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The Use of Credit Default Swaps by U.S Fixed-Income Mutual Funds

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Abstract

We examine the use of credit default swaps (CDS) in the U.S. mutual fund industry. We find that among the largest 100 corporate bond funds the use of CDS has increased from 20% in 2004 to 60% in 2008. Among CDS users, the average size of CDS positions (measured by their notional values) increased from 2% to almost 14% of a fund's net asset value. Some funds exceed this level by a wide margin. CDS are predominantly used to increase a fund's exposure to credit risks rather than to hedge credit risk. Consistent with fund tournaments, underperforming funds use multi-name CDS to increase their credit risk exposures. Finally, funds that use CDS underperform funds that do not use CDS. Part of this underperformance is caused by poor market timing.

JEL-Classification: G11, G15, G23

Keywords: Corporate bond fund, credit default swap, credit risk, fund performance, hedging, speculation, tournaments

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Abstract

We examine the use of credit default swaps (CDS) in the U.S. mutual fund industry. We find that among the largest 100 corporate bond funds the use of CDS has increased from 20% in 2004 to 60% in 2008. Among CDS users, the average size of CDS positions (measured by their notional values) increased from 2% to almost 14% of a fund's net asset value. Some funds exceed this level by a wide margin. CDS are predominantly used to increase a fund's exposure to credit risks rather than to hedge credit risk. Consistent with fund tournaments, underperforming funds use multi-name CDS to increase their credit risk exposures. Finally, funds that use CDS underperform funds that do not use CDS. Part of this underperformance is caused by poor market timing.

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When it comes to bond funds,"there is value in the complexity." (Bill Kohli, manager of Putnam Diversified Income Trust)[1]

1 Introduction

The use of credit default swaps (CDS) has caused severe losses at a number of banks, hedge funds and insurance companies during the past financial crisis. It is well known that the world's largest insurance company, AIG was brought to the brink of collapse due to its CDS positions. However, some mutual funds are also heavy end-users of CDS. Many investors may be unaware that the funds they are holding trade in CDS, exposing them to potentially significant risks. For example, the Oppenheimer Champion Income Fund lost 74% of its net asset value in 2008, partially due to its exposure to credit default swaps. In general, CDS can be used to hedge credit risk, to take on credit risk (and leverage) by providing credit protection to others, as in the case of AIG, or to arbitrage financial markets. Little is known, however, why mutual funds use CDS, and whether the use of CDS benefits fund investors.

The objective of this paper is to examine how widespread is the use of CDS among U.S. mutual funds, what CDS strategies are being used and why, and how the use of CDS has impacted fund performance. Our data allow us to differentiate between four major CDS strategies: long or short single-name CDS, and long or short multi-name CDS.[2] Thus, we are able to distinguish between risk-increasing and risk-decreasing strategies, and strategies where a fund manager took a firm-specific or a market-wide view on credit risk. We study the use of CDS since 2004, the first date since U.S. mutual funds were required to disclose their derivatives holdings twice a year by filing Form N-Q with the SEC. The period 2004 to 2008 is also of

[1] Jeffrey R. Kosnett, May 20, 2008, With Bond Funds, Keep it Simple, Kiplinger.com.
[2] Single-name CDS are contracts on one reference entity, i.e., a particular bond while multi-name CDS are contracts written on a portfolio of bonds, or a CDS index.

particular interest as it encompasses a period of slightly declining credit risk premia, until early 2007, and subsequently strongly increasing credit risk premia (see Figure 1).

We find that among the largest 100 U.S. corporate bond funds the use of CDS has increased from about 20% of funds in 2004 to 60% of funds in 2008. The size of the average CDS position (measured by the notional value relative to a fund's net asset value) increased from 2% in 2004 to almost 14% in 2008. While for most funds CDS represent less than 10% of the fund's net asset value, some funds exceed this level by a wide margin, especially during 2008.[3]

Corporate bond funds are generally net sellers of CDS rather than net buyers. This implies that on average funds use CDS to increase their credit exposures rather than to hedge credit risk. The most frequent strategy is to sell single-name CDS, which can be used to synthetically replicate a bond investment. While during our sample period funds were always net sellers of single-name CDS, funds switch between being net sellers and net buyers of multi-name CDS. Although buying credit protection can reduce a fund's overall credit risk exposure, the volatility in the multi-name CDS positions suggests that funds may be using multi-name CDS to actively take positions rather than to passively hedge credit risk.

Consistent with the possibility that multi-name CDS are used to actively take positions in credit markets, we find that funds that use CDS generally exhibit higher asset turnovers than CDS non-users. Some authors identify higher asset turnovers with more actively managed funds. Thus, more actively managed funds could be using CDS for trading purposes. The higher liquidity in many CDS compared to corporate bonds would make multi-name CDS the preferred instrument for trading purposes. Furthermore, we find that funds that belong to a larger fund family are 30%

[3] The notional values of the CDS positions exceeded 50% of a fund's NAV for six funds in our sample: Intermediate Term Bond Fund (First American Investment Funds), Oppenheimer Champion Income Fund, Putnam Diversified

more likely to use CDS than funds that do not belong to a larger fund family. This may be because trading in the CDS market requires additional costly infrastructure, which only larger fund families, due to economies of scale, are willing to invest in.

We find that underperforming funds tend to increase their (short) multi-name CDS positions during the second half of a calendar year, while single-name CDS positions do not change systematically with past performance. Increasing the (short) multi-name CDS positions increases total fund risk ceteris paribus. Thus, these results are consistent with the tournament hypothesis by Brown, Harlow, and Starks (1996). According to this hypothesis funds that underperform increase risk in order to improve their relative performance rankings. Since CDS tend to be more liquid than many corporate bonds, shorting multi-name CDS would be the most cost-effective way to increase risk for corporate bond funds.

Finally, we find that funds that use CDS perform worse on average than funds that do not use CDS. CDS users have lower absolute and relative fund returns than CDS non-users. For example, the relative return differential between CDS users and CDS non-users is about 72 basis points p.a. between 2004 and 2008. CDS users have slightly higher return volatilities than CDS non-users, but the economic and statistical significance is weak. Part of this underperformance is caused by "poor market timing." Funds tend to increase their short multi-name CDS positions before credit risk premia fall, and decrease them before credit risk premia rise. This effect is present over the entire sample period 2004 – 2008. This implies that changes in funds' CDS positions caused losses on average, and thus must have contributed to the poorer performance of CDS users.

Income Trust, Putnam Income Fund, Western Asset Core Bond Portfolio, and Western Asset Core Plus Bond Portfolio.

The rest of the article is structured as follows. Section 2 reviews the related literature. Section 3 describes the data and the data sources. Section 4 contains our econometric analysis, and Section 5 concludes.

2 Literature

Our results contribute to several strands of the literature. First, to the best of our knowledge, our study is the first that examines the use of CDS by mutual funds. Several papers examine the use of CDS by banks. Mahieu and Xu (2007), and Minton, Stulz and Williamson (2009) analyze data from the Federal Reserve Bank of Chicago Bank Holding Company Database (BHC), which contains limited information about the use of credit derivatives by U.S. banks. For example, Minton, Stulz and Williamson show that in 2005, only 23 large banks out of 395 used credit derivatives, and that most of these derivatives positions were held for trading rather than for hedging purposes. The size of these positions is generally quite small: the net notional amount of credit derivatives used for hedging purposes is less than 2% of the value of banks' loan portfolios. The authors conclude that the use of credit derivatives is limited because banks are unable to use hedge accounting when hedging with credit derivatives. In addition, Ofwegen, Verschoor and Zwinkels (2010) analyze the relation between credit derivatives and the probability of default of the 20 largest European financial institutions. They find that the use of credit derivatives is unlikely to be motivated by hedging considerations as it tends to increase default risk.

Several studies have examined the use of derivatives by mutual funds, but none has focused on credit default swaps in particular or specific derivatives strategies as we do. Koski and Pontiff (1999) survey equity mutual funds and find that the use of derivatives is positively correlated with asset turnover and membership in a fund family. Johnson and Yu (2004) find that

the use of derivatives among Canadian funds is negatively correlated with fund age, and positively correlated with fund size. Marin and Rangel (2006) confirm these findings for a sample of Spanish mutual funds. In addition, they find that funds that are part of a fund family, no load funds, and funds with higher management fees are ceteris paribus more likely to use derivatives. Our results are largely consistent with these findings, except that we find no significant correlation between fund size and the use of CDS. This may be because we focus on the largest 100 corporate bond funds rather than all bond funds. One advantage of focusing on the use of CDS is that the available data allows us to examine why funds are using derivatives, i.e., we can distinguish between derivatives strategies that increase or decrease total fund risk. The prior literature has only examined the use and the extent of derivatives usage.[4]

Deli and Varma (2002) and Almazan, Brown, Carlson, and Chapman (2004) investigate mutual funds' investment constraints. Deli and Varma (2002) find that funds with the highest transaction cost benefits are more likely to permit investments in derivatives. Furthermore, Almazan, Brown, Carlson, and Chapman (2004) show that constraints on derivatives are more common if boards contain a higher proportion of inside directors, if the portfolio manager is more experienced, if the fund is managed by a team rather than an individual, and if the fund does not belong to a large organizational complex.

Another related literature focuses on the strategies fund managers use to alter the performance and risk characteristics of their funds. Brown, Harlow, and Starks (1996) interpret the mutual fund industry as a tournament. The winners of this tournament, i.e., the best performing funds, receive the highest inflows of new money (see Sirri and Tufano, 1998). This

[4] A notable exception is Aragon and Martin (2008). They analyze 250 hedge fund advisors' holdings in equity options. They find that advisors holding options are able to achieve lower fund return volatilities and higher Sharpe ratios.

benefits fund managers because some of their compensation is linked to the size of the fund and hence new fund inflows. Therefore, managers of underperforming funds have an incentive to increase their funds' risk levels in order to close the return gap with competitor funds. Consistent with this prediction, the authors find that growth-oriented U.S. mutual funds, which underperformed during the first half of a fiscal year, increase fund volatility in the second half of the fiscal year to a greater extent than overperforming funds.[5,6] Hu, Kale, Pagani, and Subramanian (2009) argue that managers of underperforming funds face a higher risk of job termination than managers of overperforming funds. Underperforming managers therefore have an incentive to increase fund risk in order to increase the chance to exceed the termination threshold. Finally, Chevalier and Ellison (1997) find that younger funds are more likely to participate in the tournament game than older funds. We add to this strand of the literature by showing that underperforming corporate bond funds increase fund risk by increasing the size of their short, multi-name CDS positions.

Some authors also examine how derivatives usage is associated with mutual fund performance. For example, Koski and Pontiff (1999) find that 21% of equity funds use derivatives, but there are no statistical differences in the risk and return characteristics between funds that use derivatives and those that do not. However, the impact of past performance on fund risk is significantly less for funds that use derivatives than for funds that do not. Almazan, Brown, Carlson, and Chapman (2004) also find no evidence that the permission to use derivatives

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[5] Sirri and Tufano (1998) show that net fund flows are more sensitive to performance differences of high return funds than of low return funds. Thus, fund managers of top performing funds benefit more from rank improvements than managers of poorly performing funds.

