



Structured Credit: A Basic Guide to Where it All Went Wrong

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February 2009



Key Issues: Outline

- What was the economic background to the current crisis?
 - Since the mid-90s, low inflation, low interest rates, and stable economic conditions encouraged greater borrowing, feeding asset prices

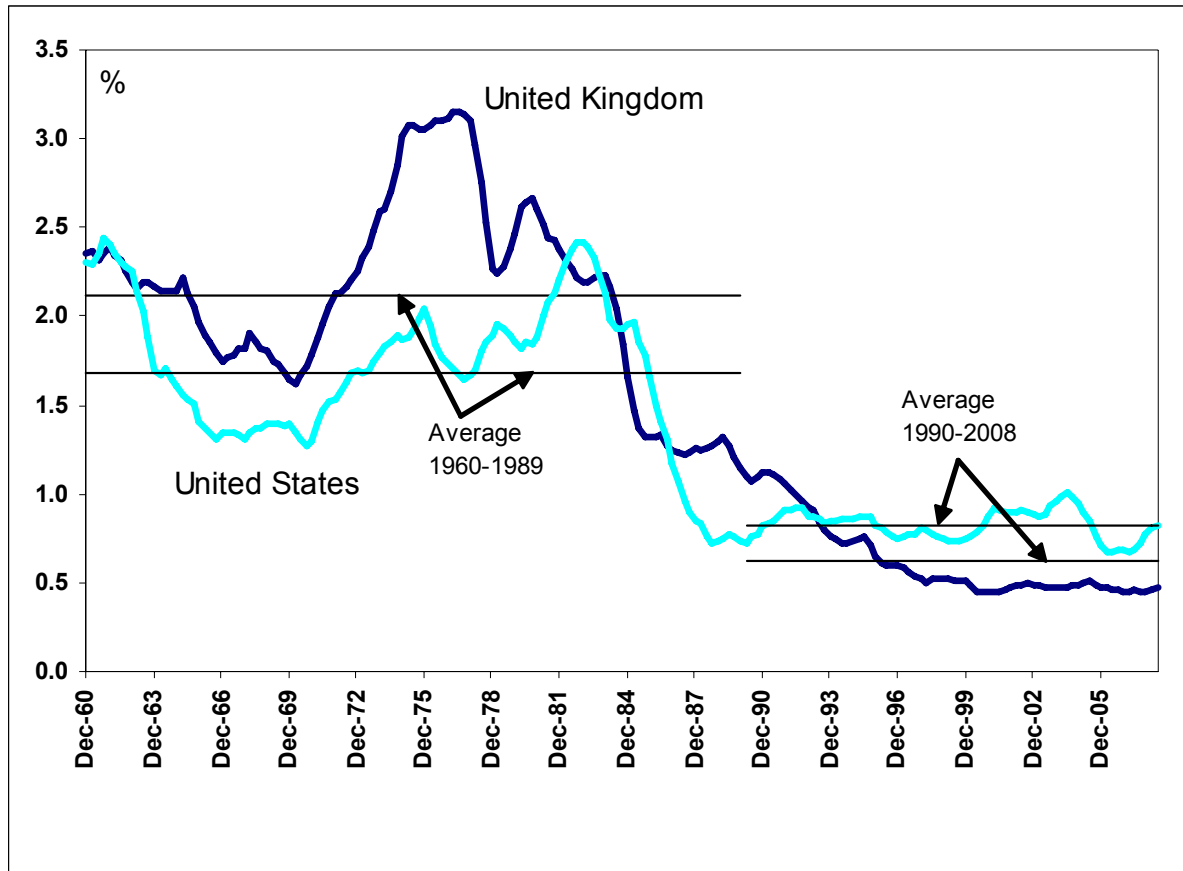
- Why has the impact on the financial system been so great?
 - Losses related to sub-prime MBS led to fear and contagion to all forms of structured credit, much of which is opaque and poorly understood. Subsequently, recession has increased projected default rates.

- What is the appropriate policy response?
 - No different to past banking crises (except in scale) - a combination of loan workout, new capital, and banking consolidation (possibly including public ownership), with fiscal and monetary easing.

- What have been the lessons learned?
 - We must retain securitisation and products such as credit derivatives – but we need more oversight and transparency to ensure functioning markets! We also need better understanding of financial instruments!

Volatility of Real GDP Growth

5-year Rolling Average of Annualised Volatility of Q-o-Q Growth



Source: Financial Stability Report, Bank of England, October 2008

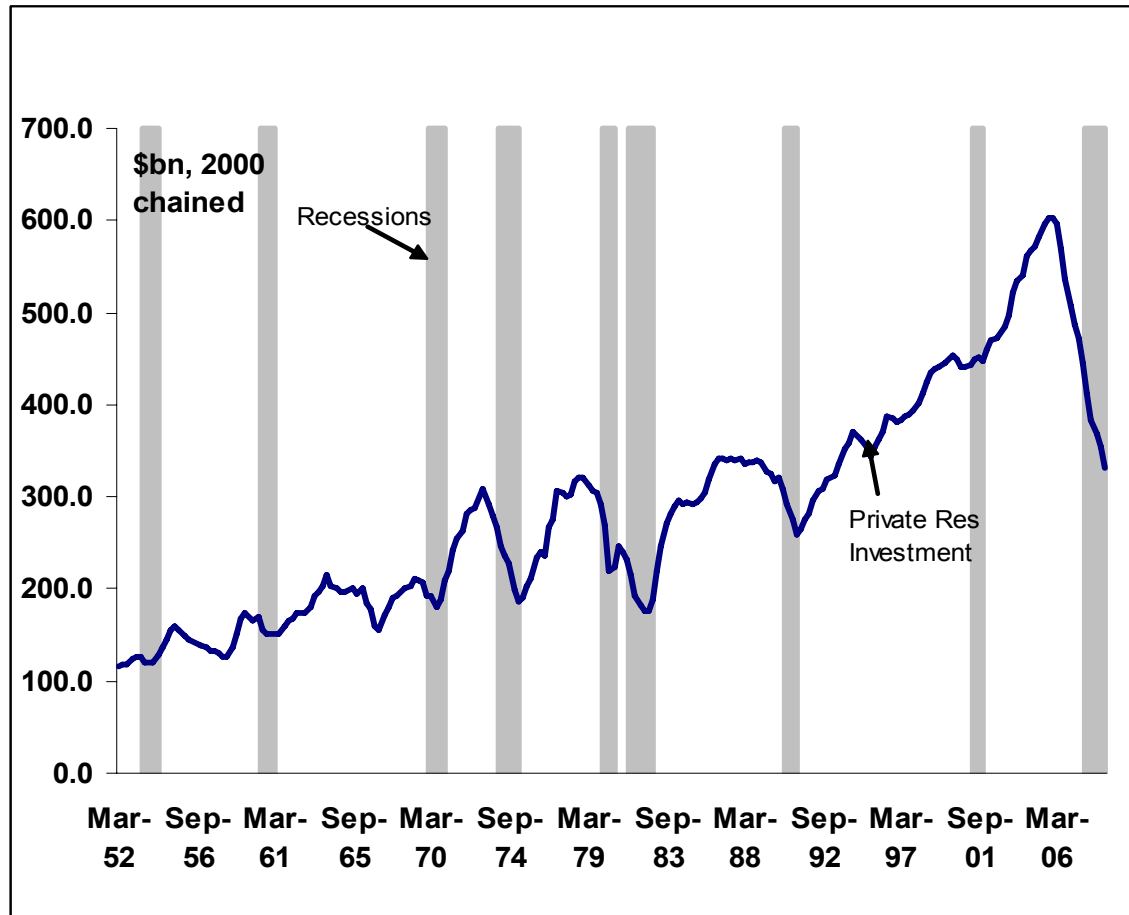


Origins of the Crisis

- The background to the current crisis is provided by the *US housing market*. The housing cycle, as measured by real private residential investment spending, peaked in 2005Q4.
- Housing investment (now!) accounts for less than 5% of GDP. But the downturn in this cycle has been severe – a decline of about 45% so far – the *steepest* drop in the post-war period.
- Initially, the impact on broader economic activity in the US was comfortably offset primarily by resilient consumer spending, non-residential fixed investment, and by improving net exports.
- But falling house prices, lower household wealth, and financial de-leveraging have now reinforced a more severe downturn, which has extended to the global economy.



