SECURITIZATION AND CREDIT CRISIS 2007

FINANCIAL INSTITUTIONS MANAGEMENT

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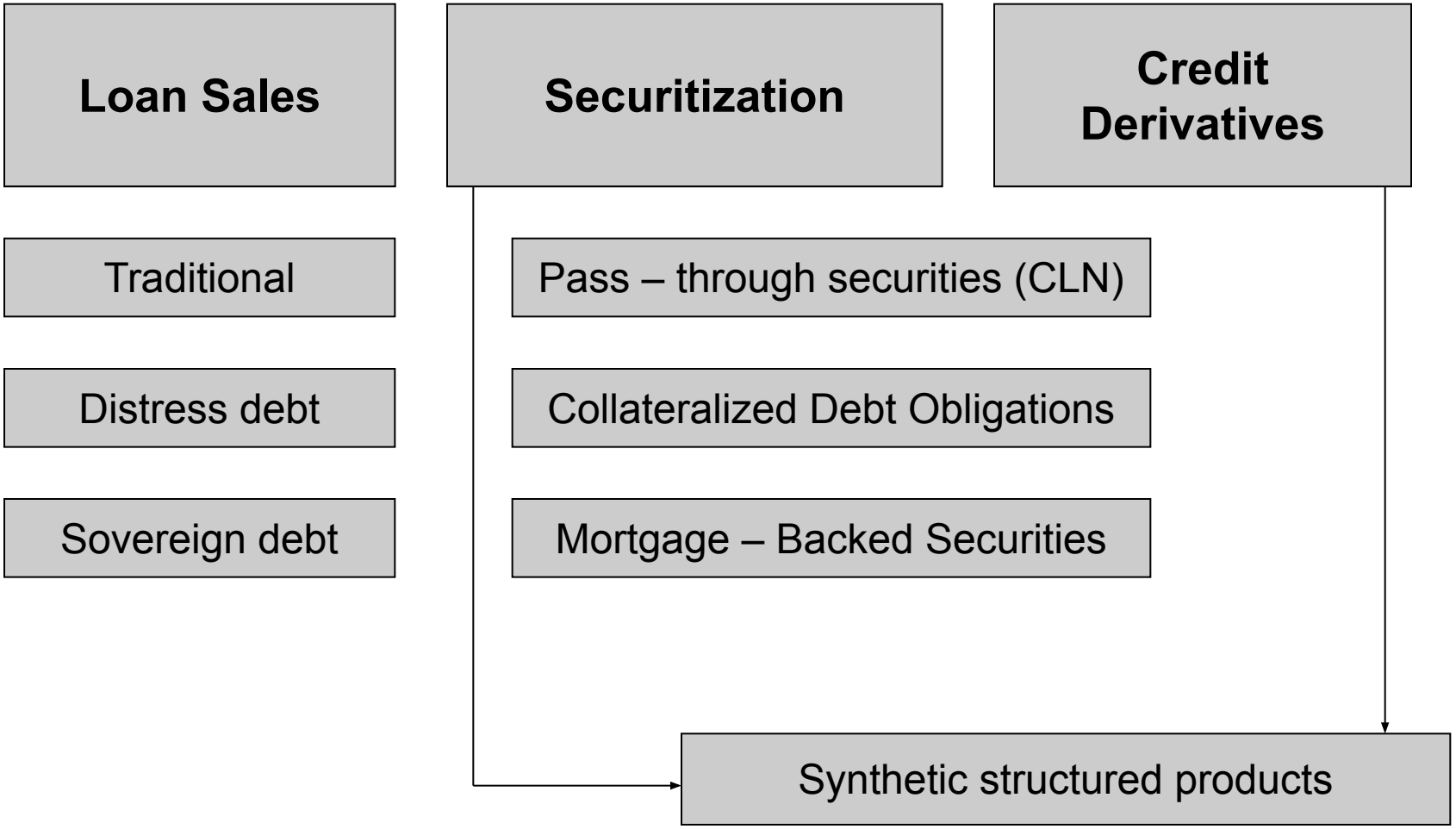
Credit risk transfer instruments



AGENDA:

I. SECURITIZATION
   1. The Pass -Through Security (PTS)
   2. Collateralized Mortgage Obligation (CMO)
   3. Mortgage-Backed Bonds (MBBs)

II. CREDIT CRISIS 2007
   1. What happened
   2. Key mistakes
   3. Key lessons

I. SECURITIZATION

- Securitization is a process of packaging and selling of loans and other assets backed by securities.
- Forms of asset securitization:
  - Pass-through securities (PTS);
  - Collateralized mortgage obligation (CMO)
  - Mortgages-backed securities (MBS);

The Pass-Through Security

- Government National Mortgage Association (GNMA)
  - Sponsors MBS programs and acts as a guarantor.
  - Timing insurance.
- FNMA actually creates MBSs by purchasing packages of mortgage loans.
- Federal Home Loan Mortgage Corporation
  - Similar function to FNMA except major role has involved savings banks.
  - Stockholder owned with line of credit from the Treasury.
  - Sponsors conventional loan pools as well as FHA/VA mortgage pools.