[6] Chavalier and Ellision (1997) find similar results. Kempf and Ruenzi (2008) find evidence that U.S. equity mutual funds adjust the risk they take depending on the relative position within their fund family. In contrast, Chen and Pennacchi (2009) and Busse (2001) do not find that underperforming equity mutual funds tend to increase the standard deviation of returns. In fact, Busse (2001) argues that the evidence in favor of risk-shifting is due to the mis-measurement in the volatility estimates of monthly returns.

correlates with equity fund returns. Johnson and Yu (2004) find that among Canadian domestic equity funds derivatives users have lower returns and higher risk than non-users. Among fixed-income funds, however, derivatives users have higher risk and higher return levels than non-users. Johnson and Yu do not explain why they observe these differences, however. Marin and Rangel (2006) provide a more negative picture for Spanish mutual funds. In their sample, 44% of fixed-income funds use derivatives. Funds that use derivatives slightly outperform non-users. In addition, these authors find evidence suggesting derivatives are used for speculation. All of these studies base their conclusions on univariate comparisons. Hence, they leave the question unanswered, whether derivatives usage impacts fund performance. In contrast, we examine how CDS position changes correlate with future credit risk premium changes, and find that fund managers adjust their CDS positions in ways that must have negatively affected fund performance.

3 Data

Since 2004, U.S. mutual funds are required to disclose their derivatives holdings semi-annually on Form N-Q. Searching these forms of all mutual funds contained in the CRSP survivorship-free mutual fund data base as of the end of 2008, for key words such as *credit default*, *default swap*, *CDS*, *default contract*, and *default protection* yielded hits predominantly among corporate bond funds.[7] We therefore focus our analysis on U.S. corporate bond funds, which we identify by membership in one of seven Lipper fund classes: Corporate debt funds A-rated, corporate debt funds BBB-rated, short investment grade, short-intermediate investment grade, intermediate investment grade, multi-sector income, and high current yield funds. To keep the data collection

[7] For instance, equity mutual funds are not allowed to hold CDS positions. We cross-checked that and find that only one fund out of the largest 30 U.S. equity funds held a small CDS position.

of CDS positions, which have to be collected by hand, manageable, we focus on the largest 100 U.S. corporate bond funds by net asset value that are included in the CRSP survivorship-free mutual fund data base as of the end of the second quarter of 2004. This is the most relevant set of corporate bond funds for investors and regulators, and make up 80.3% of the overall market capitalization of all U.S. corporate bond funds. We follow these 100 funds until the end of the observation period in December 2008 to avoid survivorship bias.[8] For each fund we obtain information on fund name, fund family, manager names, fund advisor name, net asset value (NAV), turnover rate, fund classes, shares held by retail and institutional investors, fund fees, and the inception date from the CRSP mutual fund data base.

Appendix A contains the names of the top 100 U.S. corporate bond funds as of the second quarter of 2004, the Lipper fund class for each fund, and the NAV. By far the largest fund is the Total Return Fund of the PIMCO fund family with a NAV of $73 billion. The smallest fund is the Federated Strategic Income Fund by Federated Fixed Income Securities with a NAV of $1 billion.

The most common Lipper fund classes among the top 100 funds are *high current yield funds* (32 funds) and *intermediate investment grade funds* (28 funds). *Corporate debt funds A-rated* and *investment grade, short-intermediate* feature 11 and 10 funds respectively. The remaining three fund classes, *short investment grade*, *corporate debt funds BBB-rated*, and *multi-sector income* consist of 6-7 funds each. Based on the correlation of fund returns between the Lipper fund classes we classify multi-sector income and high current yield funds as *high yield*, and all other funds as *investment grade*. The correlations of semi-annual fund returns within each

[8] Two funds were discontinued and merged into other existing funds. Fidelity's Spartan Investment Grade Bond Fund was merged into the Investment Grade Bond Fund on July 28, 2006. The Oppenheimer High Yield Fund was merged into the Oppenheimer Champion Income Fund on Oct. 12, 2006.

of these two categories generally exceed 0.90. The correlations of fund returns between the two categories are usually well below 0.90.

For our performance analysis we obtain monthly fund returns from the CRSP mutual fund data base. We construct fund-based return benchmarks by calculating equally-weighted return indices of all funds in each Lipper fund class. For this exercise we use the universe of U.S. corporate bond funds, not just the largest 100 funds. These fund-based benchmarks allow us to determine the relative performance ranking of each of our 100 funds per fund category. Since funds may compare their performance not only to other bond funds, but to the returns of particular corporate bond classes, we also construct passive return benchmarks of corporate bonds that approximately reflect the asset allocation of our 100 funds. For this, we obtain Bank of America Merrill Lynch (BOFA ML) bond indices from Datastream that match the risk profile of each one of the seven Lipper fund classes that occur in our sample. If a reasonable match cannot be found, we construct a new index from two or three bond indices. The weighting scheme we use for this construction is based on Moody's credit rating distribution for U.S. corporate bonds during our observation period. See Appendix B for further details.

In order to identify which of the top 100 funds potentially holds CDS positions, we searched 1,161 N-Q (and 21 N-Q/A) forms, available from SEC's EDGAR database, for the following key words: *credit default*, *default swap*, *CDS*, *default contract*, and *default protection*. We manually cross-check our search algorithm by randomly selecting 30 N-Q forms without any of the above key word hits. In none of these cases do we find CDS holdings. For funds with CDS holdings we manually collect for each CDS position the notional value, the reference asset, the expiration date of the swap, the counterparty, whether the swap was bought or sold, the swap

premium, and the unrealized gain or loss of the swap position.[9] This step generated information on 14,906 CDS positions.

4 Results

In this section we examine how widespread the use of CDS is among the top U.S. corporate bond funds, why some funds use CDS while others do not, what CDS strategies mutual funds use, and also determine the impact of CDS usage on fund performance.

4.1 The Use of CDS by U.S. Corporate Bond Funds

In this section we describe the top 100 U.S. corporate bonds funds in terms of fund size and other fund characteristics. We also describe the size, type and direction of the CDS positions used by these funds, and how CDS strategies evolved over time. One objective is to determine whether fund managers use CDS to increase their fund's exposure to credit risk or to hedge credit risk of the existing bond positions.

Table 1 shows summary statistics for the top 100 bond funds. Not surprisingly, bond funds are large. The mean and median NAVs are $5 billion and $2 billion respectively. The dispersion in fund sizes is large and highly skewed. NAVs range from 264 million to over 130 billion. The reason why there appear to be a number of smaller funds under the top 100 is that

[9] To ease the extraction process from the raw txt and html files, we download the N-Q forms again from EdgarOnline, a subscription-based website, which already transforms the fund holdings into standard rft and pdf formats. We find 289 different N-Q forms that include at least one of these key words. However, in many cases, the CIK number refers to a family of funds rather than to one specific top-100 fund. We thus search for the top-100 fund names and exclude those N-Q forms that do not cover our top-100 funds. Additionally, we analyze right-censoring in the CDS holding history because this occurrence might be due to i) a change in the fund name; ii) a close of the respective fund; iii) a merger with another fund. In the last two cases the fund history ends while in the first case we employ the fund history. Since some fund families, in particular large ones such as Fidelity with 12 funds, contribute more than one fund, we are left with 379 N-Q form-fund observations from 65 top-100 funds with CDS data.

some funds experienced significant value losses and redemptions during the financial crisis in 2008. Note that the smallest of the top 100 funds in 2004 had a NAV of $1 billion.

The distributions of fund sizes of investment grade and high yield funds are roughly similar to the overall average, except that the ultra large funds, with NAVs above $15 billion, all belong to the group of investment grade funds. This fact affects the sample means, so that the mean NAV of investment grade funds is about twice the mean of high yield funds, while the remaining percentiles (except for the maximum) are roughly similar. The largest high yield fund, the American High-Income Trust, had a NAV in 2004 of "only" $8.9 billion.

The average fund age (since inception) among the top 100 bond funds is 20 years, ranging from as little as four years to 73 years. About 75% of the top 100 funds belong to a larger fund family, i.e., a fund family that has at least two funds among the top 100 corporate bond funds in its portfolio.[10] These figures are similar for investment grade and high yield bonds. In contrast, however, there is a larger proportion of institutional investors among investment grade funds. On average, 44% of the NAV of investment grade funds is held by institutions, while institutions hold only 16% of the NAV of high yield funds.

The total expense ratios of the top 100 funds range from 0.13% to 1.75%.[11] There are nine index funds in our sample, which feature average total expense ratios of less than 0.25%. The total expense ratios of investment grade funds average about 0.61%, while the total expense ratios of high yield funds are almost double and average at 1.06%. The asset turnovers also appear to differ significantly between investment grade and high yield funds. The turnover ratio of investment grade funds is with 1.79 more than twice the turnover ratio of high yield funds.

[10] This definition of a large fund family follows Koski and Pontiff (1999).
[11] Expense ratios, turnover ratios, and the fraction of retail investors are value-weighted averages over the outstanding fund classes.

Finally and somewhat surprisingly, we find that 50% of investment grade funds use CDS, while only 27% of high yield funds use CDS.

Table 2, Panel A shows how funds' NAVs and their CDS positions have evolved over time. While the mean NAV increased from $4.2 billion in 2004 to $5.7 billion in 2008, the median NAV remained roughly constant at $2 billion. This implies that only a minority of funds were able to grow their asset values over the sample period.

In contrast, the number of funds that held CDS positions tripled, from 21 in 2004 to 60 in 2008. In total there are 65 funds that used CDS sometime between 2004 and 2008, while 35 funds never used CDS. Among the 65 CDS-using funds, 17 funds held CDS positions throughout our sample period. The frequency of using CDS among corporate bond funds is comparable with Chen (2009), who finds that 71% of a large sample of hedge funds uses derivatives.[12]

Among funds that used CDS, the total notional value of CDS positions increased from an average of $103 million per fund in 2004 to an average of $632 million per fund in 2008. The mean total notional value relative to a fund's NAV increased from 2% to almost 14%. The most significant increases in the size of CDS positions took place in 2007 and 2008. While most funds appear to maintain modest CDS positions, some funds carried very large CDS positions relative to their NAVs as shown by the maximum values, which range from 15% to almost 70% in 2007. In 2008, the notional values of the CDS positions of three funds even exceeded those funds' NAVs. For example, the Oppenheimer Champion Income Fund had a NAV of $2.4 billion at the end of 2007, and CDS positions with a total notional value of $1.5 billion (62% of NAV). During

[12] Mutual funds should be preferred counterparties due to the high transparency of a fund's assets, which makes the evaluation of counterparty risk relatively easy, and the unlikely possibility that mutual fund managers posses valuable private information with respect to future credit spreads.

2008, the fund lost 74% of its value. While the size of the derivatives position was reduced nominally, it increased to 101% of NAV.

Judging from the reported book values of outstanding CDS positions (see Table 2, Panel B) the potential impact of CDS on a fund's NAV would appear to be small. On average, the reported book losses are less than 1% of a fund's NAV. However, by the end of 2008, one fund reported a book loss equal to 18.7% of its NAV due to its CDS positions alone. Furthermore, the semi-annually reported CDS positions provide only a partial picture of a fund's complete CDS activities. Many CDS trades may have occurred between reporting dates. Thus, the extent of a fund's CDS exposure may be significantly larger than what is implied by the reported book values.

Next, we analyze the types and direction of CDS positions taken by the top 100 bond funds. We distinguish between four general strategies. Funds can buy or sell CDS, and these CDS can be written on a single reference asset such as a corporate bond (single-name CDS), or on a portfolio of bonds, or a CDS index (multi-name CDS).[13] When funds buy CDS they buy credit protection, and thus reduce their credit exposure if the reference asset is part of the fund's holdings. When they sell CDS they sell credit protection, which increases the fund's credit exposure. For example, single-name CDS can be used to create a synthetic corporate bond, which may provide better returns than the actual bond investment due to the higher liquidity in the CDS market. To create a synthetic corporate bond a fund would sell a single-name CDS and invest the notional value in a risk-free security. Another CDS strategy is known as a negative basis trade. In this case a fund purchases a corporate bond and purchases a CDS on the same bond. Such trade would yield a positive cash flow if the spread of the bond is higher than the spread of the CDS

(negative basis) and if the swap counterparty does not default. Of course, a negative basis trade is subject to counterparty and liquidity risk, which may partially explain the lower CDS spread. This example shows how using CDS can expose mutual fund investors to new, possibly unexpected risks.

