

Collateralized debt obligations: A double edged sword of the U.S. financial system

Obligaciones de deuda colateralizadas: Una espada de dos filos del sistema financiero de Estados Unidos

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Abstract

This paper points out a design flaw in Collateralized Debt Obligation or CDO, one of the heavily traded financial instruments by investment banks. The paper suggests that financial design of CDO was not incentive compatible among the players involved in the production, marketing and investing in this instrument. In a CDO, the underlying debt holders (borrowers) have the incentive to default and mortgage service providers (lenders) have the incentive to go for foreclosure because the mortgage insurance providers end up paying for the loss. The biggest losers in this transaction are the mortgage protection sellers like the AIG (American International Group) or the Lehman Brothers and CDO equity holders.

Key words: Financial crisis, financial instruments, investment banks.

Resumen

Este trabajo señala una falla de diseño de las Obligaciones de Deuda Colateralizadas o ODC, uno de los instrumentos financieros más altamente comercializados por los bancos de inversión. El trabajo sugiere que el diseño financiero del ODC no era compatible desde el punto de vista de los incentivos entre los participantes en la producción, comercialización e inversión en este instrumento. En un ODC, los deudores tienen el incentivo de no pagar la deuda y los acreedores tienen el incentivo para liquidar el contrato ya que los proveedores del seguro sobre hipotecas terminan pagando la misma. Los grandes perdedores en este tipo de transacciones son los protectores de las hipotecas (proveedores de seguros sobre hipotecas) como AIG (American Internacional Group) o la firma Lehman Brothers y finalmente los tenedores de ODCs.

Palabras clave: Crisis financieras, instrumentos financieros, bancos de inversión.

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1. Introduction

Recent financial markets meltdown triggered by mortgage market collapse has brought about a seismic shift in the U.S. financial landscape. Some argue that creation and bursting of housing bubble through subprime mortgages is the cause of this crisis (Whalen, 2008; Mowat, 2008). Others argue that subprime market crisis just started the process, but the true cause of this crisis lies in large scale deregulation and lack of oversight of the financial markets in recent years (Mah-Hui Lim 2008). This paper adds to this discussion by pointing out a design flaw in Collateralized Debt Obligation or CDO, one of the heavily traded financial instruments by investment banks. This paper suggests that financial design of CDO was not incentive compatible among the players involved in the production, marketing and investing in this instrument. This created a moral hazard for certain players in the markets. Due to this design flaw, a trigger event like subprime mortgage default or foreclosure made the system unstable and shifted almost all risks associated with this derivative security upon one player in the CDO markets. This instability quickly spread and became one of the major causes for the breakdown of US financial markets.

This paper presents this moral hazard and its consequences in CDO markets in three sections. Section I provides a brief history and growth of CDO. Section II discusses basic principles and structures in CDO market. Section III analyses divergent incentives among the players involved in the market and points out the inherent moral hazard. Section IV concludes the paper.

2. Section I: Brief history and growth of CDO market

Securitization developed in the 1980s is one of the ways to transfer credit risk.¹ The first CDO² issued in 1987 by Drexel Burnham Lambert Inc. is an application of securitization. A typical CDO issues debt and equity and uses the money it raises to invest in a portfolio of fixed-income assets, such as corporate debt obligations or structured debt obligations.

It distributes the cash flows from its asset portfolio to the holders of its various liabilities according to the relative seniority of those liabilities. A decade later with the development of credit derivatives market,³ CDOs emerged as the fastest growing segment of the asset-backed synthetic securities market offering returns higher than comparable corporate bonds with the same credit rating. A growing number of asset managers and investors are major participants in the CDO market including commercial banks, investment banks, pension fund managers, insurance companies and mutual fund companies.

In 2000, David Li utilized a copula function approach to estimate default correlation within a pool of bonds. His computerized financial model estimated the likelihood that a given set of corporations would default on their bond debt (Li, 2000). This provided a widely accepted model for pricing CDOs and facilitated dramatic growth of the credit-derivatives markets including CDOs. According to the Securities Industry and Financial Markets Association (SIFMA, 2008), aggregate global CDO issuance totaled US\$ 157 billion in 2004, US\$ 272 billion in 2005, US\$ 552 billion in 2006 and US\$ 503 billion in 2007. According to Celent research and financial consulting firm (Celent, 2005) the CDO market has experienced an average annual growth rate of 150% since 1998. Celent had estimated that the overall CDO market represented over US\$1.5 trillion and by the end of 2006 would grow close to US\$2 trillion, 40% of the size of the \$4.9 trillion bond market.

