COUNTERPARTY RISK IN BOND MUTUAL FUNDS: EVIDENCE FROM CREDIT DEFAULT SWAPS POSITIONS*

George O. Aragon
Arizona State University
george.aragon@asu.edu

Lei Li
University of Kansas
lei.li@ku.edu

Jun Qian
Shanghai Advanced Institute of Finance
jqian@saif.sjtu.edu.cn

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ABSTRACT

We examine the credit default swaps (CDS) positions of bond mutual funds over 2004-2009. We find that CDS are more commonly used by funds with the greatest transaction-cost benefit and that CDS usage is associated with lower flow-motivated trading in the bond market. We also find that funds' buy-protection CDS positions were more likely to be closed during the financial crisis if those positions had greater counterparty credit risk, as measured by positions in which the counterparty has a high default probability or a high default correlation with the reference entity. We also find an increase in funds' selling of CDS protection during the crisis, especially to banks with high financial distress. Overall, we find that mutual funds' aggregate net sell credit protection (sells minus buys) from the CDS market increased significantly during the recent financial crisis and that the portfolios of CDS-users displayed significantly higher systematic credit risk and lower returns during the crisis.

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1. Introduction

Many bond mutual funds buy and sell credit risk "synthetically" using credit default swaps (CDS). Presumably, derivatives can benefit funds by providing transaction efficiency in managing credit risk as compared to trading in the underlying bond market, and by providing a greater access to new markets. However, the dramatic growth in the size and complexity of the derivatives markets has renewed interest in the risk management issues related to mutual funds' use of derivatives.[1]

The collapse of Bear Stearns and Lehman Brothers – two major swap dealers – highlights counterparty risk as a significant concern to participants in over-the-counter derivatives markets. Buyers of credit protection in the CDS market, in particular, are concerned with the so-called "wrong-way" counterparty risk that arises when there is a positive default correlation between the seller of credit protection and the reference entity underlying the CDS contract (Gregory, 2012; Hull and White, 2012). If fund managers respond to counterparty risk by scaling back their CDS protection, then this could leave fund investors less protected from a general deterioration in credit market conditions.[2]

Furthermore, recent evidence shows that CDS market prices can deviate significantly from fundamentals during crisis periods due to constraints on the capital available to sellers of default insurance. As a result, the premiums from selling protection may exceed those that would

[1] See, e.g., the U. S. Securities and Exchange Commission's 2011 concept release [Release No. IC-29776] on "Use of Derivatives by Investment Companies under the Investment Company Act of 1940."

[2] The Financial Crisis Inquiry Commission Report notes that counterparty runs occurred in the OTC derivatives market during the run-up to Bear Stearns' collapse and notes (p.287), "Brian Peters of the New York Fed advised Eichner at the SEC that the New York Fed was "seeing some HFs [hedge funds] wishing to assign trades the clients had done with Bear to other CPs [counterparties] so that Bear `steps out.'" Counterparties did not want to have Bear Stearns as a derivatives counterparty any more."

result from reasonable assumptions about default rates (Siriwardane, 2015; Stanton and Wallace, 2011; Froot, 2001). Bond funds could potentially profit from such demand-supply imbalances by becoming net sellers of CDS protection. This could leave fund investors more exposed to systematic credit risk unless the manager reduces risk elsewhere in the fund's portfolio.

We examine these issues using a detailed dataset of quarterly bond and CDS positions of U. S. bond mutual funds over 2004-2009. Our analysis reveals new empirical findings. First, we study the determinants of a bond fund's decision to use CDS and find that usage is more prevalent among funds with the greatest transaction-cost benefit. These include funds with high portfolio turnover, high fund flow volatility, and funds that invest in relatively illiquid bonds. This is consistent with existing evidence that funds tend to permit the use of derivatives when the potential transaction-costs savings are large (Deli and Varma, 1999), and the evidence that mutual funds use derivatives to maintain target levels of portfolio risk (Koski and Pontiff, 1999).

We also find a negative relation between CDS usage and flow-motivated trading, as measured by the sensitivity of net bond purchases to investor flows. For example, a one percent decrease in net flows is associated with a 0.71% decrease in net bond market purchases; however, among CDS users, this relation is only 0.63%. This evidence reflects a benefit from using CDS given that flow-motivated trading can reduce fund profitability (Edelen, 1999).

Next we examine how the average CDS credit protection held by bond funds varies over our sample period, which includes the recent financial crisis. Figure 1 plots the rolling average of the difference between the notional amounts underlying a fund's buy and sell (i.e., "net-buy") protection positions scaled by total fund assets. While net buy protection increases over the pre-crisis period (2004Q1-2007Q2), it falls steadily from a peak of about 1% of total fund assets at the start of the crisis period (2007Q3) to -1% by the end of our sample period (2009Q4). Furthermore, Figure 2 shows that this decline is largely driven by funds' multi-name CDS positions (i.e., where the reference entity is a CDS index, such as CDX.NA.IG.9, and results from an increase in sells without a commensurate increase in buys. In contrast, the net-buy protection obtained through funds' single-name CDS positions (i.e., where the reference entity is a single issuer, like GMAC) is relatively flat over the crisis period.

To help explain these patterns we consider the possibility that funds were reluctant to increase their buy protection in response to concerns about counterparty credit risk. Bond funds may be less likely to purchase protection from counterparties that are of low credit quality or have a high default correlation with the reference entity underlying the CDS contract. Suggestive evidence in support of this hypothesis is provided in Figure 1, which plots the median cost of CDS protection against a default of each swap dealer in our sample. According to this measure, counterparty risk was low and stable during the pre-crisis period, but increased seven-fold from 20 to 140 basis points during the crisis. In other words, the drop in aggregate net buy protection coincides with a systematic rise in counterparty risk.

We exploit position-level data and cross-sectional variation in the credit quality of swap dealers to test whether funds are more likely to close positions with riskier counterparties and positions in which the default correlation between the reference entity and the counterparty bank (wrong way risk) is high. For singe-name entity CDS, we measure wrong way risk using the backward-looking estimate of the correlation in credit spread changes between the reference entity and counterparty bank. For multi-name entity CDS, positions with wrong way risk are those in which the underlying index is an ABX index. ABX indexes, originally launched in 2006 to track a basket of subprime mortgage-backed securities, provide a way for investors to speculate on firms, like U.S. investment banks, with significant exposure to subprime mortgages. A buyer of credit protection on ABX indexes, therefore, might be concerned that an increase in mortgage defaults would coincide with a decrease in the solvency of the counterparty bank. Therefore, in our sample of multi-name CDS positions, we identify “wrong-way” risk as a position in which the reference index is an ABX index.

Our main finding is illustrated in Figure 3, which shows that the propensity for bond funds to close existing buy protection positions is significantly greater among positions with greater wrong-way risk. This is evident in both multi-name (Panel A) and single-name (Panel B) positions, especially during the crisis period. In our multivariate analysis, we incorporate fixed effects to establish the robustness of these results. Moreover, in addition to wrong way risk, our multivariate analysis reveals that a second measure of counterparty credit risk – the CDS spread of the counterparty bank – is also positively related to a fund’s propensity to close a buy protection position. Taken together, our evidence suggests that mutual fund respond to counterparty credit risk by closing their buy protection positions.

The above evidence supports the view that funds manage counterparty risk by avoiding deals with riskier counterparties and deals with greater wrong-way risk. However, it is interesting that funds increased their selling protection on multi-name CDS over the crisis period in aggregate (Figure 2). This pattern is unlikely to be explained by funds’ attempts to maintain target credit risk exposure in response to positive investor flows, given that average flows in our sample were negative during the crisis period. Instead, it is possible that managers were attracted by the relatively high premiums from selling default insurance during the crisis period, as documented by Stanton and Wallace (2011). Higher crisis-era premiums can result if traditional sellers are capital constrained and either unwilling to take on additional credit risk (via

CDS selling) and/or are actively reducing their risk (via CDS buying). We find some evidence in support of this view. Specifically, the aggregate net selling of bond funds during the crisis period is concentrated mainly among multi-name positions with distressed counterparty banks and, therefore, banks that are plausibly less inclined to sell credit protection.

Overall, our results show that the net buy protection held by bond funds fell significantly during the financial crisis. However, at the portfolio level, it is possible for funds to offset this loss of protection through other channels, for example, by selling bonds from their portfolio. To address this issue we examine the bond trading activity of our sample funds and find no evidence of greater bond selling by CDS users during the crisis period. Therefore, it does not appear that funds were offsetting the loss of CDS credit protection through transacting in the underlying bond market.

We then estimate the systematic credit risk of bond funds using their monthly returns. Our main finding (presented in Figure 5) is that CDS users experienced a significant increase in systematic credit risk during the financial crisis period (2007Q3-2009Q1). For example, in Panels A and B we find no significant difference in systematic risk between users and non-users of CDS during the pre-crisis period. During the crisis period, however, the high-yield credit beta of CDS users (0.20) is significantly higher and nearly double that of nonusers (0.12). Such a difference in exposure, for example, would negatively impact the portfolio returns of CDS users by 1.08% during October 2008 – the worst performing month of our high-yield factor (the spread between US Corporate High Yield and US Aggregate bond indexes).[3] Indeed, as Panel C shows, CDS users realized lower returns as markets deteriorated over 2008.

[3] The -1.08% is the difference in beta (0.20-0.12) times the return on the high-yield benchmark (-13.5%) during October 2008.

Lastly, we compare the portfolio performance of CDS users and non-users following the Lehman bankruptcy. We find that CDS users experienced significantly lower returns over the subsequent months. An increase from 0% to 10% in the ratio of CDS notional amount to fund assets (measured just prior to the Lehman bankruptcy) is associated with a 1.6% drop in style-adjusted returns over the 4th quarter of 2008. We also find that the drop in performance is even more pronounced among funds with lower-credit quality counterparties and funds that deal with fewer counterparties in the CDS market.

The remainder of the paper is organized as follows. Section 2 discusses the related literature, data and summary statistics, and the determinants of CDS usage. Section 3 examines the determinants of a fund's decision to close existing CDS positions, and compares the bond market trading of CDS users and non-users. Section 4 studies whether CDS usage is related to bond funds' portfolio risk and returns over our sample period. Section 5 concludes.

2. Related literature and data sources

2.1. Related Literature

Two recent studies examine the use of credit default swaps by bond mutual funds, but with different research questions. Adam and Guettler (2015) examine the interactions between fund performance and market conditions, the fund's management structure, and the fund's complexity of trading strategies, like using derivatives. They conclude that, during normal times, CDS usage benefits team-managed funds more than single-managed funds, due to a greater diversity of skill set among team members. During crisis periods, however, the benefits of trading complexity for teams diminishes due to less efficient decision-making.

Jiang and Zhu (2015) examine the crisis period of 2007-2009 and find evidence that funds herd together in selling credit protection on the same reference entity, especially entities that are "too large to fail." They also find evidence (as we do) that CDS usage is more common among funds with greater liquidity needs. In contrast to these studies, we examine how bond funds' use of credit protection is related to counterparty credit risk in the CDS market, and its implications for portfolio risk and investor returns. In addition, our sample differs from Jiang and Zhu (2015) because we study bond funds' CDS positions during both the crisis and pre-crisis periods, and contains single-name as well as multi-name positions. As we show, the extent of credit protection held by bond funds varies significantly over our sample period, especially for the multi-name positions.

Earlier studies examine the use of derivatives by mutual fund managers. Koski and Pontiff (1999) find evidence that users of derivatives show no difference in portfolio performance or risk levels compared to non-users, but do exhibit significantly lower changes in risk in response to fund performance; in particular, they find no evidence that managers use derivatives to game performance incentives. Deli and Varma (2002) examine the decision of funds to permit the use of derivatives, and find that permission is more common among funds for which the transaction-cost benefit is greatest, such as funds with high portfolio turnover and funds that invest in illiquid securities. Consistent with this evidence, we also find that transaction-cost benefits help explain the use of CDS among bond funds.[4]

[4] Almazan et al. (2004) also find that mutual funds with higher portfolio turnover rates tend to be less constrained in their investment activities, which include the use of derivatives. Other related studies examine hedge fund managers. Chen (2011) finds that derivatives usage is related to lower changes in fund risk, a finding consistent with Koski and Pontiff (1999). Aragon and Martin (2012) finds that hedge funds' holdings of equity options can predict the direction and volatility of underlying stock returns, consistent with informed trading motives for using derivatives. Agarwal, Ruenzi, and Weigart (2015) find that tail risk is fund returns is related to a fund's holdings of equity options.

