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The Use of Derivatives by Corporate Bond Mutual Funds

Emily Scofield
University at Albany, State University of New York, escofield@albany.edu

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Emily Scofield

Research Advisor: Ying Wang, Ph.D.
Director of Department Honors: Na Dai, Ph.D.

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Abstract

This paper examines the use of derivatives by corporate bond mutual funds. Using a sample of 1,657 U.S. corporate bond funds from Morningstar during 2002-2018, I document a significant positive relation between the use of derivatives and corporate bond fund performance, even after controlling various fund characteristics. This relation is mainly driven by investment grade funds, but not high yield funds. Finally, while the positive relation holds for non-crisis periods, the use of derivatives appears to be negatively related to corporate bond fund performance during the crisis period. Overall, the results show that corporate bond funds that use derivatives significantly outperform those non-users especially during non-crisis periods, suggesting that the use of derivatives is indicative of corporate bond fund managers' superior skills.

Keywords: Corporate Bond Mutual Funds, Derivatives, Fund Performance, Investment Grade Funds, High Yield Funds, Financial Crisis

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Introduction

For this paper, I research and investigate how the use of derivatives by a corporate bond mutual fund affect the fund's performance over a specific period of time. Corporate bond mutual funds use all types of derivatives; however, some derivatives are more common than others, referring to credit default swaps. Corporate bonds, in themselves, are a debt security that is sold to investors after being issued by corporations.

The corporate bond market has grown to be one of the largest over the counter markets in the U.S due to the low risk associated with the market. However, it is important to note that only around 9% of the U.S corporate bond market is made up of investors inside of mutual funds (ICIFactBook, 2018). Over the past 10 years, the corporate bond market has mostly received net inflows for the larger part of the decade. According to the *2018 Investment Company Institute Fact Book*, "bond mutual flows have received $2.2 trillion in net inflows in reinvested dividends from 2009 through 2018." Its popularity has increased throughout the decades and began with little regulation. It was not until the financial crisis in 2008 where the mass population of investors called for regulations in the corporate bond markets. The financial crisis initially began within the sub-prime mortgage market but then intensified with the collapse of the investment bank Lehman Brothers that resulted in the mortgage crisis expanding into an international banking crisis (Colombo, 2018). This period of time, which many believe to take place from July 2007 to March 2009, is considered by many to be the most severe economic crisis since the Great Depression. The crisis itself indicated that the full extent to which mutual funds were using these derivatives is relatively unknown to both the public and market regulators because of the lack of data (e.g. Dodd-Frank Act, 2010; and SEC Concept Release on Derivatives, 2011). Additionally, literature shows that corporate bond debt levels as a share of GDP percentage have

reached an all-time high at the end of 2018 of close to 75% with the average debt from 2008 to 2018 being a staggering 69.3% (Oh, 2018). The all-time high corporate debt has split opinions amongst market regulators and investors. Some argue the corporations are in a better standing than they were prior to 2008 to issue debt because of low interest rate policies and quantitative easing (Oh, 2018). Others disagree, offering there should be cause for concern because there is a bubble forming around the corporate debt which is calling back to each prior economic crisis within the past 30 years. For each of the following, the dot com boom, the housing market mortgage crisis then subsequent banking crisis, and now, a bubble has formed that has or may lead to major shocks to the economy. Each period of negative interest rates and extremely cheap credit are primary factors for the formation of these so-called bubbles (Colombo, 2018). The bubble that is forming at the moment around the corporate debt is being referred to as the "everything bubble" because it reflects the situation growing in multiple countries, industries and assets (Colombo, 2018). There have been numerous discussions of the worry economists have for when this bubble essentially bursts and what this will mean to the economy and population as a whole.

Derivatives are most commonly used by corporations as a way to reduce risk and ease any financial burden's the company may face. It is well documented that derivatives do not necessarily increase performance or profits. Because the derivatives used by corporate bond mutual funds are exchanged on an over the counter market that is primarily unregulated, there is increased counterparty risk. The counterparty risk is important for investors in these funds because they have to take into account both an interest rate risk and credit risk in the event that the counterparty defaults (Koski & Pontiff, 1999). Many investors recently have become leery of the use of derivatives by any mutual fund. The reasoning included an illustrious history of firms

failing as a result of heavily invest in derivatives. A recent example includes the LJM Preservation and Growth Fund in the beginning of 2018 (Icten, 2018). Literature says, the most common derivative used by corporate bond mutual funds is the credit default swap or CDS.

Existing literature is minimal on this topic looking into derivative use in over the counter markets. Most of the literature focuses on the impact of derivatives in equity funds. Koski and Pontiff (1999) look into derivative usage by mutual funds and their impact on performance. Cao, Ghysels, and Hatheway (2010) look at how open-end mutual funds utilize forwards and futures. Cici and Palacios (2015) study how options are used and their impact on the risk and performance of mutual funds. The only current literature that has looked at derivative use in corporate bond funds is Adam and Guettler (2010, 2015). The aforementioned looked at credit default swaps usage in corporate bond funds and their impact on performance. The contributions to the existing literature this paper will have is the first empirical literature that looks at the usage of all derivatives in corporate bond mutual funds and the derivative's impact on the fund performance.

All existing literature finds funds using derivatives either underperform or have similar returns as non-users. I argue the opposite of the current literature and hypothesize the use of derivatives by corporate bond mutual funds will have a positive effect on the fund performance. Given that derivatives are a financial instrument that requires strategy when used, I argue the application of derivatives is an indication of a fund or a manager's skill. The strategy the fund's use for derivatives should reflect well thought out intention and technique from those utilizing them. Derivatives should allow funds using them to perform better than funds that do not.