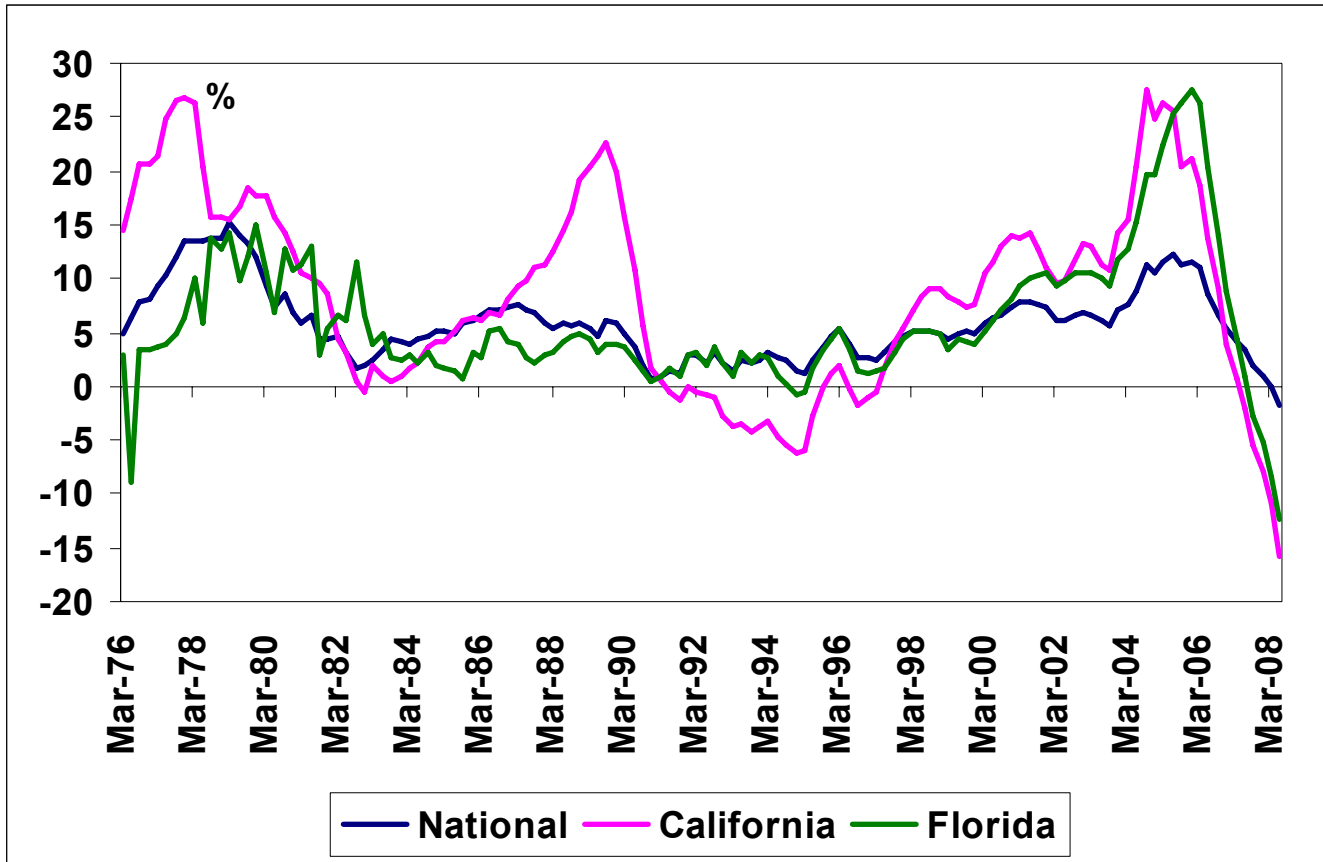
US Housing and Recessions





House Price Boom-Bust

Year-on-Year Percent Change



Source: Office of Federal Housing Enterprise Oversight, own calculations

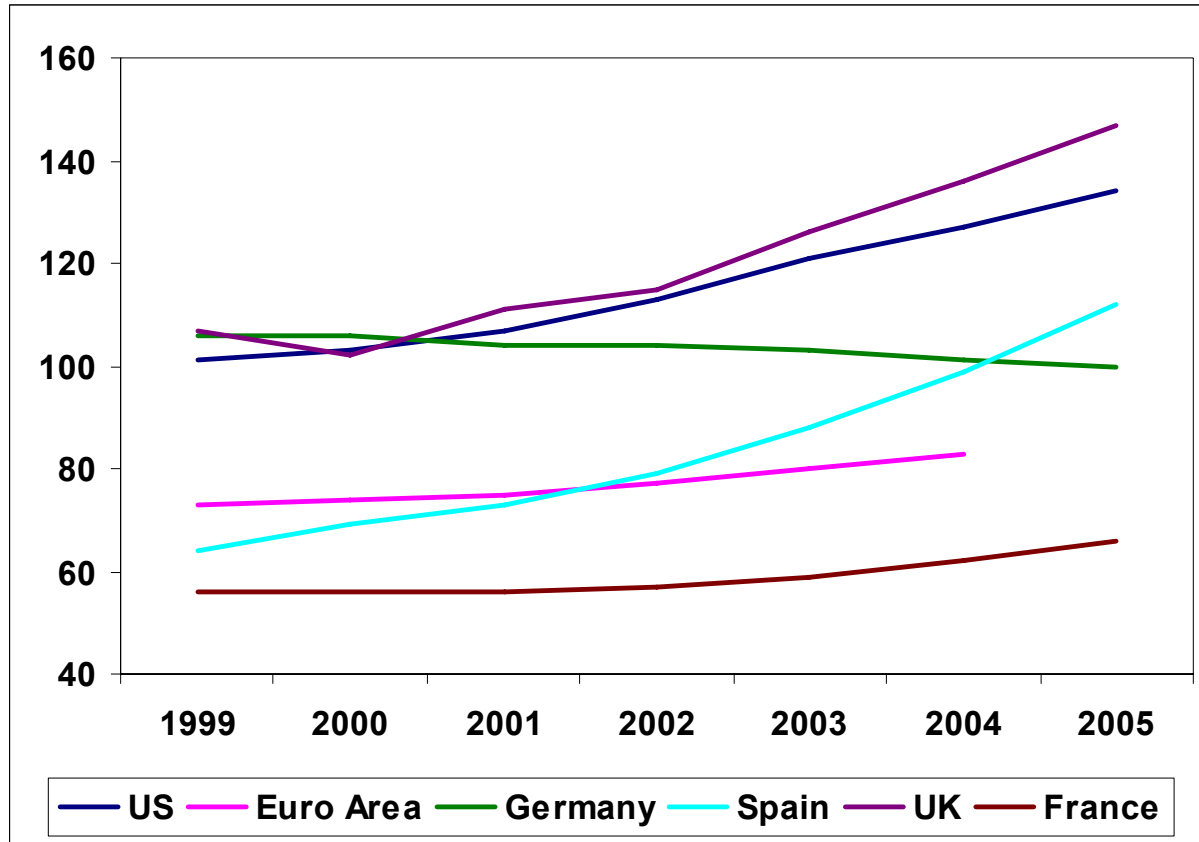


The Role of Credit

- The prior boom in housing was fuelled partly by the availability of *cheap credit*, and was accompanied by buoyant consumption (less saving). These themes were also evident in other countries.
- Global economic stability, low inflation and low interest rates encouraged a *reduction in saving* and an *increase in household debt*.
- Some blame policymakers for not tightening interest rate policy earlier, others point to the '*glut of excess saving*' arising from rapid growth in China and elsewhere, which reduced the *world real long-term interest rate*
- House prices were estimated (IMF) to have reached levels of in excess of 'fair value' of between 20% (France, Australia, Spain) and 30% (Ireland, Netherlands, UK), and about 15% in the US