Our paper is also related to the literature on counterparty risk management. There is mixed evidence on whether this risk is priced in CDS contracts. Arora, Gandhi, and Longstaff (2012) examine CDS market quotes during the financial crisis to see whether lower credit quality dealers charge a lower price when selling credit protection. While the predicted effects are statistically significant, they are also economically very small. One possible explanation is that market participants use other devices to manage counterparty risk, such as collateralization and bilateral netting in swap master agreements. On the other hand, Loon and Zhong (2014) find that the introduction of central-clearing increases CDS spreads, suggesting that central clearing reduces counterparty risk.

Du et al. (2015) use proprietary transaction data and find that, while counterparty quality does not appear to impact the price of CDS contracts, it does impact counterparty choice. Specifically, buyers of credit protection tend to avoid riskier counterparties (as measured by the CDS spread on the dealer's debt) and positions with significant wrong-way risk (measured by the default correlation between the reference entity and the counterparty). In our analysis, we examine whether counterparty quality and the presence of wrong-way risk can help explain why mutual funds reduced their net credit protection during the crisis period.[5]

Finally, Stanton and Wallace (2011) show that market prices on ABX index CDS during the crisis implied unreasonably high default rates. This is similar to Froot's (2001) finding that the premiums from selling catastrophe insurance are high relative to expected losses. Stanton and Wallace (2011) argue that capital constraints limited the supply of default insurance in the ABX market during the crisis period, and this led to higher premiums. In our analysis of CDS positions

[5] Several authors examine counterparty risk in credit and interest rate swaps markets, including Duffie and Zhu (2011), Cooper and Mello (1991), Sorensen and Bollier (1994), Duffie and Huang (1996), Jarrow and Yu (2001), Hull and White(2001), and Gregory (2012).

of bond funds during the crisis period, we find that the net selling of CDS protection by bond funds during the crisis is mainly concentrated among positions with bank counterparties that are plausibly more capital-constrained, such as banks with relatively high credit spreads. In contrast, we find no similar evidence before the crisis. One possible interpretation of this finding is that bond mutual funds tend to sell credit protection when alternative sellers of default insurance are capital-constrained.

2.2. Data sources

Data used in this paper come from multiple sources. We start with all U.S.-based open-ended fixed-income mutual funds in Morningstar's mutual fund database that were alive as of June 2004. We exclude from the sample money market funds, index funds, and funds that focus on municipal bonds, government bonds or foreign bonds. We further exclude funds without valid central index keys (CIKs), which are identifiers assigned by the U. S. Securities and Exchange Commission (SEC) to filers and companies and are needed for retrieving the SEC filings by a sample fund. The remaining sample consists of 538 actively managed, open-ended domestic bond mutual funds.

We obtain detailed (non-derivative) quarterly holdings data for these 538 funds from Morningstar’s survivor-bias free database. Mutual funds usually report their holdings to Morningstar on a quarterly basis, though some funds voluntarily report as often as monthly. For each fund and report date, Morningstar defines a *fixed income style box*, a 3x3 matrix that provides an overall representation of the fund's risk orientation (see Appendix A). The horizontal axis focuses on interest-rate sensitivity as measured by the average effective duration of the fund's holdings. The vertical axis focuses on credit quality as measured by the average credit quality of the fund's holdings. We also obtain other fund characteristics, including total net assets, monthly gross returns and fund family information, from Morningstar.

We collect monthly fund flow data from the CRSP Survivor-Bias-Free US Mutual Fund Database. CRSP mutual fund data is reported at the fund-share class level. The monthly fund flow for a share class is computed in the usual way as $flow_t = \frac{TNA_t - TNA_{t-1} * (1 + r_t)}{TNA_{t-1}}$, where r_t is the return on the share class (net of expenses before fees) in month t. Fund-level flows are obtained by aggregating flows over all share classes in a fund. Morningstar does not provide monthly TNA data. The majority (93.3%) of the 2,060 share classes in the Morningstar dataset are successfully matched to a CRSP fund identifier.

We hand-collect mutual funds' CDS holdings directly from quarterly SEC filings. Starting on May 10, 2004, mutual funds are required to disclose their complete investment schedule every quarter. Mutual funds report their holdings in N-Q filings for the first and third quarters in each fiscal year, and in N-CSR filings for the second and fourth quarters in each fiscal year. Derivative positions are usually disclosed in notes to the schedule of (non-derivative) portfolio holdings. We search all N-Q and N-CSR forms filed between June 2004 and December 2009 by bond mutual funds in the sample using the following key phrases: *credit default swap*, *credit default*, *credit derivative*, and *CDS*. For all filings with at least one of these phrases, we read the text and manually collect information regarding the type (i.e., buy or sell protection), reference entity, notional amount, unrealized appreciation or depreciation (i.e., book value), expiration date for each CDS position, and the name of the bank counterparty. The final CDS dataset contains information on 58,824 CDS positions held by 194 distinct funds.

For all single-name reference entities and bank counterparties in our sample, we collect monthly CDS spreads on their senior debt (for a 5 year tenor) from Bloomberg for the period of

March 2004 through December 2009. We also obtain the monthly total returns for Barclay's US Aggregate and US Corporate High Yield bond indexes. We use these benchmarks to estimate systematic risk in fund portfolios. Lastly, we obtain one-month Treasury bill rates from the Federal Reserve's website, which is our proxy for the risk-free rate.

Our full sample period covers 2004Q3-2009Q4. However, in our analysis we report results separately for sub-periods around the financial crisis to identify the regime shift in CDS investing and perceived counterparty risk across the different periods. Following Ben-David, Franzoni, and Moussawi (2012), we break down 2004–2009 into a pre-crisis period (2004Q1 to 2007Q2) associated with the bull market and the expansion of CDS usage, a crisis period (2007Q3–2009Q1) which begins with the collapse of two Bear Stearns' subprime hedge funds in the summer of 2007; and a post-crisis period (2009Q2–2009Q4) beginning just after the end of the bear market.

2.3 Summary statistics

Table 1 presents the comparative summary statistics of CDS users and non-users (Panel A). Users, on average, are larger, older, and have more MBA managers than non-users. They also have higher asset turnover ratios and lower expense ratios. CDS users are also not concentrated in one or a few style boxes. As of the second quarter of 2007, the percentage of mutual funds using CDS ranged from 25% to 35% in seven of nine fixed-income style boxes.[6]

Panel B of Table 1 shows the number and percentage of bond mutual funds that used CDS in each quarter. The number of CDS users grew dramatically over our sample period, from 9.3% of all funds in 2004 to approximately 30% in 2007. The trend reversed after the start of the financial crisis; CDS users dropped to 26% of bond funds in 2009. The magnitude of CDS exposure among

[6] Style boxes 3 and 9, which include high credit quality, long duration funds and low credit quality, long duration funds, each have less than 10 funds. The percentage of CDS users for these two style boxes is not meaningful.

funds that use CDS displays a similar pattern. The average CDS total notional amount to fund net assets ratio grew from approximately 3% in 2004 to 9% in 2007, and then dropped to approximately 4% in 2009. Figure 1 (discussed in Section 1) plots the average net buy protection, defined as the sum of the notional amount underlying all buy protection positions minus that of all sell protection positions, divided by total fund assets.

Panel C of Table 1 summarizes bond funds' CDS positions by reference entity type. While funds tend to hold more single-name positions (21.73 vs. 9.22), on average, the notional amount underlying multi-name positions is larger (6.34% vs. 4.34% of fund assets). Among multi-name positions, the notional amount underlying ABX index swaps represent 2.21% of fund assets, and is concentrated among positions in which the fund has sold protection. We also see that funds, on average, deal with five counterparties in the CDS market.

Lastly, Panel D of Table 1 reports summary statistics for each bank that is a counterparty to at least one CDS position in our sample. On average, a bank has at least one swap position with 39 mutual funds in a given quarter, with a notional footprint of $2073.7 million. Most of the notional amount underling a bank's CDS positions is *sell notional*, which we define as mutual funds having sold credit protection to the bank. There is considerable variation across banks in the size of the bond mutual fund market. For example, the top five banks – Deutsche, Goldman, Morgan Stanley, JP Morgan, and Lehman – represent 60% of the market in terms of average notional amount. We also summarize a measure of the bank's credit quality – that is, the end-of-month spreads for a 5-year tenor CDS contract where the reference entity is the senior debt of the bank. For example, the sample range of Morgan Stanley's CDS spread is 19 to 1033 basis points, which is larger than that of JP Morgan Chase (14 to 201 basis points).

2.4 Which funds use credit default swaps?

We estimate a probit model to examine the determinants of whether a fund holds at least one CDS position in a given quarter. The unit of observation is fund-quarter. We consider several variables that capture the potential transaction-cost benefits from using derivatives, including asset turnover ratio, average credit rating, and the volatility of monthly fund flow in the past year. Bond funds with higher turnover ratios and assets that are less liquid can benefit more from the relatively lower transaction costs in the CDS market, and may be more likely to use CDS. Average credit rating is calculated by Morningstar, ranging from 1 (best credit quality) to 17 (worst credit quality). We use this as a measure of bond market illiquidity. Fund flow volatility is a proxy for a fund's liquidity needs, and therefore is expected to relate positively to the CDS usage.

We also include several other variables related to fund and manager characteristics, including fund age, fund size, fund family size, expense ratio, and a dummy variable indicating whether the fund has front- or rear-end load fees. Age, expense, and load variables are included in the model since they are generally related to active management and fund complexity. We also include fund manager tenure (i.e., number of years) and the proportion of fund managers (in case of team-managed funds) that hold an MBA degree. We include four lags of quarterly abnormal returns in the model to control for the possibility that career concerns influence managers to increase risk using CDS (see, e.g., Brown, Harlow, and Starks, 1996; and Chevalier and Ellison, 1997). A fund's abnormal return is defined as its gross return minus the average gross return of all funds of the same fund style.

All variables except dummy and log variables are winsorized at 1% to mitigate the influence of outliers. Fund style box-by-time fixed effects dummies are included in all specifications to control for unobserved heterogeneity across fund styles and over time. All standard errors are clustered by both fund and time.

Table 2 reports the estimated marginal effects of the probit model. We find that funds with higher asset turnover ratios are more likely to use CDS. For example, Column 2 shows that a one percentage point increase in a fund's asset turnover ratio is associated with a 2.67% increase in the probability of using CDS. Funds with higher fund flow volatility are also more likely to use CDS. A one-standard deviation increase in flow volatility is associated with a 1.85% increase in the likelihood of using CDS.[7] Jiang and Zhu (2015) find similar evidence for single-name CDS positions during 2007-2009. A closer comparison is provided in Column (4) for our crisis period (2007Q3-2009Q1). The estimated relation is again similar, although the coefficient on fund flow volatility is insignificant.

We also find greater CDS usage among funds that invest in less liquid bonds. In particular, a one-point increase in average credit rating (recall, a higher rating correspond to a *worse* credit quality) is associated with a 1.3% higher chance of using derivatives. This finding is consistent with credit derivatives being a liquid alternative compared to the underlying bond market.[8]

Several other fund variables are significantly related to CDS usage. Larger funds and funds in larger families are more likely to use CDS. One possible explanation for this finding is that larger funds are better positioned to realize economies of scale in setting up necessary infrastructures for using derivatives. Funds with long-serving managers are less likely to use CDS. A one-standard deviation increase in a fund manager's tenure (years) is associated with a 4%

[7] This number is 0.066*0.280=1.85%, where 0.068 is the standard deviation of the flow volatility variable.
[8] Stulz (2010) argues that the CDS market should have greater liquidity because CDS contracts require less upfront funding and are unaffected by bond characteristics such as call provisions, covenants, and coupon rates. Oehmke and Zawadowski, (2013) present a theoretical model of choice between CDS and bonds.

decrease in the probability of using CDS.[9] The probability of using CDS for a fund with all MBA managers is 8.6% higher than comparable funds with no MBA managers. It is possible that an MBA degree signifies that fund managers are more familiar with derivatives and better suited to adopt financial innovations given their financial education. Lastly, we find that past performance, age, and load fees have no significant relation with a fund's decision to use CDS.

