Subprime Mortgage Market: Rise, Fall, and Lessons for Korea

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Outline

- Overview
- Rise of the Market
- Fall of the Market
- Prime vs. Subprime:
  - Collaterals Used
  - Credit Enhancement
  - Managing Prepayment Risk
- Lessons for Korea:
  - On Mortgage Product Design
  - On Mortgage Insurance
  - On Mortgage Funding
- Q&A&D

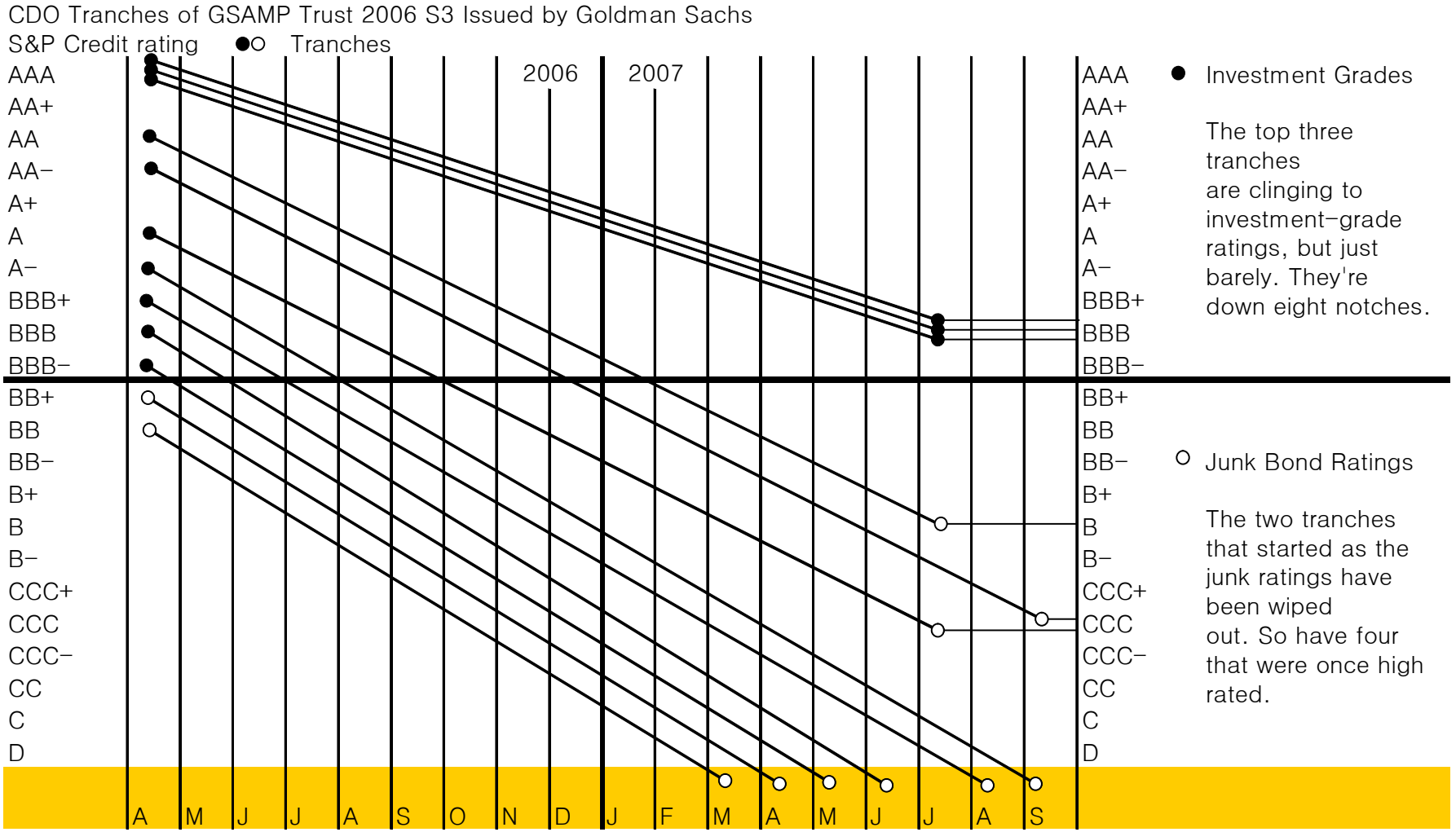
Overview:

Where We Are

Some Figures & Facts Reported

- Subprime Credit Losses: $265-$400 billion, 24-36% of the $1.1 tr subprime mortgages outstanding, amounting to 50x-70x of the prime's
- "Pricing failure" (*ex ante)* of the collateral risk: Over 90% of recent subprime loans being "exotic" ARMs (Adjustable Rate Mortgages), overlaid with various special, & risky, features
- "Over-securitization" as another culprit: Huge subprime loss rate, but not so big in the $57 tr US financial market; Then, how come it is having such a wide spread impact?
- Liquidation of Bear Sterns (3/16) as a telling case: "Too entangled" to fail, as a counterparty to some $10 tr CDS (Credit Default Swap) and other derivatives; contracts; A bunch of other acronyms used, "ABS," "CDO," "CLO," "CDO-Squared," and "ABCP" along with "CDS" (to be described along the way)
- An eye-opening case of the bond downgrading: A Goldman Sachs' CDO deal (next page) as a case showing the quick & deep bond degrading; 3000 CDO tranches downgraded in October 2007 alone
- *Motivations for Cho (2008): To offer a micro-history of the rise and fall of the subprime mortgage market, and to discuss several policy implications for Korea; To have a core to build on from future studies & news on the topic*

Goldman Sachs CDO Deal (GSAMP 2006-S3):
An “Eye-Opening” Case of Rating Migrations



SOURCE : Reproduced from Allan Slaon's column in Washington Post (October 16, 2007)

Rise of the Market:

Institutional & Economic Determinants

Political Economy in the Mortgage Funding Market of the US

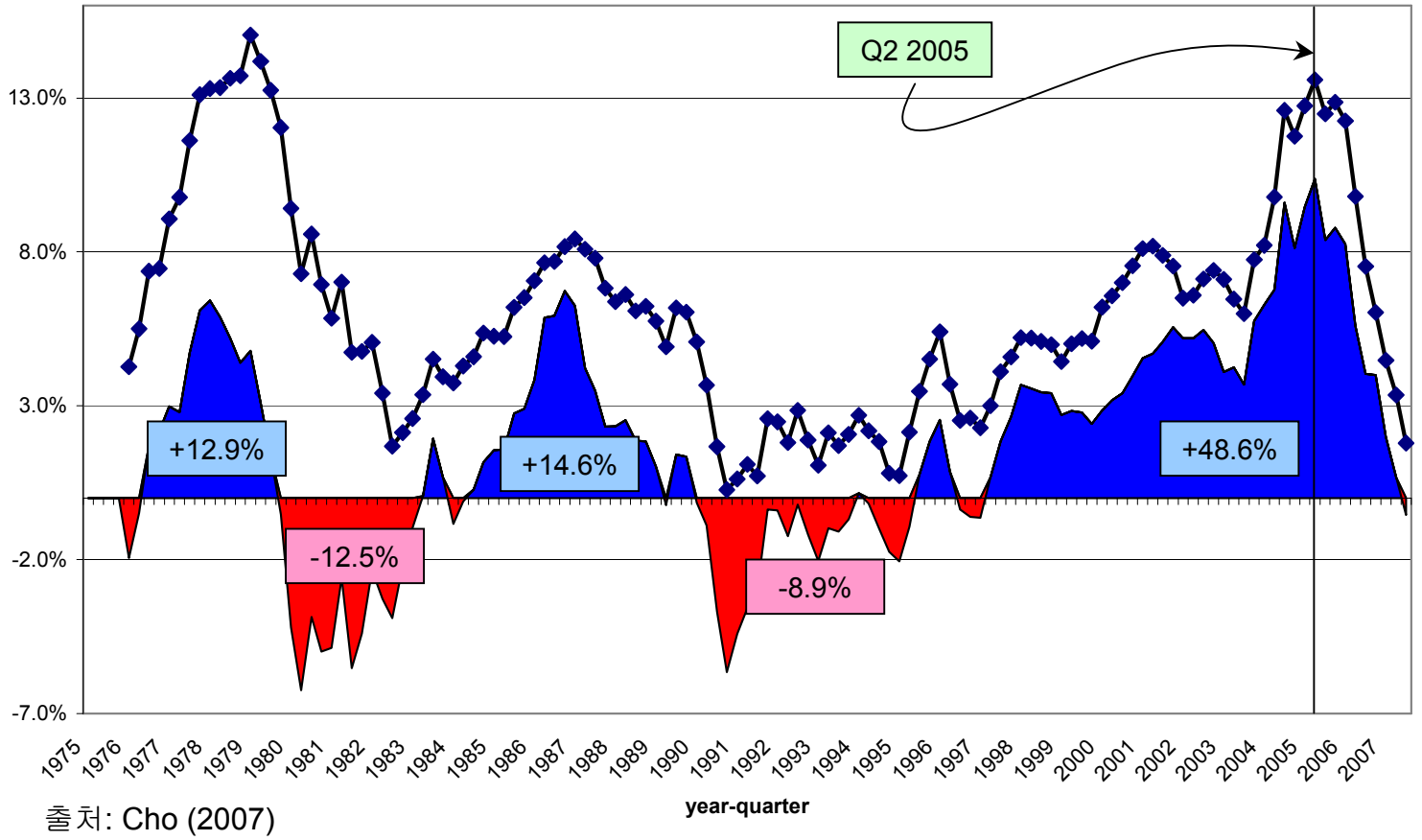
- The failed MBB experiment (mid- to late-1890s): A classic example of the principal-agent problem
- Post Great Depression Changes (1930s): Creation of the long-term, level-paying Fixed-Rate Mortgage (FRM); Public mortgage insurer (FHA) and the liquidity facilities (e.g., Fannie Mae) being created
- Dominance of the Savings & Loans (S&Ls)' deposit-based funding (up to the 1970s): The "borrow-short-lend-long" business model; High inflation, the inverted yield curve, & competition from Money Market Funds leading to the S&L debacle in the 1980s
- Dominance of the GSEs' (Fannie & Freddie) MBS-based funding (mid-1980s to the early 2000s): Filling the vacuum created by S&Ls, & a steep rise in the 1990s; Rise of other securitized products (CMBS/ABS/CDO/etc.); Segmented primary market – "A" vs. "B&C" loans; "FM Watch" as the anti-GSE lobby organization
- Surge of the Private-Label MBS issuers (early- to mid-2000s): Combined with the ample liquidity, the accounting problems of GSEs (2003 & 2004); Convoluted securitization & hedging process, as will be discussed subsequently