Household Debt

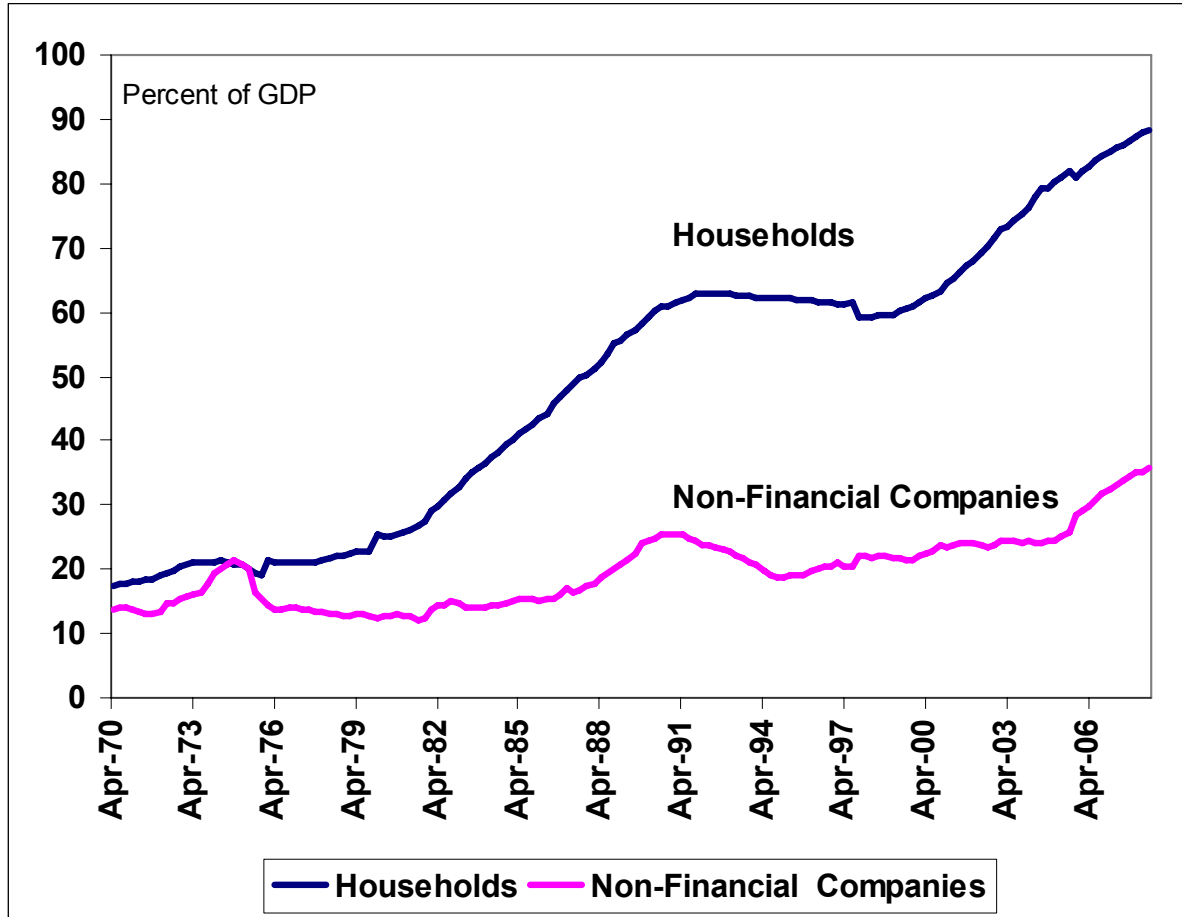
Ratio to Disposable Income



Source: Global Financial Stability Report, IMF, October 2008

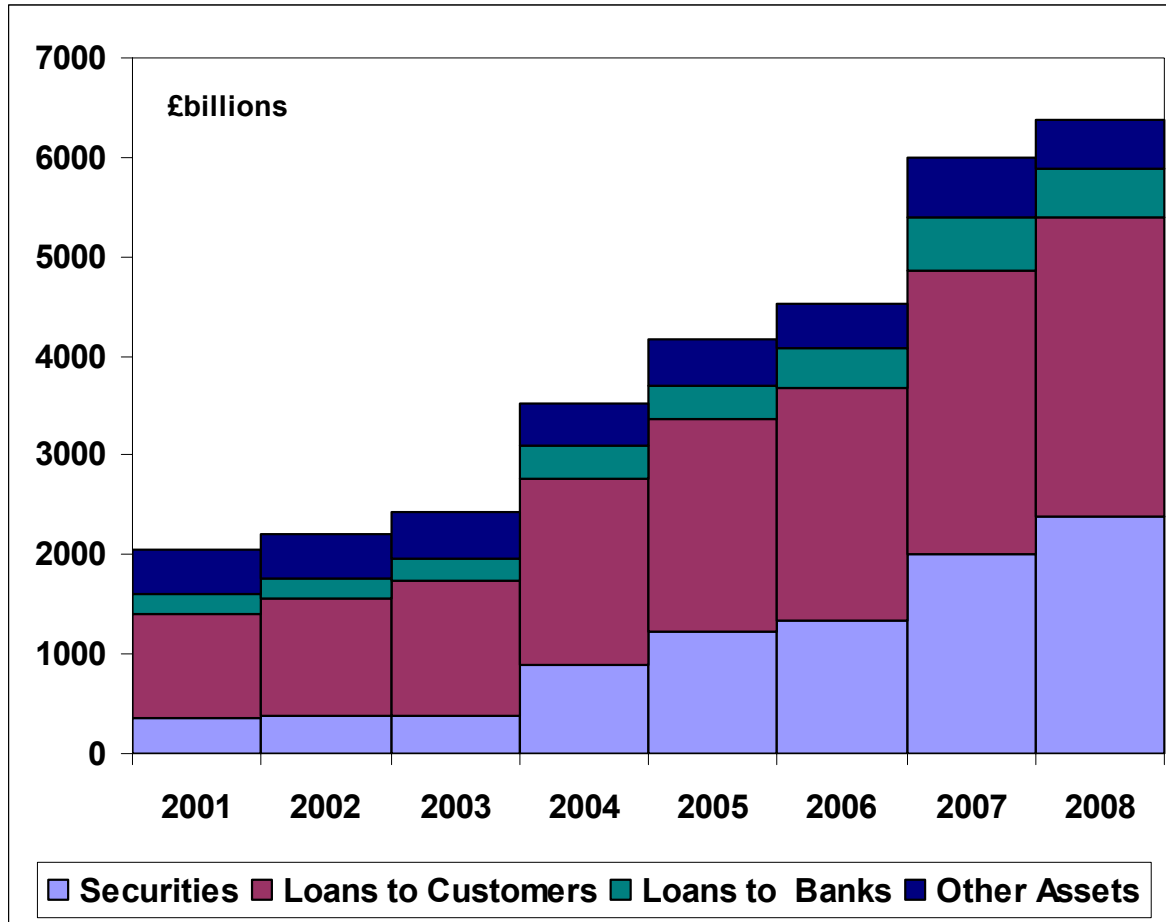
UK Bank Lending

Including Loans That Have Been Securitised



Source: Financial Stability Report, Bank of England, October 2008

Major UK Banks' Assets



Source: Financial Stability Report, Bank of England, October 2008



Features of the Crisis

- The evolution of the credit crisis has focused attention on a number of complex inter-related issues, both macro and micro:
 - The role of lax monetary policy in the build-up to the crisis
 - Should monetary policy seek to prevent asset price ‘bubbles’?
 - Securitisation and ‘structured credit’ – are the products too complex? Does securitisation aid or worsen financial stability?
 - Regulation and capital adequacy – do we need to revisit Basel 2?
 - Shadow banking – how do we avoid its re-emergence?
 - Market microstructure – transparency, price discovery, and the importance of liquidity – exchange versus OTC?
 - Counterparty risk – transparency and funding issues
 - Mark-to-market accounting – is it dangerous to apply these principles when the market is ‘broken’?



The US Mortgage Market

- Historically, the US mortgage market was dominated by *long-term fixed-rate amortising loans*. In the 10-15 years prior to the crisis, there was significant growth in adjustable rate mortgages (ARMS).
- Unsurprisingly, *floating rate* mortgages are attractive to the borrower when short-term interest rates are low and expected to remain low for a considerable period.
- The availability of credit and the stability of economic conditions increasingly led to a focus on less credit-worthy borrowers – so-called *sub-prime mortgage* lending.
- The combination of higher interest rates (or interest rate ‘re-sets’) and falling house prices led to a significant increase in delinquent loans and foreclosures, especially for sub-prime.



Sub-Prime Mortgages

- Sub-prime mortgages are non-conforming (i.e. not eligible for Agency guarantee) loans made to borrowers with poor credit standing – there is no strict definition but features include the following:
 - Self-certification of income
 - High loan-to-value ratios
 - 2 or more 30-day delinquencies in the past 12 months or 1 or more 60-day delinquencies in the past 24 months
 - Judgement, foreclosure, or repossession in the past 12 months
 - Bankruptcy in the last 5 years
 - Low FICO credit score – below 620-660

- A high proportion of sub-prime mortgages are for refinancing or home equity loans (equity withdrawal) – a high proportion of recently originated loans were second lien ARM.



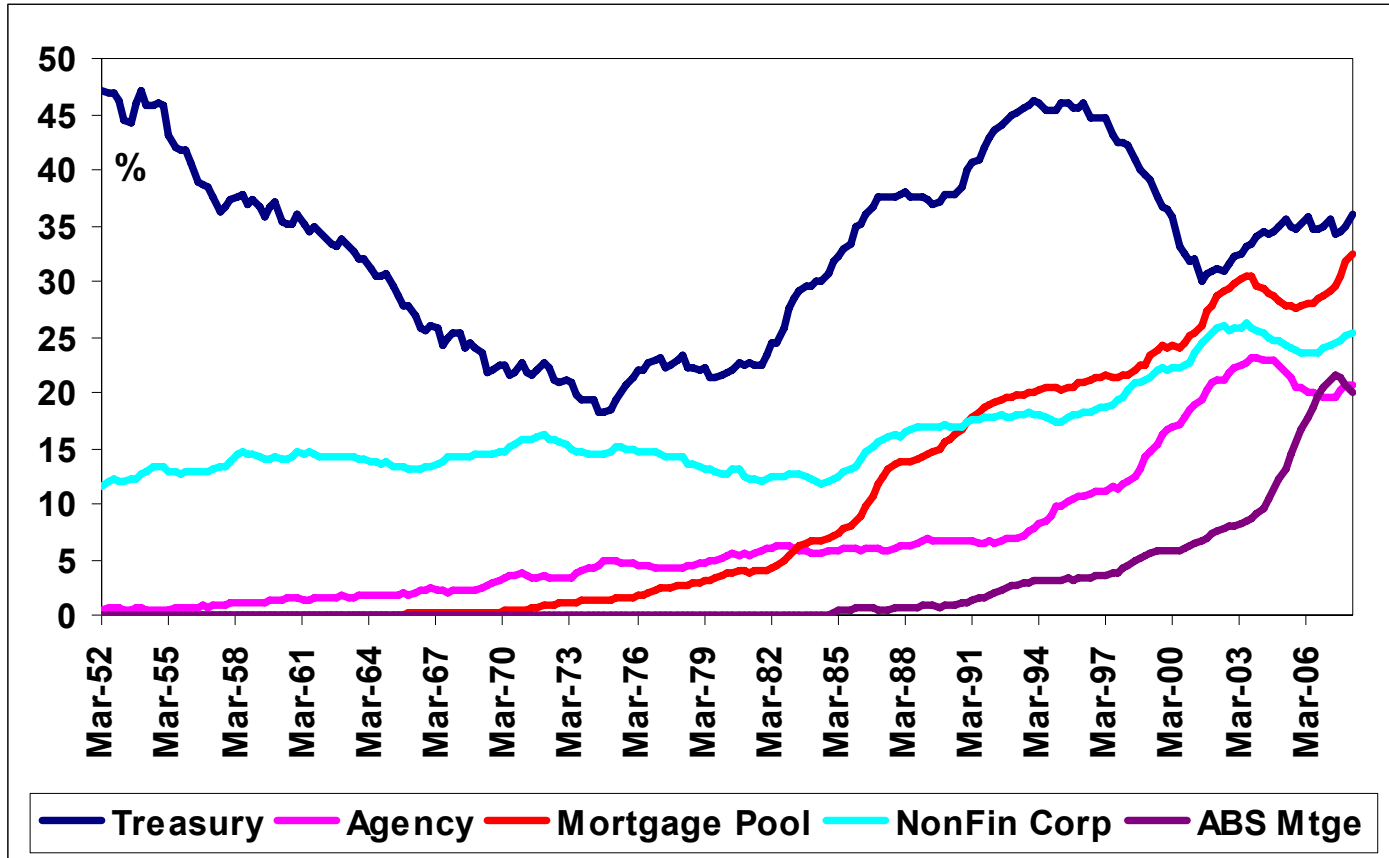
The Role of MBS

- MBS are not new - Agency MBS have played a significant role in the US mortgage market for the past 30-years, and have helped to ensure an active supply of mortgage funds.
- The Agency MBS market is a deep, liquid market – matching that of US Treasuries – the collateral (underlying mortgages) must conform to strict eligibility criteria.
- In the late 1980s, partly in response to investor demand for specific cash flow characteristics, investment banks started to construct CMOs backed by Agency collateral.
- ‘Private label’ issuance of MBS surged in the first half of this decade, as issuers mimicked the Agency model, and used CMO techniques, but increasingly backed by low quality (sub-prime) collateral.



