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# **The Credit Crisis of 2007**

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## Outline of Presentation

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1. Background to the crisis
2. Players and the Main Issues
3. Recommendations



## Background

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Since the beginning of the decade we have had a low interest environment. It has encouraged investors (financial institutions, pension funds, hedge funds) to seek instruments that offered yield enhancement.

Financial innovation lead to a dramatic growth in the market for credit risk transfer instruments. Securitization was one mechanism.

Securitization takes high yield assets and places them in a structure and divides the cash flows mainly into triple A and investment rated liabilities.

Global banks moved to an originate-to-distribute model.



## Background - the demand for high yield assets

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There was a great demand to place in collateral pools high yield assets, such as subprime mortgages, auto loans and credit cards.

Subprime mortgages offer higher yields than standard mortgages, typically 200 to 300 basis points above prevailing rates.

They made ideal assets to securitize.

The supply of subprime mortgages adjusted to meet this demand

1. by the use of low teaser rates over the first few years, often paid no principal and risk was “low”, given rising house prices.
2. by the lowering of credit standards by mortgage originators. The environment encouraged questionable practices by some mortgage originators.



## Background – delinquencies in the subprime market

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There were four reasons why delinquencies began to increase after mid 2005.

1. Typical subprime borrowers are not very credit worthy – often highly levered with high debt to income ratios, and often had mortgages with high loan-to-value ratios (often 100% or more).
2. In 2005/6 teaser loans had low fixed rates for the first two or three years, then re-set semi annually to an index plus margin. Short term mortgage rates began to increase from mid 2004.
3. Many borrowers had counted on being able to re-finance or to sell their home. However in April 2005, home price appreciation began to decline.
4. A decline in lending standards and increased fraud.

## Background - securitization

Assets placed in a collateral pool. To finance the purchase of the assets, the arranger issues debt against different tranches.

There are costs associated with securitization: managerial time, legal fees, administration fees and rating agency fees.

The equity holders of asset backed trusts would only securitize if the process generated a positive present value. What generated the added value?

If a triple A rated tranche offered a higher yield than other triple A rated assets, why?

Liquidity?

Ratings were inaccurate?



## Players and Issues

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Here we discuss issues related to the following players

1. rating agencies
2. mortgage brokers and lenders
3. SIVs
4. monolines
5. CDO type structures
6. valuation
7. transparency
8. systemic risk
9. Risk management



## Players and Issues - reliance on rating agencies

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Many investors are restricted to investing in investment grade assets.

Money market funds are restricted to investing in assets with ratings not lower than triple A, pension funds and municipalities to investment grade.

Many investors invested in assets that were both complex in structure and contained subprime mortgages.

Investors in these products typically had less information at their disposal to assess the underlying credit quality of the assets in the collateral pool than the originators.

Relied upon the credit rating agencies.



## The CDO Rating Process

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The rating agency told the CDO trust partners, the equity holders, the procedure it would use to rate the bonds – the methodology, historical default rates, prepayment rates and recovery rates.

The rating process was a fixed target. The CDO equity holders designed the liability structure to reflect the fixed target.

An iterative process to achieve a structure that would generate the required amount of profitability.

A critical input was the data.



## Rating Process: Data

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Given the use of historical data, it did not reflect the changing nature of the subprime market – declining lending standards, the growing number of no document mortgages, high loan to value mortgages.

Normally mortgages have high recovery rates. But with high debt to value ratios, declining home prices, this was not longer the case. Again, this was not reflected in the data used to rate the CDOs.

Rating agencies receive data from the issuers and arrangers and assumed that appropriate due diligence has been performed. They do not check the quality of the data.

## Incentives and the Rating Process

From the CDO equity perspective, if not enough of the CDO bonds were rated triple A, it would not be economically profitable to proceed.

Creation of CDOs was also in the interests of the rating agencies, because a CDO trust requires continual monitoring by an agency. This generates fees.

The fee arrangements generated conflicts of interest:

- (a) rating agencies offered advisory services to issuers;
- (b) rating agencies were paid by issuers.