These estimates clearly indicate that the CDO markets had expanded rapidly during the last five years until 2007. According to Nathan Lewis the market size for Credit Default Swaps (CDS⁴) began to grow rapidly from 2003, and by December 2007 it was approximately to a total notional amount of about \$45 trillion, ten times as large as it had been four years previously (Lewis, 2007). However, beginning 2008 CDO market share and value suffered steady decline. A large part of this decline is attributable to loss of value in CDS. In his latest data of March 2009, the Deutsche Bank managing director Athanassos Diplas reports that including loss from default and termination of contracts in 2008 the estimated market value of CDS had reduced to \$30 trillion.

The year 2009 indicates similar decline because of transformation of the CDS industry.

3. Section II: Basic principles, construction and structure of CDO market

Collateralized Debt Obligation (CDO) refers to a broad set of financial instruments that may include several different types of products. A typical CDO security can be backed by a diversified pool of one or more of the following debt obligations including High-yield Corporate bonds, Structured Financial Products (Mortgage backed & Asset backed Securities), Emerging market Bonds, Bank Loans or Special Situation Loans and Distress Debts. Investopedia defines CDO as an investment-grade security backed by a pool of bonds, loans and other assets (CDO, 2008). CDOs do not specialize in one type of debt but are often non-mortgage loans or bonds. CDOs are unique in that they represent different types of debt and credit risk. In the case of CDOs, these different types of debt are often referred to as 'tranches' or 'slices'. Each tranche or a bond class has a different maturity and risk associated with it. The higher the risk, the more the CDO pays.

When the underlying pool of debt obligations are bond instruments such as high yield corporate bonds,⁵ structured financial products, and emerging market bonds, a CDO is referred to as Collateralized Bond Obligation (CBO, 2009). A part of the underlying bonds within a CBO can be rated as junk bond; the CBO can still be an investment grade security. Because CBO pools bonds of different credit quality and their payoff are negatively correlated by design, it offers enough diversification to be "investment grade. When the underlying pool of debt obligations are bank loans as opposed to a bonds, a CDO is referred to as Collateralized Loan Obligation (CLO). Another version of a CDO is a Collateralized Mortgage Obligation (CMO) which is a type of mortgage-backed security that creates separate pools of pass-through securities for different classes of bonds, called tranches, with

varying maturities, risk characteristics and coupon rates. Tranches make CDOs more marketable because they are designed to suit the needs of the investors.

CDOs vary in structure and underlying assets, but the basic principle is the same. A CDO investor takes a position in an entity that has defined risk and reward, not directly in the underlying assets. Therefore, the investment is dependent on the quality of the metrics and assumptions used for defining the risk and reward of the tranches. Essentially the creator of a CDO is a corporate entity constructed to hold assets as collateral and to sell packages of cash flows to investors. The construction of a typical CDO can be described in three steps as follows:

3.1 Step 1

A special purpose vehicle (SPV) acquires a portfolio of fixed income assets. Some of the common assets include mortgage-backed securities, commercial real estate debt, and high-yield corporate loans. Typically, an investment bank often is the issuer of the CDO through SPV. The issuer earns a commission at the time of issue and earns management fees during the life of the CDO.

3.2 Step 2

The SPV issues different classes of bonds depending upon the need of the prospective buyers and equity. The proceeds are used to purchase the portfolio of credits. The bonds and equity are entitled to the cash flows from the portfolio of credits, in accordance with the Priority of Payments set forth in the transaction documents. The senior notes are paid from the cash flows before the junior notes and equity notes. In this way, losses are first borne by the equity notes, next by the junior notes, and finally by the senior notes. Hence, the senior notes, junior notes, and equity notes offer distinctly different combinations of risk and return, while each reference the same portfolio of debt securities. Here is an example

how a very simple CDO works. Suppose the investors in a CDO are divided up only into three bond classes (tranches) and equity. They are called either class A, B or C investors in which class A is the senior most class. Each class differs in the order it receives principal payments, but receives interest payments as long as it is not completely paid off. Class A investors are paid out principle first with prepayments and repayments until they are paid off. Then class B investors are paid off, followed by class C investors and the remaining goes to equity holders. In a situation like this, class A investors bear most of the prepayment risk, while class C investors bear the least.

3.3 Step 3

An investment in a CDO is therefore an investment in the cash flows of the assets rather than a direct investment in the underlying collateral. However if there is default, the loss of an investor's principal is applied in reverse order of seniority.⁶ The senior tranche is protected by the subordinated tranches and the equity tranche; thus, it is the most highly rated tranche (Tranche A in our example). The equity tranche⁷ is most vulnerable, and has to offer higher rewards to compensate for the higher risk. In our example the default risk is born the most by the equity holder class, and then by class C investors followed by class B and class A investors. It is possible that class B and class A investors may not have to bear any default risk at all depending upon when the default took place or by how much.

