fixed-Income Securities

### *Securitization*

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## Pass-Through Security

- Original use of securitization
  - result of government-sponsored programs
  - to enhance the liquidity of the residential mortgage market
- Pass-through securities
  - cash flows segregated from remainder of SPV
  - passed on to outside investors together with associated risks: who gets what?
- Building blocks for more complicated ABS

# Securitization

- Major use of pass-throughs
  - mortgage market: collateralized mortgage obligations (CMOs), and mortgage backed bonds (MBBs)
- Repackaging of other loans such as:
  - automobile loans, credit card receivables (CARDs)
  - commercial and industrial loans
  - student loans
  - junk bonds
  - adjustable rate mortgages

# Asset Securitization

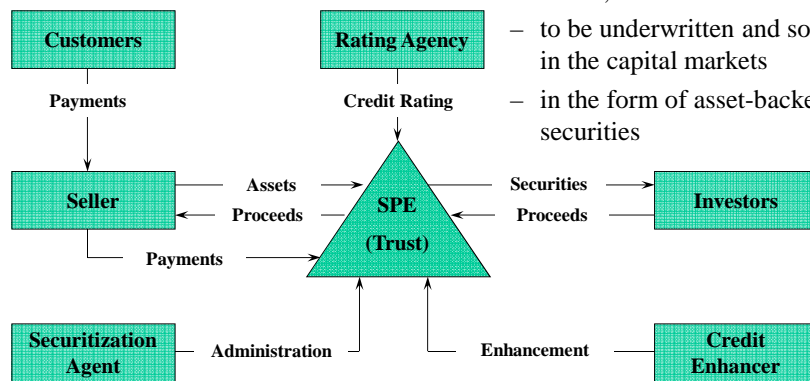
- Pioneered in the US mortgage market to enhance liquidity
  - lower lending costs for underlying illiquid assets
- Asset-backed securities and project financing
  - Collateralized debt, Securitized loans
  - Non-recourse project debt – future payments rather than assets are the collateral in the SPV
  - Techniques to better distribute risks and returns among stakeholders in a project
- Fundamental question: When is an asset worth more to outside investors than inside ones?

# 1. Pooling: Repackaging Assets

- Cash flows from assets must be grouped together, and put into a “pool”
  - Most *asset backed securities* (ABS) derive their value from a specific set of assets
  - Generally, these are legally separated from firm, and placed into a *Master Trust*
- Master trust then finances asset purchase by issuing (debt) securities to other investors
  - structured/referred to as a *Special Purpose Vehicle*

## Generic Securitization Model

- Securitization is a funding method which repackages
  - interests in mortgages, loans, leases, and other receivables
  - to be underwritten and sold in the capital markets
  - in the form of asset-backed securities



## 2. Tranching: Slicing and Dicing Risks

- Cash flows generated by pool are sold off into securities with different maturities, coupons, seniority, etc.
  - the cash flows are sliced up into different risk classes
  - Sold to investors with different interests and risk tolerances
- Simplest example is a pure “pass-through” bond, where all cash flows are passed directly to investors
  - However, more often these days the cash flows are divided into at least 4 seniority classes, and sold off separately
  - each class exposed to different risks and rewards

## Securitizable Assets

### *TRADITIONAL ASSETS*

- Home Mortgage Loans
- Credit Card Receivables
- Lease Receivables
- Commercial Real Estate  
Mortgage Loans
- Auto Loan Receivables
- Consumer Loans
- Corporate Loans
- Trade and Export Receivables
- Bonds

### *RECENT ASSETS*

- Credit Card Receivables
- Auto Loan Receivables
- Lease Receivables
- Insurance Premium  
Receivables
- Trade and Export Receivables
- *Telephone Receivables*
- *Electric/Gas Receivables*
- *Toll Road Usage Fees*

## Issuer Perspective

- Decrease Cost of Funds
- Diversify Funding
- Obtain Longer Term Financing
- Increase Return on Assets
- Enhance Asset / Liability Management
- Divest Non-Strategic Assets

## Capital Structure Design and Securitization

- Adjust debt-equity ratio
  - sell off assets through securitization
  - reduce balance sheet size: less capital required
  - retire debt
- Easy method to recapitalize
  - cash flows already collateralize debt
  - make this link apparent through securitization

# Benefits and Costs of Securitization

## Benefits

New funding source

Increased liquidity

Enhanced ability to manage assorted cash flow risks

Savings to the issuer on: risk management, funding costs

## Costs

Public/private credit risk

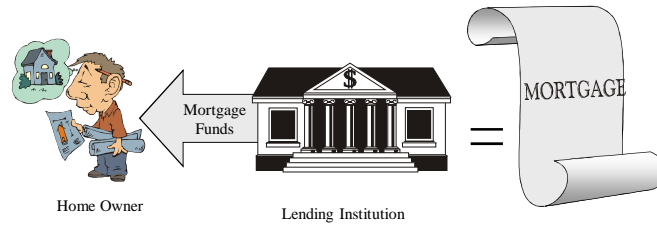
Overcollateralization

Valuation and packaging

# Mortgage Securitization

- Pawtucket Savings and Loan's business plan is to provide banking services to local residents.
    - offer FDIC insured savings accounts to their customers
    - provide mortgage and small business loans to local residents.
    - own 150 mortgage loans totaling \$195mm.
    - 500 clients with savings accounts totaling \$195mm
1. What are the risks to this business plan?
  2. What are the barriers to expansion?

