

## **1. Introduction**

Municipal bonds are debt obligation issued by municipalities in order to obtain funds which are mainly used for expenditure on long terms capital investment projects or to cover fiscal shortfalls. Given that in the United States the federal government does not want to diminish the market value of municipal bonds, it does not tax interest paid to municipal bond holders (Tomes, 1990). This exemption from federal taxation allows states and other municipal governments to acquire funding at lower cost than would otherwise be the case. In addition, the exemption makes these bonds attractive to potential buyers who happen to be in high income tax brackets (See Miller 1977).

This exemption does not extent to state and local taxation, therefore income from these municipal bonds can still be taxed depending on the bondholder's state of residency. As with most bonds, a mutual fund industry has arisen that offers diversification among municipal bonds. Because of the possibility of state and local taxation many municipal bond mutual funds invest only in bonds issued within a given state (most state exempt interest the bonds they issue). This allows the investor to benefit from diversification on municipal bonds issued from that state and at the same time manage his or her tax liabilities.

In addition to the exemption offered on interest paid by bonds issued within the 50 United States Congress has also extended this exemption to US Protectorates, which include Puerto Rico, Guam, and the US Virgin Islands. Although there is some question as to whether states can tax interest income from these US Protectorates, historically the vast majority of states have not taxed this income (Tomes 1990). This double exemption has made bonds issued by these US Protectorates very attractive to investors. Unlike the majority of municipal bonds which are only exempt from local income taxes for residents of a given state, these bonds are exempt for the

majority of investors in the 50 United States as well as the US Protectorates which issue them. It would seem that these characteristics would encourage mutual fund companies to create funds that specialize in these bonds. However, the relative size of the economies and the fiscal capacity of these US Protectorates limit the quantity of these bonds that are issued. It is likely that this is the reason that the amount of mutual funds specializing in these bonds is very limited. Of these US Protectorates, Puerto Rico has the largest economy and issues the largest quantity of municipal bonds.

This paper attempts to analyze how municipal bond funds from US Protectorates perform relative to other funds. One bond fund from the CRSP Survivorship Bias Free Mutual Fund database has been identified as continuously having invested mainly in municipal bonds from US Protectorates since 1982. There are a handful of other funds who have specialized in these municipal bonds for a time period, it is however difficult to tell if and when these funds have focused on other types of investments. Therefore this paper will focus on the one fund clearly identified as investing in municipal from Puerto Rico and to a far lesser extent other US Protectorates such as Guam.

The remainder of this paper is organized as follows. Section 2 provides background and a literature review. Section 3 describes the data. Section 4 discusses the empirical methodology. Section 5 presents empirical results comparing this municipal bond to other municipal bond funds. Finally, Section 6 summarizes the findings and concludes the paper.

## **2. Background and Review of Literature**

Miller (1977) shows that one minus the after tax rate will equate taxable and non-taxable bonds. Therefore municipalities whose bonds are exempt from federal taxation within the United States can issue these bonds at a lower interest rate. Empirically municipal bonds pay a higher interest

rate than Miller's model predicts, however they still have advantages over corporate bonds of similar risk in term of the yields they must pay investors (Chalmer 1998). This difference in what Miller's model predicts and what municipal bonds yield is known as the muni puzzle. Some have proposed that it is the differences in default rates between municipal bond and corporate bonds that explain the difference (Trzcinka (1982) and Stock (1994)). Others argue that default risk cannot explain all of the difference (Chalmer (1998) and Wang et. al. (2008)). Wang et. al. (2008) find that liquidity along with default risk helps to explain the muni puzzle. The important factor for this paper is that municipal bonds are able to pay a lower interest rate than taxable bonds. In addition, Miller's (1977) model would predict that bonds from US Protectorates would pay an even lower interest rate than other municipal bonds.

As stated in the introduction the largest economy of US Protectorates is Puerto Rico. The US took possession of Puerto Rico right after the Spanish-American War. In 1917 the US Congress passed a legislative package creating a civil government for the territory of Puerto Rico. As part of that legislation the US Congress included a provision codified in title 48 of the United States Code, section 745, which provides:

All bonds issued by the Government of Puerto Rico, or by its authority, shall be exempt from taxation by the Government of the United States, or by the Government of Puerto Rico or of any political or municipal subdivision thereof, or by any State, Territory, or possession, or by any county, municipality, or other municipal subdivision of any State, Territory, or possession of the United States, or by the District of Columbia.

