Mutual Fund Holdings of Credit Default Swaps: Liquidity, Yield, and Risk Taking*

Wei Jiang† Zhongyan Zhu‡

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Abstract

Using mutual funds' quarterly holdings of credit default swap (CDS) contracts over 2007-2011, we analyze the motives for and consequences of funds' CDS investment pre- and post-financial crisis. Consistent with theories, funds resort to CDS selling when facing unpredictable liquidity needs and when the CDS security is liquid relative to the underlying bond, and to CDS buying as part of a "negative basis trade" when the bond is illiquid. Smaller funds follow leading funds in yield searching. The reference entities that attracted the highest selling interest from the largest funds were disproportionately firms perceived to be "too large/systemic to fail."

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†Wei Jiang is the Arthur F. Burns Professor of Free and Competitive Enterprise, Finance and Economics Division, Columbia Business School. She can be reached at wj2006@columbia.edu.

‡Corresponding author. Zhongyan Zhu is Assistant Professor of Finance, CUHK Business School, The Chinese University of Hong Kong. He can be reached at zhongyan@cuhk.edu.hk.

1 Introduction

By 2007, the CDS market had grown to over $60 trillion in total notional value and more than 60 percent of all fixed income mutual funds in the U.S. held CDS positions (see Jarrow (2011) for an overview of the market). Despite the popularity of credit default swaps as a synthetic security to gain or hedge credit exposure and the numerous studies examining the effect of CDS contracts on issuers' borrowing costs, there has been little empirical research on how institutional investors take advantage of the CDS market or their strategies when employing CDS contracts on single-name reference entities specifically. Due to data availability, most empirical research based on mutual fund holdings has focused on long positions in equity and bonds and research on the CDS market usually resorts to market-level data. Our study offers a comprehensive set of empirical tests on the motives, strategies, and consequences of CDS investment by a large class of institutional investors—U.S. mutual funds—from 2007 to 2011, a period spanning from pre- to post-financial crisis eras.

Though CDS contracts represent "redundant" securities in that their payoffs could be replicated by underlying securities in the absence of market frictions, theory work (most recently by Oehmke and Zawadowski (2015a)) indicates that CDS contracts can offer advantages over investing in the underlying securities. CDS are appealing to investors with short-horizon capital and a directional view of the credit risk of the reference entity because CDS contracts require less capital and afford more liquidity to create the same return profile as buying or selling a comparable bond from the same issuer. Moreover, investors with long-horizon capital but no strong directional view can capture the usually negative spread between the CDS and equivalent bond yields through a "negative basis trade" consisting of long positions in both CDS and bonds which, in equilibrium, compensates for the illiquidity of bonds.

Mutual funds are an ideal place to test hypotheses about how institutional investors use the CDS market because they play the role of both long- and short-term investors and their

trades could be either information or liquidity driven. On the one hand, mutual funds are diversified, long-term investors which allow them to take advantage of liquidity premiums with or without superior directional information. On the other hand, their open-ended structure requires that they maintain liquidity to meet investor fund in- and out-flows; and for actively managed funds further liquidity is needed in order for fund managers to promptly respond to new investment opportunities.

In addition to liquidity management, CDS allows funds to take levered risk and to enhance yields in a way that is not easily measured with models applicable to conventional long-only portfolios. By selling (buying) CDS contracts on reference entities with high (low) spreads, mutual funds accomplish higher yields without fully changing the perceived risk of the portfolio in the absence of major credit events.[1] However, the incremental returns from selling CDS come at the cost of a "hidden tail risk" that is similar to selling disaster insurance and that is usually not fully captured in the benchmark in real time (Rajan (2006)). Since the true performance of CDS can only be assessed over a period that is much longer than the typical horizon set for the average fund manager as implied by the latter's expected tenure and incentive schemes, managers have an incentive to take such risk (Kelly and Jiang (2012), He and Xiong (2013), Gao, Gao, and Song (2015), Di Maggio (2015)). Moreover, the relative performance-based incentives in the mutual fund industry, which are implicit in the strong and convex flow-to-performance investor responses (Chevalier and Ellison, 1997), also creates an incentive for yield-chasing funds to increase their CDS exposure (Guettler and Adam, 2012).

Post crisis there has also been growing concern that the increasingly concentrated fund management industry may become the locus of potential financial instability because of the "hidden tail risk" they take and their tendency to mimic the behavior of leading funds, both of which were succinctly and presciently summarized in Rajan (2006). Funds may herd

[1]For example, mutual fund trackers often report the average credit quality of portfolios in a way that under-weighs the effects of CDS because the market value of the CDS contracts tends to be much lower than the notional amount.

into the same market or even to speculate on the same reference entities, especially those deemed to be too big or too systemic to fail (Feroli, Kashyap, Schoenholtz, and Shin, 2014). Such behaviors increase the correlation between the financial well-being of mutual funds and other financial institutions, as well as among mutual funds. In January 2014, the Financial Stability Board (FSB)—an international organization aimed at preventing financial crises—proposed that some large fund managers [2] might need to be designated "systematically important financial institutions" (SIFIs), which would require them to be subject to stricter regulation. Meanwhile, the SEC is also preparing rules to request more portfolio data from large asset managers and to subject them to stress tests. The legitimacy of such a concern can only be assessed by a careful study of the actual holdings of the mutual funds over a period spanning a full business cycle.

Analyzing a comprehensive dataset of CDS quarterly holdings by U.S. mutual funds (including fixed-income and hybrid funds) from 2007 through 2011 yields several discoveries. First, mutual funds as a whole were net sellers of CDS on single-name reference entities, where the total selling notional amount during the sample period ($244 billion) exceeded the buying notional amount by 65 percent. Nevertheless, the sell-buy skew was concentrated at the top— the Pacific Investment Management Company (PIMCO), the largest fixed-income mutual fund complex, sold twice as many CDS contracts, and with twice as high spreads, as it purchased, while the smallest 70% of mutual fund families were actually net buyers of CDS. This contrast indicates that tail risks tended to be concentrated among the largest funds which are also the most important to the stability of the financial markets.[3]

Second, our study provides strong empirical support for recent theoretical research on the liquidity advantage of CDS over their underlying bonds and on strategies that take advantage of the resulting yield spread (Bongarerts, De Jong, and Driessen (2011), Oehmke and Zawadowski (2015a)). Mutual funds take advantage of the CDS markets in very different

[2] According to Morningstar (a leading investment research firm), at the end of 2012, the top five mutual fund complexes managed 48 percent of total assets of equity funds and 53 percent of fixed income funds.

[3] Di Maggio (2015) provides a theory framework on tail risk taking by "star" funds.

ways over the short- and long-horizons. On the one hand, CDS selling and bond buying could be viewed as substitutes in obtaining credit exposure. Mutual funds with more volatile fund flows and more frequent portfolio turnovers—and hence more frequent and less predictable trading needs in the fixed income market—are more likely to substitute long positions in underlying bonds with short positions in the relatively liquid CDS market. The economic magnitude of this relation is sizable. A one-standard deviation increase in the volatility of funding flows raises the propensity of CDS selling by mutual funds about 50%. And a one-standard deviation increase in the proxy for CDS liquidity (the number of different CDS contracts on the same reference entity) more than doubles the likelihood of CDS selling. On the other hand, CDS buying and bond buying are complements when forming a negative basis trade. Mutual funds buy CDS on illiquid bonds in order to earn the illiquidity premium in the bond yield without taking the full credit risk: A one standard deviation decrease in bond liquidity is associated with 10% more CDS buying.

Third, we identify clear lead-follow patterns in CDS speculation between PIMCO funds and smaller players. In any given quarter when PIMCO holds a large CDS sell position, the probability that smaller funds initiate a new selling position in the next quarter on the same reference entity triples the normal probability, conditional on fund, reference entity, and CDS contract characteristics. Moreover, the pattern cannot be consistently explained by PIMCO's superior information about future CDS spread movements on the reference entity, nor does it seem to be driven by a "common source" of hedging needs from another sector passed through by the broker-dealer network. What potentially amplifies the herding effect is that mutual funds, especially the largest ones, collectively and disproportionately bet on institutions that were perceived as "too big/systemic to tail," most notably, the largest financial institutions.

Thanks to the government bailout, the mutual funds in our sample came out of the financial crisis mostly unscathed despite a period during which their CDS selling positions

incurred colossal losses on paper.[4] Stultz (2010) attributed the bail-out of financial institutions forced upon the taxpayers to a "web of linkage across financial institutions" via derivatives, especially credit default swaps. Our study provides a concrete picture of such a web involving mutual funds, though they might have been only incidental beneficiaries of the government bailout. A safe landing in a time when the tail risk was supposed to take its toll and to exert discipline makes it difficult to prevent asset managers from adopting the strategies that generate benefits to the funds/managers but arguably exert negative externalities on the financial system.

Our study provides suggestive evidence that mutual funds were not unaware about the risks they were taking or the potential for the government to act as an implicit backstop on these bets.[5] On the one hand they are sensitive to risk on their balance sheet and to being perceived as risky; their CDS holdings were modest relative to their total net assets, indicating that funds do not tend to take risk to a level that could endanger their own capital or justify their own SIFI designations. This finding confirms the most commonly used defense by parties who oppose proposals to classify large mutual funds as systemically important.[6] However, where funds did take on outsized tail risk it was concentrated in precisely CDS on the bonds of the largest financial institutions that the U.S. government was unlikely to let fail. Thus, their trading strategies involving CDS amplify the concentration of correlated risk among the largest financial institutions. While we document that this behavior has decreased after the financial crisis in an environment of flattened spreads, the incentives that led mutual funds to take on tail risk pre-crisis remain post-crisis, suggesting that mutual funds—especially the largest ones—should be part of the "web of linkage" when assessing systematic risk.

Empirical research on institutional investors' CDS investments is relatively scant but

[4] At the peak of the financial crisis in 2008, mutual funds in our sample incurred a total of $3.4 billion in paper losses from their single-name CDS short positons.

[5] Mohamed El-Erian, co-CIO of PIMCO, told reporters in 2008 that "We looked for assets that we felt the government would eventually have to own or support." See "Pimco's Power Play," in *Fortune,* February 19, 2009.

[6] See, for example, "Fund managers: Assets or liabilities," *The Economist*, August 2, 2014.

growing (see a survey by Augustin, Subrahmanyam, Tang, and Wang, 2014). The recent papers analyzing the use of credit default swaps by mutual funds include Adam and Guettler (2012) and Aragon, Li, and Qian (2015). While the data and samples of these two papers have some overlap with ours, the research questions are distinct. Our study resorts to mutual funds as a venue to test the interaction between the bond- and CDS- markets and the strategies of institutional investors. We focus on single-name CDS holdings which provide detailed classification of trading motives at the fund as well as the reference entity level. On the other hand, Adam and Guettler (2012) focus on how mutual funds use CDS to increase fund risk in order to game the convex incentives implied by the tournament model and their analysis is mostly based on CDS holdings aggregated at the fund level. Aragon, Li, and Qian (2015) examine general CDS holdings from the perspective of counterpart risk. Last, our paper analyzes the potential sources of financial fragility in or from the growing sector of fixed income mutual funds, complementing the findings of Goldstein, Jiang, and Ng (2015) from fund flows.

2 Institutional Background and Sample Overview

2.1 Institutional Background

A "mutual fund" is an investment company registered under the 1940 Investment Company Act and could be either an open-end or a closed-end fund. CDS positions are now common among fixed-income, hybrid, and asset-allocation mutual funds despite the fact that derivatives traditionally did not make up a significant portion of fund holdings (Koski and Pontiff, 1999). These funds are using CDS for a variety of purposes. If a mutual fund buys a CDS, it may be seeking protection by paying a yearly premium until a pre-defined credit event occurs or until the contract expires. This protection could be part of a "negative basis trade," through which the fund offsets some or all of the credit risk it takes in its long

bond positions while earning the yield spread.[7] On the other hand, it could be a "speculative" buy betting on the fund's pessimistic view about the financial health of the reference entity. A fund may also sell CDS, in which case it receives the premium but assumes the loss in case of insolvency. When a fund sells CDS, it receives credit exposure to the reference entity without holding the underlying bonds—that is, it creates a synthetic bond that delivers the yields equivalent to the credit spread on the bond that the CDS protects.

There is no legal restraint specifically targeting CDS holdings by mutual funds, but several rules apply. Under the Investment Company Act of 1940, the general restrictions that could potentially apply to funds' CDS positions come from four sources: (1) CDS positions usually count toward the limit on total illiquid investments made by a fund (no more than 15% of all investments). (2) The embedded leverage in CDS contracts subject them to the aggregate limit on a fund's actual and implied leverage (up to 33.3% of the gross asset value). (3) The diversification requirement prohibits concentrated single counterparty exposure (below 5% of total assets). And (4) the full commitment requirement states that the notional amount of total derivatives may not exceed 100% of the total value of the fund. Given that the market value of CDS contracts is at or close to zero at initiation and represents a small percentage of the notional amount in all but the most extreme cases, these restrictions were not binding in our sample period.[8]

2.2 Data Collection

Figure 1 Panel A shows the structure of the data collected from the relevant security filings. Mutual funds are first organized into "families," each containing a group of funds

[7] Blanco, Brennan, and Marsh (2005) and Longstaff, Mithal, and Neis (2005) document the prevailing negative basis between CDS spreads and equivalent bond yields. Chen, Fabozzi and Sverdlove (2010), Oehmke and Zawadowsky (2015a) and Shen, Yan, and Zhang (2014) derive equilibrium models that endogenize the negative yield spread between the synthetic bonds constructed from CDS contracts and the real bonds.

[8] There are exceptions in the more recent period. For example, the Janus Unconstrained Bond Fund has been writing CDS protection with notional amounts exceeding the funds' total net assets since its inception in 2014, when Bill Gross joined Janus from PIMCO. Such a practice resorts to the "segregation" rule (which the SEC has effectively accepted) that allows funds to use the market value of derivatives (including swaps) instead of the notional amount in measuring potential obligations.

that are sponsored by the same investment management firm, such as PIMCO. Mutual funds are required to file annual and semi-annual reports, Form N-CSR/CSRS, to shareholders also contain the funds' securities holdings, and then Form N-Q for the two other quarters to disclose their complete portfolio holdings. The two types of filings span all four quarters in a year. Both forms are filed at one level below the fund family, i.e., the "series trust" or "shared trust" level, such as "PIMCO Funds." A series trust is a legal entity consisting of a cluster of independently managed funds that have the same sponsor, share distribution and branding efforts, and often have unitary (or overlapping) boards. A Form N-CSR/CSRS or N-Q contains detailed portfolio information recorded at the quarter end for each fund which represents a distinct portfolio. CDS positions are disclosed in these original forms but are not included in most processed commercial databases such the Thomson Reuters Ownership database, and are thus available only via manual collection.

