The credit derivative market meltdown and what lesson we can learn

A case study of Abacus 2007-AC1

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Abstract
Credit derivative has become an important financial instrument in global financial market, it plays significant role in transferring credit risk. During the latest financial crisis, collapse of credit derivative market was a main reason led to this worldwide turmoil. In this thesis, I try to investigate this adverse performance through a case study of Goldman Sach's ABACUS 2007-AC1. I conclude three major findings. First, severe interest conflicts and asymmetric information existed between counterparties in credit derivative market in U.S. Second, the securities’ credit ratings provided a downward-biased view of their actual default risks, the yields failed to account for the extreme exposure of structured products to declines in aggregate economic conditions. Third, credit derivatives do not eliminate systematic risk, they just shift the risk, CDOs exchanged diversifiable risk for systematic risk during the structuring process, which was difficult to understand for most of investors, we see risk accumulation rather than spreading risk,
Acknowledgement

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1 Introduction

1.1 Background

Global financial markets are experiencing strains on scale and scope not witnessed in the past three-quarters of a century. What started with elevated losses on US subprime mortgages has spread beyond the borders of United States and the confines of the mortgage markets. Risk spreads have ballooned, liquidity in some market segments has dried up and large complex financial institutions have admitted significant losses. Bank runs are no longer the subject exclusively of history.

Banks play a crucial role in the financing of real estate. Sacasa (2008) pointed out that lower interest rates during the past decade induced more risk-taking and contributing to the creation of asset price bubbles worldwide. They lend for the purchase of land for development and existing buildings; they finance construction projects; they lend to non-banks and finance companies that may finance real estate; and they lend to non-financial firms based on real estate collateral. The lending attitude of bankers therefore has a major impact on the behavior of property investments and transactions. On the other hand, the state of the commercial property sector affects the performance of the banking sector (Allen et al, 1995). Declining property prices increase the proportion of non-performing loans, lead to a deterioration in banks’ balance sheets and weaken banks’ capital bases. Not surprisingly, most existing theories highlight a close connection between these two sectors.

The overheated real estate market and overconfidence triggered a rapid economic growth. This real estate market boom led to an employment boom drove wages in all sectors of the economy to uncompetitive levels. Banks lent more and more loans to non-financial private sectors compared to several years ago. The booming market made banks believe that there is little possibility for default. Leveraged financial institutions have inherent incentives to take on excessive risks without internalizing systemic risk (Sacasa, 2008). The overexpansion of credit in the US housing market has led to huge losses by financial institutions and an almost unprecedented tightening of credit throughout the world. When the bubble that formed by overlending burst, the real estate market and banking system
were in clear trouble. The failure of financing system between real estate market and banking system spread to all the sectors of world economy and led to a serious recession. Kane (2008) argued that the turbulence was triggered by a sudden and widespread loss of confidence in securitization and financial engineering and by the manifest failure of respected statistical models for assessing and pricing credit risk.

1.2 Objectives
The strategic question is that what went wrong in financial derivative market in U.S. and what lessons we can learn. Try to find out what went wrong with the banking system in real estate market, more specifically, how the banking system used financial derivatives to pool mortgage loans and sell these structured products to increase liquidity, the reliability of rate made by rating agencies and what we should learn from this crisis. The objectives of this thesis include: 1. Find out the reasons for the failure of financial derivatives. 2. Explain what went wrong with the rating system and shortfalls of rating agencies. 3. Highlight the systematic risk and what problems are in Abacus 2007-AC1 case.

1.3 Methodology
The study mainly uses a qualitative method based on literature review and is complemented by quantitative data. Data are collected from internet database and previous professional literatures, international financial institutions and international financial organizations. This study is basically based on market portfolio theory and behavioral finance theory. I use hand-collected data about CDOs, CMOs and CDSs from academic papers, financial reports from financial institutions to describe credit derivative market and conduct my own case study of Abacus 2007-AC1. Data of rating agencies in this thesis is mainly from Standard & Poor. Data of Abacus 2007-AC1 is collected from Securities and Exchange Commission (SEC) and articles that published in newspaper (such as, New York Times) and internet database (such as, Knowledge at Wharton). I try to use modern portfolio theory and agency theory to address what problems are in this case.
1.4 Limitation
This thesis focuses on a case study of ABACUS 2007-AC1. Over The Counter derivatives are relatively unregulated in U.S., they are traded among players, it is difficult to find data of transactions. It is insufficient to consider this case study as an explanation to the collapse of financial derivative market in U.S., some factors such as government regulation and legislation are not specified in this thesis. The lack of centralized data of structured securities makes it impossible to conduct a rigorous research of market. The validity and accessibility of secondary data of rating agencies and background of Paulson & Co. Inc and Goldman Sachs are not specified.

1.5 Disposition of the thesis
Chapter 2: I describe widely used fundamental theories in analyzing financial market and financial products.

Chapter 3: I describe the definitions of credit derivatives that were actively traded in last decade, the history of credit derivative market and how they work.

Chapter 4: I briefly describe latest financial crisis, I use Goldman Sachs’ synthetic CDO (ABACUS 2007-AC1) as my case study and give an introduction of ABACUS 2007-AC1.

Chapter 5: I use classical efficient market theory and agency theory to analyze ABACUS 2007-AC1 from different perspectives, such as: systematic risk, risk diversification, liquidity and behavior incentives.

Chapter 6: I reflect on this case study and state my conclusion in this chapter.
2 Theory

2.1 Efficient market hypothesis and modern portfolio theory
Since the 1970’s, academic research on financial markets and the financial markets themselves have been dominated by the Efficient Markets Hypothesis (EMH). The principle work that put forward EMH was done by Fama, and makes two statements: firstly that an efficient financial market is a market where security prices are always correct in respect to the available information, and secondly –and more controversially—that financial markets in the real-world fit this definition (Fama, 1970).

The EMH asserts that financial markets are efficient at information in that one cannot constantly achieve excess return above average risk-free return through arbitrage, since all the information is incorporated in security prices and is available to investors when their decisions are made. The efficient markets follow the Law of One Price. If equivalent investment opportunities trade simultaneously in different competitive markets, then they must trade for the same price in both markets.

Modern portfolio theory (MPT) is a theory of investment which attempts to maximize portfolio expected return for a given amount of portfolio risk, or equivalently minimize risk for a given level of expected return, by carefully choosing the proportions of various assets. It is widely used in financial markets, in recent years the basic assumptions of MPT have been widely challenged by fields such as behavioral finance, which we will discuss this later.

MPT is a mathematical formulation of the concept of diversification in investing, with the aim of selecting a collection of investment assets that has collectively lower risk than any individual asset under certain assumptions. Investors can achieve diversification by averaging out independent risks. Usually, prices fluctuate due to two types of risks: diversifiable risk an systematic risk. Berk & DeMarzo (2007, p305-306) suggest two principles of large security portfolio followed EMH, first, the risk premium for diversifiable risk is zero, so investors are not compensated for holding diversifiable risk; second, the risk premium of a security is determined by its systematic risk and does not depend on its diversifiable risk. Diversifiable risk can be eliminated for free by holding
large number of securities in a portfolio, whereas systematic risk can be eliminated only by sacrificing expected returns.

Investment is a tradeoff between risk and expected return, more technically, MPT is a mathematical model to measure risk and expected return.

Expected return:

$$E(R_p) = \sum_i w_i E(R_i)$$

where $R_p$ is the return on the portfolio, $R_i$ is the return on asset $i$ and $w_i$ is the weighting of component asset $i$ (that is, the share of asset $i$ in the portfolio).

Portfolio return variance:

$$\sigma_p^2 = \sum_i w_i^2 \sigma_i^2 + \sum_{i \neq j} w_i w_j \sigma_i \sigma_j \rho_{ij},$$

where $\rho_{ij}$ is the correlation coefficient between the returns on assets $i$ and $j$. Alternatively the expression can be written as:

$$\sigma_p^2 = \sum_i \sum_j w_i w_j \sigma_i \sigma_j \rho_{ij},$$

where $\rho_{ij} = 1$ for $i=j$.