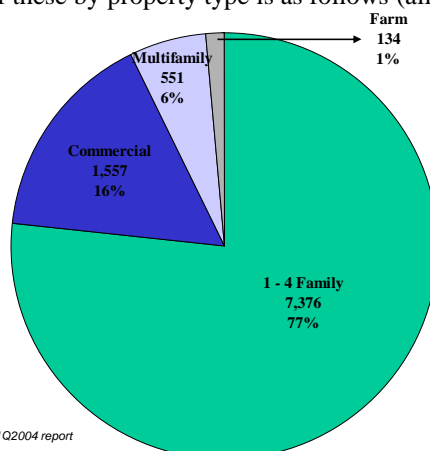
# Mortgages



- Mortgages are the loan that homeowners borrow from banks to purchase their homes
  - The homeowner pays a monthly amount that consists of both Principal and Interest.
  - The borrower pledges the underlying land as collateral for the loan
  - If the borrower fails to make re-payment, the mortgage gives the lender the right of foreclosure on the loan and therefore can seize the property
- This can be viewed as an investment by the banks in the mortgage market – they are purchasing an asset that pays a monthly amount of Principal and Interest (P&I)
- The banks often sell these assets to other investors to raise capital

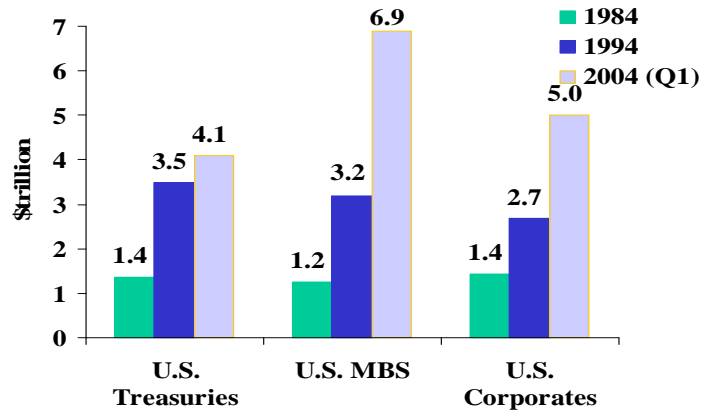
# The Mortgage Market

- As of the first quarter of 2004, there were \$9.6 trillion mortgages outstanding
- The breakdown of these by property type is as follows (all numbers in billions):



Source: Flow of Funds 1Q2004 report

# Tradable Fixed Income Supply



Source: Federal Reserve Flow of Funds, June 10<sup>th</sup>, 2004, debt growth table

# Mortgage Payments

- In a flat amortizing fixed mortgage, the monthly payment is determined at the beginning of the contract. Assume that  $A$  is the original balance,  $r$  is the interest rate, and  $N$  is the number of months in the contract. Then, the monthly payment is equal to:

$$\frac{A \left[ \frac{r}{12} \left( 1 + \frac{r}{12} \right)^N \right]}{\left[ \left( 1 + \frac{r}{12} \right)^N - 1 \right]}$$

- On a fixed amortizing mortgage, if the original balance is \$250,000, and the rate is 6.0% for 30 years, each month the principal and interest payment is:

$$\frac{250,000 \left[ \frac{6.0\%}{12} \left( 1 + \frac{6.0\%}{12} \right)^{360} \right]}{\left[ \left( 1 + \frac{6\%}{12} \right)^{360} - 1 \right]} = \$1,498.88$$



# Amortization Table

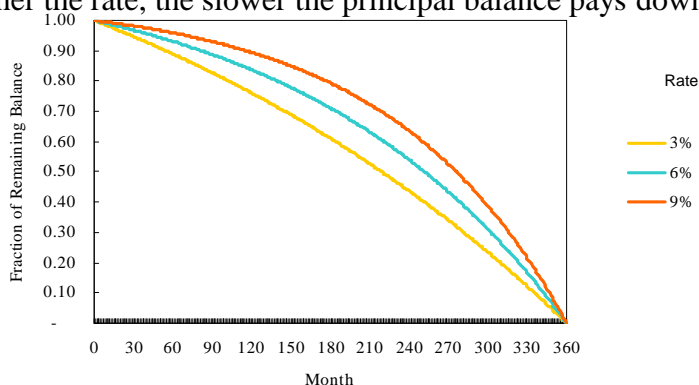
- Using the previous calculation (and example) a cash flow schedule can be created:

Month	Starting Balance	Interest	Principal	Ending Balance
1	250,000	1,250	249*	249,751
2	249,751	1,249	250	249,501
3	249,501	1,248	251	249,250
⋮	⋮	⋮	⋮	⋮
129	205,528	1,028	471	205,057
130	205,057	1,025	474	204,583
131	204,583	1,023	476	204,107
⋮	⋮	⋮	⋮	⋮
358	4,452	22	1,477	2,975
359	2,975	15	1,484	1,491
360	1,491	7	1,491	-

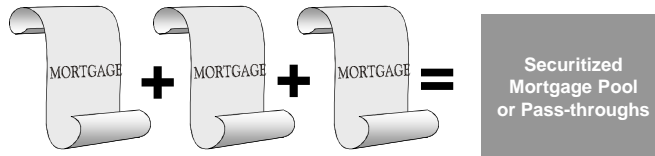
\* Note that  $\$1498.88 - \$1250.00 = \$248.88$

# Interest and Principal

- The higher the mortgage rate, the greater the proportion of each monthly payment is devoted to interest. Hence, the higher the rate, the slower the principal balance pays down



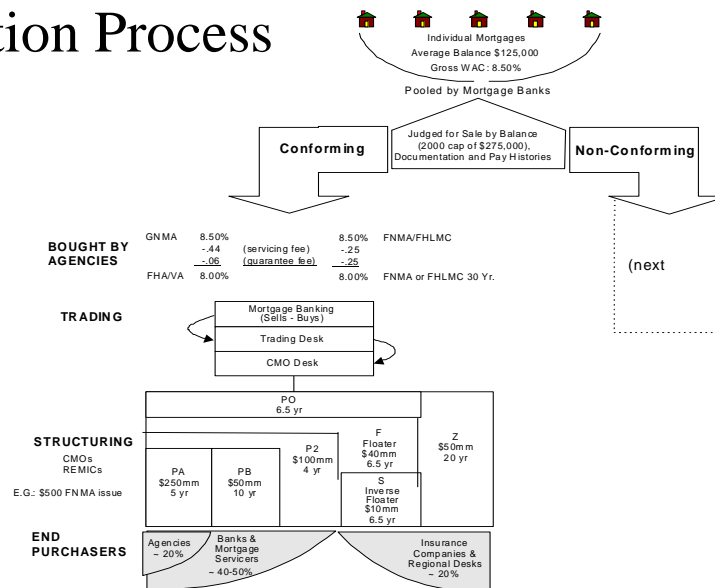
# Mortgage Backed “Pass-Through” Securities



