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# **The Danish mortgage system offers some practical tools for the GSEs**

Center for Study of Responsive Law

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## **Background: failure of the shadow banking system**

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### **1. Many problems led to the current situation, including**

- Systematic poor underwriting of credit risk due to improper incentives (e.g., originators often not “on the hook” for any portion of credit risk)
- GSE business model based on positive returns accruing to the private sector with downside risk held by the government (*heads we win, tails you lose*)
- Lax evaluation of risks and excessive demand for poorly designed securities
- Basle II allowed for doubling of leverage at the peak of the credit bubble

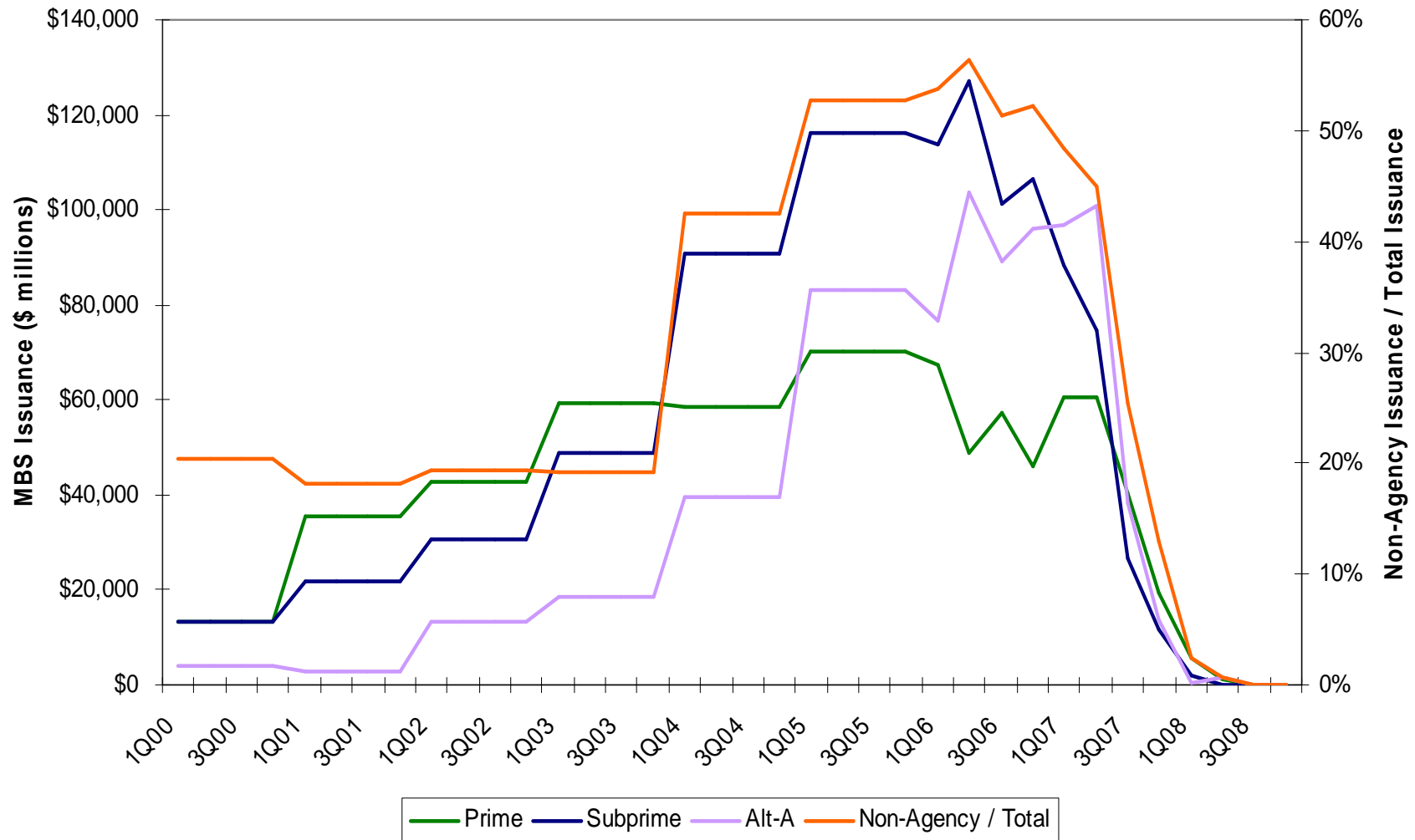
### **2. The old system is GONE, replaced by one of accidental design**

- Over 95% new mortgages have government guarantee
- Fannie and Freddie are de facto nationalized, yet act to maximize profits
- Competitive shadow banking system replaced by oligopolistic TBTF banks

### **3. Recent reforms face complex obstacles**

- Worsening economic fundamentals greatly exacerbate foreclosures and HPI
- Regulators are multiple, overlapping and uncoordinated
- GSE and TBTF bank behavior has defeated both FPP and HAMP
- TARP funds have been significantly depleted

# U.S. non-agency MBS market died in 2007



Note: 2000-2005 assumed straight-line for quarterly comparison

## **A successful GSE reform**

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### **1. Lowers mortgage interest rates**

- Key to preventing overshooting on the downside of housing prices
- Needs to be available to full range of borrowers, not just high FICO, high down-payment borrowers that currently qualify for agency mortgages

### **2. Limits foreclosures by reducing number of homes with negative equity**

- Negative equity must be addressed first as it is the best way to limit foreclosures
- Policies must address issues of fairness and homeowners who have no realistic way to afford current home
- Must be done in a way that encourages labor mobility and minimizes the “lock-in” effect

### **3. Puts the system moving forward on a sound basis with well-aligned incentives.**

- Advisors to homeowners (brokers and mortgage bankers) should evaluate and share credit risk
- Bond-holders should manage interest rate risk over time
- Bond market structure allows for effective and systemic deleveraging when nominal interest rates rise

## **This is a unique opportunity to “get it right”**

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- 1. The GSEs should be transformed into mortgage guarantee vehicles only**
  - Fannie/Freddie should be merged and eventually the portfolios should be run off
  - Frannie Mac should establish a Principle of Balance (PoB) guarantor program
- 2. Credit risk allocation to be shared between originator and federal guarantor**
  - Originator should retain 10% first loss risk position
  - Margin between loan rate and bond should NOT be capitalized, instead earned over time
- 3. Borrower gets a market rate based on transparent bond pricing**
  - Bonds are tap issued on a daily basis
  - Loan is cancelable at the lower of the market price or par – the Principle of Balance
  - New loans will have full recourse, enforced by an agency of the U.S. Treasury Department
- 4. A unitary financial regulator should be established to and be empowered to:**
  - Remove bad loans, bad brokers and bad borrowers from the system
  - Raise capital and reporting requirements as deemed necessary
  - Lower LTV ratios and/or raise credit scores as deemed necessary
  - Raise margins for borrowers if ex post credit costs prove to be higher than expected
  - FDIC, FHFA, FRB, OCC, OTS and NCUA must cede regulatory authority

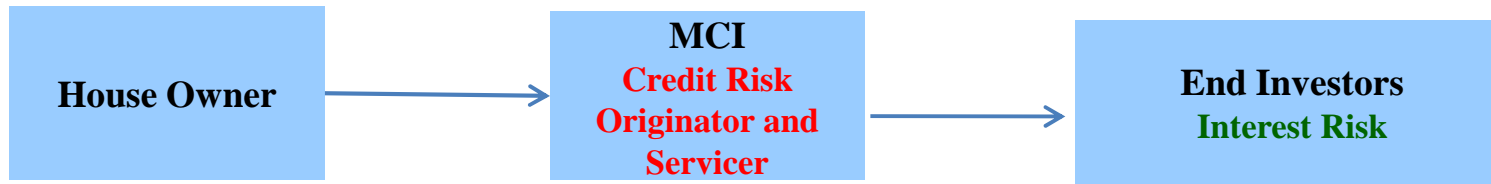
# Lowering interest rates, reducing negative equity

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1. **Lower interest rates through new or expanded government guarantee programs**
  - Super streamlined refinance should waive all requirements except one -- the borrower must be current on their existing mortgage, no appraisal required.
  - The GSEs should not be charging additional fees for loans they already guarantee.
  - The GSEs should refinance current non-agency loans at reduced fees.
  - Loan size limit should be \$729,750, going up to 130% of this limit in high cost areas.
2. **Consider modifying mortgages so that homeowners have at least 10% positive equity in their homes at current valuations based on an Automated Valuation Model (AVM).**
  - The conversion of mortgages could be systemic, enforced on the owners of mortgage securities. Servicing companies would be fully indemnified.
  - The losses from the write-down of principal would be borne by the bond holders.
  - These losses should be treated as full tax credits, counted as Tier I capital and allowed to be used to offset TARP capital injections. The tax credits should be non-transferable.
3. **As a matter of equity, homeowners with written-down mortgages would be subject to higher taxes**
  - Principal reduction will count against taxpayer's \$500,000 exemption from capital gains
  - Reduction of capital gain exemption will last for 10 years and apply to the gain from the sale of any residential real estate, not just the home associated with the principal reduction

## How the system could be fixed by emulating Denmark

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1. **Mortgage Credit Institutions (MCIs)** are required to retain credit risk and service the loans
  - Bond investors only retain interest risk rather than credit and interest risk
  - MCIs can participate on equal terms, subject to rigorous regulatory requirements
  - MCIs act as “liability advisors” to homeowners, seeking to put their customers into the lowest risk adjusted cost loans AND seeking to take advantage of temporary dislocations in the bond market that may allow for an NPV gain for the borrower
2. Mortgage is funded by the issuance of standardized bonds
  - Bond market deals with familiar and hedgeable risks: level of rates, slope and curvature of yield curve, interest rate volatility, financing and counterparty selection
3. Asymmetric nature of American mortgages is replaced by the Danish Principle of Balance

**Principle of Balance: Borrowers can retire their mortgages by paying the lower of par or by purchasing the bond at the current market price**

# The “Best” Model for Mortgage Markets

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## 1. Optimized to Basle II risk capital guidelines

- Article 22.4 of UCITS directive
- Lowest risk capital weighting will rule the roost
- Capital is required for credit, operations, technology, counter parties, liquidity and roll risks and interest rate movements
- Central Bank “repo-ability” provides liquidity(see Fed and ECB)

## 2. What should be avoided

- Extra Balance Sheets are unnecessary and a source of risk
- Deposit based systems are fraught with risks in volatile rate scenarios
- Inflexible Bond based systems do not scale up

## 3. Other Stakeholders should have a voice

- Consumers and bondholders should choose the winner
- Standardized and transparent loans and bonds are the easiest to regulate
- System should have macro economic stabilizers built in so taxpayers are not at risk



# US vs Danish MBS: Differences

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## 1. The Plumbing

- Transparency of loans to bonds and information search costs
- Regulatory and Ratings Issues
- Credit, Delinquency and Foreclosure Issues
- Legal form of covered bond vs. true sale securitization

## 2. Vertical integration or atomization of skills

- Separate origination, financing, securitization, trading, investing, servicing, master servicing and special servicing functions)
- Conflict of interest between bond holders and issuers/insurers
- Mortgage insurance through balance sheet or monoline providers

## 3. The positive externalities that come from the Principal of Balance

- Externalities through linkage mechanism to Capital Markets
- Premium vs. Discount Origination (page 13)
- Socialization of Credit Risk or Credit Availability

