

The Role of Structured Products in the Financial Turmoil of 2007-2008

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**ISTANBUL BILGI UNIVERSITY  
INSTITUTE OF SOCIAL SCIENCES  
Msc. IN INTERNATIONAL FINANCE**

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Tez Sınavı Tarihi

**Anahtar Kelimeler (Türkçe)**

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- 1) Yapılandırılmış Finansman
- 2) Kredi Derecelendirme Kuruluşları
- 3) Subprime Krizi
- 4) Kredi Temerrüt Takasları
- 5) Varlığa Dayalı Menkul Kıymetler

- 1) Structured Finance
- 2) Credit Rating Agencies
- 3) Subprime Crisis
- 4) Credit Default Swaps
- 5) Asset-backed securities (ABS)

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## TABLE OF CONTENTS

1. Introduction .....	1
2. Definition of Structured Finance .....	2
2.1 Relationship between Structured Finance and Securitization .....	3
2.2 Creation of Structured Products and Characteristics of the Market .....	4
2.3 An Overview of Structured Product Categories .....	6
2.3.1. Mortgage-Backed Securities (MBS).....	7
2.3.2 Asset-backed commercial papers (ABCP).....	12
2.3.3. Collateralized Debt Obligations (CDOs).....	13
3. Rating Agencies and Structured Finance .....	15
3.1 The Role of Ratings in Structured Finance .....	15
3.2 Problems with Ratings in Structured Finance .....	18
3.2.1 How is Structured Finance Rating Different from Traditional Rating?.....	18
3.2.2. Rating Methodologies and Shortcomings of Models.....	22
3.2.3 Conflicts of Interest and Moral Hazard Problem.....	24
4. The Role of Structured Finance in the Recent Financial Turmoil.....	27
4.1 Factors favoring the Rapid Growth in the Market.....	27
4.2 Shortfalls of the Products and Global Financial System.....	33
4.2.1 Credit Default Swaps (CDS) and Major Concerns.....	34
4.2.2 Residential Mortgage-Backed Securities (RMBS) and Major Concerns.....	37

4.2.3 Collateralized Debt Obligations (CDO) and Major Concerns.....	38
4.3 How Structured Products Triggered the Recent Turmoil? .....	39
4.4 Were the ratings on structured products misleading? .....	47
5. Conclusion.....	56
REFERENCES .....	58

## LIST OF FIGURES

Figure 1: The Main Participants in the Structured Products Market.....	6
Figure 2: Composition of the US ABCP market by collateral type.....	9
Figure 3: Classification of Structured Products.....	11
Figure 4: Asset Backed Commercial Paper (ABCP) Outstanding.....	12
Figure 5: Moodys Revenues by Segment.....	16
Figure 6: Moodys Revenues Breakdown as of End 2007.....	17
Figure 7: Global Distribution of Ratings.....	26
Figure 8: Home Price Appreciaiton according to Case Schiller Indices.....	30
Figure 9: Global Securitization by RMBS Collateral.....	32
Figure 10: Credit Default Swaps (CDS) Outstanding.....	35
Figure 11: Spreads on Major CDS Indices.....	36
Figure 12-1: Rating Downgrades by S&P from Orginal-to-Current .....	49
Figure 12-2: Rating Downgrades by S&P from Orginal-to-Current.....	51
Figure13: Summary Output for Case-Schiller and the Number of Rating Downgrades..	53

## ÖZET

Bu tezde yapılandırılmış finansal ürünlerin 2007-2008 yıllarında yaşanan global finansal çalkantıdaki rolleri araştırılmaktadır. Global krizin oluşmasına ortam hazırlayan nedenlerin büyük çoğunluğu yapılandırılmış finansal ürünler piyasasındaki hızlı ve kontrolsüz gelişmelerle bağlantılıdır. Yeni geliştirilen bu tür finansal ürünlerdeki karmaşık yapı, piyasalarda bu ürünleri denetleyecek otoritelerin yetersiz olması, bu ürünlerin çok çeşitli dayanak varlıklara bağlı oluşu ve şeffaflığın son derece düşük olması, 2008 öncesi dönemde yapılandırılmış finansal ürünler piyasasının tehlikeli şekilde büyümesine yol açmıştır. Uluslararası rating kuruluşlarının bu ürünleri ve bağlı riskleri geleneksel ürünlere benzer şekilde değerlendirmeleri ve tartışmaya açık uygulamaları da krizin başlıca nedenleri olarak göze çarpmaktadır. Bu çalışma, yapılandırılmış finansal ürünlerin değişik özelliklerini ve finansal krizin çeşitli evrelerindeki etkilerini ortaya koymayı amaçlamaktadır.

## **ABSTRACT**

This paper aims to provide an analysis on the role of structured products in the financial turmoil of 2007-2008. The recent turmoil was led by many different factors, most of which was strongly related with the rapid development in the market for structured products. Shortfalls of these newly-designed products, loopholes in the financial markets, lack of transparency of complex products and controversial methodologies of the rating agencies appear to be the main causes of the current crisis. The paper discusses different aspects of structured finance through products and examines their role in the various phases of the turmoil.



## **I. INTRODUCTION**

Global financial markets deteriorated drastically in the summer of 2007, triggered by concerns about exposures of financial institutions to the subprime mortgage market and financial instruments backed by these loans. As market players started to realize the risks associated with these assets, the financial turmoil spilled over to other financial assets - particularly those linked to structured finance. The write-offs of due to losses on securities linked to U.S. subprime mortgages triggered the rush to “safe haven” instruments such as government debt securities, while stock prices fell and volatility increased sharply. Given the increasing in risk aversion in the asset - backed commercial paper (ABCP) market, interest rates in the interbank money market rose significantly. Banks have suffered liquidity problems, resulting in sharp rises in the costs of credit, even disruptions in the credit channels. The entire investment banking industry, and two leading government sponsored enterprises (GSE) for housing-finance - Fannie Mae and Freddie Mac - proved that the crisis were on a global scale.

The markets deteriorated further by 2008, driven by losses by various large international banks which were significantly larger than anticipated. Declining home price appreciation, sharp rating downgrades of even AAA rated securities and deteriorating conditions in US housing and (subprime) mortgage markets led liquidity concerns to rise further.

Credit problems forced some banks to fail or to be taken over – i.e. Northern Rock of Britain, a troubled mortgage lender, was nationalized. While Wall Street banks incurred huge write-downs, hedge funds have halted redemptions, CDOs defaulted and special investment vehicles (SIV) were liquidated, the turmoil developed more into a crisis of solvency related to major

financial institutions. Banks, concerned about future write-downs tried to keep as much cash as possible and consequently charged each other much higher interest rates.

In this context, this paper provides an overview of the most important structured finance instruments that contributed to the financial turmoil. The first part examines the concept of structured finance and basic structured products, while the second part investigates the impact of ratings on the markets. Finally, the step-by step contribution of structured products to the recent crisis is discussed in the last section.

## **II. DEFINITION OF STRUCTURED FINANCE**

The term “structured finance” refers to the activity of pooling of economic assets (e.g. loans, bonds, mortgages) and issuing claims against these collateral pools. Fabozzi and Kothari (2007), define structured finance as the financial solutions or products which are structured to meet specific needs via creation of different classes of securities. As these different classes are assigned different ratings, the entire transaction becomes engineered, or structured, in order to meet specific needs of investors.

According to the definition of Bank for International Settlements (2008a), structured finance is a form of financial intermediation, based upon securitisation technology, in which several classes of securities are issued, each with different risk-return profiles. In contrast to traditional financial products, the pool of assets underlying as collateral is legally separated from the originator’s balance sheet.

We can conclude that, structured products are financial instruments designed to meet specific investor and issuer needs by incorporating specially tailored features whose values are linked to underlying assets as stocks, bonds, currencies, and commodities. The performance of a structured product is therefore based on the performance of this underlying asset and not on the discretion of the product provider.

Structured products are also characterized by innovative combinations of underlying asset mixes, such as combining credit derivative exposures with equity index underlyings or combining interest rate and crude oil underlyings.

## **2.1 Relationship between Structured Finance and Securitization**

Structured finance and securitisation are two terms that are strongly interrelated and almost used interchangeably. Basically, securitization involves the creation of different classes of securities with different ratings. Accordingly, the originator that creates those assets puts them off its balance sheet via securitization and transfers them to a Special Purpose Vehicle (SPV) in order to issuance of ultimate securities bought by the investors. With these aspects, securitization is an instrument for structured finance, including asset-backed securities.

According to Fabozzi et al. (2007), a securitization transaction provides financing, by the sale of assets. However, the entity securitizes its assets by selling a stream of cash flows instead of borrowing money. As the securities are issued by the SPV, they are structured into different classes of securities in order to be used in a structured finance process.

Structured finance is by definition broader and includes traditional asset-backed securitisations as well as more recent, innovative funding and risk transfer approaches. Such innovations include the future flow financing and operating assets (business) securitisation. More recently, a combination of structured finance techniques and credit derivatives are used together to create synthetic credit exposures and credit risk transfers. In other words, application of securitisation techniques gives rise to structured finance.

## **2.2 Creation of Structured Products and Characteristics of the Market**

Structured finance process is mainly a three-step procedure. BIS (2005), defines the process as pooling of assets, tranching of liabilities and finally de-linking the credit risk of the collateral pool from the credit risk of the originator.

Assets in the pool can include cash instruments (residential mortgages, credit card receivables, loans, bonds etc.) as well as synthetic exposures, such as credit default swaps (CDSs).

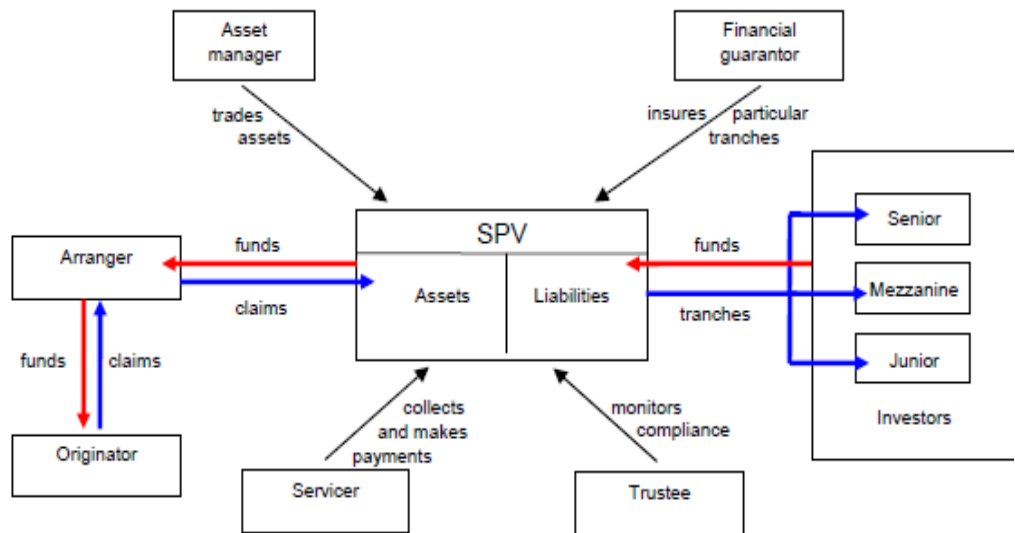
Tranching process aims to create class of securities whose rating is higher than the average rating of the underlying pool or to create rated securities from a pool of unrated assets through the use of credit enhancement. The most senior of the securities is often rated triple A, whose rating is based on the isolation of the assets from the bankruptcy risks of the originator as well as the mitigation of risk through the subordinate of classes B and C. Since the first-loss tranche –often C - absorbs initial losses, followed by a mezzanine tranche and finally more senior tranches, the most senior claims are protected from default risk to the extent that the more junior tranches absorb credit losses. Through tranching process, cash flows received from the underlying asset pool are distributed to different investor groups.