Although section 745 does not specifically state that interest is exempt from taxation, historically the vast majority of states have not taxed interest on bond issued by Puerto Rico nor does the federal government (Tomes, 1990). Tomes (1990) argues that both federal and local governments have the right to tax interest payments from obligation issued by Puerto Rico and

its municipalities. However as stated earlier the federal government and the vast majority of US states have not taxed these bonds.

### **3. Data**

Return data is taken from the CRSP Survivorship Bias Free Mutual Fund database. Only those non-index funds with an asset classification of municipal bonds “MB” under Lippers asset code are used in this study. For funds with multiple share classes, only one fund class is included in the sample since the management strategies are identical across the classes. The risk factors for excess return for the equity market are taken from Kenneth French’s web site<sup>1</sup>. A measure excess market return using a municipal bond index, as well as other risk factors are constructed from bond returns taken from the Federal Reserve Board’s H.15 Report.

### **4. Methodology**

Using data from all mutual funds identified as specializing in municipal bonds contained in the CRSP Survivorship Bias Free Mutual Fund database a multifactor regression is performed. The risk factors used are excess market return, a default factor and a yield spread factor. The measure for excess market return will be constructed with two market measures; first using the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) from Kenneth French’s web site, second with the return of the 20 years municipal bond index from the Federal Reserve Board’s H.15 Report. The one-month Treasury bill rate will then be subtract from these market measures to approximate the market excess return above the risk free rate. The measure for default risk is calculated by taking the return on bonds classified Baa minus those classified as Aaa by Moody’s Investors Service. The yield risk factor consists of the spread between returns for 10-year and 1-year treasury bonds.

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<sup>1</sup> [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

Using these risk factors as independent variables a regression will be run for each municipal bond mutual fund in the data set using the return of that fund as the independent variable as shown below.

$$ER_{i,t} = \alpha_i + \sum_{m=1}^n \beta_m F_{m,t}$$

Where:  $ER_{i,t}$  is the before tax excess return on fund i in period t.  
 $\alpha_i$  is the intercept for fund i  
 $F_{m,t}$  are market factors thought to be related to systematic risk.

Any fund with a non-zero alpha provides evidence of abnormal returns for that fund. A comparison will then be made between the fund that invests mainly in Puerto Rican municipal bonds and other municipal bond funds.

Torrez and Longobardi (2010) demonstrate that during certain short term periods equity mutual funds tend to outperform or underperform more so that the efficiency market hypothesis would predict if factors used in the literature are true measures of systematic risk. They use thirty-six month windows with the first window starting at the end of January of 1962 and ending in January of 1965. Each consecutive window drops one month from the start date and adds one month to the end date so the second window would start in February of 1962 and end in February of 1965. The final window starts in June of 2006 and ends in June of 2009. They find that in certain time periods an unusually high percentage of mutual fund manager tend to outperform the market as measured by positive and significant alphas and therefore seem to demonstrate stock picking ability. During other time periods a unusually percentage of fund managers tend to underperform the market. Given that these models attempt to measure market risk, there should not this type of discrepancy across time periods.

A similar analysis to Torrez and Longobardi (2010) will be performed to better compare how this fund that invests mainly in Puerto Rican municipal bonds performs relative to other

municipal bond funds across time. The same three factor model will be performed for each 36 month window from March 1984 to December 2010. Those periods in which an unusually high percentage of mutual fund managers either outperform or underperform the market will be identified and compared to the fund that invests mainly in Puerto Rican municipal bonds.

In order to guarantee a minimum of degrees of freedom each mutual fund must have at least 20 months of return data within that window. This does create survivorship bias within some windows however this is preferable to having regressions with insufficient observations.

After the alphas are estimated, the percentage of positive and statistically significant alphas ( $p < 0.1$ ) are calculated for each 36-month window. These percentages are then analyzed over time. The same is done for negative and significant alphas ( $p < 0.1$ ). Once the percentage of significantly positive and negative alphas are calculated for the majority of municipal bond funds, periods of an unusually high percentages of these significant alphas will be identified.

