

## WINDOW DRESSING IN BOND MUTUAL FUNDS

Matthew R. Morey

*Pace University*

Edward S. O’Neal

*Wake Forest University*

### Abstract

We examine portfolio credit quality holding and daily return patterns in a large sample of bond mutual funds and document evidence of window dressing. Using portfolio credit quality holdings data, we find that bond funds on average hold significantly more government bonds during disclosure than nondisclosure, presumably to present a safer portfolio to shareholders. Multiple-index market models estimated with daily returns data corroborate these findings. We detect differences in factor loadings on days surrounding disclosure dates that indicate systematic tilting of the portfolio toward higher quality instruments.

*JEL Classification:* G11, G20, G23

### I. Introduction

*We also are concerned about the misleading practice known as “window dressing”. Here, advisers buy or sell portfolio securities at the end of a disclosure period for the purpose of misleading investors as to the securities held by the fund, the strategies engaged in by the advisers or the source of the fund’s performance. . . . We view this as an antifraud violation. . . . We hope that funds have appropriate controls in place to prevent these abusive practices.*

—Paul F. Roye, Director, Division of Investment Management, U.S. Securities & Exchange Commission<sup>1</sup>

Although the popular financial press contains anecdotal accounts of window dressing in mutual fund portfolios, reliable evidence of its existence remains

---

We thank David Meyers and David Musto for very helpful comments on this article.

<sup>1</sup>In a speech before the American Law Institute/American Bar Association Investment Company Regulation and Compliance Conference June 14, 2001, text available at: <http://www.sec.gov/news/speech/spch500.htm>.

elusive.<sup>2</sup> The typical window dressing scenario entails an equity fund manager who replaces recent poorly performing securities with top performers around disclosure dates to present a more attractive portfolio to investors. The rationale is that in the face of poor previous fund performance, investors are more likely to stay the course if the underlying securities are recent high-fliers. Once the portfolio holdings have been disclosed, the fund manager reverses the cosmetic rebalancing, resulting in a significantly different investment vehicle from that presented to investors.

The detrimental effects of window dressing are two-fold. Most obvious, investors are misled about the sources of fund performance. Taken to the extreme, this deception could conceal investing behavior inconsistent with the fund prospectus. This implicit cost of cosmetic rebalancing is accompanied by a second detrimental effect of window dressing: additional explicit transactions costs borne to build and dismantle cosmetic positions.

Despite the concerns voiced by the U.S. Securities and Exchange Commission (SEC), not a single case of window dressing has been brought by the SEC against a U.S. mutual fund. This lack of action is not surprising given the difficulty in identifying portfolio activities that are solely cosmetic in nature. The SEC historically has required mutual funds to disclose portfolio holdings twice annually.<sup>3</sup> Absent voluntary disclosure, portfolio composition between disclosure periods is unavailable. Uncovering window dressing would therefore require the analysis of proprietary portfolio information on a case-by-case basis.

More frequent portfolio disclosure would likely reduce incentives to window dress; in the limit, continual disclosure would render window dressing ineffective. However, fund advisors generally maintain that more frequent disclosure could limit their ability to profit on research analysis as the market is more quickly apprised of securities the manager believes are undervalued (perhaps before significant fund positions can be built). Such costs to shareholders might outweigh the benefits of increased disclosure, and the SEC has recently declined to require more frequent disclosure by mutual funds.

We examine bond fund window dressing using two methods. First, we use a quarterly survey conducted by Morningstar that provides bond mutual fund portfolio credit quality holding data. By analyzing these data we can not only test for the existence of window dressing but also the form the window dressing behavior takes. Our analysis of portfolio composition centers on the detection of differences in the credit quality exhibited in disclosure periods versus nondisclosure periods. To the extent that window dressing occurs, we assess whether bond fund managers are increasing quality or bolstering yields at disclosure.

---

<sup>2</sup>See, for example, Jasen, *Wall Street Journal*, July 2, 1992, p. C21, or Norton, *Barron's*, December 11, 1995, pp. 33–34.

<sup>3</sup>In February 2004, the SEC mandated quarterly disclosure of portfolio holdings.

To augment our credit quality holding analysis, we also examine daily return patterns of bond funds. Window dressing activities should cause fund returns around disclosure periods to be driven by a different return-generating process than at other times of the year. To identify such behavior we investigate the loadings that funds have on components of a multiple-index market model. Our goal is to document whether funds have loadings on index components around disclosure periods that are different from other times of the year. Differences in factor loadings around disclosure periods indicate the portfolio is temporarily tilted toward one sector of the bond market and away from another. Such differences are consistent with window dressing.

## II. Related Literature

There are two types of window dressing behavior analyzed in the literature. The first type occurs when a fund dumps loser stocks, or loads up on winning stocks, or both, before disclosure of the portfolio holdings. The second type occurs when a fund presents different portfolio risk characteristics around disclosure dates. We examine the altering of portfolio risk.

Both types of window dressing are documented in the literature, yet rigorous academic studies are limited in number and often provide conflicting results. Lakonishok et al. (1991) find weak evidence of window dressing for equity pension funds. Pension funds appear to sell more losers in the fourth quarter than at other times of the year. However, this relative selling of losers is not accompanied by increased purchases of winners that would be consistent with theorized window dressing behavior. Because pension funds are monitored by sponsors with more sophistication than average retail investors, window dressing may be less advantageous for pension fund managers than for mutual fund managers. On the other hand, window dressing may accomplish little for mutual fund managers if investors do not look at portfolio holdings.

In an examination of the second type of window dressing, Musto (1997, 1999) examines yield patterns and portfolio holdings of money market funds and finds evidence that these funds increase the credit quality of their holdings around disclosure periods to show a safer portfolio to investors. In particular, Musto (1997) finds that commercial paper that matures shortly after a calendar year-end exhibits higher yields than do otherwise similar issues maturing shortly before year-end. He attributes this difference in yields to the disutility money fund managers face by holding higher risk securities through year-end disclosure periods. In a supporting study, Musto (1999) examines the weekly holdings of money market funds. He finds that retail money market funds tilt their allocation away from corporate securities and toward government securities around portfolio disclosures. These reallocations are more pronounced for funds with relatively poor previous-year performance.

However, Musto estimates that funds reallocate on average only 0.3% of fund assets, an amount that may be immaterial.

Chevalier and Ellison (1997) explore the propensity of equity fund managers to alter risk at the end of the year. They do not specifically examine window dressing behavior. However, they find that fund managers systematically shift their portfolio risk from September to December to increase the inflow of investments to the fund. Chevalier and Ellison's findings are relevant to our study because funds may be shifting their portfolio risk not to make themselves look better at disclosure but to enhance the fund's performance standing at year-end to maximize fund inflows. In the following analysis, we separate whether our results are due to portfolio risk shifting around disclosure or portfolio risk shifting in general.

### **III. Credit Analysis Data**

In this section we analyze the portfolio credit quality of a large sample of bond funds. Our data allow us to segregate our portfolio composition observations based on whether a fund has an official SEC disclosure. Differences in disclosure and nondisclosure holdings are then examined to uncover systematic portfolio composition changes that may be consistent with window dressing.

#### *Morningstar Data*

The portfolio credit quality holding data are drawn from the Morningstar quarterly data disks. The holdings data are acquired by Morningstar through a quarterly survey that Morningstar distributes directly to the funds. The quarterly dates are the ends of March, June, September, and December.

