



**ADVANCING CANADA'S
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Un forum national sur le management

**Finance
Risk Management and Structured Finance
Gestion des risques et finance structurée**

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Structured finance products are often identified as an important cause of the recent financial crisis.

The objective of this presentation is to show that the nature of these products was not the problem; their risk management over the recent years was however problematic.



The presentation has three sections:

- **What is structured finance?**
- **How was the financial crisis related to structured finance?**
- **Conclusions: Lessons for risk management**

1. What is structured finance? 4



Structured finance is a sector of modern finance that transfers risk to different markets.

This risk transfer is done via the securitization of various financial assets (e.g. mortgages, credit card receivables, auto loans...) and the creation of new financial products such as Collateralized Debt Obligation (CDO), Collateralized Fund Obligation (CFO), Asset-Backed Commercial Paper (ABCP) and many others.



In other words, **structured finance** means the pooling of assets such as debt that are sold by originators such as banks to investors.

The pool of assets is usually sold in the form of tranching claims via securitization.

The originator is not linked to the credit risk of the securitized assets.



Structured products are important tools of credit risk transfer from the originators to other financial institutions or sectors.

They represent a significant source of funding and reduce economic capital for originators.



Securitization is the method of pooling debt instruments and issuing new securities including structured products.

One example of more traditional securities is a Mortgage Back Security (MBS) securitized from a pool of mortgages by a bank. Securities are then sold on secondary financial markets.



The advantages of securitization are:

- **Efficient way of distributing risk**
- **Increase the availability of credit**
- **Standardize originated loans**
- **Improve liquidity in credit markets**
- **Create more complete markets**
- **Reduce regulated capital**



The **tranching** of liabilities is the main characteristic that distinguishes structured products from standard pass-through securitization products such as traditional MBSs.

This last form of securitization does not involve credit enhancing.



The tranching process allows to create different classes of securities from the original pool of assets.

The objective is to obtain (via credit enhancement) classes of rating higher than the pool's average rating.



Here is a standard example of a structured product with three tranches having a priority of payments in case of default:

- a) Equity or junior tranche which absorbs initial losses;**
- b) Mezzanine tranche which absorbs additional losses;**
- c) Senior tranche expected to be insulated from default risk.**



Market information theory suggests that senior tranches should be acquired by less informed or less specialized investors and equity tranches by more informed investors or even the originating institution.

Of course these tranches must have different ratings since they represent different default risks.



Example of a structured product is a CDO originated from a pool of credit risk products such as loans:

Suppose that a bank has a portfolio of 100 loans of \$1 million each with 10 years of maturity;

Suppose the bank wants to securitize the \$100 million portfolio (this is the **pooling) by structuring the transaction with different tranches representing different default risks and different ratings (this is the **tranching**).**



Prioritization is in function on how tranches absorb potential losses from the underlying portfolio of \$100 million.

The first tranche is the **equity tranche; let say \$10 million. This junior tranche absorbs the first 10% of any defaults that is \$10 million. The owner of this tranche will receive the highest return and will receive back the \$10 million notional investment at the maturity **if there is no default**. If 2 loans default during the period with zero recovery he will receive only \$8 million.**



The bank can also create a junior mezzanine tranche of 10 million. This tranche is labelled the 10-20 tranche. The coupon rate will be higher than for a more senior tranche because the default risk is higher.

A more senior mezzanine tranche can be the 20-40 tranche.

And the more senior tranche would be 40-100 with a much lower coupon rate corresponding to a much lower default risk. This tranche obtains a credit rating higher than the average of the collateral pool: AAA instead of BB, for example!



