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## What Does a Mutual Fund's Average Credit Quality Tell Investors?

by

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Bond mutual funds frequently report an “Average Credit Quality” statistic in their marketing materials. This statistic is based on Standard & Poor's and Moody's assessment of the credit risk of the individual bonds in the portfolio and is reported to mutual fund investors using the familiar letter scale for rating the credit risk of bonds. For example, a mutual fund might report that it has an Average Credit Quality of “A” or perhaps more finely as “A-”.

The Average Credit Quality statistic as typically calculated by the mutual fund companies and by Morningstar significantly overstates mutual funds' true credit quality. Given how this statistic is calculated, portfolio managers can easily manipulate their holdings to significantly increase their credit risk and thereby their yield without increasing their *reported* credit risk. Since bond fund managers compete for investors based on yield and risk, fund managers who report Average Credit Quality have the ability and the incentive to increase but underreport the credit risk in their bond mutual fund portfolios.

In this note, we explain the conceptual flaw in the way Average Credit Quality statistics are calculated and provide simple examples of its systematic understatement in credit risk. We also provide anecdotal evidence that mutual fund companies in fact adapt their behavior to mislead investors about credit risk.

### Introduction

Bond and bond mutual fund investors are exposed to credit risk because there is uncertainty over bond issuers' ability to make promised principal and interest payments. For example, the market value of a 20-year, 8% coupon Exxon-Mobil bond will reflect an estimate of the probability that Exxon-Mobil might not make all the \$40 semi-annual coupon payments and repay the bond's \$1,000 face value at maturity. The market value of the Exxon-Mobil bond will fluctuate because of changing views of Exxon-Mobil's

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creditworthiness, separate and apart from fluctuations due to changes in the general level of interest rates or the required compensation for any particular level of creditworthiness.

Investors rely on credit rating companies – particularly Standard & Poor’s, Moody’s and Fitch – to assess, report and monitor the credit risk of bond issuers. These companies use a simple alphanumeric scale from AAA, Aaa or A11 down through D to reflect varying degrees of credit risk. The credit ratings reflect the relative probability that an issuer will default on a bond’s promised payments or the relative expected loss investors might suffer as a result of default.<sup>2</sup>

Standard & Poor’s and Moody’s publish studies of the default and post-default experience of bonds to which they had assigned credit ratings. This published research provides feedback the ratings companies use to improve the accuracy with which their ratings in fact predict relative credit risk. The companies’ studies also inform investors and their advisors directly and indirectly through the business press of the relative risk of investing in bonds of differing credit qualities. Thus, investors and their advisors are led to believe that two identically rated bonds or bond portfolios have the same probability of default or expected loss due to credit risk when in fact the bond portfolios may have 10 or 15 times as much credit risk as individual bonds with the same credit rating.

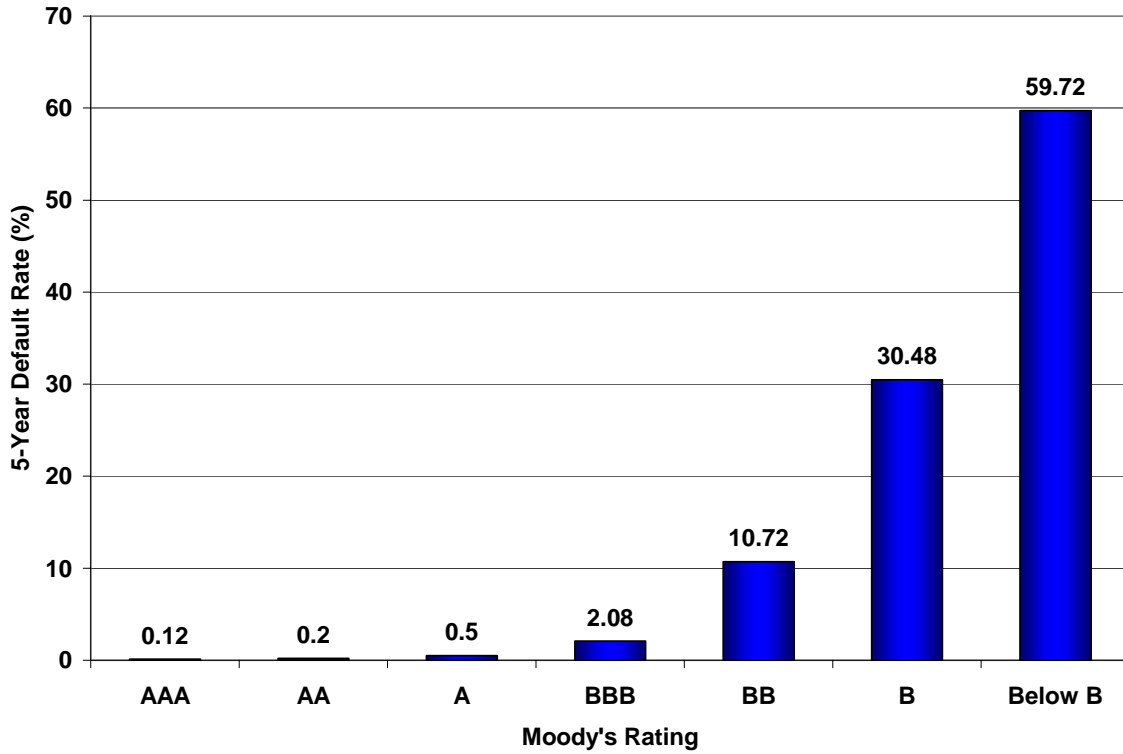
Figure 1 plots historical 5-year cumulative default rates for bonds of varying whole letter grade ratings assigned by Moody’s. Figure 2 plots the 1-, 3- and 5-year default rates for more finely divided credit ratings assigned by Standard and Poor’s.<sup>3</sup> Both Figures illustrate a ubiquitous feature of the credit rating companies’ scales; credit risk increases at an increasing rate as we move down through the scale.