The holdings data provided by Morningstar are not the actual bonds held by the fund. Instead, Morningstar provides a credit quality analysis for each fund. The credit quality analysis shows the percentage of bonds held by the fund in various credit quality grades (using S&P ratings). These grades are U.S. government, AAA, AA, A, BBB, BB, B, below B, and not available/not rated (NA/NR), where bonds listed as grades BB or below are noninvestment grade. Even though S&P classifies U.S. government bonds as AAA rated, Morningstar separates these funds from AAA-rated securities in the credit analysis to allow for a more accurate picture of a fund's holdings. Any government agency bonds such as those from Fannie Mae, Freddie Mac, Ginnie Mae, and other government agencies are included as government bonds by Morningstar. The bonds listed in the other rating categories—i.e., AAA, AA, A, BBB, BB, B, and below B—include not only corporate bonds but also mortgage- and asset-backed bonds.

The fact that the data are based on a survey raises several issues. First, the frequency and consistency of the data disclosure are not constant. Although most

of the bond funds report credit analysis data once or twice a year, a small minority report every quarter and an even smaller minority report only once every couple of years. Therefore, we do not have data for each quarter for every bond fund. Nevertheless, we are exhaustive in our use of the Morningstar data, using every unique data point that we can find in our sample range.

Second, there is no way to verify whether the information provided to Morningstar by the funds is accurate. Indeed, one might expect to find no window dressing behavior in this sample as the funds may report holdings information to Morningstar that only shows them in a positive light. As such, our use of these data should provide a conservative test of the existence of window dressing in our sample as reporting selection bias may be an issue.

### *Collection of the Data*

We focus on corporate bond funds as these represent most of the bond funds available on the Morningstar data disks. According to Morningstar (see *Morningstar Principia Plus Manual* 2001), corporate bond funds are those that “seek income by investing in fixed-income securities.” Funds with this objective may hold a variety of issues, including but not limited to government bonds, corporate bonds (both investment and junk grade), mortgage-backed bonds, asset-backed bonds, and bank loans. Hence, even though they are classified as corporate bond funds, these bond funds may hold a significant portion of their holdings in government bonds or in asset- or mortgage-backed securities. Also, note that although all corporate bond funds (as defined by Morningstar) can hold junk bonds, in practice they hold small percentages of these low-grade bonds.

Our objective in collecting the data was to include as many observation points as possible. However, because the credit analysis data are not consistently updated, we collected the data in the following manner. First, we used 13 quarterly Morningstar data disks (March 1998 to March 2001). For each disk we then selected all corporate bond funds. Morningstar subdivides this category into corporate-bond-general funds and corporate-bond-high-quality funds.<sup>4</sup> Then, for each fund from each disk we obtained the credit analysis information. This procedure produced just over 9,000 credit analysis data points.

We then narrowed our sample of credit analysis data points in the following five ways:

1. For each data disk, we eliminated all replicate credit analysis data points caused by multiple share classes. We did this to avoid counting a fund more than once per disk.

---

<sup>4</sup>Morningstar defines high-quality funds as those that invest at least 65% of their assets in securities rated A or better. General funds may hold a variety of debt securities with no specific thresholds for quality or yield.

2. We eliminated all credit analysis data points listed on earlier disks used in our sample selection process. For example, because many funds update their credit analysis data only once or twice a year, the same credit analysis data could appear on consecutive quarterly disks. To avoid counting the same data points more than once we eliminated these overlapping data points.
3. We eliminated any credit analysis data points that contained missing data.
4. We eliminated all credit analysis data points for funds that did not have a fiscal year-end provided by Morningstar.
5. We eliminated all credit analysis data points from index funds. Index funds are constrained in their holdings by the index and hence are not likely to engage in window dressing.

After these adjustments, the sample consisted of every unique nonindex, corporate bond credit analysis data point that existed on the March 1998 to March 2001 Morningstar disks that had fiscal year-end information. This procedure yielded 3,170 credit analysis data points.

#### *Disclosure/Nondisclosure Data Points*

The next step in the analysis was to define each of the 3,170 credit analysis data points as a disclosure or nondisclosure data point. Because the SEC requires funds to disclose their holdings on their fiscal year-end and then six months after that, a disclosure data point is one where the date of the credit analysis data coincides with one of these two dates. All other credit analysis data points are nondisclosure data points. For example, consider a fund with a credit analysis data point of December 31, 1998. If the fund had a fiscal year-end of December or June, that credit analysis data point would have been considered a disclosure data point. If the fund had any other fiscal year-end, the credit analysis data point would have been considered a nondisclosure data point.<sup>5</sup>

We found 804 disclosure data points, which represent 25% of the sample. Because the disks provide quarterly updates of the credit quality analysis, all but 9 of the disclosure observations take place at the ends of March, June, September, and December, with the data points spread relatively evenly among the four quarters. More specifically, December had the most observations (259), followed by June (247), March (148), and September (141). For the nondisclosure data points there

---

<sup>5</sup>Rule 6-10(c)(1) under the Investment Company Act of 1940 requires that schedules of investments be filed in support of the balance sheet entries for those investments. Because all financial statements, including balance sheets, are filed semi-annually on a fiscal-year basis, so must the portfolio holdings be reported. In 2004 the SEC began requiring funds to report holdings on a quarterly basis.

were a total of 2,366 data points, where December again had the most (643), followed by March (567), June (524), September (524), and 108 data points that were not on the quarter-end.

### *Method*

We initially use a straightforward method to examine whether the quality of the bond holdings differed between disclosure and nondisclosure periods. For this portion of the analysis, we estimate the following equation:

$$\begin{aligned} \text{QualityHeld}_i = & \alpha_0 + \beta_1(\text{June})_i + \beta_2(\text{September})_i + \beta_3(\text{December})_i \\ & + \beta_4(\text{NonQuartend})_i + \beta_5(1997)_i + \beta_6(1998)_i + \beta_7(1999)_i \\ & + \beta_8(\text{GeneralStyle})_i + \beta_9(\text{Disclosure})_i + u_i, \end{aligned} \quad (1)$$

where

*QualityHeld*<sub>*i*</sub> = amount of bonds held in a bond quality category (expressed as a percentage of the entire fund's holdings);

*Disclosure* = a dummy variable that equals 1 if the credit analysis data point is a disclosure datapoint, and 0 if a nondisclosure data point;

*June, September, December* = dummy variables to control seasonal effects;

*1997, 1998, 1999* = dummy variables to control for annual effects;

*GeneralStyle* = a dummy variable to control for any style effects; and

*i* = 1 through *N*, where *N* is the total number of credit analysis data points in the sample.

The reference group for equation (1) consists of the March 2000 corporate high-quality, nondisclosure credit analysis data points.

For equation (1) we examine two sets of dependent variables. For the first set we use four broad measures of bond quality held by the fund: (1) the percentage of holdings in government bonds, (2) investment-grade corporate bonds (corporate bonds with AAA to BBB ratings), (3) non-investment-grade corporate bonds (corporate bonds with BB to Sub-B ratings), and (4) the percentage holdings in bonds that were listed as NA/NR. The second set of dependent variables are the nine measures of bond quality used by Morningstar (i.e., the percentage of holdings in government, AAA, AA, A, BBB, BB, B, Sub-B, and NA/NR bonds).