4. Structures of CDOs

The CDO family consists of cash CDOs and synthetic CDOs. They can be categorized in several ways. The primary classifications are based on: (a) source of funds, (b) motivation (c) proportion of funding and (d) Hybrid.

4.1 Source of funds: Cash flow CDO and market value CDO

Cash flow CDOs pay interest and principal to tranche holders using the cash flows produced by the CDO's assets (CFA Institute, 2008). The cash CDO is backed by pool of debt instruments which are purchased using proceeds from equity and sale of tranches. Cash CDOs involve a portfolio of cash assets, such as loans, corporate bonds, asset-backed securities or mortgage-backed securities. Ownership of the assets is transferred to the SPV issuing the CDO's tranches. The risk of loss on the assets is divided among tranches in reverse order of seniority. Cash flow CDOs focus primarily on managing the credit quality of the underlying portfolio. The motivation behind the cash CDO is either balance sheet driven or arbitrage driven.

Market value CDOs attempt to enhance investor returns through frequent trading and profitable sale of collateral assets. The CDO asset manager seeks to realize capital gains on the assets in the CDO's portfolio. There is greater focus on the changes in market value of the CDO's assets. Market value CDOs are longer-established, but less common than cash flow CDOs.

4.2 Motivation: Arbitrage and balance sheet

Arbitrage transactions (cash flow and market value) attempt to capture for equity investors the spread between the relatively high yielding assets and the lower yielding liabilities represented by the rated bonds. In other words, the motivation of the sponsor is to capture a spread between the return that is possible to realize on the collateral backing the CDO and the cost of borrowing funds to purchase the collateral. This cost would be the interest rate paid on the obligations issued. The return is the yield offered on the debt obligations in the underlying pool and the payments made to the various tranches in the structure. These are the largest parts of cash CDO sector.

Balance sheet transactions, by contrast, are primarily motivated by the issuing institutions' desire to remove loans and other assets from their balance sheets, to reduce their regulatory capital requirements

and improve their return on risk capital. Sponsors of balance sheet transactions are typically financial institutions such as banks seeking to reduce their capital requirements by removing loans due to their higher risk based capital requirements.

4.3 Proportion of funding: Cash CDO and synthetic CDO

Synthetic CDOs, also known as collateralized synthetic obligations (CSOs), do not own cash assets like bonds or loans. In synthetic CDO the investor has the economic exposure (risk and rewards) to a pool of debt instruments but this exposure is realized via a credit derivative instrument rather than the purchase of the cash market instrument (CFA Institute 2008). Thus the CDO debt holders do not legally own the underlying pool of asset on which they have risk exposure and that is why they are called synthetic. The underlying asset can be a bond market index such as high-yield bond index or a mortgage index or even a portfolio of corporate loans owned by a bank. The reference asset serves as the basis for a contingent payment and is realized through a credit derivative instrument called Credit Default Swap (CDS). As the name suggests this credit derivative instrument, is used to protect against credit risk or default.

The credit default swap is conceptually similar to an insurance policy though many people argue it is not insurance. Whatever may be the debate, the mechanism works like this. There is a "Protection Buyer" who purchases protection against credit risk on the reference asset. In a synthetic CDO, the insurance (protection against default) buyer is the asset manager who pays a periodic fee and receives, in return, payment from the protection seller in the event of default affecting any asset included in the reference asset. The protection seller is the SPV on behalf of junior note or equity holders (CFA Institute, 2008).

A part of the US mortgage finance can be thought of an example of this mechanism. In a typical mortgage loan, a prospective homeowner borrows money from a bank to purchase a house. The house serves as collateral for the mortgage. The lender requires borrowers to purchase

homeowners' insurance to protect the lender from losses associated with fire, flood or other accidents. In addition to protection against natural disasters whenever a loan amount exceeds more than 80% of the home value, the lender also requires borrowers to purchase private mortgage insurance (PMI) against losses associated with default that may occur when a borrower becomes unable to make mortgage payments due to unemployment, divorce or death. In case of default, the lender possesses the right to foreclose on the property and sell the house to recoup investment. At the time of sale, if the value of the house is less than the outstanding balance on the mortgage, the seller of PMI pays the difference to the bank.

