How Did Banks Deal with Credit Derivatives during the Financial Crisis?

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By

Shangmin Yu

Undergraduate Finance Student

The Ohio State University

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Thesis Committee:

René M. Stulz, Advisor

Jack Bao

H. Rao Unnava

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Chapter I: Introduction

Many observers argue that credit derivatives played a big role in the recent financial crisis. Alan S. Blinder, the Gordon S. Rentschler Memorial Professor of Economics and Public Affairs at Princeton University, regards “wild derivatives” as the first error leading to the financial crisis.[1] David Paul, the president of the Fiscal Strategies Group, concludes that without credit default swaps, AIG would still be in business.[2]

A credit derivative is just a type of credit risk transfer instrument. It separates credit risk from the underlying asset and transfers the risk to others who can better bear it. To understand how credit derivatives works, let's take the bilateral single name credit default swap (CDS), the simplest and most commonly used type of credit derivative as an example. If bank Alpha has issued a loan and is afraid of the default risk, it can enter into a CDS contract with bank Beta to insure the loan. If the loan borrower defaults, bank Alpha would receive a payment from bank Beta to recover its loss. In return, like an insurance contract, bank alpha has to pay bank beta premiums over time for the credit protection.

However, Stulz (2010) indicates that there are two differences between a CDS contract and a typical insurance contract. First, you don't have to actually hold the reference entity[3] to buy credit protection through CDS, which means that you can take a short position on a credit event. Second, a CDS contract can be traded, while an insurance contract is not tradable.

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[1] Alan S. Blinder. "Six Errors on the Path to the Financial Crisis."

[2] David Paul. "Credit Default Swaps, the Collapse of AIG and Addressing the Crisis of Confidence."

[3] Reference entity is the underlying party in a credit derivative contract. It can be a company, government or other legal entity that issues debt of any kind. The protection buyer transfers the credit risk of the reference entity to the protection seller through a credit derivative contract.

While many studies have analyzed the benefits and risks of credit derivatives and the role they played during the financial crisis, there is only limited research about how banks dealt with their credit derivatives during the toughest time of financial crisis. With data collected from the Consolidated Financial Statements for BHCs (FR Y-9C), I conclude that the notional amounts of credit derivatives held by banks boomed in 2006 and 2007 but reduced sharply in 2008 and 2009. I believe that the plunge in notional amounts is due to the counterparty credit risk. Then, I use the Herfindahl–Hirschman Index to calculate the concentration level of credit derivatives positions in the banking sector, and I find out that the credit derivatives positions were highly concentrated during the financial crisis. I also briefly review the significant events that happened in 2008 and summarize the role that credit derivatives played in these events. Finally, I discover that JP Morgan Chase, Bank of America and Citigroup were the major users of credit derivatives in 2006-2010. Most of their positions were used for trading, but they did use credit derivatives for hedging their own portfolios. They largely matched their bought and sold protections and took the counterparty credit risk into consideration.

The paper is organized as follows. In Chapter II, I review the studies on credit derivatives, including introduction to credit derivatives, the reasons for banks to use credit derivatives, and the problems related to credit derivatives and their roles in the financial crisis. In Chapter III, I describe the research data and methodology, including sample description, data source description, research goals and methods. In Chapter IV, I examine my hypothesis with data, review the significant events that happened in 2008, and summarize the important information about credit derivatives disclosed by major dealers of credit derivatives. Finally, in Chapter V, I draw my conclusion.

Chapter II: Literature Review

Section 1: Introduction to credit derivatives

There are many studies introducing credit derivatives, and most of them are from the industry. Among them, J.P. Morgan (1999), Lehman Brothers (2003) and Parker (2007) describe the characters and functions of credit derivatives comprehensively.

J.P. Morgan (1999) defines credit derivatives as "bilateral financial contracts that isolate specific aspects of credit risk from an underlying instrument and transfer that risk between two parties." Credit derivatives are different from other traditional credit instruments because they can precisely isolate and transfer certain aspects of credit risk rather than their underlying assets. J.P. Morgan introduces three basic credit derivative structures, which are credit default swaps, total return swaps and credit options. The credit default swap (CDS) is a bilateral financial contract in which the protection buyer pays periodic premiums in return for a contingent payment from the protection seller if a credit event related to the reference entity happens. The credit events include failure to meet payment obligation when due, bankruptcy, repudiation, material adverse restructuring of debt, obligation acceleration and obligation default. A total return swap (TR swap) exchanges the total economic performance of the underlying asset for another cash flow, regardless of whether a credit event has occurred or not. Specifically, one party of the TR swap, the total return payer, pays the total return, which includes the sum of interest, fees, and any change-in-value payments, of the reference obligation to the other party, the total return receiver. In return, the total return receiver usually pays LIBOR plus a spread to the total return payer. Credit options can be put or call options on the price of a floating rate security, loan, or an asset swap package which comprises a credit-risky instrument and a corresponding derivative that swaps the cash flows of that instrument for a floating rate cash flow stream.

Lehman Brothers (2003) says that the primary purpose of credit derivatives is to transfer and repackage credit risks efficiently. The single name credit default swap was the most used instrument with 73% of market outstanding notional in 2003. Lehman Brothers believes that hedging synthetic CDO positions, exploiting capital structure arbitrage opportunities and shorting credit market are the reasons for the drastic growth of CDS market. It introduces more exotic structured credit products such as basket default swaps, synthetic CDOs, credit options and hybrid products. A basket default swap is similar to a CDS, but the difference is that the trigger is the nth credit event, which may be larger than 1, in a specified basket of reference entities. A synthetic CDO allows different tranches to take default losses in a portfolio of CDS in a specific order to redistribute default risk. The strategies of credit options include the repack trade, put bond stripping, price-based options, spread-based options, covered call strategy, naked put strategy, payer default swaption, receiver default swaption, callable default swaps, and credit portfolio options. Hybrid credit derivatives usually combine credit risk with other market risks such as interest rate or currency risk. Typically, they are linked to the value of a derivatives payout, such as an interest rate swap or an FX option. Clean and perfect asset swaps and counterparty risk hybrids are representatives of hybrid credit derivative. Lehman Brothers points out that credit default swap is the basic building block for more complicated credit derivatives.

Parker (2007) describes several types of credit default swaps, such as single name credit default swaps, basket credit default swap, recovery swaps, constant maturity credit default swaps, credit spread derivatives, and swaptions. A recovery swap allows the buyer to purchase deliverable obligations whose amount is equal to the credit default swap's notional amount from the seller, at a predetermined strike price. Then, the buyer can sell the deliverable obligations into the market or use them itself as seller in a back-to-back credit derivative transaction. Constant maturity credit default swaps (CMCDS) are standard credit default swaps but at the beginning of each fixed-rate payer calculation period, the fixed payment will be reset. They can be viewed as a series of credit default swaps referencing the same reference entities, and the length of each credit default swap is the fixed-rate calculation period. Under a credit spread derivative, a reference entity's creditworthiness is compared with a risk-free benchmark such as US Treasury bonds or LIBOR, and any difference between the two yields will be assumed to be caused by credit risk. Put and call options are most common forms of credit spread

derivatives. A swaption combines a swap and an option. It gives the swaption buyer the right, but not the obligation, to make the swaption seller enter into a credit default swap contract. Parker also introduces credit indexes. He indicates that iTraxx Europe, iTraxx Europe Crossover and iTraxx Europe HiVol are the three most actively traded indices for Europe. The iTraxx Europe index selects reference entities based on their credit default swap trading volume. The iTraxx Europe Crossover index is composed by the top 40 commonly traded European sub-investment grade reference entities. The iTraxx Europe HiVol consists of the top 30 highest spread names from iTraxx Europe. These indices improve market liquidity by enhancing credit derivatives transaction volumes and decreasing market entry barriers.

J.P. Morgan, Lehman Brother and Parker all categorize credit derivatives as either unfunded or funded. In an unfunded credit derivative contract, the protection seller makes no upfront payment to cover its potential future liabilities, and only makes a payment when credit events happen. On the other hand, in a funded credit derivative contract, the protection seller has to fund an initial payment for the protection buyer to buy high quality collateral. In return, the protection seller receives a coupon. At maturity, if no default has occurred, the protection seller is returned the initial payment; otherwise, the collateral will be sold to cover the loss. This is exactly how a credit linked note works. All of them also mention that the International Swap and Derivatives Association (ISDA) has made a standardized ISDA Master Agreement to allow the parties to specify the precise terms of the transaction from a number of defined alternatives since 1991.

Section 2: The reasons for banks to use credit derivatives

J.P. Morgan (1999) points out that there are three advantages to use credit derivatives. First, the reference entity is not a party to, and even not aware of a credit derivative transaction. So, the user of credit derivatives can manage its credit risks without affecting important customer relationships. Second, purchasing credit protection with a credit derivative can create a synthetic short position of a bank loan. The user of credit derivatives is able to pay a small premium for a possible large gain if credit deterioration happens. Third, most of credit derivatives are off-balance-sheet instruments, so they provide financial institutions with

considerably flexible leverage, such as reducing economic and regulatory capital, keeping funding-cost at low level, and maintaining borrower and market confidentiality.

Prato (2002) says that the key innovation of credit derivatives is that they allow market participants to sell credit risk on a claim but still record the claim on the balance sheet. On the other hand, their counterparties are able to purchase the credit risk without bearing the financing cost or interest rate risk. By decoupling credit risk from the actual claim, credit derivatives are able to synthetically transfer a claim, and it makes risk management more flexible for both risk sellers and risk buyers. Credit derivatives can be used as hedging instrument, investment instruments and trading instruments.

Effenberger (2003) summarizes the benefits of using credit derivatives. First, they are able to separate the value of credit funding from the value of credit risk assumption, so they allow credit risk trading. Credit risk management has been separated from liquidity management, which fundamentally changes the nature of banks' risk management. For specialized banks, whose loan books are highly concentrated in particular regions or sectors, credit derivatives allow them to defuse concentrations of risk without disrupting client relations and to bring more diversity into their portfolio. Thus, credit derivatives help the specialized banks exploit their regional lending potential. Moreover, credit derivatives may create new risk management strategies for banks. With credit derivatives, banks may focus on a specific customer group more tightly, and they may transfer the credit risk immediately after the origination of loans. Finally, the transfer of credit risk can heighten the ceiling for bank lending. If the credit risk is transferred within the banking sector, the aggregate default risk will decrease because the probability of the reference credit and the protection seller to default concurrently is relatively small. If the credit risk is transferred out of the banking sector, the maximum amount of loans that banks are able to issue can be heightened as long as the net sellers of protection do not draw money from the banking sector to compensate credit events.

European Central Bank (2004) describes the motivations for banks to use credit risk transfer (CRT) instruments. The key motivation for banks to purchase credit protection is to hedge their aggregate risk and single-name concentration risk. The motivations for banks to originate CRT instruments are capital management, such as regulatory arbitrage and capital relief, and enhanced access to liquidity through collateral made available by securitization. Moreover, CRT

instruments allow banks to reshape their business development strategies, because now they can establish long-term relationships with company clients without adding exposures. The key motivations for banks to sell credit protection are to diversify their risks and to generate more profit. Eventually, to earn fee income, banks start to work as intermediaries for CRT instruments, a role that is called intermediation. By product innovation, market making and introduction of new types of investors, intermediation helps banks broaden their services offered to customers.

Finnegan and Mawdsley (2004) argue that there are three reasons for banks to use credit risk transfer instruments. First, banks can release funding and regulatory capital. Through funded credit risk transfer techniques, banks are able to sell assets for cash which can be recycled for further business growth. Moreover, the credit derivative protection seller is typically substituted for the underlying asset in assigning risk weights. As long as the protection seller has a lower risk weight than the underlying asset, the protection buyer can free up the corresponding regulatory capital for other uses. Second, banks can employ CRT instruments to manage their balance sheets and diversify their risks. They can purchase credit protection to lower their risk concentration or sell protection to obtain exposures without the direct lending costs. The third reason is intermediation. Banks work as intermediaries in CRT markets in two ways: matching risks on their own books or arranging structures and transactions to effect CRT. For the first one, banks may earn income as fees or as spreads on their positions. For the second one, they may earn fee income for providing the vehicles underlying the transfer of risk.

Minton, Stulz, and Williamson (2008) show that credit derivatives were not widely used among banks during 1999-2005, but the amount of credit derivatives held by banks was very large. They show that most of the gross amount of positions was for dealer activities, not for risk management. The likelihood of using credit derivatives is positively and significantly related to bank size, but negatively related to a bank's equity capital, tier I risk capital, and net interest margin. They also explain the reasons for the limited use of credit derivatives. Adverse selection and moral hazard problems make the market for credit derivatives on riskier credits less liquid. Thus, large investment grade US firms, foreign banks, and large foreign multinational companies are the most liquid names in the credit default swap market. Larger bank holding companies are more likely to have exposures to them than the small ones, because the larger banks have less liquidity costs, transactions costs, and basis risk to use credit derivatives.

Section 3: The problems related to credit derivatives and their role in the financial crisis

Kiff, Michaud and Mitchell (2002) identify adverse selection and moral hazard problems about credit risk transfer (CRT) instruments in two contexts of relationships. These problems are caused by asymmetric information.

In the borrower-lender relationship, the introduction of CRT markets may actually aggravate adverse selection problem, because they may decrease the incentive of lender to screen the borrower if the lender is able to purchase credit protection after the loan is made. It may also exacerbate the moral hazard problem of borrowers, because the lender may have no incentive to monitor his borrowers if he has purchased complete protection on its exposure. However, reputation may be a solution to the problem. A lender may want to develop a good reputation for not bringing bad loans to the CRT market, so the lender may have incentives to screen borrowers even if they can transfer credit risk out. Finally, the moral hazard of the lender is a new problem created by the introduction of CRT markets. The lender may purchase credit protection against the borrower's wishes or without informing the borrower and it may send a negative signal about the borrower's quality to the markets. The strength of the signal is affected by whether the instrument fully transfers the underlying exposure or just hedging, by whether the lender retains a first loss position, and by whether the purchase of credit protection is observable. Specifically, banks often prefer using credit default swaps because borrowers cannot detect them.

In the lender-protection seller relationship, the CRT markets create a lemons problem. Since all lenders tend to purchase protection for their low-quality assets, the high prices of the protection may prohibit lenders from purchasing protection for their good-quality assets. Moreover, in this relationship, non-tradable CRT instruments usually minimize moral hazard of the lender, because some clauses in the contract require the lender to undertake monitoring activities. Prematurely triggering a credit event, substituting lower quality assets for maturing ones in securitized portfolios, and delivering the cheapest assets to the protection seller all belong to lender moral hazard. On the other hand, the protection seller moral hazard may lead to delay payment, refuse to pay, or litigate the claim by the protection seller when a credit event happens.

Morrison (2002) believes that the existence of the CRT market may influence funding and investment decisions in the real sector negatively. In his model, entrepreneurs raise debt to finance either first-best projects or second-best projects. Without the CRT market, some entrepreneurs will employ bank debt to signal their intention to run the first best projects, because banks will monitor the borrowers. Consequently, these borrowers are able to issue bonds, whose cost is lower, to complement the bank debt. However, with the introduction of a CRT market, banks' incentive to monitor borrowers may be eliminated. Thus, the signaling value of bank debt may be destroyed and the entrepreneurs may only issue junk bonds. Meanwhile, without bank monitoring, the entrepreneurs may run the second-best projects. Finally, overall welfare may be reduced, although banks are able to hedge their exposures, if no market players, such as rating agencies, are able to serve as perfect substitutes for bank monitoring.

Rajan (2005) argues that technical change, deregulation, and institutional change allow individuals to invest in the market indirectly through new types of intermediaries instead of banks, such as mutual funds, hedge funds and pension funds. The investment managers of these institutions have incentives to bear more risks than the bank managers of the past, because their compensation is related to investment return and their performance compared with other peer managers. Meanwhile, banks are able to move the plain vanilla risks from their own balance sheets to those of the investment managers through credit risk transfer instruments, so banks have an incentive to originate more of these risks. However, banks often have to retain the first loss position of the risks they originate, which is a small but the most volatile part of the risk they have created. Moreover, they may not be able to provide liquidity to financial markets during a crisis, because banks now need liquid markets to hedge some of their own risks, too. As a conclusion, even though risks can be absorbed by far more participants today, in fact the system risk has become greater.