### *Results*

The results of equation (1) using the four broad dependent variables are presented in Table 1. Panel A shows the results for the full sample, Panel B presents the results for a sample of general bond funds, and Panel C shows the results for a sample of high-quality bond funds. Table 2 shows the results of equation (1) using the nine specific dependent variables for the three samples (full, general, and high quality).

Because all the independent variables are dummy variables, the interpretation of the coefficient values is the percentage of assets held in the specific bond rating category. For example, the coefficient for disclosure in the first column (percent of assets held in government bonds) of Table 1, Panel A is 3.51. This signifies that after controlling for time and style effects, the average bond fund in our sample held 3.51% more government bonds at disclosure than during nondisclosure periods.

The results in Tables 1 and 2 show, first and most important, that funds hold significantly more government bonds during disclosure than during nondisclosure. For the full sample (Table 1, Panel A) funds allocate 3.51% more to government bonds during disclosure periods than during nondisclosure periods. This result supports the notion that bond funds window dress their funds at disclosure by adding safe government bonds to their portfolios and dumping other types of bonds. Intuitively, we expect this shift toward higher quality holdings at disclosure to be stronger in high-quality bond funds, as these funds attempt to showcase portfolios consistent with their prospectuses. Consistent with this intuition, we find that the increase in government holdings is stronger for high-quality funds (4.99%) than for general funds (2.68%).

Second, the results indicate that investment-grade bonds are dumped by funds at disclosure. For the full sample (Table 1, Panel A), funds hold 4.02% less investment-grade bonds during disclosure. We again find that this effect is stronger in the high-quality fund group, as this group held 4.50% less investment-grade corporate bonds at disclosure compared to 3.69% for general bond funds. Table 2 shows that this movement out of investment-grade bonds is largely in the AAA class, as this is the only class of bonds that shows a negative and significant coefficient.<sup>6</sup>

Third, we find some evidence (albeit weak) that funds are holding more non-investment-grade bonds during disclosure. As shown on Table 1, Panel A, when using the non-investment-grade bond holdings as the dependent variable, the coefficient for disclosure is positive (although small) and significant at the 5% level. The result does not hold up in Panels B and C of Table 1, nor does it show

---

<sup>6</sup>Funds with corporate bond prospective objectives (whether high quality or general) may hold a variety of issues including government, corporate, mortgage-backed, and asset-backed bonds. The inclusion of mortgage- and asset-backed bonds explains why we find such high percentages of AAA-rated funds even though marketwide the number of pure AAA-rated corporate bonds is low (see Blume, Lim, and MacKinlay 1998 for more on this issue).

TABLE 1. Credit Quality of Bond Fund Holdings at Disclosure Using Broad Measures of Credit Quality.

Independent Variable	Dependent Variable			
	Percent of Assets Held in Government Bonds	Percent of Assets Held in Investment Grade Bonds (AAA–BBB)	Percent of Assets Held in Non-Investment Grade Bonds (BB–Sub B)	Percent of Assets Held in NA/NR Bonds
<b>Panel A. Full Sample</b>				
Intercept	34.10*** (23.42)	59.97*** (42.69)	2.30*** (4.82)	3.46*** (8.15)
June	-5.06*** (3.76)	4.59*** (3.53)	-0.001 (0.00)	0.49 (1.26)
September	-1.78 (1.28)	2.89** (2.15)	-0.816 (1.78)	-0.32 (0.80)
December	-4.14*** (3.00)	5.31*** (3.99)	-0.27 (0.61)	-0.87** (2.18)
Non-quarter-end	-7.54*** (2.92)	6.38** (2.56)	2.79*** (3.29)	-1.61** (2.14)
1997	4.98*** (2.87)	-4.89*** (2.92)	-0.96 (1.69)	0.98 (1.95)
1998	2.27 (1.81)	-1.75 (1.45)	0.22 (0.54)	-0.62 (1.69)
1999	-2.90** (2.22)	3.99*** (3.18)	0.25 (0.60)	-1.25*** (3.31)
General style	-6.74*** (7.08)	1.52 (1.66)	4.60*** (14.73)	0.64** (2.33)
Disclosure	3.51*** (3.29)	-4.02*** (3.91)	0.79** (2.26)	-0.24 (0.78)
<i>N</i>	3,170	3,170	3,170	3,170
Adj. <i>R</i> <sup>2</sup>	0.03	0.02	0.07	0.01
<b>Panel B. High-Quality Bond Funds Only</b>				
Intercept	26.62*** (16.50)	62.71*** (40.56)	6.65*** (10.25)	3.94*** (7.70)
June	-5.68*** (3.45)	4.47*** (2.83)	0.15 (0.23)	1.08** (2.06)
September	-1.55 (0.90)	2.70 (1.65)	-0.99 (1.45)	-0.13 (0.25)
December	-4.07** (2.40)	5.39*** (3.31)	-0.14 (0.21)	-1.18** (2.20)
Non-quarter-end	-10.32*** (3.42)	8.14*** (2.81)	3.43*** (2.83)	-1.23 (1.28)
1997	6.36*** (3.00)	-6.49*** (3.19)	-1.15 (1.35)	1.35** (2.00)
1998	3.85** (2.53)	-3.68** (2.53)	0.51 (0.84)	-0.63 (1.31)
1999	-1.45 (0.91)	2.48 (1.63)	0.50 (0.78)	-1.53*** (3.03)
General style	NA	NA	NA	NA
Disclosure	2.68** (2.10)	-3.69*** (3.02)	0.93 (1.82)	0.12 (0.29)
<i>N</i>	1,987	1,987	1,987	1,987
Adj. <i>R</i> <sup>2</sup>	0.02	0.02	0.01	0.01

(Continued)

TABLE 1. Continued.

Independent Variable	Dependent Variable			
	Percent of Assets Held in Government Bonds	Percent of Assets Held in Investment Grade Bonds (AAA–BBB)	Percent of Assets Held in Non-Investment Grade Bonds (BB–Sub B)	Percent of Assets Held in NA/NR Bonds
Panel C. High-Quality Bond Funds Only				
Intercept	35.62*** (15.34)	57.61*** (25.44)	2.75*** (6.76)	3.72*** (6.42)
June	-4.06 (1.75)	4.87** (2.16)	-0.27 (0.66)	-0.49 (0.86)
September	-2.37 (0.99)	3.46 (1.48)	-0.49 (1.18)	-0.68 (1.14)
December	-4.33 (1.84)	5.33** (2.32)	-0.54 (1.32)	-0.37 (0.63)
Non-quarter-end	-1.40 (0.28)	2.38 (0.50)	1.32 (1.53)	-2.26 (1.85)
1997	2.47 (0.82)	-2.04 (0.69)	-0.59 (1.13)	0.36 (0.48)
1998	-0.59 (0.27)	1.71 (0.80)	-0.26 (0.69)	-0.60 (1.09)
1999	-5.39** (2.39)	6.64*** (3.02)	-0.18 (0.45)	-0.82 (1.46)
General style	NA	NA	NA	NA
Disclosure	4.99*** (2.60)	-4.50** (2.41)	0.51 (1.52)	-0.94** (1.97)
<i>N</i>	1,183	1,183	1,183	1,183
Adj. <i>R</i> <sup>2</sup>	0.01	0.01	0.01	0.01

Note: Reported are results of equation (1) using four broad measures of bond quality held by the fund as dependent variables (percent of assets held in government bonds, investment-grade bonds, non-investment-grade bonds, and not available/not rated [NA/NR] bonds). All independent variables are dummy variables. *Disclosure* is a dummy variable for whether the observation occurred on a disclosure date (the fiscal year-end or half fiscal year-end) for the fund. The *t*-statistics are in parentheses.