This PMI is comparable to a credit default swap whose seller is the SPV that was created to sell this PMI and the buyer of that credit default swap is the bank who passes on the cost of PMI to the home borrower in terms of higher mortgages. In this case, the SPV does not own the loan (which is owned by the bank), but is exposed to the credit risk of that loan. For that exposure, the SPV is receiving the monthly payment from the bank equal to the amount of PMI. The bank benefits by reduced risk on that loan and can remove that loan from its balance sheet and thus reducing its regulatory capital requirement against that loan. From where does the SPV get money to meet that loss amount from default? For that it issues CDO tranches to investors.

Similar to cash CDO, the risk of losses on the CDO's portfolio is divided into tranches. Losses will first affect the equity tranche, next the mezzanine tranches, and finally the senior tranche. Each tranche receives a periodic payment (the swap premium), with the junior tranches receiving higher premiums. A synthetic CDO tranche may be either funded or unfunded. Under the swap agreements, the CDO would have to pay up to a certain amount of money in the event of a credit event on the reference obligations in the CDO's reference portfolio. Some of this credit exposure is funded at the time of investment by the investors in funded tranches. Typically, the junior tranches that face the greatest risk of experiencing a loss have to fund at closing. Until a credit event occurs, the proceeds provided by the funded tranches are often invested

in high-quality, liquid assets or placed in a Guaranteed Investment Contract (GIC) account that offers a return that is a few basis points below *London Interbank Offered Rate* (LIBOR).¹⁰

The return from these investments plus the premium from the swap counter party provide the cash flow stream to pay interest to the funded tranches. The Buyer purchases a credit default swap at time t_0 and makes regular premium payments at times t_1 , t_2 , t_3 , and t_4 . If the associated credit instrument suffers no credit event, then the buyer continues paying premiums at t_5 , t_6 and so on until the end of the contract at time tn . However, if the associated credit instrument suffered a credit event at t_5 , then the protection seller pays the buyer for the loss, and the buyer would cease paying premiums.

Let us consider another example where an investor buys a CDS from ABC Bank where the reference entity is XYZ Corp. The investor will make regular payments to ABC Bank, and if XYZ Corp defaults on its debt (i.e., misses a coupon payment or does not repay it), the investor will receive a one-off payment from ABC Bank and the CDS contract is terminated. If the investor actually owns XYZ Corp debt, the CDS can be thought of as hedging. But investors can also buy CDS contracts referencing XYZ Corp debt, without actually owning any XYZ Corp debt. This may be done for speculative purposes, to bet against the solvency of XYZ Corp in a gamble to make money if it fails, or to hedge investments in other companies whose fortunes are expected to be similar to those of XYZ.

If the reference entity (XYZ Corp) defaults, one of two forms of settlement can take place –physical settlement and cash settlement. In a physical settlement, the investor delivers a defaulted asset to ABC Bank for a payment of the par value. In case of a cash settlement, the ABC Bank pays the investor the difference between the par value and the market price of a specified debt obligation (even if XYZ Corp defaults, there is usually some *recovery*; i.e., not all your money would be lost.)

When a credit event occurs and a payout to the swap counter party is required, the required payment is made from the GIC or reserve account that holds the liquid investments. In contrast, senior tranches

are usually unfunded since the risk of loss is much lower. Unlike cash CDO, investors in a senior tranche receive periodic payments but do not place any capital in the CDO when entering into the investment. Instead, the investors retain continuing funding exposure and may have to make a payment to the CDO in the event the portfolio's losses reach the senior tranche. Funded synthetic issuance exceeded \$80 billion in 2006. From an issuance perspective, synthetic CDOs take less time to create. Cash assets do not have to be purchased and managed, and the CDO's tranches can be precisely structured.

The new issue pipeline for CDOs backed by asset-backed and mortgage-backed securities slowed significantly in the second-half of 2007 and the first quarter of 2008 due to weakness in subprime collateral, the resulting re-evaluation by the market of pricing of CDOs backed by mortgage bonds, and a general downturn in the global credit markets. According to Security Industry and Financial Markets Association (SIFMA, 2008), global CDO issuance in the fourth quarter of 2007 was US\$ 47.5 billion, a nearly 74 percent decline from the US\$ 180 billion issued in the fourth quarter of 2006. First quarter 2008 issuance of US\$ 11.7 billion was nearly 94 percent lower than the US\$ 186 billion issued in the first quarter of 2007. Moreover, virtually all first quarter 2008 CDO issuance was in the form of collateralized loan obligations backed by middle-market or leveraged bank loans, not by home mortgage ABS (Aubin, 2008).

