Unethical misuse of derivatives and market volatility around the global financial crisis

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ABSTRACT

In this paper, we examine unethical misuse of three derivative securities of mortgage-backed securities (MBS), credit default swap (CDS), and collateralized debt obligations (CDO) to understand the cause of the global financial crisis. We then gauge their effects on market volatility based on how past major events affected swings in the volatility index (VIX). Additionally, we examine how the unethical misuse of these securities and their effects on market volatility contributed to the global financial crisis.

Keywords: Global financial crisis, derivative securities, market volatility

INTRODUCTION

This paper examines a complex usage of derivative securities that has led to the global financial crisis, while the subprime mortgage boom certainly had a major impact. Understanding the causes of the global financial crisis is essential for all market participants. Specifically, we examine the causes of the current global financial crisis based upon three derivative securities of mortgage-backed securities (MBS), collateralized debt obligations (CDO), and credit default swap (CDS), and evaluate their effects on market volatility.

The root of the global financial crisis of 2008 really begins with the stock market, or dot-com bubble, and the confidence crisis resulting from the September 11, 2001 attacks on the World Trade Center, although the bursting housing bubble is a direct cause behind the crisis. In the wake of these events, Alan Greenspan, then chair of the Federal Reserve, lowered the federal funds target rate drastically as shown in Figure 1. According to the Federal Reserve, the federal funds rate is the interest rate at which depository institutions lend balances at the Federal Reserve to other depository institutions overnight. Furthermore, the combination of low interest rates and easier leverage in a loose lending environment led investors to look for a new asset class through housing market and securitization process.

Paul Krugman (2009), the recipient of the 2008 Nobel Prize in Economics, defines a bank as: "…the essential feature of banking is the way it promises ready access to cash for those who place money in its care, even while investing most of that money in assets that can't be liquidated on a moment's notice. Any institution or arrangement that does this is a bank, whether or not it lives in a big marble building." This definition of a bank is crucial because hedge funds, insurance companies, and investment banks held investors' money and returned it on demand but were not insured by the FDIC. They are, therefore, called non-bank banks or shadow banks.

Those shadow banks use substantial derivative securities, such as mortgage-backed securities (MBS), collateralized debt obligations (CDO), and credit default swap (CDS) that resulted in abruptly high market volatility, consequently followed by market collapse leading to global financial crisis.