## Incentives and the Rating Process

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Rating agencies such as Fitch, Moody's and Standard and Poor's are Nationally recognized Statistical Rating Organizations – a regulatory barrier to entry.

Basel II uses credit ratings to determine the amount of regulatory capital that a financial institution must hold.

Reputation of a rating agency is important.

However, there is an incentive Issue:

There is no guarantee that the incentive structures offered to management, that are essentially short term in nature, will act to align management to act in the best long run interests of the firm. The agencies have reported that structured products were a major revenue generator for them.



## Mortgage Brokers and Lenders - incentive issues

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Little incentive to perform due diligence and monitor borrowers' credit worthiness, as most subprime mortgages were sold for securitization.

Incentive compensation system for brokers based on volume with minor consequences for the broker if loans defaulted with a short period.

Arrangers had put options forcing brokers to buy back such defaulting mortgages. However, in many cases originators were unable and went out of business.

Originators spend funds persuading legislators to reduce tough new laws restricting lending to borrowers with spotty credits.



## Special Investment Vehicles (SIVs)

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SIVs invest in medium and long term highly rated assets and fund these purchases with short term asset backed commercial paper (ABCP), medium term notes (MTNs) and capital.

The rating of the ABCP and MTNs relies on the ability of the SIV to roll over its debt. Each SIV must have multiple back stop lines of credit.

However the ability to roll over debt also depends on the value of the collateral – the assets of the SIV.

The rating agencies do not consider valuation issues.



## Monolines and Systemic Risk

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Sell insurance to guarantee timely payment on municipal bonds.

During the last decade moved into the business of providing surety wraps for asset backed bonds and CDOs. Viewed as a “highly profitable” business.

### Systemic risk

If a monoline is downgraded, all of the paper it has insured must be downgraded.

- 1 This will cause holders of the paper to mark down their holdings under fair value accounting.
2. Enhanced money market funds that must hold assets rated at least triple A, this means selling downgraded assets.
3. Affected the market for tender option bonds that are auctioned weekly or monthly. The underlying collateral – municipal bonds insured by monolines.



## CDOs and CDO square structures

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Average investors were less informed than originators for two reasons.

1. Each asset backed trust had its own unique waterfall structure, that had to be modeled and programmed.
2. There was (this is still true today) a scarcity of generally available and timely data on collateral pools of specific asset backed trusts. This made modeling and simulation of the cash flows nearly impossible.

Credit default swaps on asset backed trust bonds played an important role. There were not enough asset backed bonds to construct the underlying collateral pools. A large number of collateral pools were synthetic (ABS CDS). This greatly magnified the effects of a mortgage bond defaulting.

The use of synthetic collateral meant less capital was needed to construct the collateral pool.



## Valuation Uncertainty

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In fair value accounting there are three levels used for classifying the type of valuation employed:

Level 1 clear market prices;

Level 2 use market prices of related instruments;

Level 3 market prices can not be observed and model prices estimated.

Model valuation becomes increasingly problematic in turbulent markets. This increases the uncertainty associated with model prices and increases the potential for disagreement between borrowers and lenders about the valuation of collateral.

This has been a major driver behind the different market failures.

# Valuation Uncertainty

Asset Backed  
Trusts  
Pool of  
mortgages

Increasing complexity for  
valuation

CDOs  
1.Pool of bonds  
issued by ABS trusts  
2 Synthetic CDSs

CDO squared  
Pool of bonds  
issued by  
CDOs



## Transparency

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The complex nature of the products and how this affects pricing and risk management.

1. Many investors did not have the in-house technical knowledge to understand the true nature of the products, the frailty of the assumptions behind credit ratings and pricing. These investors placed faith in a credit rating.
2. What is the meaning of a credit rating? Is a triple A rating for a municipal bond the same as for a corporate bond or a CDO liability? Is a rating a measure of default or loss over the life of the instrument?
3. The lack of transparency as to the valuation of illiquid assets.