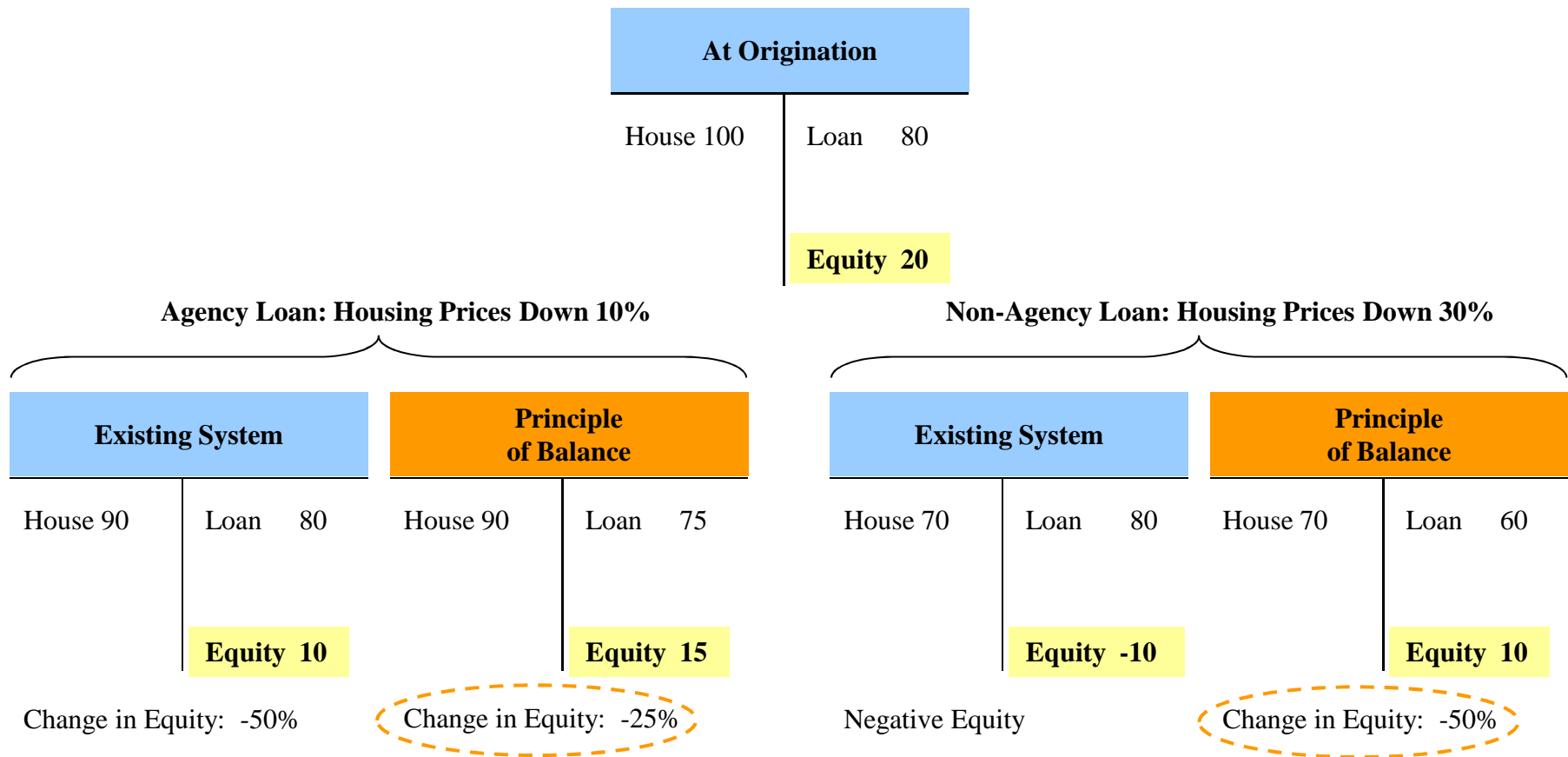
## **Danish System: High Credit Quality**

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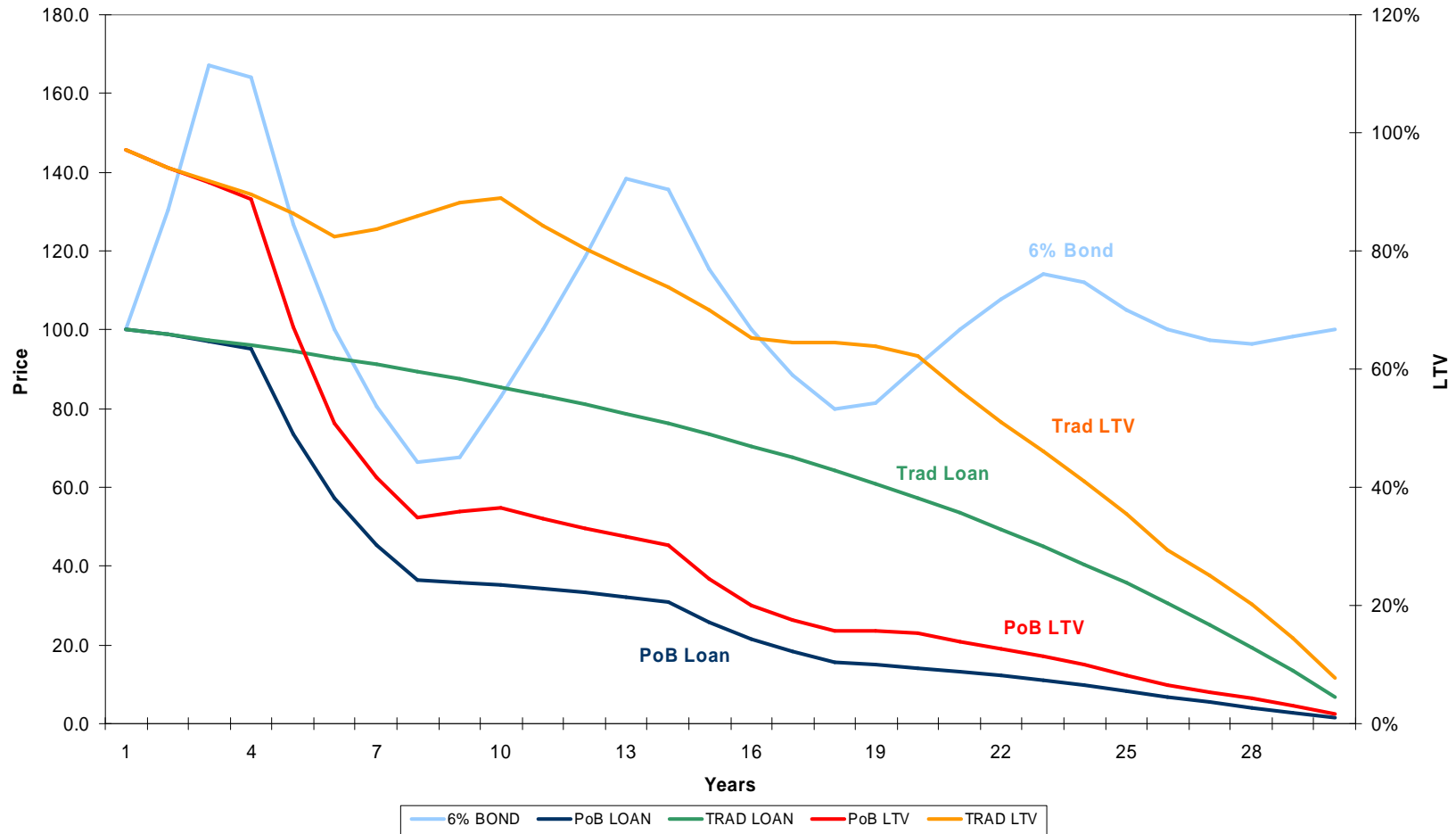
- 1. Danish MCI's have implicit government backing through strong regulation**
  - Mortgage Credit Act
  - Danish Financial Supervisory Authority / Finanstilsynet
  - Danmarks Nationalbank
  - Denmark's commitment to full recourse
- 2. High Credit Quality**
  - AAA ratings from Fitch, Moodys and S&P
  - There has never been a default
  - Principle of balance preserves homeowner equity (see slide 11)
  - Late 80's housing collapse showed system's strengths (see slide 16)
- 3. Growing international acceptance**
  - Highly favorable comparison to other European models
    - See MOW's September 2003 report
    - See BIS March 2004 Quarterly Review
    - See IMF 2006 Financial Stability Report
  - Danish system has been copied by Chile, Mexico, and Norway
  - Countries working on Danish system include Japan, South Africa, Ghana, United Arab Emirates, Azerbaijan and Nicaragua

# Choice of securitization model can reduce negative equity

- Typical homeowner scenario:
  - Borrower pays \$100,000 for a house with an 80% LTV, loan originated at par
  - Agency Loan, housing prices have fallen 10% and FN 5% mortgage bond prices have fallen to 94
  - Non-Agency Loan, housing prices have fallen 30% and mortgage bond prices have fallen to 75

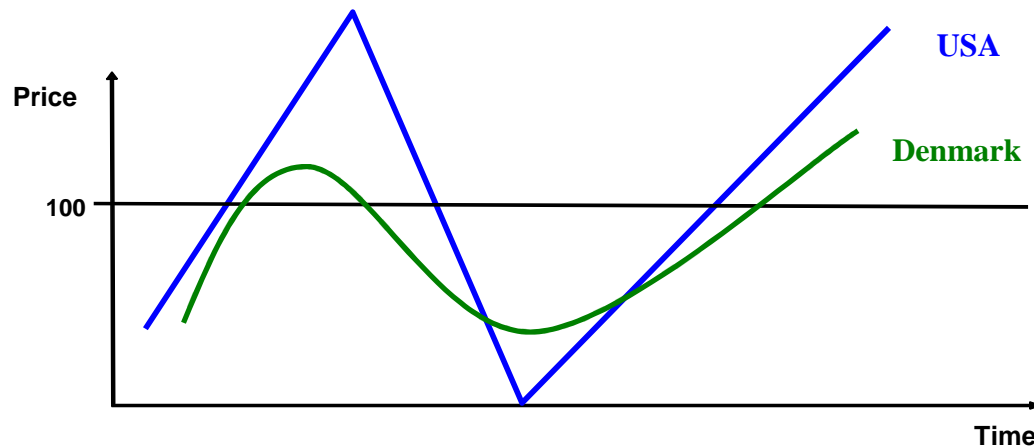


# Credit quality of borrower improves



- Simulated changes in LTV based upon typical interest rate cycle
- Both Traditional loan and PoB loan refinance when interest rates fall 100 bp
- PoB loan balance principle buyback when rates rise 100 bp

# Securitization choice can reduce interest rate volatility

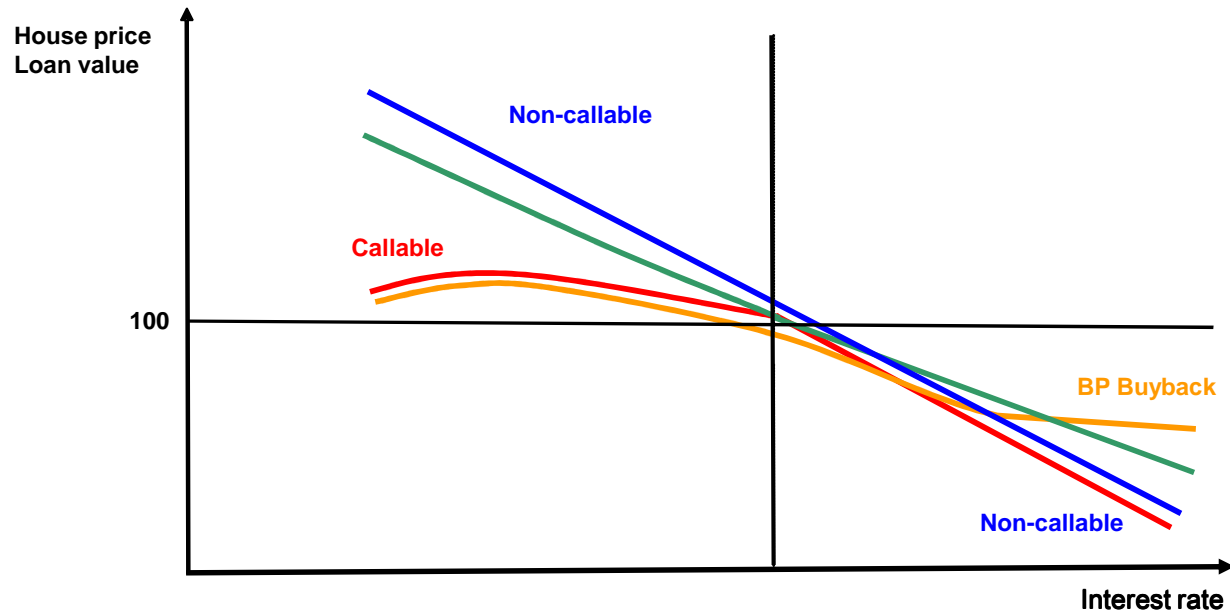


- U.S. mortgage market is a “premium origination” model. This opaque process is used to get the bond market to pay loan origination costs
- Callable loans are made with option struck in the money. This leads to the OAD “illusion” of very low durations of 30 year mortgages
- When interest rates rise, “contingent duration” appears and can be a multiple of original OAD
- No mechanism for the bond market to reduce systemic duration risk
- Danish model is a “discount origination” model
- Loans are priced transparently by bond issuance
- Mortgage banks compete with transparent origination, servicing and insurance charges
- Callable loans are made with option struck out of the money. Thus, 30 year mortgages have significant duration at issue
- When interest rates rise, the duration of the loans increases slightly
- Homeowners can take duration out of the system via optional redemption and refinancing a smaller balance into a higher coupon loan. Call option is re-struck at market rates