[Insert Figure 1 here.]

Our sample construction starts with a search of all N-Q and N-CSR filings on the SEC EDGAR servers for portfolio with period-end dates in 2007 and 2011, a period spanning from before to post the financial crisis. For each filing, we identify CDS positions using the following search keywords: "Credit Default", "Default Swap", "CDS", "Default Contract" and "Default Protection," following Adam and Guettler (2012). Given the purpose of our research, "accidental" CDS users are not of particular interest to us. Hence, we apply a filter that requires a fund (portfolio) to have at least 200 CDS positions or to have a total notional amount of $400 million during the 2007-2009 period in order to be included in our sample. Such a filtered search results in 93,544 CDS holding positions on single name entities in 309 funds in 60 trust series (filers) affiliated with 33 fund families from 2007 to 2011. From the portfolio disclosure we are able to record, for each CDS position, the reference entity, the counterparty, the notional amount, and whether the position was a buy or a sell. We also retrieve fund-level information, such as total net assets (TNA), from the same source. A sample data entry is shown in Figure 1 Panel B. Using the CUSIP as well as the names

of the funds and their affiliated families, we obtain (or construct) more fund-level variables such as returns, portfolio turnovers, and fund flows using data from CRSP Mutual Funds and Morningstar.

While our key data source is similar to that used in Guettler and Adam (2012), the samples in the two studies are constructed in quite different ways. Instead of aggregating CDS holdings for each fund in each period as in Guettler and Adam (2012), we focus on individual CDS positions and collect more detailed information about the individual holdings (notional amount, sell/basis trade/speculative buy, etc.) as well as the reference entities (size of the firm and its CDS spreads, etc.). Moreover, our sample contains all mutual funds that regularly hold CDS position rather than focusing exclusively on the top fixed income funds. The wider spectrum of funds allows us to explore different incentives and behavior among large, medium, and small mutual funds in the CDS market.

2.3 Sample Overview

Table 1 presents an overview of our sample. Panel A shows the quarterly time-series patterns of CDS holdings at the fund family, series trust, and fund level. During the five-year period, the notional amount of mutual fund single-name CDS holdings increased from $13.2 billion at the beginning of 2007 to a peak of $29.2 billion in the second quarter of 2008 before descending to $18.3 billion by the end of 2011. About 62% of the positions involve a sale of CDS, indicating that, on the whole, mutual funds use CDS to seek additional credit exposure. This general pattern is consistent with those documented in Adam and Guettler (2012) and Aragon, Li, and Qian (2015).

[Insert Table 1 here.]

The aggregate statistics, however, mask huge cross-sectional differences. The distribution of CDS positions are highly skewed among funds along multiple dimensions. For ease of discussion, Panel B of Table 1 shows the breakdown by mutual fund families into three

tiers sorted by total CDS notional amount. The PIMCO fund complex occupies the entire top tier. Its funds account for 66% of the total notional amount of CDS contracts held by all mutual funds. It is also worth singling out PIMCO's Total Return Fund (PIMCO TRF) who is the recognized leader among all fixed-income investment companies, accounting for 51.5% of the CDS positions within PIMCO. The second, "Next 9" tier represents the next nine largest mutual fund families after PIMCO, contributing 22% of the total CDS holdings. Finally, the third, or "Rest 23," tier holds the remaining 23 fund families in our sample.

Not only is CDS usage concentrated in the top fund families, but large and small players also appear to use CDS for different reasons. While 66.7% of PIMCO's CDS positions are selling protection—the same figure for PIMCO TRF is slightly higher at 69.4%–the proportion of short positions for the "Next 9" and the "Rest 23" are 62.5% and 37.7%, respectively. Thus, it is worth noting that the net selling of single-entity CDS contracts by mutual funds documented by recent studies is driven by the largest players and is actually not the typical behavior among individual funds. In fact, the "median" fund (among the "Rest 23") bought more credit protection than it sold.

Panel C of Table 1 examines the concentrated nature of fund CDS activities along a different dimension: the underlying reference entities. Out of the 450 reference entities funds hold CDS on, the top 50 (100) account for 66% (79%) of the total notional amount. Moreover, large financial institutions constitute a disproportionately large share among the top reference entities: There are 27 large financial institutions among the top 50 reference entities, including eight "Global Systemically Important Financial Institutions" (G-SIBs) headquartered in the U.S.[9] Though the "systemically important" financial institutions were designated post financial crisis, the identities of financial institutions commanding pivotal positions in the financial system were likely public information. Mutual funds appeared to have sold disproportionate credit insurance on these financial institutions prior to and during

[9]The G-SIBs were designated by the Financial Stability Bureau (FSB) in 2009 and 2010. The eight U.S. headquartered G-SIBs are: Bank of America Corp, Citigroup Inc, Goldman Sachs Group Inc, JP Morgan Chase & Co, Morgan Stanley, and Wells Fargo & Co.

the financial crisis, possibly due to an expectation that they were unlikely to be left to fail.

The clear motive for selling a CDS is to seek credit exposure.[10] The motives for CDS buying are more diverse. Panel D of Table 1 classifies mutual funds' long CDS positions into different categories based on the likely underlying purpose of the CDS contract. There is not a norm in the literature for inferring the purpose of CDS trading based on periodic holdings data; as a first effort,we classify all positions into three categories based on both information availability and the goal of our research. First, we classify a CDS long position to be an "offsetting" buy if it can be matched to a sell position on the same reference entity by the same fund in the same quarter (on the same N-Q/N-CSR filing). A pair of offsetting positions is usually used to bet on the slopes of the term structure or to effectively unwind a previous short position. Second, a "basis trade" represents CDS long positions where the same fund has a long position in the swap's underlying bond during the same period. A basis trade could be either a hedging buy or an opportunistic trade taking advantage of the usually negative basis between CDS and bond spreads. Finally, a "speculative" buy represents the remaining "purely" long CDS positions from which the funds would profit upon the financial failures of the reference entities.

Panel D indicates that while large players (PIMCO in particular) sell more CDS than they buy, they are less speculative within their long CDS positions. For example, while 22.7% of PIMCO's buy positions are classified as speculative, the same proportions are 68.3% and 53.2% respectively for the "Next 9" and "Rest" group. Moreover, PIMCO is just as dominant in basis trading, accounting for 73.2% of the total basis-trade motivated holdings by all mutual funds. A basis trade, which hedges off part or all credit exposure, represents a low risk arbitrage for investors. Superior information regarding the credit quality of the underlying is not necessary for such a strategy, but a long-term investment horizon is. PIMCO's investment supports Oehmke and Zawadowsky's (2015a) view that CDS does not necessarily crowd out demands for bonds, but could in fact increase the demand due to the

[10] Hedging is a very unlikely motive due to the difficulty in short-selling bonds.

presence of basis traders.

All panels in Table 1 combined indicate that the aggregate statistics of mutual funds' holdings of CDS contracts generally do not reflect the behavior of the typical fund because of the different strategies utilized by the large (especially the funds from the leading fund family, PIMCO) and small funds. Overall, PIMCO funds use CDS contracts to seek levered credit exposure in large companies including systematically important financial situations. Funds from small mutual fund families, on the other hand, are net buyers of CDS protection and therefore reduce their credit exposure using the derivatives. The behavior of the middle group is somewhere in between the two extremes, but has more similarity to the strategy used by PIMCO.

Figure 2 displays the empirical distribution of selling and buying intensity at the fund level, defined as the notional amount of net selling aggregated over all single reference entity contracts, scaled by the funds' total net assets. Panel A shows the net selling, equally weighted across all funds. The distribution appears to be quite symmetric, with both the average and median close to zero at 0.09 percent and 0.00 percent, respectively.[11] Panels B and C report gross selling and gross buying separately, the average of which are 2.64 and 2.55 percent of total net assets, respectively, each with a long tail.

[Insert Figure 2 here.]

Linking the CDS holdings of the funds to the market, Figure 3 Panel A displays the average spreads of the net buying and net selling positions held by mutual funds vis-à-vis that of the Markit (a leading data provider on the CDS market) single name CDS index. At each quarter end, we aggregate the buy and sell positions of each reference entity across all mutual funds and classify them into either net buyers or net sellers. Assuming mutual funds

[11] To reconcile our summary statistics with those in Adam and Guettler (2012), we compute the average total CDS notional amount and net selling intensity among the top 100 fixed income funds. The figures are 3.84 percent and –0.84 percent, respectively, smaller than the equivalent numbers in Adam and Guettler (2011) (6.16 percent and –1.67 percent). The difference is mainly due to the inclusion in their sample of CDS positions on index products and sovereign debts.

hold, throughout the quarter, the same positions as disclosed at the most recent quarter-end, we calculate the average CDS spread of both groups, and compare them to the average of all single name entities covered by Markit. The figure shows that from 2007 to 2011 mutual funds consistently hold short (long) positions in CDS with high (low) spreads, and the contrast is even starker during the financial crisis. Thus, CDS positions contribute to higher yields of the fund portfolios (in the absence of major credit events). Such patterns corroborate Becker and Ivashina's (2015) finding that institutional investors' tendency to reach for yield in the corporate bond market.

[Insert Figure 3 here.]

Similarly, Panel B of Figure 3 shows that the average total assets of reference entities on which mutual funds hold net selling positions were $3-5$ times larger than the average of all reference entities covered by Markit prior to the last half year of our sample period. On the other hand, the average size of the reference entities of the net buying positions is similar to the all-CDS market average. The patterns revealed in Figure 3 corroborate our findings from Table 1 that CDS has generally been used by mutual funds to assume leveraged credit exposure rather than for net hedging, and that this is particularly true among large and potentially systematically-important reference entities.

Lastly, the summary statistics of the main variables used in the analyses, both at the fund-quarter level, and fund-reference entity-quarter level, are reported in Table 2.

[Insert Table 2 here.]

3 Mutual Fund CDS Holdings: Liquidity Management, Basis Trading, and Risk Taking

The summary statistics show that the CDS market allows mutual funds from large and median sized fund families to gain additional exposure to corporate credit risk. The same

exposure could be accomplished by simply investing in the underlying bonds. Oehmke and Zawadowski (2015a,b) propose both theoretically and empirically that funds have an important liquidity incentive to choose CDS over the bonds issued by the reference entities in order to obtain roughly equivalent credit exposure. Liquidity in the secondary market for corporate bonds has been traditionally limited by both the fragmentation of multiple issues and the fact that many investors intend to hold the bonds till maturity (Ashcraft and Santos (2009) and Stulz (2010)). In contrast, the liquidity of the CDS market benefits from standardization as well as active trading (Longstaff, Mithal, and Neis (2005)).[12] Moreover, a CDS investor who wishes to unwind an existing position often simply enters an offsetting CDS contract, as an alternative to terminating the swap with the original counterparty or assigning the swap to another willing and acceptable counterparty. Hence, investors with more need for liquidity-driven trades should have a preference for short positions in the relatively more liquid CDS market over long positions in the underlying bonds. In the following analyses, the subscripts i, j, t serve as indices for fund, CDS reference entity, and time period (at the quarterly frequency), respectively.

3.1 Fund Level Analysis

First, we assess the relation between CDS selling intensity and two proxies for mutual funds' liquidity needs at the fund level. Results are reported in Table 3. In Panel A, the dependent variable is a dummy variable equal to one if a fund holds any CDS position over the sample period. The relevant sample is thus all fund-quarter observations where CDS usage is a possibility, whether the fund actually held CDS positions in that quarter or not. To construct such a sample of "potential" users of CDS, we resort to the Lipper fund style categories and include all funds from 37 out of the 182 categories in which at least one fund was a CDS user during our sample period. Such a procedure results in about 32,097 fund-

[12] This view was expressed in a 2014 BlackRock report on "The Liquidity Challenge: Exploring and Exploiting (Il)liquidity, available at: `http://www.blackrock.com/corporate/en-mx/literature/whitepaper/bii-the-liquidity-challenge-us-version.pdf`.

quarter observations, out of which 1,498 fund-quarter pairs hold CDS sell positions, 1,372 hold CDS buy positions, and 948 hold both.

[Insert Table 3 here.]

The first proxy for funds' liquidity needs, is *Flow volatility*, defined as the standard deviation of estimated monthly fund flows (which is the return-adjusted change in fund asset value, as commonly used in the literature) during the 24-month window ending in the same month as the portfolio period end date corresponding to the filings of their portfolio holdings to the SEC and to shareholders. Most open-end mutual funds offer daily liquidity to investors who can buy new shares or redeem shares from the fund at the funds' NAV until just before the market closes. Providing investors with such a service imposes on the funds' liquidity management, requiring these funds to keep adequate cash reserves and invest some of the fund assets in securities with adequate liquidity to trade in and out of on short notice. Edelen (1999) shows that providing this liquidity service is quite costly for even mutual funds that primarily invest in the U.S. public equity market. Chen, Goldstein, and Jiang (2010) show how the complementarities among investors due to the open-end structure can impose challenges on the funds' liquidity management; and Goldstein, Jiang, and Ng (2015) demonstrate the same mechanism for bond mutual funds. The challenge of accommodating fund flows increases with their unpredictability, which the flow volatility measure captures. Given the general lack of liquidity among corporate bonds (Edwards, Harris, and Piwowar, 2007; Bao, Pan, and Wang, 2011) and the liquidity advantage of the CDS market (Das, Kalimipallj, and Navak, 2014; Oehmke and Zawadowski, 2015a,b), the CDS market should be a more desirable venue for credit risk exposure for mutual funds with higher flow-driven, or external, liquidity needs.

The second proxy for funds' liquidity needs is *Portfolio turnover*, the annualized fund portfolio turnover rate, calculated as the lesser of the total amount of new securities purchased or the amount of securities sold, divided by the total net asset value (NAV) of the fund over the past 12 months. The variable is reported in the CRSP Mutual Fund

database. Unpredicted turnover could be forced by fund flows, or by internal motives due to discretionary trading. The portfolio turnover rate is commonly considered a proxy for the active management of mutual funds, and more active portfolio management gives rise to higher portfolio-driven, or internal, liquidity needs. Finally, *Flow volatility* and *Portfolio turnover* are modestly correlated (with a correlation coefficient of 10.3%), suggesting that they capture quite distinctive aspects of funds' liquidity needs.

The first two columns in Panel A of Table 3 adopt the standard logistic regression. Apart from the key variables proxying for funds' liquidity needs, we include common control variables such as fund size (logarithm of total net assets), fund age (logarithm of years since inception), and fund performance rank (from 0, or worst, to 100, or best) within their respective Lipper fund style categories during the previous year. The regressions further include quarterly dummy variables, as well as the 37 Lipper fund style categories. The logit coefficients are the "log ratio of odds ratios" (henceforth, simply "log odds ratios," as commonly used). In our context, the exponentiated coefficients indicate the multiple of the ratio *Prob(CDS Usage)/[Prob(No CDS Usage)]* relative to the base level due to a one-unit change in the regressors.