Fender, Frankel and Gyntelberg (2008) analyze the consequences of Lehman's failure on the credit default swap market. Since Lehman is a major counterparty and reference entity in the CDS market, its bankruptcy filing would have two immediate effects. First, it would trigger default clauses in CDS contracts referencing Lehman. Second, it would terminate the contracts that the firm had entered into as a counterparty, so operational risk will increase due to netting, settlement and replacement of the respective positions. Furthermore, at the time of the bankruptcy, there was no solid public information on the volume of CDS contracts referencing

Lehman or the net amounts required to settle the contracts. Therefore, people were not sure if the already strained money markets had capacity to meet the anticipated corresponding liquidity needs.

Zingales (2008) argues that the roots of the current financial crisis are bad regulation, lack of transparency and market complacency brought about by several years of positive returns. The credit default swap market is such an unregulated market and the level of collateral posted was very low or non-existent, which generated the possibility of a systemic failure. Although large commercial banks have hedged their massive exposure to CDS and hence the net exposure is much smaller, if a major player defaults, all the other ones will find themselves un-hedged, triggering a run to buy insurance.

Brunnermeier (2009) argues that banks typically created “structured” products, like CDOs, and issue tranches to offset risks. Investors who purchased a high rating tranche of a CDO combined with a credit default swap used to believe that the risk of their investment was low because they thought the CDS counterparty defaulting probability was small. Securitization allowed certain institutional investors to indirectly hold assets that they were not allowed to hold previously because of regulatory requirements. However, a large part of the credit risk did not transfer out of the banking system, because banks were also active buyers of structured products. The reason for banks doing this was “regulatory and ratings arbitrage”, by which banks could reduce the amount of capital they required to hold to conform with Basel I regulations. Moreover, diversification reduced the idiosyncratic risk, so assets issued by SPV rated better than individual securities. Thus, when the level of subprime mortgage default increased, the whole financial system was influenced. The bankruptcy or liquidity shortage of major financial institutions, like Lehman and AIG, created ripple effects in the financial market, because they were interconnected through the credit derivatives business and had counterparties all over the world.

European Central Bank (2009) indicates that there are three structural features in the CDS market have helped to transform counterparty risk into systemic risk. First, most of the CDS contracts are concentrated in a small group of dealers. A reduced number of counterparties cause increased concentration risk and greater systemic risk. Second, the interconnected nature of this dealer-based market can result in large trade replacement costs when a dealer failures.

Third, euro area banks seem to be net sellers of standard single-name and index CDS contracts, which would imply exposure to market risk if there is a general increase in CDS spreads. In addition, banks seem to have been net sellers of protection for sovereign CDSs, which may in some cases constitute wrong-way risk. Finally, the low levels of liquidity resulting from the crisis and the current high levels of concentration in the market have both increased trade replacement costs and resulted in significant bid-ask spreads for market participants, particularly for non-dealers.

Soros (2009) believes that credit default swaps are toxic instruments which need to be strictly regulated. He suggests that only those who actually own the underlying assets can be allowed to hold CDS. CDS are toxic because it has become a tool of speculation and such speculation can be self-validating. He argues that financial markets deal with future instead of current reality and the biased view of the future can affect the underlying reality. This feedback mechanism is called "reflexivity". He explains the poisonous nature of CDS in three steps. First, the risk/reward profile of holding long or short positions in the stock market is asymmetric. Since losing on a long position decreases risk exposure while losing on a short position increases it, the asymmetry discourages short selling. Second, the risk/reward asymmetry is opposite for the CDS market, because going short by buying CDS has limited risk but practically giant profit potential. Moreover, it is reinforced by the fact that CDS are tradable. People buy CDS because they expect them to appreciate in response to adverse developments. Third, reflexivity works here. The mispricing of financial instrument can affect the fundamentals that market prices are supposed to reflect. Since financial institutions do their businesses based on trust, a decline in their stock and bond can aggravate their financing costs, which means bear raids on financial institutions can be self-validating.

Duffie (2010) describes the failure mechanics of dealer banks and identifies the role of the over-the-counter (OTC) derivatives, including credit derivatives, in the mechanics. He argues that when a dealer bank's capital position has been severely weakened by trading losses, it may bail out some of its clients to maintain its reputation and to protect its franchise value, which will further weaken its balance sheet. As time passes, more market participants notice its worsened liquidity position, and as a result, its OTC derivatives counterparties will try to reduce their exposures to the dealer. They may borrow from the dealer, draw on prior lines of credit with the dealer, or enter new derivatives contracts with the dealer to decrease their exposures, which

will further reduce the dealer's cash position. Moreover, they may also use "novation", which means selling the derivative contract to a third party for a fee, to insulate themselves from the dealer bank's default risk. It is commonly used for credit derivatives, and it may be accompanied by removal of cash collaterals out of the dealer bank. Furthermore, in this case, other dealers may refuse these novations, which further signals the dealer bank's credit weakness. Finally, together with the flight of short-term creditors, the flight of prime brokerage clients, and the loss of cash settlement privileges, the reactions of its OTC derivative counterparties may cause the dealer bank to collapse.

Stulz (2010) analyzes the role of credit default swap played in the recent financial crisis and whether they played a role in the collapse of major financial institutions in detail. He shows that the credit default swap market worked well during the financial crisis and the losses on CDS referencing subprime mortgage securitizations were caused by defaults on subprime mortgages and by illiquidity for such securitizations, not CDS themselves. Then, he examines two arguments about the counterparty risk of CDS. The first argument is that the derivative exposures among financial institutions knitted a huge web throughout the financial system. Thus, the failure of a major financial institution in this web can cause losses of other institutions, such as the case of Lehman. He argues that the counterparties usually use collateral to protect themselves, but it is possible that the collateral arrangement is not universal and the amount of collateral may not be sufficient to cover the loss. The second argument is that the counterparty default may be triggered by the giant value jump of CDS when credit events happen. He shows that if a protection buyer insures 10 million dollars of Lehman debt on the last working day before Lehman's bankruptcy filing, he can earn more than $9 million on settlement. Such a huge amount could possibly make a protection seller who has large net exposure to default. Meanwhile, the collateral may not be enough to protect the buyer, and it may lead to additional failure of other institutions. The sheer size of gross exposures held by dealers is another serious issue. Even dealers hedge their exposures perfectly, the default of a counterparty who is a major dealer may still create havoc in the financial market, because it takes time and costs a lot to replace credit default swaps and the default may make the market less liquid or totally not functional. However, he argues that CDS is not the proximate cause of Lehman or Bear Stearns's failure, and it is not the only cause of the failure of AIG.

Chapter III: Research Data and Methodology

Section 1: Sample Description

The sample consists of 52 commercial bank holding companies (BHCs) whose total assets on their balance sheets were greater than 10 billion dollars on December 31, 2005 and which have complete data on credit derivatives from March 31, 2006 to September 30, 2010. (See Appendix I) According to the 2005 BHCPR Peer Group Average Report[4], there were 69 BHCs having total assets larger than 10 billion dollars on December 31, 2005, but 17 BHCs are excluded from the sample because of merger and acquisition, closing, and changing from BHCs to other identities. (See Appendix II)

I choose 2006-2009 as the sample period because the liquidity crisis was triggered by an increase in subprime mortgage defaults, which was first noted in February 2007 (Brunnermeier, 2009). The data in 2006 can be used as a benchmark to see how the credit derivatives volume and fair values changed during the financial crisis.

Table 1 (Appendix III) is the descriptive statistics on banks' use of credit derivatives. Data are obtained from the Schedule HC-L of banks' FR Y-9C filings. Table 1 shows that as of September 31, 2010, 26 banks, or 50% of the total number of banks in the sample, had credit derivative positions. 2009 and 2010 are the years in which the largest percentage of banks used credit derivatives. Credit default swap is the most commonly used instrument. As of September 31, 2010, 17 banks, or 32.69% of the total number of banks in the sample, had CDS positions. Moreover, the number of net protection buyers usually exceeds the number of net protection sellers.

[4] http://www.ffiec.gov/nicpubweb/content/BHCPRRPT/REPORTS/BHCPR_PEER/Dec2005/PeerGroup_1_December2005.pdf

Table 2 (Appendix III) gives information about the balance sheet of all the banks in the sample and of the banks with credit derivative positions. From Table 2, we can see that the banks with credit derivative positions have most of the assets and loans in the sample, over the whole sample period. As of September 30, 2010, the banks with credit derivative positions have 91.26% of the total asset and 86.97% of the total loan in the sample. Another interesting phenomenon is that the loan-to-asset ratio of the banks with credit derivative positions is always lower than that of the whole sample.

The average total asset for the banks in the sample was about 146 billion dollars on December 31, 2005, but the median was only close to $40 billion dollars, which means the distribution of bank sizes at the beginning of sample period was skew. The skewed distribution of bank sizes lasts for the entire sample period. On September 30, 2010, the average total asset was about 227 billion dollars while the median was only about 52 billion dollars. The distribution of loan size for the banks in the sample is also skewed. For example, on September 30, 2010, the average amount of loan for the banks in the sample was about 100 billion dollars, while the median was about 28 billion dollars.

Section 2: Data Source Description

I construct the sample based on data from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C) published by the National Information Center (NIC). NIC provides "comprehensive information on banks and other institutions for which the Federal Reserve has a supervisory, regulatory, or research interest including both domestic and foreign banking organizations operating in the U.S." [5] There are five financial reports available on the NIC public website, which are Consolidated Financial Statements for Bank Holding Companies (FR Y-9C), Parent Company Only Financial Statements for Large Bank Holding Companies (FR Y-9LP), Parent Company Only Financial Statements for Small Bank Holding Companies (FR Y-9SP), Bank Holding Company Performance Report (BHCPR), and Report of Assets and Liabilities of U.S. Branches and Agencies of Foreign Banks (FFIEC 002). The FR Y-9C is a comprehensive financial report, which is

[5] http://www.ffiec.gov/nicpubweb/content/help/NICFAQ.htm

filed quarterly, for bank holding companies with total consolidated assets 500 million dollars or more.

In Schedule HC-L of the FR Y-9C, Banks are required to report the notional amounts of credit derivatives by type of instrument, which are credit default swaps, total return swaps, credit options, and other credit derivatives. They are also required to report the gross positive and negative fair values of all credit derivatives. For both the notional amounts and gross fair values of credit derivatives, banks are required to separate the amounts for which the bank is the guarantor and for which the bank is the beneficiary. As a guarantor in a credit derivative contract, the bank sells credit risk protection, and as a beneficiary, the bank buys credit risk protection. Since the FR Y-9C filed on June 30, 2009, banks has been required to report the notional amounts of credit derivatives by regulatory capital treatment and the notional amounts of credit derivatives by remaining maturity. They also started to disclose the counterparties, net current credit exposure, and fair values of collaterals of the over-the-counter derivatives.

Section 3: Research Goals and Methods

1. How did credit derivatives positions at banks change during the financial crisis?

   The volume of credit derivatives is represented by notional amounts. The nominal amount is the value of the underlying assets insured by credit derivatives and it is used to calculate payments when credit events happen. For example, if you have bought credit protection on IBM bonds with par value $1 million through credit derivatives, then you are holding $1 million notional amount of credit derivatives as beneficiary, while the protection seller is holding $1 million notional amount of credit derivatives as guarantor . If IBM defaults on the bonds, the protection seller will pay you $1 million in exchange for the bonds. The value of the bonds now depends on recovery and it may be very low.

   Let's define "notional amount as guarantor" as the amount of credit protection banks sold, and "notional amount as beneficiary" as the amount of credit protection banks bought. Let's further define "total notional amount" as the sum of the notional amount as guarantor and the notional amount as beneficiary, and "net notional amount" as the difference between the notional amount as beneficiary and the notional amount as guarantor. I have

investigated how the value of these variables changed during the sample period to discover how the banks dealt with their credit derivative positions during the recent financial crisis.

Many studies have indicated that the credit derivative market was emerging rapidly before the financial crisis. According to Fitch Rating (2006), the notional amount of outstanding credit derivatives contracts rose from $5.3 trillion sold at year-end 2004 to nearly $12 trillion at year-end 2005, an increase of 122%. Since the beginning of the recent financial crisis, credit derivatives, especially credit default swaps, have generally been to blame for its counterparty risk. Thus, I hypothesize that the total notional amount of credit derivatives that banks held would increase before the outbreak of the financial crisis and then drop during the financial crisis. Moreover, since the possibility of default generally increased during the financial crisis, I hypothesize that the net notional amount of credit derivatives held by banks would increase after the outbreak of the financial crisis.

2. How did the fair value of credit derivatives change?

The fair value of credit derivatives is their market value. While the notional amount of a credit derivative has been decided at the beginning of the contract, the market value of it does vary with market conditions. For example, at the beginning, the value of the protection is equal to the present value of the payments the protection buyer will have to make. Over time, the value of the protection will decrease if default becomes less likely while it will increase if default becomes more likely. Of course, the value of credit protection also depends on many other factors.

I have investigated how the fair value of the bought and sold protection changed during the sample period to explore whether the banks gain or lose money on credit derivatives. I hypothesize that the fair value of credit derivatives held by banks as guarantor would decrease while the fair value of credit derivatives held by banks as beneficiary would increase because the level of default risk generally rose during the financial crisis.

3. Have the credit derivative positions in the banking sector become more concentrated?

   European Central Bank (2009) indicates that in Europe, "the top ten counterparts of each surveyed large bank account for 62-72% of its CDS exposures (when measured in terms of gross market value). In addition, the concentration of the CDS market is now higher than it was before the crisis, since some major players ... have exited the market." I believe that the notional amounts of credit derivatives held by banks in the U.S. are also concentrated.

   I use the Herfindahl–Hirschman Index (HHI) to assess how concentrated credit derivative positions are. $\mathrm{HHI} = \sum_{i=1}^{N} s_i^2$,where s_i is the share of credit derivatives held by bank i, and N is the number of banks in the sample. I will calculate the HHI of the notional amount as guarantor, of the notional amount as beneficiary and of the total notional amount on each quarter-end over the sample period. The higher the HHI, the more concentrated the notional amounts. In general, a HHI index below 0.15 indicates that the notional amount is not concentrated. A HHI index between 0.15 and 0.25 indicates moderate concentration, and a HHI index above 0.25 indicates high concentration.

   Based on European Central Bank (2009), I want to investigate whether the notional amounts of credit derivatives held by banks in the U.S. are also concentrated. I hypothesize that all of the HHIs of the notional amount as guarantor, of the notional amount as beneficiary and of the total notional amount would be high, and the level of the HHIs should not drop after the outbreak of the financial crisis because there is no incentive for more commercial banks to participate in the credit derivative market during the financial crisis due to the counterparty risk.

4. What major events happened in the financial crisis and what role did credit derivatives play in these events?

   Credit derivatives are generally blamed worsening the financial crisis. Thus, I have reviewed the major events happened in 2008 and summarized the role that credit derivative played in these events in Section 4 of Chapter IV.

5. Which banks are major users of credit derivatives and what information did they disclose about their use of credit derivatives?

   According to Minton, Stulz, and Williamson (2008), during 1999-2005, most credit derivative contracts were concentrated at several large banks. Most of their credit derivatives positions were for dealer activities, rather than for risk management. Thus, I hypothesize that there exist several major dealers of credit derivatives in the sample during the sample period. I also have summarized the information related to credit derivatives disclosed in the major users' annual reports at Section 5 in Chapter IV. Detailed information can be found in Appendix IV.

Chapter IV: Results

Section 1: How did credit derivatives positions at banks change during the financial crisis?