Portfolio return volatility (standard deviation):

$$\sigma_p = \sqrt{\sigma_p^2}$$

We can measure the systematic risk only if finding a portfolio contains only systematic risk, such a portfolio is called efficient portfolio. It is reasonable to consider a portfolio that contains all shares of all stocks and securities in the market eliminate all the diversifiable risk, which is called market portfolio. In MPT theory, we use beta ($\beta$ ) to measure systematic risk of a security's return. The beta is the expected percent change in the excess return of a security for a 1% change in the excess return of the market
portfolio. A security’s expected return is risk-free interest rate plus risk premium. The formula is:

\[ \mathbb{E}(R_i) = R_f + \beta_i(\mathbb{E}(R_m) - R_f) \]

### 2.2 Agency theory

Agency theory is an important, yet controversial theory. Agency theory has been used by scholars in accounting (Demski & Feltham, 1978), economics (Spence & Zeckhauser, 1971), finance (Fama, 1980), etc. Agency theory changes classic market theories since it was developed. Agency theory describes the risk-sharing difficulties and problems arise when cooperating parties have different attitude toward risk because of incomplete or asymmetric information, such as the problems of potential conflict of interest, moral hazard and adverse selection. Specifically, agency theory is directed at the ubiquitous agency relationship, in which one party (the principal) delegates work to another (the agent), who performs that work. Agency theory attempts to describe this relationship using the metaphor of a contract (Jensen & Meckling, 1976). Agency theory is concerned with resolving two problems that can occur in agency relationships. The first is that the principal cannot verify that agent has behaved appropriately. The second is that the principal and the agent may prefer different actions because of the different risk preferences (Eisenhardt, 1989). Figure 2-1 shows a mainly structure of agency theory.
### 2-1 Agency theory overview

<table>
<thead>
<tr>
<th>Key idea</th>
<th>Principal-agent relationships should reflect efficient organization of information and risk-bearing costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of analysis</td>
<td>Contract between principal and agent</td>
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<tr>
<td>Human assumptions</td>
<td>Self-interest</td>
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<td></td>
<td>Bounded rationality</td>
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<td></td>
<td>Risk aversion</td>
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<tr>
<td>Organizational assumptions</td>
<td>Partial goal conflict among participants</td>
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<td></td>
<td>Efficiency as the effectiveness criterion</td>
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<td></td>
<td>Information asymmetry between principal and agent</td>
</tr>
<tr>
<td>Information assumption</td>
<td>Information as a purchasable commodity</td>
</tr>
<tr>
<td>Contracting problems</td>
<td>Agency (moral hazard and adverse selection)</td>
</tr>
<tr>
<td></td>
<td>Risk sharing</td>
</tr>
<tr>
<td>Problem domain</td>
<td>Relationships in which the principal and agent have partly differing goals and risk preferences (e.g., compensation, regulation, leadership, impression management, whistle-blowing, vertical integration, transfer pricing)</td>
</tr>
</tbody>
</table>


There are important assumptions in agency theory:

#### 2.2.1. Self-interest

Agency theory reestablishes the importance of incentives and self-interest in organizational thinking (Perrow, 1986). As Kleiman wrote, Agency theory suggests that, in imperfect labor and capital markets, managers will seek to maximize their own utility at the expense of corporate shareholders. Agents have the ability to operate in their own self-interest rather than in the best interests of the firm because of asymmetric information and uncertainty.
2.2.2. Bounded rationality

It refers to designate rational choice that takes into account the cognitive limitations of both knowledge and cognitive capacity (Simon, 1947). Another way to look at bounded rationality is that, because decision-makers lack the ability and resources to arrive at the optimal solution, they instead apply their rationality only after having greatly simplified the choices available. Thus the decision-maker is a satisfier, one seeking a satisfactory solution rather than the optimal one.\(^1\)

2.2.3. Risk-aversion

The simple model assumes goal conflict between principal and agent, an easily measured outcome, and an agent who is more risk averse than the principal. (Note: the argument behind a more risk averse agent is that agents, who are unable to diversify their employment, should be risk averse and principals, who are capable of diversifying their investments, should be risk neutral.) (Eisenhardt, 1989).

2.2.4. Information as a purchasable commodity

In agency theory, information is regarded as a commodity: It has a cost and it can be purchased. This gives an important role to formal information systems, such as budgeting, MBO, and boards of directors, and informal ones, such as managerial supervision, which is unique in organizational research. The implication is that organizations can invest in information systems in order to control agent opportunism (Eisenhardt, 1989).

Information acquisition plays a critical role in agency theory. Since information is a commodity, the more information you have, the more value will be added to your decisions. If you do not have as sufficient information as your counter-party, it can cause severe agency problems. Asymmetric information describes a situation that one party has more or better information compared to its counter-party. This could lead to market inefficiency in which one party takes advantage of the information to benefit and is harmful to the parties who lack of information.

In the previous study, two types of agency problems are cited: Moral hazard and adverse selection.

2.2.5. Moral hazard

Moral hazard refers to agent lacks of effort and does not take full responsibilities for their behaviors, put his or her own interest first, therefore leave other parties to bear the responsibilities for the consequences. Economists argue that moral hazard results from hidden action. Principal cannot perfectly observe the agent's actions, so that principal cannot deny sharing the consequences of agent's actions because of the risk-seeking decisions.

Economist Paul Krugman described moral hazard as: "any situation in which one person makes the decision about how much risk to take, while someone else bears the cost if things go badly." Dowd (2009) gives us some examples of moral hazard:

- I might sell you a financial product (e.g., a mortgage) knowing that it is not in your interests to buy it.
- I might pay myself excessive bonuses out of funds that I am managing on your behalf.
- I might take risks that you then have to bear.

2.2.6. Adverse selection

Adverse selection is also a term from insurance industry. Adverse selection is the proclivity of those with higher risk to purchase insurance in greater amounts than those with lower risk. Adverse selection results from the asymmetric information between different parities, private information is only available to one party. Adverse selection is one of the most celebrated phenomena in the economics of information. In trading situations where one (informed) party possesses information which is relevant to his (uninformed) trading partner, the informed party may find it advantageous to engage in trade only in states of information which are relatively unfavorable from the viewpoint of the uninformed party (Ausubel, 1999). It often refers to a situation where sellers have information that buyers don't (or vice versa) about some aspect of product quality, the typical example is the "Lemon market" which is for used car market.

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2 The Wolfram Demonstrations Project
There are good used cars ("cherries") and defective used cars ("lemons"), normally as a consequence of several not-always-traceable variables such as the owner's driving style, quality and frequency of maintenance and accident history. Because many important mechanical parts and other elements are hidden from view and not easily accessible for inspection, the buyer of a car does not know beforehand whether it is a cherry or a lemon. So the buyer's best guess for a given car is that the car is of average quality; accordingly, he or she will be willing to pay for it only the price of a car of known average quality. This means that the owner of a carefully-maintained, never-abused, good used car will be unable to get a high enough price to make selling that car worthwhile. Therefore, owners of good cars will not place their cars on the used car market.

"Lemon market" effects have also occurred in financial market. Some of the possible explanations for "frozen" markets are increased uncertainty and information asymmetries about the true value of an asset. In particular, the difficulty in assessing the fundamental value of securities may lead to the adverse selection issue (Kirabaeva, 2009). Adverse selection is consistent with Gresham's law: bad money drives out good money.

2.3 Financial innovation lead to more efficient market

A couple of years ago, financial innovation were seemed as engine that improved the financial system to a better performance of the real economy. People hope that these products of financial innovation can lead to more efficient market through several ways: reallocating risk, increasing liquidity and reducing agency costs (Trimbath, 2009).