Next the rolling alphas for the mutual fund that invests mainly in Puerto Rican municipal bonds will be calculated. The periods with significant alphas for the Puerto Rican municipal bond fund will be compared to those periods with an unusual percentage of significant alphas for the body of municipal mutual funds. This will give an indication of whether the Puerto Rican bond fund performs well when other municipal bond funds also perform well. This will indicate whether the performance of this fund is a result of the underlying assets or simply market forces within the municipal bond market. The results are shown in the next section.

## **5. Results**

There is little evidence that this Puerto Rican municipal bond fund can outperform other municipal bond funds, however when one considers the extra tax advantages of this bond fund, the fact that there is no evidence of underperformance is a positive for investors in this fund.

The alpha for this fund using equity markets to calculate excess returns is -0.0015562, however

with a p-value of 0.5051552 it is not statistically different from zero. Table 1 has the results for all municipal bond funds in the CRSP database using value weighted equity market returns as the measure of excess returns. As can be seen the average alpha from all of these funds is similar to the alpha of the fund in question. There are however 635 municipal mutual bond funds that statistically underperform the market with an average alpha of -0.0033487. Only 67 funds statistically outperform the market with an alpha of 0.0185566. It is not surprising that so many municipal bond funds underperform the market using equity markets returns as a base, given the stock markets tendency to outperform all bond markets, not just municipal bond markets.

Table 1: Average intercept for the following equation $ER_{i,t} = \alpha_i + \sum_{m=1}^n \beta_m F_{m,t}$ . Where $F_{m,t}$ as the risk factors consisting of excess market return, default risk and yield spread risk. Excess market return is calculated using all value-weighted returns on all NYSE, AMEX, and NASDAQ stocks .			
	Average Alpha	Number of funds	Average Adjusted R-Squared
All funds	-0.0013208	2063	0.1411373
Funds with positive and significant alphas	0.0185566	67	0.1146027
Funds with negative and significant alphas	-0.0033487	635	0.3920031

Using the 20 year municipal bond index to calculate the measure of excess return produces an alpha which is now positive for the fund (0.0016809), however with a p-value of 0.7268701 it is far from statistically significant. Table 2 has the results for the all municipal bond funds in the CRSP database using the returns of a 20 year municipal bond market index to calculate excess returns. As can be seen the average alpha from all of these municipal bond funds is much larger than the alpha from the fund in question using the same measure of excess market return. There are however a 127 municipal mutual bond funds that statistically outperform the market with an average alpha of 0.0682959. Only 244 of these funds statistically underperform the market with

an alpha of -0.0018811. As expected municipal bond mutual funds fair much better using a municipal bond index.

Table 2: Average intercept for the following equation $ER_{i,t} = \alpha_i + \sum_{m=1}^n \beta_m F_{m,t}$ . Where $F_{m,t}$ as the risk factors consisting of excess market return, default risk and yield spread risk. Excess market return is calculated using the municipal fund index for municipal bonds with 20 years to maturity from the Federal Reserve Board's H.15 Report.			
	Average Alpha	Number of funds	Average Adjusted R-Squared
All funds	0.0073917	2063	0.1419741
Funds with positive and significant alphas	0.0682959	127	0.2923611
Funds with negative and significant alphas	-0.0018811	244	0.6596335

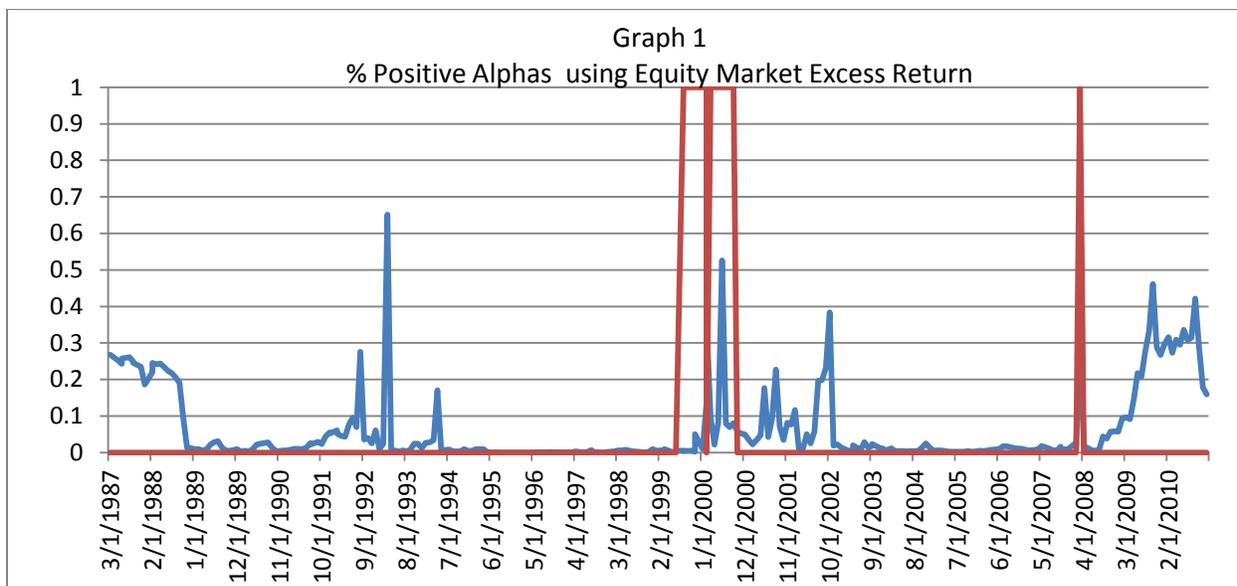
Given that so few municipal bond funds outperform the market over this time period, it is not surprising that a fund with added tax advantages would not outperform the market.