US Bonds Outstanding

Percent of GDP



Source: Flow of Funds, Federal Reserve, own calculations



Valuing Agency MBS

- Even valuing (effectively) default-free Agency MBS is not a straightforward task – the timing of cash flows is uncertain because of **pre-payment risk**.
- Prepayment risk makes the average life (or duration) of MBS uncertain, and gives rise to *reinvestment risk* – prepayment rises as interest rates fall, and vice-versa.
- In effect, holders of bonds are *selling an option* to the mortgage borrowers – the option to prepay – and should be compensated accordingly by a higher spread (the option premium).
- The cash flows of Agency MBS are interest rate path dependent and require modelling the future value of interest rates as a stochastic process to obtain the **option-adjusted spread (OAS)**.



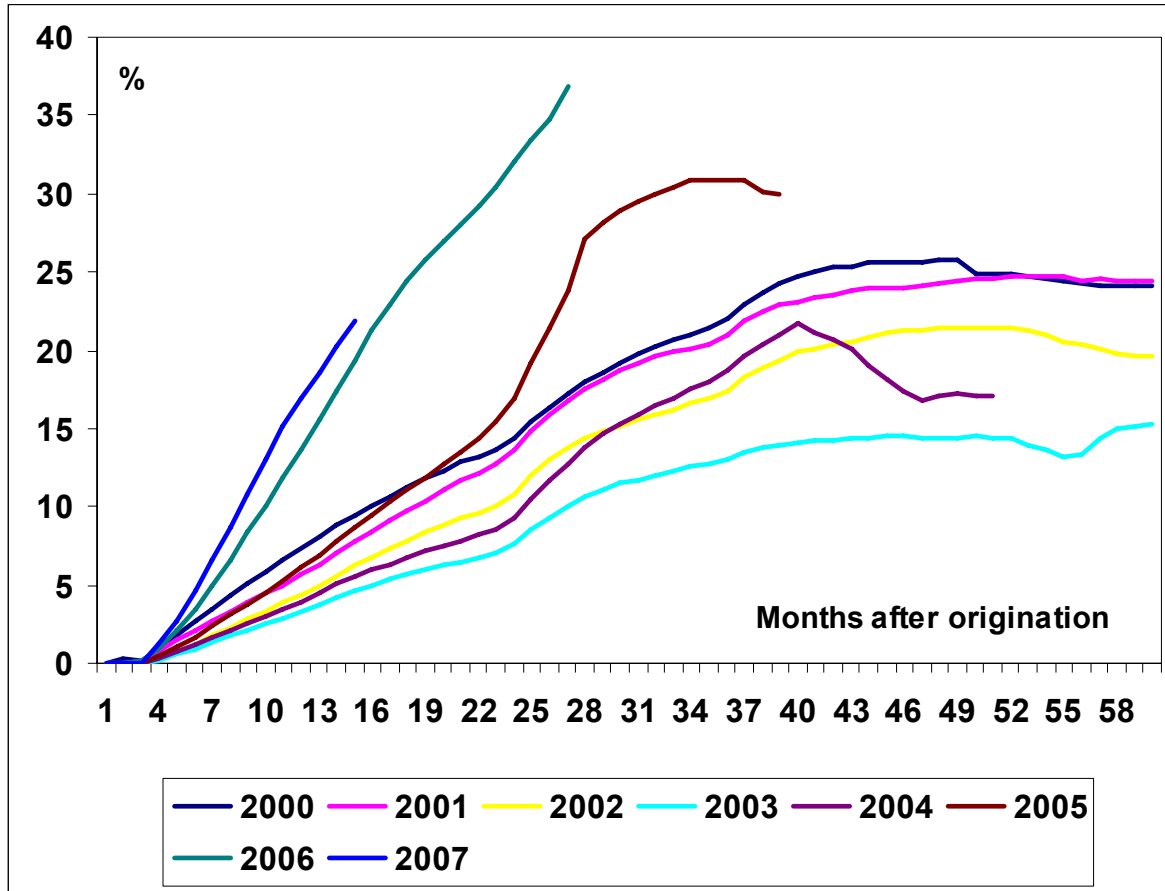
Mortgage Defaults

- The chance of default adds another dimension of risk to the valuation of private label MBS. According to Fed data, about 10% of \$13trn mortgages are sub-prime - roughly half of all mortgages are securitised.
- About 80% of outstanding mortgages were originated only since 2002. About 75% of sub-prime were originated since 2003. ARM are about 25% of the total market and 60% of sub-prime.
- The *delinquency rate* of the total market was 6.99% in 2008Q3 - delinquency rates were 4.34% for prime mortgages and 20.03% for sub-prime mortgages.
- The stock of loans in *foreclosure* was 2.97% in 2008Q3 – foreclosures are dominated by prime and sub-prime ARMs in California and Florida, but there are signs of a flattening of **foreclosure starts**.