2.3.1. Reallocating risk

Financial derivatives in real estate market that we mentioned above were created to diversify the risk of mortgages that lent to house buyers by banks. Traditionally, a local bank would write and hold a great deal of mortgages for properties in that area. If some negative influence affects the local economy, house buyers may not be able to pay back their mortgages if they lose their jobs or reduce the income, then the local bank has to bear all of the defaults and falls into tremendous risk. Susanne Trimbath (2009) pointed out CMOs (collateralized mortgage obligations) were designed to spread out the risk by shifting it to larger, better capitalized, and diversified institutions. With CMOs, the risk would be spread out across banks and investors in a broader geographic area. Since
CMOs could be held internationally, even a nationwide economic downturn might have little impact on any single mortgage holder. The purpose of trading financial derivatives on the secondary market is to alleviate the probability of defaults.

2.3.2. Increasing liquidity

Financial derivatives were designed to increase more available money for banks to lend to house buyers. When banks gather mortgages that write to house buyers and sell them to other investors and financial institutions through derivatives, they get rid of these illiquid assets and acquire cash flow. Due to the mismatch between duration of assets and liabilities held by financial institutions (duration gap), which can cause severe scarcity of cash flows, Mazumder and Ahmad (2010) showed that mortgage loans are converted to a financial security, which is known as securitization of mortgages.

2.3.3. Reducing agency cost

Financial derivatives, like CDOs or CMOs, should have been designed to mitigate the interest conflicts between stockholders, managers and derivative holders. Financial derivatives reduced the necessity of down payment and service costs in the transactions. As Susanne Trimbath(2009) mentioned normally, these securities are issued from a specially created company so that the payments from the riskiest borrowers, i.e. the sub-prime mortgages, can be separated from the more credit-worthy payees. A trustee and a portfolio manager receive fees from the newly created company.
3 Credit derivatives

3.1 Definition of credit derivatives

A credit derivative is a financial instrument whose value is derived from an existent underlying asset, for example, bond, loan or any other financial asset. Credit derivatives are financial instruments whose payoffs are linked in some way to a change in credit quality of an issuer or group of issuers. Derivatives are a form of alternative investment. A derivative is not a stand-alone asset, since it has no value of its own. However, more common types of derivatives have been traded on markets before their expiration date as if they were assets.

Protection buyers find counterparties who are willing to guarantee an asset in exchange for a fee, they move the credit risk off their balance sheet and they still retain the asset on the books. The appearance of credit derivatives helps the protection buyer’s deal with their paradoxical desire to enjoy the benefits of asset concentration without having to face the attendant risks.

During the rapid growth of credit derivative market, the credit derivative market has been the focus of significant financial innovation the creative engineers create several of kinds of credit derivatives. As Blythe Masters (1993) observed, portfolio managers have a set of tailored credit risk management tools. With increasing liquidity we can completely reverse or change or optimize our credit risk profile, which-keeping the future in perspective-is extremely valuable to us at this point of the credit cycle. In broad terms, there are two groups of derivative contracts, which are distinguished by the way they are traded in the market:

- **Over-the-counter (OTC) derivatives** are contracts that are traded (and privately negotiated) directly between two parties, without going through an exchange or other intermediary. Over-the-counter (OTC) or off-exchange trading is to trade financial instruments such as stocks, bonds, commodities or derivatives directly between two parties. It is contrasted with exchange trading, which occurs via facilities constructed for the purpose of trading (i.e., exchanges), such as futures exchanges or stock exchanges.
- Products such as swaps, forward rate agreements, and exotic options are almost always traded in this way.

- **Exchange-traded derivatives (ETD)** are those derivatives instruments that are traded via specialized derivatives exchanges or other exchanges. A derivatives exchange is a market where individuals’ trade standardized contracts that have been defined by the exchange.

### 3.2 History of credit derivatives

Banks introduced credit derivatives in the early 1990s. The credit derivative market has experienced dramatic development and continuing innovation since it was created. Figure 3-1, Figure 3-2 showed the growth of credit derivatives market and credit default swap market.

**Figure 3-1 Global OTC and exchange traded derivatives market**

![Graph showing the growth of OTC and exchange traded derivatives from 1999 to 2009](chart)

*Source: Bank for International Settlements, 2010*

In figure 3-1, it shows a rapid increase in Over-The-Counter market from 1999 to 2007, then market experienced a drop after financial crisis broke out.
In figure 3-2, we can see the notional amount of CDS grew dramatically during 2004-2007 the CDS market is six times bigger than the equity derivatives market in the second half of 2007.

At the same time, securitized financial instruments exploded as well. According to data posted by SIFMA (2007), the issuance of MBS and ABS expanded rapidly in U.S. During 2006, more than 2 trillion dollars MBS were issued in the U.S. compared to only 500 billion dollars were issued in 1996.

### 3.3 Credit derivatives in real estate market

The Fed dramatically reduced interest rates after the dotcom crisis in order to stimulate the crashing market. At the same time, excessive risk taking behavior of financial institutions was also encouraged. The “credit boom” created by low interest rates during 2001-2004 was accentuated by some financial innovations that took place in recent times. Wide varieties of mortgage-backed securities (MBS) and residential mortgage-backed securities (RMBS) were developed in last few decades and more than 50 percent of mortgages were securitized (Bhattacharya et al., 2001)
3.3.1. ABS
An asset-backed security is a security whose value and income payments are derived from and collateralized (or "backed") by a specified pool of underlying assets.

3.3.2. MBS
MBS is a type of asset-backed security that is secured by a mortgage or collection of mortgages. These securities must also be grouped in one of the top two ratings as determined by an accredited credit rating agency, and usually pay periodic payments that are similar to coupon payments. Furthermore, the mortgage must have originated from a regulated and authorized financial institution. These can be subdivided into:

A residential mortgage-backed security (RMBS) is a pass-through MBS backed by mortgages on residential property.

A commercial mortgage-backed security (CMBS) is a pass-through MBS backed by mortgages on commercial property.

3.3.3. CDO
Collateralized debt obligation (CDO) is a type of asset-backed security (ABS) whose value and payments are derived from a portfolio of fixed-income underlying assets. CDOs securities are split into different risk classes, or tranches, whereby "senior" tranches are considered the safest securities.

3.3.4. CDS
A credit default swap (CDS) is a swap contract and agreement in which the protection buyer of the CDS makes a series of payments (often referred to as the CDS "fee" or "spread") to the protection seller and, in exchange, receives a payoff if a credit instrument (typically a bond or loan) experiences a credit event. It is a form of reverse trading. A CDS is a lot like an insurance policy. This is why CDS are also called protection. Buyers and sellers can bet on a corporate or sovereign risk either in single name form or in groups of names in an index.
3.4 How the credit derivatives work

The principles behind these credit derivatives are rather simple; however, when the originators create a pool of financial assets with different qualities and from different geographical positions, the structured credit derivatives are way more sophisticated than they look.

Examine the credit derivative market during the financial crisis from a high level, there are two types of credit derivatives bear the most criticism for the fuse of the lately financial crisis. One is the credit default swap (CDS), the other one is collateralized debt obligation (CDO).

3.4.1. Credit Default Swap (CDS)

Caouette et al (2009, p 417) explains how CDS work specifically in the book, it states that:

*The plain vanilla version of a credit derivative is a credit swap where the protection buyers pays a fixed recurring amount in exchange for a payment contingent upon a future credit event. If this event occurs, then protection seller pays the agreed amount to the protection buyer to cover the credit loss pursuant to default. There may also be an intermediary who arranges this structure (not shown).*

The more risky the underlying asset is, the higher the premium a protection buyer pay to buy a credit default swap. There are three purposes why so many people buy credit default swaps:

1. Hedge risk. This is the basic function of a credit default swap. Bond holders or loan lenders buy credit default swaps to hedge against the risk of defaults, when the bonds or loans default, they lose their money on investment, but they receive full or partial of their investment from the protection seller to compensate.