Some have suggested that equity mutual funds should be evaluated over a shorter time period (Busse & Bollen (2005) and Heaney et al (2007)). Torrez and Longobardi (2010) use rolling regressions with 36 month windows to evaluate the performance of equity mutual fund managers. Using the same three factor model used in the analysis above, 36 month windows are selected with the first window starting in March of 1984 and ending in March of 1987. Each consecutive window drops one month from the start date and adds one month to the end date so the second window would start in April of 1984 and ends in April of 1987. The final window starts in December of 2007 and ends in December of 2010. This results in a total of 286 rolling regression windows. For each 36-month window a separate regressions is estimated for each mutual fund. In order to guarantee a minimum of degrees of freedom each mutual fund must have at least 20 months of return data within that window. This does create survivorship bias

within some windows however this is preferable to having regressions with insufficient observations.

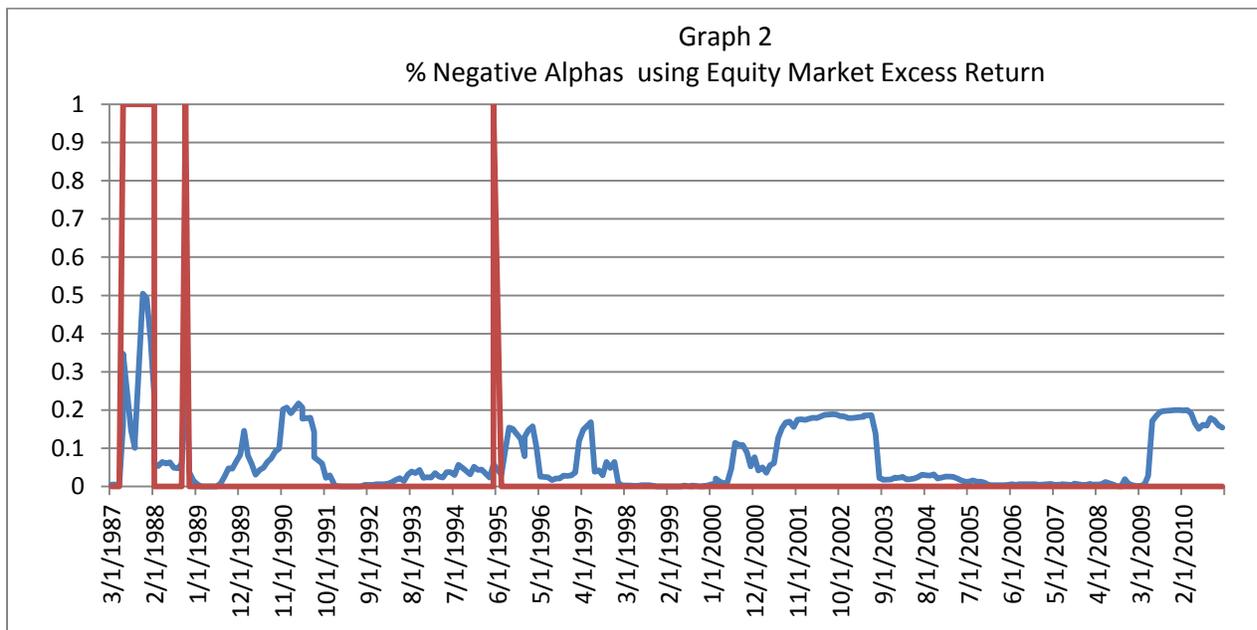
After the alphas are estimated, the percentage of positive and statistically significant alphas ( $p < 0.1$ ) are calculated for each 36-month window. These percentages are then analyzed over time. The same is done for negative and significant alphas ( $p < 0.1$ ). Periods of unusually high occurrences of both outperformance and underperformance are compared to those periods in which the fund in question may out or underperform the market.