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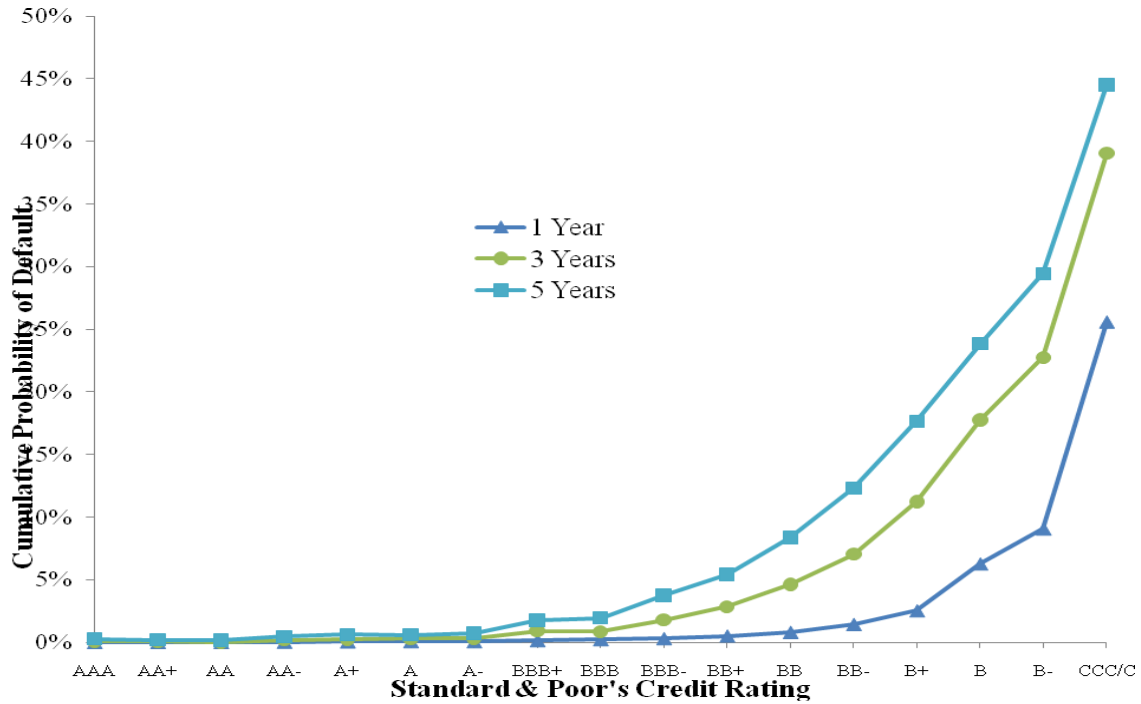
<sup>2</sup> Standard and Poor’s, Moody’s and Fitch are Nationally Recognized Statistical Ratings Organizations (“NRSROs”). We don’t address herein whether the credit ratings assigned by the NRSROs to individual securities are accurate, unbiased or comparable across security types. See for example, Richard Tomlinson and David Evans, “The Ratings Charade: Subprime mortgages have swept into the booming collateralized debt obligation market, often in CDOs awarded the highest grades by Standard & Poor’s, Moody’s and Fitch” *Bloomberg Markets* July 2007. We only address how the linear scoring system used by mutual fund companies and Morningstar significantly and systematically overstates the true credit quality of bond mutual funds.