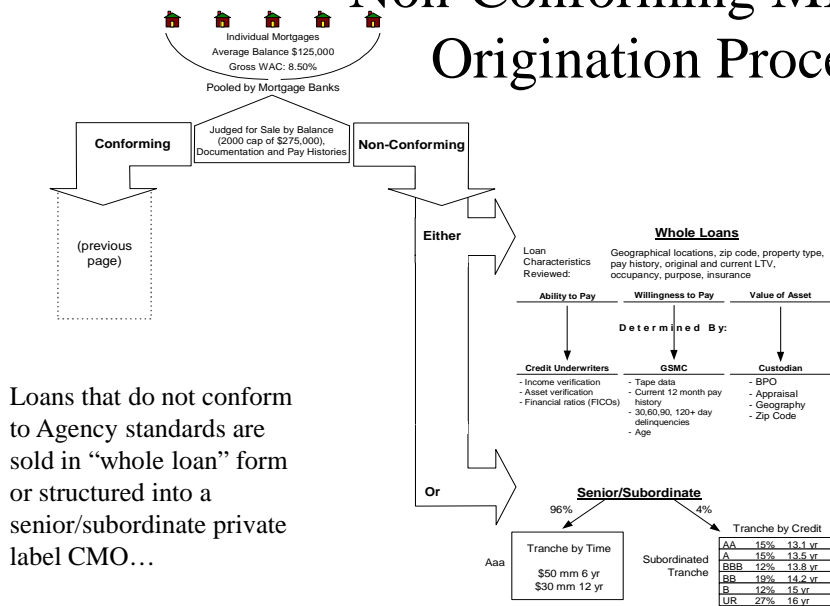
- A number of similar mortgages (underlying collateral, design, rates and maturities) are combined into a single group
- Mortgage documents associated with this group are delivered to a custodian and are assigned an identification (pool) number
- A Mortgage Backed Security (MBS) is issued with a face amount equal to the cumulative outstanding principal balance of the mortgages (original balance)
- The mortgages that have been pooled together serve as the collateral for the security
- Most MBS are guaranteed and/or issued by a U.S. Government Agency (FNMA, Freddie Mac or GNMA)

## Agency Conforming MBS Origination Process

Residential loans originated within the conforming Agency guidelines are guaranteed by an Agency, sold to the Street, then either traded in pass-through form or used to structure a CMO...



# Non-Conforming MBS Origination Process



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21

## Subordination Terminology

- Senior bonds
  - Almost always rated triple-A
- Mezzanine bonds
  - Investment grade, but subordinate to senior bonds
- Junior bonds (or B-pieces)
  - Rated below investment grade
  - Significantly exposed to real estate risk of underlying collateral pool
- First loss piece
  - Most junior class
  - Any significant loss on collateral pool likely to annihilate first loss piece

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22

# Credit Enhancement

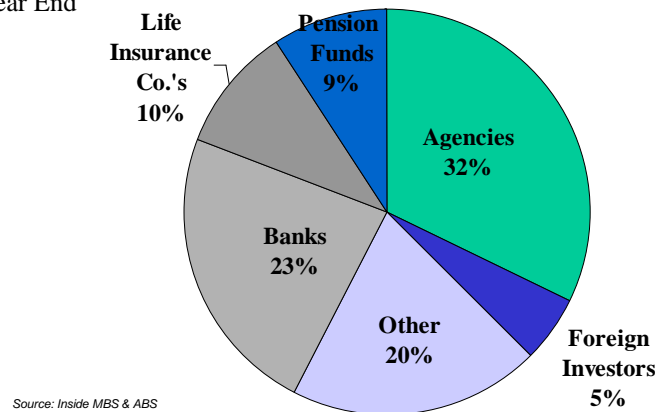
- Over Collateralization: Put in more principal than you are issuing in bonds (the excess goes to the owner of the “residual cashflow”).
- Reserve Account: Initial cash deposit from the seller provides liquidity.
  - Excess spread may be captured when increasing the reserve account
- Purchase Insurance: Insurance policy usually provided by a monoline insurance company.
  - Monoline-enhanced transactions are frequently limited to new assets or "story" credits
  - FSA, MBIA, AMBAC, and FGIC are typical surety providers
  - In 1Q04, 6.63% of new issuance were insured by these agencies
  - also used by A/AA entities to issue AAA debt (ex: The City of New York)
- Letter of Credit (LOC): Supplied by a triple-A rated bank.
  - Rarely used now.
- Credit enhancement provided by LOCs, corporate grantees and wrap guarantees are less issued since they introduce third-party event risk.

# Why Invest in Mortgages?

- The Street’s argument: “yield and no credit concerns” (GS)
- MBS can enhance portfolio performance significantly
  - Major mortgages indices have outperformed comparable duration U.S. Treasuries by an average of more than 140 bp in the decade up to 2006
  - A full range of credit qualities, durations, risk profiles and yields exist in this market.
- High Credit Quality: most MBS are issued by U.S. Government agencies which have an implied AAA rating:
  - GNMA issues carry full faith and credit of the U.S. Government,
  - Fannie Mae and Freddie Mac have the implicit backing of the U.S. Government which became explicit last year
- Non-agency mortgage securities mostly consist of AA or better rated bonds. The problems are in “private label”
  - lower rated securities (down to single-B): available in which market?

## Who Buys MBS?

- There are many different types of investors who buy MBS
- Mortgage and Asset Backed security holdings by investor type 2003 Year End



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25

## What's the Catch?

- You are buying a product with an imbedded call option
  - Duration is very hard to determine.
  - Variability in Average Life can be substantial
- You are purchasing an amortizing product
  - Reinvestment of Principal monthly can reduce yield.
- Prepayment, reinvestment, and analysis risk
  - did anyone say “default”?