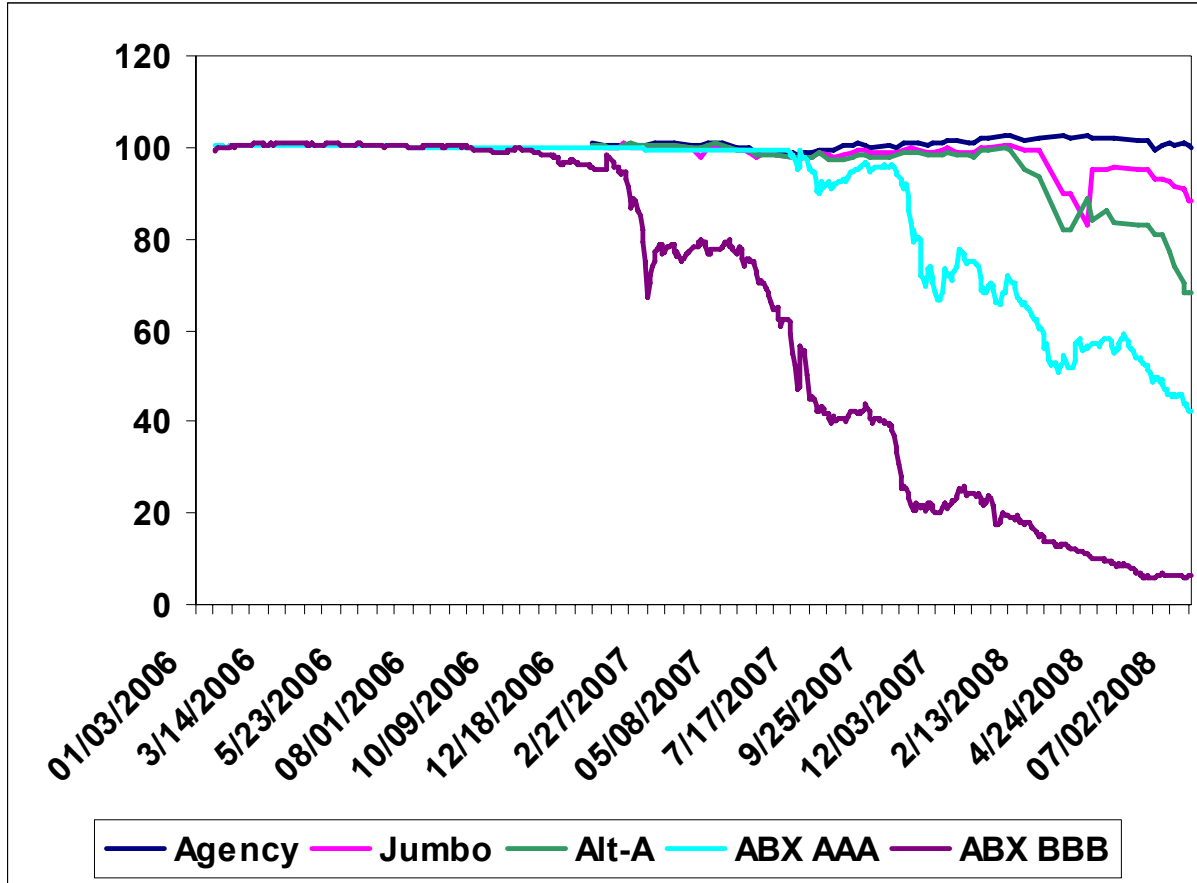
US Sub-Prime Delinquencies

60+ day, percent of original balance



Source: Global Financial Stability Report, IMF, October 2008

Prices of US MBS

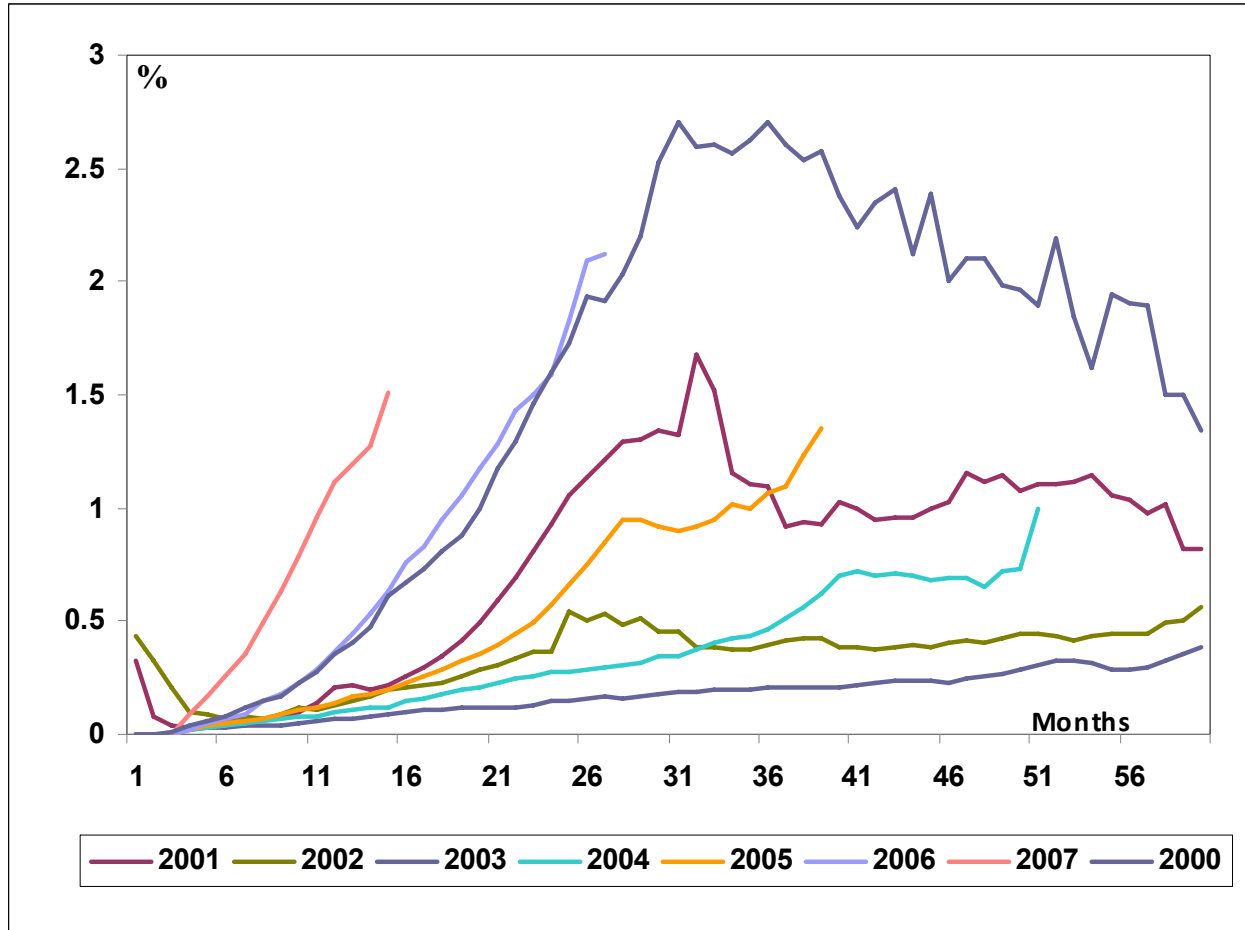


Source: Global Financial Stability Report, IMF, October 2008



US Prime Delinquencies

60+ day, percent of original balance



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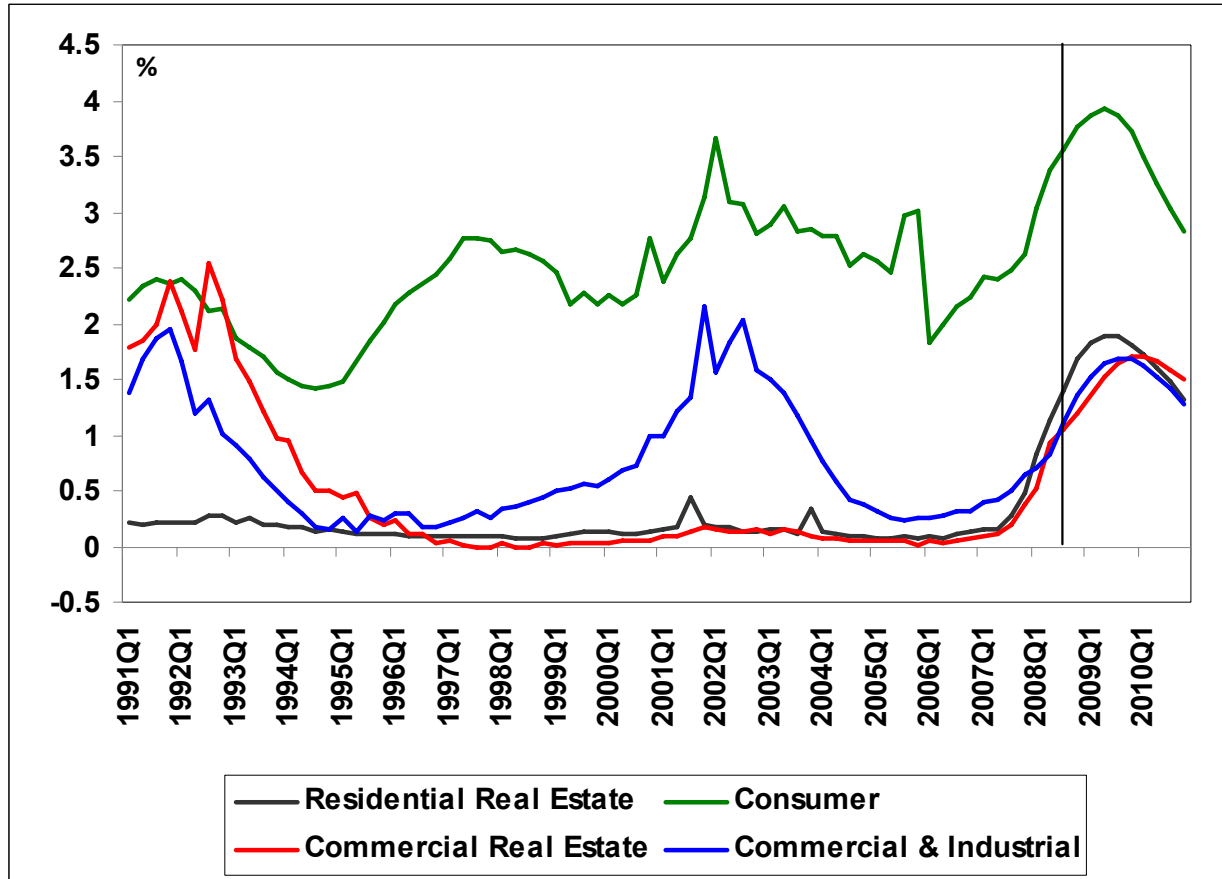
Credit Contagion

- ‘Private label’ MBS issues do **not** have the benefit of Agency guarantees – holders of RMBS face *default risk* in addition to prepayment risk.
- Securitised RMBS are structured to protect the holders against default, usually through a combination of *interest rate spread*, *reserves*, *external guarantees*, and a *subordination* structure to absorb losses.
- The valuation of securities (and derivatives based upon them) with prepayment and default risk is **complex** and **poorly understood**.
- As losses began to mount on sub-prime MBS, global investors lost confidence in **structured credit** and there was contagion to **all** forms of securitised debt, regardless of collateral or structure.



US Loan Charge-Off Rates

Percent Loans Outstanding, Annualised



Source: Global Financial Stability Report, IMF, October 2008



Securitisation

- In order to understand the evolution of the **global** crisis, we need to know more about the *process* and *features* of securitisation.
- Again, securitisation has been around for a long time - credit problems in the global banking sector in the mid-1980s led to the introduction of capital requirements (BIS) and a need for banks to manage their balance sheets much more actively.
- Securitisation techniques were first applied to consumer loans, credit card payments, and other receivables, and only in more recent years were extended to residential and commercial mortgages.
- Securitisation was seen as an **aid to financial stability** – leading to greater price transparency, a wider dispersion of risk, and preventing the banking system from becoming burdened by bad loans.