3. Analysis of mutual funds' CDS positions and bond market trading

In this section we use position-level data and exploit cross-sectional variation in counterparty quality to see whether a fund's propensity to close an existing position is related to the health of its counterparty. We also examine whether CDS usage is related to mutual funds' bond market purchases and their sensitivity to investor flows.

3.1. Are managers more likely to close CDS positions with greater counterparty risk?

We estimate a probit model in which the dependent variable is a dummy variable that equals one if the CDS position is closed over the following quarter. The unit of observation in our analysis is position-fund-quarter. We include both single and multi-name CDS positions in this analysis. However, as noted above, the decline in aggregate net credit protection during the crisis period is mainly due to multi-name positions (Figure 2), and multi-name positions represent the majority of a fund's CDS positions based on notional amount (Table 1). Therefore, we report results separately for single and multi-name reference entity CDS.

Our dependent variable – $Close_{ijk,q+1}$ – is a dummy variable that equals one if the position is closed by fund i on reference entity j with counterparty k in quarter $q+1$. For each position

[9] The calculation is 4.72*0.00852=4%, where 4.72 is the standard deviation of the manager tenure variable.

held in the current quarter (*q*), we classify a position as being closed if, in the subsequent quarter (*q+1*), the fund does not report a CDS position with a positive notional value on the same reference entity, with the same counterparty bank, and in the same direction (i.e,. buy or sell). Note that, for CDS positions in multi-name entities, a credit event in one or more of the constituents underlying the reference index would lead to a mechanical reduction, but not *elimination*, in position size. However, while a default by a single-name reference entity could lead to a mechanical elimination of a position, our results are virtually unchanged when we repeat our tests on the subsample of reference entities for which there is a quote CDS spread in the subsequent quarter (and, therefore, reference entities that are not in default). Therefore, positions for which *Close* equals one represent positions that are eliminated from the fund's portfolio in absence of a credit event.

In practice, a mutual fund has at least two ways to close out a CDS contract. First, the fund can negotiate with its counterparty directly on a termination amount based on current market prices. Alternatively, the fund can find a third party to replace it in the CDS contract ("novation"), in which case the obligation of the fund in the CDS contract will be transferred to the new party.[10] Therefore, since each position is defined in our sample in terms of the reference entity underlying the CDS contract and the counterparty, we would classify a position as being closed (i.e., *Close* = 1) in any of the two methods of position closure described above.

We model the decision to close a multi-name position as:

$$Prob\left(Close_{ijk,q+1} = 1\right) = \Phi\left(\begin{matrix}\beta_1\ Counterparty\ spread_{kq} + \beta_2\ Wrong\ way\ risk_{jk} \\ +Controls + FEs\end{matrix}\right), \tag{2}$$

[10] See, e.g., the report by European Central Bank (2009). A fund can also effectively close out a position by entering into an offsetting position with the same or different counterparty, but the original swap would remain open.

where Φ is the cumulative distribution function of the standard normal distribution and FEs are a set of fixed effects dummy variables. We exclude from our analysis all positions on 2008Q2 or later to which Lehman Brothers was a counterparty, because we expect these positions to be closed purely for mechanical reasons due to the Lehman bankruptcy.[11]

Our key independent variables include a measure of credit quality of the fund's counterparty to the position, *Counterparty spread*. Specifically, in predicting whether a position with, say, Lehman Brothers, is closed between quarters q and q+1, we use the spread (in percentage points) on a 5-year maturity CDS contract referencing Lehman Brothers that prevails at the end of quarter q. A finding that $\beta_1 > 0$ would indicate that funds are more likely to close positions with greater counterparty risk.

We follow Du et al. (2015) and also include a position-level measure of wrong-way risk. This is measured two different ways depending on whether the CDS position corresponds to a single or multi-name reference entity. For single-name positions, *Wrong way risk* is the sample correlation between monthly changes in the 5-year CDS spread of the reference entity and monthly changes in the 5-year CDS spread of the corresponding bank counterparty. We compute sample correlations using a 24-month rolling average. This captures the correlation between the market value of a fund's CDS buy protection position and the financial distress of the counterparty.

For multi-name positions, *Wrong way risk* is a dummy variable that equals one if the reference index underlying the CDS position is an ABX index. Unlike other indexes which track different segments of the debt markets (e.g., CDX HVOL), ABX indexes track the performance

[11] In some cases, a fund will report multiple positions on the same reference entity, same type (i.e., buy or sell), and with the same counterparty. In these cases, we aggregate the notional value of all CDS positions to the counterparty, type, and reference entity level. For example, fund FSUSA00008 reports three CDX HY 11 sell positions with Bank of America in 2008Q3, so before estimation of Eq. (2) we aggregate the three CDS positions into one observation.

of mortgage-backed securities. Many investment banks had a significant exposure to the subprime residential mortgage market before the financial crisis. Therefore, a decline in the performance of home equity loans would increase a fund's exposure to its counterparty as well as the risk of a counterparty default.[12] Taken together, for both single and multi-name positions, a finding that $\beta_2 > 0$ would indicate that funds are more likely to close positions with greater wrong-way risk.

We also include as control variables fund and quarter fixed effects, the logarithm of the notional amount underlying the position, and the unrealized value of the position as a percentage of notional amount. Unrealized value is reported by the mutual fund and is the perceived appreciation (or depreciation) of the market value of the position since it was initiated. We report results separately for 1) buy and sell protection positions; 2) full sample, pre-crisis, and crisis sample periods, and 3) single and multi-name reference entities.

In Panel A of Table 3 we present the results from estimating Eq. (2) on the subsample of buy protection positions. We first discuss the evidence for multi-name positions (Models 1-3). From Model 1 shows that, over the full sample period, funds are more likely to close their buy protection positions with riskier counterparties. In particular, we estimate that a 100 basis point increase in *Counterparty spread* is associated with a 3.09% higher likelihood of closing a position. Moreover, this relation is only significant during the crisis period (Model 3); in contrast, we find no significant relation between *Close* and *Counterparty spread* during the pre-crisis period (Model 2).[13] The coefficient on *Wrong way risk* is positive and significant during

[12] Stanton and Wallace (2011) find that changes in ABX index CDS prices are positively correlated with short selling activity in investment bank stocks during the recent financial crisis. See, e.g., Longstaff (2010) for further discussion of the ABX indexes.
[13] We also find qualitatively similar results when we repeat the test after excluding the eleven funds in our sample from PIMCO's Total Return series.

the crisis period, an indication that funds are more likely to eliminate positions on ABX indexes. Model 3 shows that funds are 41.2% more likely to close a position with wrong-way risk. Again, we do not find a significant relation between *Close* and *Wrong way risk* during the pre-crisis period.[14]

Next we turn to the evidence on bond funds' closure of single-name positions (Models 4-6). Panel A of Table 3 shows a positive and significant coefficient (0.0953) on *Wrong way risk* for single-name entities. In other words, an increase in the correlation of CDS spread changes of 10% is associated with a 0.95% greater likelihood of closing a buy protection position. This evidence is consistent with the above evidence for multi-name entities and Du et al.'s (2015) finding that market participants are less likely to trade buy protection CDS on reference entities that are highly correlated with the credit risk of the swap counterparty.

A few differences emerge when comparing the evidence of single-name and multi-name entities. First, we do not find a significant, robust relation between *Counterparty spread* and *Close* for single-name positions. One possible explanation for the weaker evidence among single-name positions is that the single-name market lacks depth as compared to the multi-name market. In our sample, the average number of distinct counterparties across multi-name groups (e.g., CDX, ABX) is 8.05, as compared to only 4.92 counterparties when grouping single-name entities by country and industry. Therefore, the larger set of potential counterparties could make it easier for a fund to replace or novate an existing position in response to counterparty risk.

Another difference is that the coefficient on *Wrong way risk* is positive and significant in *both* pre-crisis and crisis periods, but significant for multi-name positions only in the crisis

[14] Although we focus on our estimation of the probit model in Eq. (2), we find similar evidence when we run a linear probability regression using *Close* as the dependent variable. In addition, we find qualitatively similar results after excluding the eleven funds in our sample from PIMCO's Total Return series.

period. However, recall that, for single-name positions, *Wrong way risk* is a backward-looking (24-month rolling window) estimate of default correlation based on past CDS market prices. In contrast, for multi-name positions, *Wrong way risk* is a dummy variable for whether the reference entity is an ABX index. The latter measure is backward-looking only to the extent that mutual funds could anticipate a high default correlation between counterparty banks and the performance of residential loans. A strong correlation between bank and housing market performance might not have been apparent during the pre-crisis period.

In Panel B of Table 3 we repeat our tests for mutual funds' *sell* protection positions. In contrast to our findings for buy protection positions, we do not find that *Close* is significantly positively related to either *Counterparty spread* or *Wrong way risk*. In fact, the evidence points to a negative coefficient on *Wrong way risk*. However, wrong way risk captures the default correlation between the swap seller and the reference entity. Therefore, a negative coefficient on *Wrong way risk* in Panel B signifies that mutual funds exhibit a lower tendency to close positions when the market value of their position is expected to be *low (or even negative)* in the event of counterparty default.

Overall, the evidence provides support for the view that mutual funds manage counterparty risk by avoiding buy-protection positions with lower quality dealers and positions with greater wrong-way risk. This evidence is concentrated among buy protection positions, especially during the crisis period. Perhaps, counterparty risk became more important following the collapse of Bear Stearns and Lehman Brothers and as the credit quality across dealers generally worsened. For multi-name positions, the positive relation between *Close* and *Wrong way risk* might reflect an increasing concern over default correlation between mortgage loans and the investment banks during the crisis period. Meanwhile, for single-name positions, the positive and significant coefficient on *Wrong way risk* across all subperiods might reflect more established beliefs about the default correlations between the reference entity and counterparty.

3.2. Do capital constraints explain mutual funds' crisis-era selling of CDS protection?

The above evidence supports the view that funds manage counterparty risk by closing buy protection positions with riskier counterparties and greater wrong-way risk. However, as noted above, we also find that bond funds, in aggregate, increased their selling protection on CDS over the crisis period in aggregate (Figure 2). This pattern is unlikely to be explained by funds' attempts to maintain target credit risk exposure in response to positive investor flows, given that average flows in our sample were negative during the crisis period.

A candidate explanation comes from existing evidence that, during a crisis period, there might be limited capital available to traditional sellers of CDS insurance. For example, Stanton and Wallace (2011) argue that the high spreads (relative to expected losses) of ABX index CDS during the crisis was due to a lack of capital behind the provision of mortgage insurance during this period. Moreover, Siriwardane (2015) examines the CDS market over the post-crisis period. He finds that there is typically only a handful of net sellers of CDS protection and that shocks to their capital causes a significant increase in CDS spreads, potentially making it more attractive for other sellers of credit insurance. Therefore, we posit that crisis-era shocks to the capital of bank counterparties in the CDS market create opportunities for mutual funds to sell CDS protection at relatively higher spreads.[15]

[15] This interpretation is consistent Jiang and Zhu's (2015) finding that, during the crisis period, funds' propensity to initiate sell protection positions on single-name CDS was positively related to the CDS spread on the reference entity.

To test this hypothesis we compute the aggregate net selling of CDS protection by bond funds, depending on whether the counterparty bank is plausibly more constrained from selling CDS protection. Specifically, we classify a counterparty in our sample as having high distress if its average 5-year monthly CDS spread over 2007Q3-2009Q1 is above the median. This classification rests on the assumption that capital-constrained banks are likely to be those in greater financial distress, as measured by a greater credit spread. Over the crisis period, we would expect a more pronounced increase in net selling by mutual funds to the more constrained group to the extent that banks in that group have less capital available to sell CDS protection and/or are actively reducing their credit risk exposure through buying CDS protection from mutual funds.

Figure 4 plots the aggregate of bond funds' net selling of multi-name CDS positions for each quarter over the sample period. The figure shows a significant increase in net selling to both high and low constrained banks during the crisis period. However, the key finding here is that the net selling is significantly greater for the high constrained group. In other words, mutual funds directed most of their net selling of multi-name CDS to counterparties that were in greater distress. Specifically, the average difference in net selling by funds to more constrained (vs. less constrained) counterparties is $1.705 million (t=2.22) during the crisis period (2007Q3-2009Q1). In contrast, we find no significant difference in net selling during the pre-crisis period. Overall, the evidence here provides some support for the hypothesis that mutual funds provide capital to the CDS market when other potential sellers of CDS protection (i.e., bank counterparties) are constrained. This helps explain the overall increase in net selling of multi-name CDS protection by mutual funds over the crisis period (Figure 2).