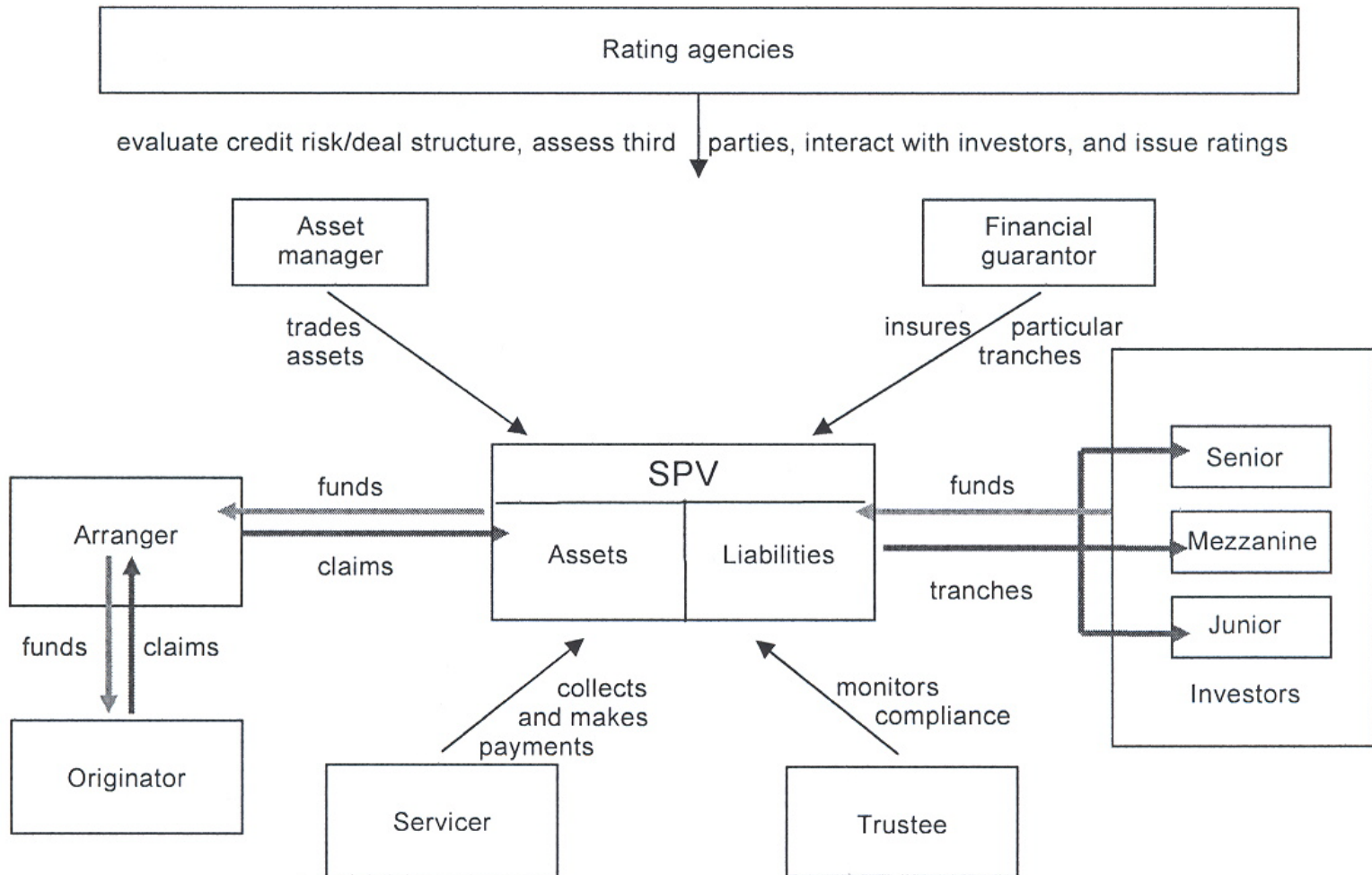
The main question now is how to **rate** and **price** these tranches?

Is the senior tranche free of credit risk?
Should it be rated AAA?

Is the default risk of each tranche
independent of the others?

Structured finance: key market participants 17

Stylised overview of the "players" involved in (funded) structured finance transactions and of their roles





Four crucial activities with different sources of complexity: pooling, tranching, pricing, rating.

Pooling implies evaluating the risk and return (and corresponding aggregate risk distribution parameters) of a structured finance product composed of a number of heterogeneous assets.



The credit risk correlation of these assets must be considered as for any **portfolio of credit risk.**

Tranching implies evaluating the distribution of cash flows for the pool of assets to the tranches under different stress situations and the rights and duties of various parties involved.



Tranching must also consider the potential conflicts of interest among tranche holders.

For example, junior holders are more interested in high up-front payout because of the default risk.

They may even sacrifice credit quality in exchange of high yield payments (structural provisions may limit this behaviour).



These tranches must also be rated according to their true risk.

They cannot be rated as traditional bonds; the rating must take into account of the correlation between the different tranches if any, as for any portfolio of credit risks.



Credit risk of a portfolio is measured by the default risk (probability of default, risk exposure and recovery rate) of each exposure **and by the correlations among the exposures within the portfolio.**



Since different tranches represent different positions in the loss distribution of the underlying pool of assets they must have different ratings corresponding to different default probabilities and different recovery rates.