Section 1.1: Total Notional Amount

The total notional amount is the sum of the notional amount as guarantor and notional amount as beneficiary. It measures how actively banks are involved in credit derivatives. For example, if bank Alpha trades credit derivatives as an intermediary, it may sell credit protection on bonds whose par value are $1 million and simultaneously, buy credit protection on the same bonds from other banks. In this case, bank Alpha balances its book perfectly and completely transfer the default risk to other banks, but its total position, or total notional amount, on these bonds is equal to $1 million notional amount as guarantor plus $1 million notional amount as beneficiary, which is $2 million. Since the total notional amount includes both bought and sold positions, it is a good indicator of how active banks are on credit derivatives.

Figure 1 shows the total notional amount of credit derivatives held by banks in the sample on each quarter-end during the sample period. The total notional amount boomed continuously until June, 2008, from $5.3 trillion up to $18 trillion. Then, it fluctuated and slid down during the remaining sample period. In the third and fourth quarters of 2008, the total notional amount decreased to $15 trillion. Then, it jumped drastically during the first quarter of 2009, up to $17.5 trillion. During the remaining sample period, the total notional amounts decreased gradually, and finally became $14 trillion on September 30, 2010.

There are two points that we need to pay attention to. First, in March 2008, J.P. Morgan Chase merged with Bear Stearns. It increased the total notional amount of credit derivatives held by J.P. Morgan Chase by at least $421 billion.[6] Second, in January 2009, Bank of America acquired

[6] See JP Morgan Chase 2008 Annual Report, page 101. "At December 31, 2008, the total notional amount of protection purchased and sold increased $421 billion from year-end 2007. The increase was primarily as a result of the merger with Bear Stearns, partially offset by the impact of industry efforts to reduce offsetting trade activity."

Merrill Lynch and it increased the total notional amount of credit derivatives held by Bank of America largely.[7] Thus, if we exclude the effect of these two events out of the sample, we can expect that the total notional amount of credit derivatives held by banks would decrease continuously after March 2008, and the trend of the total notional amount of credit derivatives in the sample would be like a parabola.

The data support our hypothesis, which is that the total notional amount of credit derivatives that banks held would increase before the outbreak of the financial crisis and drop during the financial crisis. Before the explosion of the financial crisis, the banking sector actively added their credit derivative positions. Nevertheless, since 2008, the banks did not add their positions as drastically as before, and they even largely reduced their positions during the second half of 2008, when the financial system began to be unstable.

However, there are more issues that we need to take into consideration. First, besides banks more actively participating in credit derivative trading, the increase in the total notional amount of credit derivatives during 2006-2007 may be caused by offsetting trade. Offsetting trade means going into an equal but opposite contract in order to cancel the previous contract. For example, suppose bank Alpha has bought credit protection through a credit derivative on firm Delta from bank Beta; if bank Alpha wants to cancel this contract, it can go into an equal but opposite credit derivative contract. Through this way, the total notional amount of credit derivatives held by bank Alpha doubles, but bank Alpha has eliminated its credit exposure, which means that in fact bank Alpha becomes less aggressive in the credit derivative market. Since banks do not disclose how much of the notional amount of credit derivatives is related to offsetting trade, further research is required to examine this issue.

Second, the decrease in the total notional amount of credit derivatives held by banks is largely caused by trade compression. The Economists (2009) discloses that "since August, credit-derivative dealers have been routinely giving details of their CDS trades to compression vendors. These companies propose new sets of CDS contracts that keep each of the participating dealers' net positions the same, but aggregate them into far fewer contracts. Unlike netting, which only

[7] See Bank of America 2009 Annual Report, Page 85. "The addition of Merrill Lynch drove the increase in counterparty credit risk for purchased credit derivatives and the increase in the contract/notional amount." More information is at Section 4 in this chapter

hides contracts, trade compression excises them completely, cutting down the possibility of legal wrangling and reducing counterparty risk." Thus, the reason for banks to reduce their credit derivative positions is to lower their counterparty risk exposure.

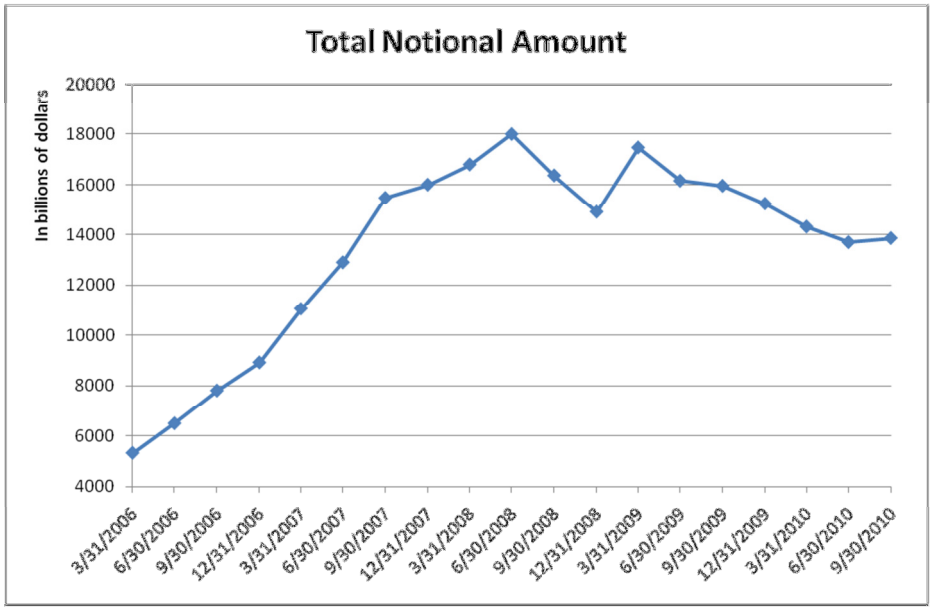

Figure 1 Total notional amount of credit derivatives held by all the banks in the sample. Data are obtained from Schedule L of FR Y-9C.

Section 1.2: Notional Amount as Guarantor and Notional Amount as Beneficiary

The total notional amount can be divided into two parts, which are the notional amount as guarantor and the notional amount as beneficiary. As mentioned in Chapter 3, the notional amount as guarantor measures how much credit protection banks sell while the notional amount as beneficiary measures how much credit protection banks buy. In the FR Y-9C, regulator requires banks to report their positions as guarantor and as beneficiary separately.

Figure 2 shows the notional amounts of credit derivatives held by banks in the sample as guarantor and as beneficiary, respectively, on each quarter-end during the sample period. From Figure 2, we can see that both of the trends of the notional amounts as guarantor and as beneficiary are similar to the trend of the total notional amount. The value of the notional amount as guarantor is always close to the value of the notional amount as beneficiary, which means the banks hedged their positions well as a whole. Since June 30, 2007, the notional amount as beneficiary has been always greater than the notional amount as guarantor, which implies some banks in the sample were net buyers of credit protection during this period.

Similar to the trend of total notional amount, the notional amount as guarantor and as beneficiary increased dramatically until June 30, 2008, from $2.66 trillion and $2.65 trillion up to $8.8 trillion and $9.17 trillion, respectively. Then, during the second half of 2008, the notional amount as guarantor and as beneficiary decreased to $7.3 trillion and $7.64 trillion, respectively. Then, it increased largely again during the first quarter of 2009, up to $8.5 trillion and $8.93 trillion, respectively. During the remaining sample period, the total notional amounts reduced gradually, and finally became $6.8 trillion and $7 trillion, respectively, on September 30, 2010.

Banks usually use credit derivatives for two purposes, which are trading for their clients and hedging their own credit portfolio. According to the annual reports of the major users of credit derivatives, most of their positions on credit derivatives are for trading.[8] Thus, it is not surprising that they largely match their positions, because as a trader, they usually earn fees and spreads between bid and ask prices, not premiums for bearing default risks.

Section 1.3: Net Notional Amount

Net notional amount is the difference between the notional amount as beneficiary and the notional amount as guarantor. Basically, positive net notional amount means that banks transfer default risk out, while negative net notional amount means that banks transfer default risk in. It is an important indicator on how much risk banks expose to.

[8] Detailed information can be found at Section 4 in this chapter.

However, even if a bank perfectly matches its book, just like what bank alpha does in the previous example, it still faces counterparty credit risk, which means that it is the credit derivative counterparty that defaults.. Let's continue the previous example about bank Alpha. Suppose that bank Alpha has sold credit protection on $1 million par value bonds and has bought credit protection on the same bonds from bank Beta. If bank Beta suddenly bankrupted and defaulted on its positions, bank Alpha would immediately have giant exposure to the credit risk of the bonds.

Since most of the credit derivative positions are for trading, the net notional amount of credit derivatives may not be a good indicator about how much banks use credit derivatives to hedge their own portfolios.

Figure 3 shows the net notional amount of credit derivatives held by banks in the sample on each quarter-end during the sample period. The net notional amount was negative until the mid 2007. Since then, the net notional amount increased drastically, up to $0.4 Trillion on March 31, 2009. However, it plunged during the second and third quarters of 2009, down to $0.19 trillion, and then went up and down around $0.2 trillion.

The data support our hypothesis that the net notional amount of credit derivatives held by banks increased after the outbreak of the financial crisis. It is clear that the net notional amount of credit derivatives increased sharply from mid-2007 to March 2009. Although the net notional amount decreased in 2009, it is still about $200 billion, which is much larger than the net notional amount of credit derivatives before the outbreak of credit derivatives.

Compared to the notional amount as guarantor or as beneficiary, the net notional amount is relatively small, which means that the banks largely hedged their positions during the sample period, although it is still hundreds of billions dollars. Moreover, during the financial crisis, the net notional amount of credit derivatives held by the banks in the sample was positive. It means that the banking sector actually transferred default risk out. It implies that the banks decreasing their positions on credit derivatives during the second half of the sample period may be caused by other factors, not directly by the increasing mortgage delinquency rate. In fact, I believe that it is the counterparty credit risk that directly caused the banks to decrease their credit derivative positions. I will discuss this issue in detail at the Section 4 of this chapter.

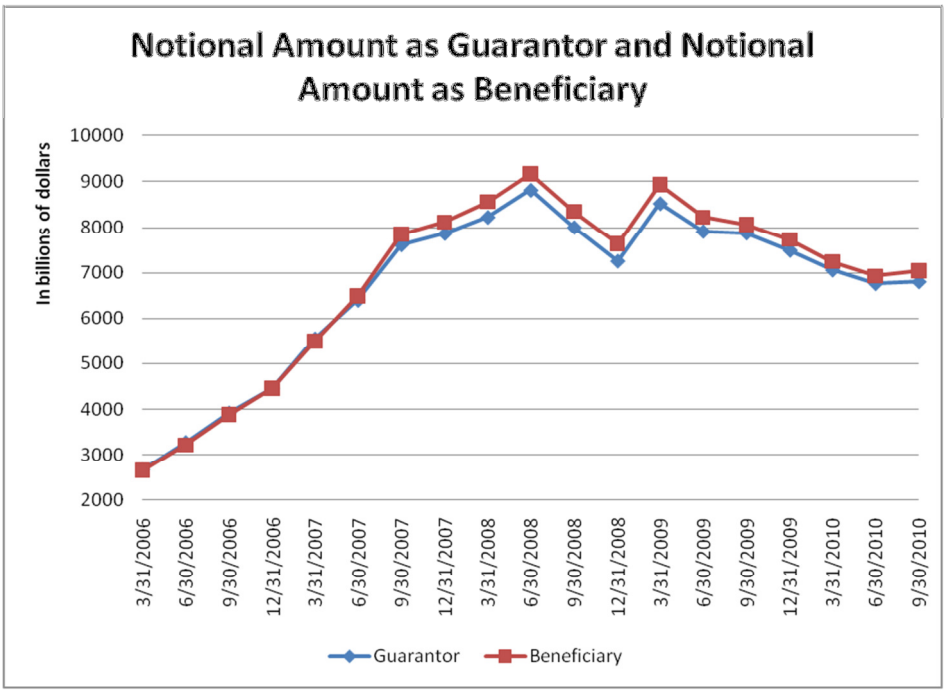

Figure 2 Notional amount of credit derivatives held by all the banks in the sample as guarantor and as beneficiary, respectively. Data are obtained from Schedule L of FR Y-9C.

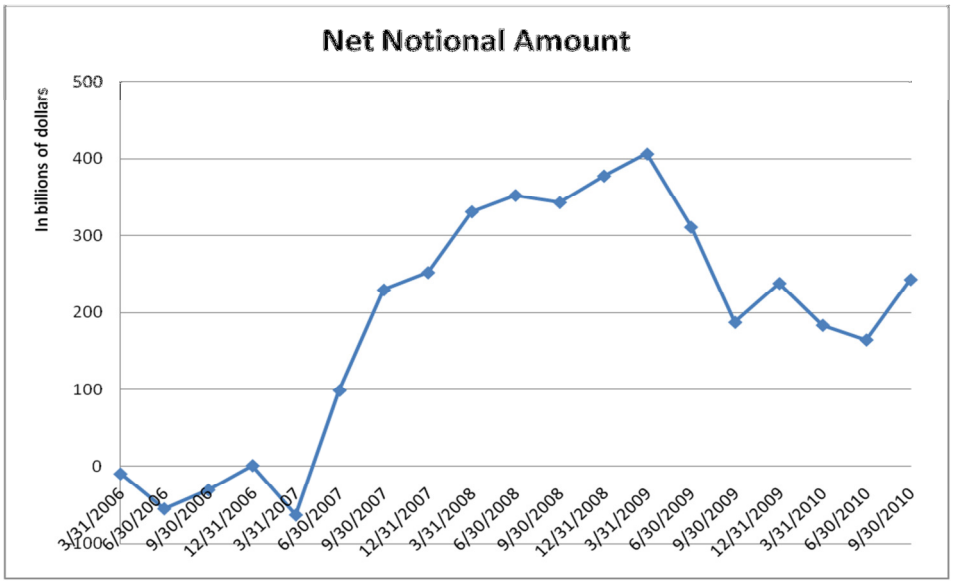

Figure 3 Net notional amount of credit derivatives held by all the banks in the sample. Data are obtained from Schedule L of FR Y-9C.

Section 2: How did the value of credit derivatives change?

As mentioned before, fair value is the market value of credit derivatives. Although the notional amount of credit derivatives has been fixed at the beginning of the contract, the market value of the protection does fluctuate over the contract period. Figure 4 shows the fair value as guarantor and the fair value as beneficiary of the credit derivatives held by the banks in the sample on each quarter-end during the sample period. Figure 5 shows the net fair value of the credit derivatives held by the banks in the sample on each quarter-end during the sample period.

The fair value as guarantor is defined as the difference between the gross positive fair value of sold protection and the gross negative fair value of sold protection. It is the gain or loss on all the credit protection that the banks sold. On the other hand, the fair value as beneficiary is defined as the difference between the gross positive fair value of bought protection and the gross negative fair value of bought protection. It is the gain or loss on all the credit protection that the banks bought. The net fair value is the difference between the fair value as beneficiary and the fair value as guarantor. It is the net gain or loss on all the credit derivative positions that the banks held.

As Figure 4 shows, the fair value as beneficiary increased sharply during June 30, 2007-March 31, 2009, up to 1.2 trillion dollars, while the fair value as guarantor decreased drastically, down to negative 1.13 trillion dollars during the same period. Finally, the fair value as beneficiary and as guarantor both approached back to the level before the outbreak of the financial crisis. On September 30, 2010, the fair value as beneficiary was $0.17 trillion and the fair value as guarantor was negative $0.15 trillion. While the notional amount of credit derivatives as beneficiary decreased during the second half of 2008, the fair value of it increased during this period. It is not surprising because the default risk on many reference entities largely ascended during this period. Thus, our hypothesis that the fair value of credit derivatives held by banks as guarantor would decrease while the fair value of credit derivatives held by banks as beneficiary would increase after the outbreak of the financial crisis is true.