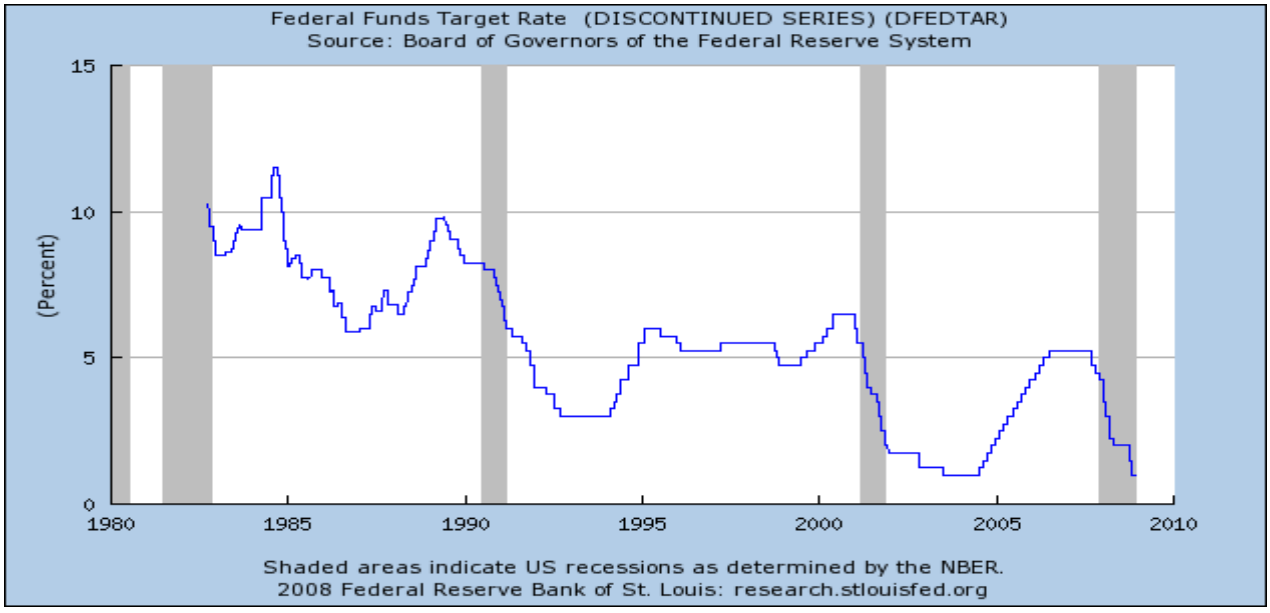
MORTGAGE-BACKED SECURITIES

Structured mortgage-backed securities (MBS), such as collateralized mortgage obligations (CMOs) interest only or principal-only STRIPs, are a type of asset-backed securities, which derive their value from an underlying pool of assets. The cash flows from those assets are allocated to render certain prepayment and maturity profiles (Jaeger, 2008). The mortgage collateral, which CMO bonds are issued against, can be agency pass-through pools, whole loans, or classes from other CMO deals (e.g. CDO squared deals in the corporate space). The majority of the collateral is mortgages on residential and commercial buildings.

The purchase and sale of home mortgages began when Federal National Mortgage Associate (FNMA, hereafter Fannie Mae) was charted in 1938. Fannie Mae finances the purchase of mortgages through the sale of its own short-term notes and long-term debentures, which, up until 2008, were effectively backed by the general creditworthiness and reputation of Fannie Mae. As Congress continued taking measures to increase housing opportunities, particularly for low-income families, Fannie Mae and similar government-sponsored enterprises became the primary originators of subprime mortgages, as well as the largest issuers of securities backed by subprime mortgages. Other institutions began to mirror this activity—issuing debt to

finance subprime lending and the securitization of pools of mortgages that included subprime mortgages. Because government-sponsored agencies like Fannie Mae were issuing so many homogenous mortgage-backed securities, a vast market for trading in MBS securities in the primary and secondary markets was created. Investment banks, as well as foreign banks, provided the majority of the market for mortgage-backed securities. Investment banks, for example, would underwrite these securities and sell them in the secondary market to other buyers, like hedge funds and foreign institutions. Until default rates on the underlying mortgages began increasing and the value of the securities decreased, the secondary market for mortgage-backed securities was large enough to make them highly liquid.

FIGURE 1: FEDERAL FUNDS TARGET RATE



Economic Role in the Capital Markets: MBS securities play an important role in the capital markets as a result of their many benefits for investors. These benefits include the diversification of idiosyncratic risk of individual mortgages. The most significant benefit of MBS securities is their role in allowing hedge fund managers, for example, to make strategic allocations that explicitly diversify across economic functions and their corresponding risk premia, which are related to various functions financial markets have in the global economy (Jaeger, 2008: 138). One of the most important economic functions for the capital markets is risk transfer for financial intermediaries, such as banks and insurance companies, which have a need to design their overall risk exposure flexibly and transfer undesired risks to other agents. This is what allowed many banks to take on more risk and make more loans, circumventing capital requirements. In addition, the use of structured derivative securities contributes to the notion of market completeness, providing hedgers and investors with specialized return profiles. For example, the market for derivative contracts creates a wide range of risk/return profiles for investors, including nonlinear risk profiles not found elsewhere. Completing the market can be seen as a specialized form of risk transfer.

Investment Banks and Credit Rating Agencies: Investment banks played a key role in the packaging of subprime mortgages into securities that were subsequently sold to institutions such as hedge funds and pension funds. Problems began to surface as investment banks increased underwriting and securitizing activity for mortgage-backed securities. In this area, the bulk of sales were made to hedge funds, pension funds, and similar foreign institutions that also included foreign banks. Since the creditworthiness of the securities had not adequately been reflected by institutions like Standard and Poor's, Moody's and Fitch Ratings, mortgage-backed securities were sold at a premium. In fact, many investors have filed suits against those specific credit rating agencies, citing that their failure to either evaluate or accurately disclose the creditworthiness of derivative securities, such as MBS securities.

One key example is the minimum "A" rating given to Lehman Brothers Holdings Inc. by Standard and Poor's, Moody's, and Fitch Rating prior to September 15, when the investment bank declared bankruptcy (Evans and Salas, 2009). In addition, regulatory commissions, such as the Securities and Exchange Commission, have subpoenaed information from such credit rating agencies. These events have brought into question the reliance of the financial system on rating agencies. State regulators depend on credit agencies when monitoring the health of $450 billion of bonds held by U.S. insurance companies, including American International Group (AIG), which has come under majority government ownership after multiple rounds of government bailout financing. Furthermore, market participants have highlighted agency problems at rating agencies, making conflicts of interest relating to fees a focus. Since the default rates have increased and prices have slumped as these institutions sell assets to bolster capital, declining debt values have forced funds to unload securities, and tighter lending has prompted bond buyers to seek lower purchase prices (Shenn, 2008). The effects of this news caused turbulence in the financial markets, in the form of record volatility levels.