## Systemic Risk

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- how events in one market affect other markets

The asset backed commercial paper (ABCP) market relied on the quality of the collateral to minimize the risk of lending.

Lenders wanted information about the type of assets and the value of the assets. Uncertainty about both dimensions.

1. Closure of the ABCP market. Investors fled to the Treasury bill market.
2. hedge funds unable to roll over assets. This caused the forced to selling of assets.



## Systemic Risk

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This affected

- 1 The CDO markets, lowering prices to “artificially low” levels.
- 2 equity markets – selling “good” and buying “bad” assets (closing short positions).
3. use of back stop lines of credit from banks.

The uncertainty of the magnitude of these demands, plus the possibility of bring assets back on the balance sheet and supporting bank sponsored money market funds, forced banks to hoard cash.



## Risk Management

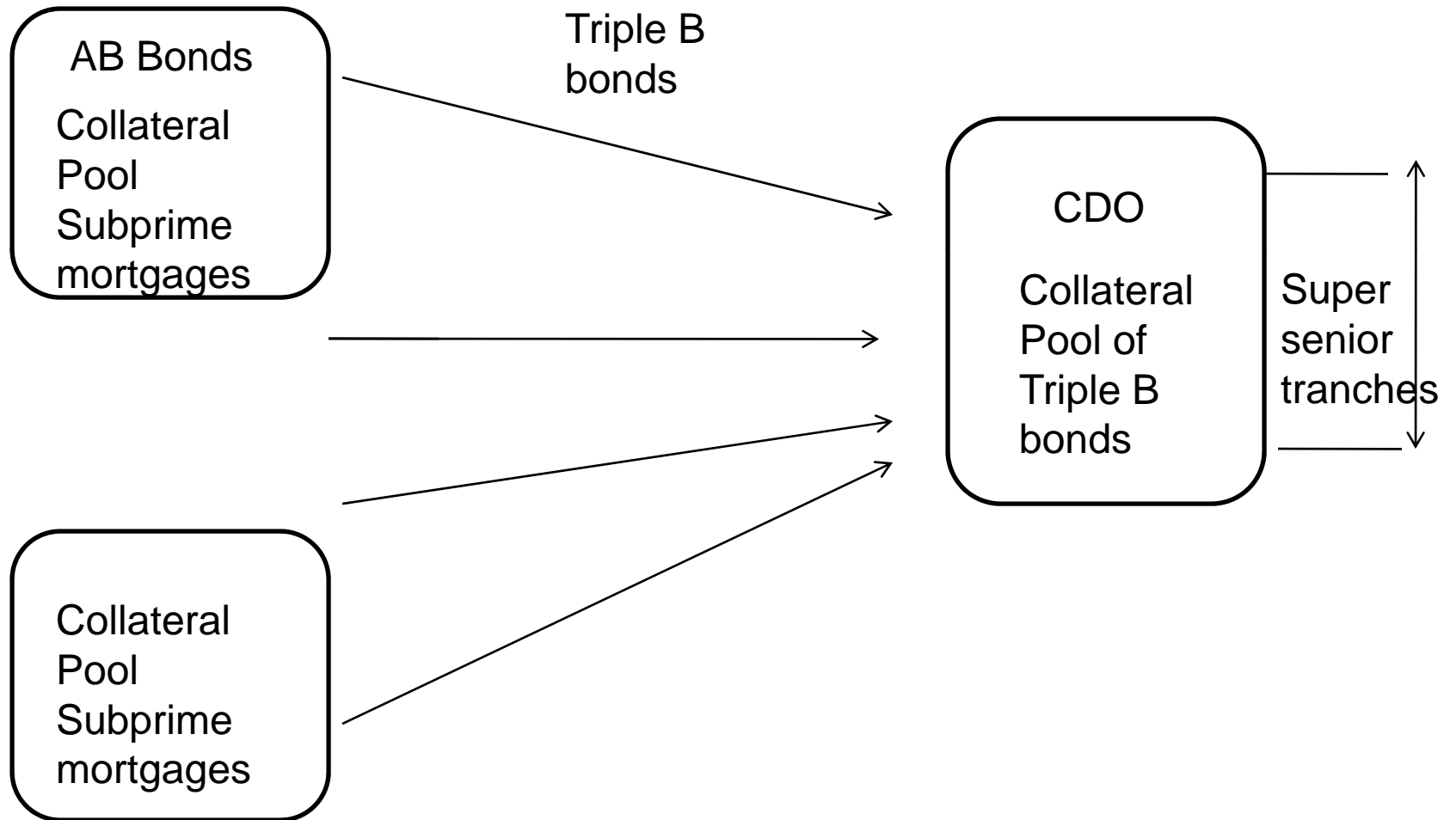
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Perhaps one of the biggest failing in the crisis was the failure to understand the binary (zero-one) nature of mortgage CDOs.