The Motivation

- Although securitisation got its impetus from market inefficiencies and crises there are many motivations (for issuers) today:
 - Balance sheet restructuring
 - Tapping new sources of finance for an expanding loan portfolio
 - Modifying an institution's risk profile
 - Reducing regulatory capital requirements
 - Matched funding
- There are also several motivations for investors:
 - Creation of unique and custom-tailored risk/return combinations
 - Exposure to new names
 - Initially higher yield for equivalent credit rating



Credit Enhancement

- Some forms of enhancement may be *external* to the deal through third-party agreements
 - Bank letter of credit
 - Insurance – provided to cover the risk of default loss on the pool of underlying assets
 - **Credit default swaps** may be purchased to cover default risk
- Other forms of enhancement may be *internal* to the structure of the deal
 - Over-collateralisation – the nominal value of the assets in the pool exceeds the nominal value of securities
 - Excess spread – the difference between the interest due on the underlying assets and the interest due to investors
 - Cash reserve funds
 - Subordination – the credit tranche structure provides assurance for the holders of senior notes



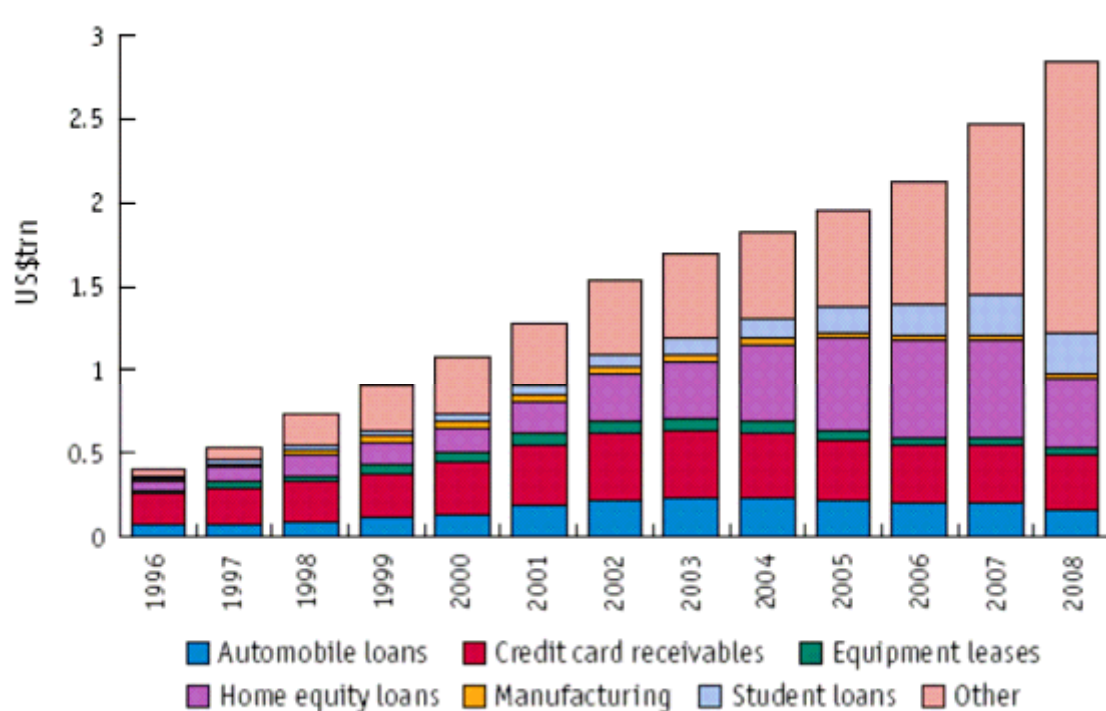
Credit Tranche Structure

- ABS (and CDOs) are typically issued with a *credit tranche* structure
 - Senior notes are typically AAA rated to reflect low credit risk except in severe market circumstances
 - *Mezzanine* tranches absorb any credit loss in the event that the equity tranche has been fully used
 - The *equity* (or most junior) tranche absorbs the first loss on the underlying pool, and is usually retained by the issuer

- The *payment “waterfall”* allocates cash flows in order of payment priority, according to the seniority of the notes



ABS Volume Outstanding (US)



Source: SIFMA

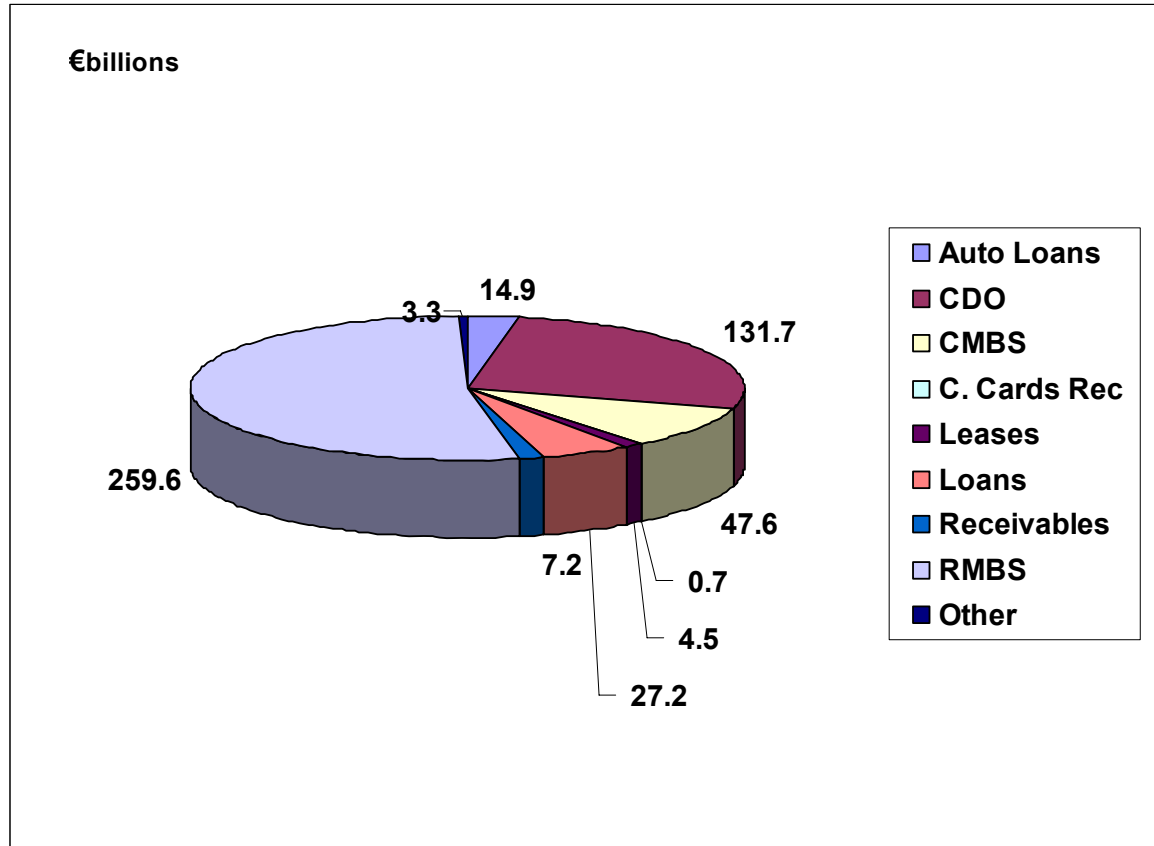
Note: 2008 figures are for the period up until the third quarter.