By this way, the risk characteristics of the collateral pool become transformed into different classes of securities with risk features specific to products.

Finally, the credit risk of the collateral pool is separated from the credit risk of the originator via a special purpose vehicle (SPV). The pool of receivables is transferred to a purpose vehicle (SPV) at par value. SPV receives average of the interest accruing on the loans while it pays for issuing securities. Accordingly, originator would not have any direct claim on the receivables and investors of the securities issued by the SPV or the SPV itself also would not have any claim against the assets of the originator.

Participants are involved in structured finance markets include the arranger - who tranches the liabilities and markets those; the originator - who originates the underlying asset – generally based on its regular business activity, as well as servicers, asset managers and credit rating agencies (CRAs).

Figure 1:  
The Main Participants in the Structured Products Market



Source: The Role of Ratings in Structured Finance: Issues and Implications, Bank for International Settlements, Working Paper (2005).

## **2.3 An Overview of Structured Product Categories**

Structured finance instruments can be broadly classified into two categories as securitizations and credit derivatives. Securitizations include short-term asset backed securities (predominantly asset-backed commercial papers) and longer-term asset-backed securities (ABS), while the latter covers mortgage-backed securities (MBS), ABS that are collateralized by all kinds of assets except mortgages and “cash flow” collateralized debt obligations (CDOs).

As a rule of thumb, the nature of the originating institution, as well as the asset class itself, determines what the issued securities are called. Usually, banks originate RMBS and CMBS, while corporates issue ABS. Insurance companies and fund managers issue CDOs.

This section provides a brief overview on basic structured finance instruments and mainly focuses on mortgage-backed securities (MBS), asset-backed commercial paper (ABCP) and cash-flow collateralized debt obligations (CDO) that played the most prominent roles in the financial turmoil of 2007-2008.

### **2.3.1. Mortgage-Backed Securities (MBS)**

Asset-backed securities (ABS) are securities that are collateralized by mortgages can be diversified into two as including commercial mortgage-backed securities (CMBS) and residential mortgage-backed securities (RMBS).

Among these, residential mortgage-backed securities (RMBS) market has experienced significant changes over the past decade and they are currently the most mature and complex of type of structured finance products (Mason and Rosner, 2007). Combined with the changes in origination and servicing practices, the complexity of RMBS, leads to greater opacity in the market.

RMBS is created by the sale of the mortgage pool to the SPV. While banks provide mortgage loans to various homeowners and combine these mortgages in a pool, this mortgage pool is then sold to the SPV, in return for cash. Via this transaction, the mortgage loans disappear from the balance sheet of the bank, the SPV issues RMBS in order to finance its purchase of the mortgage pool. At this stage, process of tranching, a key feature of the structured finance, steps in for diversifying the assets based on their credit risk. Through tranching, a mortgage pool is transformed to include different investment grade securities such as super-senior, senior, mezzanine and unrated.

The rating process of a RMBS is crucial for the marketing of these securities granting a significant importance to rating agencies as they give ratings to both the originator bank, the SPV that issues the securities and the specific tranches of the RMBS.

Investors rely on agency ratings when making purchase decisions because of the complexity of the market. Furthermore, analyzing the credit risk, even with transparent assets, are beyond the capability of many investors.

Therefore, ratings which are based on technical methods and advanced statistical techniques represent criteria of “investibility” for many investors.

According to different levels of risk preference, investors buy specific tranches. For instance, pension funds often prefer for higher-rated but lower



yielding senior (AAA or AA) tranches, while hedge funds may invest in the more risky tranches.

In many cases, the SPVs may use credit enhancement techniques in order to raise the credit quality of the RMBS tranches issued.

By this way, the credit rating agency (CRA) becomes able to issue a greater part of the RMBS tranches at investment grade level and reduce its financing costs. Fons (2008) claims that, this results in a “rating shopping” in which rating agencies to compete on standards of credit support in return of fees and other benefits.

Mason and Rosner (2007) claim that, as RMBS-based CDOs are generally comprised of lower- grade tranches of RMBS; the role of rating agencies is a necessary function of their sale and distribution. However, there is a considerable uncertainty about the meaning of original ratings. Specific structured products with an AAA rating produce a return of up to 200 bp for investors, while an AAA RMBS tranche produces only a 10/20 bp return, meaning the risk attached to this AAA tranche higher than for a standard transaction, unless there is a market imperfection.

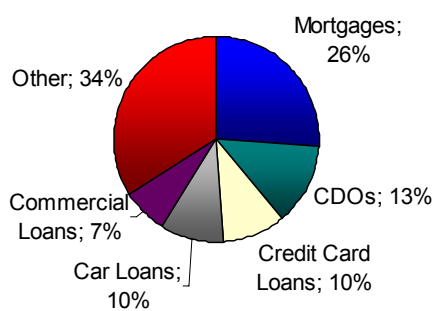
In this context, the poor rating performance of the US subprime mortgages included in the pools of RMBS and structured products backed by those – which were created through the resecuritisation of subprime RMBS in the form of CDOs have contributed significantly to the financial turmoil of 2007-2008.

As the accuracy of subprime RMBS ratings depends primarily on the CRA’s economic forecast, the default of subprime loans is perceived as a low-probability economic event. (BIS, 2008a). However, the CRAs have changed their prospects for the housing market dramatically over the last year due to the changing macroeconomic climate. The expectations about home price

appreciation (HPA) play a crucial role in the rating process. Ashcraft and Schuerman (2007) suggest that, as the housing market slows down, resulting in fall in HPA, the level of loss increases as the CRAs continue to use same level of credit enhancement to structure new products. As a result, an AAA-rated RMBS tranche becomes closer to to an AA rating in practice.

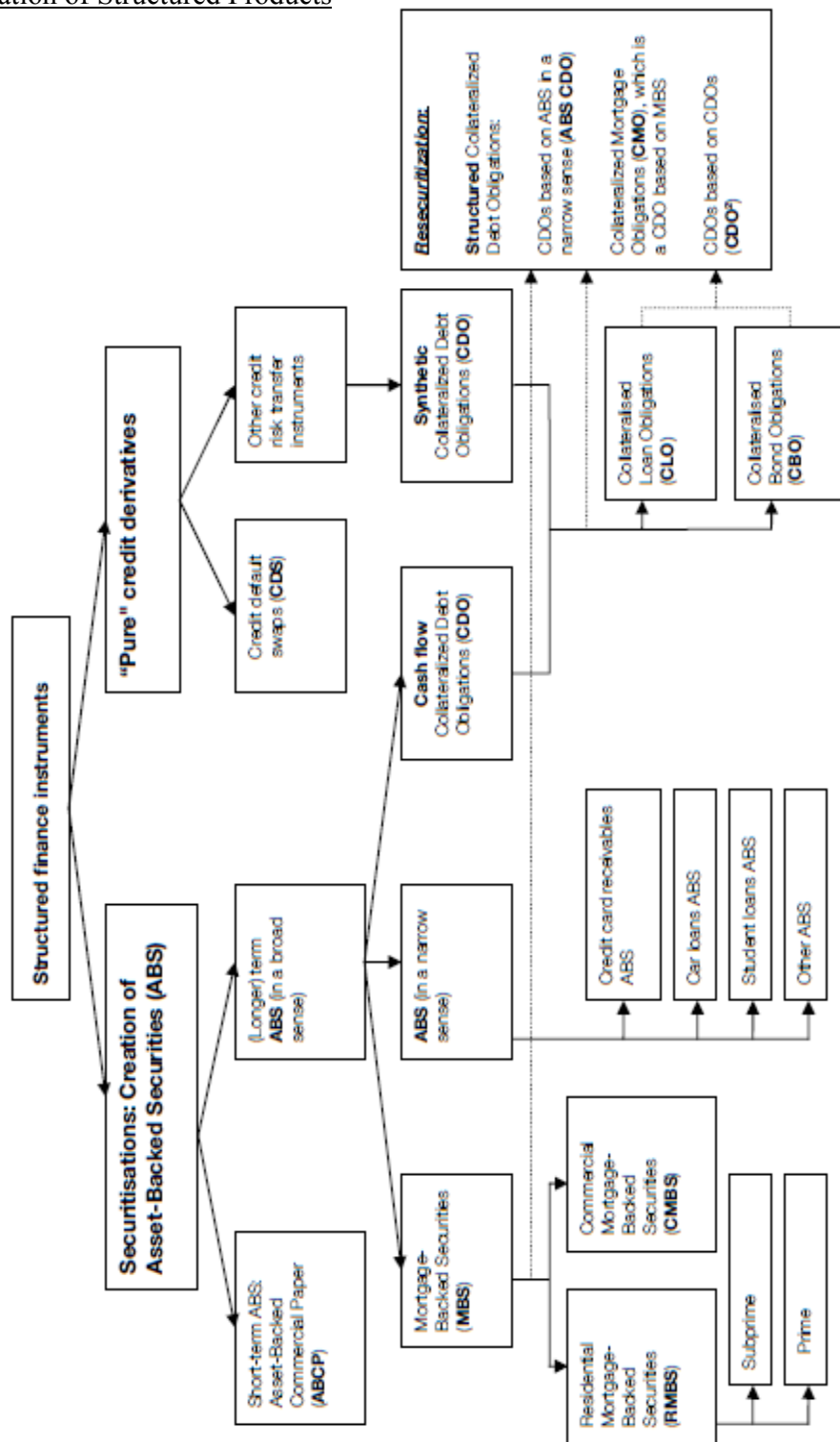
Figure 2:

Composition of the US ABCP Market by Collateral Type



Source: JP Morgan, 2007.