Option Adjusted Duration (Years)

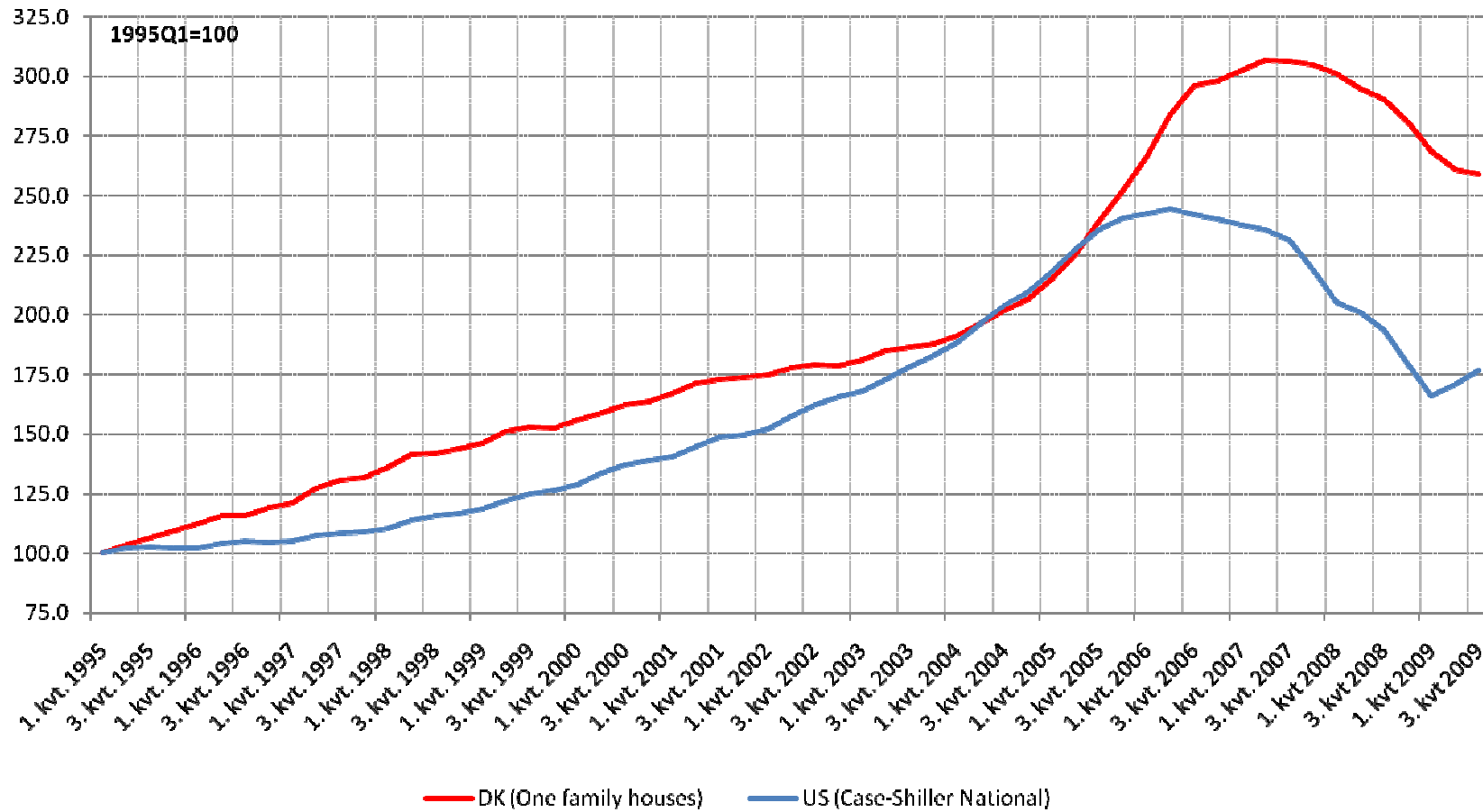
	USA (orig. @ 101.6)			DK (orig. @ 98.9)		
	<u>5.5%</u>	<u>4.5%</u>	<u>3.5%</u>	<u>5%</u>	<u>4%</u>	<u>3%</u>
Rates – 100bp	---	(0.8)	3.6	---	.28	8
Spot	---	2.5	---	---	6.9	---
Rates +100bp	n/a	7.4	---	5.5	7.5	---

## Securitization choice can improve negative convexity



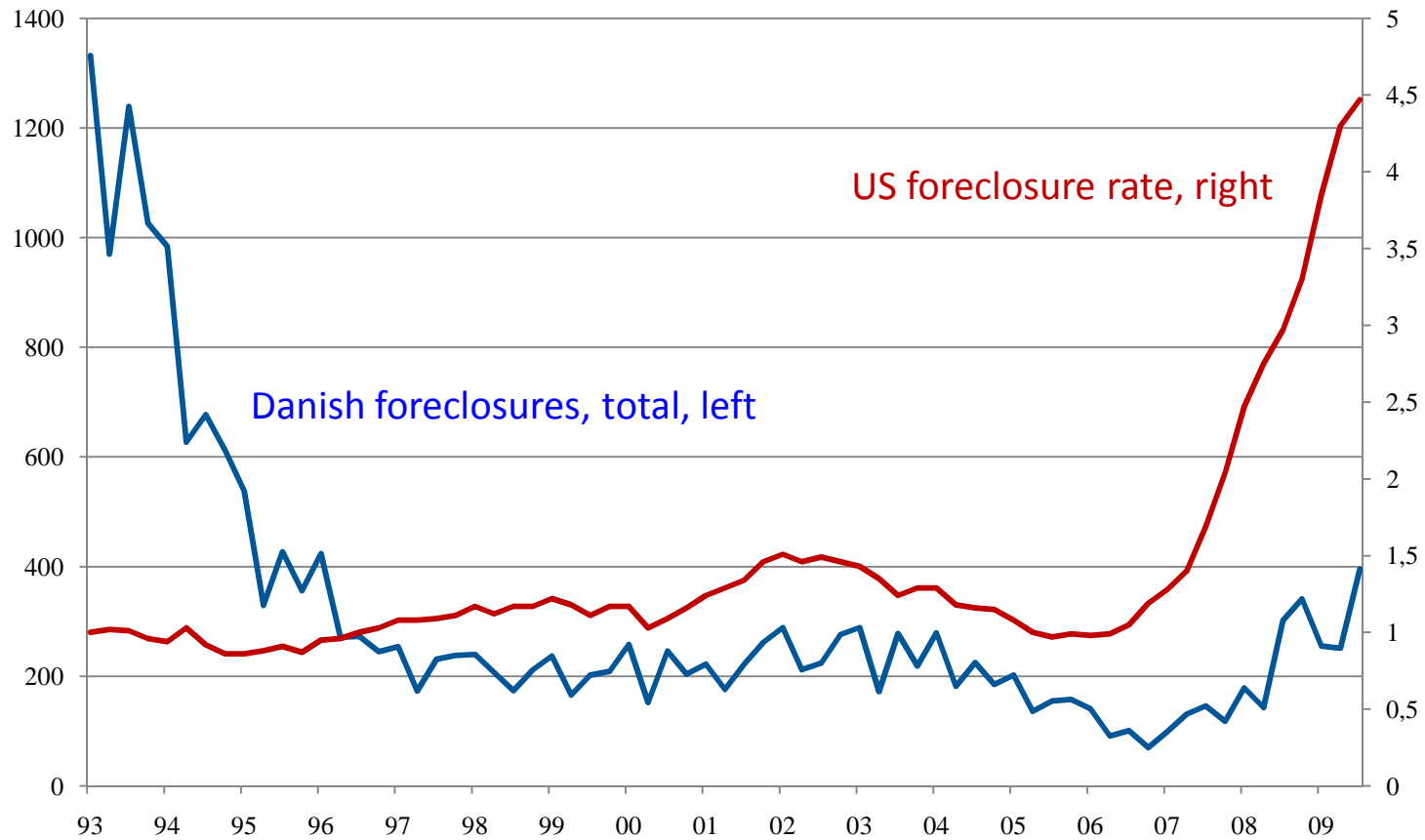
- Callable mortgage markets suffer from “convexity paradox” where each investor must hedge his own changes in OAD as well as worry about all the other investors trying to hedge changes in OAD. This becomes an exercise in game theory, as investors hedge to the expectation of other investors’ hedge activity
- Individual investors (and system) worry about change in partial durations ( $dP/dY$ ) and the size of the error term at every point on the expected callable mortgage price/yield path vs. the original hedge duration
- Duration management tools (interest rate futures, swaps and options) are smaller than the mortgage market
- Asymmetric U.S. mortgage market results in significant duration extension when interest rates rise
- Danish mortgages allow for homeowner to exercise optional redemption when bonds trade at discounts. This smoothes the price path when rates rise. The mortgages trade with lower “empirical” duration. This allows for a lower “hedge duration” at loan origination AND smaller error terms at each point on the price/yield path

# Denmark experienced a larger housing bubble...



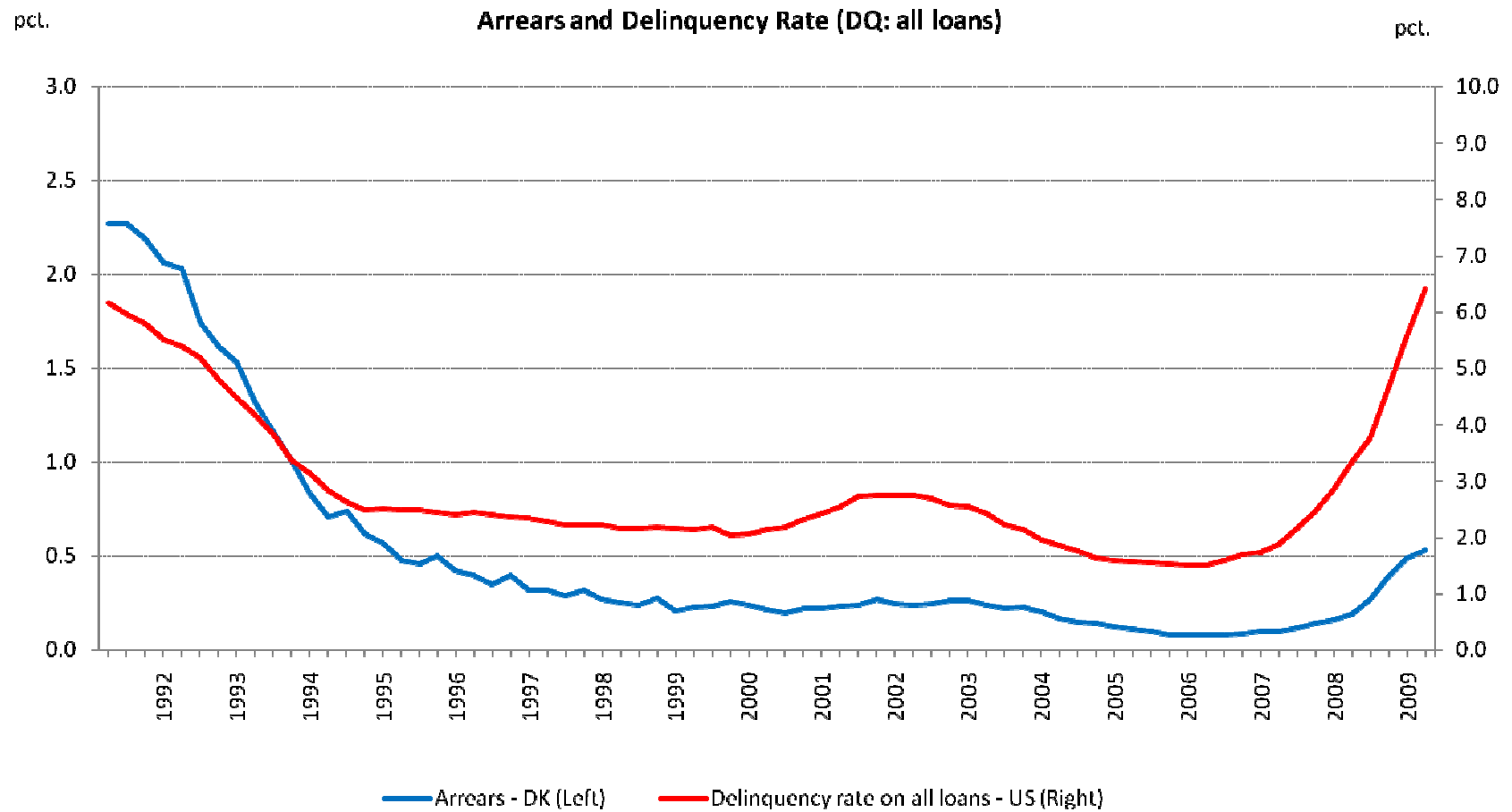
# US experiences higher total foreclosure rates