The assets of a mortgage related CDO were subprime asset backed bonds. These bonds were tranches on a pool of individual subprime mortgages. To increase profitability of the CDO, the typical CDO had pools of mortgage backed bonds rated double B to double A, average triple B.

Average attachment point for the MB tranches was between 3 to 5% and the width was very thin from 2.5 to 4%. Assuming a recovery rate of 50% and a default rate of 20%, a realistic number in the current environment, then it was to be expected that triple B tranches would be hit.

## Risk Management: Binary nature of CDOs





## Risk Management

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In the current downturn in the housing market and a recessionary economic environment, if one triple B tranche is hit, then it is likely that other triple B tranches will be hit during the same period, especially given the thin width of the tranches.

### **Domino Effect**

Either the cumulative default of the subprime mortgages keeps the MB bonds untouched and the super senior tranches will not incur losses, or the default rate wipes out the bonds and the super senior tranches.



## Summary

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1. Low interest environment generated a search for yield.
2. Demand for high yielding assets to put into a collateral pool to increase the profits from securitization. Subprime mortgages were an ideal choice, along with auto loans and credit cards.
3. Mortgage originators did not assume default risk of the risky mortgages. Little incentive to perform due diligence. There was fraud and lax regulatory oversight.
4. Some arrangers had put options to sell mortgages back to originators if the mortgages defaulted within a given period. In some cases the options were worthless due to counterparty risk.
5. To reduce capital requirements, banks employed an originate and distribute mode of operation. They had little incentive to perform due diligence.



## Summary

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6. In many cases the collateral were credit default swaps (CDSs). This implied that CDSs written on the same asset could appear in many different structures.
7. The rating agencies did no monitoring of the raw data, even though it was common knowledge that lending standards were declining and fraud increasing. This implied that assumptions about the probability of default, recovery rates and default dependence did not reflect current conditions.
8. Rating agencies were tardy in recognizing the implications of the declining subprime market for the ratings of monolines.
9. Rating agency incentives – they were paid by clients to rate structures. They received payment for also continuous monitoring CDO trusts. It was a very profitable business for the agencies. Regulatory barriers to entry.



## Summary

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10. Monolines agreed with the rating agencies re the ratings for senior tranches and sold insurance wraps.
  
11. Management of financial institutions are given bonuses based on short run performance. Labor markets are imperfect: failure, even spectacular failure, is rarely a barrier to getting a job at another institution.
  
12. Basle II capital requirements made it attractive for banks to invest super senior tranches. Enhanced money market funds are required to invest in triple A or better type assets. Pension funds and municipalities invest only in investment grade assets. These conditions provide a receptive market for triple A rated assets backed bonds.



## Summary

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13. The absence of complete data on collateral pools for many structures made valuation problematic even for sophisticated investors. It also made independent analysis of credit ratings impossible.

To an unsophisticated investor, the rating process was not transparent. They had to rely on the rating agencies. Regulators ignored this problem

14. The absence of complete and timely data and concern about valuation methodologies made investors uncertain about the valuations posted by banks in their trading books.