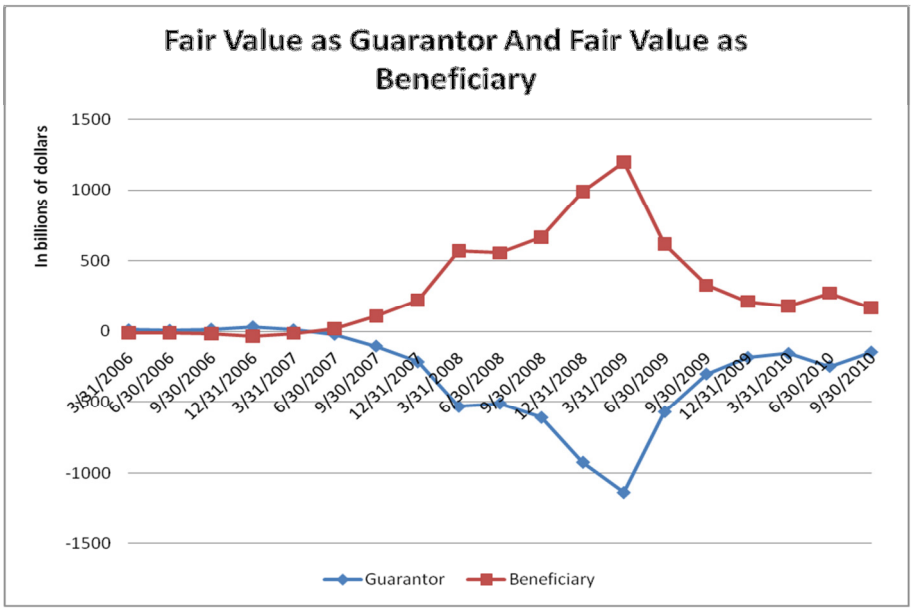

Figure 4 Fair value as guarantor and as beneficiary of credit derivatives held by all the banks in the sample. Data are obtained from Schedule L of FR Y-9C.

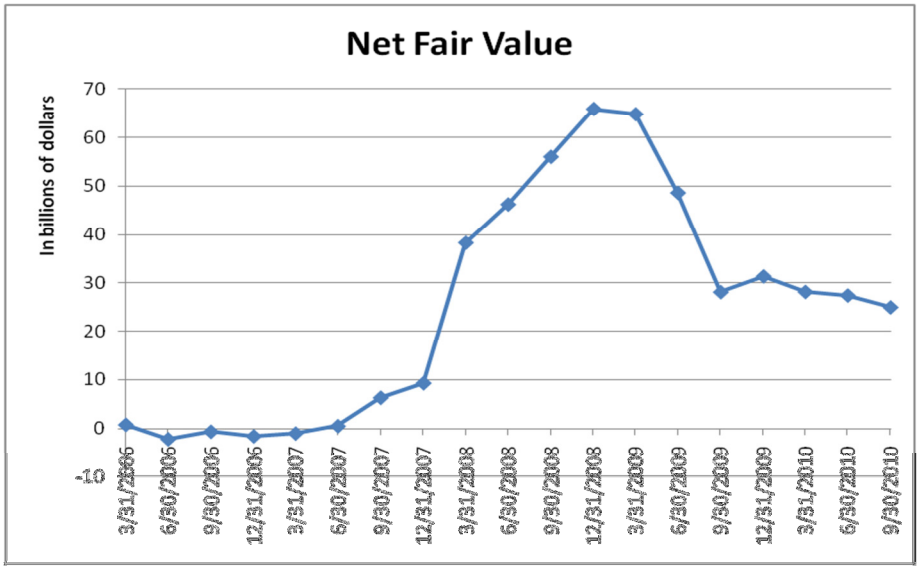

Figure 5 Net fair value of credit derivatives held by all the banks in the sample. Data are obtained from Schedule L of FR Y-9C.

Compared with the fair value as guarantor or as beneficiary, the net fair value is more stable. As Figure 5 shows, from mid 2007 to the end of 2008, the net fair value increased sharply, up to 66 billion dollars on December 31, 2008. Then, it plunged in 2009, down to 28 billion dollars on September 30, 2009. Then, the trend was slightly decreasing during the remaining sample period, but it was always greater than $20 billion since 2008. Thus, according to the sample data, the banking sector did not lose money on their credit derivative positions during the financial crisis. It is not surprising because the net notional amount is positive during this period.

Section 3: Have the credit derivative positions in the banking sector become more concentrated?

European Central Bank (2009) concludes that most of credit derivatives contracts are concentrated in a small group of dealers, and a reduced number of counterparties have caused increased concentration risk and greater systemic risk. Thus, whether the credit derivative positions are concentrated in the banking sector, and how the concentration level changes over time are interesting issues to investigate.

As mentioned before, the concentration level of credit derivative positions can be measured by the Herfindahl–Hirschman Index (HHI). The higher the HHI, the more concentrated the notional amount. I calculate HHI_1 of the notional amount as guarantor, HHI_2 of the notional amount as beneficiary and HHI_3 of the total notional amount, of credit derivatives held by the banks in the sample on each quarter-end over the sample period.

Figure 6 shows the HHI_1 of the notional amount of credit derivatives held by the banks in the sample as guarantor. $HHI_1 = \sum_{i=1}^{N} g_i^2$, where g_i is the ratio obtained as dividing the notional amount of credit derivatives as guarantor held by bank i by the sum of the notional amount of credit derivatives as guarantor held by all the banks in the sample, and N is the number of banks in the sample, which is 52. From Figure 6, we can see that the HHI_1 varied around 0.35 throughout the sample period. As of September 30, 2010, the HHI_1 was 0.32. It means that the notional amount as guarantor was highly concentrated over the sample period.

Figure 7 shows the HHI_2 of the notional amount of credit derivatives held by the banks in the sample as beneficiary. $HHI_2 = \sum_{i=1}^{N} b_i^2$, where b_i is the ratio obtained as dividing the notional amount of credit derivatives as beneficiary held by bank i by the sum of the notional amount of credit derivatives as beneficiary held by all the banks in the sample, and N is the number of banks in the sample, which is 52. Similar to HHI_1, the HHI_2 went around 0.35 over the sample period. As of September 30, 2010, the HHI_2 was also about 0.32. It indicates that the notional amount as beneficiary was highly concentrated over the sample period too.

Figure 8 shows the HHI_3 of the total notional amount of credit derivatives held by the banks in the sample. $HHI_3 = \sum_{i=1}^{N} t_i^2$, where t_i is the ratio obtained as dividing the total notional amount of credit derivatives held by bank i by the sum of the total notional amount of credit derivatives held by all the banks in the sample, and N is the number of banks in the sample, which is 52. The HHI_3 behaves almost the same as HHI_1 and HHI_2, more or less than 0.35 over the sample period. As of September 30, 2010, the HHI_1 was 0.32.

The increase in HHI_1, HHI_2 and HHI_3 in the second quarter of 2008 is caused by the acquisition of Bear Stearns by J.P. Morgan Chase. As Section 4 shows, J.P. Morgan Chase is the largest user of credit derivative, so the increase in the notional amounts of credit derivatives held by J.P. Morgan Chase drives up all of the three HHI. Moreover, the decrease in HHI_1, HHI_2 and HHI_3 in the first quarter of 2009 is caused by the acquisition of Merrill Lynch by Bank of America, which added the derivative positions of Bank of America largely.

Thus, several banks in the sample held most of both the bought and sold positions on credit derivatives over the sample period. It is impossible that several banks held most of the sold positions while several other banks held most of the bought positions, because if it is true, the HHI_3 should be obviously lower than the HHI_1 or the HHI_2.

As a conclusion, after excluding the effect of the two acquisition events indicated above, the hypothesis that all of the HHI_1, HHI_2 and HHI_3 are at high level, and the HHIs are stable after the outbreak of the financial crisis, is true.

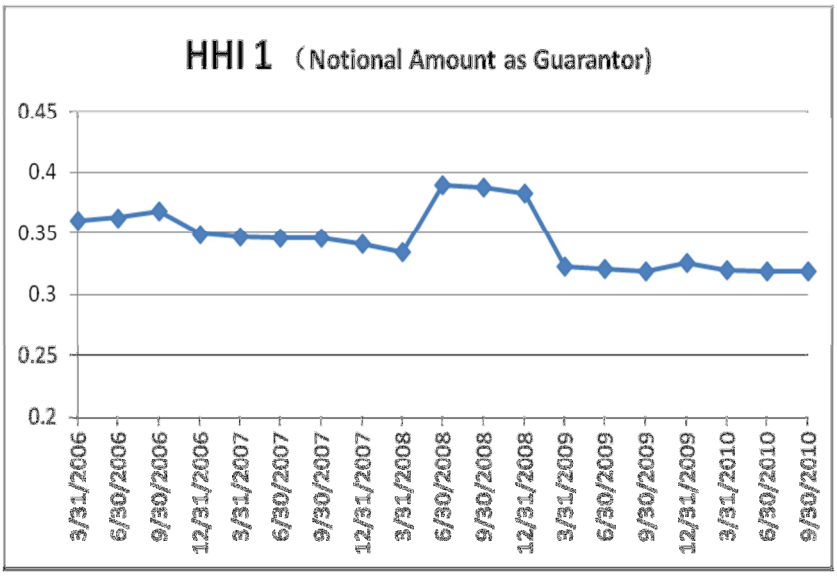

Figure 6 HHI_1 is the Herfindahl–Hirschman Index of the notional amount of credit derivatives held by the banks in the sample as guarantor. Data are obtained from Schedule L of FR Y-9C.

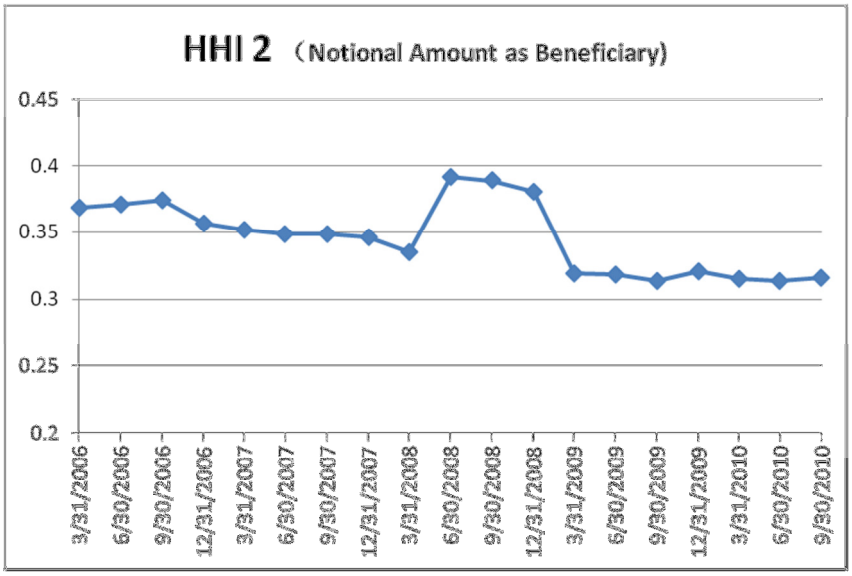

Figure 7 HHI_2 is the Herfindahl–Hirschman Index of the notional amount of credit derivatives held by the banks in the sample as beneficiary. Data are obtained from Schedule L of FR Y-9C.

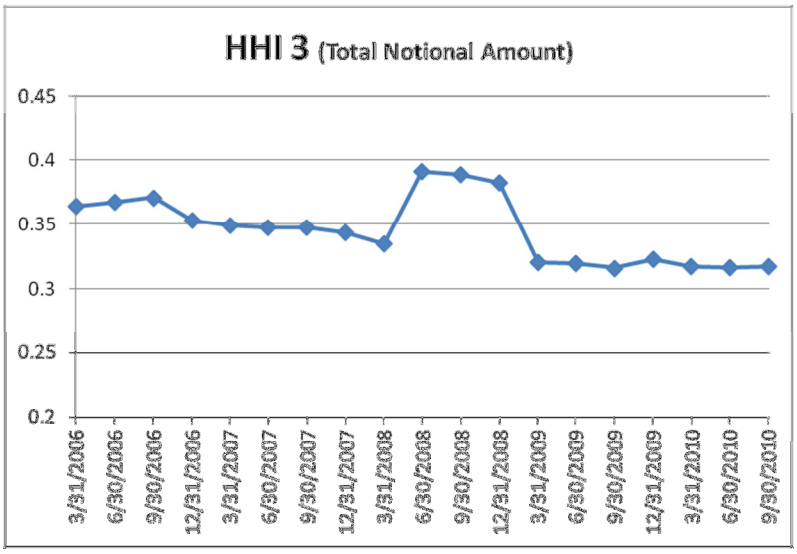

Figure 8 HHI_3 is the Herfindahl–Hirschman Index of the total notional amount of credit derivatives held by the banks in the sample. Data are obtained from Schedule L of FR Y-9C.

Section 4: What major events happened in the financial crisis and what role did credit derivatives play in these events?

At the beginning of 2008, the investors primarily worried about the downgrading of monoline insurers. On January 18, 2008, Fitch Ratings downgraded Ambac Financial Group, the second largest bond insurer in the U.S., from AAA to AA, and warned that it could cut its rating further. Different from other insurance companies, the monoline insurers only focused on one line of business, which is insuring municipal bonds against default. However, over the past decade, these monolines had extended their business into selling credit protections on mortgage-based securities and other structured finance products by credit default swap. As the default rate on subprime mortgages rose dramatically, analysts estimated that the monolines might eventually face $34 billion of losses, while they only had $48 billion to pay claims. (Duyn and Tett, 2008) Since then, investors started to worry about whether their credit derivative counterparties- not only the monoline insurers, but also other institutions such as hedge funds and investment banks-could honor their contracts when credit events happen.

In early March 2008, Carlyle Capital, a hedge fund whose portfolio was comprised entirely of securities issued by Fannie Mae and Freddie Mac, was unable to meet surging margin calls, when the value of its portfolio of residential mortgage-backed securities fell sharply. (Kennedy, 2008) Thus, its collateral was partially sold in a fire sale, which lowered the agency bonds price even further. This event seriously hurt Bear Stearns, because it had giant positions on agency bonds and it was also a creditor to Carlyle Capital. (Barr, 2008)

Noticing a potential solvency crisis of Bear Stearns, its OTC derivative counterparties, especially credit derivative counterparties, were motivated to decrease their exposures to Bear Stearns. Counterparty to Bear Stearns could reduce its exposure either by selling the contract back to Bear Stearns, or in a novation request, to another dealer for a fee. In fact, when Bear Stearns' solvency was threatened, Credit Suisse and Deutsche Bank experienced a torrent of novation requests for Bear instruments. However, in this case, other dealers naturally began to refuse these novations. Moreover, the premium of CDS on Bear Stearns' debt jumped drastically. On March 7, 2008, the annual premium to protect $10 million of Bear's debt jumped to $458,000, which was much higher than that on other investment banks' debt. After March 11, 2008, banks even refused to sell any further credit protection on its debt. It strongly signaled the weakness of Bear Stearns' cash position and contributed to the run by its hedge fund clients and other counterparties. Its liquidity situation became much worse as it was suddenly unable to finance on the repurchase agreement market. (Kelly, 2008 and Boyd, 2008)

Bear Stearns was one of the main counterparties in the credit derivative market. Duyn (2008) points out that" If Bear Stearns had defaulted, the (credit derivative) market would have had to try to unravel the complex web of trades it was involved in. This could have created a logistical headache for bankers because a CDS contract in effect pledges to protect an investor against loss if a default occurs. Counterparties need to get hold of bonds when a default occurs to pay back investors and, with Bear being a counterparty on so many trades, the complexity would have been unprecedented." Finally, to minimize the counterparty credit risk, Bear Stearns was acquired by JP Morgan Chase on March 16, 2008. (Sorkin, 2008)

As the mortgage delinquency rate kept on increasing in the following months, problems of Fannie Mae and Freddie Mac exploded. Fannie Mae and Freddie Mac were two government sponsored enterprises (GSE) with approximately $1.6 trillion in bonds outstanding. On

September 6, 2008, these two GSEs were placed into federal conservatorship. It was a big credit event for the whole credit derivative market, because CDS contracts written on Fannie Mae and Freddie Mac's debt were among the most actively traded and it triggered one of the largest ever payments in the market's decade-long history. (REUTERS,2008 and Biggadike & Harrington, 2008) On September 8, 2008, the International Swaps and Derivatives Association (ISDA) published an announcement that "it will launch a protocol to facilitate settlement of credit derivative trades involving Fannie Mae and Freddie Mac". (ISDA, 2008)

Similar to Bear Stearns, Lehman Brothers had a huge position on lower-rated mortgage-backed securities tranches and a high degree of leverage. Its asset-to-equity ratio was about 31 in 2007. (Lehman 2007 Annual Report, P29) As the subprime mortgage market was deteriorating, Lehman's stock price plunged. After Korea Development Bank, Barclays, and Bank of America refused to take it over, Lehman Brothers had to declare bankruptcy on September 15, 2008. With $639 billion in assets and $619 billion in debt, Lehman's bankruptcy filing was the largest in history. Meanwhile, Merrill Lynch agreed to sell itself to Bank of America for $50 billion. (Sorkin, 2008)

Since Lehman Brothers had a large number of counterparties all over the world, the effect of Lehman's failure rippled throughout the financial market, especially its credit derivative counterparties. Market participants were scared of the possibility of systemic default, because Lehman's counterparties might lose their exposures to Lehman and then default to their counterparties, which might finally lead to the collapse of the financial system. In fact, the spreads of CDS contracts against defaults of the remaining banks skyrocketed right after Lehman bankrupted, because all banks wanted to protect themselves against counterparty credit risk. (Brunnermeier, 2009) Moreover, the pricing of counterparty credit risk began to be highly valued by many more CDS dealers after Lehman's failure. (Arora, Gandhi and Longstaff, 2010) It implied that the significance of counterparty credit risks was largely ignored previously.