Multi-name strategies can be used to increase (decrease) a fund's credit risk exposure by selling (buying) CDS on a reference asset, which mimics the fund's general asset allocation. If the reference asset does not correspond to some of the fund's other assets, then selling CDS could help diversify the fund. The high liquidity of multi-name CDS also makes them preferred speculative instruments to take a view on the future development of credit spreads. Thus, if a fund manager wishes to time the market we would expect him to do so using multi-name rather than single-name CDS.

Table 3, Panel A provides descriptive statistics of each CDS strategy. The most frequent strategy is single-name short, used by 79% of CDS users. Single-name long and multi-name short strategies are used by about 50% of CDS users, and multi-name long strategies are used by only 35% of CDS users. Panel A further shows that on average short positions of both single- and multi-name CDS were twice as large (measured by the notional amounts of CDS scaled by a fund's NAV) as long CDS positions.[14] Thus, during our sample period mutual funds used CDS to increase rather than to hedge their credit risk exposures.

Table 3, Panel B (last column) shows that the dominance of short CDS positions existed throughout the sample period. When distinguishing between single- and multi-name CDS, we find that the average single-name net position is almost always short, while the average multi-

[13] CDS positions are defined as multi-name if the reference asset of a CDS position includes at least one of the following key words: ABX, CDX, iBoxx, iTraxx, CMBS, CMBX, Trust, backed.
[14] We code the notional amounts of long positions positive and those of short positions as negative.

name net position switches back and forth between being long and short. This volatility suggests that multi-name CDS may be used for position taking rather than hedging considerations, and thus dependent on the manager's view about the future development of the overall credit risk premium. Interestingly, the CDS users among the top 100 funds were net short in both multi- and single-name CDS during the financial crisis, which started in the second half of 2007. This was the wrong period to be net short in credit markets, and has resulted in serious losses at some funds. We will examine the impact of CDS in more detail in Section 4.3.

Finally, Table 3, Panel B shows that multi-name CDS positions are generally larger than single-name positions. Over the entire sample period multi-name CDS positions (both short and long) are about 4-5% of a fund's NAV, while single-name CDS positions are about 2-3% of a fund's NAV. The sizes of all four CDS strategies fluctuate significantly over time. The average multi-name long position ranges from 2-7%, while average multi-name short position ranges from 1-9%. Single-name long positions range from 1-4%, while single-name short positions range from 1-5%. Thus, multi-name strategies are somewhat more volatile than single-name strategies.

Figure 2 shows histograms of the multi- and single-name CDS net positions scaled by NAV. Note that the horizontal axis displays the lower interval limits of each observation bucket, i.e., the "0.00" bucket contains the observations from the interval [0, 0.02). The two histograms confirm that for both single- and multi-name CDS, net short positions are more common than net long positions (all means and medians are negative). However, there clearly are large dispersions in the net CDS positions among the top 100 funds. Some have significant net short positions while others have significant net long positions even exceeding a fund's NAV.

Do fund managers consider the four CDS strategies separately, or are long and short CDS positions interrelated? For example, do mutual fund managers employ strategies in which they take a view on credit spread differences? In this case we would expect to observe long and short CDS positions of equal magnitude simultaneously. To answer this question we graph the notional values of CDS positions against the net notional values in Figure 3. If funds speculated on credit spread differences we would expect large notional values while the net notional values should be close to zero. The scatter plots in Figure 3 show that this is rarely the case. When the net notional values are zero, the notional amounts tend to be small as well.

To summarize, by 2008, the top 100 U.S. corporate bond funds were as likely to hold CDS positions as hedge funds were to hold derivatives. Bond funds use CDS predominantly to increase a fund's exposure to credit risk rather than to hedge credit risk. While some single-name short CDS positions can be rationalized by synthetic bond investments, the volatility in multi-name CDS positions suggests managers may be timing credit markets.

4.2 The Determinants of CDS Strategies

In the next step we examine which funds / fund managers are more likely to use CDS, and the motives behind the four CDS strategies. As the prior literature on mutual funds has shown, some fund managers may have incentives to improve fund performance by increasing fund risk, while others have incentives to reduce (hedge) risk. In particular, several theories predict that the manager of an underperforming fund has incentives to increase fund risk.

We first estimate logit models based on all 100 funds in our sample to determine the determinants of CDS usage. The prior literature has shown that the use of derivatives by mutual funds is related to fund size, asset turnover, membership in a fund family, fund age, and fund expenses. We follow this literature and use all of these variables as regressors. We also control

our regressions for the fraction of a fund's NAV held by retail investors because institutional investors may influence a fund manager regarding CDS usage, while it is unlikely that such pressure would come from retail investors. In addition, we distinguish between investment grade and high yield funds, and include dummy variables for each time period to control for common time effects.

Table 4 reports the marginal effects from pooled logit models (Columns I and II), and random-effects logit models (Columns III and IV). In Columns V and VI we report standard coefficients from conditional fund fixed-effects logit models. Due to the inclusion of fund fixed-effects, only funds that began or stopped using CDS during our sample period remain in the sample. Furthermore, variables without any time-series variation drop out. Consistent with Koski and Pontiff (1999), we find that the use of CDS is positively correlated with membership in a larger fund family, asset turnover, and fund age. If a fund belongs to a large fund family it is about 30% more likely to use CDS than funds that do not belong to a large fund family. This is understandable as trading in CDS requires additional infrastructure and thus causes additional costs. If these costs can be shared across several funds, the cost per fund decreases, so that the investment in the CDS infrastructure is more economical.

An increase in the asset turnover ratio by one standard deviation increases the likelihood to use CDS by 9-14%.[15] Furthermore, the results in Columns V and VI show that the asset turnover increases on average following the adoption of CDS strategies. Some authors interpret the asset turnover as a proxy for how actively a fund is managed. The positive correlation between asset turnover and CDS usage suggests that CDS are useful tools for active fund managers, which would be consistent with our earlier findings that CDS are used to take risks

rather than to passively hedge risks. Alternatively, the positive correlation between asset turnover and CDS usage could arise because a fund manager is switching to higher-risk strategies by trading more and using CDS. These results are robust even after excluding the second half of 2008, which was characterized by unprecedented market dislocations.

We find no size effect as the prior literature did. This is probably because we focus on the largest 100 bond funds. Had we included smaller funds in our analysis, we might have found a positive correlation between fund size and CDS usage. Finally, institutional investors appear to have a positive impact on a fund's likelihood to use CDS, but only in the second half of 2008.

Next, we examine whether some of the CDS strategies are motivated by a desire to increase total fund risk following poor past performance. As discussed in Section 2, Brown, Harlow, and Starks (1996) and Hu, Kale, Pagani, and Subramanian (2009) argue that managers of underperforming funds have incentives to increase risk during the second half of a fiscal year in order to improve their relative performance ranking. In fact, the class action suit mentioned previously alleges that the Oppenheimer Champion Income Fund "altered its investment style and began to significantly increase its risk in the hopes of seeking higher returns, including by dramatically increasing its use of derivative instruments." Applying this idea to the use of credit default swaps, we expect that funds with below average performance subsequently increase their CDS short positions and decrease their CDS long positions. Given the higher diversification and often higher liquidity of multi-name CDS relative to single-name CDS we would expect multi-name CDS to be the preferred instrument to increase fund risk.

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[15] Asset turnovers are not materially affected by funds' CDS usage because the book values of a fund's total CDS positions is small compared to its NAV, as shown in Table 2, Panel B.

In order to test this hypothesis we estimate the following specification for each of the four CDS strategies.

$$\Delta \frac{CDS\ notional\ amount_{it}}{NAV_{it}} = \alpha + \beta_1 Performance_{it-1} + \beta_2 Fund\ flow_t + \gamma_t + e_{it} \qquad (1)$$

We use two variables to measures the past performance of a fund. The first measure is defined as the difference between a fund's total return and the return of our fund-based benchmark. The second measure is defined as the difference between a fund's total return and the return of the passive benchmark. Since short CDS positions are negative we expect a positive coefficient on past performance ($\beta_1 > 0$).

Fund managers may also adjust their CDS positions due to their market expectations Since credit spreads have been shown to be mean-reverting,[16] there could be systematic adjustments in funds' CDS positions: Fund managers buy credit protection when the market expects credit spreads to increase and sell credit protection when the market expects credit spreads to decrease. To control our analysis for this effect we include time fixed-effects in all regressions. Finally, CDS positions may respond to new fund in- and outflows. For example, fund managers may temporarily employ CDS to adjust a fund's duration, which had changed as a result of new net inflows. We calculate net fund flows following Sirri and Tufano (1998), and include this as an additional control variable.

Table 5 reports the estimation results of equation (1) using a Heckman selection model. In the first stage we model the decision to use CDS as in Table 4. The exclusion restrictions are the fund size, the asset turnover ratio, fund age, big fund family dummy, total expense ratio,

[16] Mean-reversion in credit markets has been documented by Bhanot (2005) for example.

investment grade dummy, and the fraction of retail investors.[17] Since the first stage results are similar to the results reported in Table 4, we omit them in Table 5. In the second stage, we use past performance and fund flows as the only regressors because the regressors of the first stage are relatively stable over time and do not explain changes in any of the four CDS strategies. In Panel A we examine multi-name CDS strategies, while in Panel B we examine single-name CDS strategies. The results show that changes in short, multi-name CDS positions are significantly correlated with past performance. A decrease in the relative performance by 50 bp increases the size of the short, multi-name CDS positions by 0.9-1.25 % (relative to NAV).[18] Given that short, multi-name positions average at about 4.6% of NAV, this is an economically large increase. Thus, fund managers appear to use multi-name CDS to increase fund risk following poor performance. Consistent with this result, Chen and Pennacchi (2009) find that mutual funds tend to increase the standard deviation of tracking errors as their performance declines.[19]

Interestingly, we find evidence of risk-increasing strategies and directional views only among short, multi-name CDS positions, but not among any of the other three CDS strategies. This is consistent with the view that multi-name CDS are the preferred instrument to increase fund risk due to their higher liquidity compared to single-name CDS. Furthermore, if managers had no view about the direction of credit spreads and simply used CDS as a way to increase

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[17] We test the validity of our exclusion restrictions and find that the asset turnover ratio, fund age, and the big fund family dummy to have a significant selection effect in the first stage (see Table 4); and that the exclusion restrictions are uncorrelated with the error terms from the second stage (not reported).

[18] The coefficient on the excess return relative to the passive benchmark is about half the coefficient on the excess return relative to the fund-based benchmark. However, what should matter for fund tournaments is the performance relative to other funds not relative to a passive benchmark.

[19] While a manger of an underperforming fund could also reduce its long (multi-name) CDS position to increase fund risk, this presumes the existence of a long CDS position. Since this is not always the case, we do not find a systematic effect. On the other hand, entering into a short position is always possible.

exposure, they would short multi-name CDS to increase a fund's implicit leverage and benefit from the higher diversification of multi-name CDS.[20]

To check the robustness of our results we also estimate equation (1) using a seemingly unrelated regression (SUR) model to account for the simultaneity of the four different CDS strategies, but the results remain qualitatively unchanged. To ensure that our results are not driven by changes in NAVs rather than changes in the CDS positions, we re-estimate all regressions using *Δ CDS notional amount* as the dependent variable. As in Table 5, we find positive and significant coefficients only in the regressions involving short multi-name CDS positions.