Major Benefits of Securitisation:

- lower cost of funding due to the enhanced rating stemming from mixed of senior and junior securities issued.
- capital saving from the sale of assets – decreases the minimum earnings required to ensure an adequate return to shareholders
- important source of fee income
- Investors enjoy the higher return from the mortgage market

Incentives and Mechanics of Pass-Through Security Creation

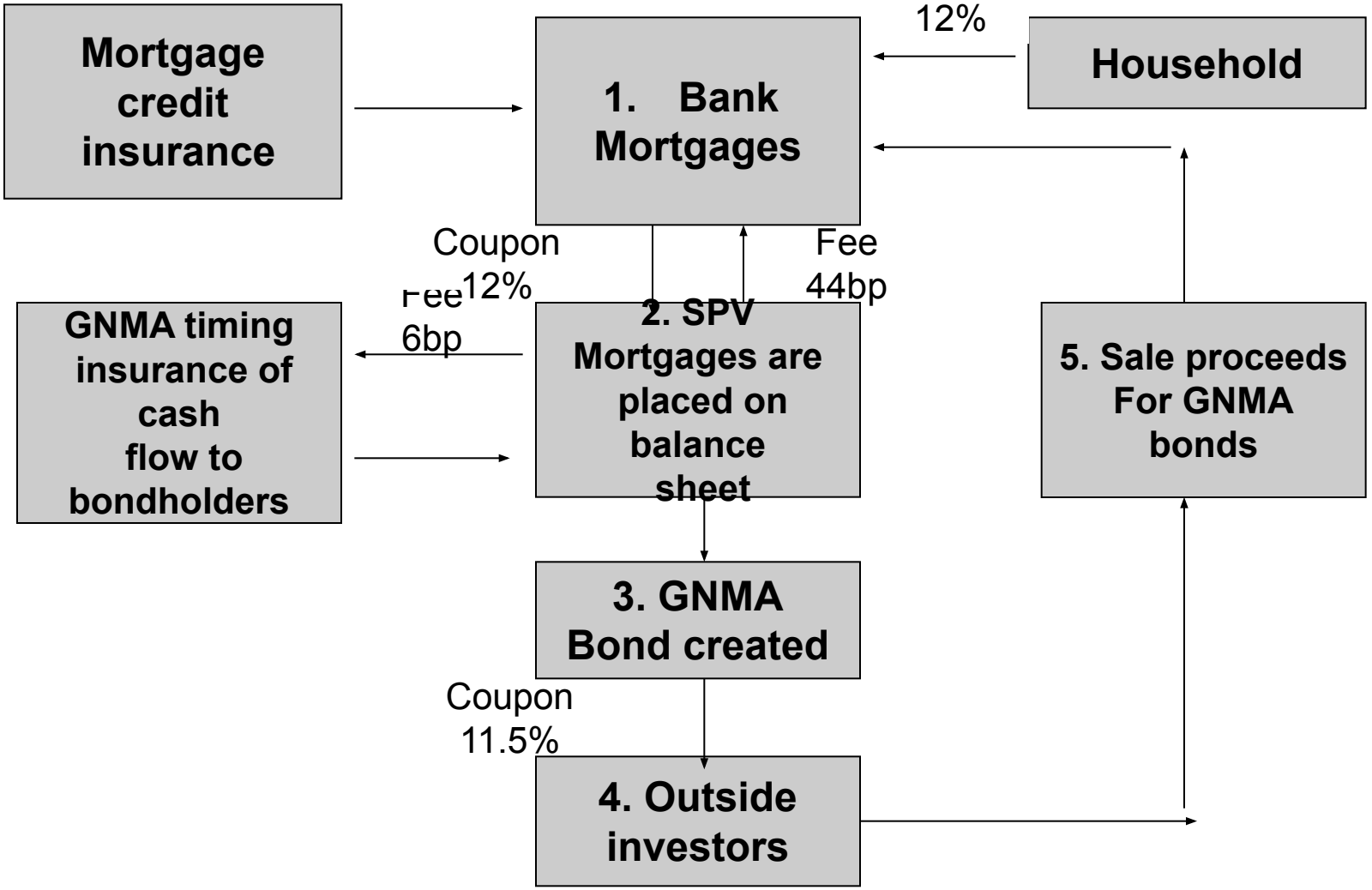
- **Example:** Assume that Bank has 1000 new residential mortgages with the average size of each = $100 000, maturity 30 years, mortgage coupon 12% p/a
- The total size of new mortgage pool is $100mill=1000*100 000
- Capital adequacy requirements (risk weight is 35%) =100*0.08*0.35=$2.8mill
- Minimum reserve requirements 10 % of deposits:
- **Assets** **Liabilities**
- Cash = 0.1 * D Deposits (D) = x
- Mortgages = 100 Equity = 2.8
- **0.1D+100** **=** **2.8+D**
- Therefore, D=108 mill.

- **Asset** **Liabilities**
- Cash = 10.8 Deposits = 108
- Mortgages = 100 Capital = 2.8
- Total = 110.8 Total = 110.8

Mechanics of Pass-Through Security Creation

- Bank pays annual insurance premium to the FDIC. Assume the deposit insurance premium of 27 bps.
- Premium = $108 x 0.0027 = $0.2916
  - It is treated as non interest expense and recorded in the Income statement.
- 3 levels of regulatory taxes:
  - Capital requirements;
  - Reserve requirements;
  - Deposit insurance premium.
- Additional exposures:
  - Gap exposure or Da > kDl .
  - Liquidity exposure.