Another critical issue is the giant amount of outstanding CDS written on Lehman. When Lehman bankrupted, there was at least $72 billion CDS total notional amount written on Lehman Brothers, according to the Depository Trust & Clearing Corporation. (DTCC, 2008) People were afraid that the protection sellers were unable to honor payments because the value of CDS skyrockets when a credit event occurs.

However, Stulz (2010) indicates that credit derivatives were not the primary cause of Lehman or Bear Stearns failure, because they largely matched their risk positions and held collaterals. The credit derivative market also worked "smoothly" to settle the CDS contracts on Lehman's debt, and the net fund transfer on the $72 billion CDS notional amounts was just $5.2 billion. (DTCC, 2008)

Unfortunately, the exposure to credit derivative did play an important role in the liquidity shortage of American International Group (AIG). AIG sold giant amount of credit protection on super senior tranches of securitizations. As of June 30, 2008, the notional exposure of AIG's super senior credit default swap portfolio was $441 billion. (AIG 2008 second quarter 10-Q, P120) As the U.S. housing market were deteriorating, it experienced serious losses. On September 15, 2008, Moody, Fitch, and Standard &Poor all downgraded the rating of AIG by at least two notches. (Reuters, 2008) It triggered the AIG liquidity crisis, because the downgrade event required AIG to post additional collateral as much as $15 billion for its credit derivative counterparties (Morgenson, 2008), but obviously AIG did not have enough cash to satisfy this requirement. Paul (2008) points out "This was the explosive event that destroyed AIG. It was not the market losses on its investments in mortgage-backed securities. It was not payouts on CDS contracts where default events had actually occurred. It was a collateral call." Because AIG was too interconnected in the credit derivatives business to fail, the Federal Reserve quickly organized an $85 billion bailout to enable AIG to meet its obligations to its CDS counterparties, in exchange for an 80 percent equity stake. (Andrews, de la Merced and Walsh, 2008)

Section 5: Which banks are major users of credit derivatives and what information did they disclose about their use of credit derivatives?

Section 5.1: The major users of credit derivatives

After investigating the data further, I discover that most of the credit derivative positions were concentrated at JP Morgan Chase, Bank of America and Citigroup over the entire sample period. For example, by the end of September 2010, JPMorgan Chase, Bank of America, and Citigroup held 40%, 34% and 19% of the total notional amount of credit derivatives in the sample, respectively. Furthermore, the sum of the total notional amounts of credit derivatives held by

these three banks is about 93% of the sum of the total notional amounts of credit derivatives held by all the banks in the sample. The notional amount as guarantor and the notional amount as beneficiary follow the same distribution. (See Figure 9, 10 and 11)

Over the entire sample period, JPMorgan Chase, Bank of America, and Citigroup together have more than 90% of both bought and sold positions of credit derivatives in the sample. Thus, the hypothesis that there exist several major users of credit derivatives in the sample during the sample period is true.

Since most of the credit derivative notional amounts are held by these three banks, the fluctuation of positions of credit derivatives held by any one of them can largely affect the notional amounts of credit derivatives in the entire sample. Figure 12 compares the total notional amount held by these three banks with the total notional amount held by all the banks in the sample. During the second quarter of 2008, Bank of America and Citigroup both lowered their positions, but J.P. Morgan Chase increased its position sharply by $2 trillion, and it drove the trend of the total notional amount of the sample going upward. It is caused by the acquisition of Bear Stearns by J.P. Morgan Chase. Moreover, in the first quarter of 2009, the total notional amount of credit derivatives held by Bank of America skyrocketed by $3.6 trillion, while the other two banks both decreased their positions. It is caused by the acquisition of Merrill Lynch by Bank of America.

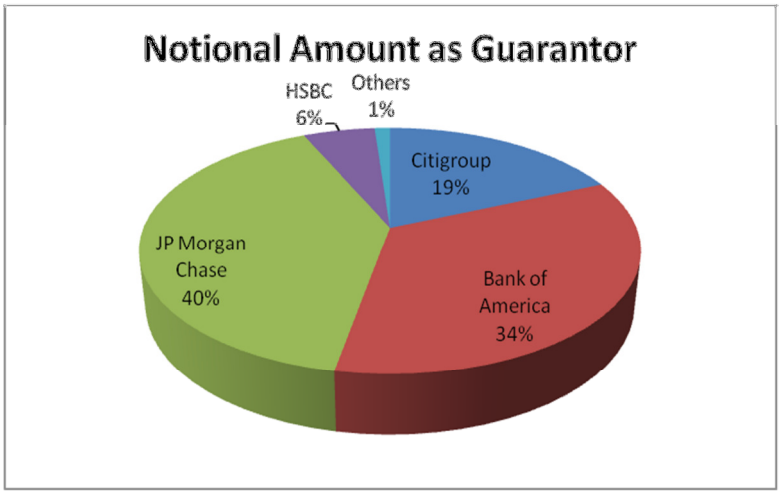

Figure 9 Distribution of the notional amount of credit derivatives as guarantor on September 30, 2010. Data are obtained from Schedule L of FR Y-9C.

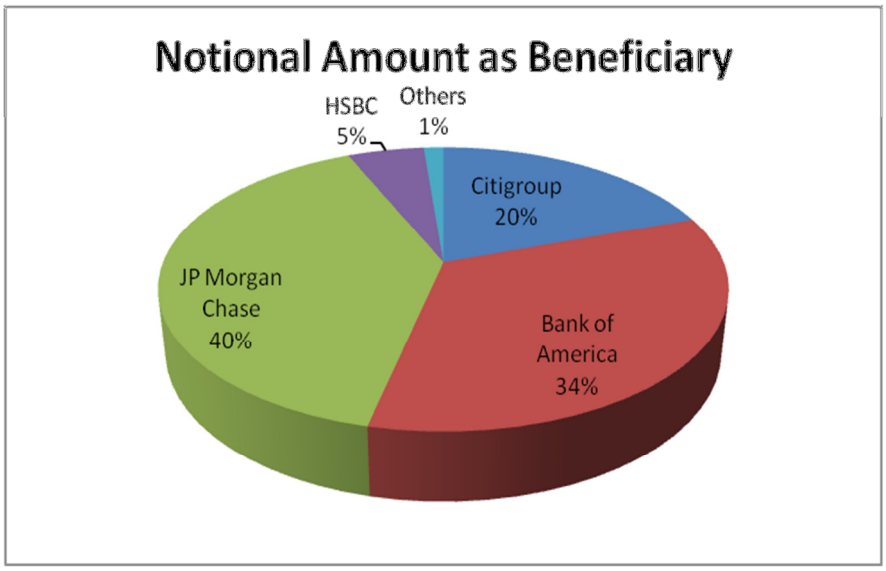

Figure 10 Distribution of the notional amount of credit derivatives as beneficiary on September 30, 2010. Data are obtained from Schedule L of FR Y-9C.

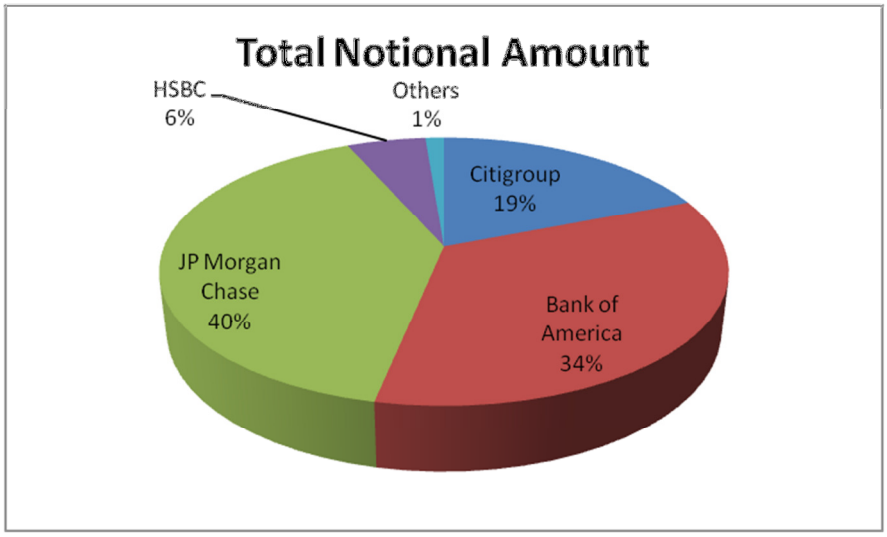

Figure 11 Distribution of the total notional amount of credit derivatives on September 30, 2010. Data are obtained from Schedule L of FR Y-9C.

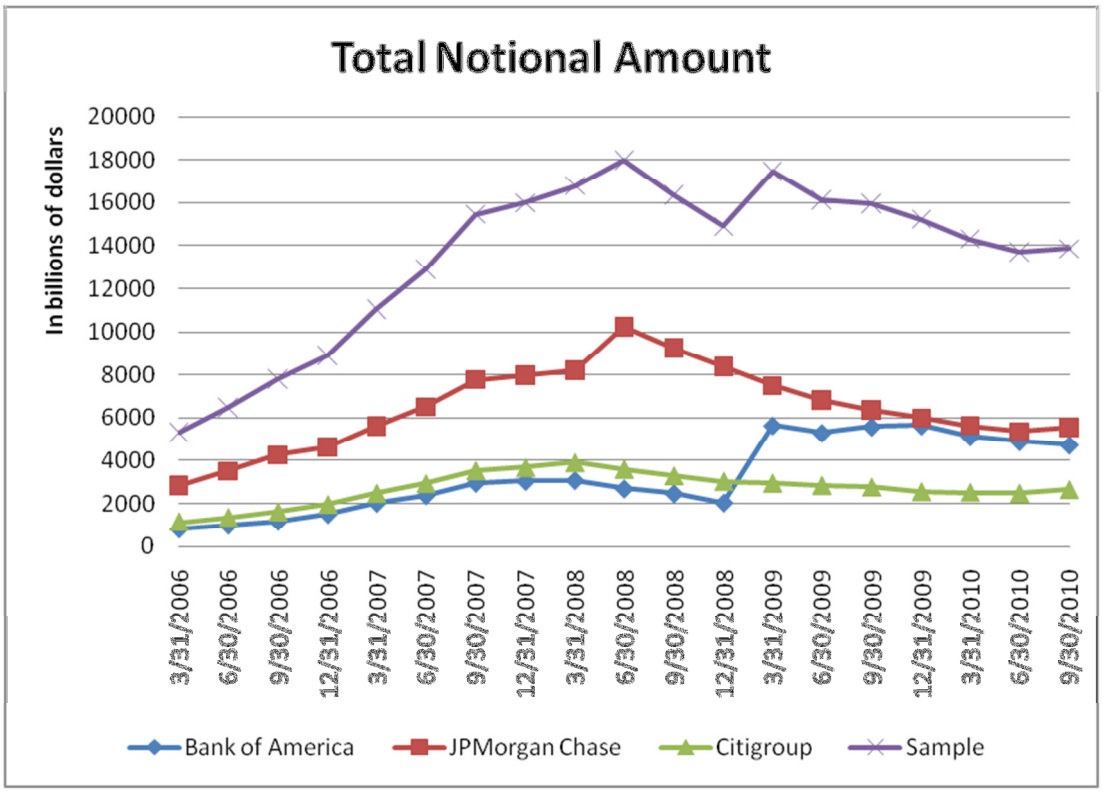

Figure 12 The total notional amount of credit derivatives held by JP Morgan Chase, Bank of America, Citigroup and all the banks in the sample. Data are obtained from Schedule L of FR Y-9C.

Section 5.2: Annual Report Information Summary

To discover why the major users of credit derivatives changed their positions, I review the 2006-2009 annual reports published by JP Morgan Chase, Bank of America and Citigroup and summarize the information they disclosed about credit derivatives. They disclose more and more information about credit derivative positions over time. They did use credit derivatives to hedge their own portfolios, although most of their credit derivative positions were for trading. They largely matched their purchased and sold positions and had noticed the counterparty credit risk. Detailed information is included in Appendix IV.

Table 3 in Appendix III summarizes the notional amounts of credit derivatives held by J.P. Morgan Chase for trading and for hedging during 2006-2009. Table 4 in Appendix III summarizes

the notional amounts of credit derivatives held by Citigroup for trading and for hedging during 2007-2008, because Citigroup does not disclose the exact notional amounts of credit derivatives for trading and for hedging in 2006 and 2009. Although Bank of America does not disclose the exact notional amounts of its credit derivatives for hedging and for trading, it reports the net notional amount of credit derivatives for hedging in 2006-2009. (Please see Table 5 in Appendix III and Figure 13 below)

Section 5.2.1: JP Morgan Chase

JP Morgan Chase discloses that in addition to the traditional risk management processes, they also use loan syndication and participations, loan sales, securitizations, credit derivatives, master netting agreements, collateral and other risk-reduction techniques to management their credit risks. JPMorgan Chase purchases single-name and portfolio credit derivatives to manage its wholesale credit exposure. Meanwhile, it sells credit protection to industries or clients where it has little or no client-related exposure to diversify exposures, but it is not material to JP Morgan Chase's overall credit exposure. However, the credit derivatives used for credit portfolio management activities do not qualify for hedge accounting under SFAS 133.

During 2006 and 2007, the booming trade volume in the market caused the total notional amount of credit derivatives in the dealer/client business increased by $2.4 trillion and $3.3 trillion, respectively. There was a mismatch between the notional amounts of protection as beneficiary and as guarantor. However, JP Morgan Chase believes that it largely matched the risk positions when securities used to risk-manage certain derivative positions were taken into consideration and the notional amounts were adjusted to a duration-based equivalent basis or to reflect different degrees of subordination in tranched structures.

In 2008 and 2009, JP Morgan Chase's annual report reviews credit risks and indicates that the failure of some financial institutions affected the function of credit markets, particularly the loan syndication and asset-backed securitization markets. JP Morgan Chase's credit portfolio was also affected. One of the credit derivatives that JP Morgan Chase enrolled in was credit default swap. JP Morgan Chase was cooperating with other market participants to reduce counterparty credit risk, including cancellation of offsetting trades and using collaterals. Moreover, it discloses the

acquisition of Washington Mutual and Bear Stearns in 2008, which added their credit risk exposure drastically.