Unprecedented Home Price Boom in Recent Years,

Causing the Worsening Housing Affordability in Many Parts of the US

Real and Nominal 4-Quarter Home Price Growth Rates - US

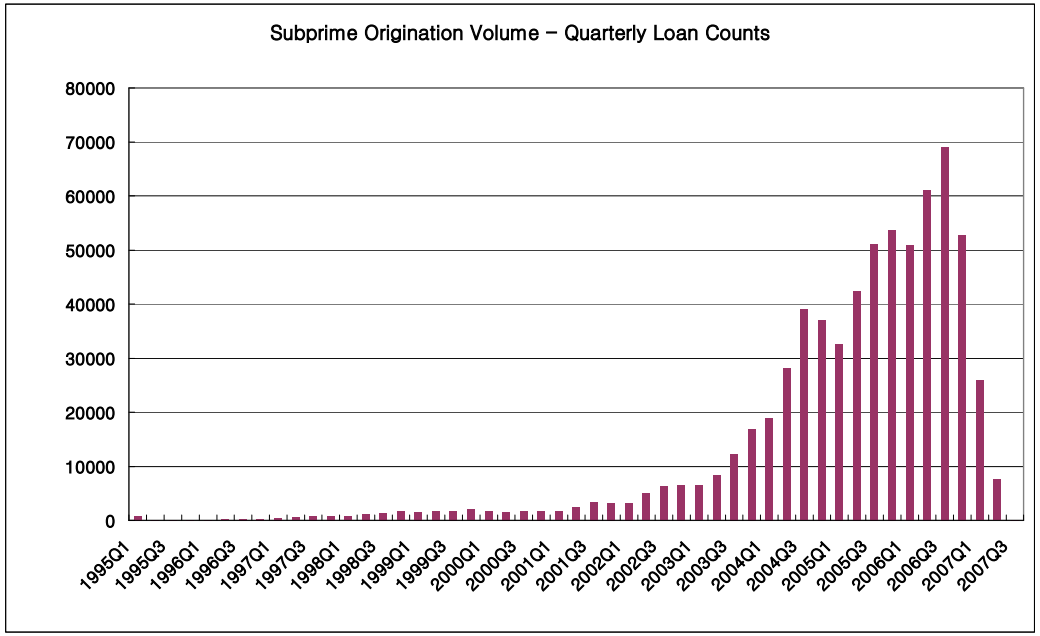
(Source: Q3-2007 OFHEO HP Index)



출처: Cho (2007)

Rise Subprime Origination Volume, &

"Risk-Layering" in the Composition of the Mortgage Stock



- Rise of the supbrime origination from 2003, peaked in 2006, and ceased in 2007
- Rising ARM share, over 90% in 2005 and 2006, with "special features (e.g., Interest-Only (IO), Option ARM, & 40-year ARM)
- Risk-layering of those ARMs with low-/no-documentation loans, & with high-DTI and low-FICO borrowers

	ARM Share	I-O ARM Share	40-Yr ARM Share	Low-No-Doc Share	Avg. LTV	Debt-to-Income	Avg. FICO
2001	73.8%	0.0%	0.0%	28.5%	84.04	39.7	602
2002	80.0%	2.3%	0.0%	38.6%	84.42	40.1	627
2003	80.1%	8.6%	0.0%	42.8%	86.09	40.5	651
2004	89.4%	27.2%	0.0%	45.2%	84.86	41.2	648
2005	93.3%	37.8%	3.0%	50.7%	83.24	41.8	650
2006	91.3%	22.8%	4.7%	50.8%	83.35	42.4	646

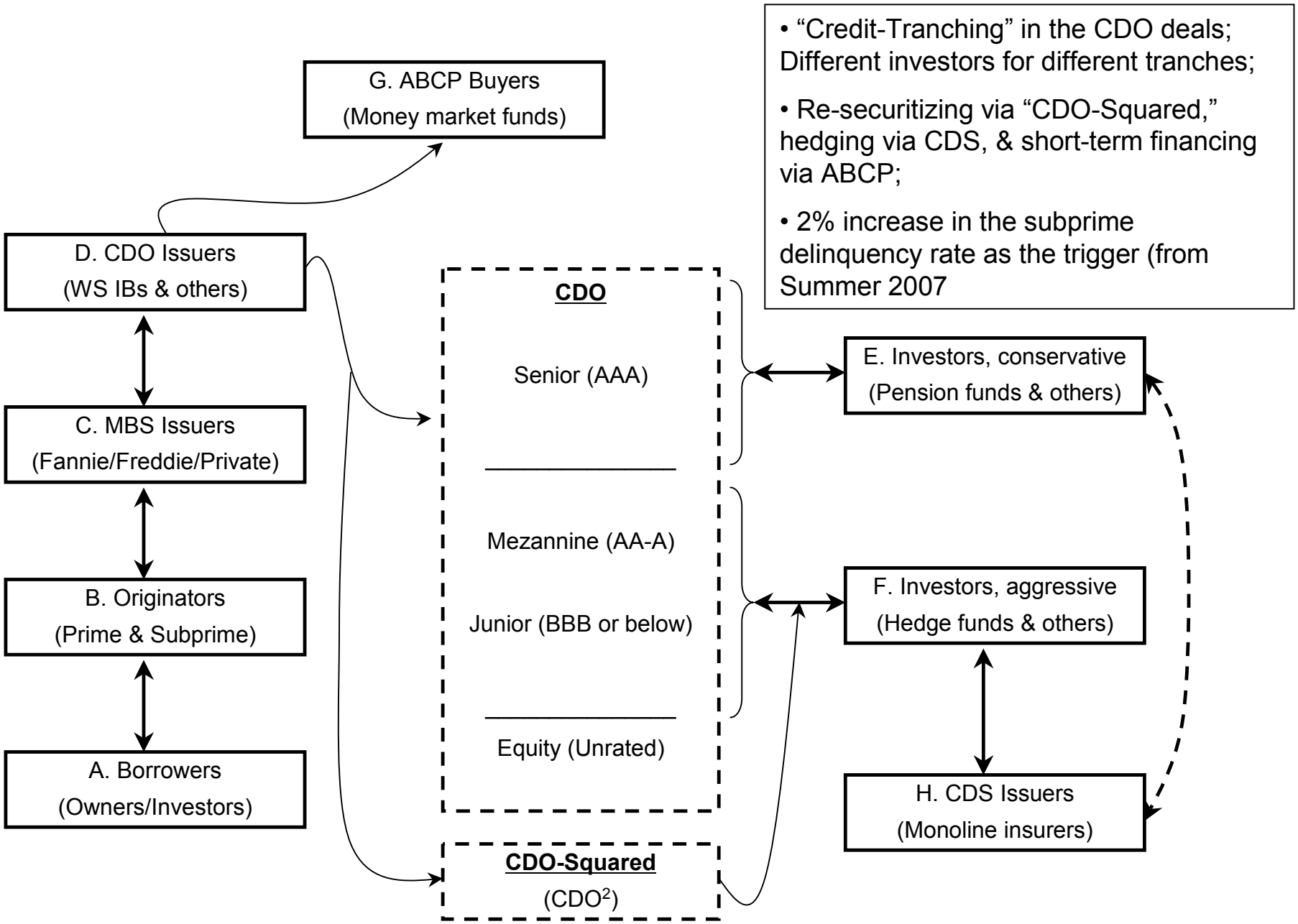
Source : Crews-Cutt (2007); LoanPerformance