GNMA Pass-Through process: Creation of the Asset backed security (ABS)



Calculation of a constant monthly payment of borrowers:

- **Size of the pool: PV = $100 000 000 (1000 x $100 000)**
- **Maturity: n =30 years**
- **Number of monthly payments per year: m =12**
- **Annual mortgage coupon rate: r = 12%**
- **PMT = constant monthly payment to pay off the mortgages over its life**

$$PMT = \$100 \text{ mill} \Big/ \frac{\{1 - 1/(1+r/m)^{mn}\}}{r/m}$$

$$PMT = \$100 \text{ mill} \Big/ \frac{\{1 - 1/(1+0.12/12)^{360}\}}{0.12/12} = \$1{,}028{,}613$$

$1,028.61 per mortgage for 1000 mortgages

Payment schedule

- Fully amortized mortgages:

Month	Outstanding balance, $	PMT	Interest	Principal	Principal remaining
1	$ 100 mill	1 028 610	1000000	28 610	99 971 390
2	99 971 390	1 028 610	999 714	28 896	99 942 494
360	…..	1 028 610	…..	….	0

GNMA Pass-Through process

- The bank aggregates the payments for mortgages and passes funds through to GNMA the bond investors via trustee net servicing fee and insurance fee deductions.
- As a result the coupon rate on bonds will be set at approximately 0.5% below the coupon rate on the underlying mortgages.
  - Mortgage coupon rate = 12%
  - Servicing fee = - 0.44%
  - Government insurance fee = - 0.06%
  - Pass through bonds = 11.5%
- Therefore, if a life insurance company bought 25% of GNMA bond issue it would get 25% share of the 360 promised monthly payments from the mortgage pool.

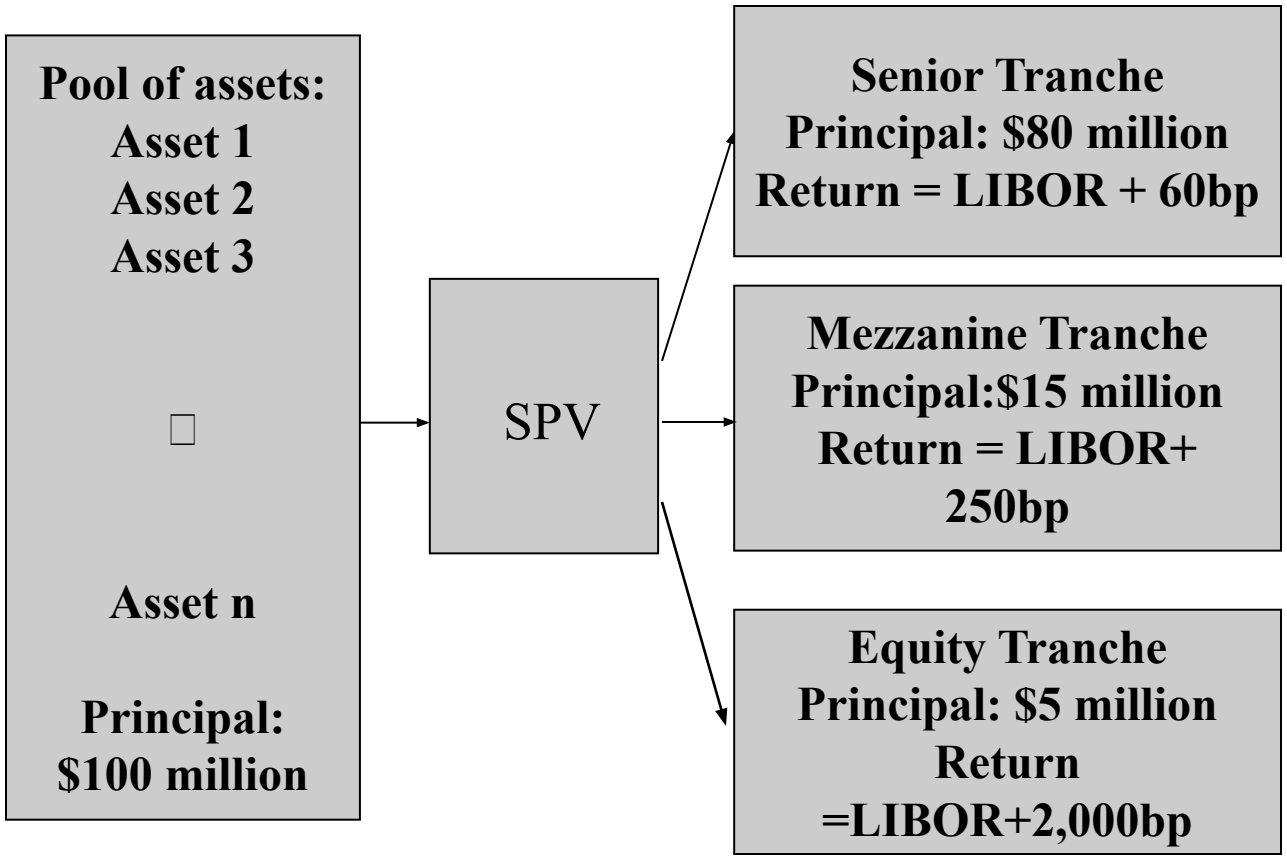
Further Incentives

- The attractiveness of these bonds to investors. In particular, investors in these bonds are protected against 2 levels of default risk:
- 1. Default risk of the borrowers.
  - If the prices on houses fall rapidly, a homeowner can leave the low-valued mortgage. This might expose the mortgage bondholders to loses unless there are external guarantors.
- 2. Default risk of Bank/ SPV
  - Even if the bank or trustee bankrupt, GNMA would bear the costs of making the promised payments in full and on time to GNMA bondholders (due to GNMA insurance).
  - Assumed LGD = 25%