<sup>3</sup> “Default and Recovery Rates of Corporate Bond Issuers, 1920-2004” *Moody’s Investor Services* January 2005 and “Default, Transition and Recovery: 2007 Annual Global Corporate Default Study and Rating Transitions” *Standard and Poor’s RatingsDirect* February 5, 2008.

**Figure 1: Cumulative 5-year Default Rates by Moody's Whole Letter Rating: 1970 – 2004.**



**Figure 2: 1981-2007 Cumulative Average Default Rates by Initial Rating.** The likelihood an issuer will default increases at an increasing rate as S&P's initial bond rating declines.



### **Average Credit Quality**

Although not a required disclosure, many bond mutual funds report the Average Credit Quality or Average Credit Rating of their funds. This statistic frequently is reported in a summary table that includes Weighted-Average Coupon, Maturity and Yield to Maturity. While the reported Weighted-Average Coupon, Maturity and Yield to Maturity statistics are economically meaningful and comparable to individual bonds and across homogenous bond portfolios, the Average Credit Quality statistic as currently calculated is not.

For the Average Credit Quality statistic to be a useful measure of the credit risk in bond mutual funds' portfolios, it must reflect the aggregate credit risk of the individual securities held in the portfolios. That is, for an Average Credit Quality statistic to not mislead investors, a reported statistic of "AA", or "BBB", must convey the same credit risk as an individual bond or collection of bonds which the ratings companies have rated "AA", or "BBB". Unfortunately, investors are not told that mutual funds that claim an "AA" Average Credit Quality for their portfolio might have the credit risk of a portfolio of BBB-rated bonds.

As we can see in Figures 1 and 2, credit risk increases quite dramatically at an increasing (not constant) rate. All the calculations of Average Credit Quality we have reviewed assume that credit risk increases at a constant rate as we move down through the ratings companies' classification scale. Effectively the mutual fund companies assign a score - 1 through N - where N is the number of ratings categories.<sup>4</sup> The funds then weight these assigned scores by the amount of the portfolio in each category and determine a weighted average score. The credit rating from the category with the score closest to this weighted average score is then reported as the Average Credit Quality.

Consider for example, the Putnam Income Fund. It is a taxable intermediate term bond fund and as of September 2009, had \$1.1B in net assets. The fund is sold in 6 share

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<sup>4</sup> Further, most funds assign the same risk score to all holdings rated below some cutoff, BB for instance, despite the fact that CCC/C rated bonds contain more than five times as much credit risk as BB rated bonds. In addition, some funds exclude non-rated ("NR") bonds from the calculation of Average Credit Quality. This exclusion has the effect of assigning all non-rated bonds in a portfolio the average rating of the rated bonds in the portfolio. These practices, in addition to the linear scoring system, yield portfolio credit risk statistics which dramatically understate credit risk.

classes with differing load and annual expense structures. Putnam claims an Average Credit Quality of AA for the fund. The top panel of Table 1 lists the portfolio quality breakdown detailed in the latest fund fact sheet. Two thirds of the fund's holdings are rated AAA. The remaining one-third is spread among lower rating categories. Putnam claims an Average Credit Quality of AA for the fund.

Although Putnam does not disclose how it calculates Average Credit Quality, we show in Table 1a) that linear mapping of credit quality categories reproduces Putnam's claimed AA quality. We have assigned AAA securities a 1, and simply increased the assignment by 1 for each subsequent rating category. Any linear scheme will reproduce the claimed Average Credit Quality of AA.

Morningstar calculates an Average Credit Quality statistic for bond mutual funds using a linear scale very similar to the scale in Table 1a). Morningstar assigns a "2" to AAA-rated holdings and increases the assigned score by 1 with each whole letter grade lower credit rating. It then categorizes funds as High Quality, Medium Quality or Low Quality in its Fixed Income Style Box<sup>TM</sup> according to the weighted average score.<sup>5</sup>

**Table 1:** Putnam Income Fund self-reports an "AA" Average Credit Quality. Morningstar also reports an Average Credit Quality of AA. Putnam Income Fund actually exposes investor to more credit risk than found in BBB rated bonds. Data as of September 9, 2009.