Consistent with theoretical predictions, coefficients on both *Flow volatility* and *Portfolio turnover* are significantly (at the 1% level) positive. The economic magnitude is sizable too. A one-standard deviation increase in *Flow volatility* (4.2 percentage points) is associated with an odds ratio for any CDS selling of 1.58. Relative to the unconditional probability of CDS selling (4.7%), this implies an incremental probability of 2.5 percentage points.[13] Due to the small unconditional probability of CDS usage among all mutual funds, the odds ratios are roughly the same as the multiples of probability. Similarly, a one-standard deviation increase in *Portfolio turnover* is associated with roughly a 2.1 percentage point increase in

[13] The detailed procedure of calculation, using column (1) of Table 3 Panel A (CDS selling) as an example, is as follows: The base line odds ratio is *Prob(CDS Selling)/[Prob(No CDS Selling)]*= 1498/(31869-1498) = 0.049. A one standard deviation increase in Flow volatility increases the odds ratio to 0.077 (=0.048* *exp*(10.85*0.042)), which implies that *Prob(CDS Selling)*=0.072 (=0.077/(1+0.077)), or an incremental probability of 0.025 (=0.072-0.047). The same calculation applies to other discussions of odds ratios.

the probability of CDS selling.

The first two columns of Panel A show very similar coefficients for CDS selling and buying, which could be due to the large overlap of the two outcome variables. That is, in about half (49%) of fund-quarter observations where it holds CDS positions, the fund engages in both buying and selling. The last three columns in Panel A separate buying from selling and report results from logit regressions where the baseline outcome is no-buy-and-no-sell. The coefficients in the "buy-no-sell" column (column (3)) are the log odds ratio for a fund to hold some buy position but no sell position during a period, relative to the baseline outcome, for a one unit change in a regressor. The coefficients for "both-buy-and-sell" and "sell-no-buy" follow analogously.

Overall, the coefficients suggest that the relation between CDS usage and fund liquidity needs is driven by selling rather than buying. For example, the coefficient of *Flow volatility*, is indistinguishable between the two outcomes involving selling ("both-buy-and-sell" and "sell-no-buy"), but is significantly different (at the 10% level) between the "both-buy-and-sell"/"sell-no-buy" and "buy-no-sell" outcomes. A similar pattern prevails for the coefficient of *Portfolio turnover*. Not surprisingly, larger and older funds are more likely to engage in CDS investments. Prior performance also positively predicts CDS usage.[14]

Panel B of Table 3 analyzes the determinants of intensity of CDS usage by mutual funds using the tobit model. Here, the dependent variable is gross selling (or buying) intensity, defined as the total notional amount of CDS selling (or buying), scaled by the fund TNA during the period. Results again support the liquidity management hypotheses as both proxies for fund liquidity needs are significantly (at the 1% level) positive. A one-standard deviation increase in *Flow volatility* is associated with a 1.39 (1.01) percentage point increase in CDS selling (buying) intensity, both sizable relative to the unconditional average intensity

[14] Adam and Guettler (2012) analyze the motives for mutual funds to resort to CDS investment based on interim relative performance within a year. Our results are not directly comparable to theirs as they focus on year-end risk-taking behavior. Moreover, the positive relation between recent past performance and CDS usage is driven by the post-crisis period. The same relation was negative during 2007-2009, suggesting a tendency for funds to be more aggressive in chasing yield after below-the-par performance during the time when CDS yields were at record high levels, consistent with Adam and Guettler's (2012) finding.

of 0.11 percentage points for selling and 0.12 for buying.

To summarize, results in Table 3 are highly consistent with theoretical predictions from Oehmke and Zawadowski (2015a) that CDS serves as an effective tool for institutional investors to gain exposure in the underlying reference bonds using the more liquid CDS market. As such, the probability as well as the intensity of CDS usage is positively correlated with mutual funds' liquidity needs due to external investor fund flows and/or internal active portfolio turnover.

3.2 Reference Entity Level Analysis

3.2.1 CDS/bond characteristics and propensity to CDS buying/selling

In the next step, we analyze the determinants of CDS usage by funds at the issuer (reference entity) level, incorporating the effects of the characteristics of both bonds and CDS contracts, including their trading liquidity. In general, we expect the high liquidity of CDS contracts facilitates all forms of CDS trading, whether buying or selling protection. However, the liquidity of CDS contracts vis-à-vis that of the underlying bonds has different interactive effects for different purposes for CDS trading, as modeled in Oehmke and Zawadowski (2015a). If the main purpose is to obtain credit exposure, a long position in bonds and a short position in CDS are substitutes, and so are their respective trading liquidity conditions. That is, funds should prefer to sell CDS relative to buying bonds if the CDS contracts are readily available or if the trading liquidity of the bonds is thin. According to this hypothesis, CDS selling should be more sensitive to CDS liquidity than CDS buying.

The relation is quite different when it comes to a "basis trade" (i.e., a paired long position in the CDS and in the underlying bonds in order to take advantage of the usually negative spread between the credit spread on CDS and that on the bonds). The basis trades are most profitable for investors with long-term horizons on bonds that are illiquid (which requires higher yield, other things equal, in equilibrium). This hypothesis predicts a negative relation between bond liquidity and CDS buying. Finally, if CDS buying is for speculative motives,

i.e., to bet on an increasing probability of a credit event, then CDS liquidity would obviously facilitate the trades. On the other hand, there is no prediction regarding its relation to bond liquidity—because the alternative way to speculate in the same direction is to short-sell the bonds. The cost to short-sell bonds is often prohibitively high, and is not directly related to the common measures of bond liquidity.

Table 4 reports the empirical tests. As in Table 3, Panel A of Table 4 performs logit regressions to analyze the propensity to hold CDS positions (buy or sell), and Panel B adopts tobit regressions to further assess the intensity of CDS holdings. Moreover, the regressions in Table 4 also incorporate dummy variables for all quarterly time periods, as well as for the 37 Lipper fund style categories. In addition, we control for the size of the reference entities by including the asset size (in logarithm) of the issuer; and we control for the level of credit risk using the CDS spread (for the five-year "modified restructuring," or MR, contract) of the reference entity at the end of the previous quarter.

[Insert Table 4 here.]

While results in Panel A of Table 4 affirm the relation between CDS holdings (especially CDS selling) and fund liquidity needs (proxied by *Flow volatility* and *Portfolio turnover*) at the issuer level, it provides new insights into the relation between CDS holdings and the trading liquidity for both CDS securities and for the underlying bonds. For the former, we follow the literature by using *#CDS Contracts*, defined as the number of quoted unique CDS contracts by the issuer as covered by Markit during the period, a characteristics that closely reflects dealers' market making capacity (Tang and Yan (2010); Augustin, Subrahmanyam, Tang, and Wang (2016)). There are usually multiple CDS contracts traded on the same reference entity, varying in both term structure (from six months to ten years) and contractual terms related to the definition of trigger events and deliverable obligations.[15]

[15] The common categories include "full restructuring" (FR), "modified restructuring" (MR), "modified-modified restructuring" (MM), and "no restructuring" (NR). The five-year MR contracts are usually the most liquid.

#CDS Contracts captures the density of contingency coverage for the credit risk of a reference entity, which signifies a unique feature in the liquidity of the CDS market, namely, a CDS investor who wishes to terminate an existing position has the option to enter an offsetting CDS contract rather than to terminate the existing contract (Oehmke and Zawadowski (2015a))[16]. The mean and standard deviation of the measure are 10.0 and 1.3, respectively.

For bond liquidity, we resort to % *Bond Days traded*, the percentage of days on which the bond has at least one trade recorded in TRACE during the previous quarter (see discussions in Chen, Lesmond, and Wei (2007) and Bao, Pan, and Wang (2011)). When there are multiple bond issues for a given issuer-period, we pick the one with the largest dollar offering amount.[17] The mean and standard deviation of the measure are 0.50 and 0.33, respectively, indicating overall low bond liquidity and high variance. Somewhat surprisingly, the correlation between *#CDS contract* and *% Bond Days traded* are low (0.076), suggesting that the CDS and the underlying bond markets have relative advantages in trading liquidity (Bühler and Trapp (2010), Qiu and Yu (2012)).

As expected, *#CDS contracts* significantly (at the 1% level) predicts a higher propensity of CDS usage by mutual funds. A one-standard deviation change in *#CDS contracts* is associated with an odds ratio of 2.81 (1.29) for any CDS selling (buying). Given the small unconditional probability of CDS selling/buying at a fund-issuer-period level (about 0.08% for selling and 0.13% for buying), the odds ratios imply that a one-standard deviation increase in the CDS liquidity proxy almost triple the likelihood of a CDS selling while it increases the likelihood of CDS buying by 29%. Though both effects are statistically significant, one cannot fail to notice that CDS selling is far more sensitive than buying to CDS contract

[16] Another commonly used CDS liquidity measure is *#Dealers*, the number of dealers providing quotes on a reference entity, as covered by Markit. In our sample we find that *#CDS Contracts* entails more within sample variation, and hence sharper results, than *#Dealers*.

[17] Another commonly used bond liquidity measure is *Bond turnover*, defined as the ratio of the monthly dollar trading volume of the bonds of the issuer over the issuance amount. The correlation coefficient of the two measures is 0.29. Results are qualitatively similar using the alternative measure. We opt for % *Bond Days traded* because, in our context, funds' ability to trade bonds quickly upon flow imbalance, rather than the intensity of trading, is the most important aspect of trading liquidity. Moreover in our sample, % *Bond Days traded* explains the liquidity component of the bond yields significantly better than *Bond turnover* or the effective trading cost imputed from the closet paired trades of opposite directions.

liquidity. The difference between the coefficients on *#CDS contracts* is significant (at the 1% level) between CDS buying and selling. The results are intuitive in that more readily available CDS contracts encourages more CDS usage by mutual funds; but more importantly, the higher sensitivity of CDS selling (relative to CDS buying) to liquidity offers direct support to Oehmke and Zawadowski's (2015a) prediction that mutual funds may sell the liquid CDS contracts in lieu of bond long positions to achieve the same credit risk exposure.

Coefficients on % *Bond Days traded* flip signs as an explanatory variable for CDS selling and buying. There, a one-standard deviation increase in % *Bond Days traded* is associated with an odds ratio of 1.24 (roughly a 24% increase) of the likelihood for a fund to be selling CDS, and an odds ratio of 0.89 (roughly an 11% decrease) for CDS buying. The negative relation between bond trading liquidity and funds' CDS buying is consistent with the basis trading motive (which accounts for the majority of buying positions as shown in Table 1) to take advantage of the yield premium for illiquid bonds without necessarily assuming additional credit risk. The positive relation between bond liquidity and CDS selling indicates that, in the cross section, bond liquidity does not seem to be a key driver in the substitutability of CDS short positions and bond long positions. Instead, mutual funds tend to write CDS protections on reference entities that are actively traded in both the CDS and bond markets.

Beyond market liquidity, we see that mutual funds prefer to invest in the CDS of large reference entities as *Assets reference entity* is associated with positive and significant (at the 1% level) coefficients in all regressions concerning CDS buying and selling. Interestingly, the size preference is far stronger in CDS selling than buying—the difference between the coefficients from "Any sell" and "Any buy" is significant at the 1% level. It is equally notable that mutual funds demonstrate a clear preference in selling CDS on risky reference entities and buying CDS on non-risky ones, as demonstrated by the significantly positive (negative) coefficients on CDS spread in the predictive regressions for CDS selling (buying). This contrast formalizes the pattern shown in Figure 3.

3.2.2 CDS/bond characteristics and Intensity of CDS buying (basis trading) /selling

Results from tobit regressions for CDS selling/buying intensity reported in Panel B of Table 4 affirm the same economic relations suggested by those in Panel A. A one-standard deviation increase in *#CDS contracts* is associated with a 3.85 (0.70) percentage point increase in gross selling (buying) intensity, both of which are statistically significant (at the 1% level) and economically substantial, given the tiny unconditional average CDS holdings at the fund-issuer-period level. The asymmetry between the effects of CDS liquidity on CDS selling and buying is also salient, and the difference between the two coefficients is statistically significant at the 1% level. A similar argument extends to the effect of the size of the reference entities. The proxy for bond liquidity again enters in opposite signs for CDS selling and buying, as does CDS spreads.

Analysis of CDS usage intensity allows us to isolate basis buy positions. Results are reported in Column (5) of Table 4, Panel B, where the additional independent variable *CDS-bond basis* has been added to the regression. The *CDS-bond basis* is calculated as the sum of the CDS five-year spread and the five-year swap rate, minus the yield of a corresponding five-year bond, all recorded or interpolated during the month of the quarter-end, following Blanco, Brennan and Marsh (2005). As expected, the spread negatively predicts the intensity of basis buying. Because the spread is predominantly negative (the mean and median are –22.2 and –13.6 bps, respectively), the result indicates that a one-percentage-point increase in the absolute magnitude of the CDS-bond spread is associated with an increase in basis trading equivalent to 30.4 basis points of total AUM. The effect is both statistically significant (at the 1% level) and economically meaningful (relative to the unconditional average of basis-trade-to-AUM ratio of 8.9 basis points).

Two additional results are informative. First, the coefficient of % *Bond Days traded* is noticeably higher for basis buying than that for buying in general, suggesting that illiquid bonds attract basis trading which takes advantage of the higher yields compensating for bond

illiquidity (Chen, Lesmond, and Wei, 2007 and Bao, Pan, and Wang, 2011) while offsetting credit exposure with CDS. Second, the level of the CDS spread no longer matters for basis trading, indicating that basis-motivated holders do not have a preference for high- or low-risk reference entities but only care for the spread between the underlying and the derivatives market. Column (6) thus confirms the motive of basis trades, i.e., to take advantage of the return spread between CDS and bond yields, which is usually caused by the relative illiquidity of bonds, without relying on a directional view about the reference entities' credit worthiness.

3.2.3 Risk taking before and after financial crisis

Mutual funds' strong preference for selling CDS on large and risky reference entities is consistent with investors' rampant "yield chasing" prior to the financial crisis. Have mutual funds' preferences changed since? Panel C of Table 4 repeats the tobit regressions for CDS buying/selling intensity separately for the 2006-2007 and 2008-2011 periods. To highlight the mutual funds' attitude toward "systemically important" reference entities, we also add to the regression *Top 20% entity in finance*, defined as the top quintile by asset size of reference entities from the finance industry (SIC code 6000-6999) covered by Markit in 2006. Because designations like G-SIBs were ex post, we resort to *Top 20% entity in finance* as an ex ante measure capturing the potential systemically importance of the reference entities.