4.4 Hybrid CDOs

Hybrid CDOs are intermediate instruments between cash CDOs and synthetic CDOs. The portfolio of a hybrid CDO includes both cash assets as well as swaps that give the CDO credit exposure to additional assets. A portion of the proceeds from the funded tranches is invested in cash assets and the remainder is held in reserve to cover payments that may be required under the credit default swaps. The CDO receives payments from three sources: the return from the cash assets, the GIC or reserve account investments, and the CDS premiums.

5. Section III: Divergent incentives among players in the CDO market and inherent moral hazard

5.1 Investors' incentive

Investors have different motivations for purchasing CDO securities depending on which tranche they select. At the more senior levels of debt, investors are able to obtain better yields than those that are available on more traditional securities of a similar rating. In some cases, investors utilize leverage and hope to profit from the excess of the spread offered by the senior tranche and their cost of borrowing. This is because senior tranches pay a spread above LIBOR despite their AAA-ratings. Investors also benefit from the diversification of the CDO portfolio, the expertise of the asset manager, and the credit support built into the transaction. Investors include banks and insurance companies as well as investment funds.

Junior tranche investors achieve a leveraged, non-recourse investment in the underlying diversified collateral portfolio. Mezzanine notes and equity notes offer yields that are not available in most other fixed income securities. Investors include hedge funds, banks, and wealthy individuals.

5.2 Underwriters' incentive

The underwriter, typically an investment bank, acts to structure and arrange the CDO. Working with the asset management firm that selects the CDO's portfolio, the underwriter structures debt and equity tranches. This includes selecting the debt-to-equity ratio, sizing each tranche, establishing coverage and collateral quality tests, and working with the credit rating agencies to gain the desired ratings for each debt tranche.

The key economic consideration for an underwriter that is considering bringing a new deal to market is whether the transaction can offer a sufficient return to the equity note holders. Such a determination requires estimating the after-default net of management fees return offered by the portfolio of debt securities and comparing it to the cost of

funding the CDO's rated notes. The excess spread must be large enough to offer the potential of attractive returns to the equity holders.

The underwriters place the tranches with investors. The priority in placement is finding investors for the risky equity tranche and junior debt tranches of the CDO. It is common for the asset manager to retain a piece of the equity tranche. In addition, the underwriters are generally expected to provide some type of secondary market liquidity for the CDO, especially its more senior tranches.

According to Thomson Financial (Thomson Financial, 2009), the top underwriters before September 2008 were Bear Stearns, Merrill Lynch, Wachovia, Citigroup, Deutsche Bank, and Bank of America Securities. CDOs are more profitable for underwriters than conventional bond underwriting due to the complexity involved. The underwriter is paid a fee when the CDO is issued.

5.3 Asset managers' incentive

The asset manager plays a key role in each CDO transaction, even after the CDO is issued. An experienced manager is critical in both the construction and maintenance of the CDO's portfolio. The manager can maintain the credit quality of a CDO's portfolio through trades as well as maximize recovery rates when defaults on the underlying assets occur.

The asset manager's role begins before the CDO is issued. Months before a CDO is issued, a bank will usually provide financing to enable the manager to purchase some of the collateral assets that may be used in the forthcoming CDO in a process called warehousing. Even by the issuance date, the asset manager often will not have completed the construction of the CDO's portfolio. A "ramp-up" period following issuance during which the remaining assets are purchased can extend for several months after the CDO is issued. For this reason, some senior CDO notes are structured as delayed drawdown notes, allowing the asset manager to drawdown cash from investors as collateral purchases are made. A transaction is fully ramped when its initial portfolio of credits has been selected by the asset manager.

However, the asset manager's role continues even after the ramp-up period ends, albeit in a less active role. During the CDO's "reinvestment period", which usually extends several years past the issuance date of the CDO, the asset manager is authorized to reinvest principal proceeds by purchasing additional debt securities. Within the confines of the trading restrictions specified in the CDO's transaction documents, the asset manager can also make trades to maintain the credit quality of the CDO's portfolio. The manager also has a role in the redemption of a CDO's notes by auction call.

The manager's prominent role throughout the life of a CDO underscores the importance of the manager and his or her staff. Asset Managers make money by virtue of the senior fee (which is paid before any of the CDO investors are paid) and subordinated fee as well as any equity investment the manager has in the CDO, making CDOs a lucrative business for asset managers.