Section 5.2.2: Bank of America

Bank of America reports that credit protection was purchased to cover the funded and the unfunded portion of certain credit exposure. To decrease the cost, they may increase their credit exposure within an industry, borrower or counterparty group by selling protection. Bank of America does not disclose its dealer activity on credit derivatives until 2008, and it does not separate the notional amounts of credit derivatives for hedging from those for trading. Bank of America trades most of their credit derivatives with "large, international financial institutions" in the over-the-counter market. Bank of America is subject to settlement risk and counterparty credit risk. Since the credit derivatives are mark-to-market, Bank of America requires its counterparties to add more collateral if credit downgrade happens. Moreover, it enters into "legally enforceable master netting agreements" to reduce risk. In 2008, the significant widening of credit spreads across nearly all major credit indices drove the counterparty credit risk for purchased protection up.

Bank of America reports that they had indirect exposure to monolines primarily in the form of guarantees supporting their loans, investment portfolios, securitizations, credit enhanced securities as part of their public finance business and other selected products. It purchased credit protection from monolines to hedge all or a portion of the credit risk on certain credit exposures including loans and CDOs. If default happens, Bank of America first looks to the underlying securities and then to recovery on the purchased insurance, but Bank of America did not hold collateral against the monoline derivative exposures. In 2008, it reports that the industry is working with the regulator to establish a central clearing house for credit derivatives to reduce the counterparty credit risk. In 2009, Bank of America merged with Merrill Lynch and it increased the notional amount of credit derivatives held by Bank of America dramatically.

Section 5.2.3: Citigroup

Citigroup reports that it does use credit derivatives to hedge part of the credit risk in its portfolio, besides outright asset sales. Since 2007, Citigroup has reported its trading activity of credit derivatives. It purchases or sells credit derivatives either on a single-name or portfolio basis. To

manage the mismatch between purchased and sold credit derivative positions, Citigroup may hold the reference assets directly instead of using offsetting credit derivative contracts, and Citigroup believes that it largely hedged the open risk exposures. In the 2007-2009 annual reports, Citigroup says that it actively monitors the counterparty credit risk associated with credit derivatives. Besides banks and broker-dealers, monoline insurers are "significant" credit derivative counterparties.

Citigroup indicates that it uses credit derivative to hedge its own portfolio and to trade for both its clients and its own account. Citigroup reports that the trading volume of credit derivatives boomed in 2007, experienced by both itself and the industry. It reports that "The volatility and liquidity challenges in the credit markets during the third and fourth quarters drove derivatives trading volumes as credit derivatives became the instrument of choice for managing credit risk." (P59, 2007 Annual Report) Most of the transactions were done with other financial intermediaries.

In 2008, Citigroup reduced its trading volumes. It reports that "The volatility and liquidity challenges in the credit markets during 2008 drove derivatives trading values higher, especially for the credit derivatives." (P93, 2008 Annual Report) Moreover, an interesting point in the 2009 annual report is that $6,981 million notional amount of credit protection purchased is considered as "Hedging instruments under ASC 815 (SFAS 133)".

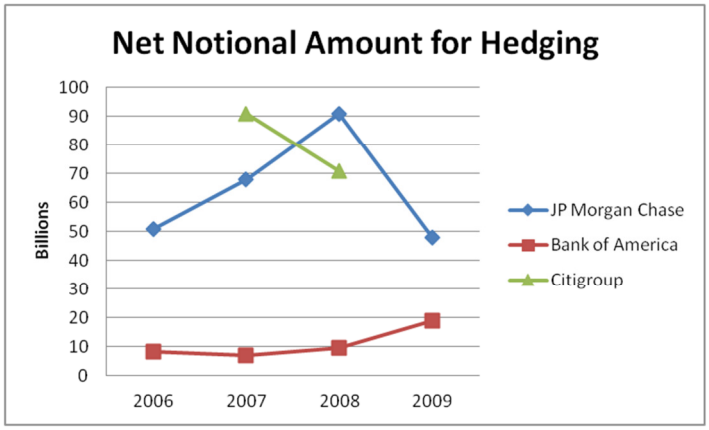

Figure 13 The net notional amount of credit derivatives held by JP Morgan Chase, Bank of America and Citigroup for hedging their own portfolios. Data are obtained from the annual reports of these three banks.

Chapter V: Conclusion

In sum, the banking sector actively involved in credit derivatives during 2006-2010, both for hedging and for trading. The credit derivative positions the banks held boomed in 2006 and 2007 but decreased in 2008 and 2009. I believe that the decrease in the credit derivative volume is caused by the concern on counterparty credit risk, through the method of trade compression.

Most of the credit derivative positions in the sample were held by JP Morgan Chase, Bank of America and Citigroup over the sample period. Most of their credit derivative positions were for dealing activity, and they largely matched their positions. These banks disclosed more and more information about credit derivatives over time. They also gave comments on the credit market situations and the actions of the industry.

Credit derivatives played an important role in the events happened during the financial crisis. The major effect of credit derivatives is that they are traded over-the-counter, so the failure of a significant counterparty in this market may harm the entire financial system. Further research may be done to explore what role offsetting trade played during the booming period of credit derivatives.

References

Andrews, E.L., Merced, M.J. and Walsh, M.W. "Fed's $85 Billion Loan Rescues Insurer" (September 16, 2008) *The New York Times.* Available at http://www.nytimes.com/2008/09/17/business/17insure.html?hp

Barr, A. "Bear Stearns slumps in Carlyle Capital fallout" (March 13, 2008) *The Wall Street Journal.* Available at http://www.marketwatch.com/story/bear-stearns-slumps-on-concern-over-carlyle-capital-exposure

Biggadike, O. and Harrington, S.D. "Fannie, Freddie Credit-Default Swaps May Be Settled" (September 8, 2008) *Bloomberg.* Available at http://www.bloomberg.com/apps/news?pid=newsarchive&sid=ajsxbVS.W2lQ

Blinder, A.S. "Six Errors on the Path to the Financial Crisis" (January 24, 2009) *The New York Times.* Available at http://www.nytimes.com/2009/01/25/business/economy/25view.html

Board of Governors of the Federal Reserve System, "Instructions for Preparation of Consolidated Financial Statements for Bank Holding Companies" (March 2007).

Boyd, R. "The last days of Bear Stearns" (March 31, 2008) *CNN Money.* Available at http://money.cnn.com/2008/03/28/magazines/fortune/boyd_bear.fortune/

Brunnermeier, M. "Deciphering the Liquidity and Credit Crunch 2007–2008" (Winter, 2009) *Journal of Economic Perspectives*, 23 (1): 77–100.

DTCC, "DTCC Trade Information Warehouse Completes Credit Event Processing for Lehman Brothers" (October 22, 2008). Available at http://www.dtcc.com/news/press/releases/2008/dtcc_processes_lehman_cds.php

Duffie, D. "The Failure Mechanics of Dealer Banks" (March 1, 2010) BIS Working Paper No. 301. Available at SSRN: http://ssrn.com/abstract=1599482

Duyn A. "CDS sector weighs Bear Stearns backlash" (March 17, 2008) *Financial Times.* Available at http://www.ft.com/intl/cms/s/0/5f020206-f392-11dc-b6bc-0000779fd2ac.html#axzz1VdVlmHbB

Duyn, A. and Tett, G. "Markets assess the costs of a monoline meltdown" (Feburary 20, 2008) *Financial Times.* Available at http://www.ft.com/intl/cms/s/0/8d715b9e-dfe9-11dc-8073-0000779fd2ac.html#axzz1VdVlmHbB

Effenberger, D. "Credit derivatives: Implications for credit markets" (July 10, 2003) Deutsche Bank Research.

European Central Bank. "Credit Risk Transfer By Eu Banks: Activities, Risks And Risk Management" (May 2004).

European Central Bank. "Credit Default Swaps and Counterparty Risk" (August 2009)

Fender, I., Frankel, A. and Gyntelberg, J. "Three Market Implications of the Lehman Bankruptcy" (December 2008) *BIS Quarterly Review. Page 6-7.*

Finnegan, B. and Mawdsley, A. "Credit Risk Transfer – Significance for the Irish Market" (2004) *CBFSAI Financial Stability Report 2004*.

Fitch Ratings. "Global Credit Derivatives Survey: Indices Dominate Growth as Banks' Risk Position Shifts" (September 21, 2006)

Gandhi, P., Longstaff, F. A. and Arora, N. "Counterparty Credit Risk and the Credit Default Swap Market" (March 1, 2011) Available at SSRN: http://ssrn.com/abstract=1830321

ISDA, "ISDA to Publish Protocol for Fannie And Freddie" (September 8, 2008). Available at http://www.isda.org/press/press090808.html

J.P. Morgan. "The J.P. Morgan Guide to Credit Derivatives" (1999) London: Risk Publications.

Kelly, K. "Fear, Rumors Touched Off Fatal Run on Bear Stearns" (May 28, 2008) *The Wall Street Journal,* page A1.

Kennedy, S. "Carlyle Capital on verge of collapse after talks fail" (March 13, 2008) *The Wall Street Journal.* Available at http://www.marketwatch.com/story/carlyle-capital-on-verge-of-collapse-as-talks-break-down

Kiff, J., Michaud, F.-L. and Mitchell, J. "Instruments of Credit Risk Transfer: Effects on Financial Contracting and Financial Stability" (December 2002) Available at SSRN: http://ssrn.com/abstract=374640 or doi:10.2139/ssrn.374640

Minton, B., Stulz, R. M. and Williamson, R. "How Much Do Banks Use Credit Derivatives to Hedge Loans?" (2009) *Journal of Financial Services Research*, 35(1): 1-31.

Morgenson, G. "Behind Insurer's Crisis, Blind Eye to a Web of Risk" (September 27, 2008) *The New York Times.* Available at http://www.nytimes.com/2008/09/28/business/28melt.html

Morrison, A.D. "Credit Derivatives, Disintermediation, and Investment Decisions." (March 2005) *The Journal of Business* , 78 (2): 621-648. Available at http://www.jstor.org/stable/10.1086/427641

O'Kane, D. et al. "The Lehman Brothers Guide to Exotic Credit Derivatives" (2003) Risk Waters Group.

Parker, E. "Credit Derivatives" (2008) Available at http://www.mayerbrown.com/london/article.asp?id=4234&nid=1575

Paul, D. "Credit Default Swaps, the Collapse of AIG and Addressing the Crisis of Confidence" (October 11, 2008) *The Huffington Post Business.* Available at http://www.huffingtonpost.com/david-paul/credit-default-swaps-the_b_133891.html

Prato, O. "Credit Derivatives: A New Source of Financial Instability?" (2002) *Financial Stability Review*, 69-83.

Rajan, R. G. "Has Finance Made the World Riskier?" (2006) *European Financial Management*, 12: 499–533. doi: 10.1111/j.1468-036X.2006.00330.x

Reuters. "Big Payments Are Expected in Credit Default Swaps" (September 8, 2008) *The New York Times.* Available at http://www.nytimes.com/2008/09/09/business/09credit.html?partner=rssnyt&emc=rss

Reuters. "Rating agencies downgrade AIG, more cuts possible" (September 15, 2008) *Reuters.* Available at http://www.reuters.com/article/2008/09/16/aig-downgrade-idUSHKG1540020080916

Sorkin, A.R. "JP Morgan Pays $2 a Share for Bear Stearns" (March 17, 2008) *The New York Times.* Available at http://www.nytimes.com/2008/03/17/business/17bear.html?pagewanted=1

Sorkin, A.R. "Lehman Files for Bankruptcy; Merrill Is Sold" (September 14, 2008) *The New York Times.* Available at http://www.nytimes.com/2008/09/15/business/15lehman.html?pagewanted=all

Soros, G. "One Way to Stop Bear Raids" (March 24, 2009) *The Wall Street Journal.* Available at http://online.wsj.com/article/SB123785310594719693.html

Stulz, R. M. "Credit Default Swaps and the Credit Crisis" (Winter, 2010) *Journal of Economic Perspectives*, *American Economic Association*, 24(1): 73-92.

Zingales, L. " Causes and Effects of the Lehman Brothers Bankruptcy" (October, 2008)

Appendix I: Banks in the Sample

(Sample is constructed from the 2005 4th quarter peer 1 BHCPR Peer Group Average Reports)

	ID_RSSD	Assets($000)	BHC Name Location and Other Notes
1	1951350	1,494,037,000	CITIGROUP INC. NEW YORK, NY
2	1073757	1,294,312,241	BANK OF AMERICA CORPORATION CHARLOTTE, NC
3	1039502	1,198,942,000	JPMORGAN CHASE & CO. NEW YORK, NY
4	1120754	481,741,000	WELLS FARGO & COMPANY SAN FRANCISCO, CA
5	3232316	404,254,480	HSBC NORTH AMERICA HOLDINGS IN PROSPECT HEIGHTS, IL
6	2816906	364,693,000	TAUNUS CORPORATION NEW YORK, NY
7	1119794	209,465,000	U.S. BANCORP MINNEAPOLIS, MN
8	2914521	206,728,390	BARCLAYS GROUP US INC. WILMINGTON, DE
9	1131787	179,712,841	SUNTRUST BANKS, INC. ATLANTA, GA
10	1132449	155,439,714	CITIZENS FINANCIAL GROUP, INC. PROVIDENCE, RI
11	1074156	109,169,759	BB&T CORPORATION WINSTON-SALEM, NC
12	1070345	105,225,054	FIFTH THIRD BANCORP CINCINNATI, OH
13	1111435	97,995,766	STATE STREET CORPORATION BOSTON, MA
14	1068025	92,844,997	KEYCORP CLEVELAND, OH
15	1069778	91,992,332	PNC FINANCIAL SERVICES GROUP, PITTSBURGH, PA
16	2277860	88,701,411	CAPITAL ONE FINANCIAL CORPORAT MCLEAN, VA
17	3242838	84,786,331	REGIONS FINANCIAL CORPORATION BIRMINGHAM, AL
18	1025608	66,345,204	BANCWEST CORPORATION HONOLULU, HI
19	1037003	55,146,406	M&T BANK CORPORATION BUFFALO, NY
20	1199844	53,682,457	COMERICA INCORPORATED DETROIT, MI
21	1199611	53,413,797	NORTHERN TRUST CORPORATION CHICAGO, IL
22	2307280	51,008,151	UTRECHT-AMERICA HOLDINGS, INC. NEW YORK, NY
23	1245415	50,006,022	HARRIS FINANCIAL CORP. WILMINGTON, DE
24	1378434	49,416,609	UNIONBANCAL CORPORATION SAN FRANCISCO, CA

25	1129382	48,624,000	POPULAR, INC. SAN JUAN, PR
26	1027004	42,762,673	ZIONS BANCORPORATION SALT LAKE CITY, UT
27	1094640	36,581,677	FIRST HORIZON NATIONAL CORPORA MEMPHIS, TN
28	1068191	32,758,006	HUNTINGTON BANCSHARES INCORPOR COLUMBUS, OH
29	1249196	32,119,130	TD BANKNORTH INC. PORTLAND, ME
30	1078529	30,858,429	COMPASS BANCSHARES, INC. BIRMINGHAM, AL
31	1078846	27,634,551	SYNOVUS FINANCIAL CORP. COLUMBUS, GA
32	2132932	26,285,042	NEW YORK COMMUNITY BANCORP, IN WESTBURY, NY
33	1199563	22,117,591	ASSOCIATED BANC-CORP GREEN BAY, WI
34	1826056	20,364,063	RBC CENTURA BANKS, INC. ROCKY MOUNT, NC
35	2744894	19,888,691	FIRST BANCORP SAN JUAN, PR
36	1145476	17,839,831	WEBSTER FINANCIAL CORPORATION WATERBURY, CT
37	1883693	16,273,288	BOK FINANCIAL CORPORATION TULSA, OK
38	3212091	14,642,982	NEW YORK PRIVATE BANK & TRUST NEW YORK, NY
39	1075612	14,639,392	FIRST CITIZENS BANCSHARES, INC RALEIGH, NC
40	1027518	14,586,336	CITY NATIONAL CORPORATION BEVERLY HILLS, CA
41	1049341	13,900,459	COMMERCE BANCSHARES, INC. KANSAS CITY, MO
42	2389941	13,484,335	TCF FINANCIAL CORPORATION WAYZATA, MN
43	1020902	12,575,553	FIRST NATIONAL OF NEBRASKA, IN OMAHA, NE
44	1048773	12,434,005	VALLEY NATIONAL BANCORP WAYNE, NJ
45	1117129	12,407,481	FULTON FINANCIAL CORPORATION LANCASTER, PA
46	1102367	11,830,329	CULLEN/FROST BANKERS, INC. SAN ANTONIO, TX
47	1097614	11,782,738	BANCORPSOUTH, INC. TUPELO, MS
48	1104231	10,391,852	INTERNATIONAL BANCSHARES CORPO LAREDO, TX
49	1888193	10,272,262	WILMINGTON TRUST CORPORATION WILMINGTON, DE
50	1025309	10,187,462	BANK OF HAWAII CORPORATION HONOLULU, HI
51	1070804	10,168,441	FIRSTMERIT CORPORATION AKRON, OH
52	1079740	10,111,589	WHITNEY HOLDING CORPORATION NEW ORLEANS, LA Moved from Peer 2