Source: Financial Risk Outlook, FSA, 2009



European Securitisation

New Issuance, 2007



Source: European Securitisation Forum



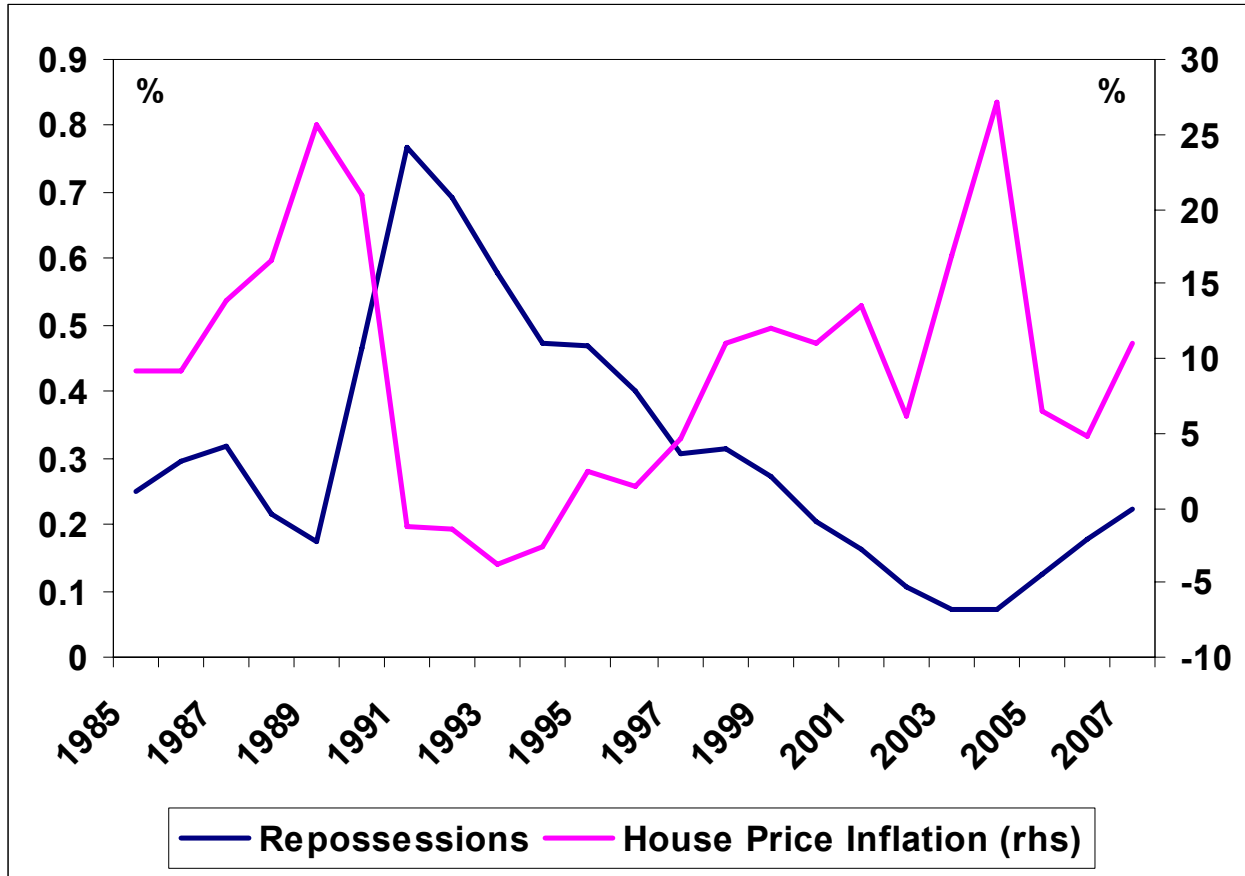
‘Economic’ vs. Market Value

- The poor performance of MBS/ABS is reflected in market values that imply **barely plausible** default rates and are at variance from economic ‘fair value’.
- Using UK RMBS as an example, Fitch estimates that the worst performing mortgage pool originated in the late 1980s sustained **cumulative** losses of 5% in the last major housing downturn.
- Most AAA rated RMBS securities (excluding non-conforming and buy-to-let collateral) would comfortably withstand similar losses today, yet they currently trade at roughly 90-95% of face value.
- Admittedly, such losses may be exceeded in the current severe recession (almost a self-fulfilling event brought about by the ‘credit crunch’ itself!).