15. The implicit commitments of banks to their SIVs and money market funds were not reported to investors. Regulators ignored this implicit commitment.



## Recommendations: Steps to Avoid a Repeat

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Having identified some of the key issues that generated the crisis, we set out a number of recommendations that will help in avoiding a repeat.

1. Rating agencies
2. Valuation
3. Transparency
4. Design of instruments
5. Regulatory issues
6. Risk management

## Rating Agencies



Jumps from triple A to junk over short periods of time have become common in the crisis.

Tardy response to the rating of monolines. Agencies waited until the end of 2007 before acting.

Agencies have a long history of estimating the probability of default and the loss given default for bonds and loans. Structured products introduce some additional levels of complexity.

## Rating Agencies

CDOs are different from corporate bonds necessary to model:

1. the cash flows generated by the assets in the collateral pool.
2. prepayments
3. default dependence among the assets
4. how the covariates that explain default by the assets varies over the life of the structure
5. the waterfall structure of the CDO
6. data for other structures that can be used to test the methodology

Rating agencies did not perform due diligence on the raw data. The situation is analogous to an accountant accepting at face value the figures given to them. No auditing function.



## Rating Agencies: Recommendations

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R1. The meaning of a rating needs to be clearly stated.

Is a rating a measure of the probability of timely payment?

Is it a measure of the expected loss averaged over the life of the instrument or some other horizon?

If a rating is through-the-cycle, what is the length of the cycle?

How is it calculated?

R2. To avoid confusion, the agencies need to be explicit and attach *actual numbers* to their forecasts.

This way investors would immediately know the credit risk for any type of instrument. For example, they could provide investors with the expected loss over the different horizons. Note the agencies must be calculating these types of numbers.



## Rating Agencies: Recommendations

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The ability to independently validate a rating would go a long way to reduce the effects of conflicts of interest. Independent validation requires that methodologies be transparent and data be available.

R3. The agencies should be explicit about their methodologies. At present, their descriptions are general.

R4. For asset backed securities, the government should sponsor an agency that collects information on a timely basis about the collateral pools and make it available to market participants.



## Rating Agencies: Recommendations

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R5. Clarity is required about the data sources used to reach a rating.

Is the agency accepting data from a third party and has the agency done anything to check if there have been structural changes in the data sources? Has it checked the data to justify the validity of its distributional assumptions?

These recommendations will facilitate an independent party's ability to reproduce the credit ratings. They add light to the whole process of credit ratings.



## Valuation

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For pricing CDOs it is necessary to determine the present value of the underlying cash flows to the different tranches over the life of structure.

This involves modeling the factors that influence the

1. occurrence of default by the assets in the collateral pool
2. the loss given default.

It is necessary to calibrate the parameters of the model.

There is the need to demonstrate that valuation methodologies can be validated with respect to external prices and risk management is feasible, especially for complex instruments.



## Valuation: Recommendations

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The introduction of credit default swap indices in late 2002 enhanced the development of the CDS market by aiding price discovery and liquidity. Investors could observe bid/ask spreads for the different tranches on the index.

R1. Encourage the introduction of indices on relatively homogeneous baskets of assets would greatly aid price discovery and would help in the calibration of pricing models.



## Transparency

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### Issues

#### 1. Level of Explicit Commitments

Backstop lines of credit to hedge funds and SIVs  
level of commitments to levered buyouts

#### 2. Level of Implicit Commitments

Financial institutions had implicit reputational commitments to their sponsored SIVs and money market funds.

#### 3. The holding of assets awaiting securitization



## Transparency: Recommendations

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R1. For banks there is the need for timely transparency as to the magnitude of explicit commitments arising from lines of credit, backstop supports, and funding for levered buyouts.

R2. For banks there is the need for transparency as to the magnitude of implicit commitments that arise from reputation concerns.

A bank should state in a timely manner the consequences of bring back onto its balance sheet its off-balance vehicles. This would help reduce the information asymmetry.

R3. There is the need for greater transparency with respect to the nature of assets held by financial institutions, especially assets that are difficult to value (level three assets).