3.3. Net purchases of bonds and CDS usage

We find that mutual funds' net buy credit protection decreased during the crisis period. However, a net reduction in credit protection does not imply an increase in credit risk at the portfolio-level because funds can offset this risk by reducing their positions in underlying bonds. To examine this possibility we estimate the following regression of bond trading activity:

$$\begin{aligned} Net\ purchases_{iq} \\ &= \beta_1 Flow_{iq} + \beta_2 CDS\ dummy_{iq} + \beta_1 Flow_{iq} \times CDS\ dummy_{iq} \\ &+ Controls \end{aligned} \tag{3}$$

The dependent variable is the difference between the dollar purchases and sales of bonds by fund *i* during quarter *q*, scaled by the fund's lagged TNA. The key independent variable is a dummy variable (*CDS dummy*) that signifies whether the fund hold a CDS position during the quarter. We also include the fund's quarterly flows (*Flow*) to account for the impact of net capital flows on a fund's trading activity. Control variables include the TNA and lagged fund returns, as well as fixed effects for the fund's style box and time.

The results are reported in Table 4. We find that greater flows are associated with greater net purchases of bonds. For the full sample, pre-crisis, and non-crisis periods (Models 1, 2, and 5), we also find that flow-motivated trading is significantly lower among funds that use CDS. We interpret this as evidence of transaction-cost benefits from using CDS. If funds respond to outflows by drawing down cash reserves, then they might be forced to sell bonds to maintain a target level of portfolio risk. Edelen (1999) shows that such flow-motivated trading can reduce fund profitability in equity funds. In contrast, CDS users can maintain target risk levels by purchasing credit protection instead of transacting in the bond market. However, as shown in Model 3, we no longer see a significant difference in the flow-motivated trading of users and non-users during the crisis period.

Furthermore, we find no significant relation between net bond purchases and CDS usage during the crisis period. This suggests that the decrease in net-buy CDS credit protection during the crisis did not coincide with a decrease in credit risk in the fund's bond portfolio. In the following section, we directly examine whether CDS users experienced an increase in systematic credit risk during the crisis.

4. Credit risk exposure and returns during the crisis

In this section we study whether a fund's exposure to systematic risk and fund returns are related to CDS usage across market conditions. We also present an "event-study" following the Lehman bankruptcy to examine whether fund performance is related to ex-ante measures of counterparty risk.

4.1. Do CDS users display greater credit market risk at the portfolio level?

We use the following pooled regression of mutual fund returns to estimate a fund's systematic risk:

$$r_{im} = (\alpha_0 + \alpha_1 CDS\ dummy_{im}) + (\beta_0 + \beta_1 CDS\ dummy_{im}) \times IGCorp_m$$
$$+ (\gamma_0 + \gamma_1 CDS\ dummy_{im}) \times HYCorp_m + e_{im},$$

where r_{im} is the fund's return in excess of the risk-free rate. This is a linear two-factor market model that includes the return on the US Aggregate index in excess of the risk-free rate (*IGCorp*) and the return on the US Corporate High Yield bond index in excess of the return on the US

Aggregate index (*HYCorp*).[16] The key variable (*CDS dummy*) is a dummy that equals one if the fund uses CDS in the current quarter. We estimate the model each month using a rolling 24-month window. A finding that $\beta_1>0$ and $\gamma_1>0$ would indicate that systematic risk is greater among CDS users, while $\alpha_1<0$ would signify that CDS usage is negatively related to abnormal fund returns

Panels A and B of Figure 5 plots the coefficient estimates of the key interaction variables for the investment grade and high yield credit factors, respectively. We find that CDS users display significantly higher risk than non-users during the crisis period, but not before. Moreover, Panel C shows that users displayed significantly lower performance during crisis period. CDS usage is associated with better performance during the pre-crisis period, but the difference is not significant.

Next we implement an alternative approach in which coefficients are estimated at the fund-level. We divide the sample based on whether the fund has ever reported at least one CDS position in any prior filing (i.e., post-adoption CDS). We then estimate the following regression for each fund within each pre and post-adoption groups:

$$r_{im} = (\alpha_0 + \alpha_1 Crisis_m + \alpha_2 PostCrisis_m) + (\beta_0 PreCrisis_m + \beta_1 Crisis_m + \beta_2 PostCrisis_m) \times IGCorp_m + (\gamma_0 PreCrisis_m + \gamma_1 Crisis_m + \gamma_2 PostCrisis_m) \times HYCorp_m + e_{im}$$

[16] Blake, Elton, and Gruber (1993) and Elton, Gruber, and Blake (1995) also use linear models to benchmark the performance of bond funds. Ferson, Kisgen, and Henry (2006) and Chen, Ferson, and Peters (2010) evaluate bond fund performance after accounting for interim trading bias, non-synchronous trading, and other sources of nonlinearities between fund returns and common factors related to bond markets. More recently, Moneta (2015) uses a portfolio weight-based measure to evaluate bond fund performance.

The above is the same two-factor market model as before, except coefficients are fund-specific and permitted to change over the pre-crisis (2004Q3-2007Q2), crisis (20073-2009Q1), and post-crisis (2009Q2-2009Q4) periods. For example, a finding that γ_1 is greater than γ_0 would indicate that credit market exposure is greater during than before the crisis period. Similarly, if γ_2 exceeds γ_0 then credit risk is greater after than before the crisis. We require each sample fund to have at least 36 monthly return observations.

Table 5 summarizes the average coefficient across funds within each user/non-user subsample. We find a significantly higher exposure to *HYCorp* during the crisis period among funds that have used CDS during any prior quarter. In addition, crisis-era performance is significantly lower among post-adopters. This evidence is consistent with our prior evidence from rolling regressions, in which funds are compared based on whether CDS are used during the current quarter. One difference from the pooled regressions is that post-adoption funds do not display a significant difference in their exposure to *IGCorp* during the crisis period; in fact, the pre-crisis exposure is significantly higher for these funds.

Taken together, the evidence shows that CDS usage is associated with higher systematic risk and lower performance during the crisis period. One possible explanation is that the reduction in net buy credit protection during the crisis periods led to an overall increase in systematic risk, and this led to lower returns. In the following we examine whether the lower performance of CDS users during this period is related to ex-ante measures of a fund's exposure to counterparty risk.

4.2. Economic significance: Cumulative fund returns Post-Lehman

We examine the cumulative fund returns following the Lehman bankruptcy using the following regression:

$$CAR_{i,k} = \alpha_0 + \beta_0 CDS\ dummy_i + \beta_1 CDS\ notional_i + \beta_2 Counterparty\ risk\ dummy_i + \beta_3 CDS\ notional_i \times Counterparty\ risk\ dummy_i + \beta_4 Number\ of\ counterparties_i + controls, \tag{5}$$

where $CAR_{i,k}$ is the fund's cumulative excess return measured over the k months following the end of September 2008. Excess returns are the fund's raw return minus the fund's style box average return over the same holding period. All right-hand side variables are measured as of September 2008. These include a dummy that equals one if the fund reports having a CDS position, the total notional amount of all CDS positions scaled by TNA, and the number of unique counterparties across all CDS positions. We also include a dummy variable that equals one if the fund has above-median counterparty risk, defined as is the notional amount-weighted average of the CDS spreads corresponding to the fund's counterparty banks across all open CDS positions. We also include several control variables, including the logarithm of TNA of the fund and the fund's family, the style box average excess return, a load dummy, and characteristics of the fund's bond portfolio.

Table 6 reports the results from estimating Eq. (5) using several holding periods ending October 2008 or later. Overall we find a negative and significant relation between fund returns and CDS usage. Specifically, an increase in CDS exposure representing a notional amount of 10% of TNA is associated with 0.58% lower returns during October 2008. By the end of 2009Q1, this effect increases to a performance differential of -1.74%. In Panel B we find that this evidence is significantly more pronounced when the fund has riskier counterparties. Specifically, if the 10% increase in notional amount corresponds to swap dealers with above-the-median counterparty risk, then the effect on cumulative returns through 2009Q1 is -2.18%, as compared to just -1.33% with safer counterparties. Finally, we observe that the number of counterparties is associated with greater performance, suggesting a potential benefit of counterparty diversification.

5. Closing Remarks

We decipher six years of quarterly portfolio disclosures to provide new evidence on the use of credit default swaps by corporate bond mutual funds over 2004-2009. We find that the use of CDS is more common among funds that stand to benefit most from transactional efficiency in using derivatives, and that CDS usage is associated with lower flow-motivated trading in the bond market. This is consistent with existing evidence on the motives behind the use of derivatives by money managers.

In aggregate, we find that the net buy CDS protection of bond funds decreased significantly during the recent financial crisis, especially among multi-name (vs. single-name) CDS positions. At the position-level, funds were more likely to close existing buy-protection CDS if those positions were sold by dealers with higher default risk, tied to indices that track the performance of mortgage-backed securities, or tied to reference entities with a high default correlation with the counterparty bank. One interpretation for this evidence is that funds respond to counterparty risk by reducing their buy protection positions. We also find that bond funds increased their selling protection on multi-name CDS during the crisis, especially to banks in high financial distress. A potential explanation for this pattern is that shocks to the capital of bank counterparties during the crisis reduced their capacity to sell credit protection, thereby increasing CDS spreads and attracting bond funds to the market.

Finally, our findings show that CDS usage has important implications for fund. We find that the systematic risk of portfolios held by CDS users increased significantly during the crisis period relative to non-users. Fund investors also experienced worse performance during the crisis, especially among funds with a greater exposure to riskier counterparties. We find no evidence that fund managers took other steps to offset the effect of a reduction in CDS credit protection on portfolio risk; in particular, users did not display a greater selling activity in the underlying bond market during the crisis as compared to non-users.

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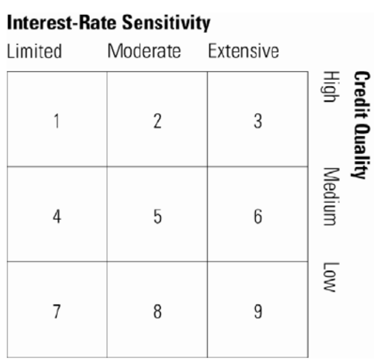
APPENDIX A: VARIABLE DEFINITIONS

- *Fund size (TNA)* is the book value of all fund assets.
- *Fund family TNA* equals the sum of TNA of all funds in a fund family minus the TNA of the fund itself.
- *Fund age* is the number of year since the inception of a fund.
- *Manager tenure* equals the longest tenure (number of years) among all current fund managers.
- *Manager MBA* equals the average of a MBA dummy over all current fund managers, where the MBA dummy for a fund manager equals 1 if the manager holds an MBA degree.
- *Fund monthly return* is the gross monthly return for a fund, i.e., before expenses and loads.
- *Flow* is quarterly net investment flow (as a percentage of quarter-beginning TNA) for a fund.
- *Flow volatility* is the standard deviation of monthly net investment flows (as a percentage of month-beginning TNA) in the past 12 months.
- *Asset turnover* equals the lesser of purchases or sales (excluding all securities with maturities of less than one year) in the past year divided by average monthly net assets.
- *Expense ratio* is the percentage of fund assets paid for operating expenses and management fees.
- *Load dummy* equals 1 for funds with non-zero front or back-end loads.
- *(Morningstar) Fixed income style box* is a 3x3 matrix that provides an overall representation of a fund's risk orientation. The horizontal axis focuses on interest-rate sensitivity as measured by the average duration of fund assets. The horizontal axis focuses on credit quality as measured by the average credit quality of fund assets.[17]

Morningstar Fixed-Income Style Box



Style box	duration	avgcredit
1	<3	AA-AAA
2	4-5	AA-AAA
3	6-10	AA-AAA
4	<3	BBB-A
5	4-5	BBB-A
6	6-10	BBB-A
7	<3	Below BBB
8	4-5	Below BBB
9	6-10	Below BBB

[17] See http://www.morningstar.com/InvGlossary/morningstar style box.aspx for detail.