These ratings must represent the result of the **pool credit risk analysis** and of the **structural specifics of the deal and the tranches**. To obtain adequate measures of credit risk, **historical performance** is a very important input in the credit risk literature (See Basel II and CreditMetrics).



The main differences between traditional securitization portfolios with large, well diversified and homogeneous pools of assets and structured products composed of less diversified and homogeneous assets are idiosyncratic and systemic risks.

Traditional securitization portfolios are more stable over time and historical experience can infer the actual default risk because their risk is typically actuarial (expected loss) with low idiosyncratic risk.



By contrast, structured portfolios are composed of smaller numbers of non-homogeneous assets. They are more subject to both idiosyncratic and systemic.

Correlations lead to loss distributions with fat tails that may affect senior tranches even if they have obtained high ratings.

2. How the financial crisis was related to structured finance? 26



A. One important criticism is related to the transparency of the four activities (pooling, tranching, rating, pricing) during the years before the financial crisis.

For example, it was suspected in 2007 that the ABCP was contaminated by US subprime loans. This suspicion that nobody was able to verify at that time was one main explanation of the liquidity crisis in this market.

How the financial crisis was related to structured finance? 27



B. According to other criticisms rating agencies did not use appropriate rating methods for these products and underestimated their systemic risk and over-rated many structured products by not taking into account the potential correlations between the tranches.

Senior tranches were sold as safe assets with a higher yield but close to that of treasury bonds although they were in fact much more risky.

How the financial crisis was related to structured finance? 28



One can show that using capital structure to structure the deals amplifies errors in evaluating the risk of underlying assets.

Small errors are sufficient to cause the default of a AAA asset with a reasonable probability (we will come back on this issue).

How the financial crisis was related to structured finance? 29



C. Another conclusion from the literature is that the likelihood of rating change is smaller in structured finance while their magnitude is larger (when there is a change it is usually a big one).

How the financial crisis was related to structured finance? 30



D. These tranches must be priced adequately.

One major difficulty is to incorporate the different correlations between the different tranches. Again many criticisms pointed out the lack of adequate pricing during the recent years because the responsible people did not have the knowledge and the information.

It was also documented that ratings had more influence on pricing structured products than for traditional bond markets because the pricing people had no other information.

How the financial crisis was related to structured finance? 31



E. Structured finance rating is now the largest business segment of the three rating agencies and their principal source of revenues.

Many questions were raised about potential conflicts of interest related to the issuer-paid fees.

The tranches are usually made by arrangers that have target ratings and rating agencies were in part in the structuring process by giving structuring opinions (ex ante rating process instead of the traditional ex post process).

How the financial crisis was related to structured finance? 32



I cannot analyse all these issues in detail here. Let concentrate on one of these problems related to the rating.

How to build AAA-rated securities from a risky underlying pool?

How the financial crisis was related to structured finance? 33



Let us come back to our CDO example and let us suppose that there are only two loans of \$50 million in the underlying pool. Each has a default probability of 10% and a zero recovery rate.

They are securitized with two tranches:

- **A junior tranche of \$50 million**
- **A senior tranche of \$50 million**

How the financial crisis was related to structured finance? 34



The junior tranche pays \$50 million if no bond defaults and zero otherwise. The senior tranche defaults only **if** both loans default.

If we assume that the two loans are uncorrelated, the default probability of the senior tranche is 1%!

If both are perfectly correlated the default probability of the senior tranche stays at 10% and with any intermediate assumption about correlation the probability is between 1 and 10%.

How the financial crisis was related to structured finance? 35



Now, if we have three tranches of \$50 million for an underlying portfolio of \$150 million, under the same assumptions the default probability of the more senior tranche becomes 0.1%!!! (that of the second tranche 2.8% and that of the junior 27.1%).

Both senior tranches have a default probability lower than 10%.

How the financial crisis was related to structured finance? 36



With CDO-square we can go further and combine the two junior tranches of two CDOs like the one in the first example having each a default probability of 19% and obtain a new senior tranche with a default probability of 3.6%.

Standard ratings are based on historical data and default rates between AAA and BBB-range between 0.02% and 0.75% so very precise information is needed.

How the financial crisis was related to structured finance? 37



For speculative grades it varies from 1.7% to 30% (Derivative Fitch). It is clear that with the above transformations we can create securities with ratings in these intervals.