5.4 Incentive structure in synthetic CDOs

The synthetic CDO can be of two kinds: synthetic balance sheet CDO and synthetic arbitrage CDO. In the synthetic balance sheet CDO a credit default swap is embedded within a CDO structure. A bank can shed the credit risk of a portfolio of bank loans without having to notify any borrowers that they are selling the loans to another party, a requirement in some countries (CFA Institute, 2008). No consent is needed from borrowers to transfer the credit risk of the loans, as is effectively done in credit default swaps. This is the reason the synthetic balance sheet CDOs were initially set up to accommodate European bank balance sheet deals.

Creating CDOs from other CDOs creates enormous problems for accounting. This is because CDO allows large financial institutions to move debt off their books by pooling their debt with other financial institutions and then bringing these debts back on to their books calling it a Synthetic CDO asset. This has the potential for financial institutions to hide their losses and inflate their earnings.

The synthetic arbitrage CDO has several economic advantages over cash CDO. First it is not necessary to obtain funding for the senior section, thus making it easier to do a CDO transaction. Second the ramp up period is shorter than for a cash CDO structure since only the high quality assets need to be assembled, not all of the assets contained in the reference asset. Finally there are opportunities in the market to be able to effectively acquire the assets included in the reference asset via a credit default swap at a cheaper cost than buying the asset directly. Because of these reasons the issuance of synthetic CDOs has increased dramatically and faster than Cash CDO since 2001.

5.5 Incentive incompatibility and moral hazard in CDO market

Any insurance or similar kind of protection brings forth the problem of moral hazard for different stake holders i.e. the insured people behave differently than non-insured people. Let's take the example of US prime mortgage crisis and how credit default swaps helped explode that crisis. The parties involved in such synthetic CDO were: 1. the final borrowers who took loans from financial institutions and purchased the houses, 2. the lenders *i.e.* the banks or financial institutions who ensured that borrowers meet the underwriting standards of Fannie Mae, Ginni Mae or Freddie Mac so that they could sell these loans to those institutions, and finally 3. the protection sellers. If the borrowers purchased protection from protection sellers, the credit rating of borrower was enhanced for that loan and the borrower became eligible for 100% loan of property value at concessional interest rates. This 100% loan amount also included the closing costs (around 3%) on purchase of residential houses apart from the actual cost of houses that went to the seller. Thus the loan amount was already 3% more than the market value of the house.

The borrower ended up borrowing without any down payment up to the limit set by underwriters in the hope that he/she would own the house with no money in pocket and live comfortably by paying the mortgage which was almost equal to rent if tax benefits were taken into account. The appreciation of the house would be the additional bonus for the borrower. Thus the borrower had the moral hazard of borrowing up

to the maximum available even though it was not possible to serve that loan in the long run. The lender did not care much for the risk of default by the borrower because the borrower had agreed to purchase private mortgage insurance (PMI, the credit default swap) which guaranteed the lender to compensate for the loss in case of default by the borrower and lender going for foreclosure. In fact it was the lender who managed from whom to buy PMI. The protection seller did not care much for the default issue because it was housing loan and hoped that there would not be many foreclosures because Americans would like to save their homes from foreclosures. Also even if the foreclosures happened, there will not be any big losses because at least the value of the property would go up with the passage of time and could be easily sold. The house prices kept on rising because of easy loans, second mortgages and the provision of 100% loans covering closing costs or in extreme cases even more than 100% loans, all of which made new borrowers and homeowners overnight. These borrowers did not even need to have any savings from before. All they needed was a fair credit score, a job to show two pay stubs or a Master degree. Often the price of the house was decided by the available loan amount as the negotiations could change prices by as much as 20% of the initially offered home sale price.

Thus everybody had the vested interest of taking excessive risks which helped CDOs to bubble out. The borrowers got the house practically at no cost because the mortgage was equivalent to rent, the lenders issued the secured loans, and the credit default sellers got regular premiums with little perceived risk. The bubble burst when the credit crisis initiated and the system of 100% or more than 100% of home value loans were stopped. The refinancing became more difficult. The prices of houses began to fall because there were no new 100% loans to purchase the new houses. This gave incentive to the borrowers to default and go for foreclosures so that they could live in their houses without paying any rent for a year or so. In USA it takes on an average more than a year for a lender to get legal title to evict a borrower. The lenders had/have the moral hazard of going for foreclosure because they had/have forced the borrower to buy protection for them and the protection seller was/is obligated to compensate for the loss. Soon the assets of protection

sellers began to vanish quickly. For example AIG (a protection seller) alone lost \$61.7 billion during just last three months of the year 2008 (BBC News, March 2, 2009). Lehman Brothers got bankrupt.