- *Abnormal return* equals a fund's gross return minus the average gross return of all funds in the same Morningstar stylebox.
- *Average credit rating* is the (value-weighted) portfolio average credit quality of a bond fund's holdings, ranging from 1 (best credit quality) to 17 (worst credit quality).
- *CDS dummy* is a dummy variable that equals one if the fund reports at least one CDS position in the quarter.
- *Counterparty spread* is the spread (in 100's of basis points) of a 5-year tenor single-name CDS where the reference entity is the senior debt of the counterparty bank.
- *IGCorp* is the return on the Barclay's US Aggregate index in excess of the risk-free rate.
- *HYCorp* is the return on the Barclay's US Corporate High Yield bond index in excess of the return on the Barclay's US Aggregate index.
- *High counterparty risk* is a dummy variable that equals one if the fund has above-median counterparty risk. Counterparty risk is the notional amount-weighted average of the *Counterparty spread* across all open CDS positions.
- *Close* is a dummy variable that is defined for all CDS positions held at the end of each quarter. *Close* equals one if the CDS position is closed between quarters q and $q+1$.
- *Log(notional amount)* is the logarithm of 1 plus the total CDS notional amount for a fund in a given quarter.
- *Number of counterparties* is the number of distinctive CDS counterparties for a fund in a given quarter.
- *Unrealized value/notional amount* is the ratio of total unrealized appreciation or depreciation to the total CDS notional amount for a fund in a given quarter.
- *Wrong way risk* is defined for positions in multi-name reference entities as a dummy that equals 1 if the position is an ABX index CDS. *Wrong way risk* is defined for positions in single-name reference entities as the monthly correlation between the 5-year CDS spread on the reference entity and the 5-year CDS spread on the corresponding bank counterparty. Correlations are estimated using a 24-month rolling window.
- *% Struc. Lehman* is the weight of structured bonds issued/sponsored by Lehman in a fund's portfolio.
- *% Struc ExLehman* is the weight of structured bonds issued/sponsored by financial institutions other than Lehman in a fund's portfolio.
- *% Corp. Lehman* is the weight of corporate bonds issued by Lehman in a fund's portfolio.
- *% Corp. ExLehman* is the weight of corporate bonds issued by financial institutions other than Lehman in a fund's portfolio.

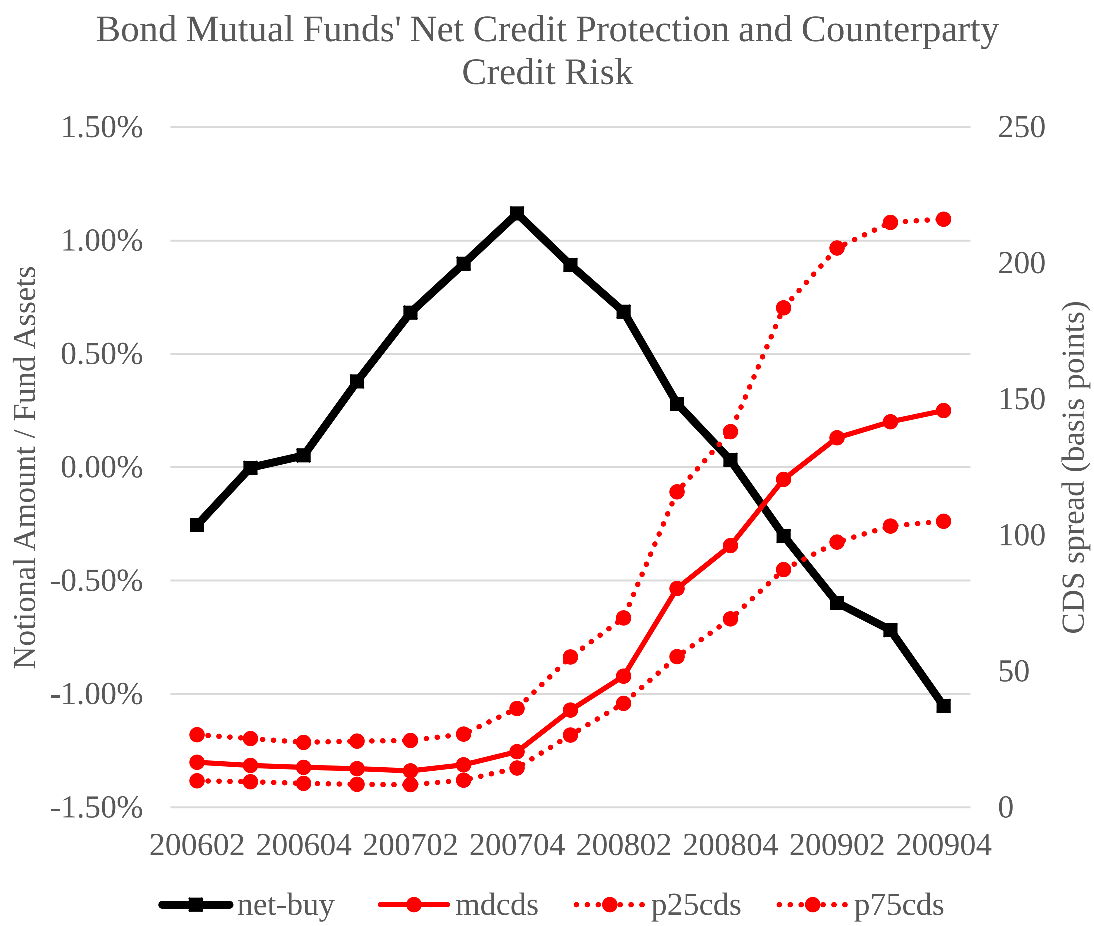


Figure 1. The figure plots the rolling 8-quarter average of the average net buy CDS position across mutual funds (solid line). Net buy is the difference between a bond fund's buy and sell notional amounts underlying its credit default swap (CDS) positions. Notional amounts are reported in quarterly filings and scaled by the fund's total net assets in the same quarter. Only funds with at least one open CDS position (buy or sell) are included. The figure also plots the rolling 8-quarter average of the 25th percentile, median, and 75th percentile of the *Counterparty spread* (in basis points) of swap dealers in our sample (lines with circles).

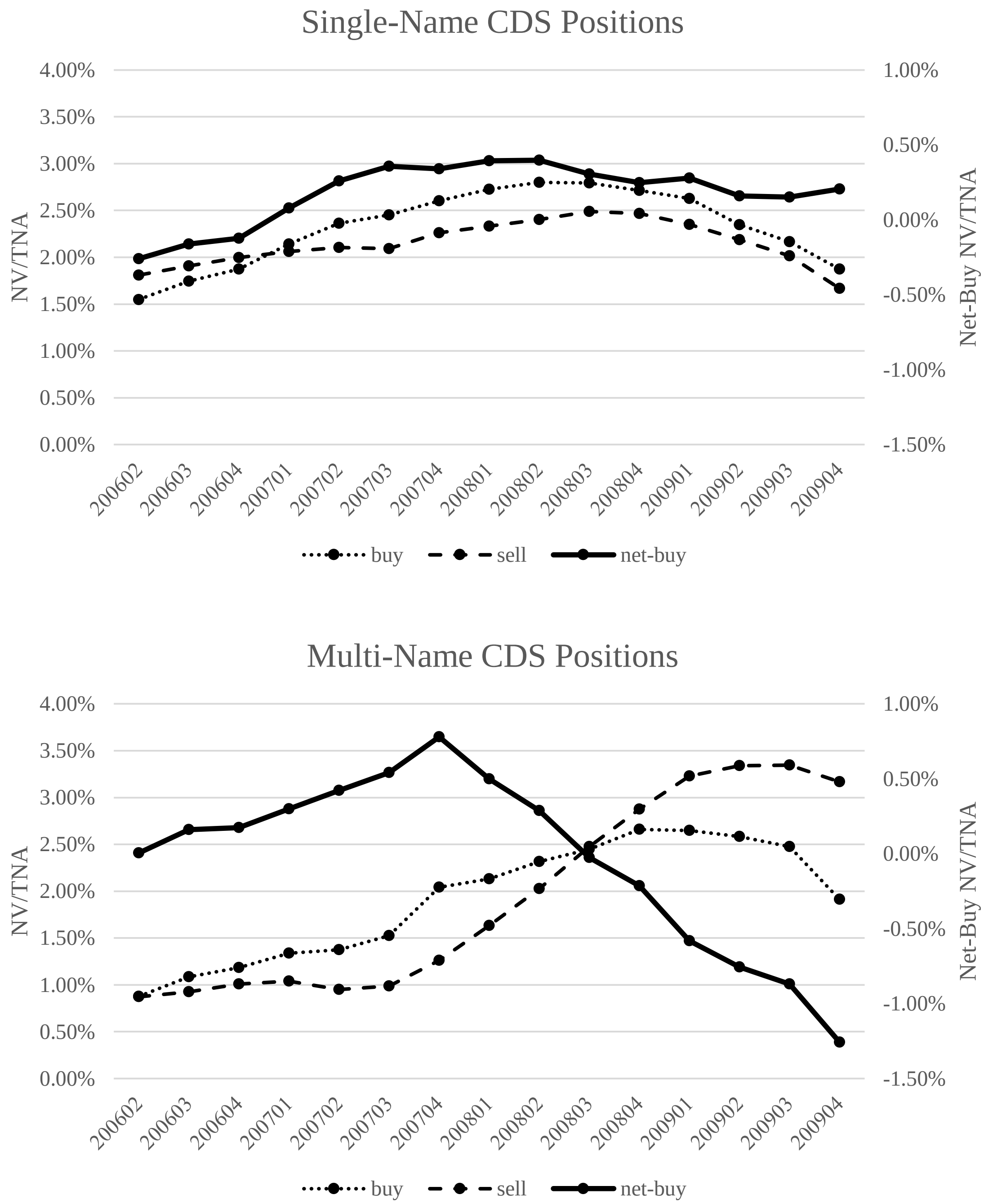


Figure 2. The figure plots the rolling 8-quarter average of the average buy (dotted line), sell (dashed line), and net buy (solid line) CDS position across mutual funds. Net buy is the difference between a bond fund's buy and sell notional amounts underlying its credit default swap (CDS) positions. Notional amounts are reported in quarterly filings and scaled by the fund's total net assets in the same quarter. Only funds with at least one open CDS position (buy or sell) are included. Figures are drawn separately for positions with single-name (Panel A) and multi-name (Panel B) reference entities.

Figure 3. The figure reports the percentage of multi-name (Panel A) and single-name (Panel B) positions that are closed by the fund in the subsequent quarter (i.e., closed positions). Positions are further subdivided based on whether the position has wrong way risk. For multi-name entities, a position has wrong way risk if the reference index is an ABX index. For single-name entities, a position has wrong way risk if the reference entity has an above-median default correlation (based on 24-month backward-looking monthly changes in 5-year CDS spreads) with the counterparty bank. The figure reports the percentage of all positions (pooled across funds and quarters) closed during the pre-crisis and crisis periods.