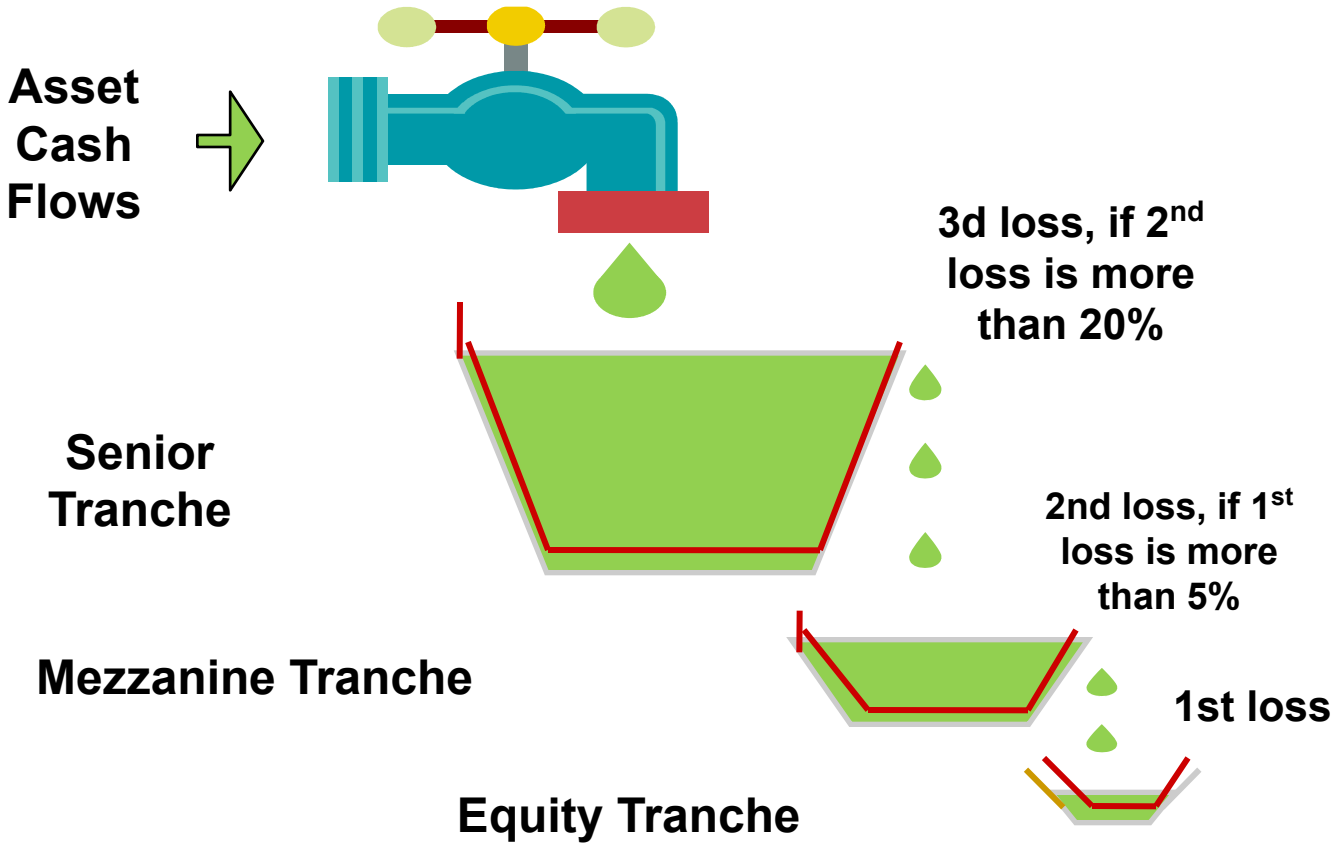
Effects of prepayments

- Prepayment risk is the risk that the loan will be paid off before the contracted maturity.
- Sources of risk:
  - Mortgage refinancing due to decrease in interest rates
  - Housing Turnover
- Good news effects
  - Lower market yields increase present value of cash flows.
  - Principal received sooner.
- Bad news effects
  - Fewer interest payments in total.
  - Reinvestment at lower rates.