Figure 3: Classification of Structured Products



Source: Structured Finance and the Financial Turmoil of 2007-2008: An Introductory Overview, Banco de España, Working Paper, 2008.

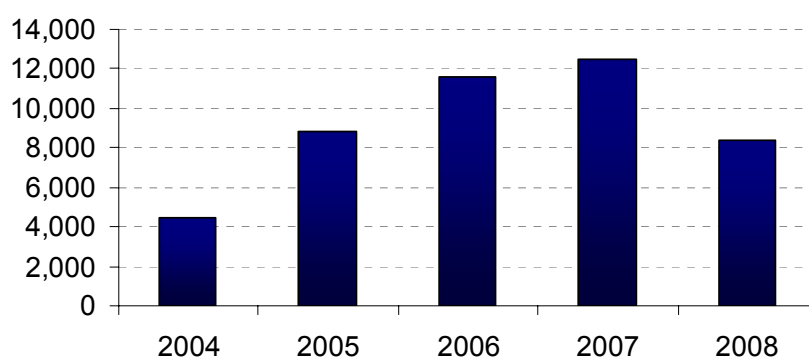
### 2.3.2 Asset-backed commercial papers (ABCP)

Standard & Poors (2007) describe asset-backed commercial papers as instruments whose principal and interest payments are designed to be derived from cash flows from an underlying pool of assets. The key feature of these assets is the SIVs (Structured Investment Vehicles) which roll over those securities to finance longer-term investments. Therefore SIVs generate income mainly from maturity mismatch. However, investor uncertainty since August 2007 have led to a contraction in the ABCP market as SIVs' ability roll over or issue new ABCP became limited forcing them to liquidate assets.

The operations of SIVs are also highly dependent on CRA ratings. Changes in the market value of SIVs' assets can lead to certain criteria – such as liquidity adequacy- to fail.

Figure 4:

Asset Backed Commercial Paper (ABCP) Outstanding (USDbn)



Source: Securities Industry and Financial Markets Association (SIFMA)

Due to their high exposure mortgage markets - representing more than one quarter of all collateral in US - ABCP market was affected significantly from the recent turmoil.

### **2.3.3 Collateralized Debt Obligations (CDOs)**

Collateralized debt obligations (CDOs) are products which are created through the repackaging of higher risk assets, such as risky loans, mortgages, bonds and asset backed securities, into a new security. Partnoy and Skeel (2007), define CDOs as a pool of debt contracts housed within a special purpose vehicle (SPV) capital structure of which is divided in tranches and resold based on differences in credit quality.

CDOs may be classified either based on aim of the transaction (Cousseran and Rahmouni, 2005) or based on the underlying debt obligations. Accordingly, balance sheet CDOs allow the originator to place certain assets off their balance sheet, while arbitrage CDOs allow the originator to benefit from the spread between the portfolio and the tranches.

Based on the underlying debt obligations, CDOs can be grouped into two as cash flow and synthetic. If the SPV of a CDO undertakes the debt obligations, then the CDO is referred as a “cash flow” CDO. In case the the SPV sells a credit default swap (CDS) to transfer the credit risk of the CDO instead of undertaking the liability of it, then the product is referred as a synthetic CDO. By the synthetic CDO, credit risk is transferred to a third party.

Finally, Jobst (2003) classifies CDOs based on the specific underlying portfolio. CDOs can be divided in collateralized loan obligations (CLOs) and collateralized bond obligations (CBOs). Based on the data from The Securities Industry and Financial Markets Association (SIFMA), the issuance of CDOs

collateralized by loans traditionally has been much larger than that of CDOs collateralized by bonds. Consequently CLOs have performed a crucial role in the recent boom via private equity and LBO.

### **III . RATING AGENCIES AND STRUCTURED FINANCE**

#### **3.1 The Role of Ratings in Structured Finance**

Since the creation of the modern credit rating industry by the early 1900's, investors were offered with ratings in order to assess credit-risks regarding the ability of institutions to satisfy their financial obligations. Until 1990's, the rating agencies generated their revenues from subscribers who received research and ratings on the creditworthiness of issuers of debt securities. As the ratings were a way to increase investor confidence, the revenues of the rating agencies have increasingly been generated by issuers of securities.

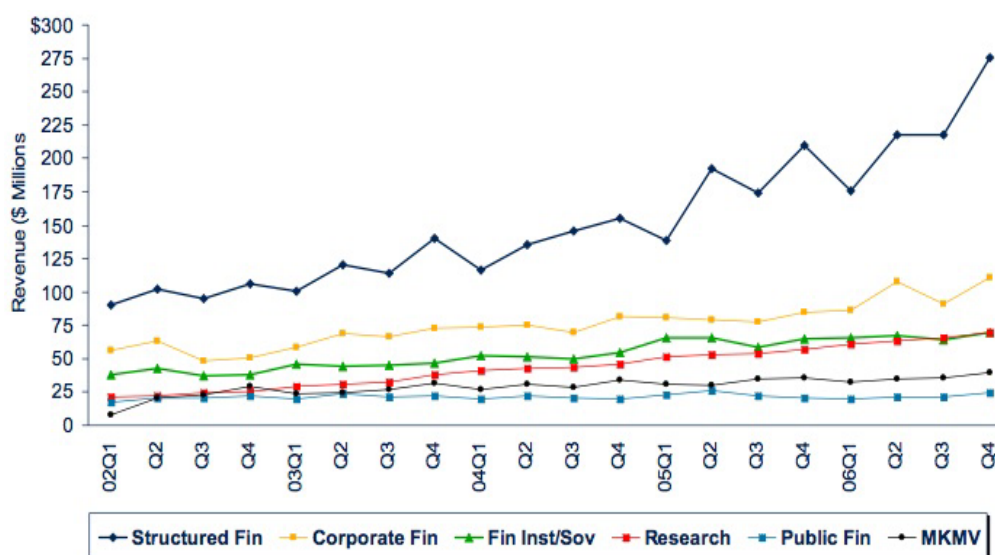
The CRAs analyses were based on the expected cash flow of the obligor's ongoing business in determining the credit risk to the note-holder. The entity, which was ranked, could almost have no power to change the credit characteristics before the rating process. Thereby, credit rating agencies (CRAs) continued to function as providers of benchmark for the traditional ratings, which primarily included bonds.

By the late 1990s, as the business of structured finance expanded significantly, the role of CRAs evolved from passive to active. The revenues of these agencies were started to be driven by ratings for structured finance products, which led to significant changes in rating definitions.

In an effort to meet the demand for higher yield-investment grade assets, the CRAs created new models and approaches for rating these assets. The limited number of Nationally Recognized Statistical Rating Agencies (NRSROs) and requirements that constrain certain investors to purchase only "investment grade" rated assets, paved the way for the increasing importance of

the CRAs in the financial markets. Structured products became a major growth opportunity for the ratings industry.

Figure 5:  
Moodys Revenues by Segment



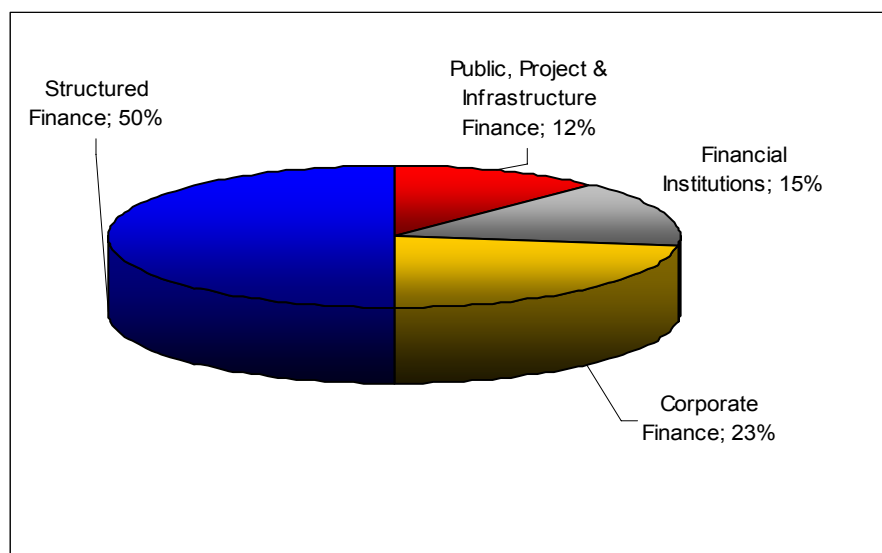
Source: Moody's Investor Presentation, March 2007



As the volume of structured products rose sharply, rating of those products turned to be a lucrative revenue source for the industry and started to make up an increasing proportion of the revenues of the CRAs. Moody's annual report 2007 suggests that, structured finance accounted for broadly 50% of ratings revenues. Similarly, it is of comparable importance for its Standard & Poor's division.

Figure 6:

Moodys Revenues Breakdown as of End 2007\*



Source: Moody's Investor Presentation, June 2008

\* Note that, due to Moody's restructuring as of January 2008, the segment breakdown has changed to reflect a considerable share of structured finance rating revenues as revenue from Moody's Analytics, an operational unit providing quantitative credit analysis.

Since substantial shares of CDOs are generally comprised of lower-grade tranches of Residential Mortgage Backed Securities (RMBS), the role of rating agencies seems to be a necessary function of their marketing and sale.

The approval of a rating agency still appears to determine the demand for the structured product in the market. In addition, securitizing assets has largely been driven by lenders' desires to move these assets off their balance sheet while the market as a whole is constrained to invest in only ERISA-eligible securities such as securities rated by NRSROs. Thereby, structured finance market has been emerged as a "rated" market.

As the role of rating agencies evolve from rating dynamic enterprises to rating structured assets, they became part of the structuring process which gave rise to conflicts of interest and moral hazard problems, which are discussed in section 3.2.3.

## **3.2 Problems with Ratings in Structured Finance**

### **3.2.1 How is Structured Finance Rating Different from Traditional Rating?**

Credit ratings characterize a security's expected payoffs depending on its default likelihood. However, as they contain no or inadequate information about the state of the economy in which default occurs, they are insufficient for pricing.

On the other hand, many investors largely rely on credit ratings for assessing risks and pricing credit sensitive securities. Among the investors, insurance and pension funds draw attention as they are restricted to hold only highly rated securities. According to Stafford et.al. (2008), this aspect of ratings

paves the way for creation of “economic catastrophe bonds” as a certain rating is the most stringent way to exploit investors.

A considerable expertise gained by rating traditional was carried over to the rating of structured finance. In both traditional rating and structured finance rating, the CRAs seek to provide independent opinion about the credit risk embodied in the regrading instruments. The three major rating agencies (Fitch, Moody’s and Standard & Poor’s) claim that, all products they are asked to rate are subject to a common rating process.