Convertible Arbitrage of Hedge Funds: The use of derivatives for both hedging and speculation is common practice in the hedge fund industry. Many hedge funds, for example, utilize convertible arbitrage strategies, which involve taking advantage of pricing inefficiencies of convertible securities, which are the equivalent of holding a bond position and an option on some underlying stock. According to Tremont Advisors, convertible arbitrage total market value grew from $768 million in 1994 to $25.6 billion in 2002 (Hutchinson and Gallagher, 2005). The strategy involves purchasing the convertible security, while shorting the underlying shares for which the security has an option, effectively taking advantage of pricing disparities between the two. The relative price movements occur when the credit profile of the company changes, the market changes its perception of the said credit, the market or the market premium paid for a given level of credit risk changes (Jaeger, 2008); there is a shift in the volatility of the underlying equity or the market premium paid for a given level of volatility changes; and interest rate movements change market yield requirements (Jaeger, 2008).

In many cases, hedge funds utilize quantitative models to execute "gamma trading" strategies, which means taking a long volatility (referring to volatility of the underlying stock) exposure. In addition to equity risk, hedge fund managers executing convertible arbitrage strategies must hedge other risks, including credit risk and interest rate risk. This is done through credit derivatives (e.g. credit default swaps) and fixed income derivatives, such as interest futures and options for duration risk. This is particularly important in the case of convertible arbitrage managers, since they often utilize substantial leverage, ranging from 1:1 to 5:1.

There is some evidence to support the success, and therefore increased use, of convertible arbitrage strategies during the turbulent markets, beginning in 2007. According to Hutchinson and Gallagher (2005), there is a negative correlation between convertible arbitrage returns and equity market returns in extreme up markets, when the equity risk premium is more than two and half standard deviations from its mean. This negative correlation is explained by the long volatility nature of convertible bond arbitrage, where in extreme up markets implied volatility generally decreases having a negative effect on portfolio returns. Because the market went into a strong downturn and financial stress caused sizeable swings in market volatility, convertible arbitrage has seen some success in 2008. Hedge funds, like the Alexandria Global Investment Fund, have benefited from utilizing convertible arbitrage strategies, despite substantially wider credit spreads. With the growth of the hedge fund industry, as well as the convertible arbitrage market value, and the growing body of research supporting the non-directional strategy, it can be deduced that hedge funds, especially those looking to hedge various types of risks (e.g. credit risk and interest rate) are heavy users of derivative securities, such as credit default swaps and asset-backed securities.

CREDIT DEFAULT SWAPS

Credit default swaps (CDSs) were put into place about ten years ago to give bondholders a way to protect themselves against borrower defaults. CDSs are derivative contracts between two parties in which the buyer makes periodic payments to the seller. If the underlying financial instrument—a bond or a loan—defaults, the buyer, who does not necessarily have to own the underlying credit instrument, receives a payment. Essentially, CDSs can be said to work like options; they resemble put options on the underlying bonds, and CDS terminology (buyer, seller, writer) is very similar to that of options (Western Asset, 2009). Credit default swaps allow investors to speculate about a company's prospects, to hedge against possible defaults by the sellers of the debt securities they own, or to transfer the risk of a company or bond default to others.

Credit default swaps are also used among Capital Structure Arbitrage (CSA) hedge funds. Examples of trades that involve CDS contracts are: (1) going short on a CDS by selling "insurance" and buying a put on the stock, and (2) buying "insurance and going long on a CDS while going short on a put on the stock. Capital Structure Arbitrage works based off a derived relationship between the issuer's CDS rate and the volatility of the company's equity. CSA offers inherent returns, but such returns are usually risk premia, rather than results of pricing inefficiencies (Jaeger, 2008).

Synthetic collateralized debt obligations also utilize CDSs. Instead of owning assets like bonds and loans, synthetics CDOs acquire credit exposure to such assets through CDSs (Harrington, 2008). The CDO (the credit protection seller) would receive premia in regular cash payments in exchange for assuming the risk.

Credit default swaps were used to encourage investors to put money into ventures in emerging markets, like Latin American and Russia, because they insured the debt from those countries. In the United States during the housing boom, CDSs were taken out to insure many mortgage-backed securities (Philips, 2008).