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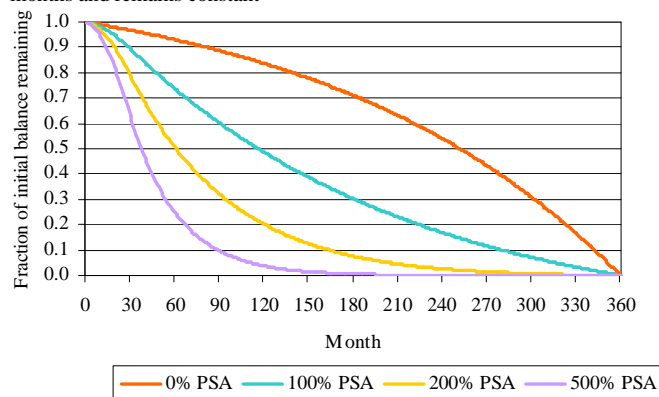
26

# Prepayment Risk

- Prepayment Option
  - The option is defined by the borrower’s right to prepay all or part of the mortgage at any given time
- Prepayment may occur for one of several reasons
  - sale of property, default, refinancing
  - motivations beyond rational economic considerations play an important roll in assessing prepayment risk
- Risk for Mortgage Holder
  - Interest rate risk (re-investment risk): Should mortgage be fixed-rate, market risk arises as a result of prepayment if rates fall and coupons are above market
  - Liquidity risk: if mortgage portfolio securitized for debt issuance, prepayment implies the need to raise new financing

## PSA Prepayment Model

- The standard model (also called “100 percent PSA”)
  - starting with an annualized prepayment rate of 0% in month 0, the rate will increase by 0.2% each month, until it peaks at 6% after 30 months and remains constant
- Variations of the model are expressed in percent,
  - 150% model means a monthly increase by 0.3%, until the peak of 9% is reached after 30 months and remains constant

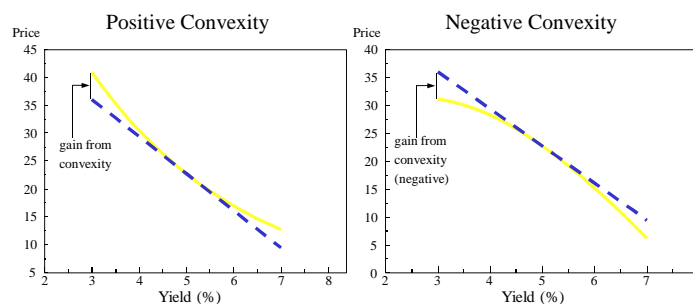


# Mortgage “Duration”

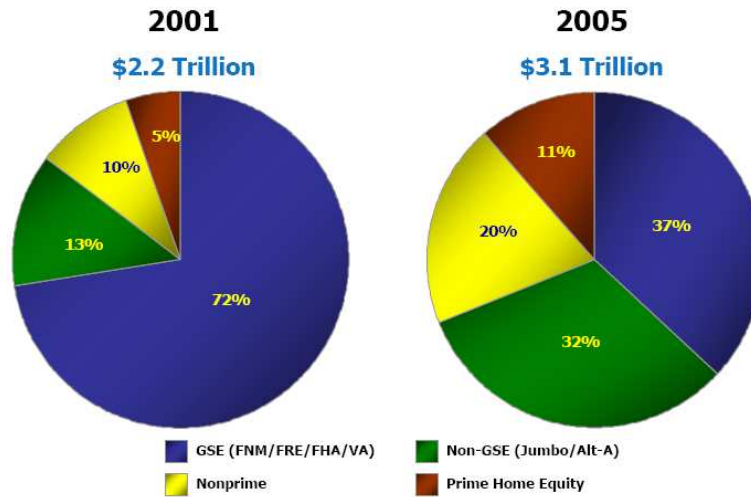
- **Modified duration, Macaulay duration, cashflow duration:** all measure a mortgage's price sensitivity to rate movements, assuming the cashflows are held constant.
  - Usually not a good assumption in mortgage product owing to prepayments
  - Durations often quoted as a percentage of modified duration
- **Option-adjusted duration (OAD), model duration:** measure price sensitivity for small rate movements, assuming constant OAS
  - Does not account for how securities actually trade
  - Reliant on prepayment model: Public Securities Association (PSA)
- **Empirical duration, EOAD:** regression of performance vs rates
  - can be price or OAS vs rates
  - adjusted for volatility, slope of the curve

## Duration and Convexity

- Duration (simply):  $\frac{\Delta_{price}}{\Delta_{yield}} = -\frac{1}{P} D^m$
- Convexity is the change in Duration as yields change



## Non-GSE Industry Origination

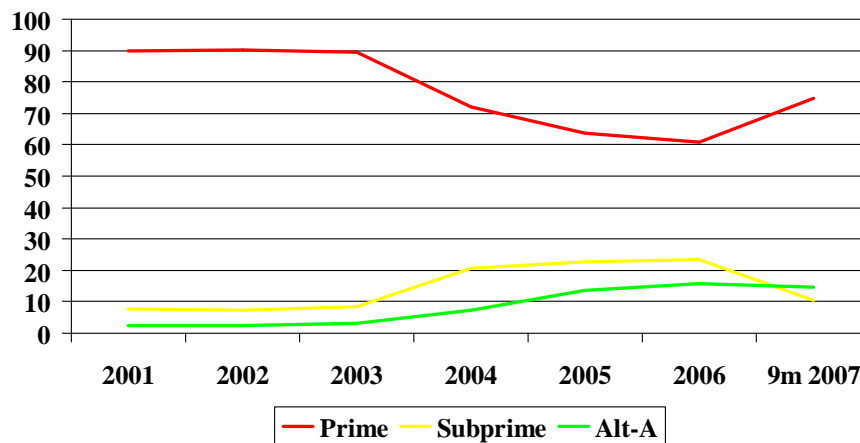


Source: Inside Mortgage Finance

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31

## Mortgage Origination % by Product



1. Total mortgage origination excludes seconds and home equity lines of credit
2. For relative growth versus 2001, 2007 annualized based on 9 months of date