Using a sample of 1657 corporate bond mutual funds during the period of January 2002 through December 2018 from Morningstar I conduct multiple regression analyses on the sample

for both excess returns and five factor adjusted returns. I control for multiple corporate bond mutual fund variables in the sample that include age, size, flow, and expense and turnover ratio. Regressions are run for the entire sample, non-crisis periods which are before and after the crisis, and the crisis period itself. Additionally, the sample of funds is broken down as high yield or investment grade and a regression analysis is performed.

In general, I document a significantly positive relation between the use of derivatives and one-month-ahead monthly returns in corporate bond mutual funds. The results are driven by the non-crisis periods. It should be noted the results are the exact opposite during the crisis period which showed funds using derivatives underperform the non-users. There is a significant negative relationship with derivative usage and fund performance during the crisis period. Additionally, results are also driven by investment grade funds as there is twice as many of them in the sample compared to high yield funds. High yield funds also show no significant relationship between derivative usage and returns. Overall, these findings go against all of the previous literature but are consistent with my hypothesis and provide new insights on derivative usage.

This paper contributes many new perspectives to the existing literature. To reiterate, this study is the first empirical literature to look into all derivatives usage as a whole and how it effects a corporate bond mutual fund's performance. Existing literature shows funds underperform non-users or have similar returns when applying derivatives in equity funds (see, e.g., Cao, Ghysels, & Hatheway, 2010; Cici & Palacios, 2015; and Koski & Pontiff, 1999). The literature shows the same for the study looking at corporate bond funds (see, e.g., Adam and Guettler (2010, 2015)). This study offers an explanation into why funds underperform in crisis periods after using derivatives when they previously outperform funds that do not use derivatives

in non-crisis periods. Essentially, the crisis period was too unstable for most managers to strategize clearly and so funds would rely on principle for what previously worked for them, which was employing derivatives. Similar performance in not seen because the market becomes unstable which changes the effectiveness of the derivatives. Another main takeaway from my study is funds and fund managers of corporate bond mutual funds need to use derivatives during non-crisis periods if the mutual fund is investment grade because the returns would be significant. To the contrary, if the market is in a crisis, corporate bond mutual funds to see worse returns if a fund manager is to utilize any type of derivative.

The rest of the paper is organized as follows. For the following section, Section 2, I will discuss existing literature. In Section 3, I will discuss the data and variables for the study. Section 4 presents the empirical results regarding the relationship between the corporate bond mutual fund's use of derivatives and its performance. Finally, Section 5 concludes.

Literature Review

Theoretical studies are few and far between when it comes to the topic of the utilization of derivatives in a mutual fund. For instance, Crawford, McCord, and Young (2010) look into credit default swaps and how they have been a major source of problems and concern for all financial institutions, specifically leading up to and directly following the financial crisis from 2007-2009. The group concluded that CDS had more of a negative impact on the financial crisis that the problem with subprime mortgages. Stulz (2010) entirely opposed the aforementioned theory by claiming that having greater derivative markets in the housing sector would have alerted investors through pertinent information that would minimize the crash with investors being able to hedge against decrease price of houses. The theoretical study only looks at the use of CDS

overall and does not hone into any particular market for any specific impact, especially in relation to a fund's performance.

Within the existing literature, there have been a small number of empirical studies conducted that have examined the application of derivatives in the US corporate bond mutual fund industry. Most of the existing literature focuses on derivative usage by equity funds. Koski and Pontiff (1999) performed one of the first studies that looked into the impact derivatives have on the performance of corporate bond mutual funds if utilized. The two originally theorized there would be a positive relationship between prior returns and derivative usage. As part of the study, equity mutual funds are surveyed and result in some evidence that funds using derivatives have a positive correlation with fund asset turnover and participation in a mutual fund family (Koski & Pontiff, 1999). It is interesting to note that the study found options and futures to be the most popular derivatives used in the over the counter markets at the time as opposed to the credit default swaps now that are most prominently used. After concluding the study, the main finding is derivative usage by mutual funds authorizes trading at smaller costs of transaction. Additionally, the study concluded derivatives allow the fund's outflows and inflows to be handled with increased efficiency. What's more, the study offers the prediction of derivatives that are utilized by mutual funds should bring higher returns, following the adjustment for the cost of trading, than funds that do not apply derivatives (Koski & Pontiff, 1999). Although the prediction is backed with strong reasoning, the data does not back up the claim. Instead, results show there is no compelling differences in the performance based on the decision of a mutual fund's use of derivatives (Koski & Pontiff, 1999).

A very similar conclusion is reached by Cao, Ghysels, and Hatheway (2010) who also examined the significance of derivative use, specifically forwards and futures, by open end

mutual funds and additionally backed that there is not much of a difference in returns between funds that use derivatives to those that do not. Moreover, the funds that used derivatives, did so very sparsely with little indication to expect meaningful impact on returns. The trio found superior fund performance when the fund's used derivatives extensively. There is an additional suggestion by the trio alluding to a "suggested motivation for money managers to use derivatives would be to meet transient portfolio considerations driven by cash flows or transaction costs." Moreover, fund managers wanted to maximize their payouts from their compensation contracts by using a derivative after a period of good performance to reduce the risk (Cao, Ghysels, & Hatheway, 2010). Cici and Palacios (2015) look into the activities and motivations of fund managers and how the usage of options impact the performance of the mutual funds. The two originally argue fund managers using options have to the ability to obtain proprietary information that can lead to greater performance compared to the funds that do not use options, nevertheless their results disprove this view. Instead, it should be known, the results from Cici and Palacios (2015) found "certain categories of options users that followed certain strategies suffered from worse performance than funds that did not use options during our sample period." The only empirical study conducted that has looked into derivative usage by corporate bond mutual funds has been Adam and Guettler (2010). For example, Adam and Guettler (2010) have observed the use of credit default swaps or CDS, both multi-name and single name, in corporate bond mutual funds and conclude the funds that apply CDS as the utilized type of derivative normally underperform those that did not use a CDS. The study also shows the usage of credit default swaps is now comparable to the frequency of derivatives used by hedge funds. In 2004, only around 20% of funds employ the use of a derivative. This percentage jumps to 60% in the midst of the financial crisis of 2008 and then evens out to around 50% after the crisis (Adam &