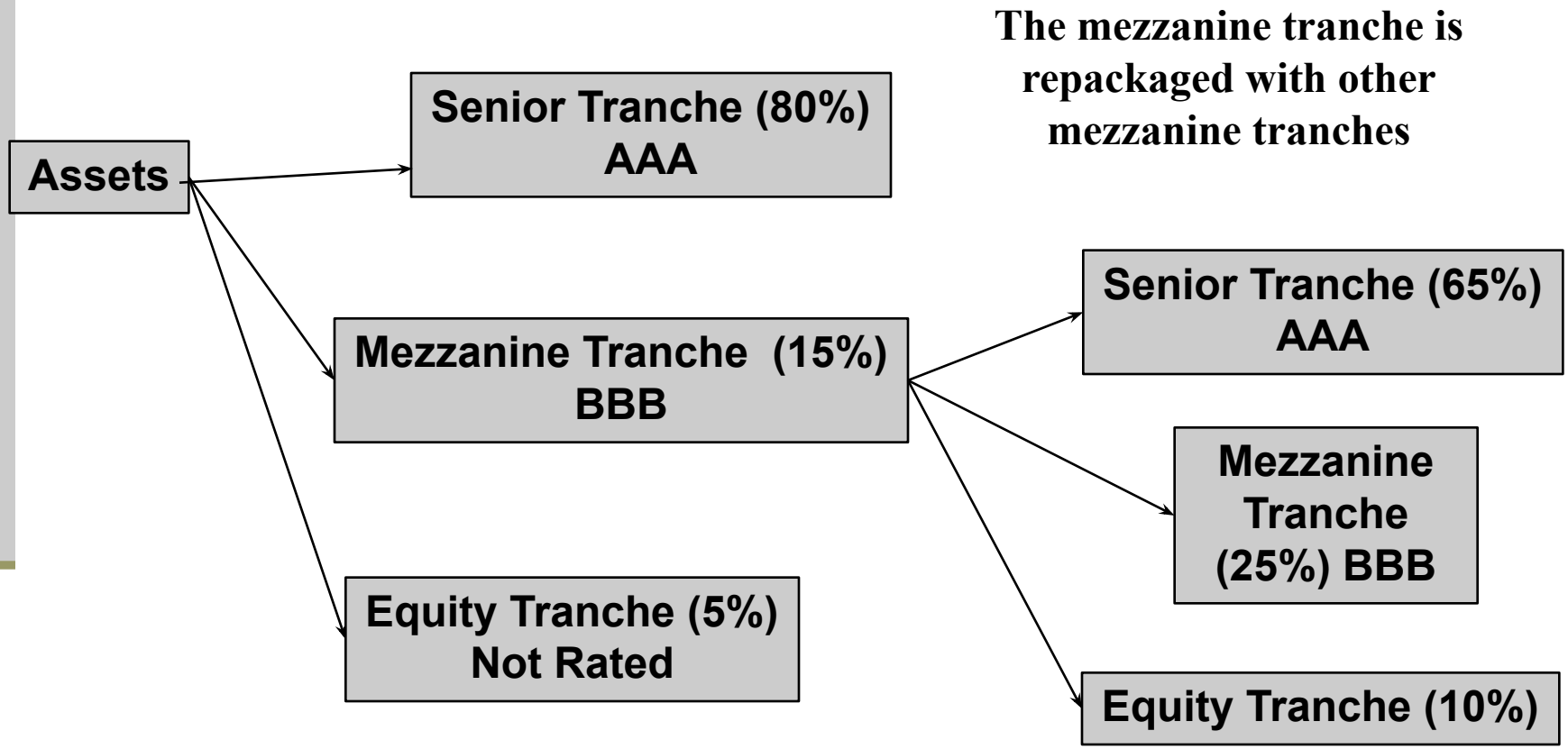
Asset Backed Security (continued)



The Waterfall

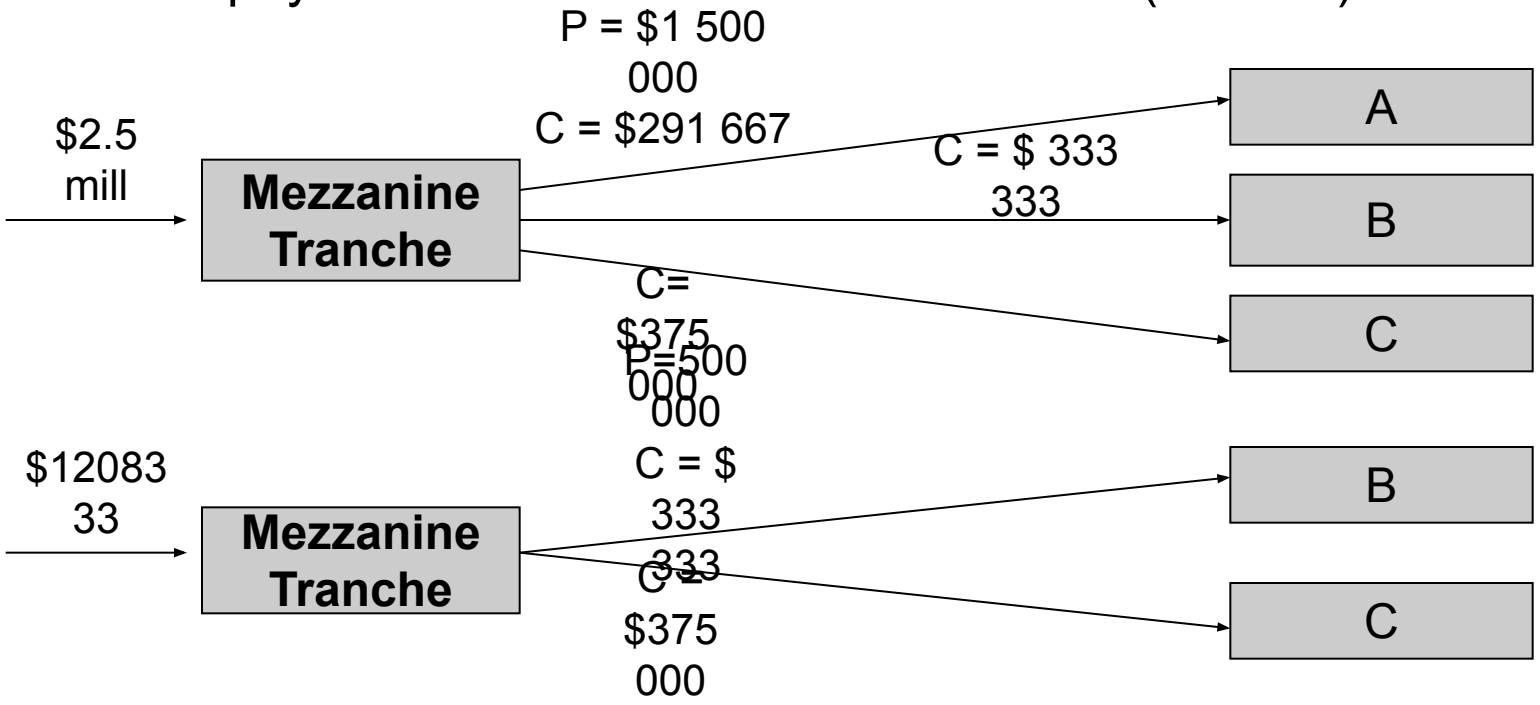


Collateralized Mortgage Obligations (ABS CMO) were created to manage the prepayment risk



Collateralized Mortgage Obligation (CMO)

- Prepayment effects differ across tranches (classes)



- R Class
- Improves marketability of the bonds

Mortgage-Backed Bonds (MBBs)

- Normally remain on the balance sheet.
- No direct link between the cash flows on the underlying mortgages and the interest and principal payments on the MBB.
- Issued to reduce the risk to the MBB bond holders:
  - Segregation the group of mortgages on the balance sheet;
  - Pledging this group as collateral against the MBB issue.