2. Speculation. Protection buyers do not have to actually own the asset to buy credit default swaps, therefore, if a financial institution, for example, say hedge fund, find mortgage loans of A bank with high possibility of default, the hedge fund could buy a
credit default swap on the mortgage loans. When these loans default, hedge fund receive compensation from protection seller.

3. Arbitrage. On the one hand, when the underlying asset's financial situation improves, its credit rating should be upgraded as well, and then the credit default swap pay-off should fall according to the improved financial position. In this case, it is more attractive for protection sellers to sell credit default swaps. On the other hand, when the underlying asset's financial situation deteriorates, its credit rating should be downgraded, the credit default swap spread will go up to cover the risk, it is more attractive for protection buyers to buy. Some market players could find arbitrage opportunities by exploiting the inefficiency of market, such as, the asymmetric information or the slowness of the market to respond to market signals. Moreover, pricing discrepancies also create arbitrage opportunities. Differing philosophies exhibited by rating agencies present arbitrage opportunities: in assigning a rating Moody's appears to consider both default probability and expected recovery rate, whereas S&P is said to be biased more toward the default probability (Caouette et al, 2009).

After the credit events (showed in Appendix chart 2) occur, the settlement methods include: physical settlement and cash settlement. Figure demonstrates them clearly.

3.4.2. Collateralized Debt Obligation (CDO)

Collateralized debt obligations (CDOs) are used to pool assets and enable investors with different risk/return appetites to participate in a particular tranche of those assets. Thy underlying assets include mortgage loans or credit card or bonds or other assets. The assets are usually chosen and managed by an asset manager, with fairly strict trading restrictions.

CDO market skyrocketed up during last decade. The surprising development is a key factor of boosting prosperity in U.S. as well as triggering the biggest financial crisis in American history. Barnett-Hart (2009) noted Collateralized debt obligations (CDOs), once a money making machine on Wall Street, have been responsible for $542 billion of the nearly trillion dollars in losses suffered by financial institutions since 2007\(^3\). ABS

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\(^3\) According to CreditFlux Newsletter, as of January 8, 2008.
CDO which are consisted primarily of asset backed securities accounted for more than 90 percent of the U.S. CDOs downgraded in 2007. An empirical study of Newman et al (2008) is consistent with that Asset-backed CDOs have performed far worse than other CDOs issued 1999–2007.

Issuers pooled mortgage loans with different qualities from different states and structured them as Asset Backed Securities (ABS). The basic structure is that an ABS was divided into different tranches: senior tranche, mezzanine tranche and equity tranche. All these tranches had different proportions in the whole mortgage portfolio. There are highly structured and complicated rules when an ABS distributes returns of the underlying portfolio. On the one hand, senior tranche receives its cash flow if the ABS achieves an expected return that promised to senior tranche (assume it is 5%), and this expected return is lower than expected returns that promised to mezzanine tranche and equity tranche. If the ABS achieves a higher promised return, say 10%, mezzanine tranche receives its cash flow from the portfolio. Only senior tranche and mezzanine tranche receive their cash flows and the ABS achieves promised return for equity tranche, say 15%, equity tranche receive its cash flow. On the other hand, these tranches have different priorities in absorbing the losses. Hull (2008) explained the cash flows of ABS specifically, as an approximation; the structure can also be characterized in terms of who bears the losses on the underlying portfolio. Equity tranche has 5% of the principal and bears the first 5% of the losses. As compensation for this, its return at any given time is 30% on the part of its principal that has not been eroded by losses. Equity tranche is wiped out when losses exceed 5%. Mezzanine tranche bears losses between 5% and 25% on the portfolio. In return for doing this it earns 10% of its outstanding principal. Losses in excess of 25% are borne by the senior tranche.

Senior tranche is pooled by mortgage loans with less probability to default, which is rated AAA by rating agencies. Therefore, senior tranche is easy to find buyers in the market. During the booming market, there was enormous demand for AAA rated securities. Equity tranche is pooled by mortgage loans with low quality; equity tranche was hold by originators or sold to hedge funds. The only problem left is how to convince investors to buy mezzanine tranche. The creative financial engineers structured mezzanine tranche the
same way as the ABS is originated so that the mezzanine tranche can be sold as an original ABS (Figure 3-3 shows the simplified structure of ABS CDO). Moreover, financial engineers can structure mezzanine tranche as they structure an ABS in the first place many times, which makes the synthetic derivatives extremely sophisticated. After the ABS CDOs are created, originators also pool these ABS CDOs and create CDO squared. Then originators can use this method over and over again until the derivative monster is created and no one completely understands it. We will discuss this later in this chapter.

**Figure 3-3 Structure of ABS CDO**

![Diagram of ABS CDO structure](image)

*Sources: The Credit Crunch of 2007, John C. Hull, 2008*

In this ABS CDO example, the total amount of AAA rated senior tranche is 90 percent of the outstanding principal, it equals 75 percent of ABS portfolio plus 75 percent of mezzanine tranche (75%+75%*20%=90%). The rules do not change if the ABS CDO generates positive cash flow, investors of senior tranche still receive their promised returns as ABS. However, the rules change dramatically if the ABS generates negative cash flows and the losses exceed 10 percent. We assume the losses on this ABS portfolio are 15 percent. In this case, equity tranche and mezzanine tranche of ABS cover the losses first, respectively, 5 percent and 10 percent. The losses on each ABS mezzanine tranche is 50% (Mezzanine tranche has 20 percent proportion in ABS, losses each mezzanine tranche bears equals 10% / 20%=50%). Therefore, the ABS CDO bears 50 percent losses as well. In the ABS CDO portfolio, the proportions of three tranches are 75
percent, 20 percent and 5 percent, respectively. As the same rules we used in an ABS, equity tranche and mezzanine tranche in ABS CDO cover 50 percent losses first, 5 percent and 20 percent for each, senior tranche in ABS CDO bears the rest of losses, which is 25 percent, then senior tranche loses 33.3 percent of the money in an ABS CDO mortgage portfolio (Senior tranche is 75 percent of principal outstanding in ABS CDO, its losses equals $25\% / 75\% = 33.3\%$). Senior tranche investors lose one third of their investment in ABS CDO compared to they receive promised returns in ABS, the complexity makes the expected return vary a wide range.

As Mcgruder (2006) pointed out, one of the largest growth areas has been in deals that use credit default swaps to give an indirect linkage to the underlying portfolio of credit risk. These are known as synthetic CDOs and appear to generally be the preferred choice. Figure 3-4 features a basic idea for a synthetic CDO.

*in a synthetic CDO, the manager does not purchase actual bonds, but instead typically enters into several credit default swaps with a third party, to increase synthetic exposure to the outstanding debt issued by a range of companies. The special purpose company formed to hold these exposures then issues financial instruments, which are backed by credit default swaps rather than any actual bonds. The development of synthetic CDOs has transformed the market as this has allowed this segment of the market to grow without regard to the availability of bonds or other cash debt instruments. (Caouette et al, 2009, p 418).*
3.5 Major players in the credit derivative market

The main players in credit derivative market are banks, hedge funds, insurance companies, corporate and other financial institutions. Chart 4-6 describe the major buyers and sellers in the market, other includes: mutual funds, pension funds and government agencies.

With no doubt, banks who are the pioneers are still the biggest players in the market, however, their share is decreasing, insurance companies and hedge funds play more and more important roles in the market. A report by Bear Stearns (2006) pointed out the market is constantly evolving:

- The structured credit market has developed a diverse participant base.
- As managers of credit risk, banks are significant buyers and sellers of protection, but their relative dominance has decreased as the market has grown. As would be expected, they are net buyers of protection.
• Monoline insurers continue to play a large role and remain net sellers of protection.

• Hedge fund activity will continue to increase due to their ability to:
  • Capture arbitrage opportunities in this adolescent market.
  • Take advantage of the opportunity to cross the debt and equity markets in the credit derivative arena. Create unique positions and tailored investment.