Panel C shows that though mutual funds' CDS selling already favors risky entities (as measured by the CDS spreads), the magnitude of the effect since the crisis is about one-seventh of that pre-crisis (the difference is significant at the 1% level). Moreover, the intensity of mutual funds' selling of CDS on the largest financial institutions remained stable before and after the crisis both in terms of the magnitude and significance. However, prior to the financial crisis, mutual fund CDS buying patterns do not suggest they anticipated a large financial crisis, as a group, and so the fragility of such institutions would have impacted them negatively if it weren't for the ex post bail out. In contrast, post crisis the preference

for such reference entities is completely symmetric between CDS selling and buying. That is, since 2008 the mutual funds do not demonstrate any particular net CDS selling interest in the largest financial institutions.

3.2.4 Assessing reverse causality

The strong relation between mutual funds' CDS holdings and CDS liquidity could be driven, or partially affected, by a reverse causality, that is, mutual funds' interests in the CDS positions of individual reference entities make these contracts more liquid. To assess the existence and magnitude of such a mechanism, we conduct a difference-in-difference analysis centered on the initiation of CDS positions by mutual funds for changes in CDS liquidity, as captured by *#CDS contracts*. More specifically, we start with a subsample at the mutual fund (i) – reference entity (j) – quarter (t) level from the $T-1$ and $T+1$ quarters where T is the first quarter fund i initiates a CDS position (either buy or sell) in reference entity j. For all the observations in this subsample, the dummy variable *Mutual fund held* is coded to be one to indicate that fund i eventually holds CDS on reference entity j. We then construct a "control" sample, in which all observations have *Mutual fund held* equal to zero, as follows: For each reference entity which a mutual fund initiates a CDS position in, we match it by assets to another reference entity from the firms covered by Markit within the same industry, using the 12 Fama-French industry classifications. For the matched sample, $T-1$ and $T+1$ become dummy variables for the "pseudo-event time."

Table 5 reports results from the following regression:

$$\begin{aligned} \#CDS\ contracts_{i,j,t} = {} & \beta_1 Mutual\ fund\ held_{i,j} + \beta_2 (T+1)_{i,j,t} \\ & + \beta_3 Mutual\ fund\ held_{i,j} \cdot (T+1)_{i,j,t} + \gamma Controls_{i,j,t} + \alpha_j + \alpha_t + \varepsilon_{i,j,t}, \end{aligned}$$

where the key coefficient is β_3, the coefficient that captures the incremental effect of a fund's initiation of a CDS position on the reference entity's liquidity in the CDS market. *Control* variables include the dummy variables for the Lipper fund categories. We use the

tobit model without quarterly and/or reference entity fixed effects and resort to the OLS when such fixed effects are accommodated. If the reverse causality argument has merit, we should observe a positive coefficient β_3.

Table 5 shows that the difference-in-difference estimates associated with $Mutual\ fund\ held \cdot (T+1)$ are all negative, suggesting that the new participation of mutual funds in the single-name CDS market does not enhance the liquidity of the reference entities. As expected, both coefficients on $Mutual\ fund\ held$ and on $(T+1)$ are positive and significant across all specifications where applicable (without reference entity fixed effects), indicating that reference entities chosen by funds overall enjoy more CDS liquidity and that there is a secular trend in the CDS market toward higher liquidity.

[Insert Table 5 here.]

4 Mutual Fund CDS Holdings: Lead-follow and risk taking

This section analyzes lead-follow pattern between PIMCO and other funds in both CDS investments and in directional betting. Such a pattern arises possibly because of PIMCO's absolute leader status among fixed income mutual funds and the relatively new CDS market.

4.1 Following PIMCO's CDS Selling

4.1.1 Herding behavior

To start with, we ask whether a non-PIMCO mutual fund is more likely to initiate a new net selling position on a reference entity if PIMCO had disclosed a large net selling position in the same reference entity in the previous quarter. The relevant sample is thus the "universe" of potential new reference entities, which consists of all reference entities that

ever appear in our sample, excluding the net selling positions that a fund already held in the previous period.

We run a logit regression at the fund-reference entity-period level where the dependent variable, $New\ Selling_{i,j,t}$ is a dummy variable equal to one if fund i discloses CDS net selling in the reference entity j in period t and the fund did not disclose any net selling position j in period $t-1$. If a reference entity j is not among the disclosed net selling positions of fund i in period t, then $New\ Selling_{i,j,t}$ is coded zero. The key independent variable, $PIMCO\ Lead_{j,t-1}$, is a dummy variable equal to one if both of the following two conditions are met: (1) The reference entity is among the top 50 net selling positions during period $t-1$ by PIMCO funds. And (2) PIMCO's selling position in the entity is the largest among all mutual fund families in notional dollar amount in period $t-1$.

Control variables include the assets of the reference entity (in log); the five-year CDS spread on the reference entity using data from Markit; and the total net assets of the fund (in log) as disclosed in the N-Q filing. All control variables are recorded as of the end of the previous quarter. We further control for time effects and investment styles by including dummy variables for quarters and for the Lipper fund categories. The results are presented in Table 6, where Panels A and B analyze the "Next 9" and "Rest 23" mutual fund families separately. Moreover, each panel separates our sample period into 2007, 2008-2009, and 2010-2011 to accommodate potentially different behavior before, during and after the financial crisis.

[Insert Table 6 here.]

Results in both panels of Table 6 show that the key independent variable of interest, $PIMCO\ Lead_{j,t-1}$ is significant at less than the 1% level in all specifications for the "Next 9" fund families and the "Rest 23" fund families. When PIMCO displayed a large selling position in a previous period on a particular reference entity, the probability that a "Next 9" fund would initiate a selling position in the same entity, other things equal, increased by 0.6, 1.7, and 1.1 percentage points before, during, and after the financial crisis, respectively,

conditional on the fund not already holding a position in the entity. Such incremental probabilities are sizable, given the unconditional probabilities for the funds to initiate a net selling position in a new reference entity in the given years (1.2%, 0.6%, and 0.5% respectively). The corresponding incremental probabilities are similar for the "Rest 23" funds, at 0.7 – 1.1 percentage points. These numbers are even more economically significant relative to the much lower unconditional probability (about 28-46 basis points) for this group of funds to initiate selling in a new reference entity.

4.1.2 Herding into potentially systematic risk

The sign and magnitude of the coefficients on the control variables in Table 6 are of interest on their own. First, the significant coefficients on *Assets reference entity* indicates that mutual funds are far more likely to initiate new CDS short positions on large entities during the sample period. The top reference entities in our sample include Ford Motor, General Motors, Procter & Gamble, General Electric Capital Corp, American International Group, Morgan Stanley, Lehman Brothers, Goldman Sachs, and Citigroup Inc. The second notable relation is revealed in the significantly positive coefficients on *CDS spread*, that is, mutual funds initiated and sold new CDS contracts on reference entities that already appeared to be risky, as measured by the spreads on the most liquid five-year contracts with modified restructuring terms as reported in Markit. The pattern was much stronger in the pre- than in the post-crisis era.

A perception (which was ex post justified) that certain risky large firms (especially financial institutions) are "too big to fail" or "too systemic to fail" might have influenced these players. Commenting on PIMCO's bet on GMAC (the struggling finance arm of General Motors) in 2008, Bill Gross, the founder and co-CIO of PIMCO, was quoted as saying "we tried to move ahead of the government, ..., to purchase assets before we believe they will have to."[18] The Mutual funds' appetite for bets on the relatively risky firms seemed to have

[18]Source: "PIMCO's power play," *Fortune,* February 19, 2009.

diminished after the financial crisis as the overall spreads flatten.

An interaction between *PIMCO Lead* and top reference entities further illustrates the pattern of herding into potential systematic risk. In the regressions reported in columns (7) and (8) in both panels of Table 6, we partition all reference entities into the top 20% and the rest, based on the size of the assets. The interaction term *PIMCO Lead*Top 20% entity* is added to the regression (and *Top 20% entity* is also controlled for on its own). Results show that not only are mutual funds as a group likely to follow PIMCO in initiating new CDS selling positions, but that for the "Next 9" largest fund families the propensity to follow is significantly higher when the reference entities are among the top size quintile. In that case, the incremental probability amounts to 0.8 percentage points, relative to the unconditional probability of 1.5% for the average "Next 9" mutual fund to initiate new CDS net sell position in a reference entity. The interaction effect among the smaller "Rest 23" fund families is similar but much weaker in terms of both economical and statistical significance. Such patterns imply a tendency for the largest and next-tier funds to concentrate their credit risk exposure in a similar group of large reference entities.

Mutual funds, due to their low leverage and diversified portfolios, are generally not as fragile as highly levered financial institutions such as banks. The CDS positions, because they are a small percentage of total net assets, are not of direct concern to the mutual funds. However, our analysis shows that CDS positions are used in a way that increases the correlation between the financial health of large reference entities (many of which are financial institutions) and the large mutual fund families. Moreover, herding by the smaller mutual funds (which does not seem to be driven by information) helps increase the risk correlation between leading and following mutual funds. Both potentially make the large risky reference entities even more too-big and too-systematic-to-fail.

4.1.3 Alternative hypothesis: Learning and risk sharing with a common buyer

The pattern uncovered so far suggests that mutual funds seem to be following the direction of the industry leader, PIMCO, in that they are more likely to take credit exposure on a new reference entity after observing a major bet made by PIMCO in a previous disclosure period. And such herding behavior is stable over time from before to after the financial crisis. However, the same pattern does not rule out two plausible alternative hypotheses. The first alternative hypothesis does not contradict the herding behavior per se but rationalizes it with an information or learning motive. That is, PIMCO's new position in a reference entity might reflect PIMCO's leading knowledge or superior information, which smaller mutual funds acquire and adopt at a lag.

The best way to test the learning (rather than "pure" herding) motive is to examine the dynamics of the CDS spreads before and after episodes where smaller mutual funds follow PIMCO to take a new selling position in a reference entity. In Figure 4, we plot the time series of the average Markit benchmark-adjusted CDS spreads of all PIMCO selling positions that are classified as "leaders" (defined the same way as in Table 6), from six months prior to the disclosure quarter end to six months after.[19] The comparison sample is the benchmark-adjusted average CDS spreads on PIMCO's other net selling positions. Panels A and B separately analyze investment grade and high-yield issues. If the smaller funds follow PIMCO for information motives, then the CDS spreads of the "lead" selling positions should decline relative to the other selling positions post month t. Figure 4 shows that a consistent pattern is lacking. During 2007-2009, there is no evidence that the "lead" selling positions exhibit a decrease in the CDS spreads. Post crisis the "lead" positions seem to be informed. Hence, the lead-follow pattern prior to and during the financial crisis (the center of our discussion on risk taking) cannot be attributed to learning or information dissemination.

[19] Due to the quarterly disclosure frequency, we can only infer that the "following PIMCO" position is initiated during the months [t-3, t] on the chart.

[Insert Figure 4 here.]

The second alternative hypothesis builds on the possibility that mutual funds as a whole absorb credit insurance needs from an ultimate counterparty (or a group of counterparties with similar needs). As such, PIMCO is naturally the first in line to sell the credit protection and, if the counterparty's needs exceed PIMCO's capacity, the residual demand trickles down to the smaller funds. Such a common source of risk sharing need would create a pattern that is observationally equivalent to smaller funds' following PIMCO into new CDS selling. There is no information about who the end CDS buyers are. Our test instead builds on the institutional regularity that CDS dealers tend to take large gross but small net positions (Stulz (2010), Atkeson, Eisfeldt, and Weil (2014)). As such, from the buying side, a "common source" insurance demand is more likely to go through fewer dealers than a similarly-sized insurance need from separate and unrelated counterparties. If PIMCO initiates a large position based on its own information or judgment, it may well engage multiple dealers; the opposite it true if it acts as a "passive" counterparty to a dealer's hedging need. Our test, reported in Table 7, builds on this argument that a higher number of dealer counterparties suggests that the position is more likely to be one that PIMCO takes active risk on.

[Insert Table 7 here.]

The test involves all observations representing new PIMCO selling positions aggregated at the PIMCO fund-quarter level. The dependent variable is either the number of dealers who are the counterparties for this position (columns (1) and (2), using a tobit regression) or a dummy variable equal to one if the position is opened with multiple dealer counterparties (columns (3) and (4) using a logit regression). The average number of dealer counterparties is 2.05 and the interquartile variation ranges from two to seven. The key independent variable, *PIMCO TFR Lead*, is a dummy variable equal to one of the new selling position by the PIMCO Total Return Fund (TFR) is also a "lead" position as defined in

Table 6. We focus on the lead positions of PIMCO TFR because TFR, given its flagship stature within the PIMCO family, is the most likely "first-line" counterpart for dealers seeking to offset a large risk position under the alternative hypothesis. Control variables include the size of the position (the notional amount), the characteristics of the CDS contracts and bonds, and the quarterly dummy variables similar to those in Table 4.

All coefficients on *PIMCO TFR Lead* are positive and significant at the 1% level. Therefore, when PIMCO TFR leads in selling CDS insurance, it is more likely to go through more dealers than through CDS positions for which it is not a leader. Such evidence is not favorable to the hypothesis that these positions serve as absorption of insurance needs from a common source which will in turn be distributed to smaller mutual funds down the road. Needless to say, *PIMCO TFR Lead* is highly correlated with position size by construction, and larger positions are indeed more likely to be handled with multiple dealers. For this reason it is important to point out that, even conditional on position size, the number of dealers is 9.9% higher, or the implied incremental probability of multiple dealers is 9.4% higher, for lead positions compared to other PIMCO selling positions. Hence, the lead-follow pattern uncovered in Table 7 is unlikely to be driven by a common CDS buying source, but rather appears more likely to be active risk taking by PIMCO.

4.2 Following PIMCO's CDS Speculative Buying

We conduct analogous analyses on the lead-follow pattern in CDS speculative buying which reflects another form of betting on the heightened risk of financial distress of the reference entities. We follow our earlier classification scheme (see Table 1, Panel D) to isolate speculative buys from basis trading and "offsetting" trading (which is a small category, representing 4% of the sample total notional amount), as the latter two trade categories do not necessitate credit risk exposure.

Following the same set up, the dependent variable now becomes $New\ Speculative\ Buying_{i,j,t}$, a dummy variable equal to one if fund i discloses CDS buying in the refer-

ence entity j in period t and the fund did not disclose any buying position j in period $t-1$. The key independent variable of interest, $PIMCO\ Lead_{j,t-1}$, is revised to be a dummy variable equal to one if both of the following two conditions are met: (1) The reference entity is among the top 50 speculative buying positions during period $t-1$ by PIMCO funds, and (2) PIMCO's speculative buying position in the entity is larger than that by any other mutual fund family in notional dollar amount in period $t-1$. The same set of control variables is included as in Table 6. Results are reported in Table 8.

[Insert Table 8 here.]