Mortgage-Backed Bonds (MBBs)

- EXAMPLE: Before securitization

ASSETS	$ mill		LIABILITIES	$ mill
Long term mortgages	20		Insured deposits	10
			Uninsured deposits	10
	20			20

Problems: Da > Dl, high risk premium paid to uninsured depositors.

ASSETS	$ mill		LIABILITIES	$ mill
Collateral	12		MBB issue	10
Other mortgages	8		Insured deposits	10
	20			20

Mortgage-Backed Bonds (MBBs)

- Weaknesses:
  - Tied up mortgages on the balance sheet for a long time;
  - Increases the illiquidity of the asset portfolio;
  - Over-collateralization;
  - Liability for capital adequacy and reserve requirement taxes.

Securitization of other assets

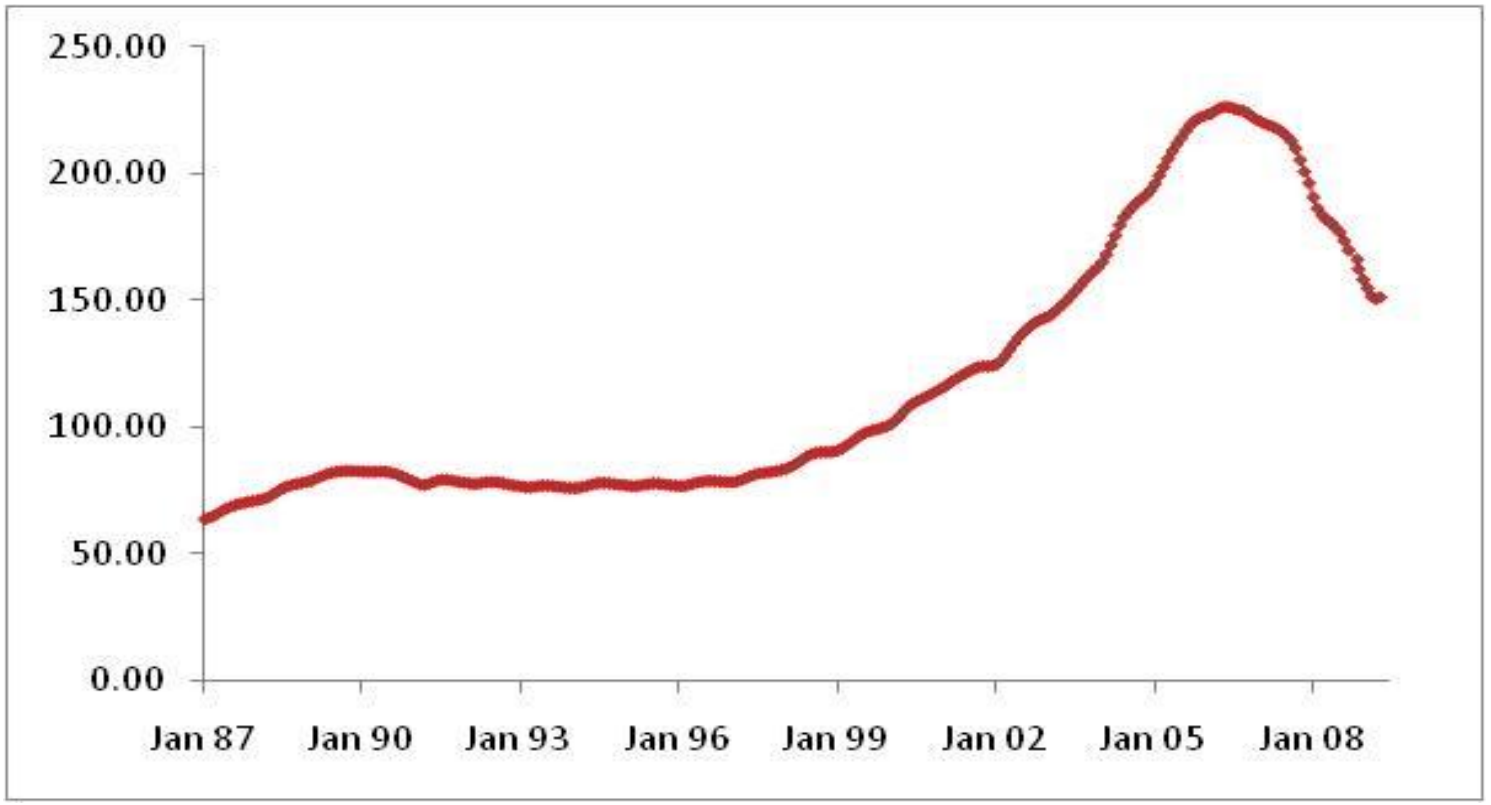
- CARDs
- Various receivables, loans, junk bonds, ARMs.

- Can all assets be securitized?