• With more favorable regulatory and accounting treatment of credit derivatives, insurance companies will likely become more active in the market.
4 Empirical study of financial crisis

4.1 Financial crisis in 2007

During the booming market from 2001 to 2007, mortgage loans issued by commercial banks increased dramatically. Ip et al. (2008) report that income and/or assets of numerous mortgage lenders increased by three folds due to issuance of subprime loans. Hull (2008) noted that the very low Fed Funds rate between 2002 and 2005 was an important contributory factor, but the bubble was largely fuelled by mortgage lending practices. The S&P/Case-Shiller Home Price Indices\(^4\) tracked the price path of single-family homes located in US market, which is summarized in Figure 4-1. All three aggregated composites told us that home price appreciated in value and peaked in 2006, after the break out of financial crisis, by April 2009, more than 30 percent decline in home price has been traced by all three composites (separately, 33.5%, 32.6% and 32%).

Figure 4-1 S&P/Case-Shiller Home Price Indices

<table>
<thead>
<tr>
<th></th>
<th>10-City</th>
<th>20-City</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak date</td>
<td>June 2006</td>
<td>July 2006</td>
<td>2006Q2</td>
</tr>
<tr>
<td>Peak level</td>
<td>226.29</td>
<td>206.52</td>
<td>189.93</td>
</tr>
<tr>
<td>Recent trough date</td>
<td>April 2009</td>
<td>April 2009</td>
<td>2009Q1</td>
</tr>
<tr>
<td>Peak-to-trough decline</td>
<td>-33.5%</td>
<td>-32.6%</td>
<td>-32.0%</td>
</tr>
<tr>
<td>Peak-to-latest data decline</td>
<td>-29.8%</td>
<td>-29.0%</td>
<td>-27.8%</td>
</tr>
<tr>
<td>Appreciation since trough</td>
<td>+5.6%</td>
<td>+5.3%</td>
<td>+6.3%</td>
</tr>
</tbody>
</table>

Sources: S&P Indices and Fiserv.

The federal funds rate increased from approximately 1 percent in late 2004 to more than 5 percent in mid-2007 to struggle against high inflation (source: http://research.stlouisfed.org/fred2/). Increase in interest rate had a negative impact on house owners especially subprime borrowers’ ability to pay off their mortgage loans. At the same time, housing price declined and fell to fundamental level when the real estate bubble started to burst (see Figure 4-2). U.S. National Home Price Index kept increasing.

\(^4\)The S&P/Case-Shiller Home Price Indices seek to accurately track the price path of single-family homes located in 20 metropolitan areas and three aggregated composites. The S&P/Case-Shiller National U.S. Home Price Index is a quarterly composite of single-family home price indices for the nine U.S. Census divisions. The S&P/Case-Shiller 10-City Composite is a value-weighted average of 10 metro area indices and the S&P/Case-Shiller 20-City Composite is a value-weighted average of 20 metro area indices.

Figure 4-2 S&P/Case-Shiller U.S. National Home Price Index

Sources: S&P Indices and Fiserv.

As defaults of house buyers’ mortgage loans increased due to the declining of their underlying assets, the probabilities of defaults of financial derivatives built up as well during the early stage of financial crisis. Figure 4-3 and 4-4 demonstrate the Mortgage Delinquency and Foreclosure Rates.
In this figure, we can see all types of mortgages delinquency rate have risen up since 2006, especially, the increase in subprime loans is dramatic, it almost increased by 15 percent from 2006 to 2009. It is reasonable to conclude that there also is an increase in foreclosure rate followed expansion of low quality mortgages.

Sources: Mortgage Bankers Association
While all types of homes and mortgages have been affected by the housing crisis, the absolute percentage of homes that are either behind payment or have entered foreclosure is much higher for sub-prime loans. It has become apparent in 2009, however, that even homes with prime mortgages were not immune to the housing crisis. Within that sector, both the rate of delinquencies and the percentage of homes entering foreclosure hit new highs in 2009.

4.2 Abacus 2007-AC1: Built to fail

4.2.1. Overview

Abacus 2007-AC1 is a synthetic CDO, which was created by Goldman Sachs in February 2007 at the request of John Paulson, the hedgie who was busy shorting subprime every which way he could find at the time.

According to New York Times: "Abacus allowed investors to bet for or against the mortgage securities that were linked to the deal. The CDO didn’t contain actual mortgages. Instead, they consisted of credit-default swaps, a type of insurance that pays
out when a borrower defaults. These swaps made it much easier to place large bets on mortgage failures."

On April 16, 2010 the Securities and Exchange Commission (SEC) formally charged Goldman Sachs & Co. SEC alleges that, in sum, GS&Co arranged a transaction at Paulson’s request in which Paulson heavily influenced the selection of the portfolio to suit its economic interests, but failed to disclose to investors, as part of the description of the portfolio selection process contained in the marketing materials used to promote the transaction, Paulson’s role in the portfolio selection process or its adverse economic interests (SEC, 2010).

4.2.2. Background
Abacus 2007-AC1 was a $2 billion notional value synthetic CDO. The synthetic portfolio consisted of many Baa2 (according to Moody’s rating) subprime residential mortgages (RMBS) issued in 2006. In the Abacus 2007-AC1 trade, there are different market participants involved: Paulson & Co Inc., Goldman Sachs & Co, investors and independent third party.

4.2.3. Paulson & Co. Inc.
Paulson & Co Inc is the manager of several hedge funds. The firm had assets under management (as of June 1, 2007) of $12.5 billion (95% from institutions), which had jumped to $36 billion by November 2008. In 2007 alone the firm earned $15 billion. John Alfred Paulson (born December 14, 1955) is the founder and president of Paulson & Co. John A. Paulson, a prominent hedge fund manager who earned an estimated $3.7 billion in 2007 by correctly wagering that the housing bubble would burst.
Paulson & Co has capitalized on the problems in the foreclosure of credit derivative markets. In September 2008, Paulson bet against four of the five biggest British banks. His positions included a £350m bet against shares in Barclays; £292m against Royal Bank of Scotland; and £260m against Lloyds TSB. His firm eventually booked a profit.

of as much as £280m after reducing its short position in RBS in January 20096. In December 2009, the New York Times reported that Paulson had profited during the financial crisis of 2007 by betting against synthetic collateralized debt obligations (CDOs)7.

Paulson understood the real estate market was not safe and believed that a wide range of mortgage loans carried higher ratings than the underlying loans deserved would default. Paulson asked Goldman to help him arrange the effect of a short position on a portfolio of sub-prime and mid-prime residential mortgage-backed securities (RMBS). Paulson’s position was through credit default swaps referencing a portfolio of 90 RMBS, each for a principal amount of $22.22 million, for a total RMBS portfolio of $2 billion (Duffie, 2010). Paulson paid the investment bank $15 million dollars for structuring and marketing the ABACUS 2007-AC1 portfolio.

In late 2008, Paulson decided to start a new fund that would capitalize on Wall Street’s capital problems by lending money to investment banks and other hedge funds currently feeling the pressure of the more than $345 billion of write downs resulting from under-performing assets linked to the housing market. On August 12, 2009, Paulson purchased 2 million shares of Goldman Sachs as well as 35 million shares in Regions Financial8. After the September of 2007, Paulson's fund generated $1 billion betting on the recovery of Citigroup9.

4.2.4. Goldman Sachs & Co.

Goldman Sachs Group Inc., the fifth-biggest U.S. bank by assets, which was founded in 1869. The Goldman Sachs Group, Inc. (Group Inc.) is a leading global investment banking, securities and investment management firm that provides a wide range of

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financial services. The firm provides mergers and acquisitions advice, underwriting services, asset management, and prime brokerage to its clients, which include corporations, governments and individuals. The firm also engages in proprietary trading and private equity deals, and is a primary dealer in the United States Treasury security market.