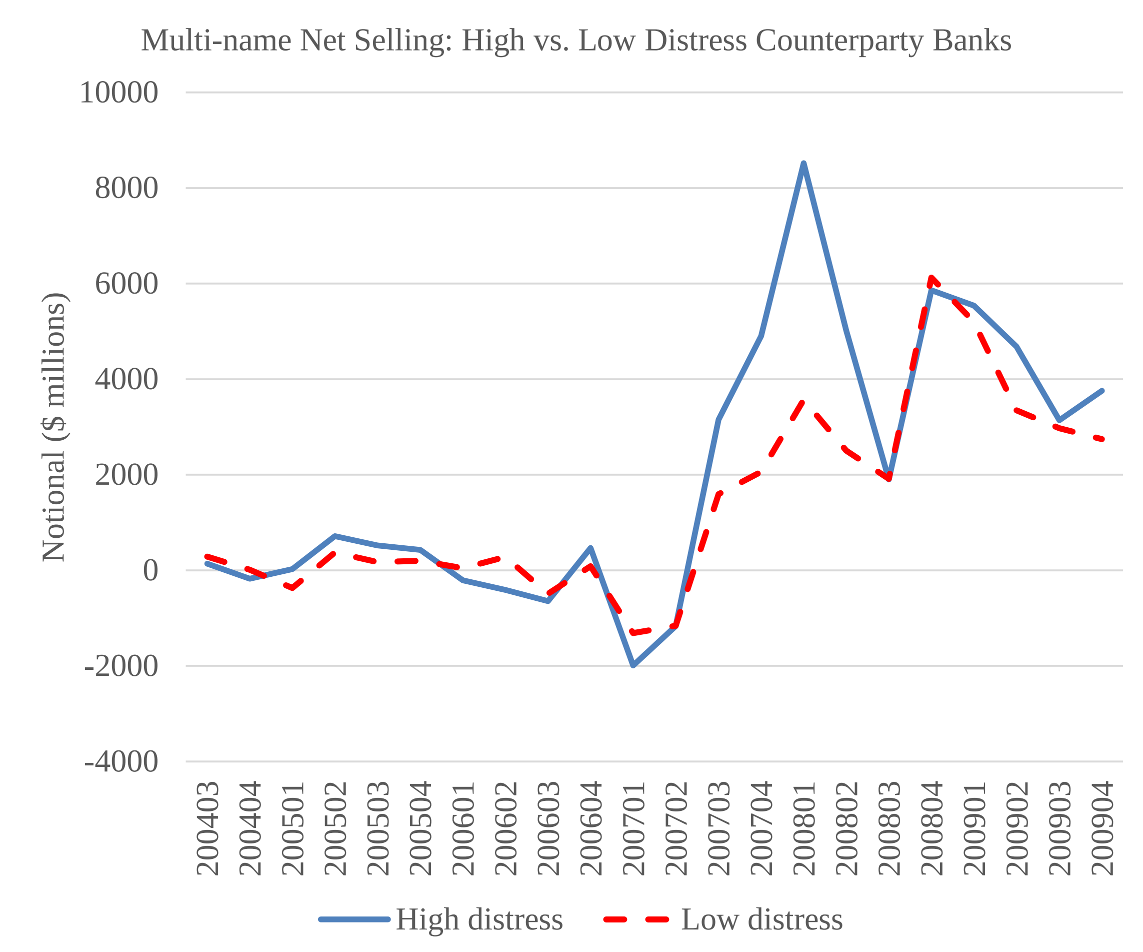
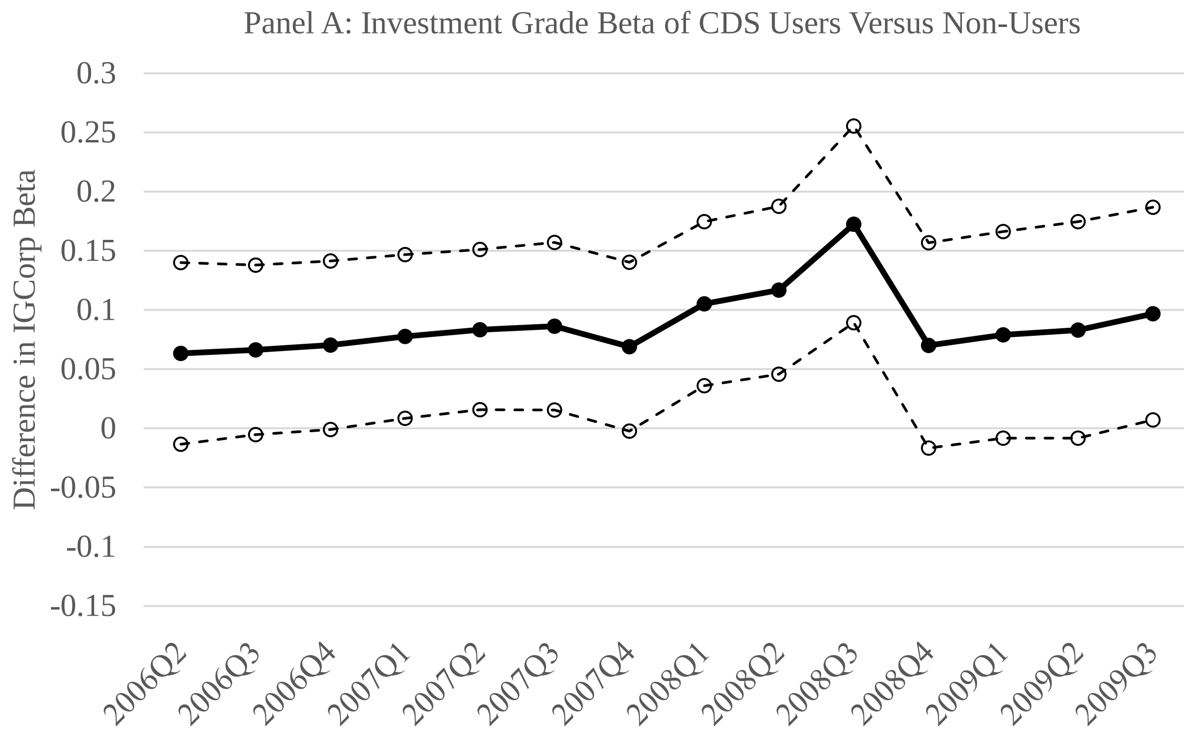
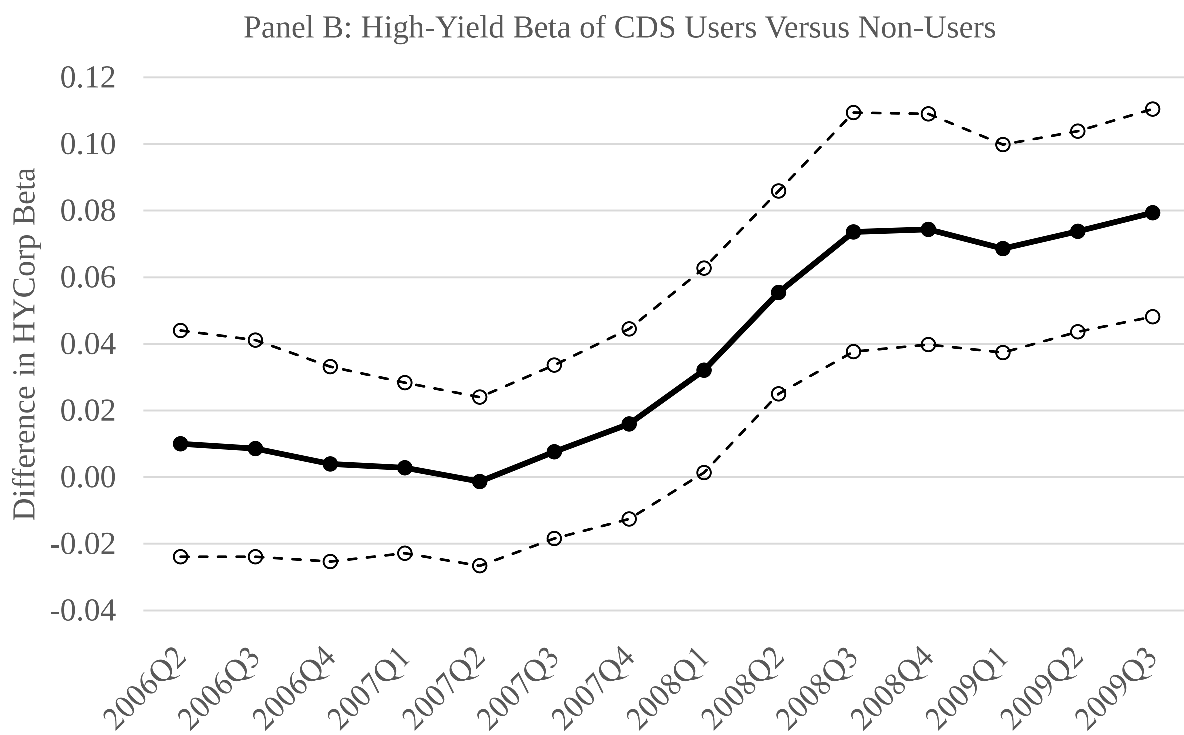


Figure 4. The figure shows the aggregate net selling of multi-name CDS protection by mutual funds to high (solid line) and low distress (dashed line) bank counterparties. A bank counterparty has high (low) distress if the average 5-year monthly CDS spread over 2007Q3-2009Q1 is above (below) the median. For each quarter and counterparty group, the figure plots the aggregate net selling of multi-name CDS positions – that is, the difference between 1) the aggregate notional value underlying all sell protection positions and 2) the aggregate notional value underlying all buy protection positions. Notional value is reported in millions of U.S. dollars. The high distress group includes Lehman, Morgan Stanley, Merrill Lynch, HSBC, Wachovia, Bear Stearns, Goldman Sachs, and Citigroup. The low distress group includes UBS, RBS, Bank of America, Barclays, JP Morgan, Deutsche Bank, Credit Suisse, Societe Generale, and BNP Paribas.


Panel A: Investment Grade Beta of CDS Users Versus Non-Users
Difference in IGCorp Beta
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
2006Q2
2006Q3
2006Q4
2007Q1
2007Q2
2007Q3
2007Q4
2008Q1
2008Q2
2008Q3
2008Q4
2009Q1
2009Q2
2009Q3


Panel B: High-Yield Beta of CDS Users Versus Non-Users
Difference in HYCorp Beta
0.12
0.10
0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
2006Q2
2006Q3
2006Q4
2007Q1
2007Q2
2007Q3
2007Q4
2008Q1
2008Q2
2008Q3
2008Q4
2009Q1
2009Q2
2009Q3

Panel C: Monthly Performance of CDS Users Versus Non-Users

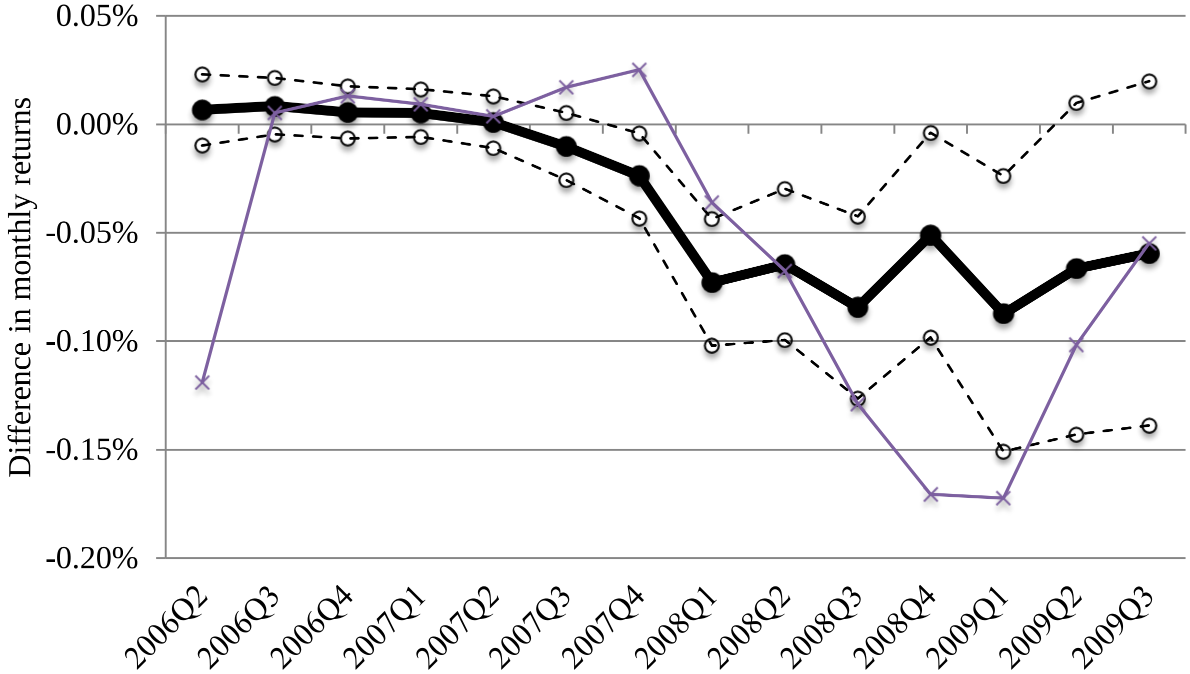


Figure 5. The figure plots the rolling 24-month window estimates (solid line) and 95% confidence bands (dashed lines) of the coefficients β_1 (Panel A), γ_1 (Panel B) and α_1 (Panel C) from the pooled regression of monthly fund returns: $r_{im} = (\alpha_0 + \alpha_1 CDS\ dummy_{im}) + (\beta_0 + \beta_1 CDS\ dummy_{im}) \times IGCorp_{im} + (\gamma_0 + \gamma_1 CDS\ dummy_{im}) \times HYCorp_{im} + e_{im}$. *CDS dummy*$_{im}$ is a dummy variable that equals one if fund *i* has at least one open CDS position (buy or sell) during the quarter. Panel C also plots (x) the difference in raw monthly returns between CDS users and non-users.