Benefits	Costs
New finding sources	Cost of public/private credit risk insurance and guarantees
Increased liquidity	Cost of overcollateralization
Enhanced ability to manage the duration gap	Valuation and packaging costs
If off balance sheet – savings on regulatory taxes	Requires homogeneous assets

Credit Crisis 2007

U.S. Real Estate Prices, 1987 to 2009:
S&P/Case-Shiller Composite-10 Index



What happened…

- Relaxation of Mortgage standards
  - Starting in 2000, mortgage originators in the US relaxed their lending standards and created large numbers of subprime first mortgages.
- Very low interest rates,
  - Increased demand for real estate □ boost in mortgage prices □ real estate speculation
- Further relaxation of lending standards
  - Mortgage lenders and brokers wanted to keep their profit and knew that loans would be sold.
- Features of the market: teaser rates, NINJAs, liar loans

What happened...

- Mortgages were packaged in financial products and sold to investors:
  - The most important thing for the lenders was whether the mortgage could be sold to others.
- Banks found it profitable to invest in the AAA rated tranches
  - Their promised return was significantly higher than the cost of funds and capital requirements were low
- In 2007 the bubble burst.
  - Some borrowers could not afford their payments when the teaser rates ended.
  - U.S. real estate prices fell and products, created from the mortgages, that were previously thought to be safe began to be viewed as risky

Key Mistakes Made By the Market

- Ratings to tranches was not assigned relative to the risk:
  - Rating agencies had lack of experience in rating structured products and used relatively little historical data.
- Mispricing of securitization tranches:
  - Assumption that a BBB tranche is like a BBB bond. In reality, BBB tranches were much more risky and incurred losses 100 % instead of assumed 25%.
- Default correlation was not taken into account when assessing the credit risk:
  - Default correlation goes up in stressed market conditions.

Key Mistakes Made By the Market

- Regulators required to retain only from 5% to 10% of tranche by the originator when the credit risk is transferred
  - Crisis showed that it was not enough to control the risk appetite of originators.
- Regulators and investors did not understand the overall risk of FIs:
  - Over-the-counter derivatives' positions were hidden off the balance sheet

Lessons learned:

- Ensure transparency of complex products.
  - Creators of the products should provide a way for potential purchasers to assess the risks (e.g., by providing software)
- Over-the-counter derivatives should be:
  - Daily marked to market;
  - Put on the balance sheet
- FIs need to create models to assess the risks
  - Most financial institutions did not have models to value the tranches they traded. Without a valuation model risk management is virtually impossible

Lessons learned:

- More emphasis on stress testing
  - More emphasis on stress testing and managerial judgement; less on the mechanistic application of VaR models (particularly when times are good)
  - Senior management must be involved in the development of stress test scenarios

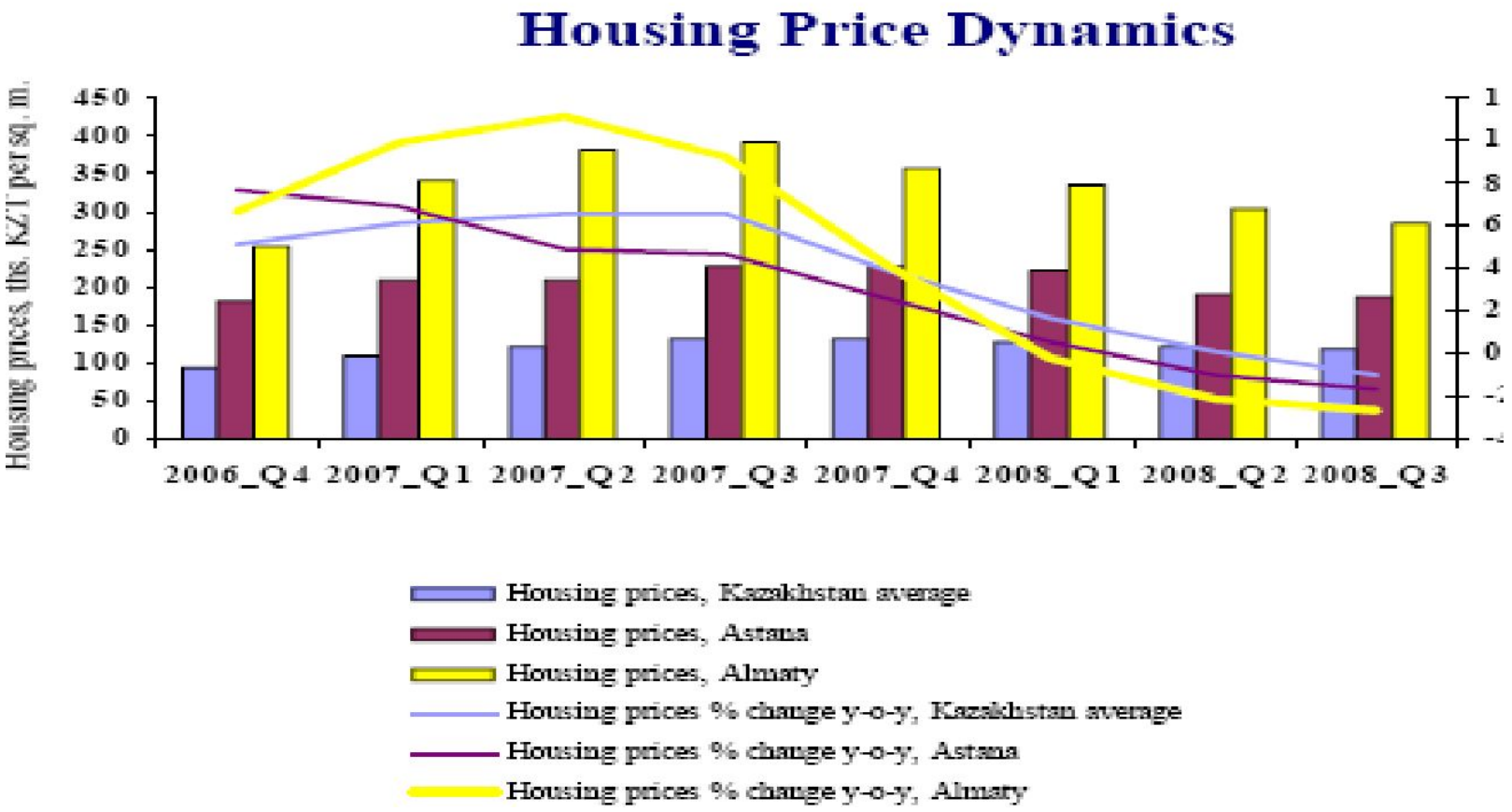
Major Reasons of the Financial Crisis in Kazakhstan