\*\*\*Significant at the 1% level.

\*\*Significant at the 5% level.

up much in Table 2. Hence, the result might be an artifact of the large sample in Table 1, Panel A. Moreover, even if the result found in Table 1, Panel A holds, the magnitude of the effect is small (0.79) when compared with what happens to the holdings of government and investment-grade bonds at disclosure.

The results of Tables 1 and 2 strongly indicate that bond fund managers are altering their portfolios around disclosure dates. We find clear evidence that funds are holding more government bond funds during disclosure and significantly fewer investment grade bonds (particularly AAA-rated bonds). These results suggest that funds are replacing investment-grade bonds with government bonds at disclosure to increase perceived quality of holdings. We find this movement especially true for high-quality bond funds. Such results are consistent with intuition, as these

TABLE 2. Credit Quality of Bond Fund Holdings at Disclosure Using Specific Measures of Credit Quality.

Independent Variable	Dependent Variable									
	% of Assets Held in Govt. Bonds	% of Assets Held in AAA-Rated Bonds (Non-Govt. Bonds)	% of Assets Held in AA-Rated Bonds	% of Assets Held in A-Rated Bonds	% of Assets Held in BBB-Rated Bonds	% of Assets Held in BB-Rated Bonds	% of Assets Held in B-Rated Bonds	% of Assets Held in Sub-B-Rated Bonds	% of Assets Held in NA/NR Bonds	% of Assets Held in Bonds
Panel A. Full Sample										
Intercept	34.10*** (23.42)	23.85*** (18.66)	7.13*** (19.39)	19.26*** (28.22)	9.70*** (13.94)	1.50*** (4.87)	0.73*** (3.04)	0.07 (1.19)	3.46*** (8.15)	
June	-5.06*** (3.75)	3.18*** (2.69)	-0.02 (0.06)	0.78 (1.23)	0.65 (1.02)	-0.08 (0.28)	-0.02 (0.10)	0.10* (1.87)	0.49 (1.26)	
September	-1.78 (1.27)	2.31 (1.89)	-0.13 (0.39)	0.48 (0.73)	0.24 (0.36)	-0.48 (1.64)	-0.34 (1.48)	0.01 (0.16)	-0.32 (0.80)	
December	-4.14*** (3.00)	2.45** (2.02)	0.26 (0.76)	1.34** (2.07)	1.25 (1.90)	-0.10 (0.37)	-0.17 (0.75)	0.01 (0.01)	-0.87** (2.18)	
Non-quarter-end	-7.53*** (2.91)	-0.85 (0.37)	2.13*** (3.27)	2.05 (1.69)	3.05** (2.46)	1.43*** (2.61)	1.23*** (2.91)	0.12 (1.20)	-1.61** (2.14)	
1997	4.98*** (2.87)	-1.26 (0.82)	0.13 (0.30)	-1.30 (1.60)	-2.45*** (2.96)	-0.72** (1.97)	-0.20 (0.71)	-0.03 (0.47)	0.98 (1.95)	
1998	2.27 (1.81)	-1.02 (0.93)	0.26 (0.82)	-0.51 (0.87)	-0.47 (0.78)	0.28 (1.05)	-0.02 (0.14)	-0.03 (0.58)	-0.62 (1.69)	
1999	-2.90** (2.22)	2.49** (2.18)	1.00*** (3.04)	0.240 (0.39)	0.26 (0.41)	0.31 (1.14)	0.02 (0.09)	-0.07 (1.48)	-1.25*** (3.31)	
General style	-6.74*** (7.08)	-2.63*** (3.15)	-0.75*** (3.11)	-2.09*** (4.70)	7.00*** (15.40)	3.00*** (14.87)	1.41*** (9.00)	0.19*** (4.93)	0.64** (2.33)	
Disclosure	3.51*** (3.29)	-3.33*** (3.55)	-0.10 (0.38)	-0.17 (0.35)	-0.41 (0.80)	0.33 (2.00)	0.45** (1.91)	0.006 (0.13)	-0.24 (0.78)	
N	3,170	3,170	3,170	3,170	3,170	3,170	3,170	3,170	3,170	
Adj. R <sup>2</sup>	0.03	0.01	0.01	0.01	0.07	0.07	0.03	0.01	0.01	

(Continued)

TABLE 2. Continued.

Independent Variable	Dependent Variable									
	% of Assets Held in Govt. Bonds	% of Assets Held in AAA-Rated (Non-Govt. Bonds)	% of Assets Held in AA-Rated Bonds	% of Assets Held in A-Rated Bonds	% of Assets Held in BBB-Rated Bonds	% of Assets Held in BB-Rated Bonds	% of Assets Held in B-Rated Bonds	% of Assets Held in Sub-B-Rated Bonds	% of Assets Held in NA/NR Bonds	% of Assets Held in Bonds
Panel B. General Bond Funds Only										
Intercept	26.62*** (16.50)	22.57*** (15.74)	6.38*** (14.87)	17.60*** (23.60)	16.15*** (18.33)	4.30*** (10.39)	2.09*** (6.39)	0.26*** (3.19)	3.94*** (7.70)	
June	-5.68*** (3.45)	3.14** (2.15)	-0.08 (0.19)	0.77 (1.02)	0.63 (0.70)	-0.02 (0.06)	0.02 (0.06)	0.16 (1.931)	1.08** (2.06)	
September	-1.55 (0.90)	2.84 (1.87)	-0.16 (0.36)	0.41 (0.52)	-0.39 (0.42)	-0.65 (1.48)	-0.36 (1.04)	0.01 (0.13)	-0.13 (0.25)	
December	-4.07** (2.40)	1.48 (0.98)	0.22 (0.48)	1.73** (2.20)	1.95** (2.10)	0.02 (0.05)	-0.17 (0.51)	0.01 (0.12)	-1.18** (2.20)	
Non-quarter-end	-10.32*** (3.42)	-2.55 (0.95)	2.49*** (3.11)	4.78*** (3.43)	3.41** (2.07)	1.50 (1.94)	1.73*** (2.83)	0.19 (1.24)	-1.23 (1.287)	
1997	6.36*** (3.00)	-1.98 (1.05)	-0.09 (0.16)	-2.23** (2.27)	-2.18 (1.88)	-0.76 (1.40)	-0.32 (0.76)	-0.06 (0.61)	1.35** (2.00)	
1998	3.85** (2.53)	-2.64** (1.95)	0.30 (0.75)	-1.64** (2.34)	0.29 (0.35)	0.62 (1.59)	-0.04 (0.15)	-0.05 (0.72)	-0.63 (1.31)	
1999	-1.45 (0.91)	1.19 (0.84)	1.03** (2.45)	-0.32 (0.44)	0.57 (0.66)	0.55 (1.36)	0.04 (0.14)	-0.10 (1.25)	-1.53*** (3.03)	
General style	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Disclosure	2.67** (2.10)	-3.58*** (3.16)	-0.02 (0.06)	-0.03 (0.06)	-0.04 (0.07)	0.45 (1.40)	0.46 (1.81)	0.01 (0.09)	0.12 (0.29)	
N	1,987	1,987	1,987	1,987	1,987	1,987	1,987	1,987	1,987	
Adj. R <sup>2</sup>	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	

(Continued)

TABLE 2. Continued.