Goldman Sachs is one of the leading M&A advisory firms, often topping the league tables in terms of transaction size. The firm gained a reputation as a white knight in the mergers and acquisitions sector by advising clients on how to avoid hostile takeovers, moves generally viewed as unfriendly to shareholders of targeted companies (SEC, 2008). The firm has also been involved in both advising and brokering deals to privatize major highways by selling them to foreign investors. In addition to advising four state and local governments on privatization projects, including Indiana, Texas, and Chicago. Goldman Sachs was the underwriter of transaction Abacus 2007-AC1. During the design procedures, real estate market started to go bearish, Goldman Sachs was aware of that it was difficult to sell Abacus 2007-AC1 without guarantee of an independent third party with good reputation. Then, Goldman Sachs found ACA Capital Management (ACA) to be third party agent. Approached ACA and proposed that it serves as the “Portfolio Selection Agent” for a CDO transaction.

In an April 16 statement, Goldman argued that the long investors had no need to know of Paulson’s role, or that Paulson was taking the short side of the deal and they provided extensive information about the underlying mortgage securities for IKB and ACA. Goldman Sachs said: “The risk associated with the securities was known to these investors, who were among the most sophisticated mortgage investors in the world. These investors also understood that a synthetic CDO transaction necessarily included both a long and short side.”

Goldman Sachs insisted it did nothing wrong in the deal. In a statement opening his testimony before the investigations subcommittee on April 27, Goldman chairman and CEO Lloyd C. Blankfein said: “While we strongly disagree with the SEC’s complaint, I

also recognize how such a complicated transaction may look to many people.... We have
to do a better job of striking the balance between what an informed client believes is
important to his or her investing goals and what the public believes is overly complex and
risky."12

4.2.5. ACA Capital Management (ACA)
ACA previously had constructed and managed numerous CDOs for a fee. As of
December 31, 2006, ACA had closed on 22 CDO transactions with underlying portfolios
consisting of $15.7 billion of assets. ACA was the RMBS portfolio selection agent for
Goldman Sachs. Goldman Sachs started the process by providing Paulson with a data
base of RMBS securities. Paulson then provided the investment bank with a spreadsheet
of 123 securities, which were sent on to ACA for its evaluation. After further meetings
and discussion, involving Paulson, ACA and the firm, ACA approved a portfolio of 90
securities. These 90 Baa2 rated (rated by Moody's) or BBB rated (rated by S&P)13
securities were selected with the high possibility to default across the U.S. when the
subprime market meltdown.

4.2.6. Investor: IKB
IKB Deutsche Industriebank AG (IKB) was a German commercial bank. IKB bought $50
Million worth of Class A-1 notes at face value. The Class A-1 Notes paid a variable
interest rate equal to LIBOR plus 85 basis points and were rated Aaa by Moody’s and
AAA by S&P. IKB bought $100 million worth of Class A-2 Notes at face value. The
Class A-2 Notes paid a variable interest rate equal to LIBOR plus 110 basis points and
were rated Aaa by Moody’s and AAA by S&P14 (SEC, 2010).

4.2.7. ACA Capital Holdings/ABN AMRO
ACA Capital Holdings (ACA Capital Management's parent company) sold protection of
the $909 million super senior tranche of ABACUS 2007-AC1 through its wholly-owned

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12 Knowledge@Wharton.Goldman Sachs and Abacus 2007-AC1: A Look Beyond the Numbers.
http://knowledge.wharton.upenn.edu/article.cfm?articleid=2481
13 ‘BBB’—Adequate capacity to meet financial commitments, but more subject to adverse economic
14 ‘AAA’—Extremely strong capacity to meet financial commitments. Highest Rating.
subsidiary, ACA Financial Guaranty Corporation. ACA assumed the credit risk associated with that portion of the capital structure via a CDS in exchange for premium payments approximately 50 basis points per year (SEC, 2010). The super senior transaction with ACA Capital was intermediated by ABN AMRO Bank N.V. (“ABN”), which was one of the largest banks in Europe during the relevant period. Through a series of CDS between ABN and Goldman and between ABN and ACA that netted ABN premium payments of approximately 17 basis points per year, ABN assumed the credit risk associated with the super senior portion of ABACUS 2007-AC1’s capital structure in the event ACA Capital was unable to pay (SEC, 2010).

The whole relationships between each participant in the ABACUS 2007-AC1 transaction are demonstrated by Figure 4-5.

**Figure 4-5 Participants in Abacus 2007-AC1**

In the ABACUS 2007-AC1 transaction, with no doubt, the biggest winner was Paulson, who betted on the real estate market would crush. Goldman Sachs promised to bear the losses from 21% to 100%, however, Goldman Sachs transferred the losses to IKB, ACA
(IKB and ACA bear 21%-45%) and ACA Capital Holding and ABN (bear 50%-100%) through series of CDS contracts, Goldman Sachs only covered the portion 45% to 50%.

As a result of the default of ABACUS 2007-AC1, ABACUS 2007-AC1’s Class A-1 and A-2 Notes were nearly worthless. IKB lost almost all of its $150 million investment. Most of this money was ultimately paid to Paulson in a series of transactions between Goldman Sachs and Paulson. In early 2008, ACA Capital entered into a global settlement agreement with its counterparties to effectively unwind approximately $69 billion worth of CDSs, approximately $26 billion of which were related to 2005-06 vintage subprime RMBS. In late 2007, ABN was acquired by a consortium of banks that included the Royal Bank of Scotland. On or about August 7, 2008, RBS unwound ABN’s super senior position in ABACUS 2007-AC1 by paying Goldman Sachs $840,909,090. Most of this money was subsequently paid by Goldman Sachs to Paulson (SEC, 2010). Paulson earned nearly $1 billion (150 million+840 million) through series of CDS in ABACUS 2007-AC1 transaction.
5 Review of ABACUS 2007-AC1

5.1 Systematic risk

As we mentioned in theory part, one of the important features of structured securities is relocating and spreading the risk. A credit derivative averages out the diversifiable risk by holding a great number of securities in the portfolio. However, in the Abacus 2007-AC1, a key of understanding this is that credit derivatives do not eliminate systematic risk - they just shift the risk around to someone who has different risk-return preferences or higher capacity of bearing risk. According to certain rules of distribution of cash flow, CDO redistributes the risk between different tranches, therefore, these tranches have different sensitivity to systematic risk ($\beta$). By shifting the risk from senior tranche and mezzanine tranche to equity tranche, the beta of senior tranche and mezzanine tranche fall whereas the beta of equity tranche increases subsequently. As the market rises and falls the senior tranche will not be affected (Cheng, 2002).

But in the ABACUS 2007-AC1 case, the German bank IKB bought $150 million Class A-1 and A-2 notes of ABACUS 2007-AC1, IKB's investment worth almost zero a couple of months after the transaction.

ABACUS 2007-AC1 is called "Built to fail". In the portfolio, there were 90 BBB rated securities from different states of U.S., in such a large geographic locations diversified underlying portfolio, it is reasonable to assume that diversifiable risks are already wiped out, the losses are only depend on systematic risk. But most of these securities are from California, Arizona, Nevada, Florida, where the housing price were over-valued substantially, these securities are with high possibility of default due to over-heated real estate market, it means ABACUS 2007-AC1 was born to have high beta. It became more dangerous after redistributing the risk from upper tranches to equity tranche. We compared risk and return of an ABS with a CDO in Chapter 3.4, losses are much bigger in CDO when a certain tranche has the same portion in both structured products. The example illustrates that tranches became more sensitive to systematic risk in a CDO, or to say, CDO amplifies the risk due to higher dependence on default possibility and correlation among different tranches. Synthetic CDO tranches are much more sensitive to
the credit cycle, or to business cycle risk, than a portfolio of similarly-rated corporate debt (Gibson, 2004). Furthermore, the dramatic rise in issuance of credit derivatives also naturally drove up market risk.