- Financing of the high credit growth through external borrowings;
  - Given up liquidity for profitability;
- Limited investment opportunities:
  - Risky investments
- Low diversification across different sectors:
  - High concentration risk
- Overvalued real estate prices in 2006-2007;
  - Fall in collateral value increases loans' LGD
- Slow reaction of AFN to changes and underestimation of major risks:
  - Regulatory oversight

Why Financial Crisis in Kazakhstan was not so severe as in developed countries?

- Proportion of foreign banks was relatively low.
  - 63% of all market belonged to the 4 largest KZ banks
- Amount of mortgages for securitization was still not high enough to practice active securitization.

Real Estate Price Dynamic in Kazakhstan



Structural changes in Kazakhstani banking industry since 2008.

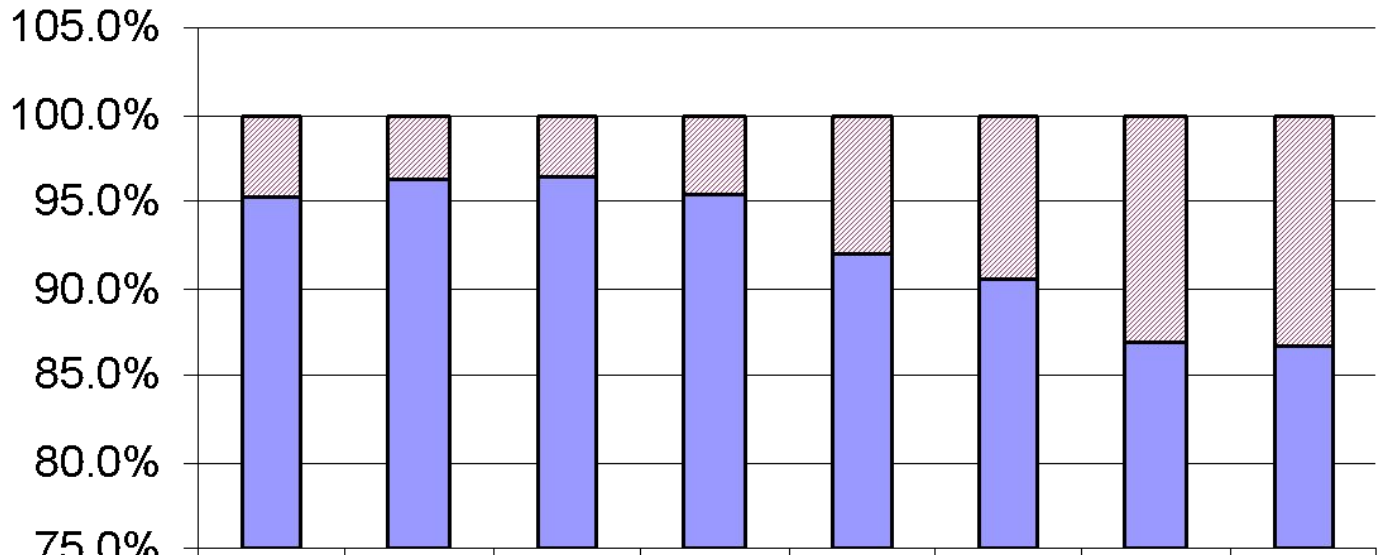
Before 2008	After 2008
Highly concentrated banking system	Highly concentrated banking system with diminishing trend
High bank assets' growth	Slow down in the bank assets' growth
Significant presence of local banks	Increase in the market share of foreign banks through mergers and acquisitions.
Significant presence of private banks	Bailout of largest private banks by the government

Concentration ratios of top five Kazakhstani banks

Indicator	1.01.07	1.01.09	1.01.11	1.01.13
Assets	77.9%	73.9%	71.8%	60.0%
Loans	79.3%	78.8%	74.8%	65.3%
Liabilities	78.2%	74.3%	72.5%	60.2%
Deposits	78.9%	71.5%	70%	57.5%
Capital	75.7%	70.1%	66%	56.3%

Source: www.afn.kz

Market share of local bank vs market share of banks with foreign ownership



	2006	2007	2008	2009	2010	2011	2012	2013
Иностранные Banks	4.9%	3.7%	3.5%	4.7%	8.1%	9.5%	13.2%	13.4%
Местные банки	95.1%	96.3%	96.5%	95.3%	91.9%	90.5%	86.8%	86.6%

- *Source: www.afn.kz*
- *All data as of January 1 of the given year.*

Kazakhstan Banks' Nationalization

Date	Bank	Stake	Amount paid
February 2'2009	BTA Bank	78.14%	$2 070 mln
February 2'2009	Alliance Bank	76%	$200 mln
March 27' 2009	Halyk Bank	20.91%	$180 mln
May 15' 2009	KKB Bank	21.12%	$240 mln