The coefficients imply that a large speculative buy by PIMCO in a previous period increases the probability that other funds initiate new speculative buy positions in the same reference entities by 0.2 – 0.7 percentage points for the "Next 9" funds and 0.4 – 1.5 percentage points for the "Rest 23" funds. The coefficients on $PIMCO\ Lead_{j,t-1}$ are significant both before and during the financial crisis. The economic magnitude is also sizable, given that the unconditional probability that non-PIMCO funds will initiate a new speculative CDS buy position in a given period ranges from 0.3 – 0.7 percent. Hence, both the sell and buy sides reveal the same herding pattern for risk taking.

5 Conclusion

Exploring a comprehensive dataset of mutual funds' quarterly holdings of credit default swap (CDS) contracts in 2007-2011, we test the motivations for mutual funds to hold CDS positions. First, mutual funds sell protection on risky and large reference entities while buying protection on much safer entities, reflecting a tendency to chase yield and to bet on too-large (or systemic)-to-fail institutions, especially prior to the financial crisis. Second, mutual funds take advantage of the liquidity in the CDS market relative to that of the underlying bonds from both the selling and the buying sides. More specifically, CDS selling allows mutual funds to assume credit risk equivalent to buying bonds but with better

liquidity. CDS buying as part of a basis trade allows mutual funds to take advantage of the additional yields compensating for bond illiquidity while offsetting the credit risk. Both strategies allow mutual funds, especially the large, established ones, to enhance both yields and liquidity relative to a conventional fixed-income portfolio. Finally, we find that asset managers are prone to herding behavior which concentrates risk in the financial system. The CDS market increases the correlation of financial health between the largest mutual funds and the largest and systemically important firms (especially financial institutions).

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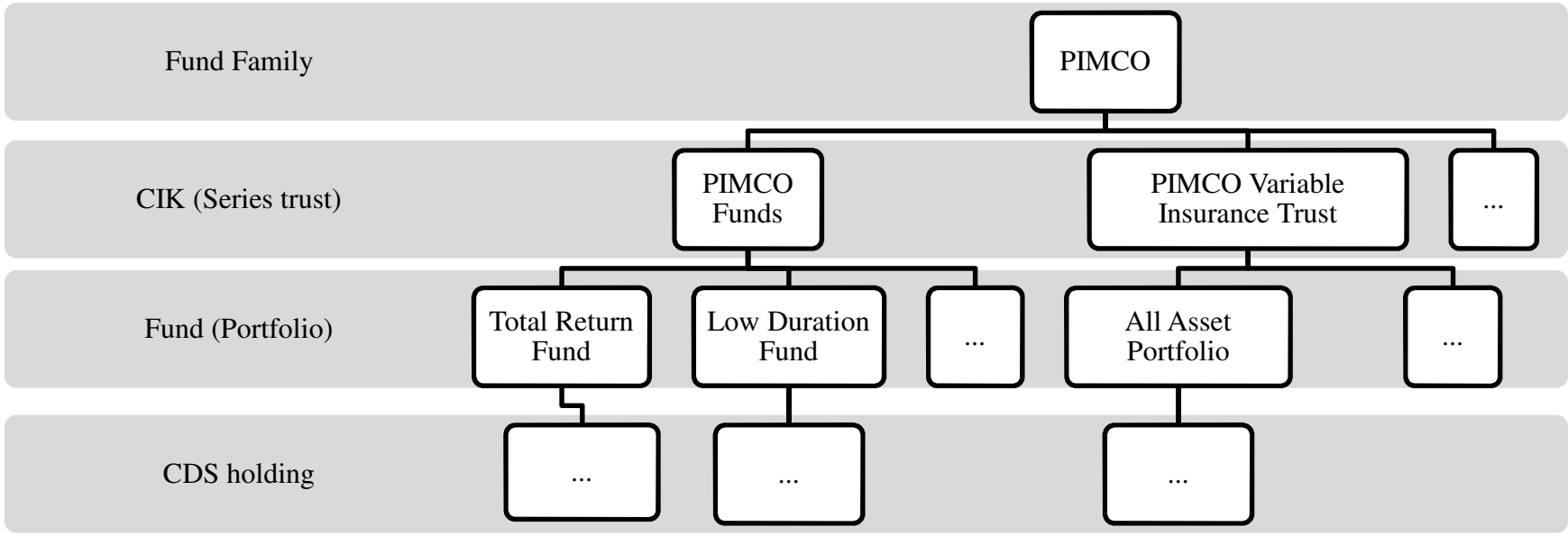
Figure 1: Structure of Mutual Funds' CDS Holdings Data

This chart illustrates the structure of mutual funds' CDS holdings data disclosed in N-Q, N-CSR and N-CSRS forms. A form is filed at the CIK (Series Trust) level where multiple filers could be affiliated with the same mutual fund family (or complex). The disclosure reveals holdings at the fund (portfolio) level where each series trust often encompasses several funds with similar or related investment strategies.



Display: Details of CDS holdings (Filer: PIMCO Funds, CIK = 810893)

Counterparty	Reference Entity	Buy/Sell	Notional Amount ($1,000)	Mark-to-market ($1,000)	Period Ending	Fund name
Bear Stearns Cos I	General Motors Corp. 7.125% due 07/15/2013	Sell	11,700	-249	6/30/2008	TOTAL RETURN FUND
Merrill Lynch & Co	General Motors Corp. 7.125% due 07/15/2013	Sell	25,000	-249	6/30/2008	TOTAL RETURN FUND
Bk of America Corp	General Motors Corp. 7.125% due 07/15/2013	Sell	30,300	-9,841	6/30/2008	TOTAL RETURN FUND
Deutsche Bk AG	General Motors Corp. 7.125% due 07/15/2013	Sell	6,400	-2,079	6/30/2008	TOTAL RETURN FUND
JPMorgan Chase Bk	General Motors Corp. 7.125% due 07/15/2013	Sell	7,000	-2,265	6/30/2008	TOTAL RETURN FUND
Citigroup Inc	General Motors Corp. 7.125% due 07/15/2013	Sell	6,400	-2,063	6/30/2008	TOTAL RETURN FUND
Deutsche Bk AG	General Motors Corp. 7.125% due 07/15/2013	Sell	14,600	-4,706	6/30/2008	TOTAL RETURN FUND

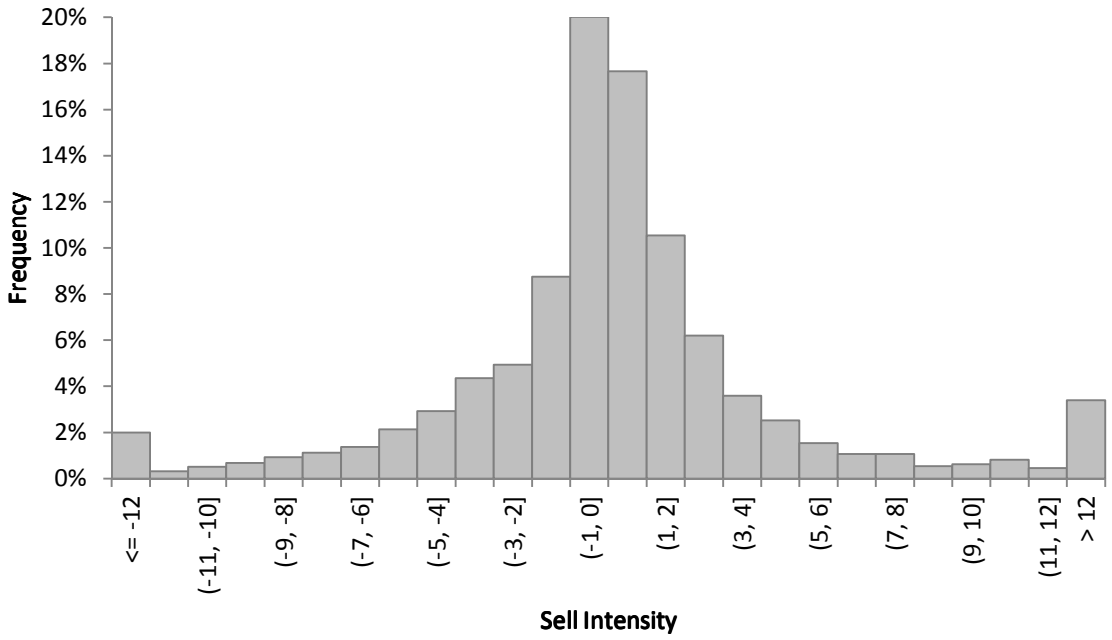
Figure 2. Distribution of Mutual Funds' CDS Net Selling and Gross Selling/Buying

The three charts plot the distributions of CDS net selling, gross selling, and gross buying intensity at the fund (portfolio) level. For each fund in each period, we aggregate the notional amount of each CDS contract (buy or sell) for each reference entity. There are a total of 309 funds represented in the charts. Panel A plots the distribution of net selling (where a buy is considered a negative sell), scaled by the funds' total net assets (TNA), and expressed in percentage points:

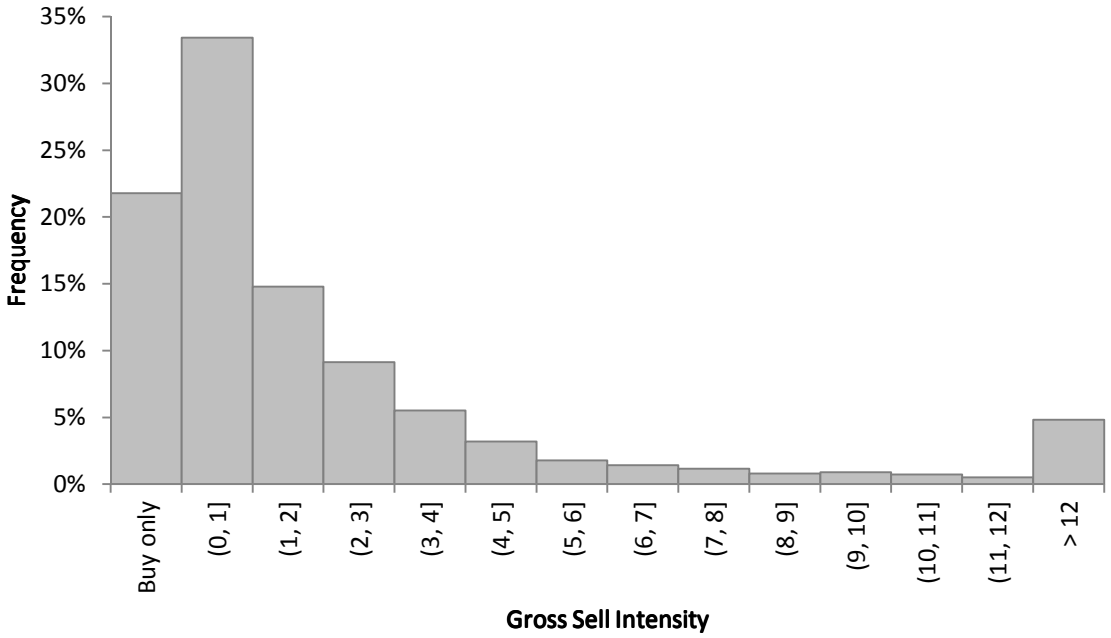
$$Net\ selling = \frac{total\ selling\ notional\ amount\ -\ total\ buying\ notional\ amount}{TNA} \times 100$$

Similarly, Panels B and C plot gross selling and gross buying, respectively, in percentage points of the funds' TNA.

Panel A: Net selling



Panel B: Gross selling



Panel C: Gross buying

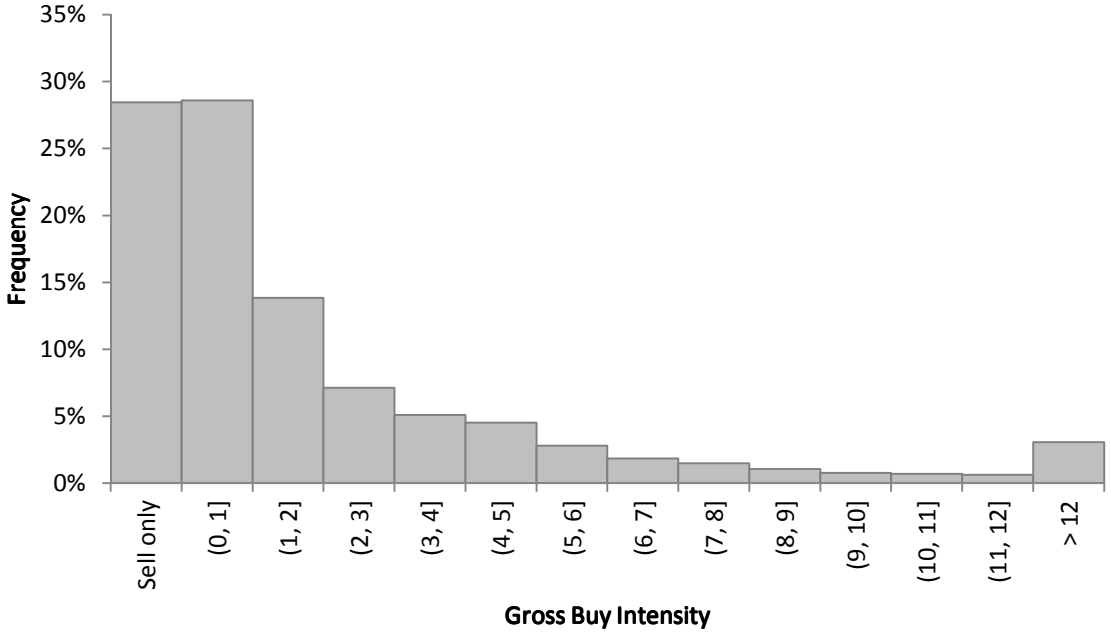
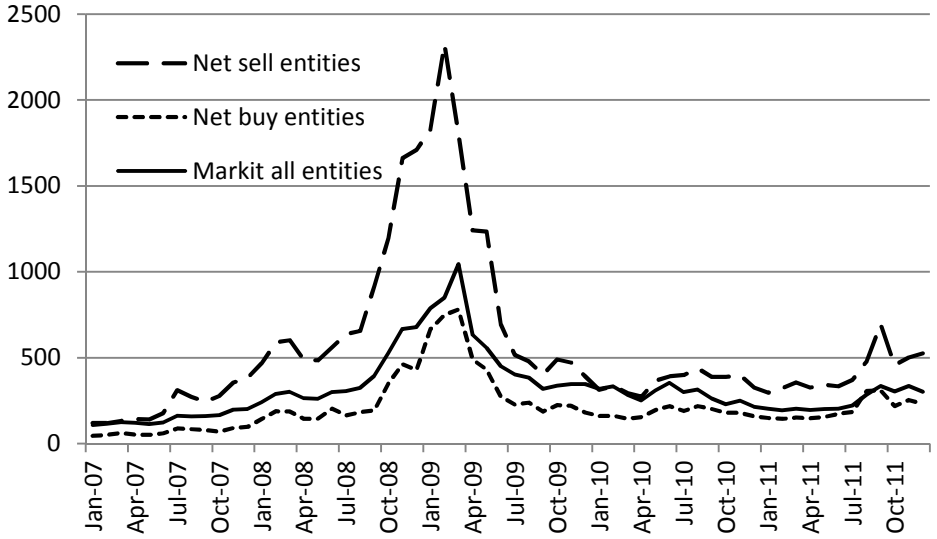


Figure 3. Characteristics of Reference Entities

The two charts plot the average CDS spreads (using the five-year Modified Restructuring, or "MR," contracts) (Panel A) and the average assets of the reference entities (Panel B) in our sample. They separately represent positions for which mutual funds as a whole are net selling and net buying at each point in time. The corresponding average of all reference entities covered by Markit from 2007 to 2011 is also plotted. For each month, we assume that a mutual fund holds the same positions as it disclosed at the most recent quarter-end.