Guettler, 2010). Despite risk not being focused on for this particular study, it is worth noting that numerous underperforming funds end up increasing fund risk after increasing their short multi-name CDS positions. The reason being, an attempt to increase their relative performance as a result of increasing the fund risk for an underperforming fund (Adam & Guettler, 2010). Both Adam and Guettler (2015) later further their study of CDS by using specific data from the 2008 financial crisis to investigate the costs and benefits of using team managed funds and single managed funds in asset management. The team concluded a CDS team managed fund outperformed a CDS single managed fund when the fund used any complex trading strategies. Additionally, there is a lack of evidence in systematic differences in numerous measures of risk and higher returns distributed between both the mutual fund users and non-users of derivatives (Adam & Guettler, 2015). Essentially, fund managers, based on the aforementioned studies, do not have a strong history of employing options and derivatives to much success to the performance of the fund relative to those funds not using any derivatives or options.

Data and Variables

For this section, I describe the data and key variables that are being used for this paper. The sample of corporate bonds mutual funds is described in Section 3.1. Additionally, Section 3.2 depicts the key variables used and on the corporate bond mutual funds. Section 3.3 describes how the monthly returns were calculated and Section 3.4 presents the summary statistics from data.

Section 3.1 - Sample of Corporate Bonds

The Morningstar database sources the primary sample of corporate bond mutual funds as well as fund characteristics and returns. All corporate bond funds from the database are used in the sample size, whether they be surviving or dead funds. Both surviving and dead funds are including in order to show a survivorship bias. The sample that is gathered of all corporate bond funds includes a focus on the derivatives the funds either use or do not use. After I compile this, the final sample size is 1,657 corporate bond mutual funds that focus on a time series from January 1, 2002 through December 31, 2018. Looking at the data from the aforementioned 17 years is strategic to looking at periods of time before, during, and after a financial crisis and how fund performance with derivatives is affected.

Section 3.2 - Key Characteristics Variables

There is multiple control characteristics I utilize on the sample data set from Morningstar. The characteristics included the size of the corporate bond mutual fund in terms of its total net assets or TNA, flow, age, expense ratio, and turnover ratio. Flow refers to the amount of cash inflows or outflows for each mutual fund in the sample. Age indicates the length of time since the mutual fund's offering date of its oldest share class or inception date. Expense ratio expresses the annual amount an investor pays to the mutual fund as a percentage of their investment and turnover ratio is the amount or percentage of funds that the company replaces during the previous year. There is a callable dummy variable to assign the value of 1 to any mutual fund that uses a derivative and the value of 0 is assigned to those funds that do not use derivatives. The callable dummy variable acts as the independent variable. In response, the dependent variables are the monthly returns of the corporate bond mutual funds. An additional

high yield indicator with a value of 1 indicates to further categorize the sample set of mutual funds classifying the funds as either high yield or investment grade with a with a value of 0, otherwise. Any corporate bond mutual fund is classified as high yield (HY) if it contains “High Yield” in its category on Morningstar or if the fund’s average high yield holdings make up greater than 60% of its portfolio worth over time. If the aforementioned is not applicable, then the fund is otherwise considered investment grade (IG).

Section 3.3 - Corporate Bond Returns and Portfolio and Regression Analysis

I perform a regression analysis to look at corporate bond fund returns for each month for all funds in the sample set. A time series average for the cross-sectional regression analysis is used to look at all 207 monthly returns from January 1, 2002 through December 31, 2018. Additionally, the complete sample of the mutual funds is broken down into whether the fund is considered investment grade or high yield which has already been previously described. Once this is determined, a regression analysis is performed to compare returns for the use of derivatives in these different types of funds. We complete the regression analysis of abnormal returns using the following formula while controlling for various fund characteristics:

$$R_{i,\,t} = \alpha + \beta D_{i,\,t-1} + cX_{i,\,t-1} + \varepsilon_{i,\,t}$$

where D is the dummy variable that either determines if a fund uses a derivative or not, while X is the vector of the control variables including the fund size (Mtna), the one-month-lagged fund age (Age), the fund flow ratio (Mflow), and both one-year-lagged turnover rate (Tr) and expense ratio (Exp). For the size of the fund in terms of total net asset value and the age, we use a natural logarithm in order to decrease positive skewness (Qin & Wang, 2017). Additionally, to reiterate

a dummy variable assigns the high yield funds that have a value of 1 and 0 for investment grade funds which we use in attempt to control for style fixed effect. Finally, we control for all tables and regressions time fixed effect.

There is an alternative method for finding corporate bond mutual fund adjusted returns that take into consideration five factors of corporate bonds. we use the Fama and French (1997) five factor model:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,Mkt}Mkt_t + \beta_{i,SMB}SMB_t + \beta_{i,HML}HML_t + \beta_{i,Term}Term_t + \beta_{i,DEF}DEF_t + \varepsilon_{i,t}$$

where Mkt, SMB and HML make up the Fama and French three-factor model. Term is the factor for the term spread that captures the interest rate risk of bonds. The DEF is the factor for the default spread and stands for the default risk premium (Qin & Wang, 2017).