Accordingly, a credit committee makes the final decision on rating of a security on the basis of instrument-specific documentation and analysts’ opinion. The committee may again be involved in the rating process, through revision of standard assumptions.

The process is mainly established on the historical performance of corporate bonds as all ratings are indexed into an alphanumeric scale according to the corporate bonds’ performance. Although the general rating process is essentially the same for bonds and structured products, a number of important features differ.

Firstly, rating process of structured products are different due to its ex ante nature. Issuers of structured products have to obtain a rating for these according to scales that were identical to those for bonds. By this way, they aim to reach to investors, who were bound by the ratings-based constraints. A rating would enable them to purchase these new assets.

However, unlike the process in traditional bonds, this rating process begins with the issuer’s specifying the mix of credit ratings it is looking for. Then the CRAs compete by specifying the level of credit support that is needed to obtain the desired rating. At this stage, the process of rating complex debt structures differs significantly from that of rating traditional bonds.

Although accurate ratings are useful for both investors and issuers, issuers have to pay for this service since a security's credit rating becomes public knowledge when it is released. This asymmetry leads to a conflict of interest for the CRAs since both parties have incentives to employ a CRA in any case in the rating process of structured products. Borrowers hold out for higher ratings while issuers search for a forged rating from a well-established reputation and world-wide brand name.

Recall that, the unprecedented growth in structured products was mainly driven by the lenders' desire to move assets off their balance sheet. On the other hand, most investors were constrained by high rating criteria for their decisions.

Given the complexity and opacity of the process and the difficulties about investors' analysis, pricing and risk assessment of structured products paved the way for new initiatives by the CRAs. Thereby, these companies started to focus on providing valuation service for buy side clients.

As a result of this involvement, the CRAs became the party that defines the pre-issuance structures of structured product - i.e CDO- deals, their collaterals and appropriate yields based on different tranches, as well as rating them.

Another difference between corporate bonds and structured products is the independence of rating from the corporate performance. In the case of a corporate bond, the rating will depend on the credit quality of the corporation. However, in case of a structured product, the rating agencies will assign a rating to each based on the expected performance of the asset pool, independent of the financial condition of the originator company. Consequently, the originator company can have a speculative grade rating but it can obtain a much higher credit rating through issuing one or more securities via special purpose vehicles (SPV).

Similarly, RMBS ratings rely more heavily on quantitative models while corporate debt ratings are more dependent on analysts' opinion based on a long historical corporate record.

While, corporate credit ratings are based on the firm's long-run condition, competitiveness and operated industry, RMBS credit ratings rely on the ability of the CRA to predict the level of losses of a particular loan pool based on the economic conjuncture. Thereby, the relationship between losses and economic conditions that are incorporated in the models of CRAs create an additional source of uncertainty. Second major difference between traditional bond rating and structured products rating is that, the capital structures of the products. While, corporates invest in real investment projects which they can dynamically manage in order to compensate for the increasing risk. In addition there is a real value created. In contrast, structured products consist of fixed income investments whose pay-off is pre-specified. Investors are not able to change the investment strategy in case of low performance. This aspect of structured finance leads to differences in the default risk. Mason and Rosner (2007), suggests that corporate default risk was a function of investment decisions, while the default risk in the structured products is a mainly a function of investment performance. Referring to residential mortgage-backed securities (RMBS), Mason and Rosner (2007) argues that, expected loss estimates, which are used for traditional bond ratings, are more difficult to compute for mortgage backed securities as they are relatively unseasoned.

In other words, when pools experience higher defaults during their initial period, mortgage pools are not able fund the credit enhancement which is crucial for preventing bigger defaults. Thereby, predicting a moving expected loss rate on unseasoned collateral is much more difficult than predicting a constant expected loss rate on a corporate investment decision, in which the debt rating is downgraded in case of expected losses overdraw a certain amount. This means that, it was misleading for the CRAs to employ the same

benchmark of grades in order to classify loss exposures of structured products and traditional bonds.

### **3.2.2. Rating Methodologies and Shortcomings of Models**

As discussed in the previous section, rating process of the structured products significantly differs from that of traditional bonds. Thereby, applying traditional rating methodologies leads to problems in assessing the risk of structured products.

Although, it is argued that diversification reduces the risk of structured products via pooling of assets, most of the time this is not the case. Within the context of residential mortgage-backed securities (RMBS), lower- grade tranches of which make up a large part of of CDOs, diversification even does not exist in practice.

Firstly, the lack of historical data leads to difficulties in correct determination of correlations, thereby the degree of diversification through a pool of RMBS. Mason and Rosner (2007), claims that, accumulation of identical uncorrelated mortgages only reduces the standard deviation of the mortgage pool, thereby the portfolio risk.

However, the amount of the portfolio, which is used for comparing the risk via the profit it generates, increases. As a result, risk and return pattern does not improve. Thereby, it can be concluded that, there is no diversification effect in such portfolios in practice. Instead, investors can diversify their own portfolios through purchasing securities representing different tranches of the pool.

Credit ratings do not assess whether an investment will be profitable, instead the instrument's ability to pay according to its terms is the point at issue.

For instance, if an investor invests in a mortgage-backed security, in case the interest rate increase, the investor faces with a relatively low rate of return, as the ratings do not take this sort of investment risk into account.

Secondly, while there is typically diversification across borrowers within a mortgage pool, there is no similar diversification between the issuers, which leads investors to be exposed to correlated risk, meaning additional risk factors. Thereby, traditional bond ratings methods are misleading when applied to RMBS.

Third, important differences remain between the rating methodologies used by the three major rating agencies Fitch, Moody's and Standard & Poor's. Moody's established Binomial Expansion Technique (BET) methodology portfolio-based, while Fitch and S&P use methodologies more geared towards the asset level (Hu, 2007).

Although, all their methodologies attempt to capture the credit risk of CDOs based on assumptions each obligor's default rates and correlations among them, techniques about measuring correlation and default rates differ significantly. Moody's continues to use Binomial Expansion Technique (BET) model, although new Monte Carlo (MC) simulation-based methodologies was introduced for synthetic CDOs and CDOs- squared. Fitch has recently upgraded its CDO rating methodology by introducing VECTOR model, which is also based on Monte Carlo simulations, while in the past; the company did not incorporated correlations to this extent.

On the other hand, Standard & Poor's uses EVALUATOR model in which a simulation engine compares the assets with a default threshold.

The model is highly similar to that of Moody's, however it is based on a one-period as different from Fitch's VECTOR model that uses a multi-period simulation. Such differences in the models used by CRAs lead to low standardization in the rating of structured products.

### **3.2.3 Conflicts of Interest and Moral Hazard Problem**

Potential conflicts of interest in the ratings industry arise from the fact that ratings are paid for by issuers rather than investors. In addition, rating revenues correspond to a significant part of agencies' total revenues. Accepting payment from an issuer, leads rating agency to sacrifice its independence.

The rating of structured finance transactions requires the rating agencies to be involved in the deal's structuring process. Thereby, a tranche rating reflects a judgment about both the credit quality of the underlying collateral asset pool and the extent of credit support that must be provided in order to receive the rating targeted by the deal's arrangers. As a result, the process involves obtaining implicit structuring advice from the CRAs, at least to the extent that arrangers use rating agency models to pre-structure the regarding deals and ratings of structured finance instruments inevitably have an *ex ante* character.

Compared to traditional bond ratings, in which pre-rating discussions between issuers and agencies play a more limited role, ratings of structured products are more exposed to moral hazard problems.

As the CRA's heavily rely on issuer-provided information, issuer-paid fees may thus encourage rating agencies to act in the issuer's interest at the expense of the investors. Thereby, most of the ratings in structured finance is higher than it should have been or downgraded less.



Another reason of conflict arises at the individual level, as many rating agency analysts may wish to move to more lucrative jobs. For instance, at investment banks that arrange structured products, rating agency executives are compensated in part with stock options (Hunt, 2008). Option-based compensation creates incentive for rating-agency executives to take excessive risks.

In addition, rating process mostly includes structuring advice as well as the assesment of the rating. Although a single fee is charged by the agency for the rating process, structuring advice is not separable from the whole process.

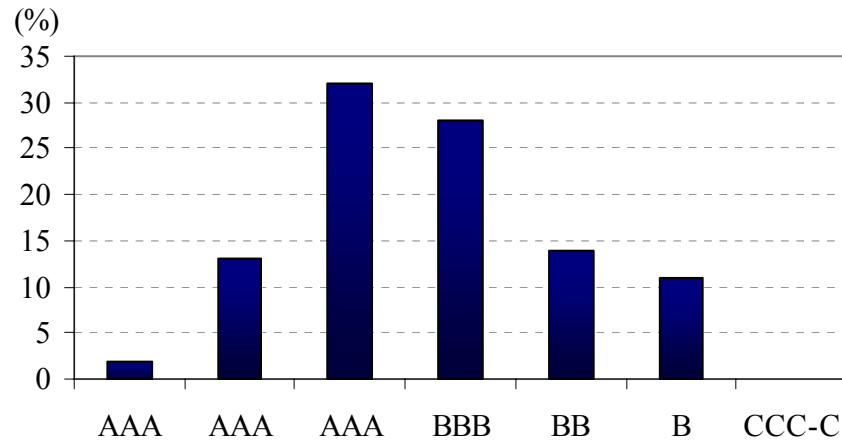
Furthermore, it has become common for the CRA's offer special services regarding firms' bond ratings that could affect the rating assigned. These services may be separately paid and thereby could trigger potential conflicts of interest further.

Another potential conflict of interest arises when the ratings of some structured products are contingent on the agency's own rating of a monoline insurer that provides credit enhancement to these securities. A CRA might hesitate to downgrade the rating of a monoline despite its deterioration, given the implications for the structured securities that the monoline has covered.

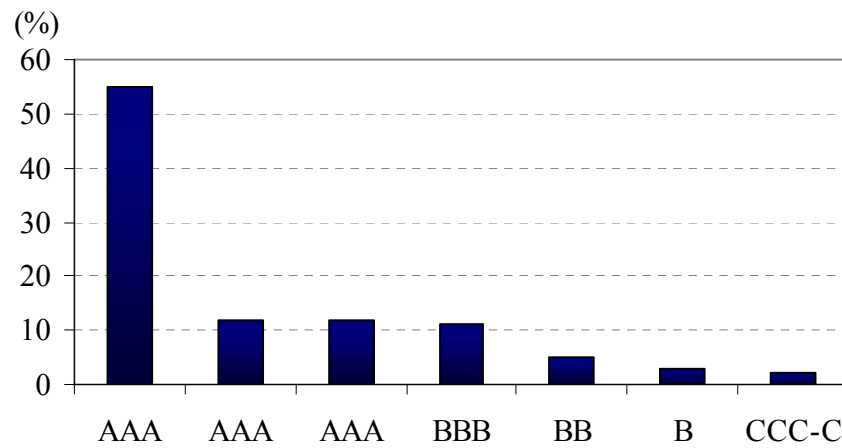
Figure 7:

Global Distribution of Ratings

Distribution of Ratings in Corporate Finance



Distribution of Ratings in Structured Finance



Source: What Credit Ratings Mean, Fitch Presentation, August 2007.