Table 1: Summary statistics. Panel A reports the mean values of selected variables for all funds, CDS users and non-users, respectively. All variables are defined in Appendix A. Panel B reports the number and percent of bond mutual funds that use CDS in each quarter and their average CDS strategy. Panel C summarizes the average fund-quarter CDS portfolio for the subsample of all, single-name, multi-name, and multi-name ABX index positions. Panel D summarizes key variables for each bank that is a counterparty to at least one CDS position in our sample. *# of funds* is the number of unique mutual funds for which the bank is a counterparty in at least one CDS position, *Avg. notional* is the average of the quarterly aggregate notional amount across all CDS positions during a quarter. *Min.*, *Med.* and *Max. CDS* denote the minimum, median, and maximum quoted spread for a 5-year tenor CDS contract referencing the bank over 2004-2009. ***, **, and * denote the difference between CDS users and non-users is significant at the 1%, 5% and 10% level, respectively.

Panel A: Mean value comparison

	All funds	CDS users	Non-users	Diff.
TNA ($MM)	1,260	3,260	715	2,545***
Family TNA ($MM)	8,420	23,500	4,270	19,230***
Flow	0.04%	0.21%	-0.01%	0.22%**
Flow volatility	4.35%	4.52%	4.30%	0.22%
Load dummy	0.54	0.53	0.54	-0.01
Fund age	13.88	15.69	13.38	2.32***
Manager tenure	7.01	7.05	7	0.04
Manager MBA	0.48	0.58	0.45	0.13***
Expense ratio (%)	0.93	0.89	0.94	-0.05***
Asset turnover	1.65	2.43	1.44	0.99***
Average credit rating (1=best, 17=worst)	7.68	8.15	7.54	0.61***

Panel B: Number of CDS users and CDS strategies

Period	# of funds	# of CDS users	% of CDS users	Average(CDS notional amount/fund TNA) total	protection sells	protection buys
2004Q3	485	45	9.3%	2.1%	1.4%	0.7%
2004Q4	484	48	9.9%	3.2%	1.5%	1.6%
2005Q1	474	54	11.4%	3.9%	2.2%	1.7%
2005Q2	459	65	14.2%	6.9%	4.3%	2.9%
2005Q3	459	70	15.3%	6.2%	3.7%	2.4%
2005Q4	462	74	16.0%	6.2%	3.0%	3.3%
2006Q1	442	76	17.2%	5.4%	2.4%	2.9%
2006Q2	451	80	17.7%	6.0%	2.5%	3.3%
2006Q3	451	91	20.2%	5.8%	2.6%	3.2%
2006Q4	434	96	22.1%	6.3%	2.7%	3.6%
2007Q1	426	98	23.0%	7.5%	2.5%	4.7%
2007Q2	423	111	26.2%	8.2%	3.3%	4.9%
2007Q3	419	124	29.6%	8.5%	3.7%	4.6%
2007Q4	408	127	31.1%	8.5%	4.1%	4.3%
2008Q1	406	120	29.6%	9.5%	5.2%	4.3%
2008Q2	406	123	30.3%	9.9%	5.0%	4.4%
2008Q3	395	116	29.4%	8.8%	4.7%	3.8%
2008Q4	384	102	26.6%	8.4%	4.5%	3.8%
2009Q1	377	99	26.3%	7.9%	4.1%	3.6%
2009Q2	385	106	27.5%	5.9%	3.3%	2.5%
2009Q3	391	105	26.9%	4.6%	2.6%	1.9%
2009Q4	360	92	25.6%	3.9%	2.1%	1.8%

Panel C: Average Fund-Quarter CDS Positions, by Reference Entity

	All	Single-name	Multi-name	Multi-name/ABX
Buy or sell positions				
# observations	2329	2109	1411	312
# positions	25.26	21.73	9.22	6.59
Notional/TNA	7.77%	4.34%	6.34%	2.21%
# counterparties	4.92	4.78	3.21	2.97
Buy positions only				
# observations	1692	1457	862	96
# positions	15.40	14.97	4.92	2.11
Notional/TNA	5.26%	3.25%	4.84%	0.77%
# counterparties	3.93	3.82	2.65	1.63
Sell positions only				
# observations	1843	1608	1007	259
# positions	17.55	14.74	8.59	7.09
Notional/TNA	4.95%	2.73%	4.69%	2.33%
# counterparties	4.43	4.22	3.08	3.09

Panel D: Characteristics of mutual fund CDS counterparties

Bank	# funds	Avg. Notional ($MM)	Avg. buy notional ($MM)	Avg. sell notional ($MM)	Min. CDS	Med. CDS	Max. CDS
Bank of America	37	1315	733	581	8	28	395
Barclays	57	2985	1055	1924	6	12	257
Bear Stearns	23	922	324	593	19	32	280
BNP	16	295	77	218	6	52	109
Citigroup	54	1981	715	1265	8	20	632
Credit Suisse	39	1440	533	906	10	27	215
Deutsche Bank	54	5952	1361	4590	10	18	158
Goldman Sachs	68	4942	1565	3366	20	35	419
HSBC	12	193	10	183	5	12	152
JP Morgan Chase	69	3100	1277	1819	14	35	201
Lehman Brothers	60	4097	1316	2779	20	31	336
Merrill Lynch	52	1378	380	992	16	34	556
Morgan Stanley	60	3086	1296	1782	19	35	1033
RBS	23	2283	260	2022	4	68	293
Societe Generale	1	29	0	29	77	77	77
UBS	41	1097	505	589	5	10	315
Wachovia	4	157	132	84	11	16	391
Average	39.4	2073.7	721.3	1395.4	15.1	31.9	342.4

Table 2: Probit model of bond mutual funds' usage of credit default swaps (CDS). This table reports the estimated marginal effects of a Probit model in which the dependent variable is a dummy variable that equals one if the fund reports at least one CDS position in the quarter. Independent variables are defined in Appendix A. Results are reported for different sample periods. All variables except dummies and log variables are winsorized at the 1% level. Standard errors (in parentheses) are clustered by both fund and time. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Log(1+TNA)	0.0764***	0.0773***	0.0642***	0.0927***	0.0972***
	(0.0103)	(0.0104)	(0.00910)	(0.0160)	(0.0182)
Log(1+family TNA)	0.00912***	0.00873***	0.00433**	0.0141***	0.0187***
	(0.00240)	(0.00248)	(0.00187)	(0.00440)	(0.00553)
Flow	-0.256*	-0.265*	-0.0470	-0.522	-0.542
	(0.154)	(0.156)	(0.140)	(0.334)	(0.422)
Flow volatility	0.264**	0.280**	0.268**	0.233	0.521*
	(0.117)	(0.121)	(0.130)	(0.235)	(0.268)
Load dummy	0.0385	0.0399	0.0208	0.0774	0.0313
	(0.0351)	(0.0358)	(0.0327)	(0.0545)	(0.0674)
Fund age	-5.40e-05	0.000323	-0.000171	0.00145	-7.55e-05
	(0.00157)	(0.00160)	(0.00133)	(0.00277)	(0.00289)
Mgr. tenure	-0.00771***	-0.00852***	-0.00565**	-0.0139***	-0.0129***
	(0.00258)	(0.00260)	(0.00220)	(0.00424)	(0.00460)
Mgr. MBA	0.0828***	0.0863***	0.0585**	0.0993*	0.179***
	(0.0296)	(0.0307)	(0.0239)	(0.0552)	(0.0629)
Expense ratio	-0.0634	-0.0874*	-0.0789*	-0.0863	-0.0407
	(0.0489)	(0.0492)	(0.0455)	(0.0786)	(0.100)
Turnover	0.0251***	0.0267***	0.0147***	0.0405***	0.0560***
	(0.00642)	(0.00652)	(0.00503)	(0.0123)	(0.0147)
Abnormal return (t-1)	-0.00634**	-0.00638**	0.00374	-0.0122*	-0.00952
	(0.00316)	(0.00315)	(0.00760)	(0.00647)	(0.00803)
Abnormal return (t-2)	-0.00334	-0.00272	-0.00839	-0.00707	0.00162
	(0.00287)	(0.00283)	(0.00852)	(0.00763)	(0.00494)
Abnormal return (t-3)	-0.00178	-0.00208	0.000950	-0.00504	-0.00336
	(0.00387)	(0.00378)	(0.00788)	(0.00985)	(0.00694)
Abnormal return (t-4)	-0.000823	-0.00185	0.000709	0.00368	-0.000158
	(0.00475)	(0.00471)	(0.00805)	(0.0112)	(0.00917)
Average credit rating		0.0130***	0.00930***	0.0159**	0.0192**
		(0.00365)	(0.00289)	(0.00620)	(0.00811)
Sample period	Full sample	Full sample	Pre-crisis	Crisis	Post-crisis
Fixed effects	Stylebox x Quarter	Quarter	Quarter	Quarter	Quarter
Observations	7,307	7,388	4,267	2,232	889

Table 3: Probit model of a fund's decision to close a CDS position. The table reports marginal effects from a Probit model that relates whether a bond fund closes an existing CDS position over the following quarter. The model is applied to all sample CDS positions. The dependent variable is *Close* - a dummy variable that equals one if the position reported in the current filing quarter is eliminated in the subsequent quarter. Explanatory variables include *Counterparty spread* (in 100's of basis points), *Wrong way risk*, the logarithm of the notional amount of the position, and the unrealized value of the position as a percentage of notional amount. All variables are defined in Appendix A. Results are reported separately for different sample periods and for single and multi-name reference entity types. Panels A and B correspond to positions in which the mutual fund has bought and sold CDS protection, respectively. Standard errors are reported in parentheses and account for clustering at the fund level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Mutual funds' buy protection positions

	(1)	(2)	(3)	(4)	(5)	(6)
Counterparty spread	0.0309***	0.103	0.0307***	-0.00700	-0.0732	-0.0162*
	(0.00969)	(0.241)	(0.0111)	(0.00823)	(0.0952)	(0.00925)
Wrong way risk	0.159*	-0.114	0.412***	0.0953***	0.0942***	0.0769***
	(0.0946)	(0.104)	(0.0530)	(0.0214)	(0.0306)	(0.0258)
Unrealized value/notional amount	-0.209*	0.761	-0.381***	0.139	1.976***	0.297***
	(0.113)	(0.606)	(0.114)	(0.102)	(0.590)	(0.115)
Log(notional amount)	-0.0204*	-0.0240	-0.0122	-0.0191**	-0.0102	-0.0165
	(0.0123)	(0.0300)	(0.0190)	(0.00908)	(0.0145)	(0.0113)
Fixed effects	Fund; Qtr	Fund; Qtr	Fund; Qtr	Fund; Qtr	Fund; Qtr	Fund; Qtr
Observations	2,916	1,129	1,372	12,170	3,751	6,676
Pseudo R2	0.152	0.144	0.179	0.169	0.180	0.178
Sample period	Full sample	Precrisis	Crisis	Full sample	Precrisis	Crisis
Reference entity type	Multi	Multi	Multi	Single	Single	Single