Section 3.4 - Summary Statistics

The first column or Column A of Table 1 represents statistical summary of our corporate bond mutual fund sample. It has already been noted that the key explanatory variable used in supplying evidence to support my hypothesis is the monthly return data. The first significant observation in the monthly return data is the sample mean to be 0.370% and a standard deviation of 1.265% indicating only a fractional positive return from the mutual funds that both use or do not apply derivatives. Looking at the use of derivatives by the funds indicates that an average of 28.75% of them employ the use of derivatives with a standard deviation of 45.26%. The key control variables reveal the average corporate bond mutual fund to have an age of 13.53 years, a logage of 2.4, size of $1424.22 million, and a logmtna size of $19.49 million. For further understanding, both logage and logmtna are the natural logarithm of age and size, respectively.

Moreover, the average flow from the sample of funds is .007%, with an expense ratio of .007% and a turnover ratio of 1.489%.

Table 2 presents the correlation matrix of all the variables. The key takeaway from the results is that monthly returns of the funds have a positive correlation to the use of derivatives that is significant with a coefficient of 0.015 or a correlation of 15 basis points. Because the correlation is important between the two, it is imperative to control for the employment of derivatives in the regression. Additionally, monthly returns are significantly positively correlated with bond logage, flow, turnover ratio, and expense ratio. It should be noted that there is a negative correlation between monthly returns and logmtna, however the negative correlation is not significant.

The regression returns on derivative usage from the funds are examined in Table 3. A regression is executed on monthly returns, both risk free and risk-adjusted, the use of derivatives, and all of the additional corporate bond mutual fund characteristics that have already been discussed. There are very significant results regarding the performance of derivatives. The use of derivatives is significantly positively related to the risk-free monthly returns and the risk-adjusted monthly returns of the funds. Furthermore, the monthly performance has significantly positive relationships with bond logmtna (size), flow, and expense ratio. Alternatively, there is a significant negative relationship between the sample fund's monthly returns, both excess and risk-adjusted, and the corporate bond mutual fund's logage, and turnover ratio. The only characteristic that imposes a different relationship between risk free and excess monthly returns is with the intercept where there is a significantly negative relationship with the intercept and risk-free returns and a positive relationship between the risk adjusted returns and the intercept that is not deemed significant.

Empirical Analysis

In this section, we show the empirical results concerning the relation between the use of the derivatives by corporate bond mutual funds and the monthly performance of the funds. Next, the main regression analysis results can be found in Section 4.2 which is executed to control for the change in the fund's employment of derivatives and the numerous characteristics of the corporate bond mutual funds. Section 4.2 also shows differences in returns from high yield funds and investment grade corporate bond mutual funds. Section 4.3-4.5 deals with the relation between the employment of derivatives and the monthly returns of the mutual funds focusing on the time periods before the 2008 financial crisis, during the crisis, and after the financial crisis.

Section 4.1 – Main Regression Analysis

The main regression analysis is important in providing substantial results that do support the hypothesis. In this regression analysis we examine the relationship between the corporate bond mutual fund monthly returns and the cross-sectional returns from running the regression. The cross-sectional regressions we perform for each month and each subsequent month's returns on (1) funds that do not employ derivatives; (2) funds that do make use of derivatives; (3) performance of the derivatives for both. The plethora of corporate bond mutual funds characteristics of logage, logmtna, mflow, turnover ratio, and expense ratio are all included in the cross-sectional regressions. With every single specification, we then report the averages of the time-series averages of the cross-sectional coefficients for the entire sample period of 207 months from January 2002 through December 2018. The t-statistics are also expressed.

Table 4 notes the regression results from the use of both returns from investment grade corporate bond mutual funds and the high yield mutual funds. In constant with Table 3, one month ahead returns are used in the regression analysis on the monthly returns. The coefficients of those monthly returns are significantly positive for both monthly risk-free returns also considered raw returns at 2.9% or 29 basis points and 2.8% or 28 basis points for monthly risk adjusted returns, also referred to as the characteristic-adjusted returns. For the raw return, the t-statistic is 4.80 and for the characteristic-adjusted return the t-statistic is 4.73. The prior results are for investment grade corporate bond mutual funds. These funds have a dummy variable of 0 as they are not high yield mutual funds. Results for the high yield mutual funds are an insignificantly positive 0.5% for monthly risk-free returns and monthly risk-adjusted returns. The dummy variable for the high yield funds is 1.

Taking the entirety of Table 3 and 4 into account, the regression analysis results indicate that the mutual funds' monthly returns have a positive relationship to future mutual funds returns that is considered significant. The conclusion can be drawn that the relation can be supported or explained by the skill or strategic moves by fund managers or the other various corporate bond mutual fund characteristics. The main findings from the tables, especially Table 4 include the results are almost entirely driven by the investment grade corporate bond mutual funds as high yield mutual funds do not provide anything significant to note to the overall results. Investment grade funds factor so highly in driving the performance results because the sample of investment grade funds is over two times larger than the sample size of the high yield mutual funds. Table 4 indicates the total number of investment grade observations compared to the total number of high yield observations. The additional number of observable funds that are investment grade

dominate any returns from the high yield funds based on the sheer number of them. Having an almost 2:1 ratio in funds shifts results of significance favorably to the investment grade funds.