Our results further suggest that the determinants of the other three strategies must follow different rationales. For example, it could be that single-name CDS strategies are mostly motivated by the creation of synthetic bond positions or negative basis trades. In this case it would not be surprising that single-name positions do not correlate with fund performance. Rather they should correlate with particular market conditions. Similarly, long multi-name CDS may be motivated purely by hedging considerations. It will be part of our future research to examine these possibilities in more detail.

To summarize, we find that funds that underperform during the first half of a fiscal year increase their short multi-name CDS positions during the second half of the same fiscal year. When we compare a fund's underperformance during the second half of a fiscal year with changes in the fund's CDS positions during the first half of the *next* fiscal year, we find no significant correlations. These findings are consistent with risk-shifting due to the fund

[20] We thank Holger Kraft for making this point.

tournament hypothesis by Brown, Harlow, and Starks (1996), or the career concerns hypothesis by Hu, Kale, Pagani, and Subramanian (2009).

4.3 The Impact of CDS Usage on Fund Performance

In this last section we examine the impact of CDS usage on a fund's performance and risk characteristics. Depending on whether CDS are used for position-taking (speculating) or hedging objectives on average, total fund risk could either increase or decrease. If managers have no private information with respect to a firm's credit risk or overall credit risk premia, expected fund performance should not be affected. If managers have market timing ability, however, then we would expect higher returns for funds that use CDS for position-taking. For example, Kosowksi, Timmermann, Wermers, and White (2006) provide evidence that a sizable minority of managers pick stocks well enough to more than cover the additional costs of stock-picking. In addition, the authors find that these managers persistently outperform their peers.

In a first step, we characterize the top 100 bond funds in terms of their average returns and standard deviation of returns. We consider both absolute and relative returns, as well as fund alphas. We estimate constant and time-varying alphas. Time-varying alphas are estimated following Huij and Derwall (2008) by a smoothed Kalman filter using a bond market, a high-yield and a mortgage securities factor.[21]

Panel A of Table 6 shows descriptive statistics. Between 2004 and 2008 the top 100 bond funds yielded semi-annual returns of 1% on average, ranging from -24% to +8%. On average, the top 100 bond funds underperformed other corporate bond funds by 0.24% p.a., and underperformed comparable corporate bonds by 0.48% p.a. Ferson, Kisgen, and Henry (2006)

also document underperformance for various groups of fixed-income funds. The variability in the relative performance is high, which ranges from -30% to +16% p.a.

Panel B of Table 6 shows that among the top 100 funds CDS users underperform non-users by 3.7% p.a. This difference in absolute returns is economically very large, and caused by a number of factors. During the second half of 2008, CDS strategies performed especially poorly. If we exclude the second half of 2008 from the analysis the difference in returns between CDS users and non-users declines to 1.2% p.a. (not reported). In terms of relative performance, CDS users also performed worse than CDS non-users, by about 0.7-0.8% p.a. The two alpha measures confirm these results. CDS users have significantly lower alphas than non-users. These differences are smaller but remain highly significant if we exclude the second half of 2008 (not reported). Interestingly, we observe no significant return differences between funds that were net short or net long in CDS.

Since the univariate analysis in Table 6 does not control for other factors that may also affect performance, we perform a multivariate analysis of funds' absolute and relative returns in Table 7. Here we regress fund returns and alphas on the CDS user dummy variable and fund characteristics, such as fund size, asset turnover, fund age, association with a larger fund family, the fraction of the fund held by retail investors, and whether a fund is an investment grade or high yield fund. We control for common time effects by including time fixed-effects.

The multivariate analysis confirms that CDS users have significantly lower returns than CDS non-users. The absolute return difference is 72 bp p.a. The relative return differences are 40-54 bp p.a.[22] CDS users also appear to have lower alphas than non-users. In addition, we find

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[21] Refer to Kim and Nelson (2000) for a general overview and Kim, Morley, and Nelson (2001) for an appearance in the finance literature.

[22] Returns are calculated net of fund fees. Our results are robust to using gross fund returns (not reported).

that larger funds and investment grade funds have higher absolute and relative returns as well as higher alphas.

Next, we examine the standard deviations of returns of CDS users and non-users. The univariate analysis in Table 6, Panel B shows that CDS users have higher standard deviations of both absolute and relative returns than CDS users. These differences seem to be driven by those funds that were net short in CDS, while the funds that were net long display return volatilities that were similar to the return volatilities of CDS non-users. This finding is consistent with the view that short CDS positions are used to increase a fund's total risk exposure.

In Table 8 we check whether these results hold up in a multivariate analysis. We regress the standard deviation of both absolute and relative returns on the CDS user dummy variable and several control variables that may be correlated with fund risk. In all regressions we find that CDS users display higher standard deviations of returns than CDS non-users. However, the coefficient is statistically significant in the last regression only. Older funds and investment grade funds have lower volatilities than younger and high yield funds. Surprisingly, funds with higher asset turnovers have lower return volatilities than funds with lower asset turnovers, but the economic magnitude of the coefficient is small.

Overall, we find that CDS users have significantly lower returns than non-users on average, while having the same or even higher standard deviations of returns than CDS non-users. These differences persist even after controlling for time effects. The underperformance is somewhat less severe if fund alphas are considered.

The underperformance of CDS users can have several explanations. Funds that underperform may be more likely to use CDS hoping to improve performance. Our evidence presented in Table 5 supports this possibility. Alternatively funds' CDS strategies may generate

losses that negatively impact performance. In order to judge whether the use of CDS has been beneficial to fund investors, we now focus on the second possibility. A challenge is the relatively short sample period (due to data availability), and the possibility that the poor performance of short CDS positions during the financial crisis is due to bad luck. We therefore focus on a partial aspect of the impact of CDS strategies on fund performance.

In Table 3 we observed that the average net multi-name CDS position fluctuated significantly between net short and net long over time. We now evaluate whether changes in the size of funds' CDS positions led to a subsequent improvement or deterioration of fund performance. For example, if a fund increased its short CDS positions before credit risk premia rose, then this would undoubtedly reduce fund performance.

To examine this possibility we follow the approach by Brown, Crabb, and Haushalter (2006) and regress changes in the sizes of each of the four CDS strategies on future credit spread changes.

$$\Delta \frac{CDS\ notional\ amount_{it}}{NAV_{it}} = \alpha_i + \beta \Delta Credit\ spread_{t+1} + e_{it} \qquad (2)$$

We measure the credit spread by the yield difference between Baa-rated corporate bonds and 10-year U.S. Treasury securities. We estimate a fixed-effects model to control for unobservable fund fixed-effects. The results show that on average funds decrease their short multi-name CDS positions before credit spreads rise. The effect prevails even if we exclude the second half of 2008 (not reported). Such strategy clearly yields losses, and at least partially explains why CDS users generally underperform non-users. This result is consistent with Huang, Sialm, and Zhang (2009), who find that funds that increase risk perform worse than funds that keep stable risk

levels over time. Boney, Comer, and Kelly (2009) also find poor market timing ability among a sample of 84 investment grade bond funds.[23]

Interestingly, we find no significant correlations between the other three CDS strategies and future credit spread changes. This is consistent with our earlier conclusion that these strategies follow other determinants, and firms primarily use short multi-name CDS to time credit markets. Unfortunately, they do not seem to be successful at this on average.

5 Conclusion

In this paper we analyze the use of credit default swaps by the top 100 U.S. corporate bond funds between 2004 and 2008. We find that the use of CDS has increased from about 20% of funds in 2004 to 60% of funds in 2008. Thus, by now the frequency of CDS usage among the largest bond mutual funds is comparable to the frequency of derivatives usage by hedge funds. The size of CDS positions (measured by the notional value) is usually less than 10% of a fund's net asset value, but some funds exceed this level by a wide margin, especially during the financial crisis in 2008.

Overall, funds are net sellers of CDS, which shows that fund managers use CDS to take on credit risk rather than to hedge credit risk. While funds are generally net sellers of single-name CDS, they switch between being net sellers and net buyers of multi-name CDS. This volatility suggests that some fund managers use multi-name CDS to time credit markets rather than to hedge credit risk. Consistent with this possibility, we find that funds increase their short (multi-

[23] To check the robustness of our results we re-estimate all regressions in Table 9 using random-effects instead of fixed-effects (Columns 2 and 4 of Table 9), excluding the second half of 2008, and using the Aaa spread instead of the Baa spread. The results are not materially affected by these adjustments.

name) CDS positions when credit risk premia rise. Such strategy may stem from a belief in mean-reversion of credit spreads.

In fact, it is the underperforming funds that tend to increase fund risk by increasing their short, multi-name CDS positions. This result is consistent with the tournament hypothesis advanced by Brown, Harlow, and Starks (1996), which states that underperforming funds increase fund risk to try to improve their relative performance. CDS would be the instrument of choice due to their higher liquidity compared to many corporate bonds. To our knowledge this is the first time evidence in favor of fund tournaments among corporate bond funds has been established.

Finally, we examine the performance of funds' CDS strategies. Generally, funds that use CDS exhibit lower returns and the same or slightly higher standard deviations than funds that do not use CDS. This result holds before and during the financial crisis. Part of the reason for this underperformance is that on average funds increase their short (multi-name) CDS positions before credit spreads rise and decrease their short (multi-name) CDS positions before credit spreads fall. This unfortunate "market timing" must have contributed to the general underperformance of CDS users.

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Figure 1: Credit Spreads

This figure shows the evolution of credit spreads defined by the difference between the average yield on Aaa-rated (Baa-rated) corporate debt (Moody's yield on seasoned corporate bonds) and the yield on 10-year U.S. Treasury securities between July 2004 and December 2008.