In Capital Asset Pricing Model (CAPM), assets with higher correlation to market should gain higher expected return due to the exposure to systematic risk than other assets with relatively lower beta. However, Coval et al. (2009) pointed out that tranches in CDO do not offer their investors nearly large enough of a yield spread to compensate them for the actual systematic risk that they bear.

Since the complexity of credit derivatives, many investors actually do not fully appreciate the structured products; the credit derivative market became a "rated" market. Rating information of credit derivatives from Three Big (Fitch, Moody's and S&P) is not only used by investors as benchmarks, but also is used by regulators as references. This is also supported by Coval et al. (2009). First, the securities’ credit ratings provided a downward-biased view of their actual default risks, since they were based on the credit rating agencies’ naive extrapolation of the favorable economic conditions. Second, the yields failed to account for the extreme exposure of structured products to declines in aggregate economic conditions (in other words, systematic risk). When the price movement was huge and sudden (as during any crisis), it is difficult to readjust (Mazumder & Ahmad, 2010). Therefore, investors cannot move positions of their portfolio immediately because of information inefficiency and suffer losses. (We will discuss information inefficiency later).

As a result, in ABACUS 2007-AC1 case, by October 24, 2007 (the transaction was closed on April 26, 2007), 83% of the RMBS in the ABACUS 2007-AC1 portfolio had been downgraded and 17% were on negative watch. By January 29, 2008, 99% of the portfolio had been downgraded. IKB lost nearly $150 million on the AAA rated assets whereas investors in the ABACUS 2007-AC1 CDO lost over $1 billion. Credit derivatives, such as ABACUS 2007-AC1, exchanged diversifiable risk for systematic risk during the structuring process, which was difficult to understand for most of investors.
5.2 Risk diversification

ABACUS 2007-AC1 was expected to spread the systematic risk and allow scarce capital to allocate to optional resource distribution, just as what people expected when the credit derivatives were created in the first place. In a contrary manner, we see risk accumulation rather than spreading risk in reality. Most of players in credit derivative market are financial institutions, money they put into credit derivatives was astronomical number. The major participants in ABACUS 2007-AC1 deal are big financial institutions, IKB was directly investors, ACA and ABN Amro guaranteed enormous amount of ABACUS 2007-AC1 to other investors, ACA experienced severe financial difficulties after the default, according to data disclosed by SEC, ACA Capital entered into a global settlement agreement with its counterparties to effectively unwind approximately $69 billion worth of CDSs, approximately $26 billion of which were related to 2005-06 vintage subprime RMBS, Royal Bank of Scotland paid $840 million for ABN Amro to bail it out from ABACUS 2007-AC1 deal. They invested many kinds of credit derivatives for the seemingly attractive return and consolidate increasing credit risk rather than allocating them broadly. Apparently, these financial institutions invested way more money beyond their ability to pay off when the credit derivatives default.

5.3 Conflicts of interest and asymmetric information

The main legal argument of ABACUS 2007-AC1 is that there are severe conflicts of interest between the originators and investors. While ACA was the portfolio agent and would select a portfolio of subprime RMBS - Goldman Sachs and Paulson were also involved into the selection of securities. During this process, Paulson screened out all the Wells Fargo's\textsuperscript{15} RMBSs. Paulson was pessimistic about the future of real estate market and bond market, he effectively shorted ABACUS 2007-AC1 by buying protection through a series of CDSs. Paulson had incentives to expect securities of ABACUS 2007-AC1 to default in the future. Therefore, Paulson's economic interests were directly adverse to investors.

\textsuperscript{15} Wells Fargo is the fourth largest bank in the US by assets and the second largest bank by market capitalization. It is generally perceived as one of the higher-quality subprime loan originators.
Normally, these securities should be issued from an independent third-party and managed by independent manager with: 1) sufficient knowledge and expertise in analyzing RMBS. 2) experiences and interests aligned with investors. However, the involvement of Paulson and Goldman Sachs in portfolio selection process jeopardized the independence and fairness of third-party and made their interests and counterparties' interests sharply conflict. In ABACUS 2007-AC1 deal, we have enough reason to blame and rating agencies whose interests should be aligned with investors. Rating agencies earn fees for grading products which are paid by originators; it seems that rating agencies' interests are aligned with originators rather than investors who to a large extent rely on the grades nowadays.

Paulson's short position was not disclosed at all to investors and ACA during the whole deal. Adversely, ACA was told that Paulson was very interested in the underlying portfolio and would invest in the 0-9% tranche of a static mezzanine of ABACUS 2007-AC1 when ACA questioned Goldman Sachs about Paulson's role in ABACUS 2007-AC1 deal. Paulson's "long position" made ACA less cautious when ACA selected and evaluated securities. The marketing material Goldman Sachs sent to IKB excluded Paulson's short position as well. SEC alleged the marketing information for ABACUS 2007-AC1 was false and misleading because they represented that ACA selected the reference portfolio while omitting any mention that Paulson, a party with economic interests adverse to CDO investors, played a significant role in the selection of the reference portfolio. In Goldman Sachs marketing materials, Goldman Sachs marked ACA as the "Portfolio selection agent" who selected securities independently and used long paragraph to described ACA's business strategy, expertise and investment philosophy without mentioning Paulson's adverse interests.

Paulson is a prominent hedge fund manager and Paulson & Co. Inc. is one of the world's largest hedge funds. Investors like IKB were not as sophisticated as Paulson or Goldman Sachs. When Paulson bet housing bubble would collapse, investors of ABACUS 2007-AC1 still believed that these securities would create an appreciation in value. Paulson's fake long position affected investors' decisions because of his reputation. This "positive signal" increased investors' confidence in ABACUS 2007-AC1. Paulson took advantage
of his superior information of housing market that investors lack of. In this harmful situation where information was imbalanced between counter-parties, investors' risk rose up.

Asymmetric information in ABACUS 2007-AC1 also led to moral hazard and adverse selection.

On one hand, in Chapter 3.4, I mentioned that one of reasons why people buy CDS is speculation. Protection buyers do not have to actually own the asset to buy credit default swaps. Therefore, Paulson boldly shorted ABACUS 2007-AC1 without investing any tranche, it means Paulson did not have to bear any loss if the portfolio defaults. He had strong incentives to create a portfolio with extremely high default risk. On the other hand, Paulson took excessive risk to short ABACUS 2007-AC1 for high return because he bought CDS from Goldman Sachs. Even though Paulson paid premium to Goldman Sachs, return from shorting ABACUS 2007-AC1 was much greater than CDS premium he paid. If the profits of the increased risk taking greatly outweigh the cost, the inherent moral hazard will prevail.

Goldman Sachs bore moral hazard as well in this case. First - the incentive to take excessive risk. Paulson bought protection from Goldman Sachs in the first place. Goldman Sachs knew the inborn defect of ABACUS 2007-AC1 and Paulson's short position. But Goldman Sachs signed CDS contracts with Paulson because they know that they would buy guarantee from IKB, ACA and ABN Amro and transfer most risk to them.

Second - the incentive to understate risk. Goldman Sachs was paid by fee for origination the product, not paid as a principal; they did not have incentive to worry about the systematic risk of their product. In Goldman Sachs' marketing materials, for instance, the flipbook for ABACUS 2007-AC1, it emphasized ACA's expertise and experience in selecting and evaluating securities, as well as ACA's aligned interests with investors'. Goldman Sachs used ACA's reputation to mitigate the systematic risk and convince investors to buy the deal. Furthermore, since it turned into a fee-based origination business, the underwriting standards that examine the responsibility of originator and the quality of product have been replaced by rating agencies' grade.
Moral hazard significantly disturbs the market efficiency, capital cannot be efficiently invested in the transactions which actually create value for investors and add value to the whole market. It causes diverge from optimal capital allocation.