First the analysis will be performed using value-weighted equity market returns to calculate excess market return. As can be seen from Graph 1 below the fund outperforms the market in the 36 month window ending in July of 1999 until the 36 month window ending in September of 2000, with the exception of the period ending in February of 2000. The only other 36 month window in which this fund outperforms the market ends on March of 2008.



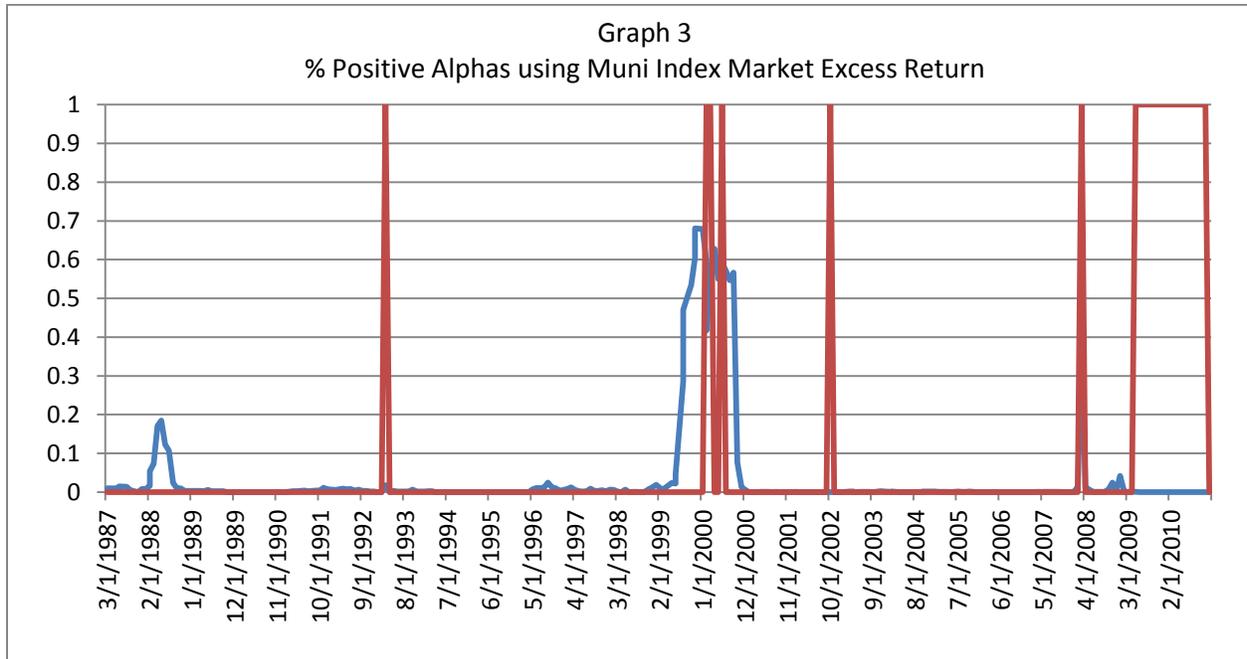
With the possible exception of the period ending in June of 2000 there does not seem to be relationship between outperformance occurrences in the general municipal bond mutual fund market and this fund.

Graph 2 show periods of unusually high underperformance in the industry compared to periods where the fund in question underperformed. As can be seen the fund underperformed early in the in time frame examined and once in 36 month window ending in May of 1995. There does not seem to be a relationship between underperformance in the overall municipal bond mutual fund market and this fund.