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# Loans in arrears – small in DK relative to US



# Fully transparent: real time information on each series

**Bonds Denmark**

Search Danish bonds  
 Search: name/ISIN-code:

Bond type  Benchmark bonds  Mortgage credit and special institutions  Government bonds  Structured bonds  Corporate and other bonds  Forwards

Issuers

Coupon/Expiry

Interest rate type  Fixed  Year of expiry

Deferred amortisation  Yes  2009

Open / Closed  Open  2010

2011

2012

2013

2014

2015

2016

2017

2018

2019

2020

2021

2023

2025

2026

2028

2029

2031

2032

2033

2035

2037

2038

2041

Name	ISIN	Coupon	B	Volume	Exp.	CCY
<a href="#">10DLR43.18</a>	DK0006304035	10.00		227	2019-02-01	DKK
<a href="#">6BRF111.26</a>	DK0009334575	6.00		109,041	2026-10-01	DKK
<a href="#">7NYK 03A.32</a>	DK0009750010	7.00		391,516	2032-07-01	DKK
<a href="#">8NYK 3Cs26</a>	DK0009726309	8.00		4,654,792	2026-10-01	DKK
<a href="#">6 D 23ds35</a>	DK0009268765	6.00		100,000	2033-07-01	DKK
<a href="#">4 KBH13.14</a>	DK0007200703	4.00		20,000	2014-01-01	DKK
<a href="#">6nyk03D 35</a>	DK0009753386	6.00		340,000	2033-07-01	DKK
<a href="#">5NYK2C 19</a>	DK0009745796	5.00		173,899	2019-10-01	DKK
<a href="#">5TK111Cs32</a>	DK0004713807	5.00		1,687,692	2032-07-01	DKK

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[iPI %](#) | [OMX Stockholm 30 Index OMXS30 %](#) | [OMX Helsinki Energy\\_PI HX10PI %](#) | [OMX Helsinki 25 OMXH25 %](#) | [OMX Iceland All-Share PI OMXIPI %](#) | [OMX Icela](#)

Price information
Fundamentals
Trades
News

**Today (2009-03-20) - 5% Hykredit 03D 2038 - DK0009763260**

Last	Bid	High	97.080	Exchange Volume	262.583.230	Average price all trades	96.803
97.000	Ask	Low	96.725	Number of exchange trades	37		
<span style="color: green;">↑</span> 0.23							

**Price information for 2009-03-19**

Open price	97.050
Close price	96.775
Average price exchange	96.851
Average price all trades	
High	97.075
Low	96.550
Duration	10.57
Yield	5.41
Yield calculation price	96.798
Exchange volume	38.539.243
Number of exchange trades	40

**Price graph** **12M graph**

[Intraday](#)   [5d](#)   [1M](#)   [3M](#)   [6M](#)   [12M](#)   [24M](#)

Nordic Market
English

**Price definition for bonds**

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**Historical price information**

From

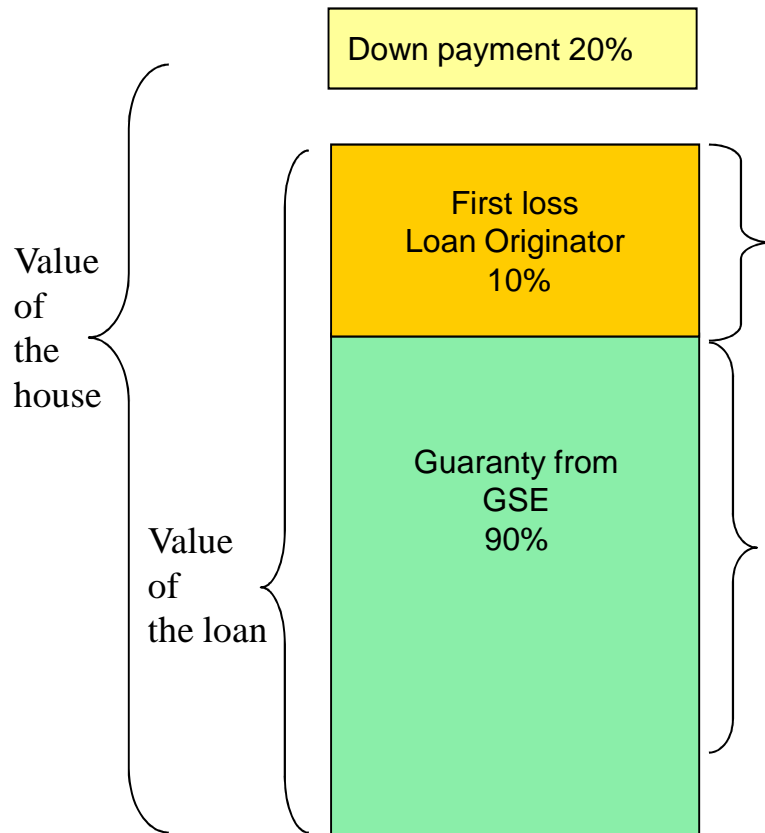
# And access to news

The screenshot displays the NASDAQ OMX website interface. At the top, there are navigation tabs for 'Nordic', 'Baltic', and 'First North', along with a search bar and links for 'Exchange info' and 'Give Feedback'. Below this is a main navigation menu with options like 'Home', 'Shares', 'Indexes', 'Bonds', 'Options & futures', 'Warrants', 'Certificates', 'Funds', 'News', and 'Historical prices'. A secondary menu lists various market indices such as 'OMX Helsinki Energy\_PI HX10PI', 'OMX Helsinki 25 OMXH25', etc.

The main content area is divided into several sections:

- Price information:** A table showing market data for 'Today (2009-03-20) - 5% Nykredit 03D 2038 - DK0009763260'. The table includes columns for 'Last', 'Bid', 'High', 'Exchange Volume', 'Average price all trades', 'Ask', 'Low', and 'Number of exchange trades'. The last price is 97.000, and there is a change of +0.23.
- Search news:** A search form with 'From' and 'To' date pickers, a 'Hits' dropdown set to 25, and a 'Search' button.
- News List:** A table with columns 'Datetime' and 'Subject'. It lists several news items from Nykredit Realkredit A/S, including company announcements, interest rate adjustments, and prospectus information.
- Price definition for bonds:** A section with a 'Download document here' link.
- Sponsored Links:** A list of advertisements including 'Is Your Bank In Trouble?', 'Bond Search Online', 'Buy Muni Bonds Online', 'Fixed Income Investments', and 'Corporate Bonds'.

# Proposed credit enhancement structure for risk sharing



- Provided by Originator and/or MI industry
- Expected Capital reserves of 20%
- Backup capital and industry skill to be provided by MI Reinsurance Industry
- AAA rating flows from GSE guarantee, which
- The value of the house will serve as collateral
- Bond holder looks to GSE for full faith and credit guaranty
- GSE looks to Originator to remove bad loans from the pool
  - Originator purchases parri passu amount of bonds from pool at lower of market or par
  - If originator fails to perform, GSE can seize servicing rights and margin and reassign to another servicer
- This can be done in the form of either true sale securitization or through the issuance of covered bonds

# Tap issuance: Back to the Future

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## 1. How it works

- Reverse the traditional process, first establish bond series then issue mortgages
- After the MCI underwrites and guarantees the creditworthiness of the borrower, the loans are funded by selling into the bond series
- Borrower receives proceeds from bond sale, thus establishing a direct link with the bond market and allowing for optional redemption in the future

## 2. Reduces Risks

- Warehouse and market risks are eliminated for MCI, allowing them to use their entire equity to guarantee credit risk
- Elimination of all interest rate risks leads to significant reduction in economic and operational capital under Basle II regulations

## 3. The USA has done this before

- Freddie Mac Cash Series (old 16 and 17 prefix bonds) was quite successful
- Loans entering the cash window were priced at a daily auction
- Pools were open for tap issuance for one month
- Large, standardized, liquid bonds were created
- Main MBS issuance program in the 1980s, eliminated when FHLMC started running an opportunistic portfolio

# Fed Purchase Program vs. Danish Alternative Redemption

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## 1. The FPP was a dismal failure for American homeowners

- The market is realizing that the Fed cannot suppress mortgage rates in perpetuity.
- Evidence that most troubled borrowers are unable to qualify for refinancing even at today's record low mortgage rates makes its current program extremely unattractive/untenable from a cost/benefit standpoint. (see Appendix 1)

## 2. Large financial institutions were able to make the FPP work for them

- Too Big to Fail Banks have exercised oligopolistic power to increase profit margins
- GSEs are attempting to recapitalize themselves with large LLPA (upfront fees)
- Large money managers were able to sell mortgage securities to the government at inflated prices. They have managed to transfer duration risk, default risk, and liquidity risk all at once at a time when interest rates could start rising
- The direct cost of the program, measured by the amount the government is overpaying for the assets, is roughly \$100 billion.

## 3. There is hope

- The second largest mortgage market (Denmark) in the world suffers from none of these issues
- The Danish system allows for automatic market based de-levering.
- Denmark was only non-sovereign European bond market to remain open in October 2008
- The Danish mortgage system required very little assistance from fiscal and monetary authorities (see Appendix 4)

## Extension Risk of Mortgage Market

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- 1. The implications of these low levels of refinancing activity at historically low mortgage rates is**
  - Extension risk in the mortgage market is vastly underestimated
  - The FPP has failed in its primary purpose
  - The homeowners who need the most help, those with declining credit and home values, are the least likely to be able to refinance into a lower rate mortgage
- 2. The shape of the yield curve is the primary determinant of mortgage duration.** Without taking into account slower than expected prepayments, the interest rate risk of the US mortgage market has doubled in the last three years
  - Increasing slope of the yield curve
  - Increased actual and implied volatility in the interest rate options market
  - Dramatic decline in the amount and market share of ARMs
- 3. We are faced with the dark side of the conundrum,** even though we now recognize the huge risks associated with callable/extendable mortgage cash flows, we are powerless to do anything about them.
  - The increase in duration of the mortgage market in the last three years is triple the increase in interest rate risk due to the \$1.5 trillion US budget deficit in fiscal year 2009.
  - A moderate increase in the level and slope of the yield curve in today's bond market can result in an overwhelming duration extension, a much larger threat to rising real interest rates than larger budget deficits and/or Chinese selling of reserves.