Independent Variable	Dependent Variable								
	% of Assets Held in Govt. Bonds	% of Assets Held in AAA-Rated Bonds (Non-Govt. Bonds)	% of Assets Held in AA-Rated Bonds	% of Assets Held in A-Rated Bonds	% of Assets Held in BBB-Rated Bonds	% of Assets Held in BB-Rated Bonds	% of Assets Held in B-Rated Bonds	% of Assets Held in Sub-B-Rated Bonds	% of Assets Held in NA/NR Bonds
Panel C. High-Quality Bond Funds Only									
Intercept	35.62*** (15.34)	21.39*** (10.67)	7.14*** (3.18)	18.33*** (16.57)	10.73*** (12.92)	1.89*** (6.62)	0.79*** (4.12)	0.07 (1.53)	3.72*** (6.42)
June	-4.06 (1.75)	3.26 (1.63)	0.08 (0.15)	0.84 (0.76)	0.69 (0.83)	-0.18 (0.63)	-0.09 (0.48)	0.01 (0.08)	-0.49 (0.86)
September	-2.37 (0.99)	1.52 (0.74)	-0.08 (0.14)	0.75 (0.66)	1.26 (1.47)	-0.21 (0.74)	-0.29 (1.45)	0.01 (0.23)	-0.68 (1.14)
December	-4.33 (1.84)	4.19** (2.06)	0.33 (0.60)	0.78 (0.69)	0.02 (0.02)	-0.36 (1.26)	-0.16 (0.84)	-0.02 (0.33)	-0.37 (0.63)
Non-quarter-end	-1.40 (0.28)	2.99 (0.71)	1.27 (1.11)	-4.22 (1.81)	2.34 (1.34)	1.23** (2.05)	0.09 (0.24)	-0.01 (0.12)	-2.26 (1.85)
1997	2.47 (0.82)	-0.16 (0.06)	0.52 (0.74)	0.35 (0.24)	-2.75*** (2.56)	-0.63 (1.72)	0.01 (0.05)	0.03 (0.47)	0.36 (0.48)
1998	-0.59 (0.27)	1.78 (0.94)	0.19 (0.38)	1.56 (1.49)	-1.83** (2.33)	-0.30 (1.12)	0.01 (0.07)	0.02 (0.47)	-0.60 (1.09)
1999	-5.39** (2.39)	4.83** (2.48)	0.93 (1.77)	1.21 (1.13)	-0.34 (0.42)	-0.10 (0.38)	-0.03 (0.18)	-0.04 (0.96)	-0.82 (1.46)
General style	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disclosure	4.99*** (2.60)	-2.78* (1.68)	-0.26 (0.58)	-0.29 (0.32)	-1.16 (1.69)	0.41 (1.75)	0.09 (0.58)	0.01 (0.19)	-0.94** (1.97)
N	1,183	1,183	1,183	1,183	1,183	1,183	1,183	1,183	1,183
Adj. R <sup>2</sup>	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01

Note: Reported are results of equation (1) using nine specific measures of bond quality held by the fund as dependent variables (percent of assets held in government bonds, AAA-, AA-, A-, BBB-, BB-, B-, sub-B, and not available/not rated [NA/NR] bonds). All independent variables are dummy variables. *Disclosure* is a dummy variable for whether the observation occurred on a disclosure date (the fiscal year-end of half fiscal year-end) for the fund. The *t*-statistics are in parentheses.

\*\*\*Significant at the 1% level.  
 \*\*Significant at the 5% level.  
 \*Significant at the 10% level.

high-quality funds must live up to their name by showing that they hold significant percentages of high-quality bonds.

We offer two possible explanations for why most of the shifting in the portfolios is between government and other investment grade bonds and, in particular, between government and AAA-rated bonds. First, as explained in the data description and revealed in the results, corporate bond funds often hold almost all of their assets in government bonds or other investment-grade bonds and relatively small portions in non-investment-grade bonds (see Table 1, Panel A). Hence, the notion that they are 100% corporate bond funds is a misnomer. Coupling this institutional detail with the fact that government bonds are perceived to be safer by investors, it is not surprising that most of the shifting of the portfolio is between non-government investment-grade bonds and government bonds, and that relatively little shifting of the portfolio takes place within other bond grades. Second, it is well known that government bonds and other bonds rated AAA are traded much more frequently than lower rated corporate bond issues. As a result, the trading costs of these types of bonds are much lower than those of lower rated bonds. If investors view the percentage of government bond holdings as a measure of the risk of the fund, it makes sense for fund managers to alter their portfolios between government and AAA-rated bonds rather than between less cost efficient AA, A, BBB, etc. bonds.

#### *Credit Analysis Pairs Test*

As a robustness check, we examine whether window dressing is evident by tracing a specific fund's credit analysis data points over time. We find a fund's credit analysis on a disclosure date and then pair that data point with the fund's quarterly adjacent nondisclosure credit analysis data point. By having disclosure and nondisclosure data points that were just one quarter apart we can examine whether the results reported in Tables 1 and 2 hold as funds are examined over time.

As mentioned earlier, the portfolio credit quality holding data from Morningstar are not updated every quarter for every fund. Some funds update once a year and others update more or less frequently. In light of these data difficulties, we were forced to use a relatively complex method to acquire these data.

Specifically, for each Morningstar data disk from March 1998 to December 2000 (12 total disks) we collected corporate bond funds (both general and high quality) that had fiscal year-ends of March, June, September, and December (unlike the previous sample, which uses all funds regardless of the time of the fiscal year-end). Our rationale for choosing these funds is that Morningstar's portfolio composition surveys are conducted on a quarterly basis (March, June, September, and December). As a result, by selecting funds with these fiscal year-ends, we were more likely to have the composition data on disclosure dates and on nondisclosure dates. For other funds, the composition data would always occur on nondisclosure dates.

After narrowing the sample by selecting funds with these fiscal year-ends, we reduced the sample by excluding funds that were simply replicates of other funds in the sample (i.e., class B, C shares, etc.) and funds that did not have credit analysis data.

Finally, with the resulting sample of funds, we examined each fund to see if it survived to the next quarter by examining the next quarter's disk. For example, for the March 1998 sample we examined the June 1998 disk. We evaluated surviving funds to see whether the fund's credit analysis data had been updated for the next quarter. If we found that the credit analysis data had been updated, we combined the credit analysis data from the earlier disk and the credit analysis data from the later disk to form a "credit analysis pair." Because the credit analysis data are updated by Morningstar on a quarterly basis and because we examined funds with fiscal year-ends of March, June, September, and December, each credit analysis pair was composed of a fund's credit analysis data on a disclosure date and on an adjacent nondisclosure date.