| Rating Category                       | AAA   | AA              | A     | BBB   | BB              | B      | Below B | Unrated |
|---------------------------------------|-------|-----------------|-------|-------|-----------------|--------|---------|---------|
| Fund Holdings                         | 66.5% | 3.7%            | 9.4%  | 11.3% | 1.8%            | 3.3%   | 4.0%    |         |
| <b>a) Putnam Reported Credit Risk</b> |       |                 |       |       |                 |        |         |         |
| Linear Scoring                        | 1     | 2               | 3     | 4     | 5               | 6      | 7       |         |
| Weighted Average                      |       | <u>2.04: AA</u> |       |       |                 |        |         |         |
| <b>b) Morningstar Reporting</b>       |       |                 |       |       |                 |        |         |         |
| Morningstar Scoring                   | 2     | 3               | 4     | 5     | 6               | 7      | 8       |         |
| Weighted Average                      |       | <u>3.04: AA</u> |       |       |                 |        |         |         |
| <b>c) Correct Credit Risk</b>         |       |                 |       |       |                 |        |         |         |
| Moody's 5-Year Default Risk           | 0.12% | 0.20%           | 0.50% | 2.08% | 10.72%          | 30.48% | 59.72%  |         |
| Correct Credit Risk                   |       |                 |       |       | 3.96: BB to BBB |        |         |         |

Putnam's reported AA Average Credit Quality implies that the Income Fund's probability of default or expected loss due to credit risk is equivalent to a portfolio of AA-rated bonds. According to Moody's the cumulative 5-year default rate of AA-rated securities was 0.20%. Table 1c) calculates the weighted average default in the Putnam

<sup>5</sup> See Morningstar Fixed Income Style Box<sup>TM</sup> Methodology, Morningstar Methodology Paper, October 31, 2008.

Income Fund portfolio by weighting Moody’s cumulative 5-year default rates by the amount invested by Putnam in each rating category. The weighted average 5-year default rate for the Putnam Income Fund is 3.96%. This level of credit risk corresponds to securities rated between BBB and BB, more than 2 whole rating categories below the Average Credit Quality Putnam reported for the Income Fund.<sup>6</sup> Investors reviewing Putnam’s fact sheet or reviewing a Morningstar report for this “AA” fund would have no way of knowing that the credit risk of the Putnam Income Fund is 20 times as great as a portfolio of AA- rated bonds.

The linear scale used by Morningstar and the mutual fund companies significantly understates the credit risk in bond fund portfolios because it assumes that lower rated bonds are not nearly as risky as they actually are relative to higher rated bonds. According to Moody’s for example, a BB-rated bond was 89.3 times more likely to default over a 5-year period than an AAA-rated bond but Morningstar’s linear scale assumes that a BB-rated bond is only three times as risky as an AAA-rated bond. *See* Table 2. Morningstar’s scoring system assumes that the BB rated bond is only three times as risky as an AAA rated bond despite the fact it is almost 90 times as risky.

**Table 2:** Linear scaling used by mutual fund companies and Morningstar significantly understates the credit risk of low rated bonds relative to higher rated bonds.

**a) Relative credit risk across category according to Morningstar.**

|     | AAA | AA  | A   | BBB | BB  | B   | Below B |
|-----|-----|-----|-----|-----|-----|-----|---------|
| AAA | 1   | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0     |
| AA  |     | 1   | 1.3 | 1.7 | 2.0 | 2.3 | 2.7     |
| A   |     |     | 1   | 1.3 | 1.5 | 1.8 | 2.0     |
| BBB |     |     |     | 1   | 1.2 | 1.4 | 1.6     |
| BB  |     |     |     |     | 1   | 1.2 | 1.3     |
| B   |     |     |     |     |     | 1   | 1.1     |

**b) Relative credit risk across category according to ratings companies.**

|     | AAA | AA  | A   | BBB  | BB   | B     | Below B |
|-----|-----|-----|-----|------|------|-------|---------|
| AAA | 1   | 1.7 | 4.2 | 17.3 | 89.3 | 254.0 | 497.7   |
| AA  |     | 1   | 2.5 | 10.4 | 53.6 | 152.4 | 298.6   |
| A   |     |     | 1   | 4.2  | 21.4 | 61.0  | 119.4   |
| BBB |     |     |     | 1    | 5.2  | 14.7  | 28.7    |
| BB  |     |     |     |      | 1    | 2.8   | 5.6     |
| B   |     |     |     |      |      | 1     | 2.0     |
|     | AAA | AA  | A   | BBB  | BB   | B     | Below B |

<sup>6</sup> We show this example using 5-year default rates. The result is qualitatively similar if we use 3-year default rates.