Fall of the Market:

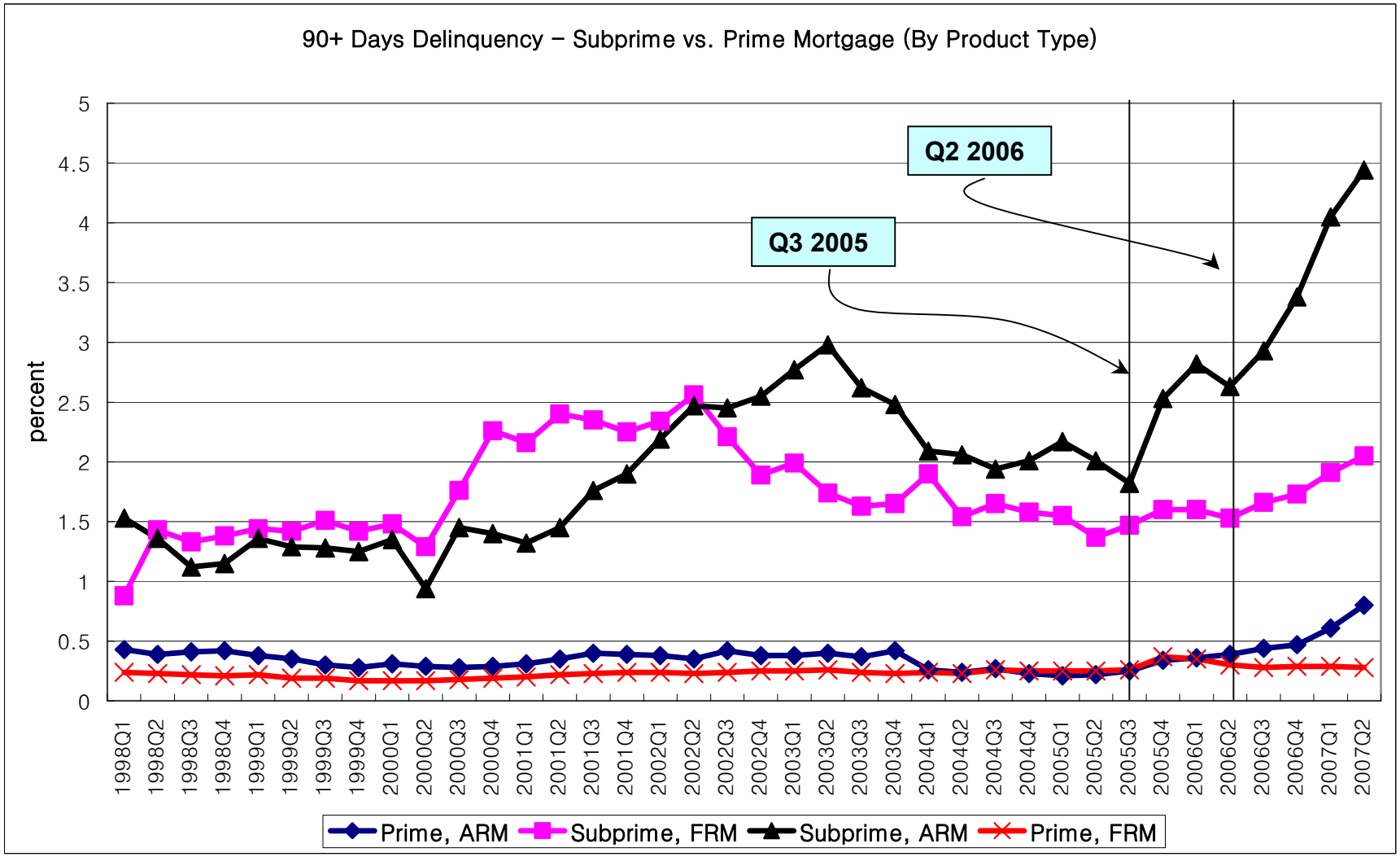
Convoluted Transaction Process & Incentive Problems

Political Economy in the Mortgage Funding Market of the US

- Subprime MBS Products: Out of the $1.1 trillion subprime mortgages, $685 billion being securitized; The product of choice being CDO (Collateralized Debt Obligation) with Senior-Mezzanine-Subordinate tranches; Mezzanine tranches being re-securitized via CDO-Squared
- Short-Term Financing & Hedging: ABCP (Asset Backed Commercial Paper) being used as the short-term financing vehicle for the "off-balance sheet" trades; CDS (Credit Default Swap) being used as hedging tool for tail credit events (the steep rise of the CDS market, from $6 tr in 2004 to $43 tr in 2007)
- Worsening Loan Performance since Q2 2006: The 90+ DLQ rate rising from Q2 2006, by 2 percentage points until Q2 2007; HSBC revealing the high subprime-related losses in February 2007; New Century, the largest subprime lender in the US, along with 25 other lenders going under around April 2007
- 2nd-Tier, & Global, Impact since Summer 2007: Bear Sterns (in June) and BNP Paribas (in August) terminating their subprime-heavy hedge funds; Being triggered from the ABCP market, the whole transaction process being shattered, making subprime loans & securities as "on-balance sheet" assets'; Heightened capital needs by the IBs and hedge funds, a large scale liquidation of their emerging market funds; Worsening credit standing for the monoline bond insurers (MBIA, Ambac, ACA Financial), and dismal P&L by Wall Street IBs in the Q4 2007 financials