Above discussion suggests that borrowers with falling home prices had/have the incentive (moral hazard) to default because the protection sellers would pay for the loss of foreclosures to the lenders hence save the borrowers from prosecution by lenders. The lenders had/have the incentive to go for foreclosures because any loss on account of foreclosures would be compensated by the protection sellers. Moral hazard occurs because the essential feature of all credit default swaps (CDO) is that they transfer wealth from one financial institution to another in a zero sum game. The loss of protection sellers is the gain to protection buyers and vice versa. The only losers from moral hazard in this mortgage crisis after it started are the protection sellers like the AIG (American International Group) or the Lehman Brothers. Earlier they were enjoying the free lunch in terms of PMI paid by the borrowers. Since the protection sellers are the only sufferers of moral hazard in the current game which got triggered by foreclosures, they need to find the solution which would change the incentives of the game so that they do not remain the only losers and the problem of moral hazard of other parties is removed. In our view, the solution is to prevent foreclosures by providing emergency credit to defaulting home owners.

Since the cause of the current financial crisis in USA started with restricted credit to potential home buyers and existing home owners, it eventually resulted in falling home prices and foreclosures. This spiral caused and further got fuelled by recession resulting in further restrictions on credit. The issue of spiraling credit crisis gave birth to moral hazard to those home owners and financial institutions which were likely to benefit from this crisis. Initially with reduced availability of finance, the borrowers did not have the ability to meet their debt obligations by refinancing new loans at lower rates than initial ones when the credit standard tightened because of few defaults. This tightening of credit adversely affected other borrowers' ability also to keep servicing their mortgages. Once borrowers defaulted, their credit score went down which further reduced their available credit forcing them to default further on

their mortgages. Along with this, the lenders had the incentive to go for foreclosures at the slightest evidence of default rather than renegotiate with the defaulters because credit default swaps which the lenders had made borrowers to purchase for them before sanctioning loans, enabled the lenders to get compensated for their losses by the protection sellers.

6. Conclusion

We therefore conclude that if the protection sellers somehow stop default of mortgage at the first instance, the problem would not start or be solved in time if already started. This is possible if the protection sellers closely monitor defaulting borrowers and start giving them emergency loans at the same or even higher interest rates if they fall behind in their mortgage payments. The dollar amount of these loans would be anyway less than the dollar amount of loss that happens to the protection sellers on foreclosures because foreclosed homes would be sold at whatever price would be available in a falling housing market and the differential loss would be recovered by the lenders from the protection sellers. Once the borrowers' financial situations improve, the protection sellers would start recovering the loans. Also these loans would be recoverable assets for the protection sellers while payment for default swaps would be the non-recoverable losses. Hence the value of stocks of these protection sellers may not go down if emergency loans are provided to defaulting home owners and thus financial crisis get averted. The borrowers too would love this availability of loans during the period of financial crunch; because it would save their credit history and the potential financial distress occurring from bad credit scores because of mortgage defaults. Since loans have positive present values borrowers initially want to save their credit history. But once their credit history gets spoiled and they are no longer able to take new loans or refinance existing loans at lower interest rates, they get the moral hazard of benefitting by not paying existing loans. On account of these reasons we believe this solution would save the entire USA from financial crisis as it will not let mortgage crisis to start or to expand to other sectors if it somehow started. This would

also prevent home prices from falling because of excessive foreclosures and help alleviate the recessionary pressure. Ultimately the credit crisis would stabilize, the housing prices would stabilize and the moral hazard issue too would be solved. The moral hazard is currently high because it is happening on a large scale.

7. Notes

- 1 Credit risk is the risk that a debt instrument will decline in value as a result of borrower's inability (real or perceived) to satisfy the contractual terms of its borrowing arrangement. In the case of corporate debt obligations, credit risk may include default risk, credit spread, and rating downgrade.
- 2 For more details see CDO (2008).
- 3 Credit derivatives are intended to make bond markets more liquid and efficient by allowing risk to be transferred to those most willing to bear it.
- 4 Synthetic CDO uses CDS as a reference asset. For basic structure and operation of CDS see CFA Institute (2008) and CDS (2009).
- 5 Also known as junk bond. A typical junk bond is a low credit quality security with rating below BB.
- 6 Losses applied to from the highest credit risk tranches to the lowest.
- 7 Also known as the first-loss tranche or toxic waste!
- 8 London Interbank Offered Rate LIBOR is an interest rate at which banks can borrow funds from other banks in the London interbank market. The LIBOR is fixed on a daily basis by the British Bankers' Association.