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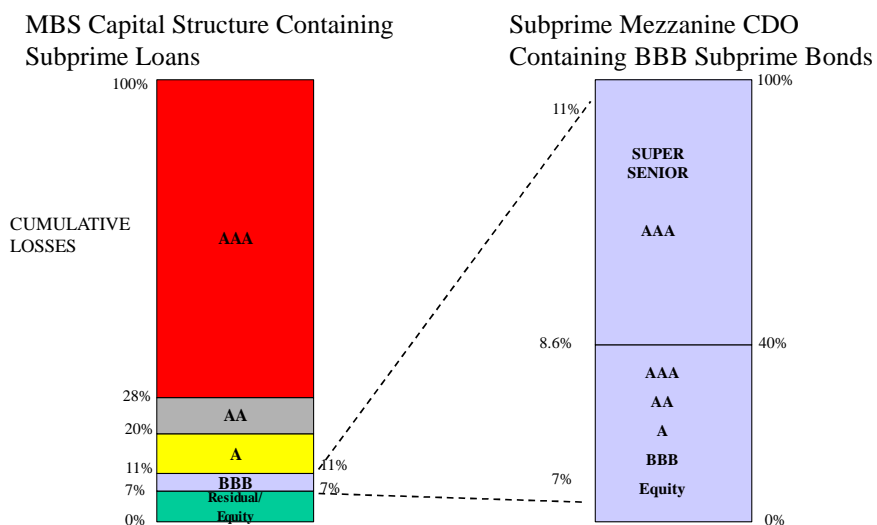
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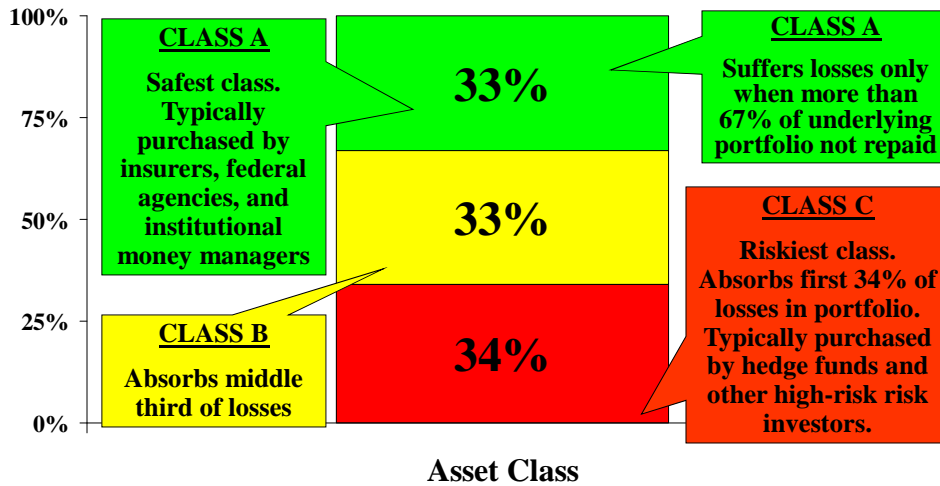
# Subprime Securitization

- 6 million securitized subprime mortgage loans totaling \$1.2 trillion.
  - Originated between 1998 and December 2004.
  - Originated in 50 states and DC.
- Secured by first lien on owner-occupied home, excluding manufactured & multifamily homes.
- Covers 70% of US subprime market by dollar volume: Center for Responsible Lending 12/06

# Dirt into Gold: Resecuritization



## Repackaged Mortgage-Backed Securities Contain Varying Degrees of Risk



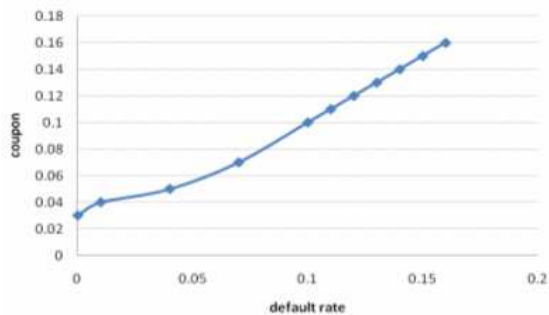
Source: Mark Stancher and Kyongsoo Noh, "Subprime Not Quite Sublime? Recent Developments in the Subprime Mortgage Markets," *Insights* 7/13/07, JPMorgan Asset Management, accessed at [http://www.jpmorgan.com/pages/jpmorgan/aria/research\\_and\\_publications/insights](http://www.jpmorgan.com/pages/jpmorgan/aria/research_and_publications/insights)

## True Costs of MBS

$$C(\alpha) = \alpha R^C + \alpha^2 R^C, R^C \text{ is Coupon Rate on MBS.}$$

	Default Rate (1-y)	Coupon Rate on MBS 2007	Coupon Rate ' 88-04
CCC-	0.33	0.16	
CCC	0.16	0.16	
BB-	0.15	0.15	
	0.16	0.14	
	0.13	0.13	
	0.12	0.12	
BB	0.11	0.11	0.0987
	0.1	0.1	
BBB	0.07	0.07	
	0.05	0.06	0.0642
A			0.0517
AA	0.001	0.04	0.0503
AAA	1	0.03	0.044

**Relationship Between Default Rate and Coupon Payment**



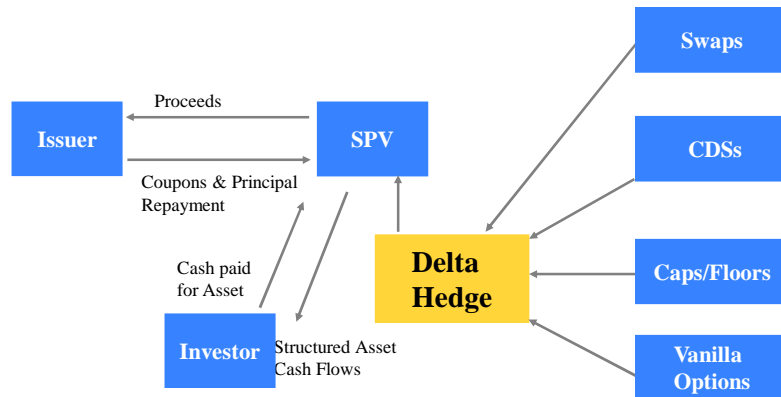
# Structured Assets

- We consider two broad classes...
- Principal Protected...
  - Exotic Libor products
  - What is an “Exotic”?
- Structured Credit Products. A very important class...
  - ...But there are many other Examples

## There are Matching Needs

- Definition: a Structured Asset is a special solution to solve matching needs
  - Issuer prefers fixed or floating rate financing
  - Investor wants special cash flows
  - Dealer wants swap business
- Structure a transaction which helps all parties
  - what is a delta hedge?