Panel B: Mutual funds' sell-protection positions

	(1)	(2)	(3)	(4)	(5)	(6)
Counterparty spread	-0.00859	-0.205	-0.0181***	0.00170	-0.0706	-0.00264
	(0.00529)	(0.217)	(0.00592)	(0.00557)	(0.0834)	(0.00511)
Wrong way risk	-0.143***	0.393***	-0.178***	-0.0683***	-0.161***	-0.0137
	(0.0429)	(0.152)	(0.0382)	(0.0187)	(0.0330)	(0.0226)
Unrealized value/notional amount	-0.239**	-0.0333	-0.333***	0.0562	-0.0137	0.104*
	(0.104)	(0.254)	(0.0971)	(0.0370)	(0.00891)	(0.0561)
Log(notional amount)	-0.0155*	0.0215	-0.0189*	-0.00445	-0.00698	-0.00860
	(0.00940)	(0.0319)	(0.0106)	(0.00649)	(0.00712)	(0.00820)
Fixed effects	Fund; Qtr	Fund; Qtr	Fund; Qtr	Fund; Qtr	Fund; Qtr	Fund; Qtr
Observations	4,832	1,065	3,000	12,283	4,732	6,285
Pseudo R2	0.154	0.175	0.157	0.137	0.114	0.179
Sample period	Full sample	Precrisis	Crisis	Full sample	Precrisis	Crisis
Reference entity type	Multi	Multi	Multi	Single	Single	Single

Table 4: Net bond purchases, investor flows, and CDS usage: crisis vs. non-crisis periods. This table reports pooled regressions of a bond fund's net purchases of bonds (scaled by total net assets) on fund flows, total net assets (TNA), lagged returns, and a dummy variable for whether the fund uses CDS. TNA and abnormal returns are lagged one quarter. All other variables are measured contemporaneously with net purchases. Net purchases are calculated as total purchases minus total sales in the quarter. Matured bonds and cash securities are excluded from purchase and sale variables construction. All variables, except log(TNA) and CDS dummy, are winsorized at 1% and 99%. Standard errors account for heteroscedasticty and clustering at the fund level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(5)	(5)
Flow	0.710***	0.701***	0.687***	0.776***	0.717***
	(0.0193)	(0.0232)	(0.0342)	(0.0458)	(0.0208)
CDS dummy	-0.00503**	-0.00212	0.00315	-0.0227***	-0.00703**
	(0.00209)	(0.00297)	(0.00367)	(0.00816)	(0.00281)
Flow * CDS dummy	-0.0758**	-0.186***	0.0420	-0.0814	-0.142***
	(0.0376)	(0.0581)	(0.0457)	(0.0821)	(0.0514)
log(Fund size)	0.000795	0.000589	0.00197*	-0.00104	0.000454
	(0.000577)	(0.000691)	(0.00110)	(0.00211)	(0.000724)
Lagged abnormal return	0.00189**	-0.00461**	0.00358***	0.00166	-7.40e-05
	(0.000862)	(0.00229)	(0.00112)	(0.00163)	(0.00136)
Constant	0.0160	0.0173	-0.00815	0.0654	0.0230
	(0.0116)	(0.0139)	(0.0224)	(0.0454)	(0.0144)
Observations	7,372	4,302	2,209	861	5,163
Adjusted R-squared	0.489	0.457	0.505	0.547	0.482
Fixed effects	Stylebox x quarter	Stylebox x quarter	Stylebox x quarter	Stylebox x quarter	Stylebox x quarter
Sample period	Full sample	Pre-crisis	Crisis	Post-crisis	Non-crisis

Table 5: Estimation of mutual fund portfolio betas by subperiod. This table reports fund-level regressions of monthly fund returns (in excess of the T-Bill rate) on the investment grade corporate (*IGCorp*) and high-yield (*HYCorp*) corporate bond factors. The estimation allows for different coefficients on all variables during the pre-crisis (2004Q3-2007Q2), crisis (2007Q3-2009Q1), and post-crisis (2009Q2-2009Q4) periods. *PreCrisis*, *Crisis*, and *PostCrisis* are dummy variables that equal one for observations before, during, and after the crisis period, respectively. All coefficients are estimated for each fund separately. We divide the historical returns of each fund based on whether the fund has ever reported a CDS position in any prior quarter in the sample period (user) or not (non-user). The table reports the average coefficient across funds. Funds are required to have at least 36 monthly observations to be included in the estimation.

	(1)	(2)	(3)
	Non-user	User	diff
IGCorp*PreCrisis	0.760***	0.824***	0.0639*
	(0.0217)	(0.0318)	(0.0384)
IGCorp*Crisis	0.772***	0.756***	-0.0161
	(0.0290)	(0.0402)	(0.0505)
IGCorp*PostCrisis	0.859***	1.013***	0.155***
	(0.0255)	(0.0344)	(0.0440)
HYCorp*PreCrisis	0.0863***	0.0651***	-0.0212
	(0.0113)	(0.0128)	(0.0186)
HYCorp*Crisis	0.117***	0.200***	0.0836***
	(0.00978)	(0.0149)	(0.0175)
HYCorp*PostCrisis	0.0996***	0.171***	0.0709***
	(0.00915)	(0.0136)	(0.0163)
PreCrisis	0.000319***	0.000431***	0.000111
	(4.12e-05)	(5.72e-05)	(7.17e-05)
Crisis	-0.000968***	-0.00214***	-0.00118***
	(0.000182)	(0.000370)	(0.000368)
PostCrisis	0.00312***	0.00349***	0.000367
	(0.000238)	(0.000449)	(0.000464)
Observations	242	114	356

Table 6: Cumulative fund returns following the Lehman bankruptcy. This table reports regressions of cumulative fund returns following the Lehman bankruptcy. The dependent variable is the cumulative returns since 2008Q3 in excess of the fund's stylebox average return. Independent variables are measured as of 2008Q3 and include a dummy variable that equals one if the fund uses CDS (*CDS dummy*). All other variables are defined in Appendix A. All variables (except logged and dummy variables) are winsorized at the 1% and 99% levels. Fund stylebox fixed effects are included in all models. The regression is estimated for cumulative returns over extending windows from 2008Q4-2009Q4. Standard errors are in parentheses.

Panel A: Baseline specification

Variables	Oct-08	Nov-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09
CDS dummy	-0.00165	-0.00533	-0.00426	-0.00868	-0.00674	-0.00408	-0.000957
	(0.00290)	(0.00453)	(0.00536)	(0.00569)	(0.00609)	(0.00759)	(0.00834)
Log(notional amount)	-0.0580***	-0.129***	-0.158***	-0.174***	-0.167***	-0.121***	-0.0904**
	(0.0126)	(0.0195)	(0.0230)	(0.0245)	(0.0263)	(0.0329)	(0.0359)
Number of counterparties	0.00218***	0.00298***	0.00376***	0.00433***	0.00486***	0.00498***	0.00483***
	(0.000439)	(0.000683)	(0.000806)	(0.000852)	(0.000906)	(0.00112)	(0.00122)
log(TNA)	-0.00133**	-0.00161*	-0.000723	-0.000219	0.000615	0.00128	0.00128
	(0.000597)	(0.000936)	(0.00111)	(0.00119)	(0.00128)	(0.00161)	(0.00176)
log(fund family TNA)	-0.000314**	-0.000676***	-0.000646**	-0.000457*	-0.000169	8.95e-06	0.000154
	(0.000136)	(0.000212)	(0.000251)	(0.000264)	(0.000282)	(0.000354)	(0.000386)
Abnormal return (2008Q3)	0.00486***	0.00964***	0.0100***	0.0116***	0.00552***	0.00212*	0.000923
	(0.000442)	(0.000687)	(0.000819)	(0.000864)	(0.000970)	(0.00128)	(0.00139)
Load dummy	0.000742	0.00270	0.00321	0.00983***	0.00439	0.000355	-0.000436
	(0.00188)	(0.00293)	(0.00346)	(0.00367)	(0.00391)	(0.00495)	(0.00540)
% Struct. Lehman	-0.450	-1.942***	-1.629**	-2.112***	-1.658**	-1.110	-0.506
	(0.354)	(0.551)	(0.650)	(0.684)	(0.749)	(0.929)	(1.012)
% Struct. ExLehman	0.00109	-0.0635***	-0.0891***	-0.0859***	-0.0643***	-0.0494***	-0.0383*
	(0.00696)	(0.0108)	(0.0128)	(0.0134)	(0.0144)	(0.0181)	(0.0197)
% Corp. Lehman	1.627**	0.332	-1.428	-0.381	-1.462	-2.975	-3.026
	(0.718)	(1.116)	(1.317)	(1.384)	(1.470)	(1.918)	(2.088)
% Corp. ExLehman	0.0169	0.0938***	0.130***	0.101***	0.197***	0.230***	0.227***
	(0.0147)	(0.0229)	(0.0271)	(0.0287)	(0.0310)	(0.0397)	(0.0434)
Constant	0.0272**	0.0468***	0.0294	0.0162	-0.0182	-0.0408	-0.0468
	(0.0115)	(0.0180)	(0.0213)	(0.0228)	(0.0245)	(0.0310)	(0.0340)
Observations	378	376	374	369	364	352	349
Adjusted R-squared	0.355	0.576	0.541	0.566	0.340	0.178	0.135

Panel B: Distinguishing between CDS positions with low and high counterparty risk

Variables	Oct-08	Nov-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09
CDS dummy	-0.00363	-0.0121**	-0.00847	-0.0138**	-0.00845	-0.00213	-0.000351
	(0.00347)	(0.00534)	(0.00635)	(0.00668)	(0.00712)	(0.00881)	(0.00965)
Log(notional amount)	-0.0511***	-0.0866***	-0.128***	-0.133***	-0.118***	-0.0758*	-0.0427
	(0.0164)	(0.0252)	(0.0300)	(0.0322)	(0.0354)	(0.0446)	(0.0488)
High counterparty risk	0.00410	0.0134**	0.00827	0.00988	0.000885	-0.00738	-0.00444
	(0.00389)	(0.00602)	(0.00715)	(0.00752)	(0.00797)	(0.00987)	(0.0110)
CDS notional * High counterparty risk	-0.0127	-0.0871**	-0.0617	-0.0845*	-0.101**	-0.0894	-0.0947
	(0.0222)	(0.0343)	(0.0407)	(0.0433)	(0.0473)	(0.0592)	(0.0649)
Number of CDS counterparties	0.00216***	0.00303***	0.00382***	0.00444***	0.00521***	0.00543***	0.00524***
	(0.000443)	(0.000683)	(0.000812)	(0.000859)	(0.000912)	(0.00113)	(0.00124)
log(TNA)	-0.00123**	-0.00130	-0.000525	-4.94e-05	0.000494	0.000829	0.000901
	(0.000604)	(0.000939)	(0.00112)	(0.00120)	(0.00128)	(0.00162)	(0.00178)
log(fund family TNA)	-0.000323**	-0.000743***	-0.000695***	-0.000517*	-0.000230	-3.39e-05	0.000107
	(0.000137)	(0.000212)	(0.000253)	(0.000265)	(0.000282)	(0.000354)	(0.000386)
Abnormal return (2008Q3)	0.00488***	0.00979***	0.0101***	0.0117***	0.00570***	0.00213*	0.000956
	(0.000444)	(0.000685)	(0.000821)	(0.000866)	(0.000968)	(0.00127)	(0.00139)
Load dummy	0.000645	0.00252	0.00313	0.00985***	0.00503	0.00124	0.000318
	(0.00188)	(0.00291)	(0.00347)	(0.00367)	(0.00390)	(0.00494)	(0.00539)
% Struct. Lehman	-0.463	-1.908***	-1.594**	-2.054***	-1.362*	-0.779	-0.196
	(0.356)	(0.549)	(0.652)	(0.686)	(0.753)	(0.933)	(1.019)
% Struct. ExLehman	0.00139	-0.0595***	-0.0861***	-0.0819***	-0.0586***	-0.0436**	-0.0323
	(0.00707)	(0.0109)	(0.0130)	(0.0136)	(0.0145)	(0.0182)	(0.0199)
% Corp. Lehman	1.713**	0.571	-1.286	-0.232	-1.545	-3.271*	-3.246
	(0.724)	(1.115)	(1.326)	(1.390)	(1.471)	(1.920)	(2.095)
% Corp. ExLehman	0.0171	0.0950***	0.131***	0.103***	0.200***	0.231***	0.228***
	(0.0148)	(0.0228)	(0.0271)	(0.0287)	(0.0308)	(0.0395)	(0.0432)
Constant	0.0255**	0.0411**	0.0257	0.0128	-0.0166	-0.0329	-0.0403
	(0.0116)	(0.0180)	(0.0215)	(0.0230)	(0.0246)	(0.0312)	(0.0344)
Observations	378	376	374	369	364	352	349
Adjusted R-squared	0.354	0.582	0.541	0.569	0.348	0.188	0.142