G. ABCP Buyers
(Money market funds)
D. CDO Issuers
(WS IBs & others)
C. MBS Issuers
(Fannie/Freddie/Private)
B. Originators
(Prime & Subprime)
A. Borrowers
(Owners/Investors)
CDO
Senior (AAA)
Mezannine (AA-A)
Junior (BBB or below)
Equity (Unrated)
CDO-Squared
(CDO2)
E. Investors, conservative
(Pension funds & others)
F. Investors, aggressive
(Hedge funds & others)
H. CDS Issuers
(Monoline insurers)
• "Credit-Tranching" in the CDO deals; Different investors for different tranches;
• Re-securitizing via "CDO-Squared," hedging via CDS, & short-term financing via ABCP;
• 2% increase in the subprime delinquency rate as the trigger (from Summer 2007

Serious (90+ Days) Delinquency Rates by Mortgage Type; Coincidental Trend with the Home Price Deceleration

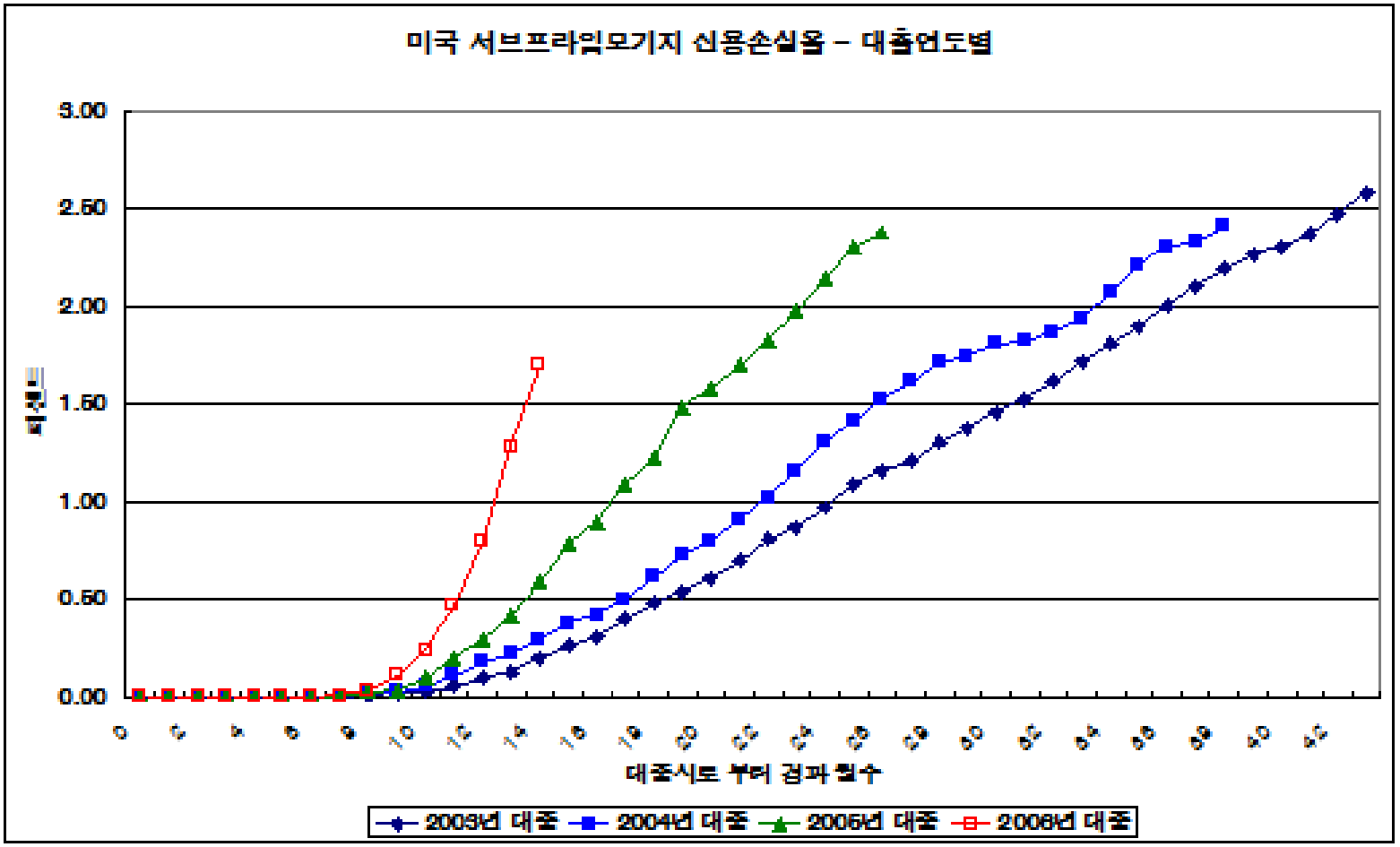


Source: Mortgage Bankers Association

Risk Factors To Watch Going Forward

- The rate/payment reset, in particular, for the 2006 origination cohort
  - The largest origination year cohort, with the highest loss rate (next slide)
  - Rate & payment reset for 2/28 ARMs in the 2006 origination vintage
  - Some facts: 545k subprime borrowers, 7.7% of 7.1m total, received some relief; But only 1/3 of them gotten "loan modifications" (WP, 2/28/2008)
- Inter-play between HP dynamics and subprime defaults
  - Duration and depth of the HP decline as a big risk factor
  - Possibly 15% correction in the national real HP changes (Shiller (2007)); 20-30% total decline, wiping out $4-$6 tr home equity (Roubini (2008))
  - Influx of homes for sale from defaulted subprime loans; 8.8 million households with negative home equity (Bernanke, 3/5/2008)
  - Well-documented wealth effect of HP & its ramification on Korea and others
- Rising delinquencies and defaults in the "prime" mortgage market
  - Over 80% of the US mortgage market consisting of the "prime" mortgages
  - Credit losses from that segment also rising (e.g., $1.6 billion for Freddie Mac (in Q4 2007) and $1.1 billion for Fannie Mae, as estimated by WSJ)
  - But Alt-A & other risky products as one of the underlying determinant
- Spillover to other capital market segments
  - Downturns in credit card, auto loan, CMBS & others being
  - Other insurance companies (e.g., AIG) being included in the victim's list