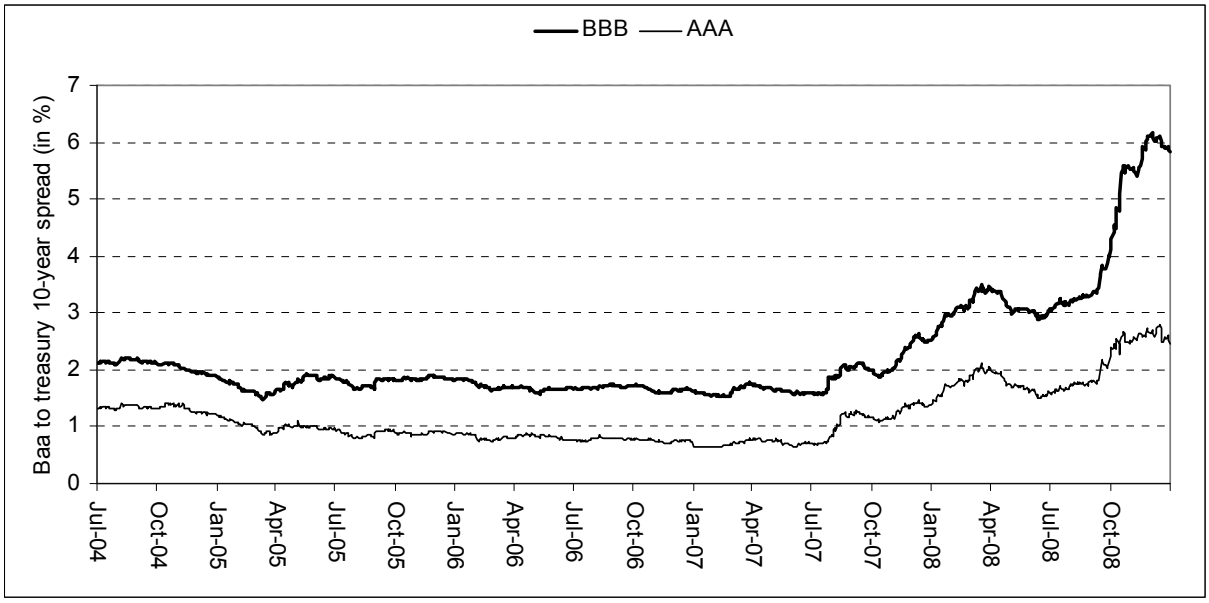
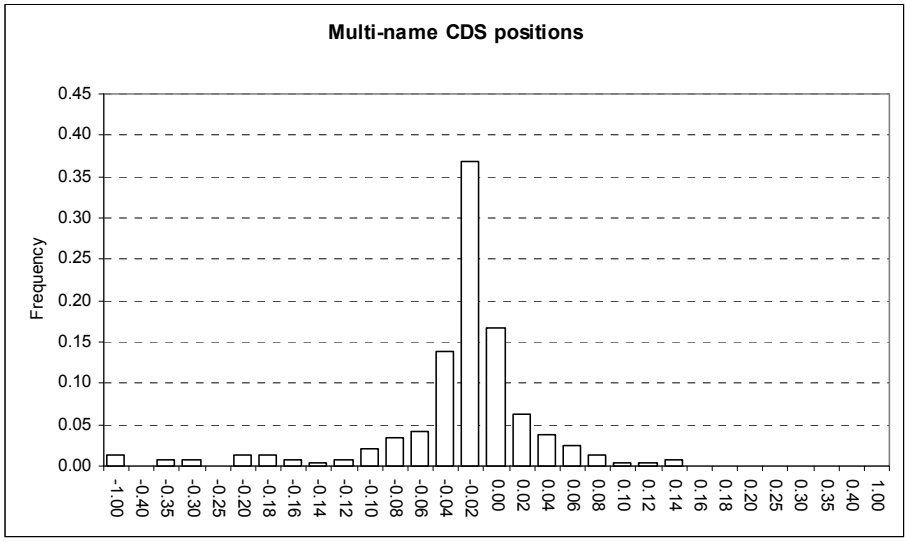


Figure 2: The Distribution of Net Notional Amounts of CDS Positions

These figures show the distribution of the net notional amounts (protection bought – protection sold) of multi-name and single-name CDS scaled by a fund's net asset values (NAV). The sample is comprised of the largest (by NAV) 100 U.S. mutual corporate bond funds as of the end of the second quarter of 2004 as reported by the CRSP survivorship-free mutual fund data base. The reporting period is semi-annual, 2004 – 2008. Each fund in the sample is classified into one the following Lipper fund classes: Corporate Debt Funds (A-Rated), Corporate Debt Funds (BBB-Rated), Intermediate Investment Grade Debt Funds, Short Investment Grade Debt Funds, Short-Intermediate Investment Grade Debt Funds, Multi-Sector Income Funds, and High Current Yield Funds. The horizontal axis displays the lower interval limits of each observation bucket, i.e., the "0.00" bucket contains the observations from the interval [0, 0.02) and thus contains zero and positive net notional values.



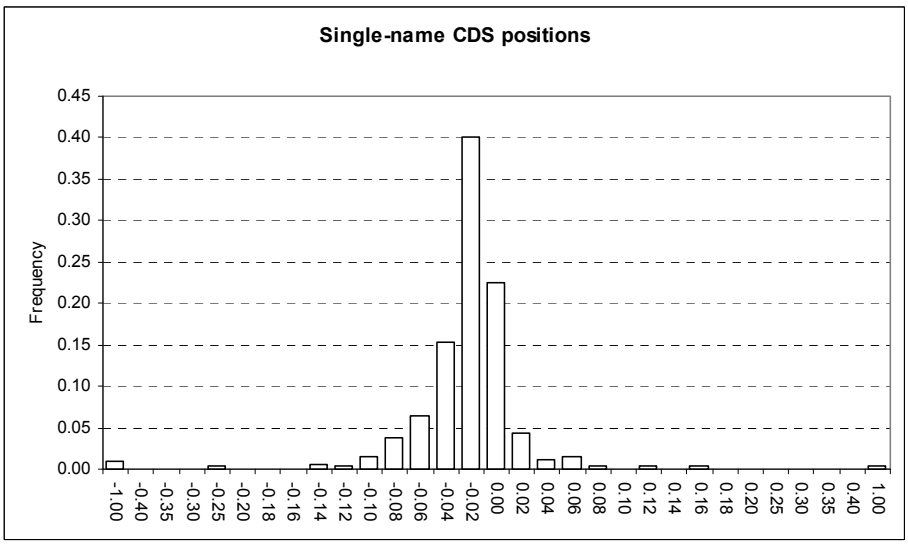
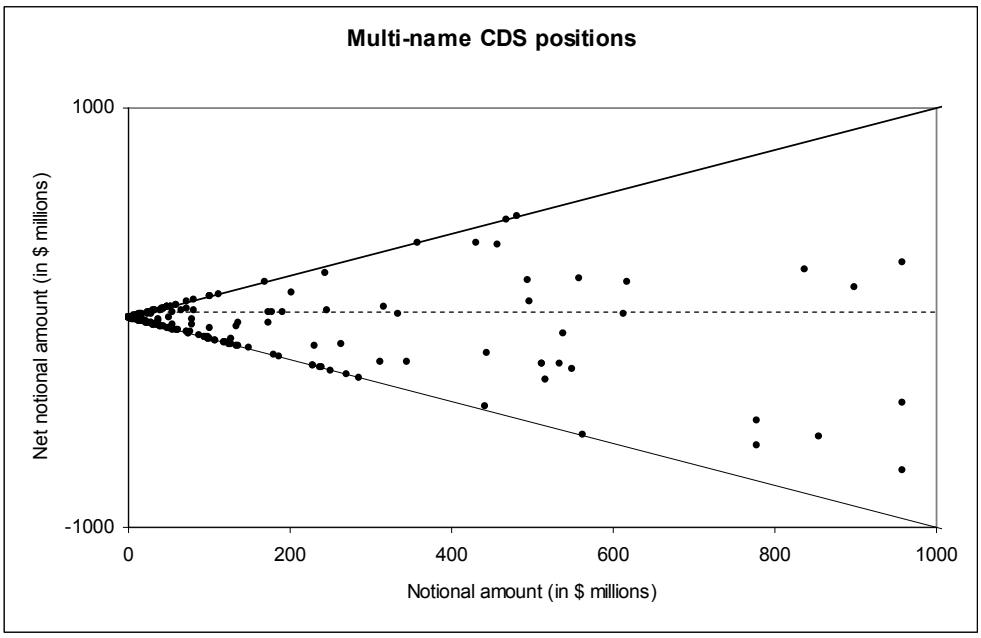


Figure 3: CDS Notional Amounts versus Net Notional Amounts

These figures show the relationship between the sum of net notional amounts (protection bought – protection sold) and the sum of the notional amounts of CDS positions for each of the top 100 U.S. mutual corporate bond funds between 2004 and 2008 (see Figure 1 for further descriptions of the sample). The upper figure refers to only multi-name CDS positions, while the lower figure refers to only single-name CDS positions. The straight lines denote points for which the notional amounts equal the net notional amounts, i.e., funds hold either long or short CDS positions, but not both. All interior points refer to cases in which funds held both long and short CDS positions. A small number of outliers is omitted from these graphs to facilitate a meaningful comparison. Axes refer to $ millions.



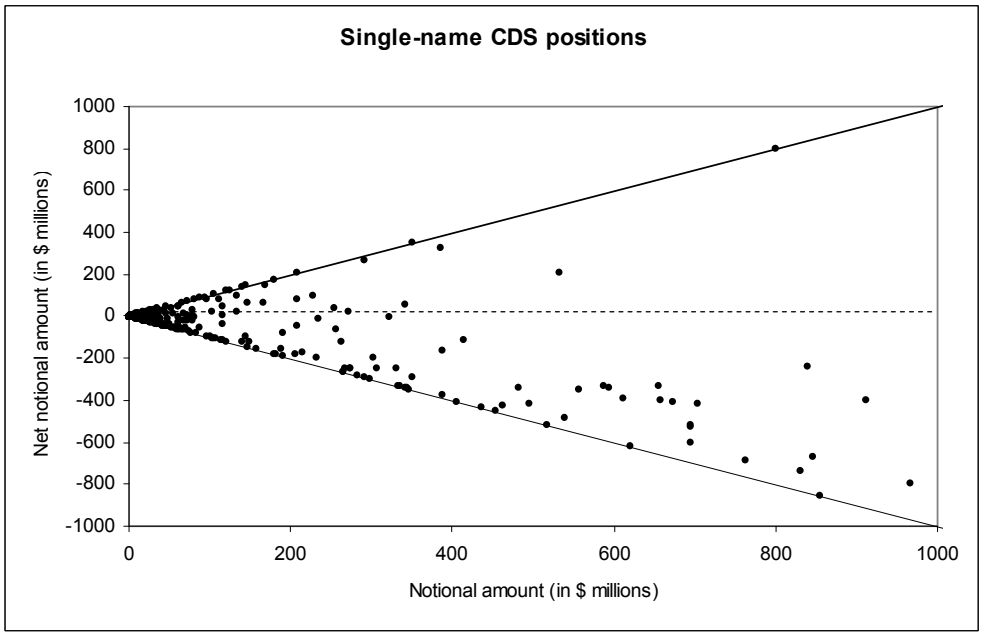


Table 1: Fund Characteristics

This table shows fund characteristics of the top 100 U.S. mutual corporate bond funds between 2004 and 2008. The top 100 funds are defined as the largest (by net asset value, NAV) 100 corporate bond funds in the CRSP survivorship-free mutual fund data base as of the end of the second quarter of 2004. Each fund is classified to one of the following Lipper fund classes: Corporate Debt Funds (A-Rated), Corporate Debt Funds (BBB-Rated), Intermediate Investment Grade Debt Funds, Short Investment Grade Debt Funds, Short-Intermediate Investment Grade Debt Funds, Multi-Sector Income Funds, and High Current Yield Funds. Funds in the last two fund classes are classified as high yield funds. Otherwise, we refer to funds as investment grade funds. *Fund age* measures the number of years since a fund's inception. *Big fund family* is a dummy variable that equals 1 if another fund in our sample belongs to the same fund family and 0 otherwise. *Fraction of retail investors* is the proportion of a fund's total NAV held by retail investors (net asset value of retail investor fund classes / total NAV). The *asset turnover ratio* is defined as the minimum of aggregated sales and purchases of securities divided by the 12-month average NAV. *Total expense ratio* is the sum of a fund's operating expenses (including 12b-1 fees, waivers and reimbursements) over a fund's total NAV. *CDS usage* is a dummy variable if a fund uses CDS and zero otherwise. All data are taken from the CRPS survivorship free mutual fund data base.