The results of the tests are presented in Table 3. The table shows 12 samples where the disclosure data point precedes the nondisclosure data point and 12 samples where the disclosure data point follows the nondisclosure data point. The table also reports the average difference between the disclosure holdings and the nondisclosure holdings for each sample of credit analysis pairs. We use four quality categories: government, investment grade (AAA–BBB rated), non-investment-grade (BB–Below B), and unrated bonds (NA/NR). Because the nondisclosure percentage holdings are always subtracted from the disclosure percentage holdings, positive (negative) numbers always indicate that the percentage of bonds held was higher (lower) during the disclosure period than during the nondisclosure period.

Because of data unavailability, there are only a few credit analysis pairs for some of the 24 samples. Hence, it is difficult to identify many statistically significant findings in Table 3. However, the signs on the average differences provide limited support for the results reported in Tables 1 and 2. We find that in most of the 24 samples, more government and less investment-grade bonds are held at disclosure. We also find that most of the samples show that more non-investment-grade bonds were held at disclosure (although only one of these samples showed a significant difference).

Although Table 3 provides only limited support for our earlier results, it is particularly informative with regards to whether funds are altering their portfolio credit quality around disclosures (i.e., window dressing) or just shifting portfolio risk (Chevalier and Ellison 1997) to enhance the fund's standing at year-end to maximize assets under management. The results indicate that the changes in credit quality holdings are just as large between March and June as between September and December. Such a result supports the window dressing hypothesis as it shows portfolio shifting on disclosure dates throughout the year rather than just at the end

TABLE 3. Credit Analysis Pairs Analysis.

Disclosure Credit Analysis Date	Nondisclosure Credit Analysis Date	No. of Credit Analysis Pairs	Mean Change in Fund Holdings from the Disclosure to the Nondisclosure Dates				NA/NR
			Government Bonds	Investment-Grade Bonds (AAA-BBB)	Non-Investment-Grade Bonds (BB-Sub B)		
December 31, 1997	March 31, 1998	65	-0.75	0.87	-0.12	0.01	
March 31, 1998	June 30, 1998	34	5.80	-7.69**	0.47	1.42	
June 30, 1998	September 30, 1998	54	-1.36	0.95	0.55	-0.14	
September 30, 1998	December 31, 1998	36	3.94	-3.69	0.12	-0.37	
December 31, 1998	March 31, 1999	41	1.92	-2.78	-0.07	0.93	
March 31, 1999	June 30, 1999	50	3.87	-5.15**	0.21	1.07	
June 30, 1999	September 30, 1999	39	-1.66	1.19	0.30	0.16	
September 30, 1999	December 31, 1999	10	-3.12	4.99*	2.51	-4.38	
December 31, 1999	March 31, 2000	21	1.66	-0.99	-0.47**	-0.19	
March 31, 2000	June 30, 2000	6	2.09	-1.84	0.08	-0.33	
June 30, 2000	September 30, 2000	21	2.54	-4.34	0.23	1.59	
September 30, 2000	December 31, 2000	31	6.01**	-11.15***	3.01	2.11	
March 31, 1998	December 31, 1997	42	1.27	-2.02	0.44	0.31	
June 30, 1998	March 31, 1998	62	-4.75**	4.64**	0.94	-0.83	
September 30, 1998	June 30, 1998	41	2.12	-1.24	-0.42	-0.46	
December 31, 1998	September 30, 1998	39	-0.08	0.57	0.62	-1.11	
March 31, 1999	December 31, 1998	45	1.21	-2.89	0.10	1.58	
June 30, 1999	March 31, 1999	69	-7.18**	6.48**	0.51	0.18	
September 30, 1999	June 30, 1999	30	1.26	-2.36	-0.26	1.35	
December 31, 1999	September 30, 1999	19	2.05	-1.96	-0.11	0.03	
March 31, 2000	December 31, 1999	11	-0.04	1.97	0.25	-2.18	
June 30, 2000	March 31, 2000	16	-1.82	0.27	-0.77	2.34	
September 30, 2000	June 30, 2000	10	8.43	-3.08	0.22	-5.55***	
December 31, 2000	September 30, 2000	27	0.12	0.39	-0.72	0.20	
No. positive cases			15	10	16	14	
No. negative cases			9	14	8	10	

Note: In this table we use credit analysis pairs to examine any time effects. A credit analysis pair is created when a fund's credit analysis on a disclosure date is paired with the same fund's quarterly adjacent credit analysis on a nondisclosure date. For example, the first row shows that in 65 credit analysis pairs a fund reported its holdings on a disclosure date (December 31, 1997) and then reported its holdings one quarter later on a nondisclosure date (March 31, 1998). We examine the average difference in the percentage of fund holdings between the two dates (the disclosure date holdings minus the nondisclosure date holdings). Hence, a positive (negative) indicates the holdings were higher (lower) at the disclosure time than at the nondisclosure time. NA/NR = not available/not reported.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

of the year, as would be the case according to the Chevalier and Ellison (1997) hypothesis.

#### IV. Daily Return Analysis

A difficulty we face in attempting to uncover window dressing in the previous analysis is that only a subset of fund managers is like to practice window dressing. Therefore, the effects we seek to identify by analyzing average holdings across the sample of all bond funds are diluted. If only 1 in 10 fund managers is window dressing, the effect in our sample will be only one-tenth as strong as the actual rebalancing occurring in the single window-dressed portfolio.

In this section we examine the daily return patterns of funds to detect changes in the return-generating process consistent with window dressing. We perform this analysis on a fund-by-fund basis. Because we have many daily observations per fund, we can detect window dressing that may be occurring in only a few funds in the sample. We investigate the loadings funds have on components of a dual-index market model to determine whether funds have different loadings on index components around disclosure periods than at other times of the year. If managers tilt their portfolios toward safer debt instruments at disclosure, this should be manifested in greater sensitivity to government securities in the days around the disclosure date.

##### *Data Collection*

Data for the daily return analysis come from two sources: Morningstar and DialData. From the Morningstar Principia Pro Plus database of September 2001 we collect all mutual funds according to the following criteria. The funds must be categorized by Morningstar as corporate bond general or corporate bond high-quality funds (similar to section III). All funds must have at least six years worth of return history to allow more precise market model estimation. For multiple-share-class funds, we collect only the largest share class. This initial search yielded 303 funds. For each fund in the sample, we then collect daily net asset values (NAVs) and distribution data from DialData. The period over which daily data are collected is January 1, 1994, through September 2001. The originating source for these data is the NASD mutual fund quote service.

##### *Daily Return Calculation and Distributions*

Bond mutual funds adopt one of several methods for reporting NAVs and distributions. The most straightforward method, because it parallels the method for equity funds, adjusts the NAV down on the day of any distribution by the amount of the distribution. This method also intuitively matches how we expect stock prices to adjust at the ex-dividend date. However, most bond funds do not account for

distributions in this manner. Most bond funds treat income and capital gains distributions differently. Whereas capital gains distributions generally are accompanied by an equivalent reduction in NAV, income distributions are most often treated just as accrued interest is treated with bonds. The NAV of the fund is quoted without the accrued interest, but a fund redeemer is entitled to the NAV plus the accrued interest of the fund. When an income distribution is made, it has no effect on the NAV.