## **We should “get it right” before it is too late**

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### **1. There are many sources of pressure on long term interest rates**

- Historic budget deficits (over \$1t) for many years
- Fear of FRB’s monetization of such debt and easy monetary policy
- Potential sale of foreign ownership of US debt instruments (\$10t)
- Enormous contingent duration embedded in the \$10.4t US mortgage system

### **2. The perfect opportunity exists to address the GSEs**

- Mortgage rates are at all time lows allowing for excellent rate refinancing opportunity
- The US Government is the “single payer” for the mortgage market

### **3. Principle of Balance system allows for automatic de-levering**

- As interest rates rise, the economic value of homeowners’ liability falls
- Homeowner’s are incentivized to redeem their existing loans at discounts, paying for this by issuing into new, smaller balance loans with higher coupons
- Face amount of debt is significantly reduced
- Weight of debt (calculated as Option Adjusted Duration) is significantly reduced

### **4. Waiting is not an option**

- Moderate increases in the level and slope of interest rates can result in overwhelming duration extension, many multiples of the risk from large deficits or foreign selling
- US homeowners are already suffering from “lock-in” effects

## **Some Near Term Proposals**

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### **1. Require FHFA to direct GSEs to use all tools available**

- Eliminate LLPAs for the refinance of ALL loans currently guaranteed by the GSEs
- Eliminate the 25bp “Adverse Market Fee”
- Eliminate appraisal requirement and paperwork as part of a new “Super-Streamlined” refinance program
- Requirements: being current on existing mortgage and full recourse on new loan

### **2. GSEs should implement new securitization program: Principle of Balance**

- Enable pooling which allows for optional redemption
- Provide guidance on future information disclosure requirements
- Discourage the ex-post opportunistic practice of culling through loan production to find loans that display preferred prepayment characteristics
- Encourage originator/securitizers to retain some “skin in the game” via significantly reduced G-fees

### **3. Promote benefits of Mortgage Servicing Rights**

- Eliminate regulatory limits on scale of holdings (see Appendix 3)
- Encourage retention of MSR as way to reduce interest rate risk and hedge credit risk
- Eliminate “gain on sale” accounting treatment, require income to be accrued

## **Some more proposals**

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### **1. Align the GSEs interests with those of society**

- Simplify and limit the size of financial businesses, starting with the GSEs
  - Eliminate portfolio, hand management of existing portfolio to professionals
  - Focus on using full faith and credit guarantee to stimulate a standardized, transparent interest aligned mortgage market
- Return to counter-cyclical credit reserving process

### **2. Reduce risk weighting of GSE MBS and debt**

- Relatively painless way to signal support without consolidation on Federal B/S
- Consistent with reduction of risk weight of TLGP paper from 20% to 0% in October

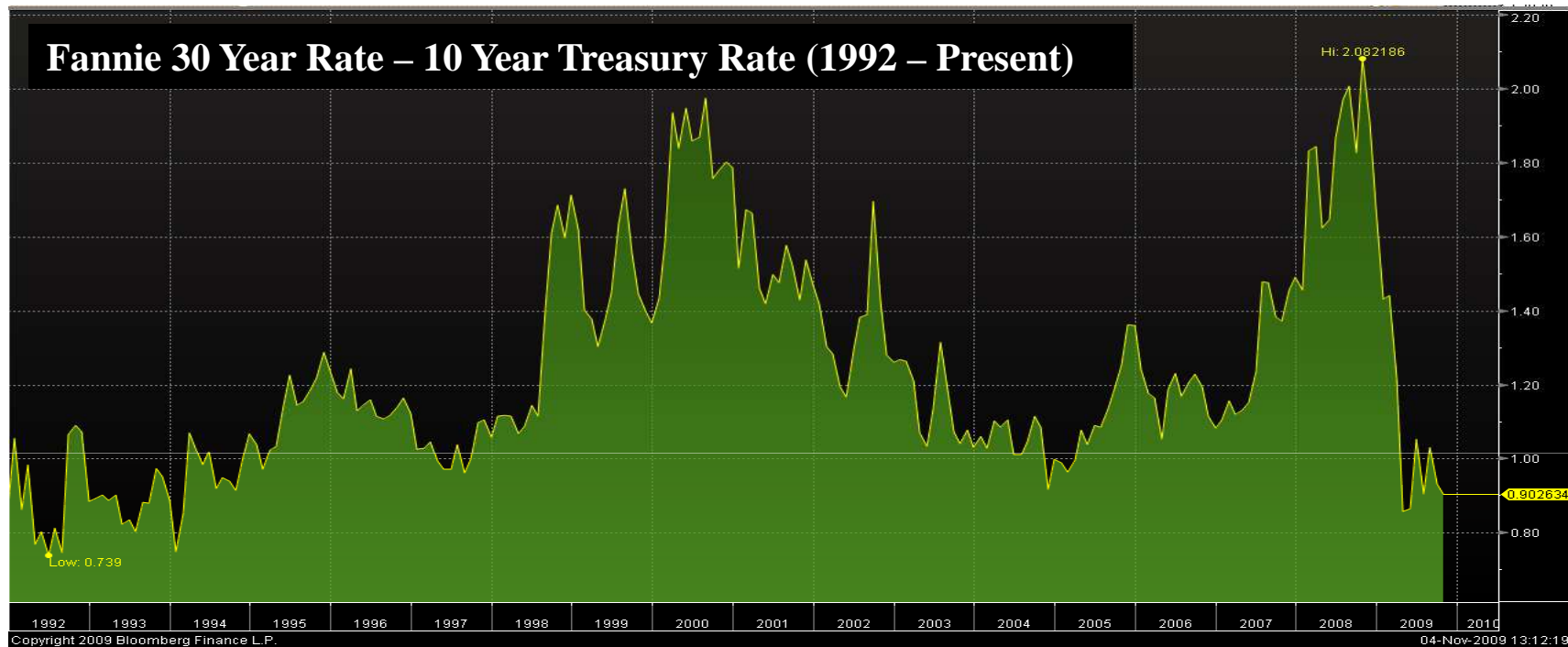
### **3. Systemic Crisis backstop “MBS buyer of last resort” should be FRB/Treasury**

- Require purchase of GSE guaranteed MBS in event of Financial Crisis
- Counter-cyclical and automatic, outside of legislative/regulatory fiat

### **4. Strong and specific legislation to support the of a covered bond market**

- Clear language on how FDIC treats covered bonds in event of issuer insolvency
- Strict limits on types and quality of underlying cover pool collateral: only first lien residential and multifamily mortgages with conservative LTVs
- Strict limits on asset/liability mismatches, in recognition that such mismatches were highly associated with insolvency among European covered bond issuers

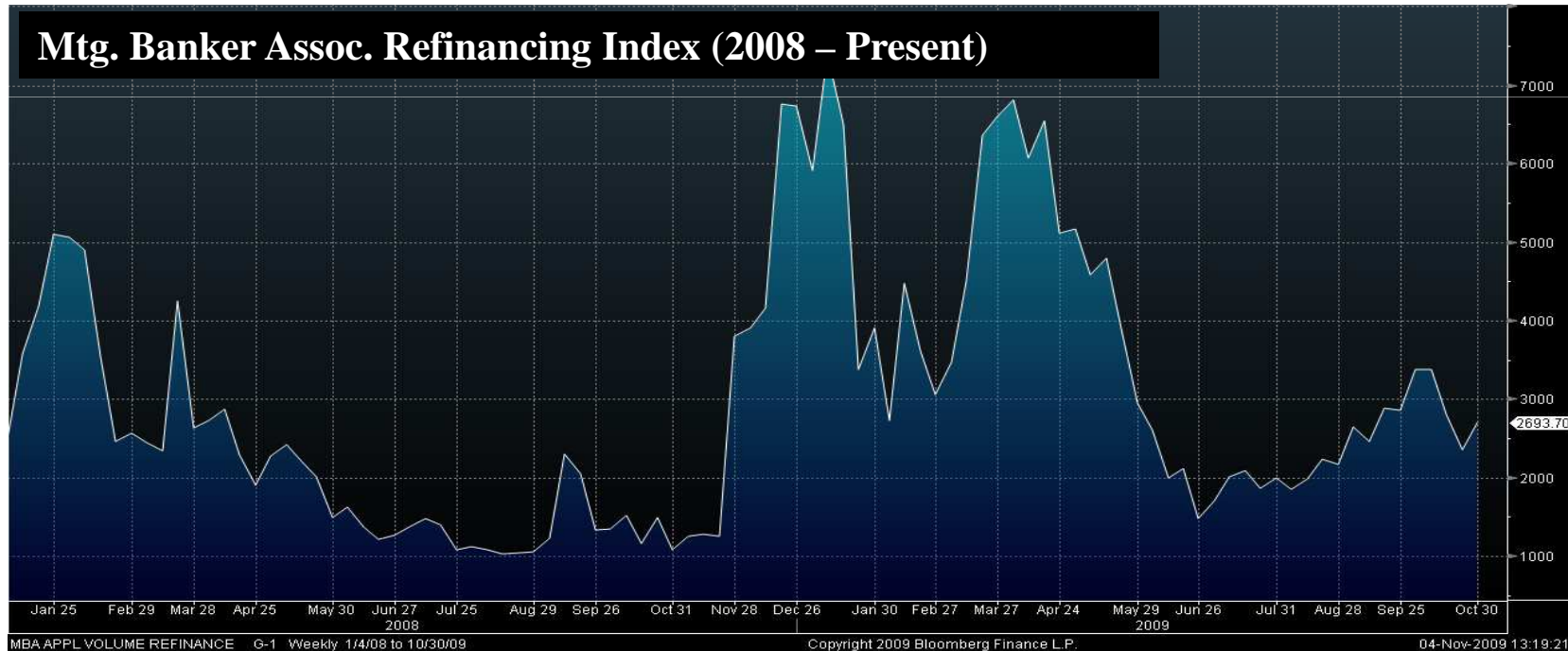
## Appendix 1: All time lows in mortgage rates and spreads



- Headline numbers for the mortgage market look strong, gets lots of press
- Mortgage Rates are at all time lows, gets lots of press
- Mortgage Spreads (CMM - 10UST) are at all time lows as a result of Fed purchase program (FPP)
- Option Adjusted Spread (OAS) on Current Coupon Mortgages (CMM) are at all time tights
- Home Sales are rising as a result of “first time homebuyer credit”
- But something is wrong with this picture, historically the mortgage market put the “starch in the string” that the Federal Reserve used to push the economy. This is not working in 2009

## Refinancing Wave Has Yet To Materialize

- Federal Purchase Program was designed to make credit more affordable for homebuyers. There was a hope that there would be another refinancing wave.
- A wave of refinancing applications at the end of 2008/early 2009 was unfulfilled, prepayments did not rise
- Despite very low mortgage rates driven by the FPP, refinancing applications have tailed off sharply.
- This is a warning sign for the future and will impact future OAD calculations
  - S-curves must be recalculated, increasing sensitivity to equity position of homeowner
  - Current speeds are running at 25% of modeled speeds



## **The Dog That Didn't Bark: Too Big To Fail Banks and GSEs defeat the Federal Reserve's Purchase Program**

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- At current mortgage rates, prepayment speeds should be 60 CPR, instead they are 15%
  - Loan-to-value ratios and bank fees suppressing refinancing activity
- GSE's are trying to recapitalize themselves while in "conservatorship"
  - Higher "G-fees", tighter standards
- Mortgage banking is controlled by "Too Big To Fail" banks
  - Profit margins have dramatically increased (and mtg. servicing values are understated)
  - No market pressure because of lack of competition
  - No political pressure!
- Headline 30 year rate is not the actual mortgage rate that borrowers receive
  - Mortgage servicers pretend it's real and it's the target of the Fed Purchase Program (FPP)
  - Actual mortgage rates to actual borrowers are 70 to 150 basis points higher
- Loan workouts under the Making Homes Affordable Act are thwarted by combination of
  - Predatory mortgage pricing laws prevent loan modifications from being made
    - Rates higher than 150bp over the survey rate are not allowed
  - Homeowners who need a loan adjustment attract lots of LLPAs
    - Fees for low FICO, high LTV, property type, MSA
  - TBTF banks are exhibiting oligopolistic behavior
    - Working for all time record profit margins BEFORE undervaluation of MSRs

# Mortgage pricing 101

Credit Metrics (FICO/CLTV) Loan Size	Mythical Zero Point Conventional	<u>750/75</u> <u>\$400k</u>	<u>670/75</u> <u>\$400k</u>	<u>750/75</u> <u>\$700k</u>
Loan Level Pooling Fees	0	(.25)	(2.25)	(.25)
Costs	(1.0)	(1.5)	(1.5)	(1.5)
MSR Multiple /Capitalized Value	6.7/2.0	4.2/1.25	3.5/1.05	3/0.9
Security Exit	Blend of FN4 and FN4.5	FN5	FN5.5	FN 5.5J
Effective Zero Point APR to Homeowner	4.85	5.50	6.0	6.0
Profit Margin(pts)	1.0	2.5	1.925	2.775