Section 4.2 - Regression Analysis for Pre-Crisis (2008) Period

The regression analysis for the pre-crisis period is explained in Table 5 and includes all monthly returns, both excess and characteristic-adjusted returns, for the period of January 2002 through July 2007. The total number of observations for this sample is 15,436. Taking all mutual funds into account, the utilization of a derivative brings significantly positive returns from risk free returns and risk-adjusted returns at 11% or 110 basis points and 10.7% or 107 basis points, respectively. Additionally, the t-statistics for each of the aforementioned returns is 7.04 and 6.86. Breaking these numbers down even further reveal that investment grade corporate bond mutual funds have a fairly significantly positive return of 28 basis points for the raw returns with an associated t-statistic of 2.52. The risk-adjusted returns consistently have a moderately significantly positive return at 25 basis points with a t-statistic of 2.28. In total, the amount of investment grade observations is 12,241. High yield mutual funds by themselves precluding investment grade funds have a positive return of 104 basis points and 103 basis points for the excess and risk-adjusted returns that is considered to be very significant. The returns correlate with t-statistics of 4.20 and 4.16. For the high yield mutual funds, the total number of observations is 3,195. It needs to be noted that the monthly returns before the economic crisis are meaningful in that they show higher returns are generated by the derivatives being used in the high yield corporate bond mutual funds. This makes sense as high yield funds are generally riskier for investors than investment grade funds, however the returns from these funds have the ability to be significantly higher than the investment grade mutual funds which the data

corroborates. Again, higher returns are possible for high yield funds because these funds have a tendency to invest in corporate bonds that are lower in credit quality but have a higher yield than the market often referred to as junk bonds.

Section 4.3 - Regression Analysis for Crisis (2008) Period

The crisis period is summarized in Table 6 and covers the months of July 2007 - March 2009. The total number of observations for this sample were 6748 with 5306 of those observations being investment grade and 1442 considered high yield. Monthly returns for the entire sample of corporate bond mutual funds see returns that are negative but not with any sort of significance. The returns are negative 50 basis points and a negative 49 basis points for monthly risk free and risk adjusted returns, respectively. In addition to the returns, the corresponding t-statistics were both negative 1.37 and 1.32. Focusing in on just the investment grade funds from the crisis, the risk-free returns were significantly negative at 89 basis points with a t-statistic of negative 3.03. Returns for the investment grade monthly characteristic-adjusted returns is consistently significantly negative at 8.7% or 87 basis points. The associated t-statistic for the risk-adjusted returns is negative 2.97. Note that the high yield mutual funds see monthly returns of 21.5% or 215 basis points and 21.2% or 212 basis points that is significantly negative for the risk free and risk adjusted return. T-statistics for these returns were 4.21 and 4.15, respectively. The returns from this table are very surprising. Before the crisis, the use of derivatives increases performance of the funds and those funds that did not employ derivatives did not see a comparable performance, but one that is worse off. During the crisis, the corporate bond mutual funds that do employ any kind of derivative see performance that is worse than the performance of the funds that do not utilize derivatives. Adam and Guettler (2010) found similar

results, however their time period covered 2004 - 2008 which include both pre crisis and crisis time periods. This is worth noting because they examined the use of CDS and found the funds that do use CDS exhibited worse performance than those that did not. Poor market timing is reasoned to contribute to the lower performance by the funds that use CDS (Adam & Guettler, 2010). Another economic explanation similar to poor market timing for the funds using derivatives that underperform those that do not could be that fund managers are too panicked to use apply the derivatives in a strategic and meaningful way. The time of financial crisis and market instability maybe cause fund managers to panic and employ derivatives because they increased performance before the crisis without thinking fully on how they should be used during the crisis. Managers employ the usage of derivatives during this time because they simply gave better returns in the non-crisis time periods.

Section 4.4 - Regression Analysis for Post Crisis (2008) Period

Table 7 documents the monthly returns from the aftermath from the 2008 financial crisis. This looks at the months of March 2009 all the way through the end of December 2018. About 47,287 total corporate bond mutual funds observations are made in the post crisis period. Overall, the funds see significantly positive returns of 29 basis points for raw monthly returns and 27 basis points for the excess returns. The accompanying t-statistics for the aforementioned are 3.48 and 3.19, respectively. Looking solely at the investment grade mutual funds the returns are also consistently significantly positive. The returns for the raw monthly returns are 50 basis points with a t-statistic of 7.51. For monthly risk-adjusted returns, the returns are a significant 4.9% or 49 monthly basis points. Taking both types of monthly returns into consideration, the total number of investment grade corporate bond mutual funds observation is 35,474. Table 7

shows the high yield returns have insignificant returns of 5 basis points for both risk free and risk-adjusted returns. The t-statistics for both monthly returns for the high yield funds is 0.43 and 0.41. The entirety of the high yield funds observations is 11,813. The outcome of this data is consistent with the data of the time period before the economic crisis of 2008. In both instances, there is significantly positive returns from the utilization of derivatives by the funds and the returns are favorably driven by the investment grade mutual funds in the sample. It is worth restating investment funds are driving the returns because there are more than double the amount of investment grade funds in comparison to the high yield funds in the sample. High yield funds are more infrequent in comparison because they deal with junk bonds that are normally seen as unfavorable to most investors and because of this there is less of a market and demand. The use of derivatives is undoubtedly affecting the performance of mutual funds in the corporate bond market.

Conclusion

Cici and Palacios originally predict fund managers employ the use of derivatives in response to previous fund performance and because fund managers can potentially obtain pertinent inside information that leads to superior performance. Investors then feel safe to invest in funds that use derivatives because know derivatives help decrease risk that the investors themselves may not fully be able to evaluate and comprehend. Cici and Palacios do end up disagreeing with their original argument about managers gathering important information that could help them strategically use derivatives to outperform others. Other studies come to similar conclusions after find funds that use derivatives have similar or worse performance than the non-users (see, e.g., Adam & Guettler, 2010, 2015; Cao, Ghysels, & Hatheway, 2010; and Koski & Pontiff, 1999). One study specifically finds funds that do use derivatives do so too sparingly to

expect any meaningful impact on the fund's performance (Cao et al., 2010). None of the prior studies included the usage of all derivatives for corporate bond mutual funds. We provide the first empirical evidence to analyze and interpret the mutual fund's usage of derivative in the corporate bond market by examining the relation between one-month-ahead monthly returns from the utilization of derivatives.