“Not All Sbuprime Loans Are Created Equal”: The 2006 Vintage Shown To Be Most Risky; & ARM Reset As a Big Risk Factor Going Foward



출처: Crews-Cutt (2007)

Prime vs. Subprime:

Several Distinct Differences

Prime MBS vs. Subprime MBS: Key Differences

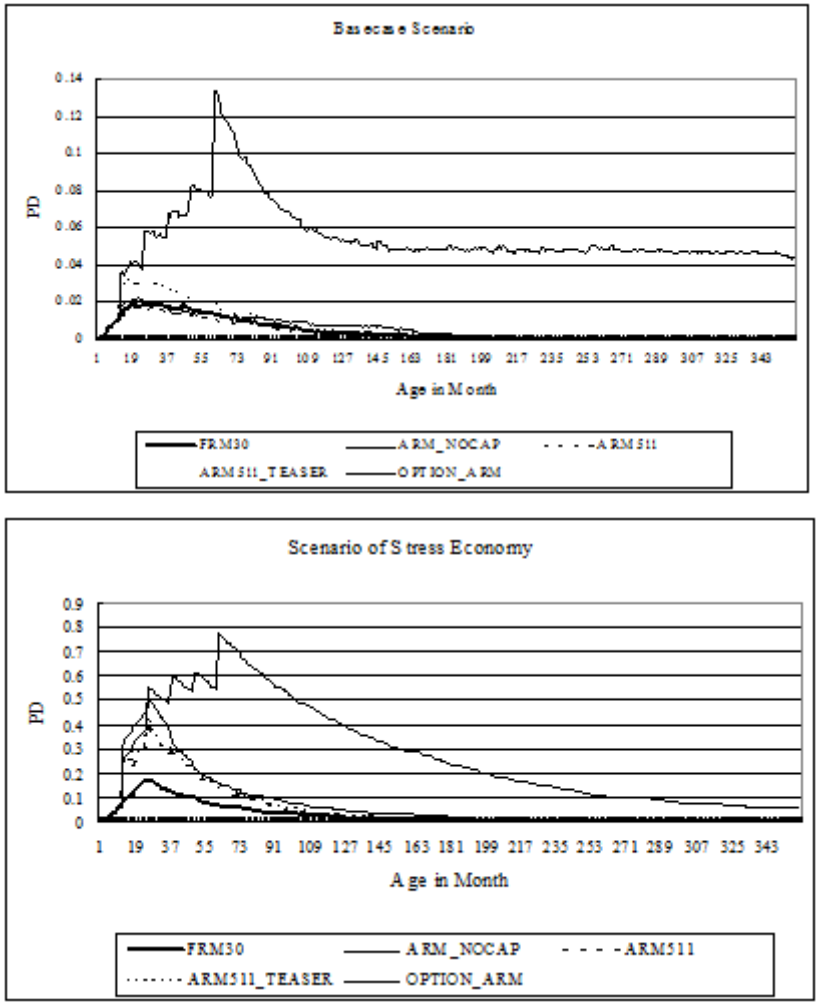
Table 2.

	Prime MBS	Subprime ABS
Collateral	About 90% being backed by two types of mortgage loans – 15-yr FRM and 30-yr FRM (the "plain vanilla" loans); Most with no prepay penalty; Recent surge of Low-/No-Doc loans (NINA/SISA/etc.)	About 90% being backed by ARM or Hybrid mortgage products (e.g., 2/28 ARM, Option ARM, IO-ARM); "Teaser rates" in the initial years; Heavy concentration of Low-/No-Doc loans (about 50% in total origination in recent years)
Structure	Pass-Through (by GSEs), CMO (Collateralized Mortgage Obligation), and Stripped MBS (IO-PO); Structuring to control the prepayment risk (via various CMO types, e.g., Sequential-Pay, Planned Amortization Classes or PAC, and Target Amortization Classes or TAC)	CDO and CDO-squared with the Senior, Mezzanine, and Junior tanches; Structuring and "sizing" decisions to control the credit risk; Tranch-level bond ratings as the key market-maker
Risk Manage-ment	Credit risk: External Credit Enhancement via public and private mortgage insurance and GSEs' default risk guarantee; Insurance premiums charged for high-risk loans, either in loan-level or in pool-level ("pseudo market price" for the insurance premia as they are determined by the competition among insurance providers Prepay risk: PSA multiples as an ex ante risk indicator at issuance; Option Adjusted Spread (OAS)[2] as the industry-wide measurement tool for relative values of CMO tranches (since 1986 when Salomon Brothers first introduced the measure); Interest rate swap, option, and cap being used as hedging tools; Monthly disclosure by MBS issuers on pool characteristics	Credit risk: Internal Credit Enhancement via structuring (i.e., sizing the credit tranches); ABX, the market index of credit risk embedded in CDO tranches, created in January 2006 by a consortium among CDO issuers (issued every six month, but the January 2008 index being postponed); Attempt made to establish Credit- OAS to measure relative values (or risk-adjusted returns) of CDO tranches (but a wide variation in the forward-looking home price distributions assumed); CDS used to hedge tail-event credit losses Prepay risk: Controlled by the prepayment penalty on the collateral

Several Lessons & Questions To Be Discussed

- Mortgage as a bundle of 3 inter-related financial assets: Scheduled P&I payment; Option to default; & Option to prepay
- Securitizing FRM vs. ARM:
  - Prime MBS being mostly backed “plain vanilla” FRMs
  - Was the subprime market ready to secrutize ARMs with such a rapid market expansion?
  - Why securitize ARMs in the first place?
- Internal vs. External Credit Enhancement:
  - Which is a better insurance vehicle?
  - Real issue being, who has the edge in managing the mortgage credit?
  - The state-of-the-art credit models lagging those used for the market risk management
- Pricing Method: “Mark-to-market” vs. “Mark-to-model”
  - “Relative values” & OAS (Option Adjusted Spread) used in the prime MBS
  - Lack of similar market-makers & the incentive problems in the subprime market

Among ARMs, Option ARMs are shown to be most risky, as expected.