- U.S. mortgage market is a “premium origination” model. This process is used to get the bond market to pay loan origination costs
- Assumes 1.5 points of origination costs
- Adverse market fee of \$0.25
- Current profit margins may be higher given lower level of competition in mortgage banking industry
- Assumes 20bp Guaranty Fee, MSR is capitalized difference between note rate and bond coupon. Note that MSRs are being capitalized significantly below where the IO market values the cash flows, thus hiding another point of profit margin.
- TBA/MSR multiple pricing as of 10/15/09:
  - FN 4.0@ 98.125/6.0
  - FN 4.5 @ 100.625/5.0
  - FN 5.0 @ 103.000/4.2
  - FN 5.5 @ 104.625/3.5/3.0J
- “Current Coupon” mortgage rate is 4.85%
- Note that “predatory” lending limits prohibit making loans over 150bp from survey rate (5%) which precludes MHA loans workouts
- Due to 10% pooling limits, Agency Jumbos must be priced to separate pooling, which trade one point behind TBAs

## Mortgage Duration 102: weight is contingent upon inputs

	<u>% ARMs</u>	<u>FNCL OAD</u>	<u>Market Size</u>	<u>Total OAD</u>
September 1997	18%	5.0 est	\$3.72t	15.3t
September 1999	9%	5.0 est	\$4.35t	19.8t
September 2001	10%	4.33y	\$5.22t	20.3t
September 2003	12%	4.53y	\$6.68t	26.6t
September 2005	28%	3.61y	\$8.58t	22.3t
September 2006	30%	3.40y	\$9.67t	23.0t
March 2007	25%	3.86y	\$10.25t	29.7t
March 2008	19%	4.70y	\$10.55t	40.2t
March 2009	14%	5.04y	\$10.43t	45.2t
September 2009	12%	5.34y	\$10.34t	48.6t

- U.S. mortgage market is a “premium origination” model. This process is used to get the bond market to pay loan origination costs.
- Issuing callable bonds struck in the money results in very low OAD at times of loan origination
- The fluctuations in FNCL OAD are driven by the slope of the interest rate swap curve and implied duration
- Combination of migration to ARMs, a flatter curve and lower volatility masked the dramatic increase in the mortgage market after 2003
- Higher volatility and a steeper curve have driven FNCL OAD much higher in the last two years
- A significant switching from ARMs to FRMs has increased the duration of the market as well
- None of the increase in OAD comes from higher rates and/or slower prepayment speeds....YET!



## Appendix 2: All You Need to Know about CMM

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- The Constant Maturity Mortgage (CMM) market has existed since 2002. CMM products are widely used to speculate on future mortgage rate moves and to hedge forward mortgage spread exposure. During this time, the volume of CMM trades and the number of market participants has increased more than tenfold. However, while there are several very good CMM primers in circulation, most are at old and do not capture the latest developments in this market or some new modeling and risk analysis techniques.
- The CMM Index (the spot CMM rate) is defined to track the par coupon rate of 30 day forward FNMA 30yr mortgage bonds. The daily CMM index fixing is determined by the dealers' poll on their FNMA 30yr TBA closes at 3:00pm. The CMM products are essentially derivative securities with payoffs dependent on the future of value of the index. Currently the two most popular products based on CMM are the CMM Forward Rate Agreements (FRAs) and CMM/CMS basis FRAs.
- When people compare CMM products with mortgage TBAs, they usually use CMS and interest rate swaps as an analogy. However there is a big difference given that a specific CMS FRA rate is always determined by the corresponding swap (bond) implied par-yield but a specific CMM FRA rate is determined by multiple TBA bonds (through linear interpolation). Therefore most CMS products are traded on their vega slew risk because the rate or duration risk can be completely hedged by entering an offsetting (forward) interest rate swap. However, the CMM products not only offer similar (but opposite) vega exposure but more importantly they also provide a unique rate (duration) exposure, the current coupon rate exposure, which cannot be replicated by TBAs.
- The goal of developing the CMM products was to provide an effective hedging tool for all the market participants who have current coupon (or benchmark) mortgage rate exposure, which includes servicing portfolios and origination pipelines. Compared to traditional mortgage TBAs, CMM enjoys the following three unique features that make it the best hedging tool for this rate exposure: elimination of negative convexity, minimization of replication efforts and no roll or basis risk.

## All You Need to Know about CMM continued

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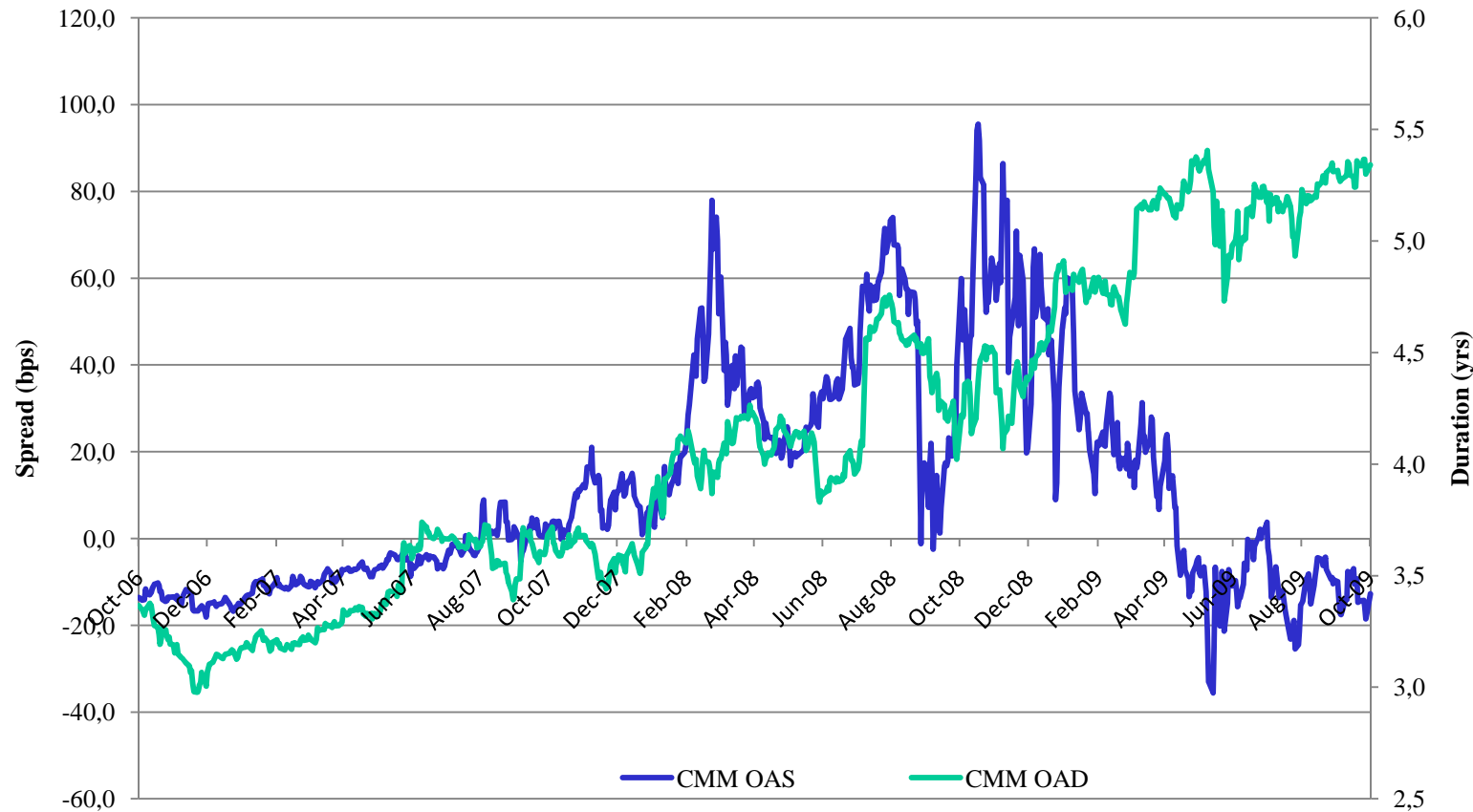
- Servicers were among the first players in this market for these reasons. By late 2003, the market structure was very simple. Servicers were long mortgages through CMM FRAs (receiving fixed rate against paying the future CMM index) and dealers were on the other side. There were less than ten servicers and even fewer dealers at that time.
- The total volume of the market was around \$30b notional of FRAs at the end of 2004. However during this period, dealers were enjoying the position given the dollar rolls traded special multiple times and volatility was low. The CMM curve was upward sloping. Apparently servicers also enjoyed this position curve shape and kept piling on positions.
- By the end of 2005, the net position from servicers amounted to more than \$100b notional in FRAs. Although there were some payers on the other side, the size was too small to offset the buying flows. The dealers still took the majority of the risk. It is also worth noting that during 2005, CMM/CMS basis FRAs began trading to accommodate some servicers who managed basis and duration risk separately. This new product also provides real and fast money accounts with a very clean view of the basis. Two way flows started trading in the product.
- During 2006, more servicers started using CMM for their hedging purposes and more leveraged accounts started using CMM/CMS basis FRAs to speculate on the basis spread move. However, the market was still imbalanced in terms of supply and demand. Dealers still had to take the majority of the servicing flows on their own. But the CMM curve was still positive given implied volatility kept drifting south. But this completely changed by the end of 2006.
- Between March 2006 and December 2006, the mortgage rates moved in a quick 100 bp range. At the highs, CMM dealers had to go up-in coupon to rebalance their hedging portfolio on the CMM FRA positions. At the lows in rate, CMM dealers had to go down-in coupon to rebalance. Most dealers took a big hit and some of them even quit the market. To make matters worse, dollar rolls traded close to general collateral, eliminating any advantage from holding TBAs.
- At the beginning of 2007, the surviving dealers repriced the CMM curve and to incorporate this coupon rebalancing cost. The CMM curve became inverted even while implied interest rate volatility remained at historical low.