Issues with CDS markets: Originally intended for making the hedging of corporate bonds easier, speculators who did not actually own bonds—in other words, speculators who had

uncovered or "naked" CDS contracts—ended up dominating the market (Morgenson, 2008). As the amount of debt defaults rose, companies who issued CDS contracts, such as American Insurance Group (AIG), found themselves short on the funds necessary to pay investors back. Aggravating matters further, credit default swap markets were virtually unregulated; transactions did not have to pass through a central clearinghouse. No one could be sure of the value of a CDS contract.

Additionally, issuers of CDS contracts, such as AIG, tended to treat CDS contracts like regular insurance policies (Philips, 2008). The problem here was that regular insurance, such as car insurance, does not assume a correlation between one incident and the increased likelihood of another—one car crash does not necessarily increase the chances of the occurrence of another. With bonds, however, one default leads to nervous investors, which leads to withdrawal of investments, which then prompts market panic, and so on.

Role of credit ratings agencies and global consequences: In order to examine how credit default swaps affected the global economy, the American insurance company American International Group (AIG) can be used as an example. AIG had businesses in over 130 countries (Karnitschnig, 2008), and in many ways functioned as a healthy company. But in September 2008, AIG was pushed to the brink of bankruptcy when it suffered a liquidity crisis after a ratings downgrade. AIG had issued a large amount of credit default swap contracts to investors; when its ratings were downgraded, AIG was required to put up additional collateral in order to satisfy margin call requirements. Lacking the cash necessary to satisfy collateral requirements, AIG suffered a liquidity crisis. Due to the "interlocking nature" of credit default swaps, AIG's fall made such a big impact on the national and international economy because so many banks were tied to the insurance firm.

Since CDSs are private contracts are formed between two parties and are not regulated by the government, there is currently no way of determining their value (Philips, 2008). This unregulated market grew into billions of dollars worth of transactions that made it around the world, dangerous securities in hiding. According to the Oct. 27, 2008 *Business Week* article "A Lethal Loophole at Europe's Banks," European banks were among the biggest buyers of AIG's credit default swaps, their deals with AIG totaling $426 billion before 2008 (Henry, 2008). These European banks used credit default swaps not only to insure against defaults, but to get around capital requirements. According to international regulations known as the Basel Accords, European lenders are required to have a certain amount of money set aside to cover potential losses. By dealing in credit default swaps, European banks were able to make it seem like they had transferred some risk over to AIG, thereby reducing the banks' capital requirements and freeing them up to make more loans. AIG's credit swaps, in particular, provided extra leverage; due to its high credit rating, AIG could make deals with very little collateral against losses, and was thereby able to increase lending with little money (Henry, 2008). However, the benefit only held if AIG maintained a high credit rating. When AIG's rating fell in September 2008 and the company needed a bailout, European banks that had dealt with AIG found themselves in the same position.

In mid-September 2008, the U.S. government made an $85 billion deal with AIG. The government's involvement in saving the company from bankruptcy implied how dangerous it would have been to the financial system to let the insurance giant fail. The Federal Reserve seemed to be worried that Wall Street's financial crisis could affect even "safe" investments by small investors, like money market funds that invested in AIG debt. Globally, the deterioration

of AIG could force financial institutions in Europe, the United States, and Asia to record the CDS contracts they had purchased from AIG as losses (Hilsenrath, 2008).

One month after the initial bailout, the Federal Reserve announced that it would borrow $37.8 billion of AIG securities in exchange for cash collateral. One month after that, the government began discussing possible changes to the terms of the loan to AIG, options including the lowering of interest rates or the extension of the credit term (Hilzenrath, 2008).

COLLATERALIZED DEBT OBLIGATIONS

Collateralized debt obligations (CDOs) are shares in bundles of securities. CDOs were born out of securitization—the process of transforming financial assets, which are typically illiquid, into marketable securities to be sold in the secondary market in order to provide more liquidity for the economy. Financial assets include mortgages, car loans, credit card debt and corporate debt. Because CMOs are also discussed in this paper, the CDO segment of this paper will only focus on financial assets other than mortgages.

CDOs are created through corporate entities that hold assets (loans, credit card debt, and corporate debt) as collateral. The cash flows are then sold in packages to investors. The purpose of CDOs is to spread out risk by investing in other pools of debt. CDOs are bundled together by investment banks (such as Lehman Brothers) or subsidiaries of asset-backed securities issuers into various tranches. The tranches are ranked A through E and Equity. Higher tranches (those rated A) are protected by security structure, so they are offered lower interest rates. Lower tranches have higher interest rates because they are riskier in nature, and therefore, should return higher yields. CDOs became popular in the 2000s; it was estimated that CDOs were worth more than $2 trillion at the beginning of 2006 (Sainsbury, 2008).