## **IV. THE ROLE OF STRUCTURED FINANCE IN THE RECENT FINANCIAL TURMOIL**

### **4.1 Factors favoring the Rapid Growth in the Market**

There are many factors that occurred simultaneously in the markets to pave the way for tremendous growth of structured finance. Firstly, the interest rates were relatively low in the first part of the decade. The low interest rate environment has triggered the demand for mortgage financing and significant increases in house prices. At the same time, it encouraged financial institutions such as hedge funds and investment banks to search for higher yielding instruments. As a result, subprime mortgages which offer higher yields than standard mortgages and many other instruments started to be heavily demanded for securitization.

Since securitization provided the opportunity to transform low investment grade assets into investment grade liabilities, the demand for increasingly complex structured products such as collateralized debt obligations (CDOs) grew significantly. Thornbull *et al.* (2008) claim that, relatively low interest rates, rising house prices, and the investment grade credit ratings given by the reliable rating agencies led investors to a greater risk of default as the embedded leverage they were exposed to was not viewed as excessive.

Originators often sold their loans to a “Structured Investment Vehicle” (SIV), followed by a third party, mostly an investment bank or hedge fund, purchase debt or securities issued by the SIV and sliced them into tranches creating layered and structured claims against the SIV’s underlying pool of assets. Thereby, investors mostly do not perceive the true risk of assets they invested in.

At the same time, being exceptional liquidity of financial markets in this period, fostered higher leverage resulting in more risk-taking. As global investment banks shifted to “originate-to-distribute” business model, and adopted improved risk management techniques, they extended the volume of loans and transferred much of the underlying credit risk to end- investors.

Financial innovation was another factor leading to dramatic growth in the market. Caprio *et al.* (2008) suggest that, as complex instruments multiplied from CDOs to CDOs of CDOs (CDO-squareds), it became harder for anyone other than the issuer and its credit rating organization to understand the quality of underlying assets.

The increasing amount of credit risk transfer (CRT) instruments was perhaps the most dramatic part of the financial innovation. Innovations in CRT security designs, especially default swaps (CDS) and collateralized loan obligations (CLO), increased the liquidity of credit markets, lowered the credit risk premium and offered a wide range of hedging opportunities for investors (Thornbull 2008). According to Bank for International Settlements (BIS), the notional amount outstanding of CDSs (Credit Default Swaps) was US\$58 trillion end of December 2007 while it was only US\$14 trillion at the end of 2005.

The development of liquid markets for credit default swaps (CDSs) led to the appearance of synthetic CDOs, in which, the SPV sells credit protection through CDSs and earns CDS premia in return.

However, starting from 2002, contracting spreads between bond and CDS resulted in reduced issuance of traditional CDOs and increased the interest in CDOs based on new collateral classes, i.e, CDOs backed by ABS or CDO tranches (CDOs- squared).

Meanwhile, subprime loans continued to grow substantially on the back of relatively lower teaser rates. Borrowers paid low teaser rates over the first few years, often paid no principal and could refinance with rising housing prices. However, when refinancing became impossible due to elevating interest rates and declining house prices, the borrowers defaulted on the mortgage.

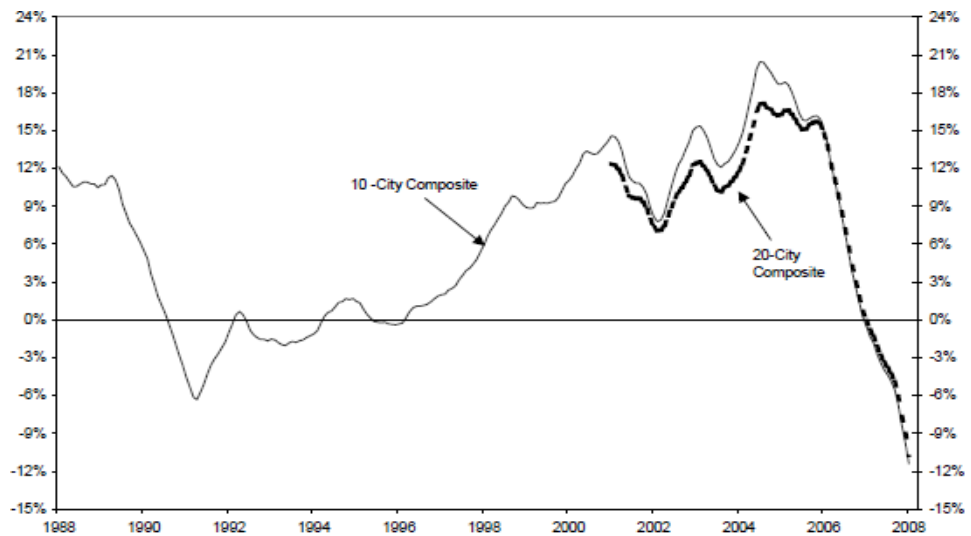
On the other hand, originators had sold the loans to arrangers who securitized the loans and sold them to investors. Therefore, the originators did not care about issuing below fair valued loans, as they passed the losses to the ABS holders instead of holding the default risk on their own books.

Another factor favoring the rapid growth of the market was the home price appreciation (HPA), which was one of the basic parameters in rating agencies' issuance criteria.

Home price appreciation also acted as an equity cushion, that subprime borrowers who experienced financial difficulties could refinance their loans. Therefore, defaulted subprime loans led to relatively lower losses, which curtailed the potential problems in the subprime market and encouraged lenders and investors for further leverage. Standard & Poor's Case-Shiller Home Price Indices, the leading measures of U.S. home prices, clearly show the declines in the prices of existing single family homes across the United States.

Home price appreciation acted as a cushion against losses masking the underlying credit problems with the mortgages since it enabled borrowers to refinance their debt.

Figure 8:  
Home Price Appreciation according to Case Schiller Indices



Source: Standard & Poor's and Fiserv

The increase in securitizations of subprime loans, such as asset-backed securities (ABS), attracted further investor attraction. A considerable amount of subprime ABS were purchased by asset managers and put into new issues of collateralized debt obligations (CDOs).

Standard & Poor's data suggests that, subprime ABS constituted slightly more than 70% of the collateral structured finance CDOs by mid 2007, since these assets were highly demanded due to their yields.

The demand for these high-yielding assets generated vast amounts of liquidity, and increased the credit volume available to subprime borrowers, resulting in a vicious circle.

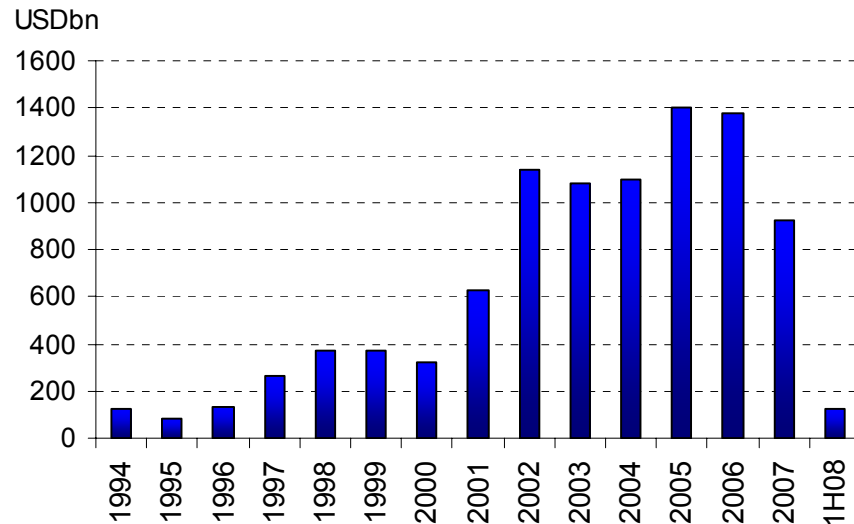
High yields also created a pressure to increase the supply of subprime mortgages. Thornbull et al. (2008) emphasizes that, a major contributor to the recent crisis was the huge demand for BBB mortgage-backed bonds that stimulated a substantial growth in home equity loans. This demand for BBB bonds was due to their higher yields, and the CDO trust could finance their purchase by issuing AAA rated CDO bonds which paid lower yields. As a result, repackaging was repeated to create CDO squared products. Accordingly, this created a demand for CDOs containing mortgage-backed securities (MBS) and different CDO tranches.

According to Duffie (2007), risk-sensitive regulatory capital requirements also created an incentive for credit risk transfer via CDS and other complex products.

In addition, recent technological improvements in mortgage lending, i.e. automated underwriting systems and statistical models used by CRAs, have allowed originators to make rapid underwriting decisions based upon the credit scores and other available credit information.

Figure 9:

Global Securitization by RMBS Collateral



Source: Securities Industry and Financial Markets Association (SIFMA)

All these developments contributed to the aggressive growth in the structured products market, while they weakened the traditional long-term relationship between the borrower and the company that originated and serviced loan.

On the other hand, Fabozzi and Kothari (2007), provide an analysis of how securitization is less expensive than issuing corporate bonds. Even after factoring in the cost of credit enhancement and other legal and accounting expenses associated with a securitization, securitization is less expensive than issuing corporate bonds. The case of Ford Motor is a clear example of this.

Following the rating downgrades in the industry in 2001, Ford Motor Credit issued securities backed by auto loans rather than issuing corporate bonds. Between 2000-2003, Ford Motor Credit reduced its exposure from U.S.\$42 billion to U.S.\$8 billion, substituting the sale of securitized car loans



rated triple A. In fact, from 2000 to mid 2003, Ford Motor Credit increased securitizations to U.S. \$55 billion (28% of its total funding) from U.S.\$25 billion (13% of its total funding). Thus, structured products act as a corporate risk management tool for the management as the originating company no longer bears the interest rate or credit risk of those assets.

Finally, achieving off-balance sheet financing through structured products created incentive for corporates. Fabozzi et al. (2007) suggest that, structured finance remove assets and liabilities off the balance sheet of the originator company.

The reduction in the amount “onbalancesheet leverage” of the originator company can help improve its return on equity (ROE) and other key financial ratios.

However, it is worth noting that, many analysts give recognition to both reported and managed leverage in their analysis of firms following the off-balance sheet activity of Enron.