These different reporting conventions significantly complicate the calculation of daily fund returns on days where funds pay distributions. The correct treatment of distributions requires knowledge of a fund's accounting method and, in many cases, the percentage of the distribution that is income versus capital gains. We have neither in our data set. For this reason, we eliminate all days on which a distribution is paid on the funds in our sample.

The lack of information on accrued interest means that technically we cannot calculate total daily returns. The actual total daily return would include changes in the NAV of the fund plus any interest that accrues on that day. We can, however, calculate a price return for each day. Price returns are thus calculated from these data as:

$$PRET_{i,t} = (NAV_{i,t} - NAV_{i,t-1})/NAV_{i,t-1}, \quad (2)$$

where

$$\begin{aligned} PRET_{i,t} &= \text{daily price return for fund } i \text{ on day } t, \text{ and} \\ NAV_{i,t} &= \text{net asset value of fund } i \text{ at close of day } t. \end{aligned}$$

Daily price returns are calculated for each fund on each day from January 1, 1994, through September 30, 2001. A fund that exists throughout the sample period has 83 months of return data. For 8 funds we were unable to find daily return data, reducing our sample of funds to 295. Approximately 30% of the funds in our sample report in June and December. The remaining 70% report on different schedules.

#### *Market Model Method and Results*

We relate the daily price returns of our sample of mutual funds to yield changes on government and corporate bonds. For the government bond sector we use the yield on 10-year Treasuries. For the corporate sector we use the Moody's Aaa yield.<sup>7</sup> The market model is:

$$Return_{i,t} = \alpha_i + \beta_{1i} * Y10_t + \beta_{2i} * Yaaa_t + \varepsilon_{i,t}, \quad (3)$$

---

<sup>7</sup>We find similar results to those reported when using Moody's Baa bond yields.

where

$Return_{i,t}$  = return to fund  $i$  on day  $t$ ,  
 $Y10_t$  = percentage change in the yield on 10-year Treasuries on day  $t$ ,  
 and  
 $Yaaa_t$  = percentage change in yield on Moody's aaa corporate bond index on day  $t$ .

The model does not appear to be well-specified for some funds in the sample, as indicated by low  $R^2$ 's in several of the individual fund regressions. Of the 295 bond funds, 135 have  $R^2$ 's greater than .80, 65 have  $R^2$ 's between .70 and .80, 24 have  $R^2$ 's between .60 and .70, the remaining 71 funds have  $R^2$ 's less than .60. For the next step in our analysis, we delete the 71 funds in the sample that do not exhibit an  $R^2$  of at least 60% for the market model.<sup>8</sup>

With the sample limited to funds for which our market model is well specified, we develop an augmented market model regression to detect differences in index factor loadings for funds around disclosure periods. The augmented market model is shown below:

$$Return_{i,t} = \alpha_i + \beta1_i * Y10_t + \beta2_i * Yaaa_t + \beta3_i * RPDum * Y10_t + \beta4_i * RPDum * Yaaa_t + \varepsilon_{i,t}, \quad (4)$$

where

$RPDum = 1$  if day  $t$  is within five days of the end of the fund's fiscal year-end or half year-end, 0 otherwise.

On most days,  $RPDum$  will be zero. On the 10 days immediately surrounding reporting periods,  $RPDum$  will be 1.<sup>9</sup> The interpretation of the interaction terms is that they represent the average incremental difference in loading on the indexes around reporting periods. Because the  $\beta1$  coefficient is negative, a negative and significant  $\beta3$  indicates heightened sensitivity to the yield changes in the government bond market at disclosure. This change would be accompanied by a positive and significant  $\beta4$ , indicating reduced exposure to the corporate bond market.

We estimate the model in equation (4) for each of the 224 funds in the sample that appear well specified by our dual-index market model. We undertake this

---

<sup>8</sup>We suspect that the low  $R^2$ 's are likely the result of errors in the data. We specify several screens to filter out erroneous returns and delete these observations from the sample before estimating the market models.

<sup>9</sup>In an alternative specification, we designated the six days surrounding the end of the month as the reporting period. Results were qualitatively the same as those presented.

**TABLE 4. Significance of Reporting-Period Interaction Coefficients for General-Quality Bond Funds.**

Alpha Level	Percentage of $\beta_3$ Negative and Significant	Percentage of $\beta_4$ Positive and Significant
Panel A. General-Quality Funds with $R^2$ on Market Model $> .60$ ( $N = 148$ )		
5%	7.4 <sup>###</sup>	5.4 <sup>#</sup>
1%	5.4 <sup>###</sup>	2.7 <sup>###</sup>
.1%	2.7 <sup>###</sup>	1.3 <sup>###</sup>
Panel B. General-Quality Funds with $R^2$ on Market Model $> .70$ ( $N = 133$ )		
5%	8.3 <sup>###</sup>	5.3
1%	6.0 <sup>###</sup>	2.3 <sup>#</sup>
.1%	3.0 <sup>###</sup>	0.8 <sup>##</sup>
Panel C. General-Quality Funds with $R^2$ on Market Model $> .80$ ( $N = 88$ )		
5%	8.0 <sup>###</sup>	5.7
1%	6.8 <sup>###</sup>	2.3 <sup>#</sup>
.1%	3.4 <sup>###</sup>	1.1 <sup>###</sup>

Note: Reported is the percentage of reporting-period interaction coefficients that are significant at various levels for a sample of general bond funds. Initially, the return series for each fund is employed in the two-factor market model in equation (3). For all funds that have an  $R^2$  greater than, successively, .60, .70, and .80, the model in equation (4) is estimated. The coefficients on the bond market interactive variables are collected and the percentage that is significant at three traditional levels is tabulated.

$$\text{Market model: } Return_{i,t} = \alpha_i + \beta_1 i * Y10_t + \beta_2 i * Yaaa_t + \varepsilon_{i,t} \quad (3)$$

$$\text{Extended market model: } Return_{i,t} = \alpha_i + \beta_1 i * Y10_t + \beta_2 i * Yaaa_t + \beta_3 i * RPDum * Y10_t + \beta_4 i * RPDum * Yaaa_t + \varepsilon_{i,t} \quad (4)$$

<sup>###</sup>The  $p$ -value on test of difference between percentage significant and (alpha level/2)  $< .001$ .

<sup>##</sup>The  $p$ -value on test of difference between percentage significant and (alpha level/2)  $< .005$ .

<sup>#</sup>The  $p$ -value on test of difference between percentage significant and (alpha level/2)  $< .01$ .

portion of the analysis separately for general- and high-quality funds. Tabulations of the numbers of funds with significant interaction coefficients and their signs are presented in Tables 4 (general-quality funds) and 5 (high-quality funds). Each table has three panels that subdivide the sample on the degree of fit of the market model.

First, consider the general funds in Table 4. Of the 148 funds, 7.4% (11 funds) have  $\beta_3$  coefficients that are negative and significantly different from zero at the 5% level, and 5.4% (8 funds) have  $\beta_4$  coefficients that are positive and significant at the 5% level. Statistically, we expect that in a sample of 148 funds, 2.5% (between 3 and 4 funds) would show negative and significant or positive and significant coefficients at the 5% level even in the absence of any true relation between the funds' returns and the interacted variable. We measure whether the percentage observed is statistically different from the alpha-level significance threshold by specifying a binomial probability test. The test measures the probability of observing a certain percentage of significant coefficients given that we expect the alpha-level percentage of funds to display a by-chance sensitivity to the

interacted variable. For example, for the  $\beta_3$  coefficient in the first row of Panel A, the binomial test measures the likelihood of observing a negative and significant coefficient for 7.4% of the sample under the null that 2.5% will display a negative and significant coefficient even in the absence of any true differential sensitivity to the government index around reporting periods.