## Structure of a Structured Asset



## Structured Credit Assets

- What is a structured Credit asset ?
- Reasons for using structured assets
- Anatomy of a structured asset
  - CLO
  - CDO
- Examples -- Pricing and sensitivity

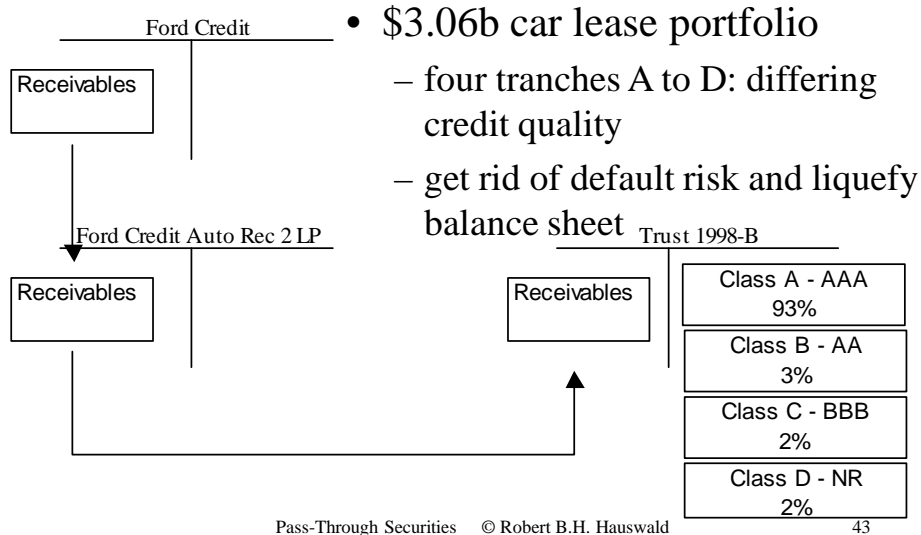
## What is a Structured Credit Product?

- A structured asset is, in the end,
  - an asset
  - incorporating a derivative strategy.
- But this notion gets broader in Credit
  - The notion of correlated events become central
- Subordination...And...Prioritization methods become important.

## Non-Mortgage Asset-Securitization

- Commercial Mortgage Products (multi-family houses, office buildings, shopping malls, golf courses...)
- Traditional ABS: Credit Card Receivables, Home Equity Credit, Student Loans, Automobile Leases/Loans,...
- Other ABS: Television Syndication Rights, Power Utility Rentals, Revenue from Oil Drillings; Revenue from Aircraft usage; Revenue from Bars....
- If it pays a fairly predictable payment over time, and if you can tell a story, if you can solve the credit problem...
  - you can securitize it.

# Securitization Example: Ford



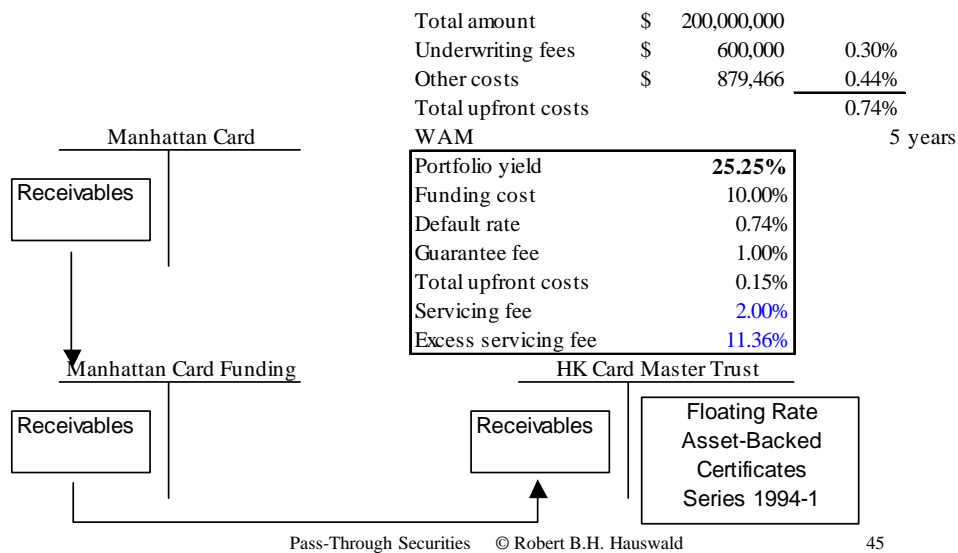
## Ford: Costs and Benefits

Underwriting fees	\$ 4,726,000	0.16%
Other costs	\$ 1,000,000	0.03%
Total upfront costs		0.19%
WAM		3.85 years

Portfolio yield	<b>11.00%</b>
Funding cost	5.83%
Default loss: prob * yield, prob = 11.5%	1.49%
Servicing fee	1.00%
Total upfront costs	0.05%
Excess servicing fee	2.63%

Tranches	Yield	Amount	% age	P-Yield
A	5.78%	2835	93%	5.35%
B	6.15%	105	3%	0.21%
C	6.40%	60	2%	0.13%
D	7.50%	60	2%	0.15%
		<u>3060</u>		<u>5.83%</u>

# Hong Kong Card: Credit Card Debt



## Pooling Assets

- From the investors' perspective: securitization leads to
  1. "Adverse selection:" issuer may have an incentive to selectively securitize their worst assets
    - Investors may be concerned that banks have incentive to securitize loans that are non-performing: "lemons problem"
  2. Default: ignoring the above, there is always the possibility that cash flows will be insufficient to pay investors
    - If bonds are securitized by mortgages, there is the chance that mortgages may default, or they may pre-pay
  3. Dilution of screening and monitoring incentives
- Any other problems?