Variable	N	Mean	Std. dev.	Min	25%ile	Median	75%ile	Max
Panel A: All funds								
Total NAV (in $ millions)	890	5,040	11,502	264	1,274	2,155	5,061	130,930
Fund age (years)	890	20.9	10.3	4.0	13.0	19.0	28.0	73.0
Big fund family (dummy)	890	0.75	0.43	0	0	1	1	1
Fraction of retail investors	890	0.66	0.40	0.00	0.19	0.91	1.00	1.00
Asset turnover ratio	890	1.36	1.42	0.00	0.48	0.81	1.74	10.81
Total expense ratio (% p.a.)	890	0.78	0.35	0.13	0.55	0.75	1.07	1.75
CDS usage (dummy)	890	0.41	0.49	0.00	0.00	0.00	1	1
Panel B: Investment grade funds								
Total NAV (in $ millions)	544	6,309	14,415	264	1,385	2,374	5,399	130,930
Fund age (years)	544	20.5	9.1	6.0	14.0	18.0	26.0	54.0
Big fund family (dummy)	544	0.75	0.43	0	1	1	1	1
Fraction of retail investors	544	0.56	0.43	0.00	0.07	0.64	1.00	1.00
Asset turnover ratio	544	1.79	1.65	0.00	0.59	1.32	2.52	10.81
Total expense ratio (% p.a.)	544	0.61	0.27	0.13	0.48	0.60	0.73	1.42
CDS usage (dummy)	544	0.50	0.50	0	0	0	1	1
Panel C: High yield funds								
Total NAV (in $ millions)	346	3,044	2,704	388	1,120	1,882	4,395	13,400
Fund age (years)	346	21.6	12.0	4.0	13.0	20.0	28.0	73.0
Big fund family (dummy)	346	0.74	0.44	0	0	1	1	1
Fraction of retail investors	346	0.84	0.28	0.00	0.85	0.96	1.00	1.00
Asset turnover ratio	346	0.67	0.36	0.00	0.41	0.58	0.83	2.02
Total expense ratio (% p.a.)	346	1.06	0.27	0.18	0.86	1.10	1.22	1.75
CDS usage (dummy)	346	0.27	0.45	0	0	0	1	1

Table 2: Fund Size and CDS Usage

Panel A shows funds' net asset values (NAV) in $ million (columns 1 and 2), the number of CDS users out of the top 100 U.S. corporate bond funds (column 3), and the mean notional amount of a fund's total CDS positions at a particular point of time (column 4). Columns 5 to 7 show the total notional value of CDS positions over the NAV per fund. Panel B reports the distribution of the CDS book values (the unrealized gains or losses from CDS positions) relative to a fund's NAV.

Panel A: Fund size and CDS notional amounts

	NAV			Mean CDS	CDS notional amount / NAV		
Period	Mean	Median	CDS users	notional amount	Mean	Min	Max
2004 02	4,247	2,041	21	103	0.0205	0.0012	0.1523
2005 01	4,379	2,001	30	216	0.0411	0.0014	0.2662
2005 02	4,520	1,996	26	315	0.0569	0.0045	0.2910
2006 01	4,579	2,074	33	296	0.0516	0.0016	0.2367
2006 02	4,959	2,158	35	387	0.0596	0.0001	0.2433
2007 01	5,347	2,289	48	444	0.0640	0.0011	0.4196
2007 02	5,692	2,359	54	527	0.0926	0.0013	0.6886
2008 01	6,026	2,285	58	787	0.1238	0.0029	1.1376
2008 02	5,659	2,038	60	632	0.1372	0.0012	1.1556

Panel B: CDS book value / NAV

Period	Mean	Std. dev.	Min	25%ile	Median	75%ile	Max
2004 02	0.00008	0.00025	-0.00029	0.00001	0.00003	0.00005	0.00091
2005 01	0.00020	0.00051	-0.00111	0.00003	0.00010	0.00032	0.00203
2005 02	-0.00045	0.00107	-0.00454	-0.00056	-0.00002	0.00009	0.00048
2006 01	0.00006	0.00039	-0.00109	-0.00011	0.00003	0.00013	0.00127
2006 02	0.00031	0.00122	-0.00206	-0.00002	0.00004	0.00026	0.00510
2007 01	-0.00001	0.00077	-0.00274	-0.00010	0.00000	0.00016	0.00276
2007 02	-0.00295	0.00730	-0.03617	-0.00201	-0.00031	0.00000	0.00191
2008 01	-0.00485	0.01239	-0.07431	-0.00357	-0.00092	-0.00001	0.00466
2008 02	-0.00888	0.02766	-0.18660	-0.00549	-0.00122	0.00009	0.01177

Table 3: The CDS Strategies

Panel A reports descriptive statistics of the sum of CDS notional amounts relative to a fund's NAV for four separate CDS strategies. We distinguish between CDS written on a single asset (single-name) and a portfolio of assets or an index (multi-name), and whether a position is short (protection sold) and long (protection bought). Panel B shows the notional amounts of CDS positions relative to a fund's NAV for each of the four primary CDS strategies separately (CDS users only). Columns 5 and 6 also report the net notional amounts over NAV. The netting is done per fund-period and separately for multi- and single-name CDS positions. The last column reports the net notional amounts over NAV for multi- and single-name CDS lumped together.

Panel A: Descriptive statistics of CDS strategies (Notional amount / NAV)

Strategy	N	N non-zero	Mean	Std. dev.	Min	25%ile	Median	75%ile	Max
Multi-name (short)	365	191	-0.029	0.079	-0.616	-0.023	-0.001	0.000	0.000
Multi-name (long)	365	126	0.016	0.051	0.000	0.000	0.000	0.010	0.551
Single-name (short)	365	289	-0.025	0.059	-0.691	-0.025	-0.009	-0.001	0.000
Single-name (long)	365	200	0.013	0.062	0.000	0.000	0.002	0.012	1.142

Panel B: CDS strategies over time

	CDS notional amount / NAV				CDS net notional amount / NAV		CDS net notional
	Multi-name		Single-name				
Period	Long	Short	Long	Short	Multi-name	Single-name	amount / NAV
2004 02	0.074	-0.014	0.011	-0.010	0.011	-0.006	-0.002
2005 01	0.023	-0.036	0.013	-0.018	-0.026	-0.013	-0.026
2005 02	0.037	-0.042	0.014	-0.020	-0.019	-0.012	-0.023
2006 01	0.035	-0.031	0.018	-0.018	0.000	-0.008	-0.007
2006 02	0.053	-0.027	0.024	-0.024	0.010	-0.007	-0.001
2007 01	0.036	-0.030	0.016	-0.031	0.001	-0.014	-0.012
2007 02	0.035	-0.053	0.019	-0.040	-0.023	-0.019	-0.035
2008 01	0.069	-0.086	0.019	-0.047	-0.051	-0.027	-0.059
2008 02	0.061	-0.093	0.044	-0.036	-0.039	0.000	-0.026
2004 02-2008 02	**0.047**	**-0.046**	**0.020**	**-0.027**	**-0.015**	**-0.012**	**-0.021**

Table 4: The Determinants of CDS Usage

This table reports the marginal effects (regressions I to IV) and standard coefficients (regressions V and VI) of logit regressions. The dependent variable is a dummy variable that equals 1 if a fund used CDS during a semi-annual period and zero otherwise. Models V and VI use only those funds that began or terminated using CDS during the observation period. The sample period is 2004 – 2008 and the sample frequency is semi-annual. *Investment grade* is a dummy variable that equals 1 for investment grade funds and 0 for high yield funds. The definitions of all other independent variables can be found in Table 1. Standard errors are reported in parentheses. They are clustered at the fund level in models I and II. *,**,*** indicate significance at the 10%, 5% and 1% levels respectively.

	I	II	III	IV	V	VI
Variables	Logit (pooled)		Random-effects logit		Conditional fixed-effects logit	
ln(total net asset value)	0.0324	0.0579	-0.0453	0.0075	-0.4591	0.0550
	(0.0507)	(0.0519)	(0.0614)	(0.0510)	(0.8306)	(1.0107)
Asset turnover ratio	0.0666	0.0666*	0.0973***	0.0883***	0.8358***	0.8712**
	(0.0423)	(0.0378)	(0.0545)	(0.0523)	(0.3129)	(0.3624)
ln(fund age)	0.1969**	0.1681*	0.3243**	0.1890	-3.3345	-4.2056
	(0.0968)	(0.0917)	(0.2220)	(0.1597)	(6.2481)	(6.9114)
Big fund family (dummy)	0.3026***	0.2937***	0.3249***	0.2651***		
	(0.0801)	(0.0769)	(0.1680)	(0.1502)		
Total expense ratio	0.0832	0.0785	-0.1720	-0.0737	-16.0737**	-16.0386*
	(0.1886)	(0.1777)	(0.2961)	(0.2286)	(7.8925)	(9.0129)
Investment grade (dummy)	0.1631	0.1534	0.2419	0.2059		
	(0.1082)	(0.1059)	(0.1868)	(0.1671)		
Fraction of retail investors	-0.2154*	-0.1897	-0.2273*	-0.0784	-1.3628	10.9256
	(0.1218)	(0.1143)	(0.1594)	(0.1199)	(1.4524)	(9.3730)
Time fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
2008 (second half) excluded	No	Yes	No	Yes	No	Yes
R square	0.1687	0.1609	0.4092	0.3835	0.5165	0.4842
N	890	792	890	792	432	360

Table 5: CDS Strategies and Fund Tournaments

This table shows the second stage regression results of a Heckman selection model. The first stage estimates the determinants of the decision to use CDS as shown in Table 4. The second stage models changes in the use of each of the four principal CDS strategies. To test the tournament hypothesis we regress changes in the use of each strategy during the second half of a calendar year on excess returns during the first half of the same calendar year. Excess returns are measured as semi-annual returns over either corporate mutual fund-based or the passive (corporate bond index) benchmarks. Appendix B contains the descriptions of the two benchmarks used. We measure *fund flow* by $(NAV_t - NAV_{t-1}(1 + \text{semi-annual return}_t))/NAV_{t-1}$.The reported results are based on regressions that exclude the second half of 2008. Standard errors are reported in parentheses. *,**,*** indicate significance at the 10%, 5% and 1% levels respectively.

Panel A: Multi-name CDS Strategies

Variables	Δ(Notional amount (short) / NAV)$_t$		Δ(Notional amount (long) / NAV)$_t$	
Intercept	-0.0091	-0.0179	0.0057	0.0041
	(0.0144)	(0.0154)	(0.0066)	(0.0070)
Return over fund-based benchmark$_{t-1}$	2.5202**		0.1769	
	(1.0280)		(0.4691)	
Return over passive benchmark$_{t-1}$		1.8569**		0.2721
		(0.8065)		(0.3660)
Fund flow$_t$	-0.0119	-0.0198	-0.0273*	-0.0284*
	(0.0357)	(0.0359)	(0.0163)	(0.0163)
Time fixed-effects	Yes	Yes	Yes	Yes
N total/uncensored	359/99	359/99	359/99	359/99

Panel B: Single-name CDS Strategies

Variables	Δ(Notional amount (short) / NAV)$_t$		Δ(Notional amount (long) / NAV)$_t$	
Intercept	0.0037	0.0082	0.0055	0.0066
	(0.0124)	(0.0132)	(0.0065)	(0.0070)
Return over fund-based benchmark$_{t-1}$	-0.6534		-0.3441	
	(0.8821)		(0.4641)	
Return over passive benchmark$_{t-1}$		-0.7864		-0.2355
		(0.6870)		(0.3631)
Fund flow$_t$	-0.0166	-0.0134	-0.0204	-0.0194
	(0.0306)	(0.0306)	(0.0162)	(0.0162)
Time fixed-effects	Yes	Yes	Yes	Yes
N total/uncensored	359/99	359/99	359/99	359/99

Table 6: Average Fund Returns and the Standard Deviation of Returns

This table reports fund returns and standard deviation of fund returns of the top 100 U.S. mutual corporate bonds funds between 2004 and 2008. We consider funds' raw returns, as well as fund returns relative to two benchmarks. See Appendix B for details. We also calculate constant and time-varying three-factor alphas. The latter are estimated by a smoothed Kalman filter. The three factors include a bond market factor, a high yield factor, and a mortgage securities factor following Huij and Derwall (2008). Panel B shows return differences between funds that use CDS and funds that do not, and between funds that were net short in CDS and funds that were net long. We use univariate OLS regressions in Panels I and II with standard errors that are clustered at the fund level to test whether the differences are significant. *,**,*** indicate significance at the 10%, 5% and 1% levels respectively.