## Design of Instruments

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SIVs were funding medium term and hard to value assets with short term money market securities, exposing the vehicle to the risk of a market disruption.

R1. There is the need to design instruments that allow for market disruptions.



## Regulatory Issues

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There was a decline in lending standards for subprime, credit cards and auto loans. This was ignored by regulators and senior management. The situation was aided by

1. differing state level laws
2. originators successfully lobbying for a relaxation of standards
3. fragmented federal regulatory divisions.

Wrong-way counterparty exposure. Events that adversely affect a bank may also adversely affect the credit worthiness of a counterparty and the value of collateral giving rise to “wrong way” counterparty exposure.

Implicit commitments arising from reputational concerns were ignored by regulators.



## Regulatory Issues

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Marking to market: the concern that current prices do not reflect the “true” value and consequently companies are being forced to recognize losses on assets they have no intention of selling.



## Regulatory Issues: Recommendations

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- R1. Minimal Federal lending standards are required across all states in order to avoid the problems arising from lobbyist pressuring state lawmakers to have state laws relaxed.
  
- R2. There is the need for compulsory random sampling of mortgage lending practices and mortgage delinquency rates, especially in major states. The responsibility for such duties must fall to an independent body.



## Regulatory Issues: Recommendations

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R3. Originators should be required to hold a randomly selected number of mortgages from each mortgage class. Arrangers should be required to hold a specified percentage of the equity tranche of any structure that they sell.

R4. In cases where a counterparty posts collateral, regulators need to consider the effects of “wrong-way” counterparty credit exposure in determining capital requirements. They also need to recognize the effects of pro-cyclicality in stress testing and scenario analysis.



## Regulatory Issues: Recommendations

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- R5. Fair value accounting has come in for criticism due to its pro-cyclical nature. A possible solution is to allow investment banks to place an asset either in the trading book or the bank book. This decision is made at the time the bank buys the asset. There is the need for some rules to avoid “cherry picking” by banks – that is banks cannot keep on switching an asset back and forth as market conditions change.
- R6. For financial institutions that are of a size or importance such that their failure threatens the stability of the financial system, there is the need for consistent regulation across such institutions.



## Regulatory Issues: Recommendations

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- R7. The fragmented regulator system both at the Federal level and at the state level needs to be improved.
- R8. Regulators need to monitor the rating agencies with respect to data quality and methodologies.  
The inherent conflicts of interest between the rating agencies and their clients needs to be addressed. The ability to perform independent validation of ratings would go a long way to reduce the effects of possible conflicts of interest, which are impossible to eliminate.
- R9. Centralized clearing houses (CCHs) should be used to reduce and localize counterparty risk.



## Risk Management

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Clearly risk management broke down in the crisis.

In some cases risk managers did identify some of the risks, but were ignored by senior management. There was no regulatory pressure.

In other cases there was a failure to understand the true nature of the instruments, especially the binary nature of mortgage backed CDOs.

In many cases there was insufficient data available to accurately assess the risks.



## Risk Management: Recommendations

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R1. The incentive and compensation system should be reviewed to better align the interests of all the participants in the securitization chain with the interests of the investors and shareholders of the firm. The incentive compensation scheme should be closely related to long-term, firm-wide profitability.

R2. To perform risk management, it is necessary to have complete and timely data available about the underlying assets.

R3. Rigorous internal processes should be put in place to

1. understand the nature of the instruments
2. value complex and illiquid securities
3. internal credit quality assessment should complement external ratings.



## Summary: the factors that contributed to the crisis

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1. from the search for yield,
2. fraud,
3. agency problems resulting in lax underwriting standards,
4. incentive issues: originators, arrangers, rating agencies,
5. failure to identify a changing environment,
6. poor risk management by financial institutions,
7. lack of transparency,
8. the limitation of extant valuation models and
9. the failure of regulators to understand the implications of the changing environment for the financial system.

The paper addresses the different issues and offers suggestions on how to move forward.