Looking at the data from the sample period of January 2002 through December 2018, it is important to note that there is almost always a significantly positive relationship between the use of derivatives and one-month-ahead monthly returns that included both risk free and risk-adjusted returns. The results remain consistent after running a regression on all of the mutual funds and then further categorizing the funds as either investment grade or high yield. A regression analysis is performed for the period before the economic housing crisis, during the crisis period, and after the crisis. From the regressions of specific time periods, monthly returns from before and after the crisis show a significantly positive relationship between monthly returns and the use of derivatives. The explanation for the positive returns is attributed to funds and fund managers using the derivatives strategically. However, it is very interesting to note that during the crisis period, the funds that do not utilize any derivatives perform better than those that do. The results from the crisis period support my original hypothesis that theorize funds that do employ the use of derivatives will see better returns and outperform those funds that do not.

Looking a bit further into the returns, an explanation as to why the performance is worse during the crisis period for the utilization of derivatives could be explained by fund managers who were flustered or trying to do damage control by using derivatives that they did not think through fully enough to be able to use them strategically. The crisis period is a time of confusion and instability that caused many fund managers to be put back on their heels. They then try to do

a quick fix rather than what would have actually made sense if they took the time to employ a strategic option. Investors then trusted these funds and the derivatives based on principle and for previous returns from derivatives while they most likely blindly invested in these funds. The same, however, could be said for the fund managers who may have used the derivatives based on past principle that returns were better when they employ derivatives. There is also the argument that originally, the funds and fund managers may not have even known they were in a crisis period in the beginning and continued to use derivatives as they normally would. This also supports a point made by Adam and Guettler (2010) where they offer that around 60% of corporate bond funds use derivatives during the 2008 crisis and this point may explain why performance is underperformed. Funds that had not utilized derivatives before in the non-crisis period use them during the crisis period as a way to fix the decreased returns because they knew other funds saw better returns when they would use the derivatives before.

Everything goes back to as it is before the crisis concerning the monthly performance of the funds after the crisis period is resolved. Another conclusive note about the empirical analysis shows that when looked at all together, the funds that used derivatives have better performance, but it is actually the investment grade funds out of this total that is really driving the performance. The reasoning for this is there is greater than a 2:1 ratio for investment grade funds to high yield funds. Additionally, the results of this study are driven by the non-crisis periods.

Generally, funds have better returns while using derivatives. This is important for investors to take into consideration. Nevertheless, the investors themselves should become more aware of how the funds are employing the derivatives and in addition the managers need to regularly employ derivatives in a strategic manner and not for damage control and prior principle. This study sheds light on the importance of the fund's managers role in utilizing

derivatives for the fund, corporate bond market, investors and regulators and how using derivatives does increase performance of a corporate bond mutual fund.

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Table 1. Summary Statistics of Key Variables

This table reports the summary statistics of the corporate bond mutual funds sample during January 2002 through December 2018. The sample includes all active U.S corporate bond funds. The table reports summary statistics of the key variables being the utilization of derivatives and the monthly corporate bond returns. Mret (in %) is the monthly fund return; Der (in %) is the use of a derivative being used is 1 and not used is 0. Additionally, key fund characteristics for all corporate bond funds including high yield and investment grade are reported. Age of a fund is defined as the number of years since the inception of the fund's oldest share class; Logage is the natural logarithm of age; Mtna (in $ million) is the fund size; Logmtna is the natural logarithm of Mtna; Mflow (in %) is the monthly net fund flow ratio; Tr (in %) is annual turnover ratio; Exp (in %) is annual expense ratio.

	N	Min	p25	Mean	Median	p75	Max	Std
Corporate Bond Returns								
Mret (%)	133826	-4.10	-0.19	0.37	0.37	0.99	4.54	1.26
Utilization of Derivatives								
Der (%)	78810	0.00	0.00	0.29	0.00	1.00	1.00	0.45
Corporate Bond Fund Characteristics								
Age (year)	133826	0.21	5.67	13.53	11.96	19.28	44.08	9.74
Logage (year)	133826	0.19	1.90	2.40	2.56	3.01	3.81	0.83
Mtna ($ Millions	131403	2.71	82.67	1424.22	291.93	1017.37	27387.29	3729.81
Logmtna ($ Millions)	131403	14.81	18.23	19.49	19.49	20.74	24.03	1.84
Mflow (%)	129803	-16.30	-1.19	0.75	0.05	1.69	32.98	5.64
Tr (%)	117307	6.00	44.00	148.88	79.00	179.00	966.00	174.69
Exp (%)	123165	0.00	0.50	0.74	0.71	0.93	1.82	0.35

Table 2. Correlations of Fund Characteristics (%)

Table 2 reports the correlation matrix of fund characteristics among all funds. ***, **, and * indicate the significance levels at 1%, 5%, and 10%, respectively. Mret is the monthly fund return; Der is whether a derivative is being used (1) or is not (0); Logage is the natural logarithm of age; Logmtna is natural logarithm of size; Mflow is the monthly net fund flow ratio; Tr is annual turnover ratio; Exp is annual expense ratio.