What was the economic role of CDOs in the capital markets? CDOs are important because spread out the risk of various investments by capitalizing on other pools of investment. CDOs play a big role in corporate loans. Collateralized loan obligation (CLOs) is a type of CDO that is backed by corporate loans. CLOs have not been in the market lately due to the credit crisis. Like CDOs, these corporate loans are pooled together to spread out the risk and protect against potential losses. This attracted private equity firms, pension funds and insurance companies to buy these packages, raising $100 billion in 2006 (Farzad, 2007). Transactions became riskier as private equity firms kept bidding up prices for leveraged buyouts. In addition, companies were having trouble covering interest payments of their debt. Furthermore, loan terms became looser. As a result of the credit crisis, buyout financing was all but disappeared, leaving nobody to buy loans at current prices. This has taken a huge toll on the corporate loans market because market confidence started to slip, putting the CDO business to a halt (Stein, 2008). Once investors stop investing in these markets, there is no longer protection against risk exposure for these financial institutions. As a result, CDOs have a very important role in protecting against risk in the capital market.

It is also possible to create CDOs from other CDOs; these are called synthetic CDOs. Synthetic CDOs are different, in the sense that banks can pool credit default swaps into them and sell pieces of those. Essentially, investors in synthetic CDOs protect a pool of bonds against default loss (Whitehouse, 2005). However, synthetic CDOs do not actually contain the securities they sell—banks make these CDOs without having to purchase the underlying bonds. Banks create synthetic CDOs to earn more money through trading these securities. So, why do people

invest in these securities if they are not actually investing in the physical asset? Synthetic CDOs have the potential of yielding high returns with just a little to invest, but are very risky in nature.

One problem with synthetic CDOs is that they allow financial institutions to write off debt by pooling their debt with other institutions. They then, bring all of those debts back to their books and call it a synthetic CDO asset, even though there is nothing to back the "asset" up. So, a potential problem would arise if people start defaulting on their payments. If payments start defaulting, the financial institutions that issue these CDO assets would have no cash flows to pay out the interests on the investment. And since a synthetic CDO is a CDO built on top of another CDO or CDS, there would be even less (if any) cash flows to pay out the interests on those secondary CDOs/CDSs. Another problem with CDOs is the fact that they are not transparent and are really hard to track because they package so many underlying securities together (Attwood, 2004). Because the nature of these securities are so complicated (they are securities on top of securities), it is very hard to determine the credit-riskiness.

Role of credit rating agencies: Even though the value of CDOs were clearly declining, credit rating agencies were slow to downgrade the creditworthiness of these secruities. Because the rating agencies did not disclose the downgrades in time, many investors were misled to think that CDOs were still safe to invest in. But, the truth unraveled as more defaults submerged to the surface and the CDOs became practically value-less. This was especially problematic with the synthetic CDOs because they were influenced by the "primary" securities. So, even though the ones rated triple-A or double-A were expected to be paid out with the cash flows from the primary securities, it did not happen because people started defaulting on their payments, cutting the cash flows off.

Large investment banks, including Bear Stearns, Merrill Lynch and Lehman Brothers were impacted by the credit crisis through their CDOs. These investment firms reported a loss of $9 billion in writedown of assets during the first quarter of 2008. Lehman Brothers was the biggest marketer of CDOs. Therefore, when Lehman Brothers filed for bankruptcy in 2008, even the international market was negatively affected because everyone had invested in so many securities that the company underwrote, guided by the "safe" ratings credit rating agencies had given to CDOs.