Appendix II: Banks Excluded from the Sample and Reasons

	ID_RSSD	Assets($000)	BHC Name Location and Other Notes
1	1073551	520,755,000	WACHOVIA CORPORATION CHARLOTTE, NC
2	1379552	144,073,691	ABN AMRO NORTH AMERICA HOLDING CHICAGO, IL
3	1069125	142,410,520	NATIONAL CITY CORPORATION CLEVELAND, OH
4	1033470	102,157,000	BANK OF NEW YORK COMPANY, INC. NEW YORK, NY
5	1048429	57,616,871	NORTH FORK BANCORPORATION, INC MELVILLE, NY
6	1078604	52,619,315	AMSOUTH BANCORPORATION BIRMINGHAM, AL
7	1199497	46,295,972	MARSHALL & ILSLEY CORPORATION MILWAUKEE, WI
8	1068762	38,773,216	MELLON FINANCIAL CORPORATION PITTSBURGH, PA
9	1117679	38,496,335	COMMERCE BANCORP, INC. CHERRY HILL, NJ
10	1080465	21,440,300	COLONIAL BANCGROUP, INC., THE MONTGOMERY, AL
11	1072442	16,421,729	MERCANTILE BANKSHARES CORPORAT BALTIMORE, MD
12	2801546	16,149,557	W HOLDING COMPANY, INC. MAYAGUEZ, PR
13	1071203	15,688,573	SKY FINANCIAL GROUP, INC. BOWLING GREEN, OH
14	1141599	14,328,524	SOUTH FINANCIAL GROUP, THE GREENVILLE, SC
15	1130780	13,724,559	FBOP CORPORATION OAK PARK, IL
16	2337045	12,103,390	INVESTORS FINANCIAL SERVICES BOSTON, MA
17	1246702	10,954,414	PEOPLE'S MUTUAL HOLDINGS BRIDGEPORT, CT

The Reasons Why They Are Excluded

1	2008-12-31WACHOVIA CORPORATION was acquired by WELLS FARGO & COMPANY.
2	Data Missing
3	2008-12-31NATIONAL CITY CORPORATION was acquired by PNC FINANCIAL SERVICES GROUP, INC., THE.
4	2007-07-01BANK OF NEW YORK COMPANY, INC., THE was acquired by BANK OF NEW YORK MELLON CORPORATION, THE.
5	2006-12-01NORTH FORK BANCORPORATION, INC. was acquired by CAPITAL ONE FINANCIAL CORPORATION.
6	2006-11-04AMSOUTH BANCORPORATION was acquired by REGIONS FINANCIAL CORPORATION.
7	2010-01-01Institution is **closed**.
8	2007-07-01MELLON FINANCIAL CORPORATION was acquired by BANK OF NEW YORK MELLON CORPORATION, THE.
9	2008-06-01COMMERCE BANCORP, LLC **changed** from Bank Holding Company to Domestic Entity Other.
10	2009-08-15COLONIAL BANCGROUP, INC., THE **changed** from Financial Holding Company - Domestic to Domestic Entity Other
11	2007-03-02MERCANTILE BANKSHARES CORPORATION was acquired by PNC FINANCIAL SERVICES GROUP, INC., THE.
12	2010-05-01W HOLDING COMPANY, INC. **changed** from Bank Holding Company to Domestic Entity Other.
13	2007-07-01SKY FINANCIAL GROUP, INC. was acquired by HUNTINGTON BANCSHARES INCORPORATED.
14	2010-10-01SOUTH FINANCIAL GROUP, INC., THE was acquired by TD BANK US HOLDING COMPANY.
15	2009-10-31FBOP CORPORATION **changed** from Financial Holding Company - Domestic to Domestic Entity Other.
16	2007-07-02INVESTORS FINANCIAL SERVICES CORP. was acquired by STATE STREET CORPORATION.
17	2006-08-18PEOPLE'S MUTUAL HOLDINGS **changed** from Financial Holding Company - Domestic to Domestic Entity Other.

Appendix III: Tables

Table 1 Number and percentage of banks using credit derivatives.

Sample=52	31-Dec-06		31-Dec-07		31-Dec-08		31-Dec-09		30-Sep-10	
	n	%	n	%	n	%	n	%	n	%
Credit Default Swap										
seller of credit risk protection	14	26.92 %	16	30.77 %	16	30.77 %	14	26.92 %	13	25.00 %
buyer of credit risk protection	18	34.62 %	18	34.62 %	18	34.62 %	17	32.69 %	15	28.85 %
banks with positions	20	38.46 %	21	40.38 %	20	38.46 %	18	34.62 %	17	32.69 %
Total Return Swap										
seller of credit risk protection	7	13.46 %	8	15.38 %	9	17.31 %	8	15.38 %	8	15.38 %
buyer of credit risk protection	8	15.38 %	9	17.31 %	10	19.23 %	9	17.31 %	11	21.15 %
banks with positions	10	19.23 %	11	21.15 %	12	23.08 %	11	21.15 %	12	23.08 %
Credit Options										
seller of credit risk protection	3	5.77%	4	7.69%	3	5.77%	4	7.69%	2	3.85%
buyer of credit risk protection	4	7.69%	4	7.69%	5	9.62%	4	7.69%	4	7.69%
banks with positions	5	9.62%	5	9.62%	5	9.62%	5	9.62%	4	7.69%
Other Credit Derivatives										
seller of credit risk protection	5	9.62%	5	9.62%	7	13.46 %	11	21.15 %	13	25.00 %
buyer of credit risk protection	4	7.69%	5	9.62%	6	11.54 %	8	15.38 %	11	21.15 %
banks with positions	5	9.62%	6	11.54 %	8	15.38 %	11	21.15 %	13	25.00 %
All Types of Credit Derivatives										
seller of credit risk protection	17	32.69 %	19	36.54 %	20	38.46 %	22	42.31 %	22	42.31 %
buyer of credit risk protection	21	40.38 %	21	40.38 %	23	44.23 %	22	42.31 %	23	44.23 %
banks with positions	23	44.23 %	24	46.15 %	25	48.08 %	26	50.00 %	26	50.00 %

Table 2 Asset and loans of the whole sample and of the banks with credit derivative positions.

(in trillions of dollars)	31-Dec-06	31-Dec-07	31-Dec-08	31-Dec-09	30-Sep-10
Total asset of the sample	8.76	10.17	11.41	11.46	11.83
Total loans of the sample	4.17	4.78	5.51	5.09	5.21
Total asset of the banks with credit derivative positions	7.95	9.29	10.51	10.44	10.80
Total loans of the banks with credit derivative positions	3.61	4.18	4.90	4.44	4.53
Total asset of the banks with credit derivative positions / Total asset of the sample	90.80%	91.30%	92.14%	91.09%	91.26%
Total loans of the banks with credit derivative positions / Total loans of the sample	86.66%	87.55%	88.96%	87.23%	86.97%
Total loan of the sample / Total asset of the sample	47.59%	46.95%	48.27%	44.44%	44.04%
Total loan of the banks with credit derivative positions / Total asset of the banks with credit derivative positions	45.42%	45.03%	46.60%	42.56%	41.97%

Table 3 Notional amounts of credit derivatives held by J.P. Morgan Chase for hedging and for trading.

JP Morgan Chase					
Notional Amounts ($ Billions)					
		2006	2007	2008	2009
Hedging	Bought	52	70	92	49
	Sold	1	2	1	1
Trading	Bought	2277	3999	4097	2997
	Sold	2289	3896	4198	2947

Table 4 Notional amounts of credit derivatives held by Citigroup for hedging and for trading.

Citigroup					
Notional Amount (Billions)					
		2006	2007	2008	2009
Hedging	Bought	N/A	91	71	N/A
	Sold	N/A	0	0	N/A
Trading	Bought	N/A	1816	1519	N/A
	Sold	N/A	1768	1443	N/A

Table 5 Net notional amount of credit derivatives held by Bank of America for hedging.

Bank of America			
Net Notional Amount for Hedging (Billions)			
2006	2007	2008	2009
8.3	7.1	9.7	19

Appendix IV: Annual Reports Summaries

JP Morgan Chase

JP Morgan Chase says in its annual reports that in addition to the traditional risk management processes, they also use loan syndication and participations, loan sales, securitizations, credit derivatives, master netting agreements, collateral and other risk-reduction techniques to management their credit risks. JPMorgan Chase purchases single-name and portfolio credit derivatives to manage its wholesale credit exposure. Meanwhile, it sells credit protection to industries or clients where it has little or no client-related exposure to diversify exposures, but it is not material to JP Morgan Chase's overall credit exposure. However, the credit derivatives used for credit portfolio management activities do not qualify for hedge accounting under SFAS 133.

2006

As of December 31, 2006, JP Morgan Chase's total notional amount of credit derivatives was $4,619 billion and approximately $5.7 billion derivative receivables, or 10% of total derivative receivables mark-to-market, associated with credit derivatives before taking liquid securities collateral into account.

The notional amounts of credit derivatives as guarantor and as beneficiary for hedging its own credit portfolio were $1 billion and $52 billion, respectively. Of the $52 billion credit protection purchased, $40.8 billion was for managing loans and lending related commitments, and $11.2 billion was for managing derivative receivables. Furthermore, within the $52 billion credit protection purchased for hedging, $23 billion was for structured portfolio on which JP Morgan Chase retained the first loss.

Meanwhile, the notional amounts of credit derivatives as guarantor and as beneficiary for dealer activity were $2,289 billion and $2,277 billion, respectively. During 2006, the booming trade volume in the market caused the total notional amount of credit derivatives in the dealer/client business increased by $2.4 trillion. There was a mismatch between the notional amounts of protection as beneficiary and as guarantor. However, JP Morgan Chase believes that it largely matched the risk positions when securities used to risk-manage certain derivative positions

were taken into consideration and the notional amounts were adjusted to a duration-based equivalent basis or to reflect different degrees of subordination in tranched structures.

Moreover, 16% of its credit derivative notional amounts for hedging were less than 1 year maturity, and 75% were more than 1year but less than 5 years maturity, and 9% were above 5 years maturity. 88% of the underlying assets were at the investment grade.

JP Morgan Chase also discloses its wholesale credit exposure, net credit derivative hedges, and the amount of collateral held against derivative receivables by industries. As of December 31, 2006, the total wholesale credit exposure was $630,767 million. The net credit derivative hedge for the credit exposure was totally $50,733 million in notional amount, and the collateral held against derivative receivables was $6,591 million in total.

2007

JP Morgan Chase's 2007 annual report shows that its total notional amount of credit derivatives was $7,967 billion and it had $22.1 billion credit derivative receivables, or 29% of the total derivative receivables MTM, before the benefit of liquid securities collateral as of December 31, 2007. It says that the credit derivatives receivables increased by $16.4 billion because of the increasing credit spreads and the decline in the U.S. dollar.

The notional amounts of credit derivatives as guarantor and as beneficiary for hedging its own credit portfolio were $2 billion and $70 billion, respectively. Within the $70 billion credit protection purchased, $63.6 billion was for managing loans and lending related commitments, and $6.5 billion was for managing derivative receivables. Different from that in 2006, of the credit protection purchased for hedging, $31.1 billion was for structured portfolio on which JP Morgan Chase retained a "minimal" first loss.

The notional amounts of credit derivatives as guarantor and as beneficiary for dealer activity were $3,896 billion and $3,999 billion, respectively. Similar to 2006, the total notional amount of credit derivatives in the dealer/client business ascended by $3.3 trillion in 2007, which was led to by the climbing trade volume in the market. Again, JP Morgan Chase believes that it largely matched the risk positions when securities and other factors were taken into consideration.

Moreover, 39% of its credit derivative notional amounts for hedging were less than 1 year maturity, and 56% were more than 1year but less than 5 years maturity, and 5% were above 5 years maturity. 89% of the underlying assets were at the investment grade.

Again, JP Morgan Chase discloses its wholesale credit exposure, net credit derivative hedges, and the amount of collateral held against derivative receivables by industries. As of December 31, 2007, the total wholesale credit exposure was $736,864 million. The net credit derivative hedge for the credit exposure was totally $67,999 million in notional amount, and the collateral held against derivative receivables was $9,824 million in total.

2008

JP Morgan Chase's 2008 annual report gives much more comments than previous ones.

At the "Credit Risk Management" section, it reviews the credit risks in 2008. It reports that "During 2008, credit markets experienced deterioration and increased defaults and downgrades reflecting, among other things, reduced liquidity. The liquidity and credit crisis has adversely affected many financial institutions, resulting in the failure of some in both the U.S. and Europe, and has impacted the functioning of credit markets, particularly, the loan syndication and asset-backed securitization markets. The Firm’s credit portfolio was affected by these market conditions and experienced deteriorating credit quality, especially in the latter part of the year, generally consistent with the market." (P93) Moreover, at the "Credit Portfolio" section, it discloses the acquisition of Washington Mutual and Bear Stearns, which added their credit risk exposure drastically.

As of December 31, 2008, its total notional amount of credit derivatives was $8,388 billion and the mark-to-market credit derivative receivable was $44,695 million. The total notional amount of protection had increased by $421 billion since year-end 2007. JP Morgan indicates that "The increase was primarily as a result of the merger with Bear Stearns, partially offset by the impact of industry efforts to reduce offsetting trade activity." (P101)

The notional amounts of credit derivatives as guarantor and as beneficiary for its own credit portfolio were $1 billion and $92 billion, respectively. Within the $92 billion credit protection purchased, $81.2 billion was for managing loans and lending related commitments, and $10.9

billion was for managing derivative receivables. Of the credit protection purchased for hedging, $34.9 billion was for structured portfolio on which JP Morgan Chase retained a first risk of loss.

The notional amounts of credit derivatives as guarantor and as beneficiary for dealer/client business were $4,198 billion and $4,097 billion, respectively. JPMorgan Chase actively bought and sold credit protection, predominantly on corporate debt obligations, to meet client demand for credit risk protection for their dealer/client business, including single-name, portfolio, and indexed credit derivatives. They usually hedged their positions by purchasing credit protection from third party on the same reference entity. Their trading desks were actively managing the residual default exposure and spread risk.

When classified by years of maturity, 47% of its credit derivative notional amounts for hedging were less than 1 year, and 47% were more than 1year but less than 5 years, and 6% were above 5 years. 90% of the underlying assets were at the investment grade.

By the end of 2008, the total wholesale credit exposure was $820,682 million. The net credit derivative hedge for the credit exposure was totally $91,451 million in notional amount, and the collateral held against derivative receivables was $19,816 million in total.

JP Morgan Chase indicates that credit default swap is a type of credit derivative it enters into. It reports that "During 2008, the Firm worked with other significant market participants to develop mechanisms to reduce counterparty credit risk, including the cancellation of offsetting trades. In 2009, it is anticipated that one or more central counterparties for CDS will be established and JPMorgan Chase will face these central counterparties, or clearing houses, for an increasing portion of its CDS business." (P101) It implies that the major dealers of credit derivatives reduced their positions because of the counterparty credit risk.