Variable	Mret	Der	Logage	Logmtna	Mflow	Tr	Exp
Mret	1.000						
Der	0.015***	1.000					
Logage	-0.016***	0.050***	1.000				
Logmtna	-0.003	0.168***	0.440***	1.000			
Mflow	0.033***	-0.002	-0.245***	-0.051***	1.000		
Tr	-0.006**	0.240***	-0.010***	0.056***	0.000	1.000	
Exp	0.023***	-0.010***	0.102***	-0.201***	-0.029***	-0.035***	1.000

Table 3. Regressions of Returns on Derivative Usage by Corporate Bond Mutual Funds

Table 3 reports regression results of corporate bond fund performance on portfolio concentration, controlling for various fund characteristics, during January 2002 - December 2018. The results are based on every fund in the sample including both high yield and investment grade. The dependent variable is the monthly returns both for the risk-free rate of return and the risk-adjusted returns. Additionally, the dependent variable is the monthly fitted pre-fee abnormal returns estimated as the differences between realized pre-fee returns and returns predicted by fund factor loadings and the realizations of the factors, where factor loadings are estimated based on the unconditional four-factor model using pre-fee returns over the previous 36 months. Derivative usage is measured at the end of the previous month. Other controlled fund characteristics include the one-month-lagged natural logarithm of fund age (Logage) and fund total net assets (Logmtna), net flow ratio (Mflow), one-year-lagged turnover rate (Tr) and expense ratio (Exp). We also control for time fixed effect (FE) in all regressions and report t-statistics (in parentheses) based on standard errors clustered at the fund level. ***, **, and * indicate the significance levels at 1%, 5%, and 10%, respectively.

Parameter	**Retrf**	**Retadj**
Intercept	-0.136**	0.015
	(2.22)	(0.24)
Der	0.040***	0.039***
	(5.26)	(5.13)
Logage	-0.040***	-0.039***
	(7.75)	(7.63)
Logmtna	0.015***	0.012***
	(7.25)	(5.83)
Mflow	0.300***	0.301***
	(4.37)	(4.38)
Tr	-0.020***	-0.020***
	(9.45)	(9.40)
Exp	13.349***	13.309***
	(12.91)	(12.88)
Time Fe	Yes	Yes
Control	Yes	Yes
AdjRsq	0.518	0.297
Number of Observation	69471	69471

Table 4. Regression of Investment Grade and High Yield Funds

The table reports corporate bond fund performance sorted by portfolio concentration during January 2002 - December 2018. Each quarter I sort funds into equal-weighted quintile portfolios based on their portfolio concentration indices (demeaned within the investment grade or high yield fund category) at the end of the previous quarter. We then obtain unconditional five-factor alphas of these portfolios as well as the differences in alphas between the most concentrated and diversified quintiles (5-1). Panel A reports results based on the investment grade subsample and Panel B based on high yield bond fund subsamples, respectively. Columns 3 and 4 show results based on risk free - and risk-adjusted returns, respectively. I also control for time fixed effect (FE) and report t-statistics (in parentheses) in all regressions. The Newey-west adjusted t-statistics are shown in parentheses. ***, **, and * indicate the significance levels at 1%, 5%, and 10%, respectively.

Panel A. Investment Grade

Parameter	Retrf	Retadj
Intercept	0.716***	0.242***
	(14.98)	(5.07)
Der	0.029***	0.028***
	(4.80)	(4.73)
Logage	-0.023***	-0.022***
	(5.66)	(5.42)
Logmtna	0.010***	0.007***
	(6.09)	(4.29)
Mflow	-0.020	-0.015
	(0.35)	(0.27)
Tr	0.003*	0.003*
	(1.67)	(1.77)
Exp	-2.629***	-2.751***
	(2.97)	(3.11)
Time Fe	Yes	Yes
Control	Yes	Yes
AdjRsq	0.671	0.418
Number of Observation	53021	53021

Panel B. High Yield

Parameter	Retrf	Retadj
Intercept	-2.067***	0.128
	(24.01)	(1.49)
Der	0.005	0.005
	(0.50)	(0.49)
Logage	0.007	0.007
	(0.99)	(0.98)
Logmtna	0.001	-0.003
	(0.26)	(0.90)
Mflow	-0.075	-0.074
	(0.91)	(0.89)
Tr	-0.006	-0.006
	(1.30)	(1.27)
Exp	-7.051***	-6.891***
	(4.66)	(4.57)
Time Fe	Yes	Yes
Control	Yes	Yes
AdjRsq	0.893	0.751
Number of Observation	16450	16450

Table 5. Regression of Pre-Crisis Period

Table 5 reports corporate bond fund performance sorted by portfolio concentration during January 2002 - June 2007 which is considered the pre-crisis period. Each quarter I sort funds into equal-weighted quintile portfolios based on their portfolio concentration indices (demeaned within the investment grade or high yield fund category) at the end of the previous quarter. We then obtain unconditional five-factor alphas of these portfolios as well as the differences in alphas between the most concentrated and diversified quintiles (5-1). Columns 2-3 reports results based on the entire sample, columns 4-5 report the investment grade subsample and columns 6-7 based on high yield bond fund subsamples, respectively. Each fund portfolio concentration shows results based on risk free - and risk-adjusted returns, respectively. I also control for time fixed effect (FE) and report t-statistics (in parentheses) in all regressions. The Newey-west adjusted t-statistics are shown in parentheses. ***, **, and * indicate the significance levels at 1%, 5%, and 10%, respectively.

	All Funds		Investment Grade		High Yield	
Parameter	**Retrf**	**Retadj**	**Retrf**	**Retadj**	**Retrf**	**Retadj**
Intercept	-0.876***	-0.084	-0.742***	0.132*	0.643***	0.948***
	(8.40)	(0.80)	(10.00)	(1.79)	(3.84)	(5.68)
Der	0.110***	0.107***	0.028**	0.025**	0.104***	0.103***
	(7.04)	(6.86)	(2.52)	(2.28)	(4.20)	(4.16)
Logage	-0.067***	-0.069***	0.002	0.001	-0.018	-0.019
	(5.61)	(5.75)	(0.18)	(0.08)	(1.04)	(1.09)
Logmtna	0.023***	0.019***	0.002	0.001	0.001	-0.005
	(4.68)	(3.83)	(0.53)	(0.26)	(0.17)	(-0.65)
Mflow	0.635***	0.638***	0.192*	0.203**	-0.051	-0.066
	(4.63)	(4.66)	(1.92)	(2.04)	(0.26)	(0.34)
Tr	-0.031***	-0.031***	0.000	0.000	-0.003	-0.003
	(8.03)	(8.00)	(0.12)	(0.08)	(0.20)	(0.25)
Exp	24.847***	24.780***	-1.806	-1.881	4.192	4.363
	(12.41)	(12.40)	(1.19)	(1.25)	(1.29)	(1.35)
Time Fe	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes
AdjRsq	0.551	0.136	0.785	0.209	0.854	0.684
Number of Observation	15436	15436	12241	12241	3195	3195