## All You Need to Know about CMM ...continued some more

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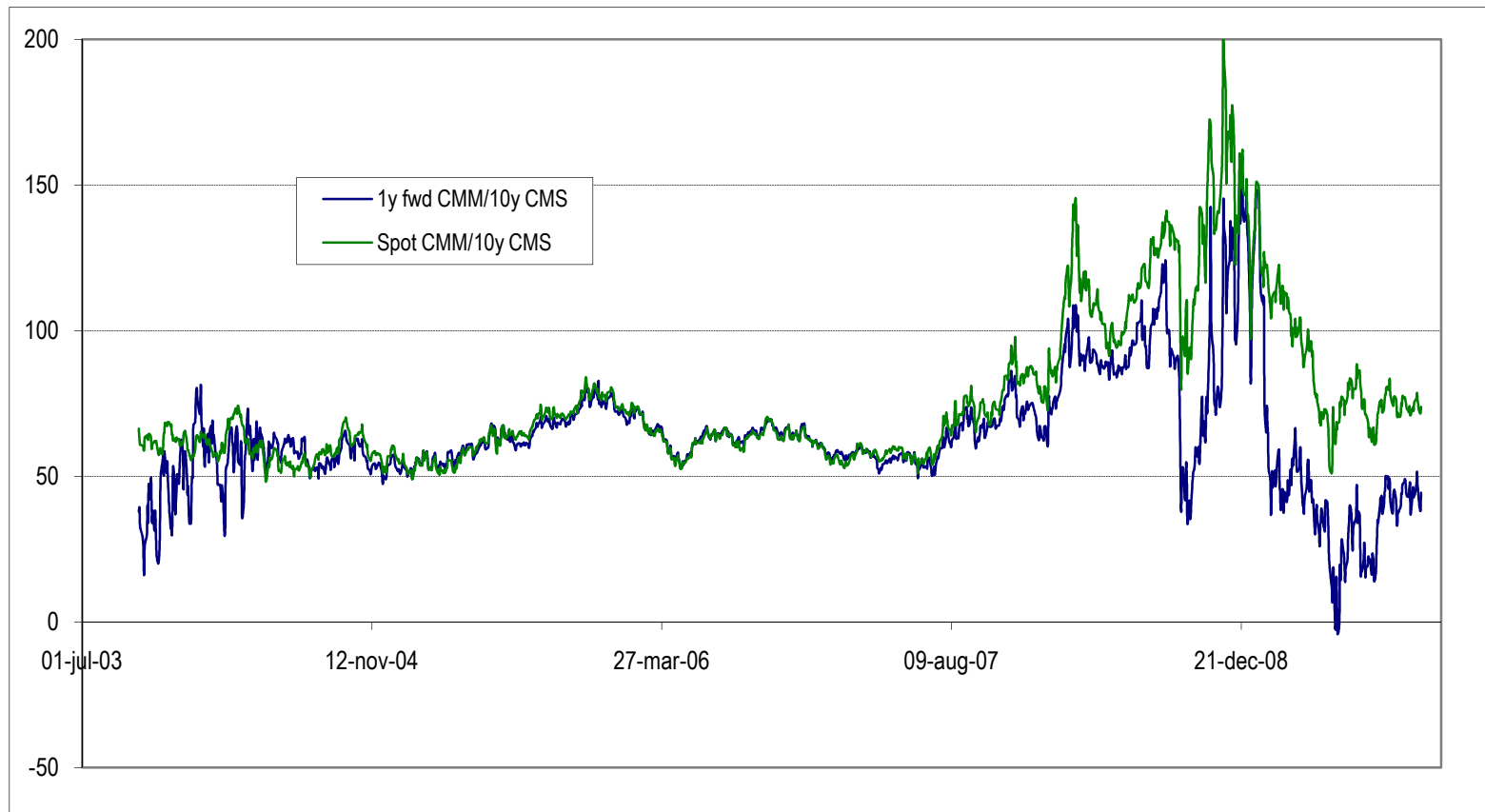
- At the beginning of 2007, servicers did not like the inversion of the CMM curve and unloaded some positions. However, eventually they realized it was still economical to buy CMM FRAs at these levels given the increased uncertainty in the market. And thus we saw another new wave of servicer buying in 2007 that made the total volume of the market surge to \$250b in 2007. In late 2007, the market started to have two way flows. By the end of 2008, the CMM curve had become fully inverted, where it remains.
- The CMM curve changed a lot between mid 2005 and now. Of course, part of this change is from the volatility surge but more is due to the coupon rebalancing cost adjustment of the CMM curve. Does current CMM curve fairly reveal this cost? It does when CMM is at all time tights!
- The impact of the Federal Reserve Purchase Program was significant. CMM fell dramatically in late November and early December of 2008. This was partially due to the non-existence of FN4s, which became part of the CMM interpolation calculation. Once the FN4s were able to be produced, CMM rose to reflect the supply of real bonds.
- The CMM/10yr CMT spread moved to all time tights in April 2009 as the full impact was felt of the FPP while actual production of mortgages declined and interest rates of Treasuries rose.
- CMM tightened significantly in early May and late September or 2009, as two TBTF bank mortgage servicers adjusted their hedges to match their model inputs.
- Today, CMM/CMT spreads remain tight, on a spot and forward basis. These are supported by:
  - Continuation of the FPP
  - Cessation of money manager selling as they ran out of agency MBS
  - Continued interest in receiving CMM by TBTF bank mortgage servicers
  - Continued inability of 80% of performing borrowers to qualify for today's low mortgage rates.
    - TBTF banks working for large profit margins
    - GSEs trying to recapitalize themselves via large LLPAs

## Constant Maturity Mortgage (FNCLMTGE <go>) OAS vs OAD



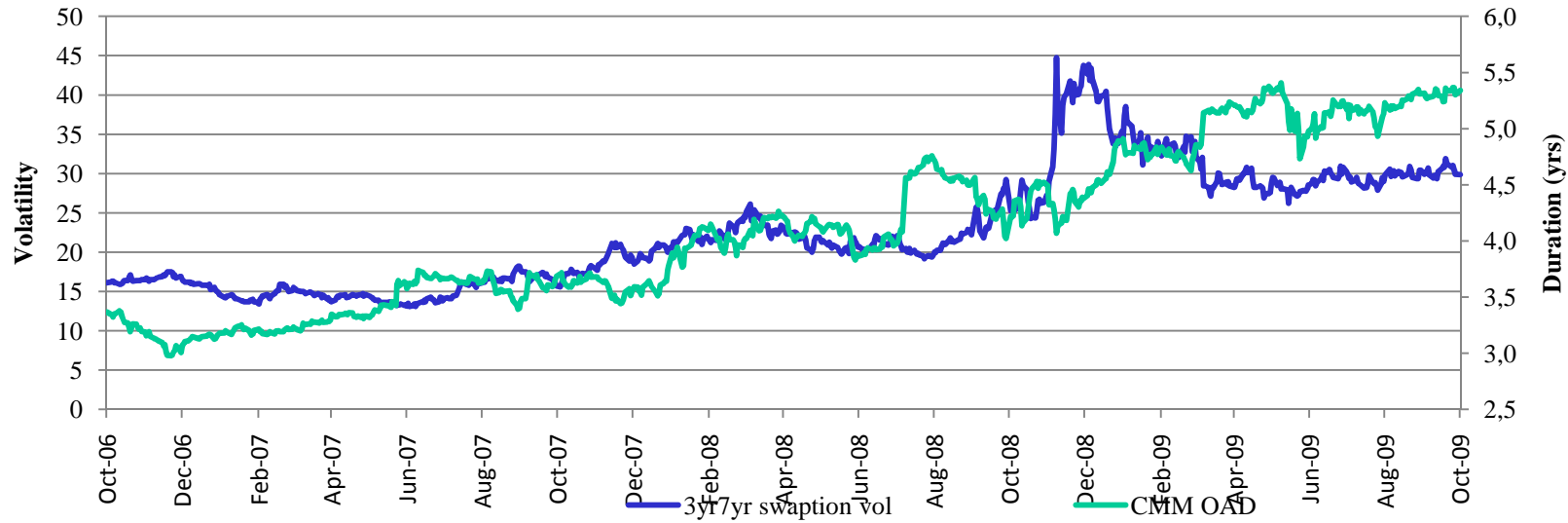
- OAS on current coupon is back to the all time tights, while other risk vectors (slope of curve, implied volatility, repo haircuts, term financing spreads) remain elevated
- OAD has increased by 2/3 since early 2007 making the “spread duration” a much more significantly negative number. If spreads revert to long term averages, investors will lose more on a -20 OAS bond with a longer OAD.

## CMM vs 10 Year CMS: Spot and 1 Year Forward



- Spot basis swap tight despite steep curve and elevated interest rate volatility
- Forward basis swap should be wider since mortgages have positive carry, but has been driven lower by:
  - Mortgage servicer hedging
  - Fewer dealers to stand up to supply & demand imbalance
  - FPP driving MBS prices
  - Constrained supply due to GSE LLPAs and TBTF bank oligopoly pricing mortgages

# Swap Curve drives OAS, Volatility drives OAS



## Appendix 3: Mortgage Servicing Rights: What are they?

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- Mortgage Servicing Rights (MSRs) can be described as
  - Present Value of Interest Only (IO) cash flow stream that exists between mortgage note rate and bond coupon, net of GSE guarantee fees and costs of servicing the loan
  - IOs are negatively convex, negative duration assets whose value is driven by
    - Positively correlated to moves in actual mortgage rates and the slope of the swap curve
    - Negatively correlated to moves in actual and implied interest rate volatility
    - Negatively correlated to house prices, financial innovation, mortgage banker competition
  - Costs of servicing is driven by costs of handling default, this has become significant
    - FHA servicers must advance the note rate while they are reimbursed at the “FHA debenture rate”
  - MSRs are a “tax deferred asset” and a “non-cash asset”
    - Federal and state tax authorities finance MSRs at 0% interest rate until the cash flows are realized
    - Remaining balance (1-combind tax rate) must be financed on B/S with non-secured funding
- MSRs are the best hedge for a large financial institution
  - Only significant negative duration asset, which can help balance tendency for banks duration risk
    - Negative duration equivalent of \$750b FN5s
  - Only significant asset to perform better when household credit conditions deteriorate
    - Voluntary prepayments are significantly reduced when FICOs fall and LTVs rise
    - Current prepayments are 25% of modeled speeds, indicative of sensitivity to HPI and RU
  - MSRs hedge benefits scale up for the financial system as a whole, unlike CDS in which every winner is matched to an equal and opposite degree by a loser

## Mortgage Servicing Rights: Mark to Historical Herd?

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- MSR asset is marked to market on a quarterly basis along with the associated hedges
  - TBTF banks (70% of MSRs today) run an “echo system with no biodiversity”
  - Concentration of MSR asset makes it easy for TBTF banks to copy each other in
    - Prepayment modeling
    - Hedging of rate, curve, basis and volatility risk
    - Creates “abnormal demand “ for CMM swaps as CMM is the main model assumption that drives refinancing incentive and prepayments
- Pro-cyclical “regulation” of mark to market process exacerbates tendency to mis-value and mis-hedge
  - OCC does quarterly survey of top 20 mortgage servicers who report on standardized form
    - MSR mults (capitalization multiples) by loan type
    - MSR hedge ratios (in 10yr equivalents) by loan type
  - Price Waterhouse does a mid-quarter survey of the top 10 mortgage servicers who report
    - Intent on where next quarter end MSR mults will be moving, net of hedges
    - Changes in other servicing inputs (costs of advances, labor, unexpected hedging expense )
  - In combination with Analysts, the two surveys provide incentive for servicers to try to guess where everyone else will mark to market their MSR assets at quarter end. Like the mythical Keynesian beauty contest, each participant attempts to pick the number in the middle of the distribution, not the right valuation
- End result is that each TBTF bank is forced to mark to market by adjusting their marks to be at or below the middle of the “herd” as defined by the last OCC quarter-end survey. In a falling rate environment, this leads to significant undervaluation of MSRs and provides accounting cover to understating true profit margins by a point.



# Mortgage Servicing Rights: Pro-Cyclical Regulation

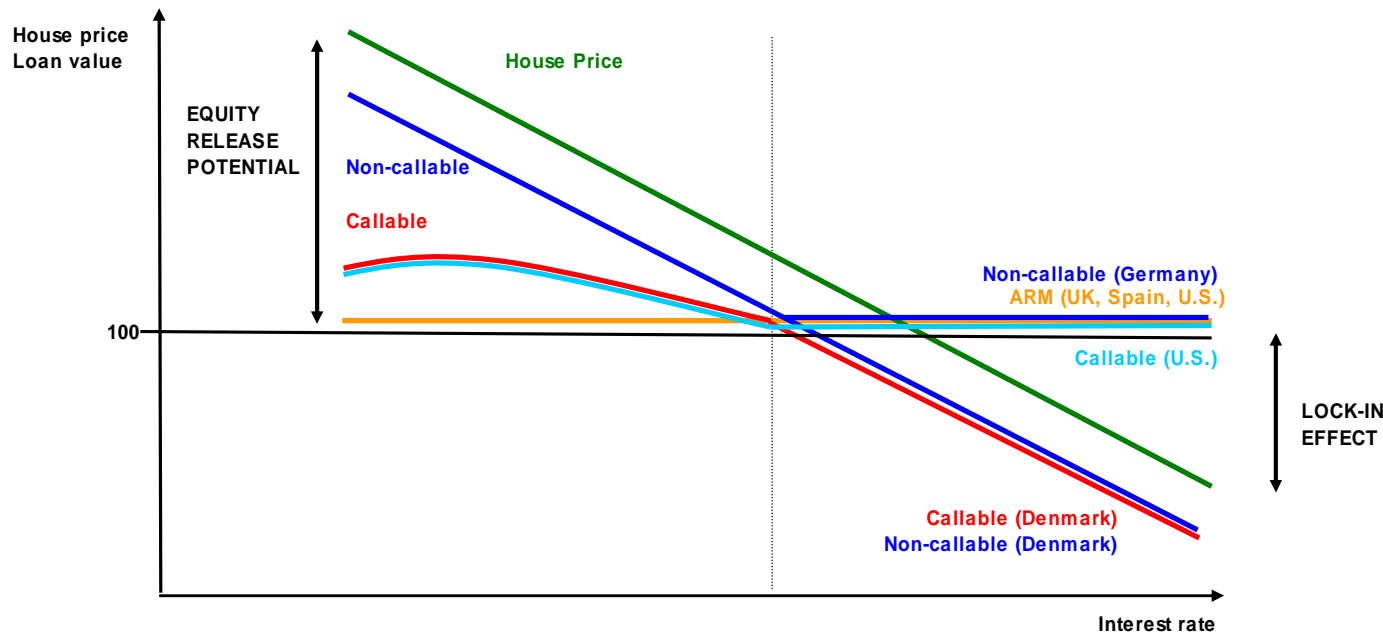
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- Regulation of MSR's has significant, unintended and poorly understood consequences
  - FRB limits MSR's to no more than 75% of a regulated financial institution's Tier I capital
    - Drives small loan originators to sell their loans "servicing released" to TBTF banks TPO channels
      - Now servicers have zero connection to borrower, making future loan problem resolution hard
      - Small banks lose their only natural interest rate hedge
    - Medium sized mortgage originators are faced with "sell or grow" business choice, with organic growth causing regulatory problems
    - Drives large mortgage originating banks into National bank/thrift charters
  - FRB did NOT create a special financing program for servicing advances, most private sector lenders have tried to minimize financing to mortgage servicers, forcing even more small and medium sized originators to sell loans servicing released
  - All bank regulators view MSR's and MSR growth as a necessary evil, something to be minimized
- Financial analysts do not understand MSR's, MSR hedging and MSR accounting
  - Analysts are afraid of what they do not understand
    - Designation as a Level 3 asset raises investor sensitivity
    - Anecdotes of large blowups in MSR hedging are widely advertised (Homeside/NAB, Long Beach/Wamu, LASER, Capstead) and not easily forgotten
  - 28 year bull market in bonds has reinforced analyst myopia
    - Positive duration has been a source of profits while unhedged negative duration has been a source of loss.....lets extrapolate that forever!
  - Reporting is opaque, making it hard for experienced mortgage traders to discern proper hedging