Panel A. Average CDS spreads of reference entities (in bps)



Panel B. Average assets of reference entities (in $ million)

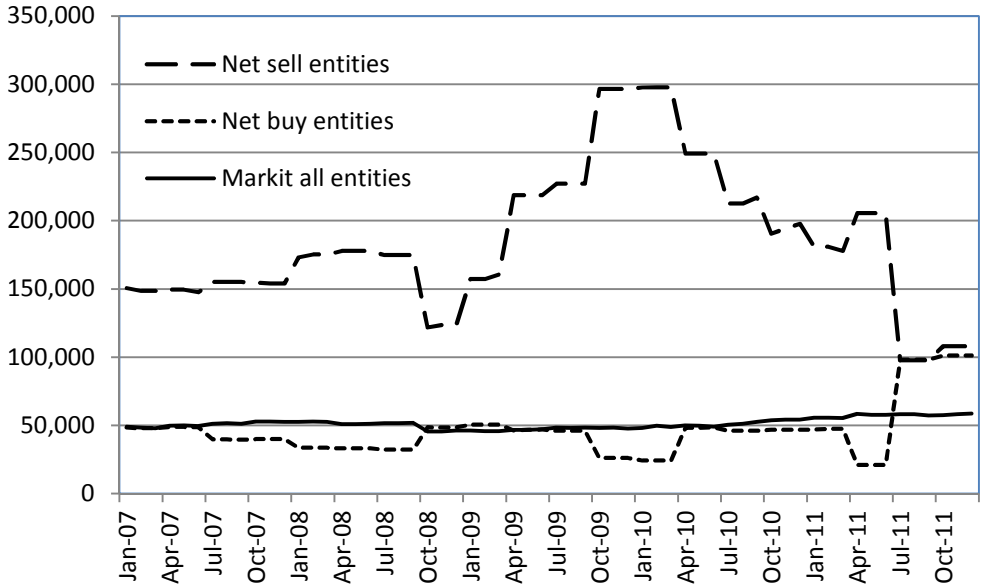
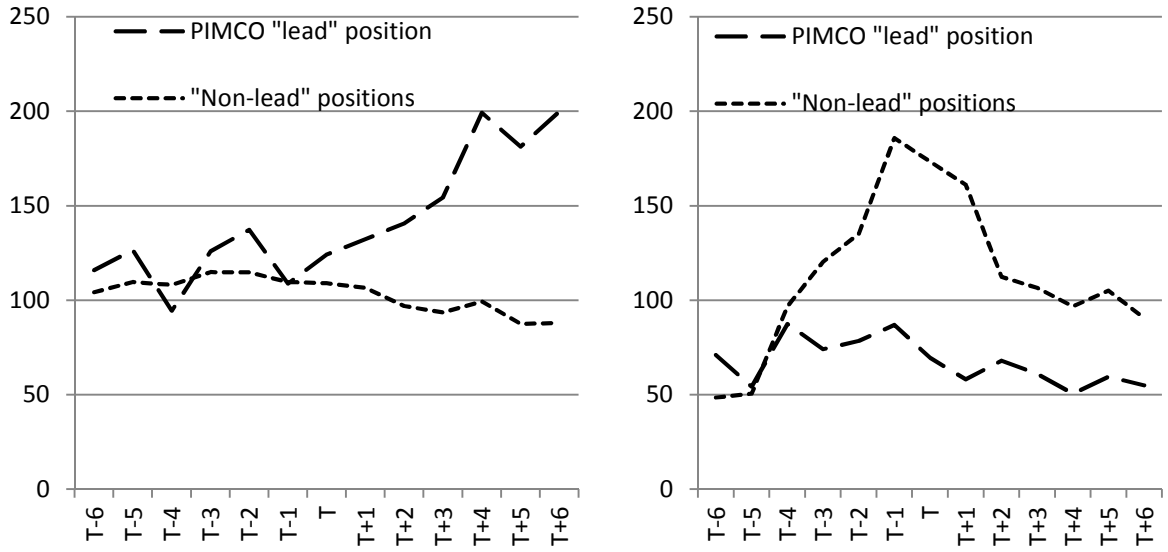


Figure 4. The Dynamics of CDS Spreads of "PIMCO Lead" and "Non-Lead" Positions

This figure plots the event-time series of the average CDS spreads on reference entities held by non-PIMCO families. The time period covers [t-6, t+6] months, where the event month *t* is the time period during which a non-PIMCO fund initiates a new net selling position in a reference entity. In each month, we calculate the equal-weighted average CDS spreads across all reference entities in each sample, assuming that funds continue to hold the position they disclosed at the most recent quarter-end. In all figures, the dashed lines represent "PIMCO lead" positions in CDS selling which satisfy the following conditions: (1) The net selling position is new for the non-PIMCO fund in the current period (quarter *t*); (2) the position of the PIMCO family funds in the entity is larger than that by any other mutual fund family in notional dollar amount during quarter *t-1*; and (3) the position of the PIMCO family funds in the reference entity is among the top 50 net selling positions (among all fund families) during quarter *t-1* by PIMCO funds. The dotted line represents "non-lead" positions, i.e., positions also held by PIMCO funds during quarter *t-1* which do not qualify as a "lead" position. Panel A (B) plots the time series for positions in investment-grade (high-yield) reference entities. Entities are allocated into either investment grade or high yield based on the Market Implied Rating reported in Markit. When such rating is not reported, we manually classify a reference entity based on whether the spread on its U.S. dollar denominated five-year MR contract is below or above 250 bps. Each panel separately covers the crisis (2007-2009) and post-crisis (2010-2011) sub-periods. Finally, all charts plot average CDS spreads in excess of the benchmark, defined as the CDS spreads averaged over all investment-grade or high-yield five-year MR contracts covered by Markit.

Panel A: Investment-grade positions during 2007-2009 (left) and 2010-2011 (right)



Panel B: High-yield positions during 2007-2009 (left) and 2010-2011 (right)

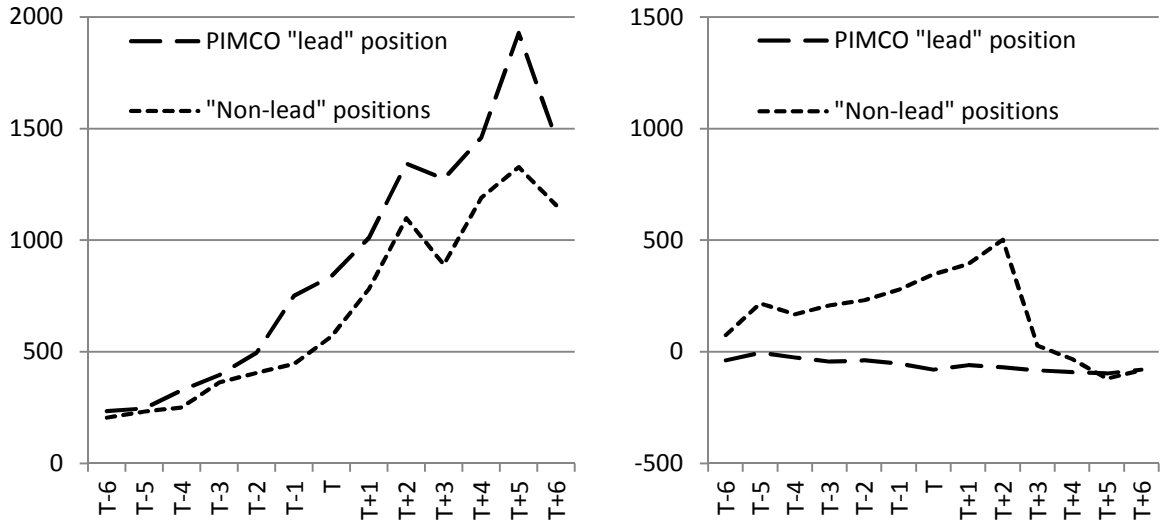


Table 1.

Table 1 provides an overview of CDS positions disclosed by mutual funds at the quarterly frequency for 2007-2011. Panel A shows CDS holdings by quarter from 2007 to 2011. Fund families, series trusts, funds, and reference entities are defined in Figure 1. Panel B reports CDS positions and notional amounts from 3 groups of mutual fund families: PIMCO (the top fund family by total CDS notional amount), where its Total Return Fund and other funds are separately reported, the next 9, and the remaining 23 fund families, ranked by total CDS holdings in notional amounts. Panel C reports the CDS positions of the three groups of reference entities, sorted by their total CDS notional amount in the sample, as well as the average spreads of each group at year-ends. Panel D further classifies CDS buying into three categories: An "offsetting" buy is a CDS long position that can be matched to a sell position on the same reference entity by the same fund during the same period. A "basis trade" buy represents CDS long positions where the same fund has long positions in the same underlying bonds during the same period. Finally, a "speculative" buy represents the remainder of the long positions.

Panel A. Mutual fund CDS holding by quarters, 2007-2011

Period	#Positions	Total Notional Amount ($1,000s)	Sell Amount ($1,000s)	#Families	#Series Trusts	#Funds	#Reference Entities
2007Q1	3,107	13,207,975	8,563,359	28	51	152	292
2007Q2	4,475	15,935,468	9,314,444	30	56	203	335
2007Q3	5,889	20,043,365	13,654,085	32	57	208	344
2007Q4	6,512	22,074,966	14,306,067	33	58	214	349
2008Q1	7,280	24,319,872	15,031,952	33	58	219	375
2008Q2	9,331	29,189,570	17,456,235	33	58	230	394
2008Q3	7,747	26,390,969	16,102,148	33	56	216	385
2008Q4	6,410	24,023,810	13,316,142	33	58	199	355
2009Q1	4,996	21,249,905	9,572,984	32	55	194	329
2009Q2	3,856	15,634,865	8,133,547	32	49	173	290
2009Q3	3,745	15,501,565	8,410,742	29	49	173	269
2009Q4	3,430	15,996,135	9,151,922	31	49	168	256
2010Q1	3,284	17,792,151	10,740,607	26	42	154	239
2010Q2	3,097	17,240,338	10,785,213	25	42	150	230
2010Q3	3,172	18,400,742	11,734,490	26	42	158	247
2010Q4	3,192	18,358,791	12,651,894	24	41	150	242
2011Q1	3,272	19,898,308	14,045,280	26	42	153	250
2011Q2	3,447	18,755,822	13,965,809	27	44	153	244
2011Q3	3,571	19,344,830	13,661,008	24	41	150	255
2011Q4	3,731	18,278,149	13,099,536	23	39	149	247
2007-2011	93,544	391,637,593	243,697,465	33	60	309	450

Panel B. Mutual Fund CDS holding by mutual fund families

	#Positions	Amount ($1,000s)	% of total	Sell Amount ($1,000s)	Buy Amount ($1,000s)
All	93,544	391,637,593	100%	243,697,465	147,940,128
PIMCO Total Return Fund	7,376	134,330,491	34%	93,286,730	41,043,761
Other funds in PIMCO family	33,485	124,490,906	32%	79,378,189	45,112,717
Next 9	30,453	84,494,334	22%	52,799,071	31,695,263
Rest 23	22,230	48,321,862	12%	18,233,476	30,088,387

Panel C. Mutual Fund CDS holding by CDS reference entities

	#Positions	Total Amount ($1,000s)	% of total	Sell Amount ($1,000s)	Buy amount ($1,000s)	Average spread (bps)				
						2007	2008	2009	2010	2011
All	93,544	391,637,593	100%	243,697,465	147,940,128	263	884	946	270	642
Top 50	48,078	259,415,310	66%	197,934,755	61,480,554	311	1,103	1,299	285	728
Next 50	15,113	49,484,889	13%	16,675,527	32,809,362	169	468	269	214	478
Rest 345	30,353	82,737,395	21%	29,087,183	53,650,212	246	753	536	260	535

Panel D. Mutual fund CDS holdings by classified purposes

	Sell Amount ($1,000s)	Buy: Offsetting ($1,000s)	Buy: Basis ($1,000s)	Buy: Speculation ($1,000s)
PIMCO	172,664,919	3,740,428	63,682,387	18,733,663
Next 9	52,799,071	1,910,396	9,465,734	20,419,433
Rest	18,233,476	364,167	13,829,871	15,894,348
Total	243,697,465	6,014,990	86,977,992	55,047,445

Table 2. Summary Statistics

This table reports the summary statistics of the main variables. This table reports the number of observations, mean, standard deviation, and values at the 25th, 50th (median), and 75th percentiles, of the main variables both at the fund-period and fund-issuer-period level. Panel A reports the statistics at the fund-period level where the sample includes all funds that are *potential* CDS investors. For each Lipper mutual fund category, if any one fund holds any CDS position during any quarter, all the fund-quarter observations from that Lipper class are included in our sample. Panel B reports statistics at the fund-reference entity-period level. *Flow volatility* is the monthly standard deviation of estimated fund flows (measured as the change in return-adjusted fund asset value, as commonly used in the literature) during the 24-month window ending in same month as the portfolio period end date corresponding to the N-Q, N-CSR and N-CSRS filing. *Portfolio turnover* is a fund's annualized portfolio turnover rate during the last year. *Fund size* is the logarithm of the total net assets of the fund that holds the position. *Fund age* is the logarithm of number of years since the fund first offered. *Performance rank* is the past 12-month performance ranking for mutual fund, within its Lipper classification. *Any CDS sell* (*buy*) is a dummy variable equal to one if a fund holds any CDS selling (buying) position in a given reference entity during a period. *Gross sell* (*buy*) *intensity* is the ratio of total notional amount of CDS selling (buying) by a fund in a given reference entity during a period, scaled by a fund's total net assets during the same period. *% Days traded* is the percentage of traded days of the underlying bond in the previous quarter. *#CDS contracts* is defined as the number of quoted CDS by the issuer reference entities covered by Markit during quarter *t-1*. *CDS spread* is the 5-year MR USD quotes in Markit at the end of quarter t-1. The *CDS-bond basis* is calculated as the difference between the CDS five-year spread and the yield of a corresponding five-year bond, recorded or interpolated during the month of the quarter-end following Blanco, Brennan and Marsh (2005).