It is now well documented that the structure of CDOs as applied during the years before the financial crisis yielded imprecise ratings because rating agencies did not have all the historical data to do appropriate ratings.

How the financial crisis was related to structured finance? 38



The lack of precision is even larger with CDO-square and depends heavily on the correlation assumptions (Coval et al. HBS, 2008).

By using the desired correlation it is easy to obtain senior tranches with a rating AAA with CDO-square products.

But many suspect that rating agencies had no precise information on these correlations because they had no historical data on these products.

How the financial crisis was related to structured finance? 39



It is also documented that a large fraction of CDOs in the market before the crisis were composed of subprime residual mortgage-backed securities as underlying assets.

These securities were themselves tranches from an original pool of subprime loans not well documented in terms of default risk. So the observed CDOs are in fact CDO-square.

How the financial crisis was related to structured finance? 40



The possibility of errors was then significant during the years preceeding the financial crisis. Moreover the subprime mortgages were highly correlated as we observed in 2007.

It is also clear that errors in rating affected the pricing of these products.

How the financial crisis was related to structured finance? 41



Why did investors purchase these products and why were they supplied?

A. Before 2007, there were very few defaults for structured securities.

The AAA rated offered yields attractive relative to other securities even they were probably too low because of inappropriate pricing.

How the financial crisis was related to structured finance? 42



In fact, these yields did not take into account systemic risk and investors underestimated these risks.

Also short-term interest rates were very low.

How the financial crisis was related to structured finance? 43



- B. The market grew exponentially and banks made large profits in asking large fees for originating and structuring these products.**
- C. It is also well documented that rating agencies made mistakes. There were also incentives problems. Some suspect that rating agencies were part of the underwriting process.**

How the financial crisis was related to structured finance? 44



D. The regulators did not anticipate these problems as well.

The Basel II regulation requires only half of the capital for AAA securities when compared to other investment-grade bonds.



Many firms lost money during the financial crisis because they did not apply the basic principles of risk management:

- **Risk appetite not well stated in many firms;**
- **Enterprise risk management not well defined and used;**



- **Relevant risk management policies not well supported by the top decision makers;**
- **In many organizations, focus on risk management seems cyclical with peaks after a crisis.**



There was bad risk management before the financial crisis by underestimating the default and the liquidity risks of the new structured financial products.



Many new products were introduced during the years before the crisis and many investors adopted them without sufficient understanding of their risk because they did not have the systems required to evaluate them.

They evaluated these complex financial products as standard ones.



Therefore there was no tail analysis, no back testing and no stress testing related to the risk of these complex products.

The risk management function became obsolete for top decision makers that were more motivated by their bonuses than by the financial stability of the firm. This explains in part the overreliance on rating agencies.



What are the main lessons?

A. For the system of structured finance:

- 1. Need more responsibility for originators of structured products; they must keep a large fraction of the pool they sell: possibly the complete junior tranche.**

This would increase their incentives for applying better risk management in their credit decisions and obtain better portfolios to sell.



- 2. Need more transparency in the tranching of the structured products. As for any security, participants in the market and researchers must be able to replicate the composition of these products.**

Public data sets must be available for studying these products.



- 3. More transparency also in the rating of these products. Any good researcher is able to verify the rating of any standard bond in the market because data are available and rating methods can be replicated. The same must apply for structured products.**
- 4. More transparency in the pricing of these products as well.**



B. For the investors:

- 1. Senior management and the board must rely more on risk management in making decisions; they must use more information on the enterprise-wide risk and consider this risk in making decision.**



- 2. The board must be composed of individuals that understand what is going on with the management of these risks.**

The risk management committee must be very active in the risk oversight of the firm.

- 3. The risk appetite of senior managers must be defined and known by the board; it must also be monitored by the board.**



- 4. The CRO (Chief Risk Officer or equivalent) must have enough authority and not be a passive officer that monitors, measures and reports risk.**

He must report to the CEO and have periodic meetings with the board.

Some suggest that the CRO should have veto power over some transactions.

The CRO office must be independent of the business units.



- 5. All important transactions must be robustly analysed ex ante with appropriate data and models for rating, pricing and testing the products.**

CVaR instead of VaR



This implies greater investment in risk management for many firms.

This also implies more transparency and appropriate disclosure to all constituencies.

In summary more due diligence with respect to risk.

Copy of the lecture available at:

www.hec.ca/gestiondesrisques

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Merci / Thank you