Table 6. Regression for Crisis Period

Table 6 reports corporate bond fund performance sorted by portfolio concentration during July 2007 - March 2009, which is considered the crisis period. Each quarter I sort funds into equal-weighted quintile portfolios based on their portfolio concentration indices (demeaned within the investment grade or high yield fund category) at the end of the previous quarter. We then obtain unconditional five-factor alphas of these portfolios as well as the differences in alphas between the most concentrated and diversified quintiles (5-1). Columns 2-3 reports results based on the entire sample, columns 4-5 report the investment grade subsample and columns 6-7 based on high yield bond fund subsamples, respectively. Each fund portfolio concentration shows results based on risk free - and risk-adjusted returns, respectively. I also control for time fixed effect (FE) and report t-statistics (in parentheses) in all regressions. The Newey-west adjusted t-statistics are shown in parentheses. ***, **, and * indicate the significance levels at 1%, 5%, and 10%, respectively.

	All Funds		Investment Grade		High Yield	
Parameter	**Retrf**	**Retadj**	**Retrf**	**Retadj**	**Retrf**	**Retadj**
Intercept	3.571***	-0.319	2.746***	-1.041***	4.398***	0.081
	(15.51)	(1.39)	(14.81)	(5.62)	(14.78)	(0.27)
Der	-0.050	-0.049	-0.089***	-0.087***	-0.215***	-0.212***
	(1.37)	(1.32)	(3.03)	(2.97)	(4.21)	(4.15)
Logage	0.108***	0.108***	0.001	0.003	0.044	0.043
	(3.90)	(3.91)	(0.05)	(0.14)	(1.31)	(1.27)
Logmtna	-0.046***	-0.035***	-0.008	0.002	-0.043***	-0.019
	(4.14)	(3.12)	(0.88)	(0.17)	(2.91)	(1.32)
Mflow	2.438***	2.446***	1.886***	1.917***	0.247	0.282
	(7.50)	(7.52)	(6.85)	(6.96)	(0.67)	(0.77)
Tr	0.016	0.016	-0.002	-0.003	0.036*	0.038**
	(1.52)	(1.51)	(0.28)	(0.31)	(1.95)	(2.03)
Exp	-30.035***	-30.389***	-0.606	-0.935	-31.095***	-30.862***
	(5.83)	(5.90)	(0.14)	(0.21)	(4.41)	(4.37)
Time Fe	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes
AdjRsq	0.459	0.410	0.586	0.538	0.916	0.845
Number of Observation	6748	6748	5306	5306	1442	1442

Table 7. Regression of Post Crisis Period

Table 7 reports corporate bond fund performance sorted by portfolio concentration during April 2009 - December 2018, which is considered the post crisis period. Each quarter I sort funds into equal-weighted quintile portfolios based on their portfolio concentration indices (demeaned within the investment grade or high yield fund category) at the end of the previous quarter. We then obtain unconditional five-factor alphas of these portfolios as well as the differences in alphas between the most concentrated and diversified quintiles (5-1). Columns 2-3 reports results based on the entire sample, columns 4-5 report the investment grade subsample and columns 6-7 based on high yield bond fund subsamples, respectively. Each fund portfolio concentration shows results based on risk free - and risk-adjusted returns, respectively. I also control for time fixed effect (FE) and report t-statistics (in parentheses) in all regressions. The Newey-west adjusted t-statistics are shown in parentheses. ***, **, and * indicate the significance levels at 1%, 5%, and 10%, respectively.

	All Funds		Investment Grade		High Yield	
Parameter	**Retrf**	**Retadj**	**Retrf**	**Retadj**	**Retrf**	**Retadj**
Intercept	-0.225***	0.157**	0.652***	0.389***	-2.136***	0.246***
	(3.68)	(2.57)	(13.61)	(8.15)	(24.27)	(2.80)
Der	0.029***	0.027***	0.050***	0.049***	0.005	0.005
	(3.48)	(3.19)	(7.51)	(7.27)	(0.43)	(0.41)
Logage	-0.051***	-0.050***	-0.032***	-0.030***	0.010	0.012
	(9.34)	(9.15)	(7.19)	(6.93)	(1.34)	(1.53)
Logmtna	0.021***	0.015***	0.014***	0.009***	0.004	-0.008**
	(9.15)	(6.69)	(8.04)	(5.20)	(1.22)	(2.14)
Mflow	-0.121	-0.122	-0.403***	-0.402***	-0.117	-0.117
	(1.57)	(1.59)	(6.18)	(6.18)	(1.27)	(1.28)
Tr	-0.020***	-0.020***	0.005***	0.005***	-0.014**	-0.015***
	(8.30)	(8.33)	(2.89)	(2.96)	(2.54)	(2.71)
Exp	15.579***	15.585***	-3.553***	-3.561***	-7.183***	-6.854***
	(13.48)	(13.50)	(3.49)	(3.51)	(4.18)	(4.01)
Time Fe	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes
AdjRsq	0.510	0.250	0.636	0.340	0.888	0.699
Number of Observation	47287	47287	35474	35474	11813	11813