- From Yang, Lin and Cho (2007), who simulated three economic variables – HP, interest rate, and household income – to estimate forward-looking PD, PnegQ, and PSHORT
- Results showing that, while FRM is the most safe product, Option ARM defeats all other products, reaching to 70% PD at the time of stress economy
- ARMs with a cap structure (e.g., 5/2/2) shown to mitigate the default risk, especially under the stress economy

Policy Implications to Korea:

On Mortgage Design, Funding, & Credit Enhancement

Korea as one of the fastest MDO growth country in the world

	1996	1997	1998	2000	2001	2004	2006	2007 (May
A. Mortgage Debt Outstanding (M	36.4	43.3	44.2	51.5	93.9	240.2	298.8	302.4
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
Total MDO, Private Lenders	18.2	22.7	20.8	22.3	86.4	222.6	276.7	279.8
	(50.0)	(52.4)	(47.0)	(43.3)	(92.0)	(92.7)	(92.6)	(92.5)
Commercial Banks	14.9	16.7	16.4	20.3	86.4	169.7	217	217
	(41.0)	(38.6)	(37.0)	(39.4)	(92.0)	(70.6)	(72.6)	(71.8)
Non-Bank Financial Institution	3.3	6.0	4.4	2.0	–	36.9	43.2	45.4
	(9.0)	(13.9)	(10.0)	(3.9)	–	(15.4)	(14.5)	(15.0)
Insurance Companies[b]	–	–	–	–	–	12.2	14.3	15.3
	–	–	–	–	–	(5.1)	(4.8)	(5.1)
Mutual Savings Banks	–	–	–	–	–	3.8	2.2	2.1
	–	–	–	–	–	(1.6)	(0.7)	(0.7)
Total MDO, Government Agenc	18.2	20.6	23.4	29.2	7.5	17.6	22.1	22.6
	(50.0)	(47.6)	(53.0)	(56.7)	(8.0)	(7.3)	(7.4)	(7.5)
National Housing Fund[c]	18.2	20.6	23.4	29.2	7.5	14.7	15.7	16.2
	(50.0)	(47.6)	(53.0)	(56.7)	(8.0)	(6.1)	(5.3)	(5.4)
Korea Housing Finance Corp.	–	–	–	–	–	2.9	6.4	6.4
						(1.2)	(2.1)	(2.1)
B. Total Consumer Debt	151.0	185.0	165.8	241.1	303.5	449.4	550.4	550.4
C. GDP (Nominal)	448.6	491.1	484.1	578.7	622.1	779.4	847.9	847.9
B/C	(33.7)	(37.7)	(34.3)	(41.7)	(48.8)	(57.7)	(64.9)	(64.9)
A/B	(24.1)	(23.2)	(26.7)	(21.6)	(30.9)	(53.4)	(54.3)	(54.9)
A/C	(8.1)	(8.7)	(9.1)	(9.0)	(15.1)	(30.8)	(35.2)	(35.7)

Source: Bank of Korea; Kim (2003) and Lee (2002)

But several growing pains being observed

- High ARM share: Over 95% of all mortgage loans originated being ARMs indexed to the short-term rate; Possibility of a payment shock when rising inflation and the short-term rates; “3-year rollover-over ARMs” as a particularly risky product to monitor
- Deposit- and CD-based funding: Funding source predominantly being bank deposits or short-term CD, with the MBS funding only about 2%; Potentially an unstable and risky funding source
- Rising leverage in home purchase leading to a rapid HP growth: Mortgage lending often viewed as a source of “speculative” home purchase, and potentially leading to a HP hike, in the face of low level of housing supply (see the next slide); Chonsei being used as a leverage-enhancing mechanism; Leading to a blanket lending restriction
- Three policy issues being explored: (1) mortgage product design for income-/wealth-constrained consumers, (2) funding mode (deposit vs. MBS vs. CB), (3) credit enhancement vehicles