Panel A: Descriptive statistics

	N	Mean	Std. dev.	Min	Median	Max
Panel I: Average semi-annual returns						
Returns	890	0.0101	0.0498	-0.2375	0.0157	0.0813
Returns over fund-based benchmarks	890	-0.0012	0.0167	-0.1432	0.0011	0.0607
Returns over passive benchmarks	890	-0.0024	0.0180	-0.1498	-0.0006	0.0837
Three-factor alpha (constant)	890	0.0021	0.0014	-0.0074	0.0022	0.0050
Three-factor alpha (time-varying)	890	-0.0008	0.0034	-0.0467	-0.0002	0.0121
Panel II: Average semi-annual standard deviation of monthly returns						
Returns	890	0.0220	0.0196	0.0066	0.0159	0.1784
Returns over fund-based benchmarks	890	0.0123	0.0143	0.0019	0.0079	0.1514
Returns over passive benchmarks	890	0.0170	0.0171	0.0052	0.0112	0.1578

Panel B: Two-sample comparisons

	CDS			CDS users		
Period	Non-users	Users	Difference	Net short	Net long	Difference
Panel I: Average semi-annual returns						
Returns	0.0177	-0.0009	-0.0186***	-0.0016	0.0007	0.0022
Returns over fund-based benchmarks	0.0003	-0.0032	-0.0035***	-0.0037	-0.0021	0.0016
Returns over passive benchmarks	-0.0006	-0.0049	-0.0043***	-0.0058	-0.0029	0.0029
Three-factor alpha (constant)	0.0022	0.0018	-0.0004**	0.0018	0.0019	0.0001
Three-factor alpha (time-varying)	-0.0004	-0.0014	-0.001***	-0.0016	-0.0012	0.0004
Panel II: Average semi-annual standard deviation of monthly returns						
Returns	0.0192	0.0261	0.0069***	0.0268	0.0246	-0.0022
Returns over fund-based benchmarks	0.0106	0.0148	0.0042***	0.0157	0.0127	-0.0030*
Returns over passive benchmarks	0.0144	0.0207	0.0063***	0.0219	0.0181	-0.0037*

Table 7: Fund Returns – Multivariate Regression Results

This table shows OLS regression results of the semi-annual fund returns and three factor alphas of the top 100 U.S. corporate bond funds. In Column 1, the dependent variable is a funds' raw returns. In Columns 2 and 3, the dependent variables are a funds' return relative to a benchmark. See Appendix B for details. In Columns 4 and 5, the dependent variables are a fund's constant and time-varying three-factor alphas. See Table 6 for details. *CDS* is a dummy variable that equals 1 if the fund used CDS positions in the respective semi-annual period and 0 otherwise. *Investment grade* is a dummy variable that equals 1 for investment grade funds and 0 for high yield funds. Definitions of the other control variables are given in Table 1. Standard errors are reported in parentheses and are clustered at the fund level. *,**,*** indicate significance at the 10%, 5% and 1% levels respectively.

		Returns over benchmark		Three-factor alpha	
Variable	Returns	Fund-based	Passive	Constant	Time-varying
Intercept	-0.1299***	-0.0433***	-0.0412***	0.0014	-0.0061***
	(0.0076)	(0.0062)	(0.0068)	(0.0010)	(0.0017)
CDS (dummy)	-0.0036**	-0.0020*	-0.0027**	-0.0004**	-0.0001
	(0.0014)	(0.0011)	(0.0013)	(0.0002)	(0.0004)
ln(total net asset value)	0.0029***	0.0020***	0.0021***	0.0003***	0.0004**
	(0.0007)	(0.0006)	(0.0006)	(0.0001)	(0.0002)
Asset turnover ratio	-0.0002	-0.0003	-0.0003	-0.0000	-0.0001
	(0.0004)	(0.0003)	(0.0003)	(0.0000)	(0.0001)
ln(fund age)	-0.0001	-0.0003	-0.0002	-0.0005**	-0.0004*
	(0.0010)	(0.0009)	(0.0010)	(0.0002)	(0.0002)
Big fund family (dummy)	0.0020*	0.0014	0.0016	-0.0003	-0.0003
	(0.0012)	(0.0009)	(0.0010)	(0.0002)	(0.0003)
Investment grade (dummy)	0.0044***	0.0039***	0.0059***	0.0008**	0.0005
	(0.0013)	(0.0011)	(0.0013)	(0.0003)	(0.0003)
Fraction of retail investors	0.0017	0.0011	0.0014	0.0005*	0.0002
	(0.0017)	(0.0014)	(0.0015)	(0.0003)	(0.0003)
Time fixed-effects	Yes	Yes	Yes	Yes	Yes
Adj. R square	0.8397	0.3054	0.2216	0.1271	0.2255
N	890	890	890	890	890

Table 8: Standard Deviation of Returns - Multivariate Regression Results

This table shows OLS regression results of the standard deviations of monthly fund returns of the top 100 U.S. corporate bond funds. In Column 1, the dependent variable is the standard deviation of a fund's raw returns. In Columns 2 and 3, the dependent variables are the standard deviations of a fund's excess returns. See Appendix B for further details. *CDS* is a dummy variable that equals 1 if the fund used CDS positions in the respective semi-annual period and 0 otherwise. *Investment grade* is a dummy variable that equals 1 for investment grade funds and 0 for high yield funds. Definitions of the other control variables are given in Table 1. Standard errors are reported in parentheses and are clustered at the fund level. *,**,*** indicate significance at the 10%, 5% and 1% levels respectively.

Variable	Standard deviation of fund returns	Standard deviation of fund returns over fund-based benchmark returns	Standard deviation of fund returns over passive benchmark returns
Intercept	0.0712***	0.0470***	0.0644***
	(0.0049)	(0.0045)	(0.0046)
CDS (dummy)	0.0007	0.0006	0.0021**
	(0.0008)	(0.0008)	(0.0008)
ln(total net asset value)	0.0005	0.0001	-0.0002
	(0.0004)	(0.0004)	(0.0005)
Asset turnover ratio	-0.0004*	-0.0006**	-0.0007***
	(0.0002)	(0.0003)	(0.0003)
ln(fund age)	-0.0014**	-0.0011	-0.0013*
	(0.0006)	(0.0007)	(0.0008)
Big fund family (dummy)	0.0012	0.0005	0.0007
	(0.0007)	(0.0006)	(0.0009)
Investment grade (dummy)	-0.0017*	-0.0009	-0.0024**
	(0.0010)	(0.0009)	(0.0010)
Fraction of retail investors	-0.0008	-0.0003	-0.0009
	(0.0012)	(0.0012)	(0.0012)
Time fixed-effects	Yes	Yes	Yes
Adj. R square	0.8003	0.6400	0.7481
N	890	890	890

Table 9: Did the Use of CDS Affect Fund Performance?

This table shows fixed-effects (Columns 1 and 3) and random-effects (Columns 2 and 4) regression results of changes in each of the four principal CDS strategies. In Panel A we consider multi-name CDS positions only, while in Panel B we consider single-name CDS positions only. To test whether changes in a fund's CDS positions has subsequently led to improved or reduced fund performance we regress changes in a fund's CDS positions on future credit spread change. The credit spread is measured by the Baa-rated bond yield (Aaa-rated in robustness checks) over 10-year Treasury yields in % p.a. Standard errors are reported in parentheses and are clustered at the fund level. *,**,*** indicate significance at the 10%, 5% and 1% levels respectively.

Panel A: Multi-name CDS Strategies

Variables	Δ (Notional short / NAV)$_t$		Δ (Notional long / NAV)$_t$	
Intercept	0.0026	-0.0005	0.0016	0.0028**
	(0.0045)	(0.0016)	(0.0024)	(0.0014)
Δ Credit spread$_{t+1}$	-2.0768***	-1.5482***	0.3002	0.1032
	(0.7688)	(0.4816)	(0.4041)	(0.2264)
Fund fixed-effects	Yes	No	Yes	No
Random-effects	No	Yes	No	Yes
R square	0.0495	0.0301	-0.0005	0.0004
N	284	284	284	284

Panel B: Single-name CDS Strategies

Variables	Δ (Notional short / NAV)$_t$		Δ (Notional long / NAV)$_t$	
Intercept	-0.0031*	-0.0025**	0.0093**	0.0087
	(0.0017)	(0.0011)	(0.0044)	(0.0076)
Δ Credit spread$_{t+1}$	-0.3090	-0.4139	-0.7398	-0.3505
	(0.2836)	(0.3193)	(0.7571)	(0.3686)
Fund fixed-effects	Yes	No	Yes	No
Random-effects	No	Yes	No	Yes
R square	-0.0012	0.0044	0.0002	0.0000
N	284	284	284	284

Appendix A: The Sample

The table contains the names of the top 100 U.S. corporate bond funds as of the second quarter of 2004, the net asset values (in $ million), and the Lipper fund classes. All data is from the CRSP mutual fund summary.

Fund name	Total net assets	Fund category
PIMCO Funds: Pacific Investment Management Series: Total Return Fund	73,202	Intermediate Investment Grade Debt Fund
Vanguard Bond Index Funds: Vanguard Total Bond Market Index Fund	26,864	Intermediate Investment Grade Debt Fund
Vanguard Fixed Income Securities Funds: Vanguard Short-Term Corporate Fund	17,752	Short Investment Grade Debt Funds
Bond Fund of America, Inc	17,621	Corporate Debt Funds A Rated
PIMCO Funds: Pacific Investment Management Series: Low Duration Fund	14,470	Short Investment Grade Debt Funds
American High-Income Trust	8,896	High Current Yield Funds
Vanguard Fixed Income Securities Funds: Vanguard High-Yield Corporate Fund	8,743	High Current Yield Funds
Lord Abbett Bond-Debenture Fund, Inc	8,212	High Current Yield Funds
Pioneer High Yield Fund, Inc	7,665	High Current Yield Funds
Fidelity Commonwealth Trust: Fidelity Intermediate Bond Fund	6,775	Short-Intmdt Investment Grade Debt Fund
PIMCO Funds: Pacific Investment Management Series: High Yield Fund	6,759	High Current Yield Funds
Dodge & Cox Income Fund	6,629	Corporate Debt Funds A Rated
Oppenheimer Strategic Funds Trust: Oppenheimer Strategic Income Fund	6,182	Multi-Sector Income Funds
Fidelity Fixed-Income Trust: Fidelity Investment Grade Bond Fund	5,732	Intermediate Investment Grade Debt Fund
Putnam Diversified Income Trust	5,533	Multi-Sector Income Funds
Fidelity Fixed-Income Trust: Fidelity Short-Term Bond Fund	5,045	Short Investment Grade Debt Funds
Intermediate Bond Fund of America	5,039	Short-Intmdt Investment Grade Debt Fund
Fidelity Concord Street Trust: Fidelity US Bond Index Fund	4,768	Intermediate Investment Grade Debt Fund
Vanguard Bond Index Funds: Vanguard Short-Term Bond Index Fund	4,607	Short Investment Grade Debt Funds
Evergreen Select Fixed Income Trust: Evergreen Core Bond Fund	4,517	Intermediate Investment Grade Debt Fund
Vanguard Fixed Income Securities Funds: Vanguard Long-Term Corporate Fund	4,444	Corporate Debt Funds A Rated
Vanguard Fixed Income Securities Funds: Vanguard Intermediate-Term Corporate	4,226	Intermediate Investment Grade Debt Fund
MainStay Funds: MainStay High Yield Corporate Bond Fund	4,226	High Current Yield Funds
Fidelity Summer Street Trust: Fidelity Capital & Income Fund	4,149	High Current Yield Funds
SEI Institutional Managed Trust: Core Fixed Income Portfolio	3,949	Intermediate Investment Grade Debt Fund
T Rowe Price High Yield Fund, Inc	3,897	High Current Yield Funds
Vanguard Bond Index Funds: Vanguard Intermediate-Term Bond Index Fund	3,860	Intermediate Investment Grade Debt Fund
Western Asset Funds, Inc: Western Asset Core Plus Bond Portfolio	3,431	Intermediate Investment Grade Debt Fund
Putnam High Yield Trust	2,938	High Current Yield Funds
Franklin High Income Trust: AGE High Income Fund	2,849	High Current Yield Funds
AXP Diversified Bond Fund, Inc	2,817	Intermediate Investment Grade Debt Fund
Fidelity Fixed-Income Trust: High Income Fund	2,786	High Current Yield Funds
Calvert Fund: Calvert Income Fund	2,777	Corporate Debt Funds BBB-Rated
Sanford C Bernstein Fund, Inc: Intermediate Duration Portfolio	2,691	Intermediate Investment Grade Debt Fund