#### **4.2 Shortfalls of the Products and Global Financial System**

Despite its rapid development, structured finance created many loopholes for the markets as well. Over the last ten years, risks of all kinds have been repackaged to create vast quantities of triple-A rated securities with competitive yields. According to Fitch Ratings (2007), roughly 60 percent of all global structured products were AAA-rated, compared to less than 1 percent of the corporate issues.

By offering AAA-ratings along with attractive yields during a period of relatively low interest rates, these products were eagerly bought up by investors around the world, leading structured products to represent a large share of Wall

Street and rating agency revenues. Moody's Corporation reported that 44 percent of its revenues came from rating structured finance products, surpassing the 32 percent of revenues from their traditional business of rating corporate bonds.

However, there are many shorthfalls of structured products and there were many loopholes in the global financial system. This section briefly focuses on the pitfalls of most widely used structured products:

#### **4.2.1 Credit Default Swaps (CDS) and Major Concerns**

A credit default swap (CDS) is a private contract in which private parties bet on a debt issuer's bankruptcy, default, or restructuring. For instance, a bank that has loaned to a company might enter into a credit default swap with the same size with a third party for hedging purposes. In case the company defaults on debt, the bank will compensate for its loss by making money on the swap and it will make a payment to the third party if the company does not default, reducing its profits on the loan.

However, the use of credit default swaps for speculation or arbitrage rather than hedging leads to problems. The CDS market is mainly characterized by the index contracts. Duffie (2007) defines credit default swap index contract as an insurance contract covering the default risk of the pool of debts issued by the group of companies on which the index is based. In practice, a CDS index contract enables investors to take synthetic exposures to a large diversified and standardized basket of corporates. There are two main two main families of standardized CDS index contracts -Dow Jones CDX and iTraxx.

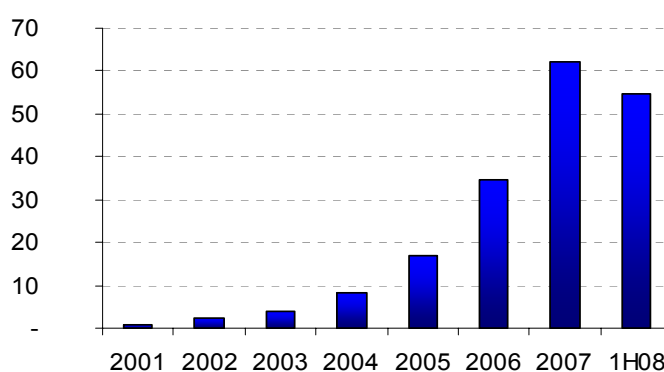
The development of the spread between these two main index contracts is highly indicative of the development of the financial turmoil in 2007 and

2008, as they are representative for a broad category of financial and non-financial companies.

Figure 10:

Credit Default Swaps (CDS) Outstanding

(USDbn)

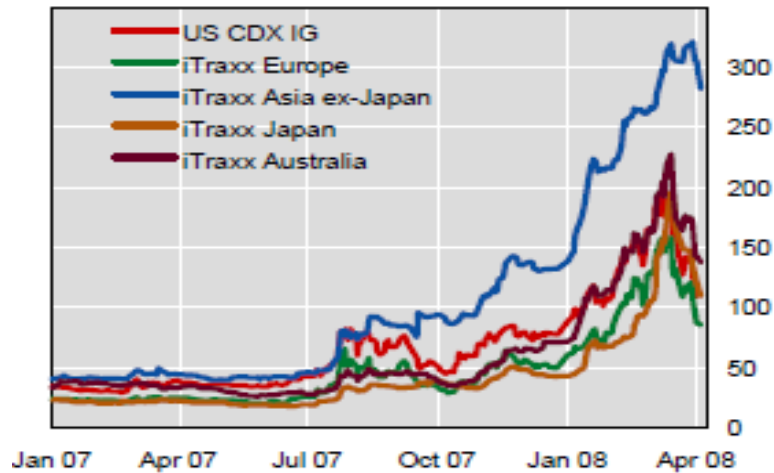


Source: International Swaps and Derivatives Association (ISDA), Market Surveys

Scheicher (2008) provides an analysis of the determinants about the spreads of CDS index tranches during the financial turmoil and concludes that, liquidity factors played a more important role since the start of the turmoil in the summer of 2007, as the turmoil affected the pricing of these instruments.

Figure 11:

Spreads on Major CDS Indices



Source: BIS Quarterly Review, June 2008

Partnoy and Skeel (2007) argue that, CDSs also reduce the incentives for banks to monitor. Such that, banks making loans to a troubled company does not always mean that the banks have an incentive to actively monitor the company and Enron is atypical example for this.

The banks that financed Enron had used massive amounts of credit derivatives to limit their exposure in the event Enron defaulted. This suggests that, credit default swaps may reduce monitoring oversight, and can lead to moral hazard problems.

In addition, the market for credit default swaps is not transparent enough. Since swaps are structured as Over the Counter (OTC) derivatives, they are mostly unregulated. Thereby, the details of particular swaps often go undisclosed. International Swaps and Derivatives Association (ISDA) has also resisted to the disclosure of credit default swap documentation, claiming it is proprietary information.

In this sense the introduction of credit default swaps (CDS) into the RMBS market was a significant development (Hu, 2007). Most CDOs before 2006 were entirely cash while only a few of them incorporated synthetic technology to use customized CDS documentation to transfer credit risk off of bank balance sheets.

Furthermore, credit default swaps raise systemic concerns. Because many investors - primarily hedge funds- place highly leveraged bets on CDS, even small market changes could trigger a crisis of the sort that Long Term Capital Management. Market's rush to close interconnected contracts could create serious liquidity problems in the financial markets (Partnoy and Skeel, 2007).

#### **4.2.2 Residential Mortgage-Backed Securities (RMBS) and Major Concerns**

RMBS are securities used to finance the purchase of a mortgage pool from a mortgage originator and they pass the risk of mortgage pool payments to individual investors. However, Mason and Rosner (2007) suggest that, standard securities merely pass principal and interest payments through to investors on a periodic basis, while RMBS create a much more complex set of securities through tranching.

Thereby, it is more difficult to estimate how much the RMBS passes the risk of the entire mortgage to investors. The difficulty arises from determining the mortgage pool's value due to default risk, prepayment risk and different tranches.

In addition, due to the fact that BBB rated ABS had high yields and the CDO issuer could finance their purchase by issuing AAA rated bonds with

lower yields, CDO holders generated a positive net present value investment from repackaging of cash flows. This process boosted the demand of CDOs for residential mortgage-backed securities (RMBS).

#### **4.2.3 Collateralized Debt Obligations (CDO) and Major Concerns**

Many of the shotfalls of CDOs are similar to those of credit default swaps (CDS). As CDO special purpose entities (SPEs) hold bonds and loans instead of banks, there the incentives of banks to play their traditional monitoring is reduces further. Furthermore, hedge funds and other sophisticated investors have incentives to manipulate the pricing and structuring of CDOs, and some studies suggest that CDO managers manipulate collateral in order to shift risks among the various tranches (Partnoy and Skeel, 2007).

Another problem specific to CDOs is the costly mispricing of credit. If similar assets do not have similar values someone would buy low, sell and make arbitrage. In case a bank is able to make money by repackaging corporate debt through a CDO, it is an indicator of inefficiency in the corporate debt market. However, if some of the debt in the portfolio is mispriced, market participants should earn arbitrage profits from this mispricing, through buying and selling bonds.

In this context, credit rating agencies also provide the markets with an opportunity to arbitrage from their mistakes since rating categories cover a wide range of default probabilities instead of point estimates.

Managers of cash-flow CDOs also make money by buying loans in secondary markets, restructuring them by issuing tranches and taking the profits mostly as a result results in highly rated securities in the structuring process. In

other words, cash-flow arbitrage CDOs make money by exploiting credit-rating arbitrage through pooling and tranching.

In addition, in a cash flow CDO, the SPE purchases a portfolio of debt issued by a range of companies, and finances its purchase by issuing its own financial instruments. CRAs rate different tranches of the SPE's debt. However, in a "synthetic" CDO, the SPE does not purchase actual bonds, but instead enters into credit default swaps with a third party, to create exposure to the outstanding debt issued by a range of companies. The SPE then issues financial instruments, which are backed by credit default swaps instead of actual bonds.

Usually, originators sold their loans to a Structured Investment Vehicle (SIV) and a third party, such as an investment bank, could then purchase the securities issued by the SIV in order to create tranches and transform them into a Collateralized Debt Obligation (CDO). This process inevitably paved the way for further layered and structured claims against the underlying pool of assets. Turnbull (2008) argues that, as instruments became more complex such as CDOs of CDOs (CDO-squareds), it became harder for anyone other than the issuer and its CRA, to understand the true value of the underlying assets.

#### **4.3 How Structured Products Triggered the Recent Turmoil?**

The financial turmoil in 2007-2008 has led to the most severe financial crisis since the Great Depression and expected to have substantial repercussions on the real economy throughout 2009. The wane of the housing bubble forced banks to write down significant losses through the bad loans caused by mortgage delinquencies. Squeezing liquidity, declining issuance of collateralized debt obligations and defaults led Wall Street banks to incur massive write-downs. This section analyses the roles of different structured products in the different stages of the turmoil.

As discussed in section 4.1, there are many factors that occurred simultaneously to trigger the enormous growth of structured products. Among these, home loans were the key element to fire up the beginning of the crisis as low interest rates and increasing housing prices encouraged an over-friendly regulatory environment for extremely leveraged mortgages and related securitizations.

Throughout the first part of the decade, the U.S. economy was experiencing a low interest-rate environment, mostly backed by large capital inflows from abroad, especially from Asia. Asian countries bought U.S. securities in order to hedge against a depreciation of their own currency against the dollar, as a lesson learned from the Asia crisis in the late 1990s. Meanwhile, the banking system underwent an important transformation evolving through traditional banking model to “originate and distribute” banking model.

While the former was based on holding of the loan by the lender bank, the latter was established on a system in which loans are pooled, tranced and then resold via securitization.

This new trend led to a decline in lending standards and enabled an unprecedented credit expansion which supported the boom in housing prices while making various types of securitizations attractive to a wide range of investors.

These securitizations did not only lower credit quality, they played an important role in the deterioration of of asset backed markets as well though assessing and pricing mortgage risk as well. As the market grew in size, effort to squeeze tranches of highly rated claims against low-quality assets led securitizers to create very complicated structures of products in which the relation of particular tranches to the underlying asset pool was not transparent enough. This made layered claims difficult to value.