MARKET VOLATILITY

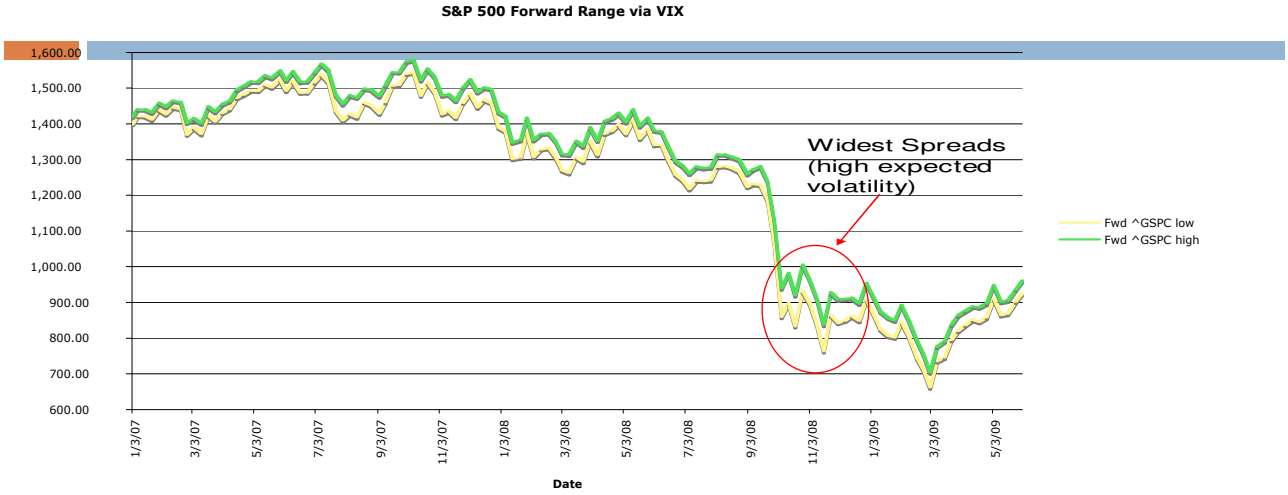
As our measure of volatility, we used the Chicago Board Options Exchange Volatility index (VIX) as our reference for market volatility. The VIX index is a measure of 30-day forward volatility, based on a basket of S&P 500 options. It is representative of the market as a whole because the S&P 500 is a cap-weighted index (GSPC), covering a wide range of large capitalization American companies, across many industries. However, the VIX does understate risk since it does not take into account skewness and kurtosis. Using the VIX index, we predict forward S&P 500 ranges using the following formula:

$$\text{Forward GSPC Range} = \text{GSPC} * (\pm (\text{VIX}/\sqrt{(250)}))$$

The dependence of financial institutions on structured derivative securities made their devaluation a cause for increased market volatility, especially in late 2008. Furthermore, the need for the U.S. government to step in and provide bailout funds for large financial institutions, like

American International Group, has been a cause for increased volatility, as investors worried about the solvency of key financial institutions in the aftermath of the bankruptcy of Lehman Brothers Holdings Inc. For example, on September 15, 2008 Lehman Brothers filed for chapter 11 bankruptcy.

FIGURE 2: S&P 500 FORWARD RANGE VIA VIX



The VIX continued to show significant swings in volatility throughout the latter half of 2008, responding violently to news pertaining to structured derivative securities and companies that had used them. The week of November 3, 2008, Morgan Stanley analysts reported a prediction that leveraged loans would outperform high yield bonds. This week saw the VIX close at 56.10, -6.33% versus the previous week's close. This translated to a 66-point S&P 500 range (898 – 964). The following week, AIG received a restructured package from the U.S. government. As a result, the VIX closed the week at 66.31, +18.20% over the previous week's close. This translated to a 73-point S&P 500 range (837 – 910).

This news shocked the market, causing the VIX to close at 31.70, +23.54% over the previous close. From a trader's perspective, this translated to a 48-point S&P 500 range (1,168 – 1,216) (see Figure 2). That same week AIG got an $85 billion loan from the U.S. government. The fall of Lehman Brothers and the first bailout of AIG caused a jump in volatility, sending the VIX into a strong uptrend over the next two months. The week of October 20 2008, AIG tapped $90 billion from its credit line with the U.S. government, causing the VIX to close the week at 79.13, +12.51% over the previous week's close. This translated to an 88-point S&P 500 range (833 – 921). This was near the peak VIX level in 2008.

CONCLUSIONS

The turbulence and high volatility that the financial markets experienced in 2008 were the result of misuses of derivative securities, which had become popular among large investors and financial institutions for their hedging and speculative properties. In the case of shadow banks (Krugman, 2009), these securities made it possible to take on more risk by transferring risk to other institutions to circumvent capital requirements. The solvency issues facing Lehman

Brothers Holdings, American International Group and many other companies were the direct result of fluctuating values in structured derivative securities, like collateralized debt obligations, mortgage-backed securities, and credit default swaps. The underlying causes of highly volatility, particularly in the latter half of 2008, are evidently the result of uncertainty in the psychology of investors, regarding the economic impact of the unethical misuses of derivative securities.

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