# Principal Benefits

Companies securitize assets to free up capital and redeployed the latter to support other corporate priorities

Alternative Funding Source	Expands alternatives beyond traditional capital sources: debt, equity, preferred, etc.
Increased Financial Flexibility	Frees capital on balance sheet for other corporate priorities
Lower Cost of Capital	Capital markets enables efficient funding – typically below cost of debt
Stronger Balance Sheet	True sale treatment improves balance sheet – and related metrics
Potential Tax Savings	Capital tax savings for taxable corporations
Reduced Credit Exposure	Catastrophic credit risk is transferred to the funding vehicle

## Appendix: Case Study

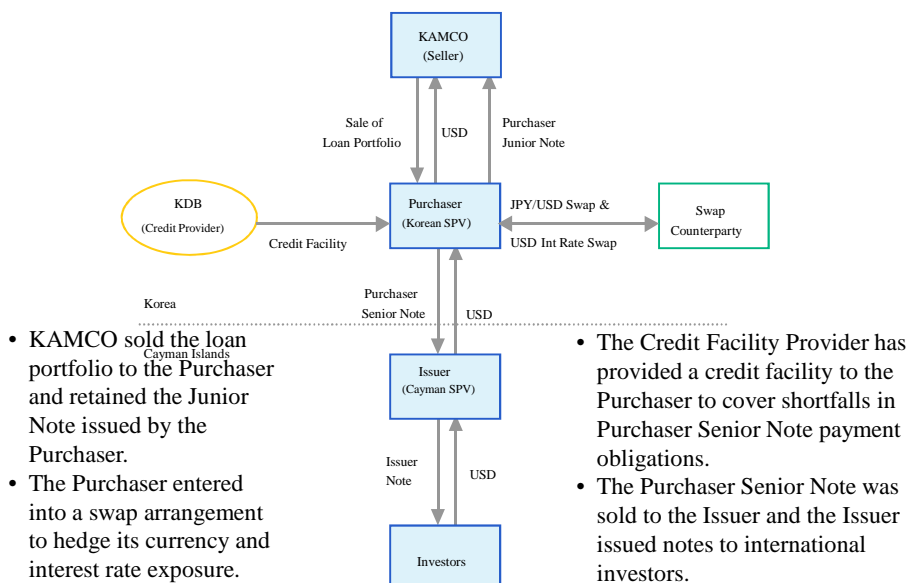
- **Securitization transaction: Korea Asset Funding**
  - bank restructuring: non-performing loans sold off
  - transaction structure with on- and off-shore SPV
  - global floating rate note: Europe, US, Asia
- **Banks pool non-performing loans to free up balance sheets**
  - common technique in banking to reduce exposure to credit risk
  - illustration of securitization



# Korea Asset Funding 2000-1 Limited

<b>ISSUER:</b>	Korea Asset Funding 2000-1 Limited
<b>PURCHASER:</b>	KOREA 1 <sup>st</sup> International ABS Specialty Co., Limited
<b>SELLER:</b>	Korea Asset Management Corporation
<b>SIZE:</b>	USD 367 million
<b>RATING:</b>	Baa2/BBB+ by Moody's Investor Service and Fitch Inc.
<b>COUPON:</b>	6 month USD LIBOR + 200 bps
<b>EXPECTED FINAL MATURITY:</b>	February 2009
<b>EXPECTED AVERAGE LIFE:</b>	4.6 years
<b>ORIGINATING BANKS:</b>	KDB, KEB, Chohung, Hanvit, Shinhan & Kookmin
<b>MASTER SERVICER:</b>	Korea Asset Management Corporation
<b>CREDIT FACILITY PROVIDER:</b>	Korea Development Bank
<b>CREDIT ENHANCEMENT:</b>	
<b>Put Options:</b>	100% Puttable to Originating Banks
<b>Credit Facility:</b>	USD 110.0 million amortizing credit facility from KDB
<b>Subordinated Note:</b>	USD 52.9 million
<b>LEAD MANAGERS:</b>	Deutsche Securities Limited and UBS Warburg
<b>SWAP COUNTERPARTY:</b>	Deutsche Bank AG and UBS Warburg
<b>LISTING:</b>	Luxembourg
<b>NOTES OFFERED:</b>	Rule 144A and Regulation S

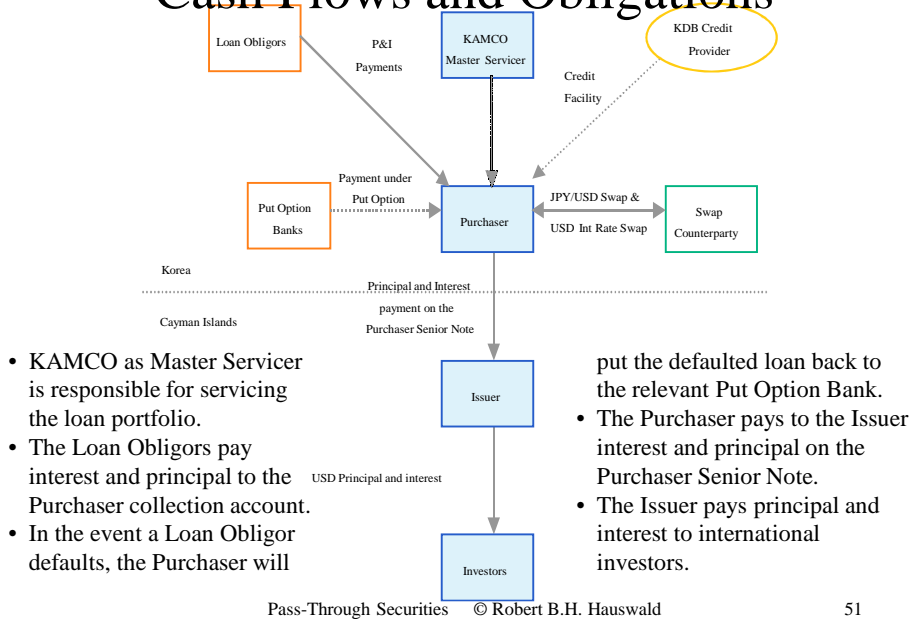
## Transaction Structure



- KAMCO sold the loan portfolio to the Purchaser and retained the Junior Note issued by the Purchaser.
- The Purchaser entered into a swap arrangement to hedge its currency and interest rate exposure.