Panel A. Fund-period level

Variable name	# Obs	Mean	Std Dev	25th	Median	75th
Fund-period level						
Flow volatility	32,097	0.059	0.042	0.029	0.049	0.074
Portfolio turnover	32,097	1.18	2.187	0.32	0.63	1.25
Fund size ($ million)	32,097	1531.9	6890.1	76.5	266.2	927.5
Log Fund size	32,097	5.578	1.886	4.337	5.584	6.832
Fund age (years)	32,097	14.425	12.353	6.581	12.066	17.419
Log Fund age	32,097	2.394	0.745	1.884	2.49	2.858
Performance rank	32,097	0.507	0.277	0.272	0.51	0.743
Any CDS sell	32,097	0.047	0.211	0	0	0
Any CDS buy	32,097	0.043	0.202	0	0	0
Gross sell intensity	32,097	0.115	0.945	0	0	0
Gross buy intensity	32,097	0.121	0.915	0	0	0

Panel B. Reference entity-period level

Variable name	# Obs	Mean	Std Dev	25th	Median	75th
Reference Entity-period level						
% Bond Days traded	5,241	0.499	0.329	0.203	0.476	0.803
# CDS contracts	5,241	10.013	1.344	9.431	10.477	10.908
Assets of Reference Entity ($ million)	5,241	93,554	324,551	7,158	15,874	38,486
Assets of Reference Entity (log)	5,241	9.861	1.454	8.876	9.672	10.558
CDS spread (bps)	5,241	263.6	693.2	54.3	110.8	248.1
Fund-Reference Entity-period level						
Flow volatility	8,317,931	0.059	0.042	0.029	0.049	0.074
Portfolio turnover	8,317,931	1.173	2.163	0.32	0.63	1.25
Fund size ($ million)	8,317,931	1,533.3	6,881.2	76.3	265	926.8
Log Fund size	8,317,931	5.577	1.885	4.335	5.58	6.832
Fund age (years)	8,317,931	14.419	12.385	6.581	12.03	17.362
Log Fund age	8,317,931	2.394	0.745	1.884	2.487	2.854
Performance rank	8,317,931	0.506	0.277	0.271	0.51	0.743
% Bond Days traded	8,317,931	0.501	0.329	0.206	0.484	0.81
# CDS contracts	8,317,931	10.003	1.344	9.431	10.455	10.908
Assets of Reference Entity ($ million)	8,317,931	93,301	323,796	7,148	15,861	38,444
Assets of Reference Entity (log)	8,317,931	9.859	1.452	8.875	9.672	10.557
CDS spread (bps)	8,317,931	267.0	706.2	54.4	111.1	250.5
CDS-bond basis (bps)	3,986,345	-22.196	180.508	-74.458	-13.587	35.795
Any CDS sell	8,317,931	0.001	0.028	0	0	0
Any CDS buy	8,317,931	0.001	0.036	0	0	0
Gross sell intensity	8,317,931	0.003	0.175	0	0	0
Gross buy intensity	8,317,931	0.003	0.148	0	0	0

Table 3. CDS Selling and Funding Liquidity: Fund-Level Analysis

This table explores the fund-level relation between CDS usage and mutual funds' liquidity needs and other fund-level characteristics using logit regressions. The sample includes all mutual funds (whether they hold CDS positions or not) that could potentially invest in CDS. Operationally we include all fund-quarter observations from the 37 Lipper fund style categories in which at least one fund holds any CDS position in any quarter. Panel A relates the propensity to hold CDS buy and/or sell positions to fund characteristics. The first two columns adopt logit regressions where the dependent variable is a dummy variable equal to one if a fund holds any CDS sell (column (1)) or CDS buy (column (2)) position during the sample period. The last three columns report results from logit regressions which estimate the risk ratio of each of the three parallel outcomes at the fund-period level: Buy no sell, both buy and sell, and sell no buy, relative to the base outcome of no buy or sell. In all columns, the reported coefficients represent the logarithm of the odds ratio of a particular outcome (relative to the base outcome) for a one-unit change in the corresponding covariate. Panel B relates the intensity of CDS usage to the same set of independent variables using tobit regressions. The dependent variables are *Gross sell intensity* and *Gross buy intensity*, defined as the total notional amount of all CDS sell (or buy) positions during a fund-period, scaled by a fund's total net assets. The two key independent variables are proxies for mutual fund liquidity needs. The first is *Flow volatility*, the monthly standard deviation of estimated fund flows (measured as the change in return-adjusted fund asset value, as commonly used in the literature) during the 24-month window ending in same month as the portfolio period end date corresponding to the N-Q, N-CSR and N-CSRS filing. The second is *Portfolio turnover,* a fund's annualized portfolio turnover rate during the last year. Control variables include *Fund size*, the logarithm of the total net assets of the fund that holds the position; *Fund age,* the logarithm of number of years since the fund first offered; *Performance rank*, the past 12-month performance ranking for mutual fund, within its Lipper classification. All independent variables are at *t*-1 quarter, where t is the quarter the CDS buy/sell positions are identified. All regressions control for time and investment styles by including dummy variables for time periods and Lipper fund categories. Standard errors adjust for heteroskedasticity and are clustered at the fund level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A. Determinants of mutual funds' propensity to use CDS

Dependent variable:	Logit		Logit, vs. no buy, no sell		
	Any sell	Any buy	Buy no sell	Both buy and sell	Sell no buy
	(1)	(2)	(3)	(4)	(5)
Flow volatility	10.85***	8.473***	4.922*	11.11***	11.78***
	(1.948)	(2.024)	(2.984)	(2.315)	(2.902)
Portfolio Turnover	0.177**	0.159***	0.0955***	0.168**	0.0682**
	(0.0774)	(0.0559)	(0.0344)	(0.0685)	(0.0311)
Log Fund size	0.574***	0.444***	0.271***	0.560***	0.626***
	(0.0557)	(0.0549)	(0.0625)	(0.0645)	(0.0807)
Log Fund age	0.127	0.0848	0.135	0.0745	0.211
	(0.137)	(0.136)	(0.170)	(0.156)	(0.219)
Performance rank	0.587***	0.336*	0.577**	0.322	1.152***
	(0.199)	(0.189)	(0.268)	(0.227)	(0.342)
# observations	31,869	32,037	26,882	30,682	28,587
% (Dep var =1)	4.70%	4.28%	1.58%	3.09%	1.92%
Pseudo R squared	0.2348	0.1895	0.1121	0.2359	0.2473

Panel B: Determinants of the intensity of CDS usage by mutual funds

Dependent variable:	Gross sell intensity (1)	Gross buy intensity (2)
Flow volatility	33.04***	24.16***
	(6.796)	(6.121)
Portfolio Turnover	0.398***	0.520***
	(0.126)	(0.123)
Log Fund size	1.508***	1.208***
	(0.191)	(0.163)
Log Fund age	0.197	0.0853
	(0.349)	(0.391)
Performance rank	1.351***	1.024*
	(0.522)	(0.530)
# observations	32,097	32,097
Pseudo R squared	0.1438	0.1235

Table 4. CDS Selling and Funding Liquidity: Reference Entity-Level Analysis

This table explores the reference entity-level relation between CDS usage and both fund-level and reference entity level characteristics. The sample includes all potential CDS positions by all mutual funds which could potentially invest in CDS positions. The "potential" CDS positions include all reference entities that appear in our sample. The set of mutual funds are the same as in Table 2. Panel A relates the propensity to hold CDS buy and/or sell positions to fund and reference entity characteristics using logit regressions. Panel B relates the intensity of CDS usage to the same set of independent variable using tobit regressions. In both panels the specification are the same as in the corresponding panels of Table 3, except that all variables are recorded at the fund-reference entity-period level. The fund-level variables, *Log Fund size*, *Log Fund age*, and *Performance rank* are defined the same way as in Table 3. The key reference entity-level independent variables are the proxies for bond and CDS liquidity. The first, *% Days traded,* is defined as the percent of the days in the previous quarter where there were trades in the underlying bond. When there are multiple bond issues for a given issuer-period, we pick the one with the largest issuance dollar amount. The second is *#CDS contracts,* defined as the number of quoted CDS by the issuer reference entities covered by Markit during quarter *t-1*. The two additional control variables on the reference-entity level include *Log Firm assets*, the logarithm of the reference entity's assets in the quarter t-1, and *CDS spread*, the 5-year MR USD quotes in Markit at the end of quarter t-1. In analyzing the determinants of "basis buy" (defined in Table 1), column (5) further includes *CDS-bond basis,* calculated as the difference between the CDS five-year spread and the yield of a corresponding five-year bond, adjusted for the five-year swap rate, recorded or interpolated during the month of the quarter-end. Panel C repeats the specification of columns (3) and (4) separately for the 2007-2008 and 2009-2011 periods, with the added regressor *Top 20% Entity in Finance*, defined as a firm in the top quintile by asset size of reference entities from the finance industry (SIC code 6000-6999) covered by Markit in 2006. All regressions control for time and investment styles by including dummy variables for time periods and Lipper fund categories. Standard errors adjust for heteroskedasticity and are clustered at the fund level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Determinants of mutual funds' propensity to use CDS

Dependent variable:	Any sell	Any buy	Any sell	Any buy	Buy no sell	Both buy and sell	Sell no buy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Flow volatility			13.03***	7.239***	7.047***	11.49***	13.22***
			(2.065)	(2.222)	(2.274)	(3.073)	(2.137)
Portfolio turnover			0.0751***	0.133**	0.134**	0.115***	0.0732***
			(0.0140)	(0.0557)	(0.0579)	(0.0299)	(0.0141)
Log Fund size			0.626***	0.647***	0.646***	0.730***	0.630***
			(0.0608)	(0.112)	(0.115)	(0.145)	(0.0626)
Log Fund age			0.152	-0.185	-0.188	-0.128	0.169
			(0.162)	(0.176)	(0.179)	(0.232)	(0.167)
Performance rank			0.395	0.397	0.416	0.176	0.438
			(0.280)	(0.263)	(0.263)	(0.494)	(0.286)
% Bond Days traded	0.642***	-0.342***	0.648***	-0.347***	-0.383***	0.566***	0.653***
	(0.0736)	(0.0773)	(0.0748)	(0.0804)	(0.0832)	(0.159)	(0.0781)
# CDS contracts	0.770***	0.190***	0.780***	0.192***	0.207***	0.633***	0.802***
	(0.0636)	(0.0225)	(0.0638)	(0.0230)	(0.0242)	(0.182)	(0.0687)
Log Firm assets	0.615***	0.152***	0.624***	0.155***	0.114***	0.668***	0.621***
	(0.0356)	(0.0260)	(0.0372)	(0.0261)	(0.0305)	(0.0790)	(0.0368)
CDS spread	2.075***	-4.912***	2.103***	-4.956***	-9.020***	3.205***	1.962***
	(0.122)	(1.258)	(0.122)	(1.274)	(1.466)	(0.254)	(0.127)
# observations	8,153,062	8,270,447	8,153,062	8,270,447	8,214,266	6,105,676	8,092,744
% (Dep var =1)	0.080%	0.129%	0.080%	0.129%	0.122%	0.010%	0.073%
Pseudo R squared	0.1697	0.1094	0.2509	0.2081	0.2079	0.2425	0.2471

Panel B: Determinants of the intensity of CDS usage by mutual funds

Dependent variable:	Gross sell intensity (1)	Gross buy intensity (2)	Gross sell intensity (3)	Gross buy intensity (4)	Basis buy intensity (5)
Flow volatility			55.31***	21.14***	18.92**
			(10.27)	(7.232)	(7.752)
Portfolio turnover			0.347***	0.409***	0.343***
			(0.0773)	(0.112)	(0.0978)
Log fund size			2.536***	1.726***	1.655***
			(0.241)	(0.196)	(0.176)
Log fund age			0.666	-0.537	-0.479
			(0.668)	(0.444)	(0.474)
Performance rank			1.410	1.082	1.602**
			(1.124)	(0.694)	(0.662)
% Bond days traded	2.606***	-0.948***	2.610***	-0.902***	-1.638***
	(0.349)	(0.194)	(0.354)	(0.209)	(0.237)
# CDS contracts	2.861***	0.520***	2.921***	0.522***	0.553***
	(0.343)	(0.0799)	(0.353)	(0.0823)	(0.0979)
Log firm assets	2.663***	0.466***	2.700***	0.488***	0.561***
	(0.235)	(0.100)	(0.238)	(0.0942)	(0.128)
CDS spread	9.625***	-12.12***	9.918***	-11.92***	-2.129
	(0.860)	(3.214)	(0.865)	(3.350)	(3.466)
CDS-bond basis					-30.40***
					(4.284)
# observations	8,317,931	8,317,931	8,317,931	8,317,931	3,986,345
Pseudo R squared	0.1328	0.0852	0.1892	0.1521	0.2133

Panel C. Intensity of CDS usage on potentially "systematically important" reference entities

Dependent variable:	2007-2008		2009-2011	
	Gross sell intensity	Gross buy intensity	Gross sell intensity	Gross buy intensity
	(1)	(2)	(3)	(4)
Top 20% entity in Finance	1.407***	0.0208	1.278*	1.183***
	(0.504)	(0.366)	(0.726)	(0.421)
Flow volatility	50.13***	15.85*	55.91***	19.79**
	(14.41)	(8.957)	(13.28)	(8.020)
Portfolio turnover	0.880***	1.138***	0.311***	0.429***
	(0.232)	(0.174)	(0.0759)	(0.127)
Log fund size	2.220***	1.601***	2.903***	1.744***
	(0.308)	(0.244)	(0.315)	(0.186)
Log fund age	1.227	-0.322	-0.0400	-0.265
	(0.899)	(0.533)	(0.663)	(0.483)
Performance rank	-0.258	0.176	4.086***	1.928***
	(1.343)	(1.003)	(1.238)	(0.671)
% Bond days traded	1.207***	-0.760***	4.550***	-0.869***
	(0.345)	(0.264)	(0.716)	(0.222)
# CDS contracts	2.204***	0.474***	2.951***	0.627***
	(0.335)	(0.106)	(0.427)	(0.0972)
Log firm assets	2.285***	0.669***	2.748***	0.0732
	(0.268)	(0.100)	(0.274)	(0.104)
CDS spread	59.74***	-18.68***	8.146***	-11.28***
	(6.076)	(6.993)	(0.930)	(3.113)
# observations	3,407,566	3,407,566	4,910,365	4,910,365
Pseudo R squared	0.1705	0.1457	0.2348	0.1838