In insurance business, people who bear high risk are more inclined to buy insurance than other who are risk-averse. In this deal, Paulson and Goldman Sachs are the culprits. IKB and other participants could have bought protection for themselves, but they did not fully understand ABACUS 2007-AC1 and were overconfident on their long position because of asymmetric information. ABACUS 2007-AC1 was an epitome of U.S. credit derivative market. In an overheating market, housing price went up sharply; investors barely believed that residential mortgage loans market would collapse. Unqualified mortgage loans (such as, subprime loans) filled up the market. As a result, higher and higher demand for CDS against toxic loans drove up premium level. Investors had difficulties in estimating fundamental value of underlying asset. Investors holding so called "AAA" asset may not be willing to pay the increasing premium to protection sellers. It could be an explanation to why participants on the long side (IKB, ACA) of ABACUS 2007-AC1 suffered losses by themselves and participants on the short side (Paulson, Goldman Sachs) reallocated losses to others.

In blooming market, rapidly increased value of securities made asymmetric information less significant in a transaction, however, when the market experiences a downturn, market correction is more sensitive to asymmetric information. As more and more securities default, adverse selection leads to serious market liquidity problem, since investors cannot estimate the true value of securities and do not know whether securities are sold because of demand for liquidity or low quality. As a result of adverse selection, investors may pick low-quality securities for higher pay off and high-quality securities are difficult to sell and are driven out by low-quality securities.
6 Conclusion

We analyzed the ABACUS 2007-AC1 case and found endogenous problems of synthetic CDO and questionable behaviors of participants. No one is innocent in this "Built to fail" deal and the collapse of market. It is irrational to only blame that financial innovation or credit derivatives destroyed the market. Actually, today's finance industry needs these financial products to help the industry grow even though they did an adverse performance lately. The most important thing is that how to profoundly rethink what market participants have done. Equivalently, market participants need to reflect themselves as well. No matter how market evolves, you make your decisions by yourselves.

Lax lending standards should be questioned as well. Banks and other financial institutions have to take responsibility for their behavior. Greedy banks have lent too much money to borrowers who are not qualified for a mortgage loans. Credit derivatives gave banks a way out to get rid of illiquid loans from their balance sheets and make the financing system more efficient. However, banks took advantage of them in the wrong way. Everyone pinned his hope on market's self-adjustment doing its job. Financial institutions' behavior has spillover effect. Their bad decisions have negative influence on the whole financial market. Closer balanced regulations on financial institutions are badly in need. Neither too strict regulation nor too little regulation could maintain the system work smoothly. Too strict regulation hampers financial market from growing, it frustrates investors' passion and prevents them investing in productive assets. Too little regulation leads to excessive actions, as we saw in this catastrophic crisis. How to find out a balanced regulation scheme is what government should give top priority to.

Credit rating agencies (CRAs) are required to improve their evaluation system. They need to be aware of their increasing importance in economy. Their grading of assets profoundly influences the investors' decisions. Investors are not always able to carry sophisticated analysis by themselves, especially when it refers to complex financial derivatives. This is obvious in the ABACUS 2007-AC1 case. Sometimes, even experienced financial institutions could not fully appreciate the product. According to how much the investor’s rely on CRAs, it is reasonable to require CRAs to share responsibility in any transaction. Their evaluation weight so much more than just "their
opinions”. CRAs need to enhance their methodologies and standards of credit derivatives, assessing models should not only calculate the potential losses of underlying asset, but also the probability of default and correlations of default among different tranches, macro economy situation should also be considered in their models. Structured financial products are distinct from single name securities due to their heterogeneous structural features. It is inappropriate to directly adopt the methods used for single name credit securities. CRAs have to develop new standards for new credit market. The important principal-agent problem that originators pay CRAs for grading could be changed other financing methods. This principal-agent relationship between originators and CRAs makes CRAs' interest severely drift apart from investors'. As independent third-party in credit market, independency always comes first.

An agreed upon reason for growth of credit derivative market is the demand for credit derivative products. The first thing failed investors need to do is reflecting their imprudent decisions. Under a background of fairly strong economy, investors had little incentive to consider the robustness of the assets. Strong macro economy concealed risk and each party thought they would be paid off from credit derivatives. In my point of view, confidence and insufficient knowledge of credit derivative market contribute to flippancy. They believe that they have fully understood the structured securities which they do not. Many financial institutions and individual investors tried to achieve higher short term return by taking more risk and picking up securities highly correlated. In contrast, some hedge funds, another major participant in credit derivative market, earned huge amount of money due to investment strategies, more diversified portfolios and their ability to short securities and market. There are two appropriate terms in behavioral finance to describe investors: overconfidence and myopia. Missing rationality is the first thing that investors have to retrieve.
7 References


S&P/Case-Shiller Home Price Indices: 2009 A Year In Review


Appendix

Chart 1 Structure of CDS

Risk Seller  (Protection Buyer)  →  Risk Buyer  (Protection Seller)

Default: Based on the default of a reference security by a reference credit.

Alternative settlement forms:
(1) Fall in market value of the reference security at x-number of months from default date.
(2) Physical Delivery of Notional Principle in exchange for defaulted security.
(3) Binary: Payment of a predetermined fixed amount.

Materially:
There should be a significant deterioration in the price of the reference security before settlement is triggered.

Chart 2 Overview of CDS credit events

CDS MECHANICS - CREDIT EVENTS

- **Bankruptcy**: A Corporation’s insolvency or inability to pay its debts. Constitutes a credit event if the inability to repay debts is part of a judicial, regulatory, or administrative proceeding or filing.

- **Failure to Pay**: A reference entity’s failure to make due payments, taking into account any applicable grace period.

- **Restructuring**: A change in the debt obligation terms, such as: (i) reduction in rate or amount of interest payable; (ii) reduction in the amount of principal or premium payable at maturity; (iii) postponement or deferral of dates for payment of interest/premium; (iv) change in ranking priority of obligations; (v) any change in currency or composition of which is not a permitted currency (i.e. G7).

- **Obligation Acceleration**: When an obligation has become due and payable earlier than it would have otherwise been due because of a reference entity’s default or similar condition.

- **Reputation / Moratorium**: A reference entity rejection or challenge of the validity of its obligations by an authorized officer or governmental authority.

*Source: BMO Financial Group*
Chart 3 Settlement methods of CDS

Settlement Following a Credit Event

Physical Settlement:
- Protection BUYER delivers eligible debt (typically a bond or loan) to the Protection SELLER in exchange for a cash payment equal to par

Cash Settlement:
- Calculation Agent makes a market value determination of loss (par minus recovery) that the Protection SELLER is then obligated to pay to the BUYER

Market Standard is Physical Settlement

Source: BMO Financial Group

Chart 4 Market participants

<table>
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<tr>
<th>Bank Portfolio Managers</th>
<th>Insurance Companies / Asset Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Predominantly buyers of protection</td>
<td>- Predominantly sellers of protection</td>
</tr>
<tr>
<td>- Loan Exposure Management</td>
<td>- Relative value</td>
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<tr>
<td>- Sell protection to subsidize their hedging programs and diversify their portfolio</td>
<td>- Customization of credit risk</td>
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<tr>
<th>Reinsurers / Monolines</th>
<th>Hedge Funds</th>
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<tr>
<td>- Predominantly sellers of protection</td>
<td>- Buyers and sellers of protection</td>
</tr>
<tr>
<td>- No funding requirement using CDS</td>
<td>- Ability to short credits</td>
</tr>
<tr>
<td>- Exposure to corporate credit risk</td>
<td>- Basis trades: bonds versus CDS</td>
</tr>
</tbody>
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New Market Participants

- P&C / Life Insurance Companies – Investment alternative to bonds, hedging, shorting credits
- Money Managers – Investment alternative to bonds, hedging, shorting credits to outperform index
- Corporates – Primary needs of managing counterparty credit risk

Source: BMO Financial Group
Chart 5 Buyers of Protection

Source: British Bankers Association

Chart 6 Sellers of Protection

Source: British Bankers Association