- The Credit Facility Provider has provided a credit facility to the Purchaser to cover shortfalls in Purchaser Senior Note payment obligations.
- The Purchaser Senior Note was sold to the Issuer and the Issuer issued notes to international investors.

# Cash Flows and Obligations



## Transaction Summary

### **Creditworthy Cash Flow**

- All loans have put options from the originating banks which sold the loans to KAMCO.
- 60% of the loans are backed by put options to KDB. The other put options are all to major Korean banks.

### **Investment Grade Rating**

- Baa2 by Moody's Investors Service and BBB+ by Fitch Inc., Korea's sovereign rating.

### **Attractive Return for Investors**

- Spread over KDB, though the deal's credit risk is largely KDB credit risk.

### **Strong Credit Enhancement**

- Put options to the originating banks. 60% of the underlying loans have put options to KDB.
- Subordinated note equal to 12% of the Loan Portfolio.
- KDB credit facility equal to 27% of the Loan Portfolio.

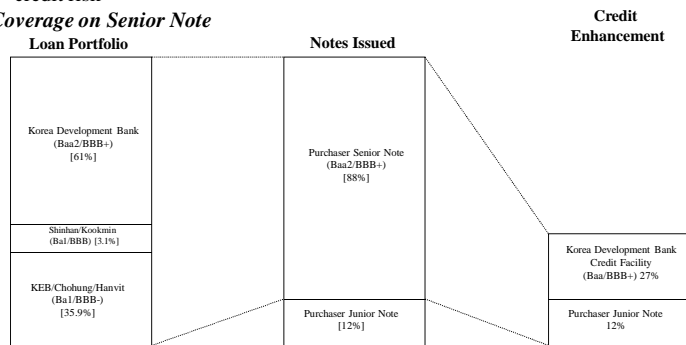
### **Minimal Extension Risk**

- "Worst" case principal repayment profile supported by the KDB credit facility.
- CLO loan defaults usually extend maturity; Korea Asset Funding 2000-1 defaults shorten bond maturity.
- Hence, in a deteriorating credit environment, investors are likely to be repaid early; in an improving credit environment, investors are likely to be paid according to the schedule.

# Credit Enhancements

- **Subordinated Note**  
12% of the Loan Portfolio
- **Credit Facility**  
27% of the Loan Portfolio; USD 110 million amortising facility from KDB
- **Bank Put Options**  
The 39% credit enhancement is approximately equal to the Loan Portfolio amount attributable to all non-KDB banks. Hence, the credit risk of the transaction is largely KDB credit risk

## Coverage on Senior Note



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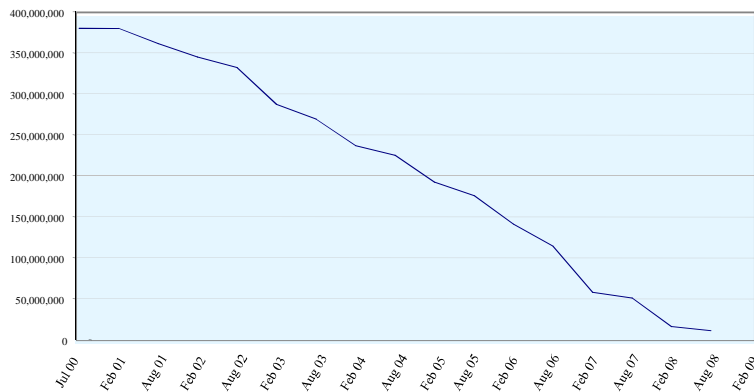
53

# Note Paydown Structure

## Scheduled Note Principal Paydown

- Principal payments on a pass-through basis, subject to minimum Expected Principal Outstanding Schedule.
- If cash flow can't pay principal to meet Expected Principal Outstanding amount, the Credit Facility is drawn pay the cash flow shortfall.

Expected Principal Outstanding Schedule

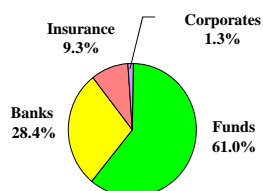


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54

# Placement: Investor Characteristics

## Investor Type Distribution



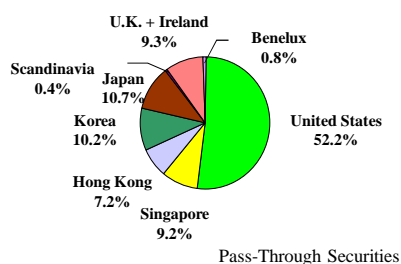
## Issue Details

**Announcement:** July 2000

**Launch spread:** 6 Month Libor + 200bps

**Deutsche Bank and UBS Warburg:** Joint Bookrunners  
Lead Managers

## Geographical Distribution



## Deal Highlights

- Largest international ABS by a Korean borrower
- Second largest international ABS for any Asian borrower
- First international NPL Securitization in Ex-Japan Asia.
- 4X over-subscribed

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55

# Korea Asset Management: Non-Performing Loans Securitization

July 2000  
This information is a matter of record only

한국자산관리공사  
Korea Asset Funding 2000 - 1 Limited  
US\$ 367,000,000  
Secured Floating Rate Notes due July 2009  
Joint Lead Managers  
Deutsche Bank UBS Warburg



"Under the auspices of the Financial Supervisory Commission, Korea Asset Management Corporation (KAMCO) is a key element in recapitalising the banks."

FITCH, July 2000



"For KAMCO, the sale was an important test of investor sentiment, providing high yield on debt for investors."

Bloomberg, 26 July 2000



"The South Korean agency achieved excellent penetration in all three main continents with its global deal."

IFR 29 July 2000



"The deal opens the door for KAMCO and other financial institution to access international investors through securitisation in the future."

Euroweek, 28 July 2000

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56