UK House Repossessions

Annual Data

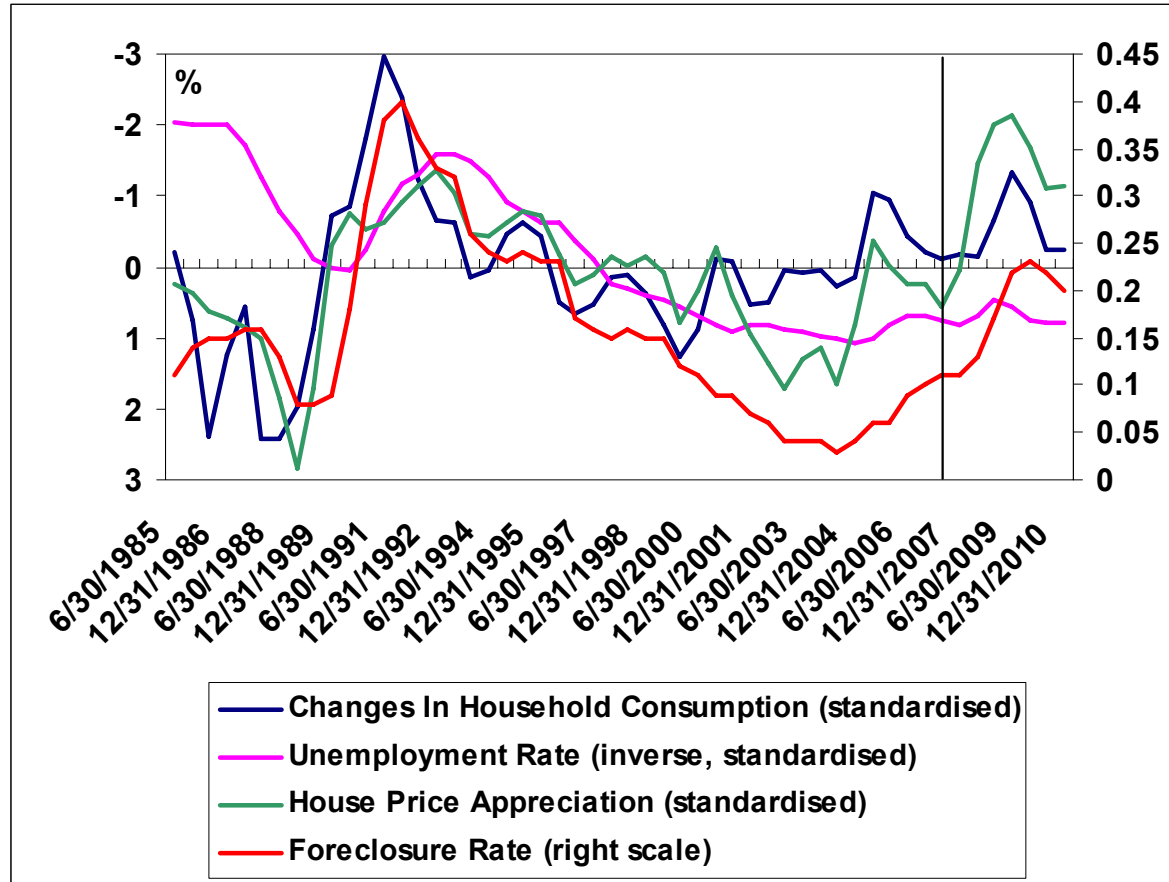


Source: Council of Mortgage Lenders



UK Mortgage Foreclosures

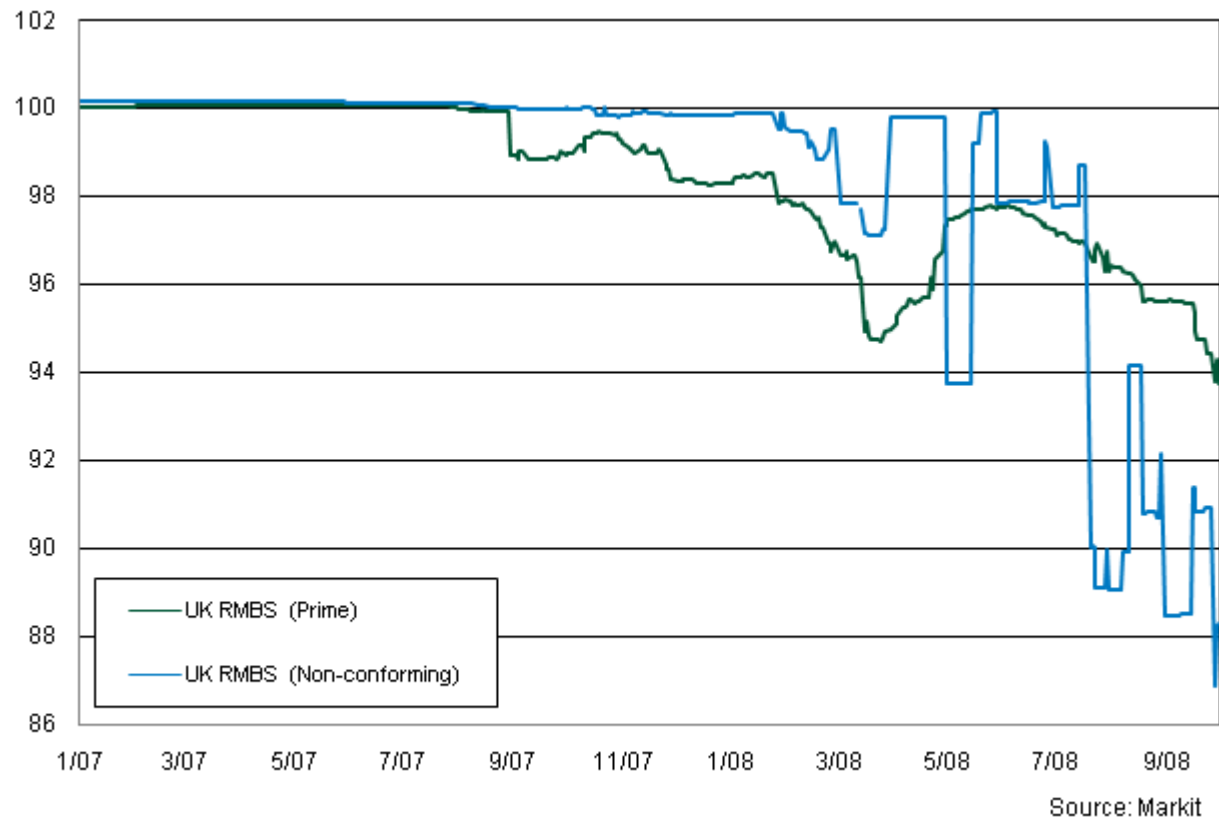
Percent



Source: Global Financial Stability Report, IMF, October 2008



UK AAA RMBS





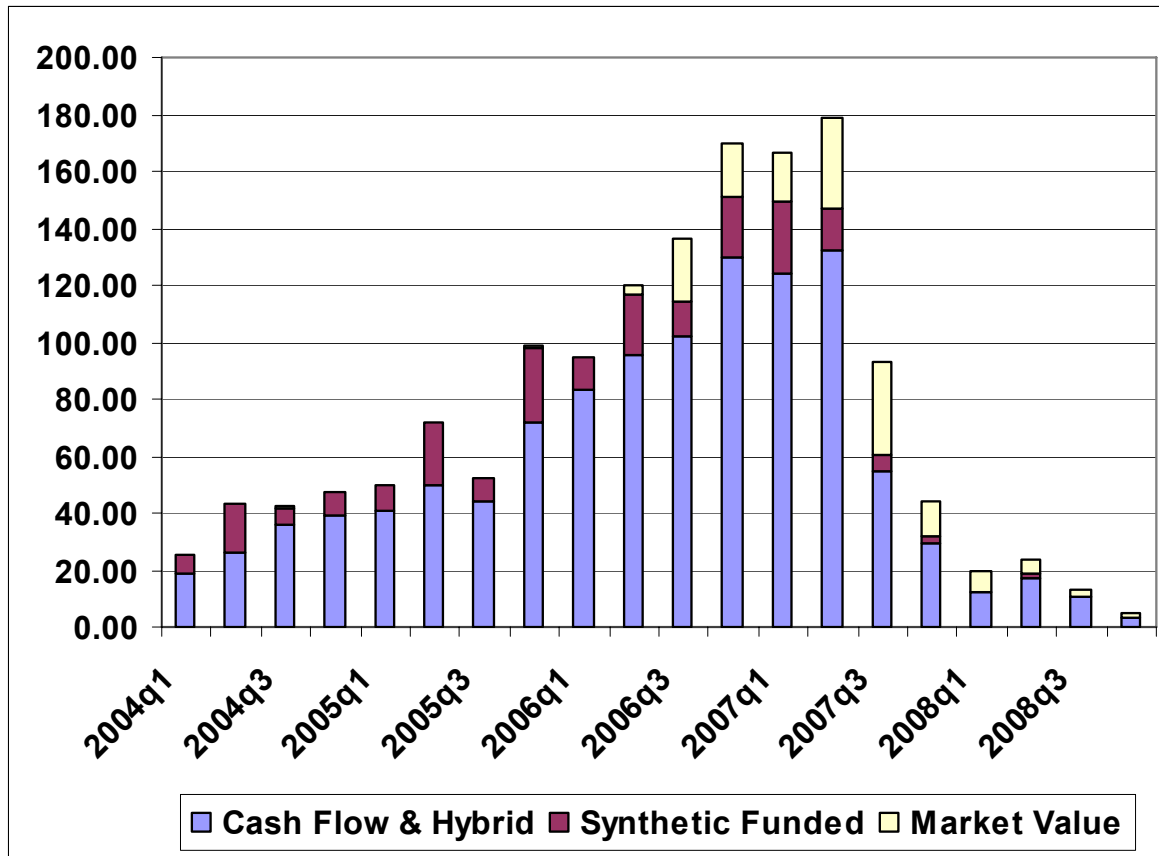
What About CDOs?

- A 'CDO' (CLO/CBO/CSO) is a generic term referring to '*collateralised loan/bond/synthetic obligation*' where the middle term references the underlying asset class
- The structure of a CDO is similar to traditional ABS – securities (tranches, classes or notes) are issued with various risk-return characteristics backed by a pool of assets (loans, bonds etc.)
- Again, the concept has a **long history** – *Collateralised Bond Obligations* (CBO) were issued in the late 1980s backed by High Yield bonds to provide wider access to sub-investment grade securities.
- CDOs have suffered in the current crisis firstly because many invested in RMBS/ABS and, secondly, because, they have been tainted by the lack of confidence in complex credit structures.



Global CDO Issuance

Quarterly, \$billions



Source: Securities Industry and Financial Markets Association



Structured Credit Problems

- Various problems with the asset class have been highlighted by the crisis of the past two years:
 - Principal/agent problem – do issuers/ratings agencies fail to conduct proper due diligence? Surely reputational risk would provide some check?
 - Information asymmetry – is it possible for buyers fully to assess the risk of structured debt securities?
 - Complexity – it is not straightforward to value prepayment and default risk, as already said, and it's more difficult in a portfolio context
 - Lack of historical data – we do not have sufficient history to evaluate the performance of loan collateral through several business cycles but this is true of any financial and economic analysis
 - Lack of robust stress testing – volatility and correlation risk is poorly understood, the 'Peso effect' – small probability of large event



Proposals for Reform (1)

- Several proposals for reform of the structured credit market (excluding synthetic structures) have been made:
 - Guarantees – either at the loan level or at the security level – but existing structures do provide such safety mechanisms
 - Public Agency – some form of **public** guarantee (mortgage agency?) might be required to be fully effective, if the problems of today are not to be repeated
 - Public Rating Agency – would not be immune from making the same risk assessment mistakes but would avoid conflicts of interest
 - Risk Models – complex pricing and risk assessment models need to be more widely available and open to scrutiny
 - More Information – it is hard to imagine more information than is already provided but it could be made more accessible
 - Pricing Transparency – more accessible public platform



What About CDS?

- The **credit default swap** (CDS) has not been directly at the centre of events but has come under intense scrutiny as the crisis engulfed the credit asset class in general, for several reasons.
- First, some market participants have exposure to mortgage and other forms of *structured credit* through the use of CDS – e.g. CDS of RMBS, or synthetic CDO constructed with CDS.
- Second, single name CDS (and indices of CDS) is *more liquid* than the underlying cash market in corporate bonds, so CDS have provided the *vehicle for bearish views* on the credit asset class.
- Third, unknown CDS exposure has been highlighted in *counterparty risk* exposure, e.g. AIG, Lehman Brothers (in addition to default).



Criticism of CDS

- The CDS market functions *over-the-counter* (OTC) – this offers greater flexibility (although the terms of the market have become increasingly standardised) but lacks the regulatory control of exchange trading.
- As such, the CDS market is accused of being ‘*opaque*’ and leaving market participants open to significant *counterparty risk* (though no different from in any other form of OTC trading).
- Counter to some of these criticisms, the CDS market has continued to function well through the crisis, with reasonable liquidity, high visibility of (electronic) dealer prices, and reasonable bid-offer spreads.
- Proposed reforms include switching to *cash settlement* as the norm, netting of outstanding contracts, and the establishment of a *clearing house* to improve transparency and reduce counterparty risk.



Proposals for Reform (2)

- Re-define as *insurance* – at one extreme, some advocate linking credit protection more clearly to the underlying exposure and regulating the product and providers as insurance.
- More *standardisation* – the market has already gravitated towards a high degree of standardisation - we can't have both a tailored hedging instrument and standardisation!
- *Clearing house* – this would provide for transparent application of margins, netting of risk, the reduction of counterparty risk and, hence, elimination of (CDS) counterparty risk
- *Price visibility* – how much can the CDS market learn from the international bond market? Can we have information equivalent of TRACE?



Market Micro Structure

- The current crisis has highlighted the requirements of well-ordered and properly functioning markets:
 - Executable two-way prices - liquidity
 - Price discovery – market-clearing price mechanism
 - Standardisation – is this always possible?
 - Easily understood products? What about options?
 - Control of counterparty risk
 - Visibility and transparency

- Much of the debate has focused on the relative merits of exchange trading versus OTC but many of the world's markets operate OTC (e.g. foreign exchange), albeit with less product complexity.



Liquidity v. Solvency

- The crisis started with poor underlying fundamentals in one sector (sub-prime mortgages) leading to price deterioration of badly understood products in illiquid markets.
- This led to write-downs of other related assets (the ABX is an inappropriate benchmark for the pricing of structured mortgage products), and contagion to structured credit in general.
- Liquidity dried up in many markets, exacerbating the effect of an imbalance in supply and demand – declines in collateral values further increased funding pressures and triggered ratings actions.
- The downward spiral led to greatly increased counterparty risk, leading to higher funding costs, further asset price falls, solvency concerns and, ultimately, systemic risk.



Regulation

- Basel 2 allows for risk managers to have much greater freedom in applying models to asset pricing – should this be revisited?
- Bank regulators and supervisors will look more closely at loopholes – the desire to avoid re-growth of the ‘shadow banking’ system. In addition, there may be some attempt to limit leverage – e.g. Switzerland
- The role of the ratings agencies will be looked at closely – there are well recognised ‘agency problems’ (in the economic sense) involved in the structuring and rating of public debt securities.
- Accounting – mark-to-market is supposed to provide an accurate measure of ‘fair value’ but what does this mean in the absence of a properly functioning traded market?



Macro Stability

- Policymakers (i.e. Central Banks in the first instance) at first separated liquidity issues ('lender of last resort') from macroeconomic policy issues (easier monetary policy).
- The more aggressive approach now taken by governments has led to a combination of easier fiscal and monetary policy – this need not compromise 'inflation targeting'.
- Looking further ahead, policymakers will look closely at the involvement of banks in the 'originate-to-distribute' model – is securitisation a stabilising or de-stabilising influence?
- More generally, the topic of how to assess asset prices in the formulation of monetary policy, and whether to respond to asset price 'bubbles', will remain a lively subject of debate.



Research Agenda

- Examine the extent to which CDS have played a leading role in the **contagion** – use high frequency data across asset classes – but we know that credit spreads have been genuinely at the forefront of economic risk
- Examine the **volatility** characteristics of CDS compared with other asset classes and derivatives – is there anything unusual going on?
- Re-examine the drivers of the **CDS-bond basis** – do we find large unexplained residuals – are they idiosyncratic or systematic – again this might provide evidence of ‘**destabilising**’ speculation
- Consider the behaviour of volatility and **correlation risk** in periods of crisis – dynamic risk management and state-contingent correlation
- Can we borrow techniques from other OTC markets to improve the pricing transparency of structured products and credit derivatives?



Summary: Lessons Learned

1. We need to keep the benefits of securitised markets – wider access to credit, dispersal of risk, proper marking to market.
2. We need a hedging vehicle for credit risk (credit derivatives).
3. **BUT** we require proper functioning markets for these benefits to be realised.
4. This requires less complexity, more transparency, better regulation.
5. We need more education (e.g. the ICMA Centre).
6. Economists (and policymakers) need a better understanding of financial instruments!
7. Finance quants and risk managers need to know a bit more about economics!