Appendix A continued

Fund name	Total net assets	Fund category
American Express Funds: AXP High Yield Bond Fund	2,614	High Current Yield Funds
Putnam Income Fund	2,596	Corporate Debt Funds A Rated
T Rowe Price New Income Fund, Inc	2,552	Corporate Debt Funds A Rated
GE S&S Program Funds: S&S Income Fund	2,515	Intermediate Investment Grade Debt Fund
BlackRock Funds: Core Bond Total Return Portfolio	2,506	Intermediate Investment Grade Debt Fund
Loomis Sayles Funds I: Loomis Sayles Bond Fund	2,412	Corporate Debt Funds BBB-Rated
Western Asset Funds, Inc: Western Asset Core Bond Portfolio	2,406	Intermediate Investment Grade Debt Fund
Fidelity Advisor Series II: Fidelity Advisor High Income Advantage Fund	2,405	High Current Yield Funds
Scudder High Income Fund	2,386	High Current Yield Funds
Fidelity Charles Street Trust: Spartan Investment Grade Bond Fund	2,355	Intermediate Investment Grade Debt Fund
Fidelity School Street Trust: Fidelity Strategic Income Fund	2,336	Multi-Sector Income Funds
Morgan Stanley Institutional Fund Trust: Core Plus Fixed Income Portfolio	2,319	Corporate Debt Funds BBB-Rated
PIMCO Funds: Pacific Investment Management Series: Total Return Fund II	2,319	Intermediate Investment Grade Debt Fund
Scudder Advisor Funds: Preservation Plus Income Fund	2,141	Intermediate Investment Grade Debt Fund
Nations Fund Trust: Nations Bond Fund	2,120	Intermediate Investment Grade Debt Fund
Merrill Lynch Bond Fund, Inc: Core Bond Portfolio	1,993	Intermediate Investment Grade Debt Fund
First American Investment Funds, Inc: Core Bond Fund	1,991	Corporate Debt Funds A Rated
Goldman Sachs Trust: Goldman Sachs High Yield Fund	1,939	High Current Yield Funds
Dryden High Yield Fund, Inc	1,928	High Current Yield Funds
Frank Russell Investment Company: Diversified Bond Fund	1,921	Intermediate Investment Grade Debt Fund
BlackRock Funds: Low Duration Bond Portfolio	1,891	Short Investment Grade Debt Funds
Federated High Income Bond Fund, Inc	1,862	High Current Yield Funds
Merrill Lynch Bond Fund, Inc: High Income Portfolio	1,846	High Current Yield Funds
Salomon Brothers Series Funds, Inc: Salomon Brothers High Yield Bond Fund	1,845	High Current Yield Funds
Fidelity Advisor Series II: Fidelity Advisor Strategic Income Fund	1,813	Multi-Sector Income Funds
FPA New Income, Inc	1,732	Corporate Debt Funds A Rated
USAA Mutual Fund, Inc: Income Fund	1,698	Corporate Debt Funds A Rated
Columbia High Yield Fund, Inc	1,667	High Current Yield Funds
Oppenheimer Champion Income Fund	1,658	High Current Yield Funds
Frank Russell Investment Company: Multistrategy Bond Fund	1,619	Corporate Debt Funds BBB-Rated
PIMCO Funds: Pacific Investment Management Series: Moderate Duration Fund	1,608	Short-Intmdt Investment Grade Debt Fund
Oppenheimer High Yield Fund	1,588	High Current Yield Funds
Eaton Vance Income Fund of Boston	1,567	High Current Yield Funds
T Rowe Price Short-Term Bond Fund, Inc	1,556	Short Investment Grade Debt Funds
SEIX Funds, Inc: SEIX High Yield Fund	1,515	High Current Yield Funds

Appendix A continued

Fund name	Total net assets	Fund category
Harbor Fund: Harbor Bond Fund	1,507	Intermediate Investment Grade Debt Fund
MFS Series Trust IX: MFS Bond Fund	1,447	Corporate Debt Funds BBB-Rated
John Hancock Strategic Series: John Hancock Strategic Income Fund	1,445	Multi-Sector Income Funds
MFS Series Trust III: MFS High Income Fund	1,436	High Current Yield Funds
One Group Mutual Funds: One Group Income Bond Fund	1,381	Intermediate Investment Grade Debt Fund
First American Investment Funds, Inc: Intermediate Term Bond Fund	1,350	Short-Intmdt Investment Grade Debt Fund
PIMCO Funds: Pacific Investment Management Series: Total Return Fund III	1,346	Intermediate Investment Grade Debt Fund
Fidelity Advisor Series IV: Fidelity Advisor Intermediate Bond Fund	1,314	Short-Intmdt Investment Grade Debt Fund
Evergreen Select Fixed Income Trust: Evergreen Short Intermediate Bond Fund	1,295	Short-Intmdt Investment Grade Debt Fund
AIM Investment Securities Funds: AIM High Yield Fund	1,281	High Current Yield Funds
Metropolitan West Funds: Total Return Bond Fund	1,270	Intermediate Investment Grade Debt Fund
Fidelity Advisor Series II: Fidelity Advisor Short Fixed-Income Fund	1,241	Short Investment Grade Debt Funds
John Hancock Sovereign Bond Fund: John Hancock Bond Fund	1,236	Corporate Debt Funds A Rated
Putnam High Yield Advantage Fund	1,217	High Current Yield Funds
Federated Total Return Series, Inc: Federated Total Return Bond Fund	1,210	Intermediate Investment Grade Debt Fund
One Group Mutual Funds: One Group High Yield Bond Fund	1,194	High Current Yield Funds
Janus Investment Fund: Janus Flexible Income Fund	1,193	Intermediate Investment Grade Debt Fund
Nations Fund Trust: Nations Short-Term Income Fund	1,189	Short Investment Grade Debt Funds
Goldman Sachs Trust: Goldman Sachs Core Fixed Income Fund	1,174	Intermediate Investment Grade Debt Fund
Smith Barney Income Funds: Diversified Strategic Income Fund	1,174	Multi-Sector Income Funds
Smith Barney Income Funds: High Income Fund	1,154	High Current Yield Funds
MassMutual Institutional Funds: MassMutual Core Bond Fund	1,120	Intermediate Investment Grade Debt Fund
Federated Investment Series Funds, Inc: Federated Bond Fund	1,113	Corporate Debt Funds BBB-Rated
Frank Russell Investment Company: Short Term Bond Fund	1,112	Short Investment Grade Debt Funds
Evergreen Fixed Income Trust: Evergreen High Yield Bond Fund	1,111	High Current Yield Funds
First American Investment Funds, Inc: Short Term Bond Fund	1,074	Short Investment Grade Debt Funds
SEI Institutional Managed Trust: High Yield Bond Portfolio	1,065	High Current Yield Funds
Vanguard Bond Index Funds: Vanguard Long-Term Bond Index Fund	1,061	Corporate Debt Funds A Rated
Columbia Funds Trust VIII: Columbia Intermediate Bond Fund	1,054	Intermediate Investment Grade Debt Fund
Nations Funds Trust: Nations High Yield Bond Fund	1,040	High Current Yield Funds
Federated Fixed Income Securities, Inc: Federated Strategic Income Fund	1,032	Multi-Sector Income Funds

Appendix B: Construction of Benchmarks

We use two benchmarks to evaluate the performance of our sample of corporate bond funds. The first benchmark is calculated by the average return of all U.S. corporate bond funds of the respective Lipper fund class of Panel I. We call this benchmark the *fund-based benchmark*. The second benchmark measures the return of a portfolio of corporate bonds that is comparable to the bond holdings of a particular fund. Panel I shows how we match Bank of America Merrill Lynch bond indices to the seven Lipper fund classes that occur in our sample. If a reasonable match cannot be found we create a new index from two or three bond indices. We use Moody's U.S. corporate rating distributions to determine the weights for the construction of the new indices. In the case of the Intermediate Investment Grade Debt Funds (Short Investment Grade Debt Funds) there is no A 3-5Y (1-3Y) index. These weights are given to AA and BBB indices accordingly. Panel II shows Moody's U.S. corporate rating distribution for the period 2004 to 2008. This data is extracted from Moody's Default Report 2008.

Panel I: Construction of passive benchmarks

Lipper fund class	Weight	Bond index
Panel A: Investment grade funds		
Corporate Debt Funds (A-Rated)	100%	US CORP A
Corporate Debt Funds (BBB-Rated)	100%	US CORP BBB
Intermediate Investment Grade Debt Funds	5%	US CORP AAA 3-5Y
	40%	US CORP AA 3-5Y
	55%	US CORP BBB 3-5Y
Short Investment Grade Debt Funds	5%	US CORP AAA 1-3Y
	40%	US CORP AA 1-3Y
	55%	US CORP BBB 1-3Y
Short-Intermediate Investment Grade Debt Funds	26%	US CORP AA-AAA 1-5Y
	74%	US CORP BBB-A 1-5Y
Panel B: High yield funds		
Multi-Sector Income Funds	100%	GLB BROAD
High Current Yield Funds	54%	US HY CORP.BB
	29%	US HY CORP.B
	17%	US HY CORP.C

Panel II: Moody's U.S. corporate rating distribution

Rating	2004	2005	2006	2007	2008	Average	Ratio
Aaa	143	144	139	150	182	152	3%
Aa	611	632	670	702	795	682	13%
A	1,204	1,242	1,279	1,298	1,240	1,253	24%
Baa	1,175	1,175	1,176	1,164	1,138	1,166	22%
Ba	555	559	598	598	590	580	11%
B	901	967	1,041	1,197	1,210	1,063	20%
Caa-C	281	330	348	334	425	344	7%
Investment grade	3,133	3,193	3,264	3,314	3,355	3,252	62%
High yield	1,737	1,856	1,987	2,129	2,225	1,987	38%
All	4,870	5,049	5,251	5,443	5,580	5,239	100%