Table 5. CDS Trading Liquidity Before and After Mutual Fund Holding Initiations

This table analyzes the effects of individual mutual funds' CDS holdings on the trading liquidity of CDS contacts. The dependent variable is *# CDS contracts*. The observation unit is a mutual fund (*i*) - reference entity (*j*) – quarter (*t*) triple from the *T-1* and *T+1* quarters where *T* is the first quarter fund *i* initiates a CDS position in reference entity *j*. *Mutual Fund Held* is a dummy variable equal to one if the reference entity *j* belongs to the 450 reference entities that mutual funds ever held CDS positions in over our sample period. The "control" observation (*Mutual Fund Held* = 0) is a reference entity from the rest of the reference entities covered by Markit within the same 12 Fama-French industries classification with assets closest to the observation with *Mutual Fund Held = 1*. *T+1* is a dummy variable equal to one if the quarter falls after fund *i* initiates a CDS position (either buy or sell) in reference entity *j* or an analogous "pseudo-event time" for the control observations. The other variables are defined in Table 4. Columns (1) and (2) estimate with Tobit, and columns (3) to (5) adopt OLS to accommodate quarterly and/or reference entity fixed effects. All regressions control for investment styles by including dummy variables for Lipper fund categories. Standard errors adjust for heteroskedasticity and are clustered at the fund level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Estimation method	Tobit		OLS		
	(1)	(2)	(3)	(4)	(5)
Mutual Fund Held	2.305***	2.265***	2.249***		
	(0.166)	(0.164)	(0.162)		
T+1	0.179***	0.171**	0.167**	0.170**	0.188***
	(0.0692)	(0.0707)	(0.0677)	(0.0697)	(0.0693)
Mutual Fund Held * T+1	-0.0920	-0.178***	-0.135**	-0.190***	-0.150**
	(0.0670)	(0.0648)	(0.0653)	(0.0691)	(0.0726)
% Bond days traded		0.272	0.158	0.999***	1.078***
		(0.255)	(0.256)	(0.269)	(0.228)
Log firm assets		0.0652	0.0437	-0.285	-0.763***
		(0.0510)	(0.0563)	(0.273)	(0.248)
CDS spread		4.798***	3.108***	4.875***	1.933
		(1.051)	(1.020)	(1.813)	(1.611)
Quarter dummy	N	N	Y	N	Y
Reference entity fixed effect	N	N	N	Y	Y
# observations	1,892	1,892	1,892	1,892	1,892
(Pseudo) R squared	0.0701	0.0726	0.318	0.840	0.858

Table 6. Lead-Follow in CDS Net Selling

This table reports results of logit regressions for the propensity of non-PIMCO mutual funds' net selling of CDS on new reference entities. The unit of observation is at the fund-reference entity-period (quarter) level, and the universe of reference entities in any period *t* consists of all potential entities (including any reference entity that ever appears in our sample) for which a fund did not already have a net short position on in period *t-1*. The dependent variable is a dummy variable equal to one if a fund takes a new net selling CDS position in a reference entity (the new position is defined as a CDS net selling position by a mutual fund in period *t* on a reference entity for which the mutual fund did not have a net selling position in period *t-1)*. The key independent variable, *PIMCO Lead* is a dummy variable equal to one if the following two conditions are met: (1) The entity is among the top 50 net selling positions during period *t-1* by PIMCO funds, and (2) PIMCO's position in the entity is larger than that by any other mutual fund family in notional dollar amount. Control variables include the following: *Log Firm assets*, the assets of the reference entity (in log) in period *t-1*; *CDS spread*, the five-year CDS spread on the reference entity in period *t-1* using data from Markit; *% Bond Days traded*, the ratio of number of traded days of the underlying bond in period *t-1*; *#CDS contracts*, the number of quoted CDS contracts in Markit in *t-1* period; *Log Fund TNA*, the logarithm of the total net assets of the fund disclosed in the N-Q, N-CSR and N-CSRS filing at *t-1* period (if missing, we use the number in *t* period); and *Top 20% entity*, defined as the top quintile reference entities covered by Markit by asset size in 2006. Panels A and B analyze the mutual funds in "Next 9" families and "Rest 23"families, respectively. All regressions control for time effects and fund-specific investment styles by including dummy variables for quarters and funds. Standard errors adjust for heteroskedasticity and are clustered at the fund level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: The next 9 mutual fund families

Dependent variable:	New net selling							
	2007		2008 - 2009		2010 - 2011		Full sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PIMCO Lead	1.439***	0.455***	1.642***	1.346***	1.506***	1.197***	1.209***	0.941***
	(0.0948)	(0.130)	(0.129)	(0.136)	(0.203)	(0.181)	(0.126)	(0.140)
(marginal probability)	3.36%	0.64%	2.50%	1.69%	1.51%	1.15%	1.55%	1.10%
Log Firm assets		0.454***		0.202***		0.109		
		(0.0341)		(0.0383)		(0.0767)		
CDS spread		42.59***		2.046***		2.611***		1.886***
		(3.833)		(0.186)		(0.562)		(0.181)
Log Fund TNA		-0.165		0.865		-0.0577		0.214*
		(1.139)		(0.540)		(0.435)		(0.129)
% Bond Days traded		0.454***		0.518***		0.407**		0.485***
		(0.122)		(0.110)		(0.171)		(0.102)
# CDS contract		0.566***		0.178**		0.0870		0.351***
		(0.122)		(0.0769)		(0.0757)		(0.0861)
Top 20% entity							0.0984	0.0990
							(0.0968)	(0.102)
PIMCO Lead*							0.650***	0.788***
Top 20% entity							(0.149)	(0.171)
# observations	67,098	52,309	155,710	124,446	81,467	56,491	304,275	270,436
% (Dep var =1)	1.092%	1.136%	0.620%	0.609%	0.439%	0.505%	0.676%	0.715%
Pseudo R squared	0.1288	0.2242	0.1760	0.1994	0.1093	0.1115	0.1517	0.1681

Panel B: The remaining 23 mutual fund families

Dependent variable:	New net selling							
	2007		2008 - 2009		2010 - 2011		Full sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PIMCO Lead	1.974***	1.289***	2.163***	1.200***	2.133***	1.120***	1.771***	1.453***
	(0.186)	(0.224)	(0.215)	(0.217)	(0.322)	(0.194)	(0.203)	(0.209)
(marginal probability)	2.33%	1.14%	1.93%	0.66%	1.88%	0.66%	1.37%	0.99%
Log Firm assets		0.523***		0.459***		0.430***		
		(0.0640)		(0.0523)		(0.153)		
CDS spread		28.87***		1.561***		3.093***		1.117***
		(4.693)		(0.466)		(0.408)		(0.356)
Log Fund TNA		1.987		0.814		0.554		0.396
		(1.641)		(0.725)		(0.506)		(0.309)
% Bond Days traded		-0.267*		0.296**		0.482***		0.233**
		(0.146)		(0.127)		(0.183)		(0.107)
# CDS contract		0.397***		0.312***		0.460***		0.410***
		(0.102)		(0.0741)		(0.0969)		(0.0702)
Top 20% entity							0.715***	0.764***
							(0.162)	(0.171)
PIMCO Lead*							0.338**	0.525***
Top 20% entity							(0.155)	(0.160)
# observations	86,483	63,392	212,574	162,358	104,299	64,804	403,356	358,615
% (Dep var =1)	0.386%	0.440%	0.257%	0.286%	0.258%	0.324%	0.285%	0.306%
Pseudo R squared	0.1397	0.2056	0.1786	0.2250	0.1728	0.2227	0.1678	0.1780

Table 7. Active vs. Passive Risk Taking: Evidence from PIMCO Funds

This table explores the relationship between the number of counterparty institutions traded with PIMCO mutual funds and *PIMCO TRF Lead,* a dummy variable equal to one if the reference entity is one in which the PIMCO Total Return Fund (TRF) takes a "lead" position in CDS selling. The sample includes all net-sell entities held by PIMCO funds, and the unit of observation is at the fund-reference entity-period (quarter) level. The dependent variable in the first two columns is *Log # Counterparties*, the logarithm of the number of counterparty institutions plus one on each reference entity for PIMCO funds in period *t*. In the last two columns, the dependent variable is *Multiple counterparties,* a dummy variable equal to one if PIMCO funds take a sell position on the reference entity in quarter *t* with multiple counterparty institutions. The key independent variable, *PIMCO TRF Lead* is a dummy variable equal to one if the dollar amount of a net selling position on the reference entity held by the PIMCO TRF in the current period is the largest among all mutual funds in our sample. Control variables include the following: *Log Net sell amount* is the logarithm of net selling dollar amount on the reference entity in quarter t. *Log Fund TNA* is the logarithm of the total net assets of the fund disclosed in the N-Q, N-CSR and N-CSRS filing in quarter *t-1* (and if missing we use the number in *t*). *% Bond days traded* is the percent of days in quarter *t-1* where there was a trade in the underlying bond. *#CDS contracts* is the number of quoted CDS contracts in Markit during quarter *t-1*. *Log Firm assets* is the logarithm of the assets of the reference entity in quarter *t-1*. *CDS spread* is the five-year MR CDS spread on the reference entity at the end of quarter *t-1*, according to Markit. All regressions control for time effects and fund-specific investment styles by including dummy variables for quarters and funds. Standard errors adjust for heteroskedasticity and are clustered at the fund level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	Tobit		Logit	
	Log # Counterparties	Log # Counterparties	Multiple counterparties	Multiple counterparties
	(1)	(2)	(3)	(4)
PIMCO TRF Lead	0.233***	0.0994***	0.625***	0.378***
	(0.0419)	(0.0362)	(0.122)	(0.139)
(marginal probability)			15.20%	9.36%
Log Net sell amount		0.304***		1.068***
		(0.0249)		(0.139)
Log Fund TNA	0.115***	-0.0697*	0.303***	-0.252*
	(0.0263)	(0.0400)	(0.0723)	(0.147)
% Bond days traded	0.319***	0.168**	0.725***	0.455
	(0.0831)	(0.0739)	(0.259)	(0.278)
# CDS contracts	0.0855**	0.0511*	0.144	0.101
	(0.0355)	(0.0278)	(0.106)	(0.117)
Log Firm assets	0.0568**	-0.00237	0.136**	-0.0127
	(0.0232)	(0.0191)	(0.0667)	(0.0715)
CDS spread	0.397	0.632***	2.086	3.382**
	(0.264)	(0.188)	(1.394)	(1.476)
# observations	5,384	5,384	5,231	5,231
Pseudo R squared	0.1680	0.3257	0.1430	0.2892

Table 8. Lead-Follow in CDS Speculative Buying on New Reference Entities

This table reports the results from logit regressions for the propensity of non-PIMCO mutual funds to initiate speculative buys of CDS on new reference entities. The unit of observation is at the fund-reference entity-period (quarter) level, and the universe of reference entities in any period *t* consists of all potential entities (including any reference entity that ever appears in our sample) for which a fund did not already have a speculative buy position in period *t-1*. The dependent variable is a dummy variable equal to one if a fund takes a new speculative buying CDS position in a reference entity where a new position is defined as a CDS speculative buying position by a mutual fund in period *t* on a reference entity for which the mutual fund did not have a speculative buy position in period *t-1*. The key independent variable, *PIMCO Lead* is a dummy variable equal to one if the following two conditions are met: (1) The entity is among the top 50 speculative buying positions during period *t-1* by PIMCO funds, and (2) PIMCO's position in the entity is larger than that by any other mutual fund family in notional dollar amount. Control variables include the following: *Log Firm assets*, the assets of the reference entity (in log) in period *t-1*; *CDS spread*, the five-year CDS spread on the reference entity in period *t-1* using data from Markit; *% Bond Days traded*, the percent of days in quarter *t-1* where there was a trade in the underlying bond; *#CDS contracts*, the number of quoted CDS contracts in Markit in the *t-1* period; *Log Fund TNA*, the logarithm of the total net assets of the fund disclosed in the N-Q, N-CSR and N-CSRS filing at *t-1* period. Panels A and B analyze the "Next 9" and "Rest 23" mutual fund families, respectively. All regressions control for time effects and fund-specific investment styles by including dummy variables for quarters and funds. Standard errors adjust for heteroskedasticity and are clustered at the fund level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: The next 9 mutual fund families

Dependent variable:	New speculative buying					
	2007		2008 - 2009		2010-2011	
	(1)	(2)	(3)	(4)	(5)	(6)
PIMCO Lead	0.762***	0.523**	0.556***	0.643***	0.351	0.307
	(0.203)	(0.208)	(0.179)	(0.185)	(0.332)	(0.286)
(marginal probability)	0.97%	0.67%	0.23%	0.30%	0.13%	0.16%
Log Firm assets		-0.199**		0.0607		0.117**
		(0.0865)		(0.0460)		(0.0470)
CDS spread		-108.4***		-4.368		0.503
		(18.05)		(3.283)		(1.805)
Log Fund TNA		-0.356		0.215		0.273
		(1.710)		(0.178)		(0.459)
% Bond Days traded		-0.229**		0.0958		0.510***
		(0.113)		(0.201)		(0.115)
# CDS contract		0.689***		0.176***		0.254**
		(0.0659)		(0.0657)		(0.125)
# observations	64,345	49,441	172,536	132,874	66,155	38,029
% (Dep var =1)	0.861%	0.997%	0.316%	0.332%	0.314%	0.460%
Pseudo R squared	0.1135	0.1603	0.0954	0.1110	0.0924	0.0947

Panel B: The remaining 23 mutual fund families

Dependent variable:	New speculative buying					
	2007		2008 - 2009		2010-2011	
	(1)	(2)	(3)	(4)	(5)	(6)
PIMCO Lead	1.233***	1.181***	0.674***	0.553***	0.594**	0.0111
	(0.184)	(0.183)	(0.122)	(0.116)	(0.259)	(0.288)
(marginal probability)	1.46%	1.50%	0.34%	0.30%	0.22%	0.004%
Log Firm assets		0.0738		-0.0896**		0.191***
		(0.0493)		(0.0365)		(0.0689)
CDS spread		-76.20***		-9.838**		-12.09***
		(19.24)		(4.503)		(4.517)
Log Fund TNA		4.038		-1.173**		0.371
		(3.198)		(0.508)		(0.351)
% Bond Days traded		-0.394*		0.201		-0.216
		(0.220)		(0.145)		(0.238)
# CDS contract		0.507***		0.0880**		0.275***
		(0.123)		(0.0374)		(0.0817)
# observations	92,655	72,342	223,590	166,297	132,108	83,931
% (Dep var =1)	0.611%	0.680%	0.356%	0.411%	0.269%	0.335%
Pseudo R squared	0.0967	0.1343	0.0959	0.1059	0.0821	0.0935