All three panels of Table 4 show that at various alpha-level thresholds for identifying negative and significant  $\beta_3$  coefficients, the percentage of funds identified is highly statistically different from the alpha level. We conclude that the significant coefficients strongly suggest that some funds have reliably different sensitivities to the government bond index around reporting periods.

The results are almost as strong for the  $\beta_4$  coefficients, which signal altered exposure to corporate bonds around reporting periods. The number of coefficients that are positive and significant is greater than we would expect by chance for most alpha levels and  $R^2$  cut-offs.

A stronger test of window dressing is to document funds that have both  $\beta_3$  and  $\beta_4$  coefficients that are significant and of opposite signs. In every case of a negative and significant  $\beta_3$ , the  $\beta_4$  coefficient is of the opposite sign but not necessarily significant at traditional levels. Of the 148 funds in the general bond fund sample, 7 display negative and significant  $\beta_3$  coefficients and positive and significant  $\beta_4$  coefficients consistent with a quality-increasing strategy. If we assume that there is no altered sensitivity to these indexes around reporting periods, we would expect by chance to find both  $\beta_3$  and  $\beta_4$  coefficients significant at the 5% level in only  $(.05)^2 = .25\%$  of all funds. We find it in approximately 4.7% of funds.<sup>10</sup> Three of the 8 funds have reporting periods in June and December, two report in April and October, one each report in March and September, and February and August. These results suggest that specific reporting months are not driving the findings.

Table 5 presents the results for the sample of high-quality bond funds. As with the general funds, there is strong evidence that the numbers of significant  $\beta_3$  and  $\beta_4$  coefficients are not statistical artifacts. The results for altered government exposure are stronger than those for altered corporate exposure, especially at the lower .1% alpha level. The strong results for the government bond exposure increases are consistent with window dressing.

These daily return results are consistent with our earlier findings that indicate window dressing behavior rather than just portfolio risk shifting at the end of year. We find significant evidence that managers are altering portfolios during the 10 days surrounding disclosure dates, regardless of whether these disclosure dates are at the end of year or at other times. Such evidence suggests window dressing

---

<sup>10</sup>If we limit the sample to funds with market model  $R^2$  greater than .8, we find five funds (5.7%) with both coefficients significant.

**TABLE 5. Significance of Reporting-Period Interaction Coefficients for High-Quality Bond Funds.**

Alpha Level	Percentage of $\beta_3$ Negative and Significant	Percentage of $\beta_4$ Positive and Significant
Panel A. High-Quality Funds with $R^2$ on Market Model $> .60$ ( $N = 76$ )		
5%	14.5 <sup>###</sup>	9.2 <sup>###</sup>
1%	6.6 <sup>###</sup>	2.6 <sup>#</sup>
.1%	3.9 <sup>###</sup>	1.3 <sup>###</sup>
Panel B. High-Quality Funds with $R^2$ on Market Model $> .70$ ( $N = 67$ )		
5%	13.3 <sup>###</sup>	10.4 <sup>##</sup>
1%	7.5 <sup>###</sup>	3.0 <sup>##</sup>
.1%	4.5 <sup>###</sup>	1.5 <sup>###</sup>
Panel C. High-Quality Funds with $R^2$ on Market Model $> .80$ ( $N = 47$ )		
5%	12.8 <sup>###</sup>	10.6 <sup>###</sup>
1%	8.5 <sup>###</sup>	4.3 <sup>##</sup>
.1%	6.4 <sup>###</sup>	2.1 <sup>###</sup>

Note: Reported is the percentage of reporting-period interaction coefficients that are significant at various levels for a sample of high-quality bond funds. Initially, the return series for each fund is employed in the two-factor market model in equation (3). For all funds that have an  $R^2$  greater than, successively, .60, .70, and .80, the model in equation (4) is estimated. The coefficients on the bond market interactive variables are collected and the percentage that are significant at three traditional levels are tabulated.

$$\text{Market model: } Return_{i,t} = \alpha_i + \beta_1 i * Y10_t + \beta_2 i * Yaaa_t + \varepsilon_{i,t} \quad (3)$$

$$\text{Extended market model: } Return_{i,t} = \alpha_i + \beta_1 i * Y10_t + \beta_2 i * Yaaa_t + \beta_3 i * RPDum * Y10_t + \beta_4 i * RPDum * Yaaa_t + \varepsilon_{i,t} \quad (4)$$

<sup>###</sup>The  $p$ -value on test of difference between percentage significant and (alpha level/2)  $< .001$ .

<sup>##</sup>The  $p$ -value on test of difference between percentage significant and (alpha level/2)  $< .005$ .

<sup>#</sup>The  $p$ -value on test of difference between percentage significant and (alpha level/2)  $< .01$ .

but does not rule out that funds may also be pursuing portfolio risk shifting at the end of year.

## V. Conclusion

We present the first direct investigation of the degree to which window dressing behavior exists in bond mutual funds. Using two unique data sets, we find significant evidence of behavior consistent with window dressing. Specifically, after controlling for time and style effects, we find that bond funds hold significantly more government bonds at disclosure than at nondisclosure. Furthermore, we find that bond funds hold significantly fewer investment-grade bonds at disclosure than at nondisclosure. Similar to Musto (1997, 1999), we suspect that this behavior is an effort to increase the perceived quality of the holdings of the funds at disclosure. Finally, we find that these results are robust to the time of the disclosure, indicating

that our findings are not just a result of year-end portfolio risk shifting to maximize fund in-flows.

Our findings have regulatory implications. Investors in bond funds may bear implicit and explicit costs due to window dressing. However, from an enforcement perspective, there has been significant difficulty in identifying funds that are engaging in such activities. Our daily returns method in section IV suggests a mechanism for identifying funds with return patterns consistent with window dressing. Using daily returns and well-specified market models, regulators can screen the universe of funds to isolate a manageable sample of funds that appears most likely to be cosmetically managing their portfolios on the disclosure dates.

## References

- Blume, M., F. Lim, and A. C. MacKinlay, 1998, The declining credit quality of U.S. corporate debt: Myth or reality? *Journal of Finance* 53, 1389–1413.
- Carhart, M., R. Kaniel, D. Musto, and A. Reed, 2002, Leaning for the tape: Evidence of gaming behavior in equity mutual funds, *Journal of Finance* 57, 661–93.
- Chevalier, J. and G. Ellison, 1997, Risk taking by mutual funds as a response to incentives, *Journal of Political Economy* 105, 1167–1200.
- Lakonishok, J., A. Schliefer, R. Thaler, and R. Vishny, 1991, Window dressing by pension fund managers, *American Economic Review Papers and Proceedings*, 227–31.
- Morningstar Principia Plus Manual*, 2001 Chicago, IL.
- Musto, D. K., 1997, Portfolio disclosures and year-end price shifts, *Journal of Finance* 52, 1563–88.
- Musto, D. K., 1999, Investment decisions depend on portfolio disclosures, *Journal of Finance* 54, 935–52.