Meanwhile, creation of subprime mortgage-backed securities by US commercial banks continued aggressively. Initially, subprime mortgages were designed to provide home ownership opportunities to riskier borrowers in the U.S. These borrowers were indeed riskier, thus lending to this group involved a particular mortgage design that required linking the outcome to house price appreciation.

However, subprime borrowers were not very creditworthy enough and highly levered with high debt-to-income ratios. Turnbull et al. (2008), analyses that subprime borrowers had counted on being able to refinance mortgages by early selling houses and produce some equity cushion in a market where home prices kept rising. When house price appreciation began to decline after April 2005, it became more difficult for subprime borrowers to refinance and they had to incur higher costs than they expected at the initiation of mortgages.

While the deterioration in the markets accelerated, the collateral values of the SIVs were also eroded, resulting in major refinancing difficulties. There were a lot of of “cash flow” CDOs issued by investment banks and collateralized by residential mortgage loans and finally bought by SIVs.

CDOs of subprime mortgages were the credit risk transfer instruments at the heart of the crisis, is that a massive amount of senior tranches of these securitization products have been downgraded from triple-A rating to non-investment grade during the turmoil. These unprecedented downgrades in the rating of investment grade structured products were due to the significant increase in default rates on subprime mortgages after mid-2005, especially on loans that were originated in 2005-2006. Many academics argue that there would have been no/less downgrades if these instruments had been rated correctly. At this point, a key problem of the structured finance market exists: ratings.

Since the beginning, the market for structured products was evolved as a rated market, in which the risk of tranches was assessed by CRAs. Issuers of structured products desired these new products to be rated on the same scale as bonds so as to enable investors with rating constraints to purchase these securities. As these securities were rated, the issuers created comparability with traditional bonds in some sense, providing access to a large number of buyers – i.e pension funds – who would otherwise perceive these as very complex derivative securities and not able to add these to their portfolio.

In addition, structured products received more favorable ratings compared to corporate bonds, as rating agencies collected higher fees for structured products and involved in the process. While an AAA-rated bond represents a band of risk from close-zero default risk to a risk that just enables it to be included in the AAA-rated group, issuers worked closely with the rating agencies to ensure that AAA tranches were always sliced to reach the AAA rating. This resulted in CDO tranches to be downgraded even in the incremental changes in the underlying default probabilities (Brunnermeier, 2008).

Large investment banks could sell almost any type of loans, securities, or revenues by the securitization process. Buyers would slice these claims in order to create subordinated tranches: senior (AAA), mezzanine (BBB), and an unrated tranche of equity. The unrated tranche would absorb losses until the equity was used up, followed by the BBB tranche for further losses until it was exhausted.

By this way, senior tranches had the first claim on whatever cashflow the whole asset pool generates. Thereby, buying a senior tranche provided protection against losses by assigning them to junior tranches. Investment-grade credit ratings of CROs suggest that senior tranches suggested they were safe even when the underlying collateral was all subprime.

Furthermore, investors are not always interested in triple A rated securities. Obviously, the securities with this rating carry the smallest spread to benchmark bonds. Given that investors have different risk-return profiles, some may prefer a triple B rated security, but with a higher spread. Thereby, structured products allow the originator company to create securities tailored to meet investor needs. In addition, rating is not the only basis for structuring of securities while there are many other features such as duration, maturity, cash flow pattern, and prepayment/call protection.

CDOs were also interested in buying subprime RMBS bonds. The reason was that, the spreads on subprime BBB tranches appeared to be wider than other structured products with the same rating, creating an incentive to arbitrage the ratings between the ratings on the subprime and on the CDO tranches (Gorton, 2008). Thereby, CDO portfolios were increasingly dominated by subprime, suggesting that the market was pricing this risk inconsistently with the ratings, giving opportunity to arbitrage.

Furthermore, it was the investment bank structuring the CDO, not the rating agency that typically performs these complex calculations. Partnoy and Skeel (2007) suggest that, the process of rating CDOs becomes a mathematical game that smart bankers know they can win as they understand the details of the models can finetune the inputs, assumptions, and underlying assets to produce predetermined outcomes.

The lack of regulations in the market was another factor contributing to the turmoil. Credit derivatives have been largely unregulated, and they had exemptions from securities law that apply to over-the-counter derivatives generally. In addition, companies were required to include descriptions of the effects of credit derivatives only in footnote disclosure rather than their true impact.

According to Gorton (2008), the introduction of new synthetic indices - the ABX.HE (“ABX”) indices- was a turning point for the markets since it was the first time that information about subprime values and risks was revealed. For the first time, market participants could express their views about the value of subprime bonds, by buying or selling protection. A year later, the ABX prices plummeted, ending up the demand.

Throughout the turmoil, banks became no longer able to sell CDOs and other structured instruments to investors. As a result, some SPVs of banks could not get rid of them and forced their sponsoring banks to absorb these instruments. Bank of Spain (2008) notes that, Merrill Lynch was one of the banks that suffered through this channel.

The banks and their ABCP conduits landed with putting specific assets off their balance sheet or to absorb debt securities that they issued.

Moreover, when the crisis hit the banking sector, the debt securities issued by the sponsoring bank that the SIV purchased dropped in value as well. Ultimately, the problems spilled over to the banks as they had to bail out their SIVs, by taking over the impaired assets which had declined significantly in value, leading to major write-downs for the banks involved. This resulted in major liquidity constraints for the banks, thus a stress in the interbank markets, since the banks had not anticipated that they would have to provide such large amounts of liquidity.

During the turmoil, underwriting standards became much tougher, many lenders went bankrupted and thus for borrowers to refinance their debt became impossible in practice as their ability to sustain their mortgage payments depended heavily on refinancing. The increase in subprime origination was associated with the significant increase in the ratio of issuance to origination. Ashcraft and Schuermann (2008) show that, the ratio of

subprime RMBS issuance to subprime mortgage origination was close to 75 percent in both 2005 and 2006.

Standard & Poor's data also suggest that, subprime ABS constituted slightly more than 70% of the collateral in rated mezzanine structured finance CDOs by 2006.

As there is usually one-quarter lag between origination and issuance, the data suggests that an increasing fraction of subprime are sold to investors, while little is retained on the balance sheets of the institutions who originated them.

Meanwhile, many of the subordinate classes of subprime ABS were purchased by asset managers and transformed into new issues of collateralized debt obligations (CDOs). The growing demand for these high-yielding CDOs consisting of subprime ABS, generated vast amounts of liquidity, and dramatically increased the volume of credit available to subprime borrowers. Given the existence of automated underwriting systems originators were enabled to make rapid underwriting decisions based upon the available credit information of prospective borrowers.

However, the credit process of these products was subject to strong doubts due to ratings methodologies and moral hazard problems. By 2006, Moody's was generating over \$6 million revenue per employee as many regulatory agencies, investors and bond insurers relied on CRA credit ratings to substitute for their own due diligence. Caprio et al. (2007) argue that, growing complexity of structured instruments placed ratings to the central of the synthetic securities as they created an illusion to combine AAA and AA ratings with extraordinarily high yields.

The doubts about CRAs further increased by substantial ratings' downgrades both in the course of 2007 and 2008, which resulted in major

losses of the structured finance instruments. As a result, problems with the valuation of structured finance products and CRAs became apparent.

Revenues of rating agencies from structured finance ratings disappeared significantly and the stock prices of these companies fell, suggesting the market expected revenue declines as permanent. According to Bank of International Settlements (2008), Moody's downgraded 31 percent of all tranches for asset-backed collateralized debt obligations it had rated and 14 percent of which were initially rated AAA. Furthermore, Portes (2008) states that, a considerable amount of CRA revenues came from advising issuers first on how to collateralize and to assign -slice/ tranche- cash flows from pools of securitizable assets to obtain a desirable rating.

Authorities also played a role in the pullulating of the crisis. With the motivation to help US firms to compete in global markets, supervisors refused to make the necessary political and practical regulations to discipline complicated risk exposures. By allowing the decline in transparency and the use poorly tested models supervisors made it difficult for market participants to recognize the real degree of the risks. As a result investors became overly optimistic about the credit quality of the instruments they purchased.

With this demand from investors, issuers of structured products continued to sell many derivative claims. In most cases, credit default swaps (CDS) written on asset backed bonds were the underlying collateral, suggesting that credit default swaps written on the same asset could appear in many different structures. This inevitably increased the systemic risk of such products.

Management of financial institutions who were given bonuses based on short run performance also increased the risk appetite of issuers as they had little incentive to care about the long run consequences of their transactions.

Accordingly, subprime mortgages financed via securitization, tranches of these sold into CDOs and purchase of these CDOs by off-balance sheet vehicles created additional subprime risk. According to Gorton (2008), the growth of the repo market constitute created a “shadow banking system.” However, as the U.S. housing prices did not rise as expected, this chain of securities, derivatives, and off-balance sheet vehicles collapsed one by one.

Brunnermeier (2008) concludes that, the strategy of off-balance-sheet vehicles based on investing in long-term assets and borrowing with short-term paper, exposed banks to funding liquidity risk. As investors suddenly stopped buying asset-backed commercial papers, the roll-over their short-term debt became impossible. This paved the way for the credit crunch of 2007-2008.

#### **4.4 Were the ratings on structured products misleading?**

Worldwide securitisation activity, which grew unprecedentedly until the summer of 2007, plummeted abruptly with the subprime crisis, especially in the market for asset-back securities (ABSs) and collateralised debt obligations (CDOs) at the beginning of 2008. In the mean time, CRAs' actions also changed sharply. Ratings, which were held steady in the summer of 2007 despite the already deteriorating US housing market, started to be downgraded as the financial crisis became deeper. The upward revision of expected default rates triggered rating agencies to make massive downgrades of numerous tranches of subprime residential mortgage-backed securities (RMBSs) while the rate cuts spread to all categories of structured finance, regardless of grade in early 2008. CRAs actions during the period were characterised by a delayed reaction to fluctuating market prices of RMBSs and CDOs and rising frequency and magnitude of downgrades. In this context, CRAs were sharply criticized for giving misleading ratings from the beginning.

S&P data clearly shows that, massive number of subprime RMBSs was downgraded from mid 2008 until May 2009, which cover the vintages of 2005–2007, corresponding to 73% of the total securities. Accordingly, 94,5% of speculative grade ratings were downgraded in the regarding period, while the rate cut activity was milder in investment grades with a rate of 71%. The data also suggests that, subprime RMBS segment experienced the highest percentage of downgrades from the original rating among other segments, i.e. RMBS, CDOs of ABS etc.