2009

Similar to 2008, at the "Credit Risk Management" section, JP Morgan Chase reviews the credit risks in 2009. It reports that "During 2009, the credit environment experienced further deterioration compared with 2008, resulting in increased defaults, downgrades and reduced liquidity. In the first part of the year, the pace of deterioration increased, adversely affecting many financial institutions and impacting the functioning of credit markets, which remained weak. The pace of deterioration also gave rise to a high level of uncertainty regarding the

ultimate extent of the downturn. The Firm's credit portfolio was affected by these market conditions and experienced continued deteriorating credit quality, especially in the first part of the year, generally consistent with the market."

As of December 31, 2009, the total notional amount of credit derivatives was $5,994 billion, and the mark-to-market credit derivative receivable was $18,815 million, or 23% of its total derivative receivables MTM, before counting the liquid security collaterals. The total notional amount had reduced by $2.4 trillion since year-end 2008, as a result of the industry efforts to decrease offsetting trade. The plunge of mark-to-market credit derivative receivable was caused by tightening credit spreads.

Meanwhile, the notional amounts of credit derivatives as guarantor and as beneficiary for its own credit portfolio were $1 billion and $49 billion, respectively. Within the $49 billion credit protection purchased, $36.9 billion was for managing loans and lending related commitments, and $12 billion was for managing derivative receivables. Furthermore, of the credit protection purchased for hedging, $19.7 billion was for structured portfolio on which JP Morgan Chase retained a first risk of loss. The notional amounts of credit derivatives as guarantor and as beneficiary for dealer/client business were $2,947 billion and $2,997 billion, respectively. Again, JPMorgan Chase actively makes market for its clients and hedge risks by purchasing protection from thirty parties.

This year, 49% of their credit derivative hedges notional amounts were less than 1 year maturity, and 42% of their credit derivative hedges notional amounts were more than 1year but less than 5 years maturity, and 9% of their credit derivative hedges notional amounts were over 5 years maturity. 100% of the underlying assets of the credit derivatives were at the investment grade. As of December 31, 2009, the total wholesale credit exposure was $650,212 million. The net credit derivative hedge for the credit exposure was totally $48,376 million in notional amount, and the collateral held against derivative receivables was $15,519 million in total.

For CDS, it reports that "In 2009, the frequency and size of defaults for both trading counterparties and the underlying debt referenced in credit derivatives were well above historical norms. The use of collateral to settle against defaulting counterparties generally performed as designed in significantly mitigating the Firm's exposure to these counterparties." (P111)

Bank of America

Bank of America reports that credit protection was purchased to cover the funded and the unfunded portion of certain credit exposure. To decrease the cost, they may increase their credit exposure within an industry, borrower or counterparty group by selling protection. Bank of America does not disclose its dealer activity on credit derivatives until 2008, and it does not separate the notional amounts of credit derivatives for hedging from those for trading in its 2006-2009 annual reports

2006

Bank of America reports that its total notional amount of credit derivatives was $1,497,869 million and the credit risk amount associated with it was $756 million as of December 31, 2006. It does not disclose the notional amount as guarantor and as beneficiary separately, and it does not report the notional amount of credit derivatives for trading, either. Furthermore, it does not disclose the exact amount of cash collateral for credit derivatives.

By December 31, 2006, they had $8.3 billion net notional credit default protection purchased for hedging. They reduced their net credit default protection by $6.4 billion in 2006 because of their view of the underlying risk in their credit portfolio and their near term outlook on the credit environment. They lost 241 million dollars on the net cost of credit default protection, including mark-to-market impacts, in 2006. They believed that the losses in 2006 were caused by the impact of credit spreads tightening across most of our hedge positions.

When classified by maturity profile, 7% of their net credit default protection portfolio was less than 1year, and 46% was greater than 1year but less than 5 years, and 47% was greater than 5 years. 82.7% of its net credit protection notional amount was at investment grade.

The average Value-at-Risk (VAR) for the credit derivative hedges was $54 million for the twelve months ended December 31, 2006. Compared with that in 2005, The VAR decreased, because the average amount of credit protection outstanding reduced during the period. There was a diversification effect between the credit derivative hedges and the market-based trading portfolio such that Bank of America's combined average VAR was $57 million for the twelve months ended December 31, 2006.

2007

This year, Bank of America reports that they had indirect exposure to monolines primarily in the form of guarantees supporting their loans, investment portfolios, securitizations, credit enhanced securities as part of their public finance business and other selected products. It purchased credit protection from monolines to hedge all or a portion of the credit risk on certain credit exposures including loans and CDOs. If default happen, Bank of America first look to the underlying securities and then to recovery on the purchased insurance.

As of December 31, 2007, the total notional amount of credit derivatives was $3,046,381 million and the credit risk amounts was $7,493 million. Similar to 2006, it does not disclose the notional amount as guarantor and as beneficiary separately, nor the notional amount of credit derivatives for trading. It does not disclose the exact amount of cash collateral for credit derivatives, either.

By December 31, 2007, it had $7.1 billion net notional credit default protection purchased for hedging. Its net credit default protection purchased reduced by $1.1 billion to $7.1 billion in 2007 as they continued to reposition the level of purchased protection based on their current view of the underlying credit risk in their portfolio. Bank of America earned $160 million in 2007 compared to net losses of $241 million in 2006 because of the net mark-to-market impacts and the cost of credit default protection.

In its net credit default protection portfolio, 2% was less than 1year maturity, and 67% was greater than 1year but less than 5 years maturity, and 31% was greater than 5 years maturity. 81.8% of its net credit protection notional amount was at investment grade.

The average VAR for the credit derivative hedges was $22 million for the twelve months ended December 31, 2007. The reduction of the average amount of credit protection outstanding during the year caused the decreasing of VAR. There was a diversification effect between the credit derivative hedges and the market-based trading portfolio such that Bank of America's combined average VAR was $55 million for the twelve months ended December 31, 2007.

2008

Bank of America's 2008 annual report gives much more information about credit derivatives than the previous ones. There are five new points in the 2008 annual report.

First, Bank of America reports its exact exposure to monoline insurers. Compared to the $420 million mark-to-market counterparty derivative credit exposure at December 31, 2007, it was $2.6 billion at December 31, 2008. It reports that "The increase in the mark-to-market exposure was due to credit deterioration related to underlying counterparties and spread widening in both wrapped CDO and structured finance related exposures." (P76) The counterparty credit valuation adjustment of monoline derivative exposure was $1.0 billion as of December 31, 2008. It decreased Bank of America's net mark-to-market exposure to $1.6 billion. Unfortunately, Bank of America did not hold collateral against these derivative exposures. Furthermore, it was evaluating the impact of one monoline counterparty's business restructuring and credit rating downgraded in the first quarter of 2009.

Second, it reports the notional amounts of credit derivatives as guarantor and as beneficiary separately. As of December 31, 2008, the notional amounts of purchased and written protection were $1,032,451 million and $1,006,237 million, respectively. The credit risk of purchased and written protection was $13,450 million and $13,450 million, respectively. The credit risk amount was measured as the net replacement cost if Bank of America's counterparties with contracts in a gain position fail to perform under the terms of those contracts. Bank of America reduced its aggregate positions by $1.0 trillion to minimize market and operational risk.

Third, it discloses that besides the net notional credit default protection purchased to cover their own credit exposures, credit derivatives were used for market-making and trading. It reports that it trades most of their credit derivatives with "large, international financial institutions" in the over-the-counter market. Bank of America is subject to settlement risk and counterparty credit risk. Since the credit derivatives are mark-to-market, Bank of America requires its counterparties to add more collateral if credit downgrade happens. Moreover, it enters into "legally enforceable master netting agreements" to reduce risk. In 2008, the significant widening of credit spreads across nearly all major credit indices drove the counterparty credit risk for purchased protection up.

Fourth, the 2008 annual report adds a new "Counterparty Credit Risk Valuation Adjustments" section to discuss the counterparty credit risk of credit derivatives. Bank of America assesses the amount of counterparty credit risk by the value of the derivative contract, collateral, and credit worthiness of the counterparty. In 2008, within the $3.2 billion valuation adjustments of trading account losses related to derivative assets for counterparty credit risk, $1.1 billion was related to insured super senior CDOs and $537 million was related to structured credit trading business. Bank of America reports that "The losses were driven by increases in the value of the derivative contracts resulting primarily from spread widening, market volatility and credit deterioration related to the underlying counterparties." (P79)

Last but not least, it reports that the industry is working with the regulator to establish a central clearing house for credit derivatives to reduce the counterparty credit risk. Similar information appears in JP Morgan 2008 annual report.

Bank of America had $9.7 billion net notional credit default protection purchased for hedging by December 31, 2008. It earned $993 million from the credit derivatives for hedging because of the mark-to-market impacts. The average VAR for these credit derivative hedges was $24 million. The increasing of VAR was resulted in by the ascending of the average amount of credit protection outstanding in 2008. There was a diversification effect between the net credit default protection hedging its own credit exposure and the related credit exposure such that its combined average VAR was $22 million in 2008.

In its net credit default protection portfolio, 1% was less than 1year maturity, and 92% was greater than 1year but less than 5 years maturity, and 7% was greater than 5 years maturity. 80% of its net credit protection notional amount was at investment grade.

2009

In the 2009 annual report, the most important information I find is that the skyrocketing of the notional amounts of credit derivatives during the first quarter of 2009 is driven by the acquisition of Merrill Lynch. As of December 31, 2009, the notional amounts of purchased and written protection were $2,822,224 million and $2,821,869 million, respectively. The credit risk of purchased and written protection was $27,704 million and $27,704 million, respectively. Bank

of America reports that "The addition of Merrill Lynch drove the increase in counterparty credit risk for purchased credit derivatives and the increase in the contract/notional amount." (P85)

Bank of America had $19 billion net notional credit default protection purchased for hedging by December 31, 2009. It reports that the increasing in net notional amount of credit derivatives was primarily caused by the acquisition of Merrill Lynch. It lost $2.9 billion on the credit derivatives for hedging in 2009 because of the mark-to-market impacts. The average Value-at-Risk (VAR) for these credit derivative hedges was $76 million in 2009. The average VAR for the related credit exposure was $130 million in 2009. The year-over-year increase in VAR was caused by the combination of the Merrill Lynch and Bank of America businesses in 2009. There was a diversification effect between the net credit default protection hedging its credit exposure and the related credit exposure such that the combined average VAR was $89 million in 2009.

When classified by maturity profile, 16% of Bank of America's net credit default protection portfolio was less than 1year, and 81% of its net credit default protection portfolio was greater than 1year but less than 5 years, and 3% was greater than 5 years. 84.1% of its net credit protection notional amount was at investment grade.

Citigroup

Citigroup reports that it does use credit derivatives to hedge part of the credit risk in its portfolio, besides outright asset sales. Since 2007, Citigroup has reported its trading activity of credit derivatives. It purchases or sells credit derivatives either on a single-name or portfolio basis. To manage the mismatch between purchased and sold credit derivative positions, Citigroup may hold the reference assets directly instead of using offsetting credit derivative contracts, and Citigroup believes that it largely hedged the open risk exposures. In the 2007-2009 annual reports, Citigroup says that it actively monitors the counterparty credit risk associated with credit derivatives. Besides banks and broker-dealers, monoline insurers are "significant" credit derivative counterparties.

2006

The Citigroup 2006 annual report does not disclose much information about credit derivatives. As of December 31, 2006, Citigroup's total notional amount of credit derivatives was $1,944,980 million. Its credit derivative mark-to-market receivable was $14,069 million and its credit derivative market -to-market payable was $15,081 million. All of its credit derivative positions were recorded for trading.

2007

In 2007, Citigroup reported much more information about credit derivatives. The 2007 annual report discloses the notional amounts as guarantor and as beneficiary by types of instruments, such as credit default swap, total return swap and credit default options. As of December 31, 2007, the notional amounts of credit derivatives as guarantor and as beneficiary were $1,767,837 million and $1,906,956 million, respectively. The credit derivative mark-to-market receivables as guarantor and as beneficiary were $4,967 million and $78,426 million, respectively. The credit derivative mark-to-market payables as guarantor and as beneficiary were $73,103 million and $11,191 million, respectively.

A new section, "Credit Derivatives", is added in the 2007 annual report. Citigroup indicates that it uses credit derivative to hedge its own portfolio and to trade for both its clients and its own account. As of December 31, 2007, the notional amounts as guarantor and as beneficiary for hedging were $0 and $91,228 million, respectively, and the notional amount as guarantor and as beneficiary for trading were $1,767,837 million and $1,815,728 million, respectively. The credit derivative receivable and payable for hedging were $626 million and $129 million, respectively, and the credit derivative receivable and payable for trading were $82,767 million and $84,165 million. The counterparty with the largest notional amounts was banks, and the type of credit derivative with the largest notional amounts was credit default swap.

Citigroup reports that the trading volume of credit derivatives boomed in 2007, experienced by both itself and the industry. It reports that "The volatility and liquidity challenges in the credit markets during the third and fourth quarters drove derivatives trading volumes as credit derivatives became the instrument of choice for managing credit risk." (P59) Most of the transactions were done with other financial intermediaries. It discloses detailed information

about this booming. "During 2007 the total notional amount of protection purchased and sold increased $906 billion and $824 billion, respectively, and by various market participants. The total market value increase of $69 billion for each protection purchased and sold was primarily due to an increase in volume growth of $63 billion and $62 billion, and market spread changes of $6 billion and $7 billion for protection purchased and sold, respectively. The Company expects to continue actively operating in the credit derivative markets." (P59)

As of December 31, 2007, 77% of Citigroup's gross receivables were with collateral agreements. Citigroup may call for additional collateral if its credit derivative counterparty's credit rating is downgraded. However, the master agreements with the monoline insurance counterparties are generally not collateralized, and only significant downgrade can terminate the contracts.

2008

As of December 31, 2008, the notional amounts of credit derivatives held by Citigroup as guarantor and as beneficiary were $1,443,280 million and $1,590,212 million, respectively. The credit derivative mark-to-market receivables as guarantor and as beneficiary were $5,890 million and $222,461 million, respectively. The credit derivative mark-to-market payables as guarantor and as beneficiary were $198,233 million and $5,476 million, respectively.

Citigroup discloses the market value and notional amounts by activity, by counterparties, and by instrument type. As of December 31, 2008, the notional amounts as guarantor and as beneficiary for hedging were $0 and $71,131 million, respectively. The notional amounts as guarantor and as beneficiary for trading were $1,443,280 million and $1,519,081 million, respectively. The credit derivative receivable and payable for hedging were $3,257 million and $15 million, respectively, and the credit derivative receivable and payable for trading were $225,094 million and $203,694 million. Similar to 2007, the counterparty with the largest notional amounts was banks, and the type of credit derivative with the largest notional amounts was credit default swap.

In 2008, Citigroup reduced its trading volumes. It reports that "The volatility and liquidity challenges in the credit markets during 2008 drove derivatives trading values higher, especially for the credit derivatives." (P93) Compared to December 31, 2007, the notional amounts of purchased and sold protections as of December 31, 2008 decreased by $317 billion and by $325

billion, respectively, but the fair value of purchased and sold protections increased by $145 billion and $119 billion, respectively, because of the widened general credit spreads.

As of December 31, 2008, 88% of Citigroup's gross receivables were with collateral agreements. Citigroup may call for additional collateral if its credit derivative counterparty's credit rating is downgraded.

2009

In the 2009 annual report, Citigroup moves some information about derivatives from "Derivative" section to "Note 24". As of December 31, 2009, the notional amounts of credit derivatives held by Citigroup as guarantor and as beneficiary were $1,214,053 million and $1,332,962 million, respectively. An interesting point in the 2009 annual report is that $6,981 million notional amount of credit protection purchased is considered as "Hedging instruments under ASC 815 (SFAS 133)". The credit derivative trading assets as guarantor and as beneficiary were $24,234 million and $68,558 million, respectively. The credit derivative trading liabilities as guarantor and as beneficiary were $58,262 million and $24,162 million, respectively.

This time, Citigroup does not separate the notional amounts or the MTM receivable/payable of credit derivatives for hedging from those for trading. However, it reports that about 50% and 30% of its credit derivative positions were at investment and non-investment grade, respectively, as of December 31, 2009. Again, the counterparty with the largest notional amounts was banks, and the type of credit derivative with the largest notional amounts was credit default swap.