## Appendix 4: More details about the Danish system

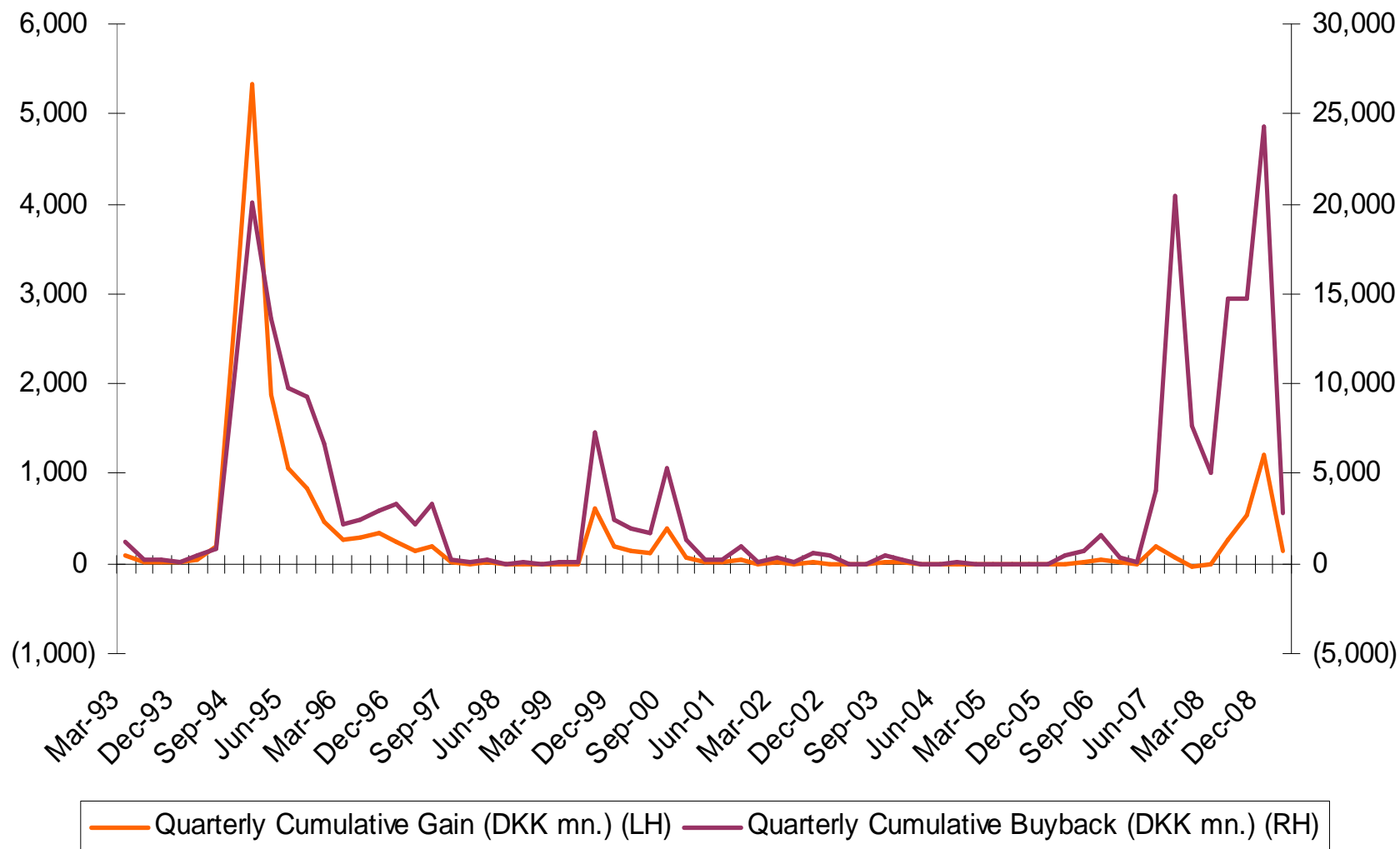
	Sweden	DK	SW-DK
<b>Rates</b>			
5 Year Government	2.66	2.82	-16
5 Year Swap	2.96	2.95	1
5 Year Mortgage Loan	3.84	3.41	43
5 Year Mortgage Bond	2.89	2.9	-1
<b>Spreads</b>			
Swaps - Government	30bp	13bp	17bp
Loan-Bond	87bp	51bp	36bp
Bond-Swap	-7bp	-5bp	-2bp
<b>Ratings</b>			
LTV Maximum	75%	80%	5%
Balance Principle	Cover Principle	Extreme Balance Principle	

# Summary of mortgage risk transfer systems

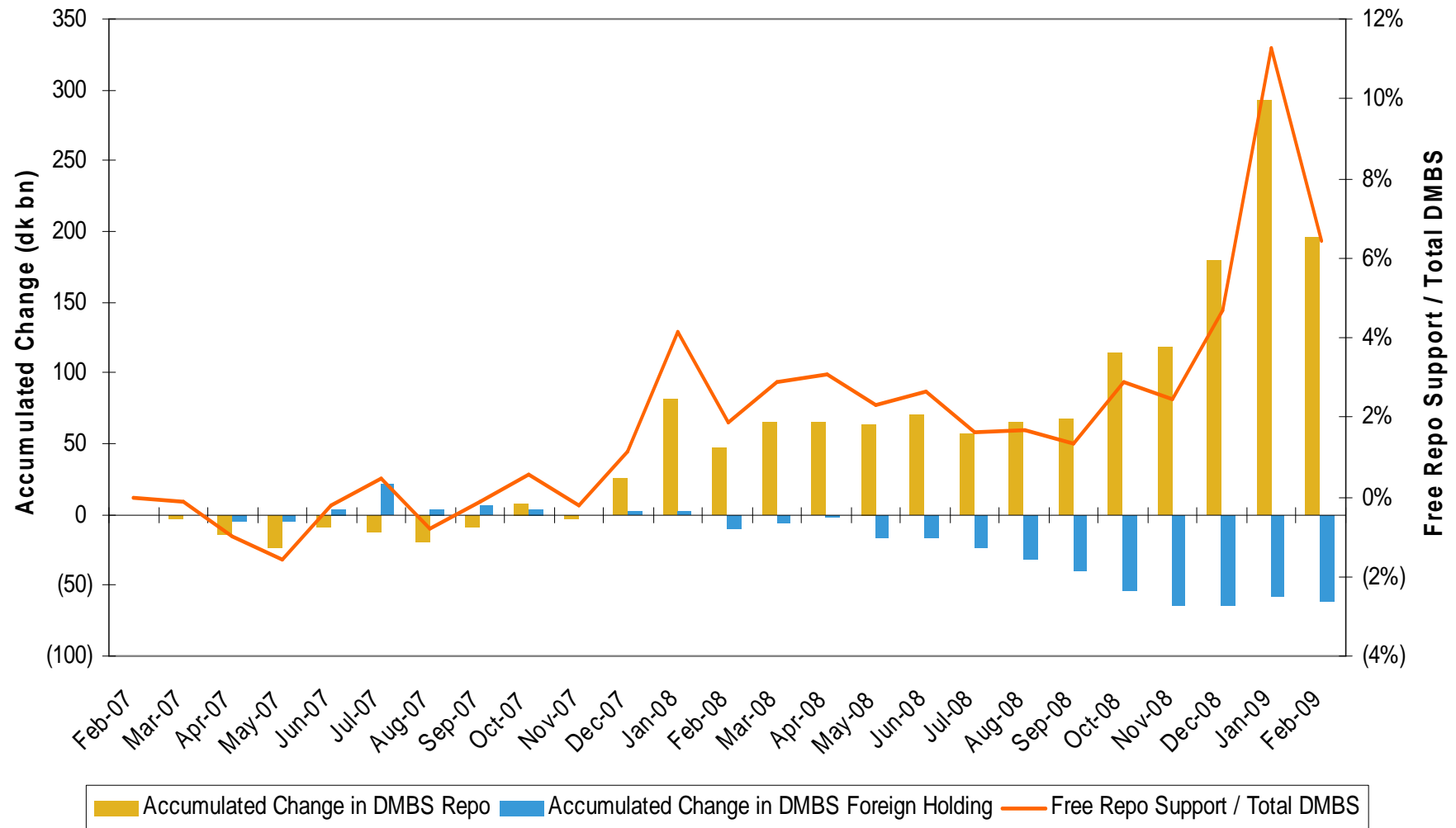


- **U.S. Mortgage Loans:** Can be called at par. However, due to non-standardized securitization, loans may not be redeemed at the market price when trading at a discount. This allows for equity release in event of lower rates, but subjects the borrower to the lock-in effect when rates rise
- All Adjustable Rate Mortgages are worth par in most interest rate scenarios. This implies that the borrower has no hedge against the interest rate sensitivity of home prices exposing him to more significant fluctuations of net home equity
- **Danish Mortgage Loans:** Can always be prepaid at par or redeemed by purchasing the bond at the market price
- **German Mortgage Loans:** Non-Callable at par: homeowners must instead pay a yield maintenance penalty equal to the NPV of the cash flows. When interest rates are higher, the loans are not redeemable at a discount. This is the worst of all possible risk transfer mechanisms

## Alternative Redemption Increased to Stabilize Market



# Net Nationalbanken Repo of MBS has been Small



## Rescue Packages: Denmark did not help very much

Country	Entity	Capital	Loans	Guarantees	Total	Mortgage Market	Rescue/Market
USA	Treasury(TARP)	\$ 602.5	\$ 30.0	\$ 67.5	\$ 700.0		
	Federal Reserve	\$ 1,300.0	\$ 2,009.1	\$ 317.0	\$ 3,626.1		
	FDIC	\$ 29.5	\$ -	\$ 1,381.4	\$ 1,410.9		
	FHLBs						
	Total	\$ 1,932.0	\$ 2,039.1	\$ 1,765.9	\$ 5,737.0	\$ 11,000.0	52.2%
UK	Sovereign	\$ 75.0		\$ 133.3	\$ 208.3		
	Bank of England		\$ 250.0		\$ 250.0		
	Total	\$ 75.0	\$ 250.0	\$ 133.3	\$ 458.3	\$ 1,000.0	45.8%
EuroZone	Sovereign	\$ 400.0					
	ECB		\$ 800.0				
	Total	\$ 400.0	\$ 800.0		\$ 1,200.0	\$ 2,000.0	60.0%
Denmark	Sovereign						
	Nationalbanken	\$ 25.0	\$ 38.5	\$	\$ 63.5		
	Total				\$ 63.5	\$ 575.0	11.0%

note: amounts reflect increase from beginning of crisis in February 2007

note: amounts in billions of USD

note: Germany 200b, Ireland 50b, Iceland 35b, Spain 30b, Belgium 30b, Netherlands 47b