Figure 12-1: Rating Downgrades by S&P from Original-to-Current\*

Original/Current	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CC-	C	D	
AAA	1942	1	111	2	9	178	9	42	161	30	14	202	13	21	531	29	13	249	73	282	0	132
AA+	0	945	64	1	6	104	0	3	89	7	8	113	5	12	282	61	2	450	2	87	0	71
AA	4	8	1518	6	4	119	4	6	133	37	11	139	11	15	258	107	5	1026	32	493	0	301
AA-	0	5	2	469	3	35	3	1	53	3	3	61	6	3	107	52	3	544	19	203	0	217
A+	0	0	0	0	416	12	2	2	43	5	5	57	2	4	81	14	0	642	13	237	0	313
A	0	0	2	1	4	1009	8	8	63	9	6	77	4	8	131	18	6	846	17	645	0	585
A-	0	0	0	0	1	0	421	1	51	6	6	56	3	1	46	9	1	526	27	497	0	509
BBB+	0	0	0	0	0	0	0	313	17	4	8	52	3	4	67	3	0	429	3	316	0	735
BBB	0	0	0	0	0	1	2	1	801	9	8	72	9	7	76	14	2	510	28	827	0	1036
BBB-	0	0	0	0	0	0	1	0	0	362	8	25	2	3	49	13	0	284	5	618	0	1080
BB+	0	0	0	0	0	0	0	0	0	0	66	3	0	2	12	2	0	94	0	253	0	592
BB	0	0	0	0	0	0	0	0	0	1	0	387	1	0	57	1	0	179	6	427	0	765
BB-	0	0	0	0	0	0	0	0	0	0	0	0	17	0	2	2	0	37	1	30	0	47
B+	0	0	0	0	0	0	0	0	0	0	0	0	1	5	2	0	0	24	0	5	0	9
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	170	1	0	86	1	163	0	735
B-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	21	0	14

Figure 12-1: (Cont'd)

<b>Original/Current</b>	<b># of Ratings</b>	<b># of Down</b>	<b>Down %</b>
AAA	4044	2102	52,0%
AA+	2312	1367	59,1%
AA	4237	2707	63,9%
AA-	1792	1316	73,4%
A+	1848	1432	77,5%
A	3447	2431	70,5%
A-	2161	1739	80,5%
BBB+	1954	1641	84,0%
BBB	3403	2598	76,3%
BBB-	2450	2087	85,2%
BB+	1024	958	93,6%
BB	1824	1436	78,7%
BB-	136	119	87,5%
B+	46	40	87,0%
B	1156	986	85,3%
B-	41	40	97,6%

<b>Rating Grade</b>	<b># of Ratings</b>	<b># of Down</b>	<b>Down %</b>
Investment Grade	27648	19420	70,2%
Speculative Grade	4227	3579	84,7%
Total	31875	22999	72,2%

Source: S&P

\*The data covers the number of rating downgrades from March, 2008 to May, 2009 for the 2005–2007 vintages of U.S. RMBS, CDOs of ABS and SIV.

Figure 12-2: Rating Downgrades by S&P from Original-to-Current\*

Original/Current	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CC-	C	D	
AAA	1859	1	104	2	5	172	4	33	154	27	5	193	6	10	521	18	0	230	0	52	0	34
AA+	0	943	62	1	6	104	0	3	89	6	8	113	5	12	279	61	0	450	0	77	0	67
AA	2	7	1400	5	4	116	3	1	132	32	5	136	9	11	254	101	0	1014	0	222	0	211
AA-	0	3	0	463	2	34	3	1	53	1	2	61	5	3	107	52	0	541	0	147	0	196
A+	0	0	0	0	413	12	0	2	43	5	5	57	2	4	81	14	0	642	0	225	0	306
A	0	0	2	1	4	977	7	6	63	9	6	71	2	5	129	15	0	842	0	382	0	493
A-	0	0	0	0	1	0	418	1	51	6	6	56	3	1	45	8	0	526	0	443	0	491
BBB+	0	0	0	0	0	0	0	312	17	4	8	51	3	4	67	3	0	429	0	296	0	714
BBB	0	0	0	0	0	1	2	1	779	9	8	71	7	7	76	12	0	502	0	498	0	941
BBB-	0	0	0	0	0	0	1	0	0	356	8	25	2	3	49	13	0	284	0	553	0	1026
BB+	0	0	0	0	0	0	0	0	0	0	65	3	0	2	12	2	0	94	0	159	0	574
BB	0	0	0	0	0	0	0	0	0	1	0	384	1	0	57	1	0	175	0	379	0	748
BB-	0	0	0	0	0	0	0	0	0	0	0	0	17	0	2	2	0	37	0	24	0	47
B+	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	0	0	24	0	5	0	9
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167	1	0	86	0	158	0	734
B-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	21	0	14

Figure 12-2: (Cont'd)

<b>Original/Current</b>	<b># of Rating</b>	<b># of Down</b>	<b>Down %</b>
AAA	3430	1571	45,80%
AA+	2286	1343	58,75%
AA	3665	2256	61,56%
AA-	1674	1208	72,16%
A+	1811	1398	77,19%
A	3014	2030	67,35%
A-	2056	1637	79,62%
BBB+	1908	1596	83,65%
BBB	2914	2131	73,13%
BBB-	2320	1963	84,61%
BB+	911	846	92,86%
BB	1746	1361	77,95%
BB-	129	112	86,82%
B+	44	39	88,64%
B	1146	979	85,43%
B-	41	40	97,56%

<b>Rating Grade</b>	<b># of Rating</b>	<b># of Down</b>	<b>Down %</b>
Investment Grade	25078	17133	68,32%
Speculative Grade	4017	3377	84,07%
Total	29095	20510	70,49%

Source: S&P

\*The data covers the number of rating downgrades from March, 2008 to May, 2009 for the 2005–2007 vintages of U.S. Subprime RMBS.

Following the rating downgrades, the credibility of the ratings of structured finance instruments started to be questioned. A noteworthy point was the vicious cycle, arised from the declining house prices and the rating downgrades.

CRA's original ratings were based on the assumption that the appreciation of the house prices would continue. Lending to subprime mortgage borrowers was riskier and involved a particular mortgage design that required linking the outcome to house price appreciation. Accordingly, subprime borrowers had counted on being able to refinance mortgages by early selling houses and produce some equity cushion in a market where home prices kept rising. However, when house price appreciation began to decline after April 2005, it became more difficult for this group of borrowers to refinance. Finally, refinancing became impossible due to elevating interest rates and declining house prices and the borrowers defaulted on the mortgage, which resulted in a vicious cycle as the house price appreciation declined sharply with the rating downgrades.

The regression analysis run for the relationship between Case-Shiller Home Price Index and the number of rating downgrades in the regarding period rejects the null hypothesis that there has been no effect of downgrades on Case-Shiller index. The regression equation of  $Y=184.91-0,0014X$  suggests that, one unit increase in the number rating downgrades has 0,0014 points negative impact on the Case-Shiller index, with a high explanatory power of  $R^2=0,95$ .

Figure13: Summary Output for Case-Schiller Index and the Number of Rating Downgrades

SUMMARY OUTPUT					
<i>Regression Statistics</i>					
Multiple R	0.975280032				
R Square	0.951171141				
Adjusted R Square	0.944195589				
Standard Error	4.687743987				
Observations	9				
<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	2996.45595	2996.45595	136.3578443	7.63345E-06
Residual	7	153.8246058	21.97494369		
Total	8	3150.280556			
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>
Intercept	184.9149404	2.564625922	72.10211003	2.5961E-11	178.8505638
X Variable 1	-0.001460385	0.000125063	-11.67723616	7.63345E-06	-0.001756111

The regression analysis was carried through the period of 2007-2009 YTD based on the quarter-end values of Case-Schiller Index and the data of rating actions of three major CRAs, S&P, Moody's and Fitch, gathered from Bloomberg. Accordingly, the null hypothesis, which suggests that there is no significant relationship between Case Schiller and rating downgrades, has been rejected at a confidence level of 95%. The correlation coefficient between the Index and the number of rating downgrades points to 97%.

Although the number of observations is limited to 9 - as the quarter-end values of Case-Schiller Index were used - impact of rating downgrades on the

index is visible to a large extent. Case-Shiller composite index, which is based on recorded changes in residential real estate market in 10 geographical areas in the United States, is released monthly by Standard & Poor's with a two month lag. The index showed the highest quarter-on-quarter declines in 4Q08 and 1Q09 - 7.4% and 8% respectively, when the massive rating downgrades by three major CRA's took place. S&P, Moody's and Fitch made total of 26,338 downgrades in the last quarter of 2008, leading to a 7.4% drop in the Case Schiller Index. Similarly, the number of rating downgrades by the three CRA's was 39,278 in the first quarter of 2009, dragging down the index by 8% on a quarter-on-quarter basis.

Accordingly, CRAs' original ratings, which were based on the assumption that the appreciation of the house prices would continue, started to be unsustainable given the declining trend in the house price appreciation. As the refinancing of mortgage loans became impossible, borrowers defaulted on the mortgage, resulting in a vicious cycle as the house price appreciation declined sharply with the rating downgrades.

Expected developments in the housing sector are also tracked by futures contracts on the Case-Shiller composite index, which are traded on the Chicago Mercantile Exchange and cash-settled on the day the Case-Shiller index is released.

#### **IV. CONCLUSION**

The financial turmoil of 2007-2008 addressed many shortcomings of the global financial markets mostly arising from lack of transparency and complexity of the structured product. It can be concluded that, structured finance products have resulted massive losses due to the opacity of transactions, multi-layered products created via tranching process and related ratings issued by an oligopolistic rating market.

Asset-backed securities, such as (subprime) mortgage-backed securities (MBS), asset-backed commercial paper (ABCP), cash-flow collateralized debt obligations (CDOs) and pure credit derivatives such as synthetic CDOs, played a crucial role in the development and the accelerating growth of the financial turmoil.

Furthermore, low interest rate environment in the first part of the decade led to a search for yield enhancement and changed the investment motives of market players. They demanded for high yielding assets to put into the collateral pools in order to increase the profitability of securitizations for which subprime mortgages were an ideal choice.

The rating agencies' inadequate monitoring of the raw data reduced lending standards, while the involvement of CRAs in every stage of the process paved the way for moral hazard. Thereby, the assumptions used to estimate the probability of default, recovery rates and default dependence did not reflect true risks.

Misleading credit ratings for structured products - especially for those, whose underlying asset was subprime RMBSs - acted as deceptive guidance for the financial markets and triggered the aggressive growth of the markets for



structured products, without effective monitoring mechanisms. The pricing of the tranches underestimated the risk of the individual ratings. Furthermore, CRA's rate cut actions were significantly delayed given the already deteriorating housing market.

All in all, the financial turmoil of 2007-2008 was a result of the combination of many factors. However, complexity of the structured products, lack of adequate control mechanisms and misleading credit ratings, stand out as the most effective reasons for the credit crunch.

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