As a result of using a linear scale to determine Average Credit Quality when credit risk is in fact increasing at an increasing rate, Morningstar and the fund companies report an Average Credit Quality for the majority of funds that is at least one whole letter credit rating higher than the rating that would accurately convey the credit risk in the mutual funds' portfolios. For many funds, the reported Average Credit Quality is an astounding two whole letter grades higher than the portfolios' credit risk warrants.

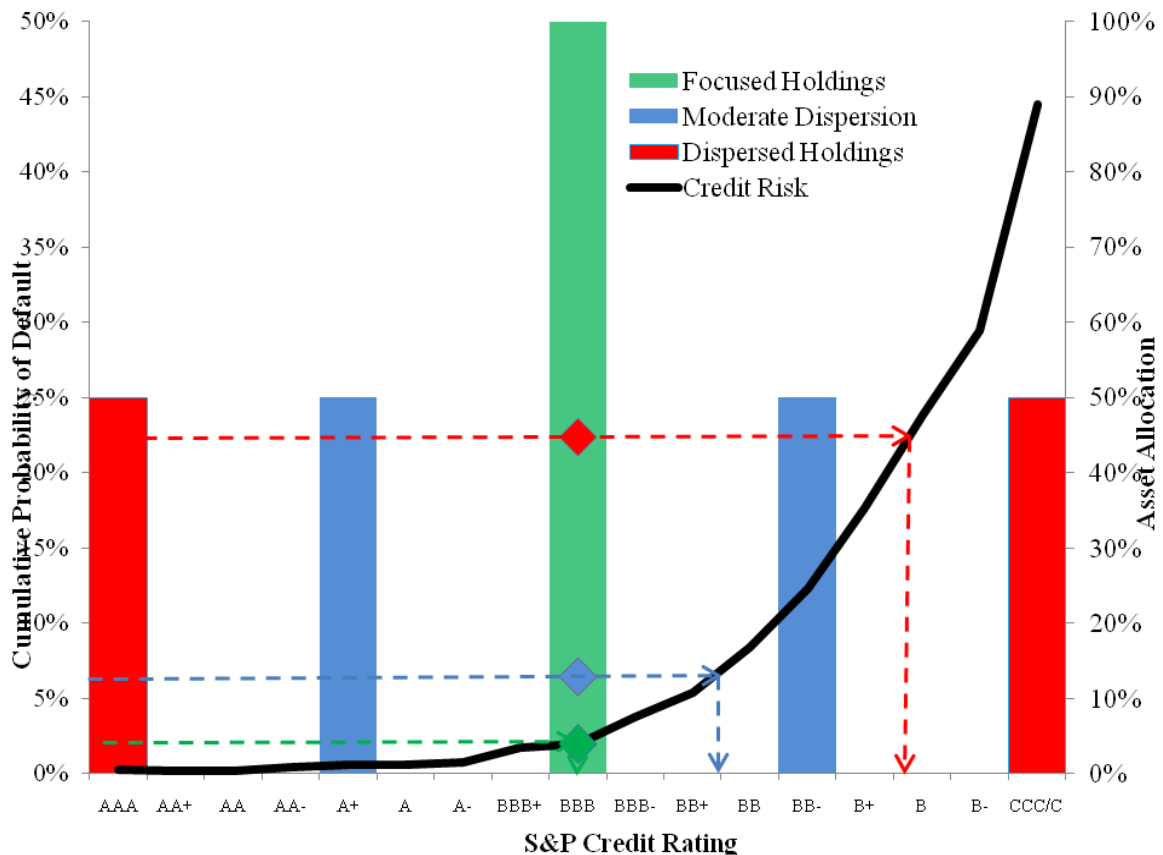
Consider a simple bond portfolio consisting of 50% AAA rated bonds and 50% below B rated bonds. Based on Moody's data illustrated in Figure 1, this portfolio has an average 5-year cumulative default probability of 30%.<sup>7</sup> A "B" credit rating is warranted for such a portfolio, since historically b-rated bonds have had a 30% 5-year cumulative default rate. However, the linear scale used by some mutual fund companies and by Morningstar yields an Average Credit Quality of BBB since that rating is exactly midway between AAA and Below B and the portfolio contains equal amounts of AAA-rated and Below B-rated securities. In this example, the actual credit risk is 15 times greater than would be conveyed to investors via Average Credit Quality calculated by the mutual fund companies and Morningstar.