8. References

Aubin, D. (2008, April 9). CDO Deals Resurface but Down 90 pct in Q1 Report. *Reuter News*. Retrieved from <http://uk.reuters.com/article/marketsNewsUS/idUKN0947372020080409>

- BBC News. (2009) Retrieved on March 2, 2009 from <http://news.bbc.co.uk/1/hi/business/7918643.stm>
- CBO. (2009). In *Investopedia*. Retrieved February 2, 2009, from <http://www.investopedia.com/terms/c/cbo.asp>
- CDO. (2008). In *Wikipedia*. Retrieved December 1, 2008, from http://en.wikipedia.org/wiki/collateralized_debt_obligation
- CDS. (2009). In *Wikipedia*. Retrieved January 7, 2009, from http://en.wikipedia.org/wiki/credit_default_swap
- Celent. (2005). Collateralized Debt Obligation Market (Celent Press Release) Paris. Retrieved from <http://www.celent.com/PressReleases/20051031/CDOMarket.htm>
- Lewis. N (2007). Meanwhile in the Derivative Market. Retrieved from http://en.wikipedia.org/wiki/Credit_default_swap
- Athanasos Diplas. (2009). Worries remain even after CDS clean-up. Retrieved from http://en.wikipedia.org/wiki/Credit_default_swap
- CFA Institute (2008). *Fixed Income Securities, Level II*. Pearson Custom Publishing.
- Li, D.X. (2000). "On Default Correlation: A Copula Function Approach". *Journal of Fixed Income*, 9(4), 43-54.
- Lim, M. M. (2008). "Old Wine in a New Bottle: Subprime Mortgage Crisis-Causes and Consequences". Levy Economics Institute, working paper number 532.
- Murphy, A. (2008). "An Analysis of the Financial Crisis of 2008: Causes and Solutions". Social Science Research Network, working paper.
- Mowat, L. A. (2009). *The Causes and Consequences of the Subprime Mortgage Crisis*. Thesis. Mount Saint Mary College, Newburgh, NY
- SIFMA. (2008). Security Industry and Financial Markets Association (Global CDO Market Issuance Data. Source: Thompson Financial). Retrieved from http://www.sifma.org/research/pdf/SIFMA_CDOIssuanceData2008q2.pdf
- Thomson Financial. (2009). In *Wikipedia*. Retrieved January 17, 2009, from http://en.wikipedia.org/wiki/Thomson_Financial
- Whalen, C. R. (2008) The Subprime Crisis: Cause, Effect and Consequences. Networks Financial Institute Policy Brief No. 2008-PB-04. Retrieved from SSRN: <http://ssrn.com/abstract=1113888>

Collateralized Debt Obligations (CDO): the underlying assets can be any kind of debt (bonds, mortgages, even other ABS). Always has multiple tranches with different priority of payments. An MBS with a CDO-like structure is called a CMO (collateralized mortgage obligation). There is a big difference in the typical purpose of CMOs vs other CDOs though: CDOs are mainly about apportioning credit risk -- the low-priority tranches buffer the high-priority tranches from the risk that some underlying credits will default. CMOs, on the other hand, are largely. A collateralized debt obligation (CDO) is a complex financial product backed by a pool of loans and other assets and sold to institutional investors. CDOs are called "collateralized" because the promised repayments of the underlying assets are the collateral that gives the CDOs their value. Other types of CDOs include collateralized bond obligations (CBOs) "investment-grade bonds that are backed by a pool of high-yield but lower-rated bonds, and collateralized loan obligations (CLOs)" "single securities that are backed by a pool of debt, that often contain corporate loans with a low credit rating. How Are CDOs Structured? A Collateralized Debt Obligation (CDO) is a synthetic investment product that represents different loans bundled together and sold by the lender in the market. The holder of the collateralized debt obligation can, in theory, collect the borrowed amount from the original borrower at the end of the loan period. The holder of the collateralized debt obligation can, in theory, collect the borrowed amount from the original borrower at the end of the loan period. A collateralized debt obligation is a type of derivative security because its price (at least notionally) depends on the price of some other asset. Structure of a Collateralized Debt Obligation. A mortgage-backed CDO was considered a very safe investment instrument prior to the 2008 financial crisis. The paper suggests that financial design of CDO was not incentive compatible among the players involved in the production, marketing and investing in this instrument. In a CDO, the underlying debt holders (borrowers) have the incentive to default and mortgage service providers (lenders) have the incentive to go for foreclosure because the mortgage insurance providers end up paying for the loss. Alakh Niranjan Singh & AKM Rezaul Hossain, 2009. "Collateralized debt obligations: A double edged sword of the U.S. financial system," *Economía*, Instituto de Investigaciones Económicas y Sociales (IIES). Facultad de Ciencias Económicas y Sociales. Universidad de Los Andes.