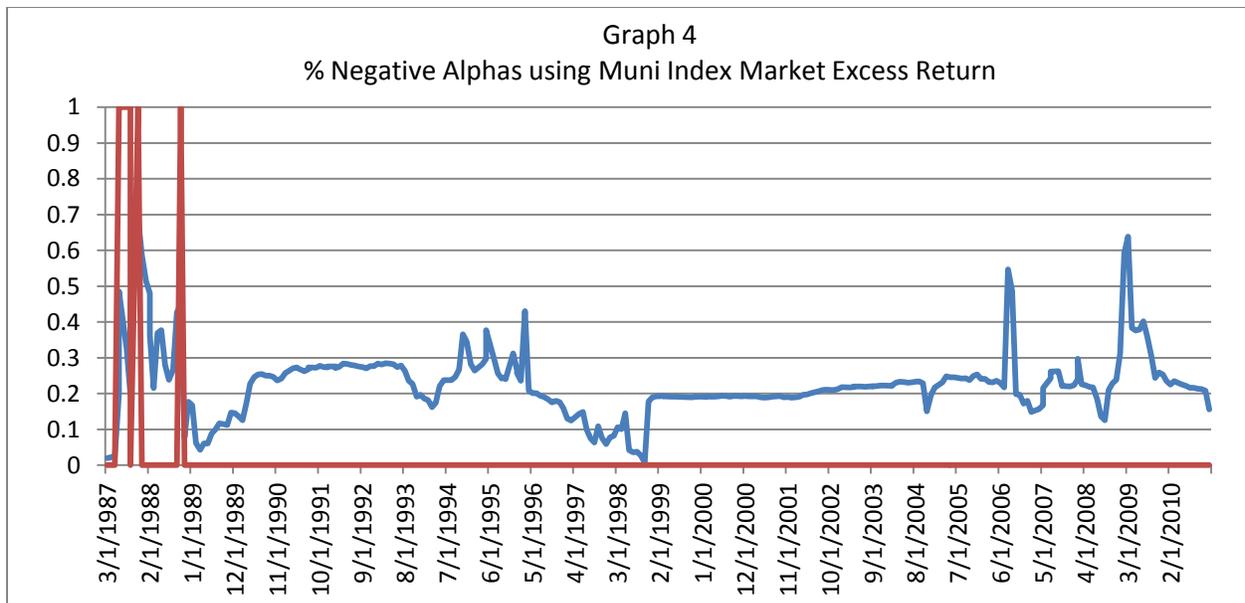


Next the relationship will be examined using the 20 year municipal bond index to calculate excess market returns within these 36 month windows. As can be seen in graph 3 there are very few 36 month windows where a large percentage of the industry outperforms the market with the exception of the window ending on July of 1999 until the 36 month window ending on September of 2000. This fund which specializes in Puerto Rican municipal bonds outperforms the market for part of this period. This fund also outperforms the market in the period from the 36 month window ending in May of 2009 until that window ending in November of 2010. The fund also outperforms in 3 other single occurrence windows. Again there does not seem to be a

strong relationship between outperformance for the fund in question and the rest of the municipal bond mutual funds in the industry.



Graph 4 below shows periods of unusually high underperformance in the industry compared to periods where the fund in question underperformed. Again there does not seem to be a relationship between underperformance in the municipal bond mutual fund market and this fund. Although there are multiple periods where a large percentage of municipal bond mutual funds underperform, the fund in question does not show evidence of underperformance after October of 1985. So there is not a lot of evidence that this fund underperforms in periods when other municipal bond mutual funds are underperforming.



It is evident that although this Puerto Rican municipal bond mutual fund does not outperform the market, neither does it underperform the market. We can conclude that this is an industry where underperformance seems to be more prevalent than outperformance. Looking at graphs 1 through 4 above it becomes evident that the fund that specializes in Puerto Rican municipal bonds does not follow the market in terms of periods where underperformance is common.

## 6. Conclusion

Municipal bond mutual funds allow investors to better manage their tax liabilities and at the same time diversify across bond holdings. This paper has evaluated one of these funds which specializes in bonds issued by US Protectorates, the largest of which is Puerto Rico. Therefore this fund invests mainly in bonds issued by the Puerto Rican government.

Although this fund does not show evidence of risk adjusted outperformance relative to other municipal bond funds in the industry, neither does it underperform the industry. Given the added tax benefits this fund has for investors in many states and Puerto Rico, the fact that it is at par with the industry is very positive for past investors in this fund.

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