Figure 3 illustrates that, perversely, "diversification" across credit quality increases credit risk, and the Average Credit Quality statistic allows mutual funds to hide this increased credit risk from investors. The first fund has focused holdings; all the bonds are BBB-rated. The second fund has moderately dispersed holdings, 50% in A+ rated bonds and 50% in BB- rated bonds. The third fund has dispersed holdings, 50% in AAA rated bonds and 50% in CCC/C rated bonds. Under the linear scoring systems used by the mutual fund companies and Morningstar, all three funds would report BBB Average Credit Quality.

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<sup>7</sup>  $0.5 \times 0.1\% + 0.5 \times 59.7\% = 29.9\%$ .

Figure 3: More dispersed bond portfolios have higher risk for any given “Average Credit Quality”. These three portfolios all have a BBB “Average Credit Quality” but the portfolio with dispersed holdings has 12 times as much credit risk and the moderately dispersed portfolio has 4 times as much credit risk as the focused portfolio.



The focused mutual fund’s portfolio has a 5-year cumulative default risk of 2.2% - the same as a portfolio of BBB-rated bonds. The moderately dispersed mutual fund has a 5-year cumulative default risk of 8.6% - the same as a portfolio of BB-rated bonds and four times the risk of a portfolio of BBB- rated bonds. The most dispersed fund has a 5-year cumulative default risk of 27.1% - the same as a portfolio of B-rated bonds and twelve times the risk of a portfolio of BBB- rated bonds.

The three funds in Figure 3 illustrate the systematic understatement of credit risk in bond mutual funds. Imagine that each fund in Figure 3 holds bonds worth \$100 million. The \$300 million in bonds would have a 5-year cumulative default rate of 10.27%. All three funds report a BBB Average Credit Quality which has a 1.95% 5-year cumulative default probability. Thus, by sleight of hand, mutual funds that report Average Credit Quality disclose less credit risk in the aggregate than the aggregate of the

credit risk in the securities they hold. This could only occur in Lake Woebegone where each is better than the average.

Of course, this example also illustrates how mutual funds could just as easily report an accurate Average Credit Quality as report a statistic that significantly understates credit risk. Morningstar and the mutual fund companies could report the Standard and Poor's or Moody's letter grade that most closely corresponds to the fund's portfolio's weighted average probability of default or weighted average expected loss. This would lead the focused fund in Figure 3 to report "BBB", the moderately dispersed portfolio to report "BB" and the dispersed fund to report "B". These Average Credit Quality statistics would correspond to the credit risk of the bonds originally rated by Standard and Poor's.

### **Implications**

The mutual funds' under-reporting of credit risk via the Average Credit Quality statistic has many statistical and behavioral implications which we leave for further research.

#### **Statistical Implications**

1. Mutual funds with the same reported Average Credit Quality can have dramatically different amount of credit risk. We find a large fraction of mutual funds' reported Average Credit Quality overstate their credit quality by 2 whole letter grades. As a corollary, mutual funds with any given reported Average Credit Quality may have significantly more credit risk than funds with higher reported Average Credit Quality.
2. Funds with more dispersed holdings will have higher yields than funds of the same reported Average Credit Quality that have more focused holdings. These more dispersed funds will have higher yields because they have additional, undisclosed credit risk. We find that within reported Average Credit Quality ratings funds with more disperse holdings and therefore lower correctly calculated credit qualities have higher yields.
3. Small reductions in reported Average Credit Quality can mask dramatic increases in credit risk.

#### **Behavioral Implications**

1. Funds that voluntarily report an Average Credit Quality statistic will hold a more dispersed portfolio than funds that do not.

2. Funds that report an Average Credit Quality statistic will focus their holdings within a letter category in the highest risk third of the distribution of bonds within that whole letter grade.
3. Funds that previously had not reported a statistic but which start reporting one will disperse their portfolio over time exposing investors to more credit risk without disclosing this additional risk.
4. Morningstar's 4-Star and 5-Star rated bond funds will tend to be funds with the most undisclosed credit risk within their categories.
5. The understatement of credit risk in bond mutual funds will increase the demand for low rated bonds relative to high rated bonds. This will lower the compensation investors receive for bearing additional credit risk.

### **Conclusion**

Mutual fund companies report a statistic that can understate the credit risk in most bond mutual fund portfolios. Morningstar calculates essentially the same statistic, essentially the same way. As a result of the dissemination of this misinformation bond mutual investors may be led to take on more credit risk than they would otherwise take and to receive less compensation for any given level of credit risk.