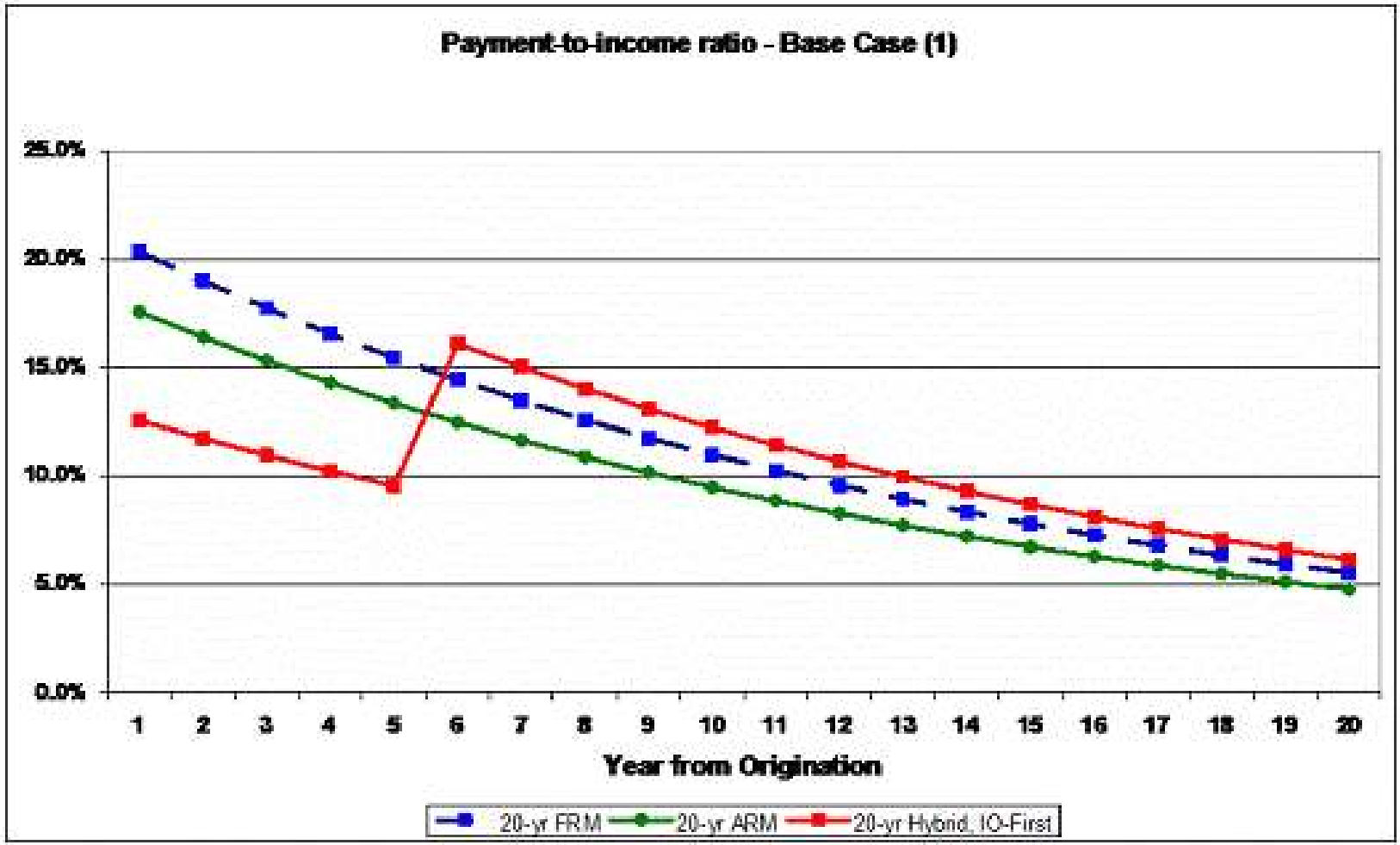
Issue #1: Mortgage Product Design

- FRM is a sub-optimal contract for lenders due to the changing asset value over time; But it can be a welfare-enhancing product for those borrowers who purchase large (expensive) homes relative to their income (Campbell and Cocco (2003))

- In reality, however, ARM is preferred by the borrowing-constrained consumers due to its initial low payment burden, despite the risk of rising payments over time; These are referred to as the problem of consumer myopia and the "tilt" problem for FRM (Miles (2004) and (2007))

- What mortgage contracts will fit best in the Korean context, in alleviating the initial payment burden yet protecting consumers from payment shock? Hybid ARM with a cap structure (e.g., 5/1 ARM with 5/2/2 cap structure)? Shared-Equity Mortgage? With no prepay penalty?

“Tilt” or “front-load” problem for FRM, compared to ARMs



Issue #2: Mode of Funding - MBS vs. CB

- Both MBS and CB (Covered Bond) can be effective ways to enhance the liquidity, and to ensure a stable funding, in the mortgage market; CB is recently gaining a popularity among EU countries (see the next slide); What would be pros and cons for each funding mode in the Korean context?
- But there are several important differences between the two funding modes:
  - Specialization in the mortgage banking functions (the unbundled model for MBS, which can result in the principal-agent problem)
  - Capital arbitrage (yes for MBS, no for CB (on-balance-sheet funding)
  - Information asymmetry between lenders and investors (Tranched MBS can mitigate this, as argued by Oldfield (2000), DeMarzo (2005), Downing, Jaffee and Wallace (2005))

Rising CB (Covered Bond) issuance among EU countries

Total Covered Bonds Outstanding, € million

	2000	2001	2002	2003	2004	2005
Denmark	165,862	193,980	202,678	226,164	249,728	286,238
Germany	247,484	255,873	261,165	259,199	249,848	237,547
Spain	11,539	14,328	25,266	58,448	96,083	157,663
Sweden	75,060	65,294	70,865	81,569	81,428	92,808
France	47,701	43,006	44,351	21,079	26,816	32,133
UK	n/a	n/a	n/a	5,000	15,668	25,439
Hungary	n/a	n/a	n/a	3,622	4,962	5,072
Ireland	n/a	n/a	n/a	n/a	2,000	4,140
Poland	n/a	n/a	99	183	223	558
Latvia	8	14	30	36	54	40
Lithuania	n/a	n/a	n/a	n/a	14	14

Source: European Mortgage Federation National Experts; National Central Banks; OECD

Issue #3: Mortgage Insurance (MI) – Public vs. Private

- Constraining effect of the current LTV limits (60% for the banks and 70% for the KHFC loans): 85% of the FRM borrowers having LTV between 50-70% (Figure 7); Also, LTV as a less significant loss indicator than in US due to the borrower recourse in Korea (similar to UK)
- Two private MI providers recently being approved for their operation in Korea (Genworth & Seoul GI-AIG); Do we also need a public MI provider, such as FHA in the US? And how high the LTV limit can go? 85%? 90%? 95%?
- Only Italy and Spain are those (among 15 countries surveyed by KHFC (2005)) that have only private MI programs, while all other either have both or only public MI programs
- Hong Kong Mortgage Corporation's (HKMC) case would be a good benchmark: Bing created in 1997 with the mission to increase the home ownership in HK to 70% within 10 years, HKMC established an MI program with private sector institutions, which helped the LTV limit from the initial 70% to the current 95%

IV. Q&A&D